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Saudi Standards, Metrology and Quality Org. (SASO)



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**Rigid Decorative Polyurethane Foam Moldings for
Interior and Exterior Use in Buildings — Requirements
and Test Methods**

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Foreword

Saudi Standards, Metrology and Quality Organization (SASO) has prepared the Saudi Standard “**Rigid Decorative Polyurethane Foam Moldings for Interior and Exterior Use in Buildings — Requirements and Test Methods**” based on International and National foreign Standards and references.

Rigid Decorative Polyurethane Foam Moldings for Interior and Exterior Use in Buildings — Requirements and Test Methods

1. Scope

This standard specifies the requirements, sampling, and test methods for molded rigid decorative polyurethane (PU) foam products intended for use as decorative elements in buildings, manufactured in various shapes and forms.

This standard does not apply to polyurethane foam products intended for load-bearing applications, including but not limited to heavy-duty seating, office furniture seats, or scatter cushions.

2. Normative references

2.1 ISO 105-B01, Textiles — Tests for color fastness — Part B01: Color fastness to light: Daylight.

2.2 SASO ISO 1923, Cellular plastics and rubbers — Determination of linear dimensions.

2.3 ISO 845, Cellular plastics and rubbers — Determination of apparent density.

2.4 SASO ISO 844, Rigid cellular plastics — Determination of compression properties.

2.5 SASO ISO 178, Plastics — Determination of flexural properties.

2.6 SASO ISO 527-1, Plastics — Determination of tensile properties — Part 1: General principles.

2.7 SASO ISO 527-2, Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics.

2.8 ISO 2896, Rigid cellular plastics — Determination of water absorption.

2.9 SASO ISO 9772, Cellular plastics — Determination of horizontal burning characteristics of small specimens subjected to a small flame.

2.10 SASO ISO 2808, Paints and varnishes — Determination of film thickness.

2.11 SASO ISO 4624, Paints and varnishes — Pull-off test for adhesion.

2.12 SASO ISO 4892-2, Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps.

2.13 SASO ISO 4628, Paints and varnishes — Evaluation of degradation of coatings — Designation of quantity and size of defects, and of intensity of uniform changes in appearance.

2.14 SASO ASTM D3574, Standard Test Methods for Flexible Cellular Materials—Slab, Bonded, and Molded Urethane Foams.

2.15 ASTM D7091, Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals.

2.16 SASO ASTM D4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

2.17 SASO ASTM G154, Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.

2.18 SASO ASTM G155, **Standard Practice** for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials.

3. Terms and Definitions

3.1 Polyurethane foam (PU foam): Cellular polymer material produced by the reaction of polyhydroxy compounds, water and isocyanates.

3.2 Rigid polyurethane foam: Polyurethane foam having a predominantly closed-cell structure and sufficient stiffness to maintain its shape under normal service conditions.

3.3 Molded polyurethane foam product: Polyurethane foam product produced in a closed mould by reaction injection moulding or equivalent moulding process.

3.4 Decorative polyurethane foam mouldings: Rigid polyurethane foam products manufactured in various shapes and profiles and intended for decorative use in buildings.

3.5 Coating system: One or more coating layers applied to the surface of polyurethane foam mouldings, including primer and finishing layers, intended to provide protection and improve durability and weather resistance.

3.6 Primer: Preparatory coating applied to polyurethane foam moldings prior to finishing coats to improve adhesion, surface sealing and durability.

3.7 Adhesive: Substance used to bond polyurethane foam moldings to building substrates or to join foam parts together.

3.8 Dimensions: Measurements of a product or test specimen in different directions, including length, width and thickness.

3.9 Density: Mass per unit volume of the foam material, expressed in kilograms per cubic meter (kg/m^3).

3.10 Tensile strength: Maximum tensile stress sustained by a test specimen during a tensile test, expressed in megapascals (MPa).

3.11 Compressive strength: Compressive stress required to deform a test specimen to a specified strain level, expressed in megapascals (MPa).

3.12 Flexural strength: Maximum stress in the outer surface of a test specimen at the moment of failure during a flexural test, expressed in megapascals (MPa).

3.13 Water absorption: Increase in mass of a test specimen after immersion in water for a specified period, expressed as a percentage by mass.

3.14 Dimensional stability: Ability of a product or test specimen to retain its original dimensions when exposed to specified environmental conditions such as heat and humidity.

3.15 Straightness (warpage): Maximum deviation of a product from a straight line measured over a specified length.

3.16 Squareness (end deviation): Maximum deviation of the end surface of a product from a plane perpendicular to its longitudinal axis.

3.17 Weather resistance: Ability of coated polyurethane foam moldings to withstand environmental exposure such as ultraviolet radiation, moisture and temperature variation without significant degradation.

3.18 Color fastness: Ability of the coating or surface finish to resist fading or color change when exposed to light or weathering conditions.

3.19 Impact resistance: Ability of polyurethane foam moldings to withstand mechanical shock or impact without cracking, breaking or surface damage.

3.20 Flammability: Ability of polyurethane foam moldings to resist ignition and flame spread under specified test conditions.

3.21 Lot: A quantity of products of the same type and specification, produced under uniform conditions and submitted for inspection and testing as one group.

4. Classification

Rigid polyurethane foam decorative Moldings shall be classified as given in **Table 1**:

Table1 –Rigid polyurethane foam classification

Category	Classification	Description
Coating System	Class 1: Coated	Rigid PU foam decorative Moldings provided with a protective coating system.
	Class 2: Uncoated	Rigid PU foam decorative Moldings supplied without coating.
Application	Type I: Interior Use	Products intended for indoor decorative use.
	Type II: Exterior Use	Products intended for outdoor decorative use, exposed to weathering.

Uncoated rigid polyurethane foam decorative Moldings (**Class 2**) shall not be used for exterior applications (**Type II**) unless protected by an approved coating system meeting the requirements of **Class 1**.

5. Requirements

5.1 Appearance

5.1.1 The material shall consist of a uniform network of cells and shall be free from any flaws, stains and other defects which might detrimentally affect the serviceability.

5.1.2 Foam thickness ranges from 10 mm up to 300 mm.

5.1.3 The primer, color and texture shall be uniform and shall be as agreed between the supplier and the purchaser, having regard to the tendency for polyurethane foam to change color on exposure to light. For this purpose, the colorfastness test can be performed according to [ISO 105-B01](#).

5.1.4 Decorative elements made of polyurethane (Class 1 and Class 2) must be free from cracks, voids, flaking, excess bubbles, or unacceptable surface defects.

5.2 Workmanship requirements

5.2.1 The straightness/warpage of the product shall not exceed 2.0 mm per 1000 mm, when tested in accordance with [SASO ISO 1923](#), and shall comply with the requirements for Class 1 and Class 2.

5.2.2 The squareness (end deviation) of the product shall not exceed 1.0 mm, when tested in accordance with [SASO ISO 1923](#), and shall comply with the requirements for Class 1 and Class 2.

5.2 Joints

Where it is necessary to join lengths of material together, the joint shall be as strong as the foam itself, and the adhesive or method of joining used shall not be injurious to the foam or to the material to which it is to be laminated. The construction and minimum spacing of joints shall be as agreed between the purchaser and the supplier.

5.3 Odour

The material shall be free from objectionable odour.

5.4 Dimensional tolerances

The nominal dimensional shall be agreed between the purchaser and the supplier.

Tolerances on dimensional shall be as given in [Table 2](#).

Table2 – Dimensional tolerances

Requirement	Acceptance limit	Applicable classification	Test method
Length tolerance	± 1.0 mm per 1000 mm	Class 1 & Class 2	SASO ISO 1923

Width/height tolerance	± 0.8 mm	Class 1 & Class 2	SASO ISO 1923
Thickness tolerance	± 0.5 mm	Class 1 & Class 2	SASO ISO 1923

5.5 Performance requirements

5.5.1 The performance requirements, determined in accordance with the appropriate methods indicated in test methods, shall be in accordance with the limits stated in [Table 3](#).

Table 3 — Performance requirements for Class 1 & Class 2

Property	Performance Limit	Test Methods
Density (kg/m ³)	≥ 120	ISO 845
Compressive strength at 10% strain (MPa)	≥ 0.60	SASO ISO 844
Flexural strength (MPa)	≥ 1.00	SASO ISO 178
Tensile strength (MPa)	≥ 0.50	ISO 527-1 / SASO ISO 527-2
Water absorption	Coated $\leq 2.0\%$ by mass; Uncoated $\leq 5.0\%$ by mass	ISO 2896
Dimensional stability at elevated temperature	Linear change $\leq 2.0\%$ after exposure at 70°C for 24 h	ISO 2796

5.5.2 For Class 1 products, the coating and exterior performance shall be evaluated in accordance with the applicable test methods, and the results shall comply with the requirements specified in Table 4.

Table 4 — Coating and exterior performance requirements (Class 1 only)

Requirement	Acceptance limit	Applicable classification	Test method
Coating thickness	≥ 1.0 mm (minimum system thickness)	Class 1 (Coated)	SASO ISO 2808 / ASTM D7091
Coating adhesion strength (pull-off)	≥ 0.50 MPa	Class 1 (Coated)	SASO ISO 4624 / SASO ASTM D4541
UV resistance / weathering (Exterior)	No cracking, peeling or blistering after accelerated UV exposure	Type II (Exterior) - Class 1	SASO ISO 4892-2 / SASO ASTM G154 / SASO ASTM G155
Coating defect rating after weathering	Rating shall be in accordance with SASO ISO 4628 with no severe cracking or flaking	Type II (Exterior) - Class 1	SASO ISO 4628

5.6 Flammability requirements

5.6.1 Rigid decorative polyurethane (PU) foam moldings intended for interior and exterior use in buildings shall be tested for flammability (reaction to fire) in accordance with [SASO ISO 9772](#).

5.6.2 The product shall meet the requirements of Class HB (horizontal burning performance) as determined by [SASO ISO 9772](#).

5.6.3 The product shall comply with the following requirements:

a) The burning rate shall not exceed 100 mm/min.

- b) The product shall not exhibit flaming drips or flaming particles during the test.
- c) The after-flame time shall not exceed 10 s after removal of the ignition flame.

6. Sampling

6.1 Samples shall be selected at random from each production lot.

6.2 A lot shall consist of products of the same model/profile, classification (Class 1 or Class 2), type (Type I or Type II), manufactured using the same formulation and, where applicable, the same coating system under essentially the same production conditions.

6.3 Unless otherwise specified, the minimum number of finished products sampled from each lot shall be as follows:

- a) lot size up to 1 200 units: 5 units;
- b) lot size from 1 201 to 10 000 units: 8 units;
- c) lot size exceeding 10 000 units: 13 units.

6.4 Where test specimens cannot be obtained from finished products due to shape or size, specimens shall be cut from representative locations or prepared from molded test slabs manufactured using the same formulation and process conditions, as agreed between the purchaser and the supplier.

7 Conformity Assessment

7.1 A lot shall be considered conforming to this standard when all applicable requirements are met.

7.2 Dimensional tolerances, workmanship requirements, marking requirements, and flammability requirements shall be assessed on the sampled finished products. Failure of any sampled unit to comply with these requirements shall constitute failure of the lot.

7.3 For measured physical and mechanical properties, unless otherwise specified in the relevant test method, at least five (5) test specimens shall be tested for each property. The average value shall comply with the specified requirement, and no individual test result shall deviate by more than 10 % from the specified limit.

7.4 For safety-related requirements, including flammability performance, all test specimens shall comply with the specified acceptance criteria.

8 Packaging and marking

The product shall be packaged in such a manner as to be protected against possible contamination and deformation. Each product or package shall be marked with the following information:

- a) The name and/or distinctive mark of the manufacturer;
- b) The production date and/or batch number.
- c) The product name;
- d) Dimensions (Thickness, width and length);
- e) The number of this standard;
- f) Intended use (Interior **Type I** or Exterior **Type II**);
- g) Classification (Class 1 or Class 2);
- h) Country of origin.

Bibliography

- 1) **EN 13165:** Thermal insulation products for buildings - Factory made rigid polyurethane foam (PU) products – Specification.
- 2) **ASTM C1029:** Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.
- 3) **ISO 4590:** Rigid cellular plastics — Determination of the volume percentage of open cells and of closed cells.