

METHODS OF TEST FOR
TOXICITY OF
WOOD PRESERVATIVES
TO FUNGI

B.S. 838 : 1961

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THIS BRITISH STANDARD, having been approved by the Wood Preservation Industry Standards Committee and endorsed by the Chairman of the Chemical Divisional Council, was published under the authority of the General Council on 30th March, 1961.

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The Institution desires to call attention to the fact that this British Standard does not purport to include all the necessary provisions of a contract.

In order to keep abreast of progress in the industries concerned, British Standards are subject to periodical review. Suggestions for improvements will be recorded and in due course brought to the notice of the committees charged with the revision of the standards to which they refer.

A complete list of British Standards, numbering over 5000, indexed and cross-indexed for reference, together with an abstract of each standard, will be found in the Institution's Yearbook,

This standard makes reference to the following British Standards:

B.S. 572. Interchangeable conical ground glass joints.

B.S. 658. Apparatus for the determination of distillation range.

B.S. 1282. Classification of wood preservatives and their methods of application.

British Standards are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users of British Standards should ascertain that they are in possession of the latest amendments or editions.

The following B.S.I. references relate to the work on this standard:
Committee reference WPC/10 Draft for comment A(WPC)3716

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CO-OPERATING ORGANIZATIONS

The Wood Preservation Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

- *Association of British Chemical Manufacturers
- *Association of Tar Distillers
- *Board of Trade
- *British Wood Preserving Association
- *D.S.I.R.—Forest Products Research Laboratory
- *D.S.I.R.—Laboratory of the Government Chemist
- Electricity Council, the Generating Board and the Area Boards in England and Wales
- English Joinery Manufacturers' Association (Incorporated)
- Fencing Contractors' Association
- Ministry of Agriculture, Fisheries and Food
- Ministry of Aviation
- Ministry of Power
- National Coal Board
- Post Office
- *Timber Development Association
- Timber Trade Federation of the United Kingdom

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the Committee entrusted with the preparation of this British Standard:

- Association of Clinical Pathologists
- Biochemical Society
- British Medical Association
- Crown Agents for Oversea Governments and Administrations
- Federation of Gelatine and Glue Manufacturers
- Industrial Pest Control Association

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BRITISH STANDARD METHODS OF TEST FOR TOXICITY OF WOOD PRESERVATIVES TO FUNGI

FOREWORD

This British Standard was first published in 1939. In this revision the wood block method has been retained as the basic method of test for toxicity, but procedures are now given for determining both the initial toxicity and the residual toxicity after leaching and evaporation. A test for toxicity to soft-rot microfungi is also included.

The effectiveness of any substance for the preservation of wood depends on a number of factors* of which the most important are:

- (i) Toxicity towards wood-destroying fungi, timber-boring insects and marine borers.
- (ii) Degree of permanence, i.e. resistance to leaching, evaporation and chemical decomposition.
- (iii) Penetrating power, e.g., low viscosity at temperatures at which the product is normally applied.
- (iv) Freedom from undesirable effects on timber and metals, and from hazards to health.

In the present standard, only tests for initial toxicity to fungi and residual toxicity after exposure to leaching and evaporation are considered. It must be emphasized that, whilst laboratory testing provides a convenient and reasonably rapid method of evaluating these properties, it is not possible to estimate from the results of such laboratory tests alone the precise value in practice of any substance as a wood preservative, particularly if this is to be used on timber exposed out of doors to the influence of the weather, nor to forecast the probable life of timber structures treated in any particular way with the substance.

Further it must be emphasized that the amounts of preservative found necessary to inhibit fungal attack under the conditions specified in the test cannot be assumed to be those required for the protection of timber in service. This is because the methods of impregnation and quality of timber may not be comparable with those used in the laboratory tests, and because timber in use may be exposed to weathering influences which tend to lower the effective concentration of preservative in the wood and which may not be completely reproduced in laboratory leaching procedures.

In the past, various methods have been employed to determine the toxicity of wood preservatives, but in recent years two types of test, basically similar in

* For further information, see B.S. 1282, 'Classification of wood preservatives and their methods of application'.

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principle, have generally been used. In Europe a wood block test similar to that described in the first edition of this standard has been generally adopted, whereas in America the so-called 'soil/block' method, in which soil and wood are used instead of nutrient agar, has been developed and recently adopted by the American Society for Testing Materials as a tentative standard.*

The relative values of these two methods have been discussed in several papers and the general conclusion seems to be that the results obtained by the two methods do not differ greatly. Slightly higher toxic limits for tar oils are generally obtained in the soil/block than in the agar/block method, as might be expected in view of the use of a smaller test block and a longer conditioning period in the former test. Control of the moisture content of the test blocks during the course of the test appears to be rather easier when soil is used. A disadvantage of the soil method is that handling of soil is more laborious and slower than that of agar solutions, and the test has been criticized on the grounds that soil is a variable material that cannot be standardized. Since the fungi in this method are, however, cultivated on a 'feeder' block of untreated wood resting on soil, this objection is probably of minor importance.

For the preliminary screening of chemicals as wood preservatives, determination of the minimum concentration inhibiting growth of the test fungi in malt agar (the so-called agar or Petri-dish test) may be of value for determining the toxicity.† It is most useful for determining the relative toxicity of substances of similar chemical character and of similar solubility in water, e.g., a series of phenols of different boiling points, but its use as a standard test for wood preservatives is not recommended.

Recent investigations have shown that decomposition of wood in contact with the soil and in water-cooling towers may be brought about by the action of certain cellulose-destroying microfungi which cause the so-called 'soft rot'. Preservatives intended for use in such situations should be tested according to the method laid down in Part 2, in addition to undergoing the tests laid down in Part 1 of the standard.

It is not intended that every test described in this British Standard should be carried out when information on the initial toxicity of a wood preservative is required; the appropriate tests should be selected according to the purpose for which the preservative is to be used.

This standard prescribes methods of test only and should not be used or quoted as a specification. A form of words indicating that a preservative conforms to B.S. 838 should not be used as it conveys no meaning.

NOTE. Where figures in British units are stated they are to be regarded as the standard. Any metric equivalents shown in parentheses are approximate only. More accurate conversions should be based on the tables in B.S. 350, 'Conversion factors and tables'.

* A.S.T.M. Method D-56T.

† Cartwright and Findlay, 'Decay of timber and its prevention', 2nd edn. (H.M.S.O., 1958), p. 292.

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METHODS OF TEST

SCOPE

1. This British Standard describes methods of test for the initial toxicity of wood preservatives to fungi and the residual toxicity after exposure to leaching and evaporation. A test for toxicity to soft-rot microfungi is included.

The methods are applicable to tar-oil, water-borne and organic-solvent types of wood preservatives. They enable comparisons to be made between preservatives which all belong to any one of these types; great caution should be exercised in comparing preservatives of different types, since it is not possible to ensure that one test procedure will accurately take into account the different mechanisms by which various preservatives operate under service conditions.

PART 1. WOOD BLOCK METHOD (BASIDIOMYCETE TEST)

SECTION ONE: GENERAL

PRINCIPLE

2. The principle of this test is the exposure, to pure cultures of wood-rotting fungi growing under controlled conditions, of test pieces of a perishable type of wood that have received the prescribed treatment with the preservative under investigation. Control tests are carried out at the same time, using test pieces that have been treated with the solvent (if any is used in diluting the preservative solution) before exposure to the test fungi.

Wood preservatives are generally applied to timber in one of two ways, either (i) by impregnating the wood under pressure or (ii) by brushing or by steeping the wood in the fluid.* The basis of comparison between preservatives of the first type is the determination of the minimum quantity of preservative, expressed as kilogrammes per cubic metre (or pounds per cubic foot), that inhibits attack by the test fungi, and for type (ii) is whether or not fungal attack of the treated test pieces is prevented where the preservative has been applied according to the procedure described in Clause 9.

The susceptibility of the preservative to loss by leaching and evaporation is estimated by determining the residual toxicity of the preservative in test pieces that have received the arbitrary standard washing and heating treatment described in Clause 11*b* or Clause 11*c* and comparing this residual toxicity with the toxicity determined on samples that have not been so treated.

The leaching test described in Clause 11*b* should reveal whether the preservative under test has any tendency to leach from the wood after impregnation, but for preservatives for timber to be used under conditions of high leaching hazard, for example cooling towers, marine work and other timbers subject to persistent leaching, the more severe leaching test described in Clause 11*c* should be used.

* For further information, see B.S. 1282, 'Classification of wood preservatives and their methods of application'.

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CULTURE VESSELS

3. Either flat culture flasks of the type known as Kollé flasks, or square glass bottles with wide mouths and screw tops may be used as culture vessels.

The dimensions of the Kollé flask shall be as shown in Fig. 1.

In the neck there is a reservoir for water formed by a second ridge (see Fig. 1) in which a pad of cotton wool soaked in water can be retained. To facilitate inoculation an inner tube is fitted through the large cotton wool plug closing the neck. This tube is closed by means of a small cotton wool plug.

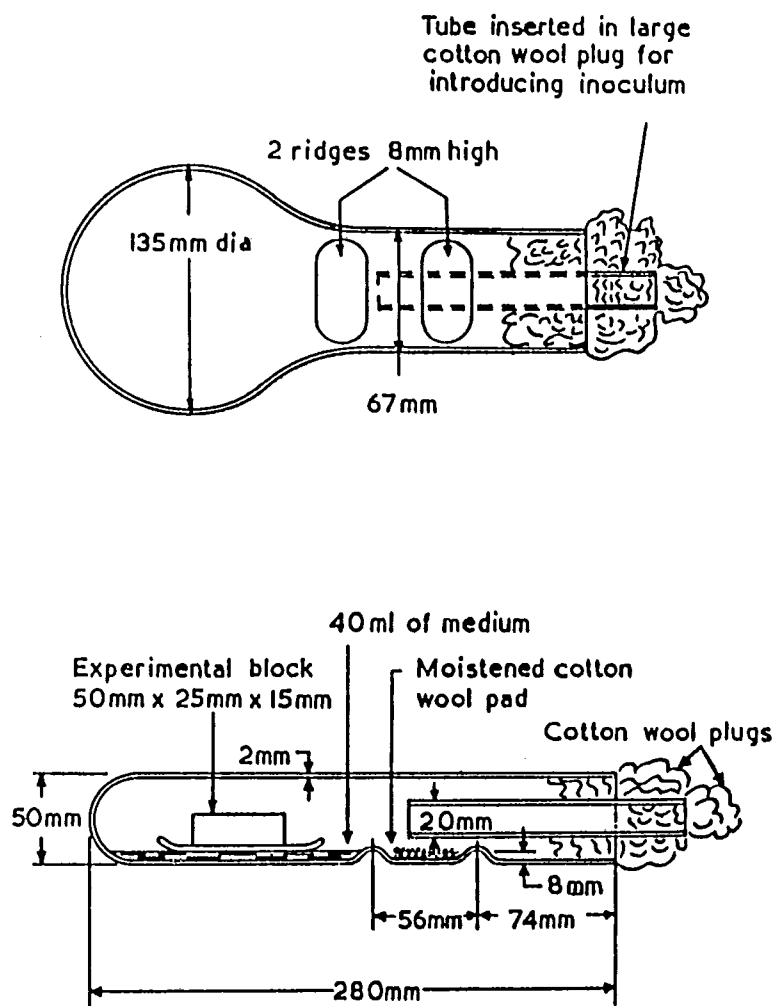


Fig. 1. Flask for wood block test of toxicity of wood preservative.