

Quality control requirements for reinforced plastic mouldings

Part 1. Guide to the preparation of a scheme to control the quality of glass reinforced polyester mouldings

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Committees responsible for this British Standard

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- BEAMA Ltd.
- British Plastics Federation
- Chemical Industries Association
- Department of the Environment (Building Research Establishment)
- Department of Trade and Industry (National Physical Laboratory)
- European Resin Manufacturers' Association
- Ministry of Defence
- Motor Industry Research Association
- RAPRA Technology Ltd.
- Society of Motor Manufacturers' and Traders Ltd.

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Foreword

This British Standard was prepared by Technical Committee PRI/42. It supersedes BS 4549 : Part 1 : 1970 which is withdrawn and takes into account the revision of the standards for glass fibre reinforcement (BS 3396, BS 3691 and BS 3749) and polyester laminating resin (BS 3532) made since BS 4549 : Part 1 was first published.

This revision presents the materials properties in a form consistent with current best design practice, as illustrated by BS 4994 : 1987 *Specification for design and construction of vessels and tanks in reinforced plastics*.

The purpose of this standard is two fold:

- to facilitate the preparation of adequate schemes for the quality control of the production of reinforced plastic mouldings, such as might be included in a certified quality scheme, e.g. BS 5750;
- to define all types of GRP laminates with clearly defined mechanical properties that designers can call up by code number thereby avoiding any potential problems arising from lack of clarity in the laminate specification.

It is recognized that for the satisfactory performance of glass reinforced mouldings it is necessary to give consideration to the selection of the resin system, the reinforcement and the method of manufacture. Prior to the acceptance of a particular design it may be necessary to undertake a programme of type approval tests relevant to the specific application. This standard is intended as a guide to the test of a routine nature undertaken to ensure the continued supply of satisfactory mouldings, and does not extend to type approval tests.

It is intended that BS 4549 be composed of several Parts. Part 2 specifies the composition and mechanical properties of a number of standard laminates made from polyester resin, reinforced with either chopped strand mat or randomly deposited glass fibres.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, an inside back cover and a back cover.

Guide

1 Scope

This Part of BS 4549 gives guidance on the preparation of a scheme to control the quality of all types of glass reinforced polyester laminates and mouldings to enable conformity to the laminate specification.

2 References

2.1 Normative references

This Part of BS 4549 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on page 9. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 4549 only when incorporated in it by updating or revision.

2.2 Informative references

This Part of BS 4549 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on page 10, but reference should be made to the latest editions.

3 Materials

3.1 General

For adequate quality control, the particular resin and reinforcement to be used should be specified and of a consistent quality.

Glass fibre reinforcements should conform to BS 3496 for chopped strand mat or BS 3691 for chopping roving. Polyester resin, filled or unfilled, should conform to BS 3532. All laminating materials, including catalyst and accelerator, if required, should be obtained from manufacturers registered under a recognized quality certification scheme.

3.2 Laminates

The laminate composition and the required mechanical properties should be clearly defined in the laminate specification. Laminates should be specified in accordance with BS 4549 : Part 2.

3.3 Moulding procedures

The moulding procedures should be clearly defined and include sufficient written records to allow full traceability of the materials used in the laminate, the moulding and workshop conditions and the laminators involved.

Laminator training and certification to a nationally recognized procedure is recommended.

The information on the moulding procedure should include the items listed in annex B, but not necessarily limited to this list. Further information may also be given in other reference documentation and on the component drawing.

A suggestion for a simple laminate production record sheet suitable for hand laminating is given in annex E.

3.4 Certification of the moulded laminate properties

The dimensional and physical properties of the moulded products should be determined by the test methods listed in this standard, together with such other tests as may be necessary to ensure conformity to other specified properties to meet specific needs. The sampling plan and testing frequency should be in accordance with a recognized statistical sampling plan standard.

NOTE. BS 6000, BS 6001 and BS 6002 provide a comprehensive guide to sampling procedures for production runs of identical items. For small production batches 100 % inspection may be necessary or some other simple plan may be acceptable.

4 Selection of test specimens and frequency of sampling

4.1 Selection of test specimens

For the determination of dimensions, Barcol hardness and loss on ignition, the test specimen should be taken from the moulding. The number of test specimens and their location in the moulding will depend on the size, shape and complexity of the individual moulding. For some other tests it may be necessary for the test specimens to be taken from a special flat moulding, made from the same materials and under the same fabrication conditions. In this case it is essential that the method of preparation of this test moulding should be specified in detail and should follow as closely as is reasonable the method used in the manufacture of the moulding.

Test specimens intended for the determination of mechanical properties should be taken from laminates or mouldings that have either been post cured to the specified schedule or which have been kept under defined conditions for a minimum period. BS 4549 : Part 2 defines a set of controlled cure conditions. Other conditions may be defined in individual product specifications where these are more appropriate.

NOTE. It is the manufacturer's responsibility to ensure that the test moulding is representative of the whole production batch.

4.2 Frequency or level of sampling

The frequency of sampling should be a function of the expected variability of the tested parameter of the moulding, combined with the past history obtained from the statistical sampling described in BS 6001 and BS 6002. Although the production batch of a particular moulding may not be sufficiently large to generate statistical quality data, the total production of similar items by the same production unit may be used to define the sampling frequency. Each individual test method will define the number of measurements required to provide one reported property determination.