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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 27797.2-2011

**Fibre-reinforced plastics - Methods of producing test plates -
Part 2: Contact and spray-up moulding**

纤维增强塑料 试验板制备方法 第2部分：接触和喷射模塑

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1 Scope

This part of GB/T 27797 lays down the methods of producing reinforced plastic test plates by contact moulding and by spray-up moulding.

It applies only to glass-fibre reinforcement.

This part is used together with GB/T 27797.1.

2 Normative references

The documents listed below cannot be dispensed with for the application of this document. For dated references only the edition corresponding to that date applies; for undated references the latest edition, including any amendments, applies.

ISO 1172 Textile-glass-reinforced plastics - Prepregs, moulding compounds and laminates - Determination of the textile-glass and mineral filler content - Calcination methods.

ISO 1268-1 Fibre-reinforced plastics - Methods of producing test plates - Part 1: General conditions.

3 Health and safety

See ISO 1268-1.

4 Principle

4.1.1 Contact moulding. The reinforcement layers described in 5.1 are placed on a rigid flat plate and impregnated by hand with the liquid thermosetting resin. The lay-up is to be completed within the curing cycle recommended by the resin supplier and the exposure of the resin to air is to be kept as small as possible. A hand roller is used to consolidate the material.

4.1.2 The method applies to any thermosetting resin that cures at ordinary temperature and atmospheric pressure.

4.2.1 Spray-up moulding. A chopper unit cuts the glass-fibre roving to a preset length and the chopped fibre is mixed with the resin spray coming from the spray gun; the deposit is consolidated with a hand roller.

4.2.2 The glass fibre and the resin are sprayed onto the rigid flat plate and consolidated with a hand roller. The method applies to unsaturated polyester resins.

5 Materials

5.1.1 Contact moulding - reinforcement: cut to the same size as the test plate, with the warp and weft directions or the preferred direction marked. Suitable materials are chopped strand mat containing a binder which is soluble in the matrix resin, woven fabric made of rovings or of fine yarns, non-woven fabric and the like.

5.1.2 Thermosetting resin and curing agent: mixed according to the instructions of the supplier.

5.1.3 Release agent: applied to the flat plate or to the mould when the test plate is prepared.

5.2.1 Spray-up moulding - rovings or bundles of fine yarn.

5.2.2 Pre-accelerated thermosetting resin; a resin recommended for spray-up moulding is preferred.

5.2.3 Catalyst: the catalyst recommended for the resin in use.

5.2.4 Release agent.

6 Dimensions

6.1 General. The length, the width and the thickness of the plate depend on the raw materials and on the preparation process used.

6.2.1 Contact moulding: the recommended size is 600 mm by 600 mm, which yields enough tensile and flexural specimens in two directions.

6.2.2 The thickness is to be between 2 mm and 10 mm.

6.3 Spray-up moulding: the size is to be large enough to allow tensile and flexural testing in two mutually perpendicular directions, the recommended size being 600 mm by 600 mm. The thickness is not to exceed the thickness from which a roller can completely drive out all the bubbles of the laminate, the typical value being from 2 mm to 5 mm.

7 Reinforcement content

7.1 General. The reinforcement content of the laminate depends on the type of material used. The recommended reinforcement contents are 50 % $\pm$ 3 % for roving fabric and 32 % $\pm$ 4 % for mat and chopped rovings.

7.2 Contact moulding. To obtain the expected thickness and fibre content, the number of layers of reinforcement material is to be fixed before the final preparation scheme is settled; see Annex A. Where necessary, preliminary trials are made and the properties are tested.

7.3.1 Spray-up moulding. To obtain the expected thickness and fibre content, the final spraying scheme is fixed by preliminary trials, before the spraying is carried out.

7.3.2 For multi-layer spraying, one single spray gun is best used; the thickness of each sprayed layer is about 1 mm.

8 Equipment

8.1.1 Contact moulding - scissors or blade, used to cut the reinforcement material.

8.1.2 Balance, accurate to 0.1 g.

8.1.3 Beaker, of glass or plastic material; it may also be of uncoated or waxed paper.

8.1.4 Brush.

8.1.5 Roller, of mohair or of steel, with or without a backing pad.

8.1.6 Rigid flat plate, which may be of polished steel or of non-porous material, with raised edges to prevent the resin from overflowing; the material of the plate is not to affect the properties of the resin.

8.1.7 Forced-air oven, with a timer and a control device.

8.1.8 Desiccator.

8.2 Spray-up moulding. The equipment is that of 8.1 with the addition of: a) a glass-fibre chopper unit and a spray gun unit; b) a stopwatch.

9 Procedure

9.1.1 Contact moulding. The test plate is prepared with the same parameters as the

laminate produced, that is number of layers, angle, fibre content and type of resin.

9.1.2 A release agent is brushed on the surface of the flat plate or of the mould and is polished when dry.

9.1.3 The reinforcement material is cut to the size needed, of a surface large enough to allow specimens to be machined; the state of the material is adjusted and, where necessary, it is dried before use.

9.1.4 The total mass of the reinforcement material is weighed after its state has been adjusted.

9.1.5 The mass of resin needed to obtain the intended reinforcement content is determined by formula (1), whose legend is: the mass of resin, in grams; the mass of the glass fibre, in grams; and the glass-fibre content of the laminate, expressed as a percentage of the total mass. Note: about 20 % more resin is needed, since resin is lost by overflow at the edges and by absorption on the roller.

9.1.6 Before the curing agent is added, the resin is brought to room temperature and the mixture is prepared immediately after it has been evenly mixed.

9.1.7 A thin layer of resin is brushed on the surface of the mould, then the first layer of reinforcement material is carefully laid on that resin layer; resin is passed into the first layer, the roller is used to drive out the bubbles, the reinforcement material is impregnated, then a further layer of resin is brushed on, the second layer of reinforcement material is laid, and the operation is repeated until the intended thickness is reached.

9.1.8 When the lay-up is completed, the test plate is cured (see 9.3).

9.2.1 Spray-up moulding. The glass-fibre roving of the type specified is placed in the chopper unit; the knife roller is adjusted so that the pressure between the knife roller and the anvil roller gives a clean cut.

9.2.2 The pre-accelerated resin and the catalyst are placed in the storage tank of the equipment.

9.2.3 The chopper unit is run for 15 s and the mass of the chopped fibre is weighed. The mass of the resin in the container is weighed. The pressure of the spray gun is adjusted, without the atomizing function being switched on, so that the intended ratio between the resin output and the glass-fibre output is reached in a suitable container such as a paper cup.

9.2.4 A release agent is brushed on the surface of the flat plate or of the mould and is polished when dry.

9.2.5 The chopped fibre and the resin are sprayed evenly on the flat plate or on the mould, and after each layer has been sprayed the bubbles are driven out with the roller.