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**Unplasticized polyvinyl chloride (PVC-U) profiles for the doors
and windows**

门、窗用未增塑聚氯乙烯(PVC-U)型材

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1 Scope

This document specifies the materials, the classification, grading and designation, the requirements, the inspection rules and the marking, packing, transport and storage of unplasticized polyvinyl chloride (PVC-U) profiles for doors and windows, and describes the test methods.

It applies to the production, the inspection and the sale of profiles for doors and windows made mainly of unplasticized polyvinyl chloride.

2 Normative references

The contents of the following documents constitute indispensable provisions of this document through normative reference in the text. For dated references, only the edition corresponding to that date applies. For undated references, the latest edition, including all amendments, applies.

GB/T 250 Textiles - Tests for colour fastness - Grey scale for assessing change in colour ·
 GB/T 1033.1 Plastics - Determination of the density of non-cellular plastics - Part 1:
 Immersion method, liquid pycnometer method and titration method · GB/T 1040.2 Plastics -
 Determination of tensile properties - Part 2: Test conditions for moulding and extrusion
 plastics · GB/T 1043.1 Plastics - Determination of Charpy impact properties - Part 1:
 Non-instrumented impact test · GB/T 1633 Plastics - Thermoplastic materials -

Determination of Vicat softening temperature (VST) · GB/T 1766-2008 Paints and varnishes - Rating schemes of degradation of coats · GB/T 2828.1 Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection · GB/T 6739 Paints and varnishes - Determination of film hardness by pencil test · GB/T 7122 Determination of peel strength of high strength adhesive bond - Floating roller method · GB/T 8484-2020 Test method of thermal insulating properties for building external windows and doors · GB/T 9286 Paints and varnishes - Cross-cut test · GB/T 9341 Plastics - Determination of flexural properties · GB/T 11186 Methods for measuring the colour of paint films · GB/T 12000 Plastics - Determination of the effects of exposure to damp heat, water spray and salt mist · GB/T 16422.2-2022 Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps · GB/T 33284 Indoor decorating and refurbishing materials - Limit of harmful substances of unplasticized polyvinyl chloride (PVC-U) profiles for windows and doors · JG/T 176 Functional and structural dimensions of plastic windows, doors and profiles · JG/T 451 Unplasticized polyvinyl chloride compound for building plastic window and door profiles · QB/T 5080 Special coloured co-extrusion compound for unplasticized polyvinyl chloride (PVC-U) profiles - Technical requirements

3 Terms and definitions

profile: product of a particular cross-sectional shape produced by extrusion.

homogenous profile: profile whose material is uniform throughout.

white profile: profile whose colour lies within L^* not less than 82, a^* from -2.5 to 5 and b^* from -5 to 15 in the CIE 1976 ($L^*a^*b^*$) colour space.

profile laminated with foil: profile decorated, and its surface properties changed, by laminating a film onto it.

co-extruded profile: profile decorated, and its surface properties changed, by co-extruding a polymer material.

coating profile: profile decorated, and its surface properties changed, by applying a coating.

main profile: frame, sash (other than the insect screen sash) and mullion profile.

auxiliary profile: profile other than a main profile.

sight surface: surface of the profile that can be seen at eye level when the installed door or window is closed.

decorative surface: surface of the profile that has been laminated, co-extruded or coated.

special decorative surface: decoration made up of more than one colour, of a surface that is not flat, or the like.

decorative profile: profile having a decorative surface.

base profile: body of the profile other than the decorative surface.

depth of a profile, D: greatest distance measured between the two sight surfaces along the X axis of the cross-section of the profile.

overall width of a profile, W: greatest dimension of the structure measured along the Y axis of the cross-section of the profile.

4 Materials

The base material of the profile shall meet JG/T 451, its Vicat softening temperature (VST) being not less than 78 degrees Celsius.

A suitable proportion of the reclaimed material generated by the enterprise itself is permitted as base material.

The special coloured co-extrusion compound of co-extruded profiles shall meet QB/T 5080.

5 Classification, grading and designation

By colour and process, profiles are divided into homogenous profiles - white (BT) and non-white (FBT) - and decorative profiles - laminated with foil (FM), co-extruded (GJ) and coated (TZ). A profile with a white decorative surface is classified by its process.

By the wall thickness of the main profile, profiles are divided into classes AA, A and B.

By the falling-weight impact of the main profile they are graded I, II and III; by ageing time M, S and SS; and by the thermal insulation of the main profile 1, 2, 3, 4 and 5.

Designation of the main profile, by examples: a white homogenous profile with a sight-surface wall thickness of 2.5 mm, a drop height of 1 000 mm at -10 degrees Celsius, an ageing time of 4 000 h and a heat transfer coefficient of 1.8 W/(m²·K) is designated BT-B-I-M-1; a co-extruded profile with a wall thickness of 2.8 mm, a drop height of 1 500 mm at -20 degrees Celsius, an ageing time of 6 000 h and a heat transfer coefficient of 1.3 W/(m²·K) is designated GJ-A-III-S-3; and a profile co-extruded on one face and laminated on the other, with a wall thickness of 2.5 mm, a drop height of 1 500 mm at -10 degrees Celsius, an ageing time of 6 000 h and a heat transfer coefficient of 0.82 W/(m²·K) is designated GJ/FM-B-II-S-4.

6 Requirements

Appearance: the colour of the sight surfaces shall be uniform and the surface smooth and flat, free of marked unevenness and of foreign matter; the ends shall be clean and free of burrs. Faint shrinkage marks caused by the process are permitted. Decorative profiles shall also meet Table 2: on FM profiles the film shall cover completely and lie flat, free of bubbles

and overhanging edges; on GJ profiles the co-extruded face shall not show the substrate; and on TZ profiles the coated face shall be free of bubbles, pinholes, cracks, runs, exposed substrate, foreign matter and wrinkling. The appearance requirements for special decorative profiles may be agreed between customer and manufacturer.

Dimensions and deviations: the deviation is plus or minus 0.3 mm on the depth D and plus or minus 0.5 mm on the overall width W; the functional and structural dimensions and their deviations shall meet JG/T 176.

Minimum wall thickness of the main profile (Table 4): class AA, not less than 3.0 mm on the sight surface and 2.8 mm elsewhere; class A, 2.8 mm and 2.5 mm; class B, 2.5 mm and 2.2 mm. For GJ and TZ profiles the wall thickness includes the decorative surface; for FM profiles it excludes the film and the adhesive layer.

Thickness of the decorative surface: the film of an FM profile shall be not less than 0.160 mm; the dry film on the sight surface of a TZ profile not less than 0.025 mm; and the co-extruded layer of a GJ profile not less than 0.10 mm.

Straightness: the deviation over a 1 m length shall be not more than 1 mm for main profiles and not more than 3 mm for auxiliary profiles. The mass per metre of the main profile shall be not less than 95 % of the nominal mass.

Dimensional change after heating: not more than 2.0 % on the two opposite largest sight surfaces of the main profile, the difference between the two sight surfaces of one specimen being not more than 0.4 %; not more than 3.0 % for auxiliary profiles. After heating, the surface shall be free of bubbles, cracks and pitting, and on decorative profiles there shall be no delamination or blistering between the layers or between layer and substrate, and no peeling or blistering of the coating.

Falling-weight impact of the main profile (Table 6): with a 1 000 g weight, grade I is a drop of 1 000 mm at -10 degrees Celsius, grade II a drop of 1 500 mm at -10 degrees Celsius and grade III a drop of 1 500 mm at -20 degrees Celsius; not more than one specimen shall crack on the sight surface. Where the mean temperature of the coldest month is below -10 degrees Celsius, grade II or III should be chosen in the design. On the decorative sight surface of a decorative profile, whether or not the decorative surface cracks, the film, co-extruded or coated layer shall not delaminate from the substrate.

Properties of the base material: the density shall be not more than 1 480 kg/m³; the Vicat softening temperature not less than 78 degrees Celsius; the tensile stress at yield not less than 37 MPa and the nominal tensile strain at break not less than 100 %; and the flexural modulus not less than 2 200 MPa.

Decorative layers: the peel strength between the film and the substrate of an FM profile shall be not less than 2.5 N/mm; the pencil hardness of a TZ coating not less than H and its cross-cut adhesion to the substrate class 0; and on a GJ profile the co-extruded face shall