BRITISH STANDARD

BS 1982-2: 1990

Fungal resistance of panel products made of or containing materials of organic origin —

Part 2: Method for determination of resistance to cellulose-decomposing microfungi

IMPORTANT NOTE. It is essential that this Part of BS 1982 is read in conjunction with Part 0, which is published separately.

Confirmed November 2008

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Wood Preservation Standards Policy Committee (WPC/-) to Technical Committee WPC/10, upon which the following bodies were represented:

Association of Consulting Scientists
British Pest Control Association
British Wood Preserving and Damp-proofing Association
Chemical Industries Association
Department of the Environment (Building Research Establishment)
Timber Research and Development Association

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Contents

Foreword

This Part of BS 1982 has been prepared under the direction of the Wood Preservation Standards Policy Committee. BS 1982 was published in 1968 as a single standard including three test methods. This revision provides a fuller consideration of the possible hazards to organic based panel products and has been divided into Parts to allow each method to be kept up-to-date separately. The following Parts supersede BS 1982:1968 which is withdrawn.

— *Part 0: Guide to methods for determination;*

— *Part 1: Method for determination of resistance to wood-rotting Basidiomycetes;*

— *Part 2: Method for determination of resistance to cellulose-decomposing microfungi;*

— *Part 3: Methods for determination of resistance to mould or mildew.*

The soil burial procedure in this Part has been modified from the corresponding method in the 1968 edition by the introduction of preconditioning of the test samples at 50 °C. The incubation period has been extended from 12 to 16 weeks. The use of edge-sealed test samples has been introduced to assess the effect of attack through the edges. The test for the effect of moisture in the absence of fungal attack using sterile soil has been deleted. A test for the water holding capacity of the soil substrate used has been added.

WARNING. This standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

The procedures described in this standard are intended to be carried out by qualified or other suitably trained and/or supervised personnel.

Attention is also drawn to the comments on health and safety in Part 0 of this standard and to the caution in clause **2** of this Part.

Technical Committee 38 Durability of wood and wood-based products of the European Committee for Standardization (CEN) has just commenced work, under a mandate from the Commission of the European Economic Community (EEC), on the classification of biological hazards and durability of timber, performance of treated timber, and the performance testing of preservatives. With the publication of European Standards arising from this work, this Part of BS 1982 will be amended, revised or withdrawn so as to remove any conflicting aspects.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 1982 describes a method for subjecting panel products to attack by cellulose-decomposing microfungi and assessing the significance of the results obtained.

The method is applicable to rigid sheet materials which do not disintegrate upon exposure to moisture alone. It is applicable to the determination of the inherent resistance of such panel products to attack by cellulose-decomposing microfungi or the resistance to such attack conferred by the use of preserving chemicals during manufacture or subsequently.

The method of test is designed solely to meet the above objectives and is not intended to simulate any form of conditions in service. The test results in themselves cannot be used directly to predict service life in practice.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Principle

Samples of the panel products to be tested are exposed to attack by microfungi by partial burial in a natural garden soil or in prepared semi-sterilized "compost". These substrates are used to supply the inoculum of microfungi and the additional nutrients they require to permit rapid attack of ligno-cellulose. Substrate moisture contents are adjusted to provide conditions suitable for fungal growth in the test samples.

Controls of specified timber species are used to monitor the suitability of the substrate moisture content and the decaying activity of the microflora in it. After prescribed periods of incubation the extent of fungal attack is primarily assessed by determining the loss in mass of the test samples and controls.

NOTE In some tests mass loss may not be a wholly satisfactory criterion and may need to be supplemented by visual observations.

CAUTION. The test procedures involve handling and working with micro-organisms from natural populations which may present a health risk. Therefore, it is important that personnel trained in microbiology should perform those parts of the test involving handling infected test specimens. It is essential that such personnel are familiar with the general recommendations on personnel safety given in BS 2011-2.2J, in particular National appendix Z, and have appropriate equipment and facilities available.

3 Materials and reagents

3.1 Biological materials

3.1.1 *Timber stock: species.* The following shall be used for the test beech (*Fagus sylvatica* L.)

3.1.2 *Timber stock: wood quality.* Use sound, straight-grained wood without knots. The beech shall be even-grained, free from tyloses and discoloration and having a growth rate of not less than 2 and not more than 6 annual rings per centimetre.

NOTE Wood that has been floated, water-stored, chemically treated or steamed is not acceptable. Wood that has been kiln dried at temperatures below 60 °C is allowed. Information on these treatments should be obtained from the supplier.

Prior to conversion to the final dimensions for immediate use, the timber shall be conditioned to a moisture content of 12 % to 15 % (*m*/*m*) on a dry mass basis.

3.1.3 *Soil substrate.* Natural top soil or a prepared soil of pH 6 to 8 and not containing added agrochemicals. It shall have a water holding capacity (WHC) greater than 25 % (*m*/*m*) when determined by the method in Appendix A.

NOTE A horticultural soil of the John Innes No. 1 type has been found to be suitable.

If a natural soil is used, it shall have the turf or the top 50 mm removed and shall not be taken from a depth below 200 mm from the surface. It shall be passed through a sieve of nominal aperture size 12.5 mm to remove stones and larger soil particles. Prior to use the soil shall be stored in closed, moisture-proof containers.

3.2 Other materials and reagents

Water complying with grade 3 of BS 3978 shall be used throughout.

3.2.1 *Edge-sealant* (see **7.2.3**), comprising the fungicide dichlofluanid at a concentration of 0.3 % (m/m) in beeswax.

NOTE The fungicide is taken into solution in the minimum volume of white spirit and then dispersed in the molten beeswax. During preparation and use of the sealant the minimum temperature required to achieve liquidity (approximately 65 °C) should be used.

CAUTION. It is essential that the precautions normally employed with toxic chemicals are used during preparation and use and subsequently during handling of edge-sealed materials.

4 Apparatus and facilities

Ordinary laboratory apparatus and in particular the following are required.

4.1 *Facilities for vacuum filtration*, comprising vacuum source, filter flask, Buchner funnel and coarse grade fitting filter papers[1)] 125 mm in diameter.

4.2 *Ventilated drying oven*, capable of being controlled at 50 ± 1 °C and at 103 ± 2 °C (or separate ovens for each temperature).

4.3 *Sealable containers*, e.g. desiccators without desiccant.

4.4 *Culture vessels.* These shall be made of inert material and shall be provided with ventilated lids. The depth shall be at least 140 mm so as to provide at least 40 mm below the test stakes when inserted in the substrate to a depth of 80 mm and adequate clearance above the top of the protruding parts of the stakes. The exact dimensions are otherwise not critical but determine the number of stakes in each vessel (which should be not less than 10). An example of a suitable vessel is described in Appendix B.

4.5 *Culture chamber* (incubator or room), dark and capable of being maintained at 28 ± 1 °C and at 80 % r.h. or greater. It shall be provided with a water-filled tray at its base and its door shall provide a good seal.

4.6 *Analytical balance*, capable of weighing to the nearest 0.001 g.

5 Sampling

A minimum of three replicate sheets of the panel product under test shall be sampled. Ensure that they are clean and as free as possible from contaminant that might give misleading results.

6 Test specimens

6.1 General

The test specimens consist of stakes cut from sheets of the panel product under test (clause **5**) or from the beech stock (**3.1.1**).

For each test, three series of test stakes are required.

a) *Unsealed test stakes* (**6.2.1**) for testing the overall resistance of the test product to fungi throughout its thickness.

b) *Edge-sealed test stakes* (**6.2.2**) in which the cut edges are sealed using the edge-sealant (**3.2.1**) so that an effective challenge by fungi arises solely through the original faces of the product.

c) *Edge-sealed check stakes* (**6.2.3**) used to determine changes in the mass of edge-seal caused by experimental handling but not caused by fungal attack.

In addition to the test stakes cut from the test product, a series of control stakes cut from the beech stock are required.

1) *Virulence control stakes* (**6.3.1**) to assess that the decaying ability of the soil substrate is of acceptable virulence and to provide a measure of comparability between tests.

NOTE If early reassurance of the virulence of the substrate is required the test procedure using cotton fabric described in Appendix C may be used.

2) *Moisture monitoring stakes* (**6.3.2**) to assess that the initial substrate moisture content level is adequate to support active fungal attack.

3) *Size control and size check stakes* (**6.3.3**) to assess the ability of the substrate microflora to cause significant attack in the time available on samples of a given thickness and to provide a standard against which the performance of test stakes of varying thickness can be quantified.

Details of the dimensions and numbers for each type of stake are given in **6.2**. The choice of which types of stakes are to be included in a particular test programme will depend on the nature of the test product and its history and on whether this information is available. The first part of Appendix D sets out a series of questions and answers leading to the second part of the table showing the types and numbers of stakes required.

All test stakes and control stakes shall be numbered and otherwise marked to maintain stake and sheet identity.

6.2 Test stakes

6.2.1 *Unsealed test stakes*

Four replicate stakes 100 mm long by 10 mm wide shall be cut using the whole thickness of the product from each of the three sheets of the product, after rejection of the 300 mm nearest to each of the original edges. Reject any stakes that show defects such as gaps, knot voids, veneer rupture or discontinuous adhesion.

If it is intended to include artificial ageing procedures (see **7.2.2**) prior to exposure in the substrate, an additional series of stakes for each ageing procedure shall be prepared.

[1)] Whatman No. 4 filter paper has been found to be suitable.

Some types of dense panel product, e.g. wood cement particleboard or those containing water-repellent additives, may fail to attain the required moisture content (see **9.4**). If this is a possibility, cut two further stakes from each sheet and use them as wetting check stakes (see **9.4**) if required.

6.2.2 *Edge-sealed test stakes*

A series of stakes shall be cut from each test product as described in **6.2.1**, for subsequent edge-sealing as described in **7.2.3**.

6.2.3 *Edge-sealed check stakes*

Two replicate stakes shall be cut from each of the three sheets of the test product as described in **6.2.1**. They shall be handled similarly to the edge-sealed test stakes except that after edge-sealing, instead of exposure to fungal attack they shall be stored in polyethylene bags under normal laboratory conditions.

6.3 Control stakes

NOTE Use of six virulence control stakes and six moisture monitoring stakes assumes the test to be carried out in one or two culture vessels of the type described in Appendix B. If a greater number of culture vessels is used, each vessel requires three replicates each of virulence control and moisture monitoring stakes.

6.3.1 *Virulence control stakes*

Six stakes, 100 mm long by 10 mm wide by 5 mm thick, shall be cut from the beech stock (**3.1.1**). The longitudinal faces shall be parallel to the grain and the growth rings shall be at 90 ± 10° to the 100 mm × 10 mm faces.

6.3.2 *Moisture monitoring stakes*

Six stakes, 100 mm long by 10 mm wide by 5 mm thick, shall be cut from the beech stock, and orientated as described in **6.3.1**.

6.3.3 *Size control and size check stakes*

Six stakes, 100 mm long by 10 mm wide and of a thickness equal to that of the test product, shall be cut from the beech stock, and orientated as described in **6.3.1**.

If edge-sealed test stakes are to be tested, six additional size control stakes shall be cut and edge-sealed. To determine changes in the mass of the edge-seal a further six edge-sealed size check stakes are required.

7 Preparation of test materials

7.1 Determination of water content and water holding capacity (WHC) of soil substrate

Use the methods described in Appendix A.

NOTE If wood test specimens are sealed in bottles in contact with different soils, each adjusted to its own WHC, then the equilibrium moisture contents of all the wood specimens will be approximately equal.

7.2 Pretreatment of test specimens

7.2.1 *Conditioning*

Condition the stakes at 50 ± 1 °C by placing them in the drying oven (**4.2**) for periods to be determined experimentally. Cool them in a sealed container (**4.3**) and weigh the sample stakes to the nearest 0.001 g, repeating these operations until the mass is constant to 0.01 g. Record the conditioned mass (m_1) of each stake.

NOTE The use of conditioned initial mass and final mass introduces an error compared with drying at 103 °C but this error is considered to be insignificant.

7.2.2 *Artificial ageing*

If artificial ageing is required prior to any conditioning, carry out either the evaporative ageing procedure described in BS 5671-1 or the leaching procedure described in BS 5671-2 as appropriate. A separate series of untreated replicate stakes cut from the test product is required for each ageing procedure.

7.2.3 *Edge-sealing*

Melt sufficient of the edge-sealant (**3.2.1**) to provide a depth of 3 mm in a flat-bottomed container on a hot plate using minimum heat. Successively dip the cut edges of the conditioned test stakes and check stakes (**6.2**) and the equivalent faces of the size control and size check stakes (**6.3.3**) which are to be edge-sealed up to 1 mm into the molten sealant. Allow the sealant to set and repeat the dipping process. Seal any imperfections noted after the second dipping with melted sealant using a small paint brush.

Record the mass after edge-sealing (m_2) to the nearest 0.001 g.

To reduce the risk of moisture uptake during the sealing process, seal only small numbers of stakes at one time and hold the remainder in a sealed container.

8 Preparation of culture vessels and biological test

8.1 Preparation of soil substrate

Determine the WHC and the moisture content of the soil (**3.1.3**).

Determine the mass of substrate required to provide the necessary depth of substrate in the selected culture vessel. Calculate the total amount of water required by adding together the amount of water necessary to bring the substrate in the fully charged culture vessel to 95 % of its WHC (see Appendix A) and the amount of water equivalent to 50 % of the mass of the stakes to be exposed in the vessel.

Add the required mass of substrate to the culture vessel and slowly add the calculated amount of water whilst thoroughly mixing to ensure uniform distribution of moisture.

8.2 Planting the test specimens

Plant the stakes vertically, in rows, with 20 mm of their length protruding above the surface of the substrate and with a minimum of 20 mm between adjacent stakes and from the sides of the vessel. Assign the positions of the test stakes, virulence controls, moisture monitoring and size control stakes at random. During planting and subsequent handling ensure that the exact location of each stake is recorded to guard against loss of identity if the numbering is obscured. Apply a ventilated lid to the charged culture vessel.

8.3 Incubation

Transfer the charged culture vessel to the culture chamber (**4.5**) and incubate at 28 ± 1 °C for 16 weeks.

8.4 Monitoring initial moisture content

After 5 days' incubation remove the moisture monitoring stakes from the culture vessel, cleanse them of adhering soil particles and weigh to 0.001 g. Calculate the moisture content of each stake from its original conditioned mass.

The optimal conditions for decay are achieved if the mean moisture content of the moisture monitoring stakes is 50 ± 5 %. If the mean moisture content is within this range, continue to monitor as described in **8.5**.

If the mean moisture content is below 45 %, add a volume of water not greater than 10 % of that originally added (**8.1**) distributing it evenly over the surface of the substrate. Replant the moisture monitoring stakes, incubate for 2 days to allow re-equilibration and repeat the weighing. Add further water and repeat if necessary.

If the mean moisture content is greater than 55 %, remove the lid of the culture vessel and leave for one week to allow some drying. Replant the moisture monitoring stakes, replace the lid and continue incubation; recheck the moisture content of the stakes after 5 days as previously.

NOTE If a more frequent indication of substrate moisture content is required, or as an alternative to the procedure described in **8.5**, insert fresh sets of moisture monitoring stakes at suitable intervals during the incubation and check as above.

8.5 Monitoring and maintenance of substrate moisture

NOTE If the culture chamber is a sealed incubator fitted with a water tray, the moisture content may be assumed to remain constant during incubation and no monitoring of moisture content is required.

Prior to the start of incubation weigh the charged culture vessel and lid to the nearest 5 g and record the initial mass. After 4 weeks' incubation remove the culture vessel and reweigh it. Make good any loss in mass, allowing for the mass of moisture monitoring stakes removed, by addition of water distributed uniformly over the surface of the substrate. Repeat the operation at 4 week intervals.

If the vessel is too large to be weighed use the procedure described in **8.4** at 4 week intervals.

9 Post-incubation procedures

9.1 Harvesting the stakes

Remove the test and control stakes from the soil substrate and cleanse them of adhering soil particles. Make good any obscured numbering, note outstanding features of their condition and weigh each to the nearest 0.001 g and record the wet masses (m_3).

9.2 Conditioning

Transfer the stakes together with those stored under laboratory conditions (**6.2.3**) to the oven and condition as in **7.2.1**. Record the conditioned masses (m_4).

9.3 Calculation of results

Calculate the final moisture content and loss in dry mass of each stake, allowing for edge-seal where appropriate, as described in Appendix E.

9.4 Invalid results

Reject results from any test or control stakes having both a loss in mass of less than 3 % (*m*/*m*) and a final moisture content of less than 25 % (*m*/*m*) except for those stakes of a particularly dense or water-repellent nature (see **6.2.1**). In these latter cases the wetting check stakes shall be used to determine the validity of the test by the following method.

Impregnate the wetting check stakes with water, using the method described in BS 5761-2, soak overnight, then record the saturated mass (s_1) of each stake. Dry the stakes to constant mass at 103 ± 2 °C and record the dry mass (s_2) of each stake. Calculate the saturation moisture content, % (*m*/*m*), of each stake by using the formula

$$\frac{s_1 - s_2}{s_2} \times 100$$

and calculate the mean value.

If the mean saturation moisture content so determined is less than 75 % (*m*/*m*), reject any test stakes having a moisture content less than one-quarter of the calculated value on the grounds that they have not received sufficient challenge from the test fungi.

If more than one stake per sheet is rejected due to an inadequate moisture content, that part of the test shall be rejected and the reason noted in the report.

10 Validity of the test

The results shall be accepted as valid provided that the virulence control stakes (**6.3.1**) show a mean loss in mass of 25 % (*m*/*m*) or more and the size control stakes (**6.3.3**) have suffered a mean loss in mass of greater than 3 % (*m*/*m*).

11 Assessment of results

11.1 The test product shall be designated as fully resistant to attack by cellulose-decomposing microfungi if the mean loss in mass of the test stakes without edge-seal is less than 3 % (*m*/*m*), and not more than one stake has lost greater than 3 % (*m*/*m*) and no stake has lost more than 5 % (*m*/*m*).

11.2 Test products which meet the requirements in **11.1** only when the cut edges of the test stakes have been edge-sealed shall be designated as surface resistant to cellulose-decomposing microfungi.

NOTE Such products are not suitable for use in hazardous situations unless the original edges of the product and any cut edges are protected from fungal attack by a treatment of proven effectiveness under the conditions of service.

11.3 If mean mass losses are greater than 3 % (*m*/*m*), some indication of the extent of resistance to fungal attack can be deduced by comparison of the results with those obtained from the size controls (**6.3.3**). One method of undertaking this is by calculating a decay susceptibility index (DSI) by the method given in Appendix F.

12 Test report

The report shall include at least the following (see also Appendix G for an example):

a) the number and date of this Part of this British Standard, i.e. BS 1982-2:1990;

b) the title of this method;

c) the name of the applicant;

d) the name of the panel product under test and a description including as much of the following information as is available together with the basis or source of the information:

1) type, e.g. plywood, particleboard etc.;

2) identifying marks, e.g. batch number;

3) country of origin and producer;

4) main constituents including, for plywood, the species of timber in each veneer;

5) the nature of any bonding agents used;

6) product thickness and density;

7) presence of added biocides and whether incorporated during or after manufacture.

e) reference to ageing or other preconditioning procedures applied prior to exposure of any of the test pieces to fungal attack, quoting where appropriate the standard describing the method;

f) the duration and temperature of exposure to fungal attack;

g) the mean mass loss of the virulence control stakes, and the size control stakes and, if included, the mean corrected mass loss of edged-sealed size control stakes;

h) the mean mass loss of test stakes and artificially aged test stakes, and, if included, the mean corrected mass loss of edged-sealed test stakes;

i) an assessment of the results obtained using the guidelines laid down in clause **11**;

j) the organization responsible for the report and the date of issue;

k) the name and signature of the officer(s) in charge;

l) the following note:

"The interpretation and practical conclusions that can be drawn from a test report demand a specialized knowledge of the subject of wood preservation and, for this reason, this test report cannot of itself constitute an approval certificate."

The test report shall also list any variation from the described test method, as well as any factors that may have influenced the results.

Appendix A Determination of water holding capacity (WHC) of soil substrate

A.1 Principle

The ability of a soil sample to retain water against the pull of a vacuum pump has been accepted as a measure of its WHC.

A.2 Procedure

NOTE The method described is that used for a moist soil sample. If the sample is dry it should be wetted, mixed to give a crumb structure and allowed to stand overnight in a covered container prior to determination of WHC.

Place a 200 g test portion of the soil (m_1) to be used in the Buchner funnel over a coarse grade filter paper (**4.1**). Tamp down gently and flood gently with water. Apply suction for 10 min, increasing the degree of suction slowly to avoid perforation of the filter paper. Transfer the soil plus filter paper to a container of known mass (m_2) and weigh (m_5). Dry the container and contents in an oven at 103 ± 2 °C and weigh again (m_4). Repeat with two further replicate samples.

Determine the mass of a wet filter paper, after subjecting it to suction in the Buchner funnel (m_6). Determine the mass of the same filter paper after oven drying at 103 ± 2 °C (m_3).

A.3 Calculations

A.3.1 *Initial moisture content of soil*

The initial moisture content, W_1 [in % (m/m)] is given by the following formula:

$$\frac{m_1 + m_2 + m_3 - m_4}{m_4 - (m_2 + m_3)} \times 100$$

where

m_1 is the mass of soil taken (in g);

m_2 is the mass of the container (in g);

m_3 is the mass of the oven dry filter paper (in g);

m_4 is the mass of the container plus oven dry soil plus filter paper (in g).

A.3.2 *Moisture content of soil at WHC*

The moisture content of the soil at its WHC, W_2 [in % (m/m)], is given by the formula:

$$\frac{m_3 + m_5 - (m_4 + m_6)}{m_4 - (m_2 + m_3)} \times 100$$

where

m_5 is the mass of the container plus wet soil plus filter paper (in g);

m_6 is the mass of wet filter paper (in g).

A.3.3 *Amount of water required to raise moisture content of soil substrate to a given percentage of the WHC*

The amount of water is given as a percentage of the mass of soil taken by the formula:

$$\frac{\left(\frac{W_3}{100} \times W_2\right) - W_1}{100 + W_1} \times 100$$

where

W_3 is the percentage of WHC required.

A.3.4 ***Example of calculations***

The following are examples of the calculations used in **A.3**.

m_1, mass of soil taken = 200 g

m_2, mass of container = 174 g

m_3, mass of the oven dry filter paper = 1 g

m_4, mass of container plus oven dry soil plus filter paper = 367 g

m_5, mass of container plus wet soil plus filter paper = 433 g

m_6, mass of wet filter paper = 3 g

W_3, percentage of the WHC required = 95 %

W_1, initial moisture content of soil = $\dfrac{200 + 174 + 1 - 367}{367 - (174 + 1)} \times 100 = 4.2\ \%\ (m/m)$

W_2, moisture content of soil at WHC = $\dfrac{1 + 433 - (367 + 3)}{367 - (174 + 1)} \times 100 = 33.3\ \%\ (m/m)$

Additional water to raise soil to 95 % WHC = $\dfrac{\left(\dfrac{95}{100} \times 33.3\right) - 4.2}{100 + 4.2} \times 100 = 26.3\ \%\ (m/m)$

Appendix B Example of suitable culture vessel

B.1 Vessel

Plastics fish tank capacity 15 L; approximate dimensions 210 mm high × 220 mm wide × 330 mm long.

The tank is closed with a glass lid which rests on a draught strip attached to the top edges. Gaps 5 mm long are left in the stripping at two diagonal corners to allow some ventilation.

B.2 Use

The tank is filled to a depth of approximately 160 mm with moist soil substrate (about 10 kg is needed), and will accommodate up to 50 test and control stakes.

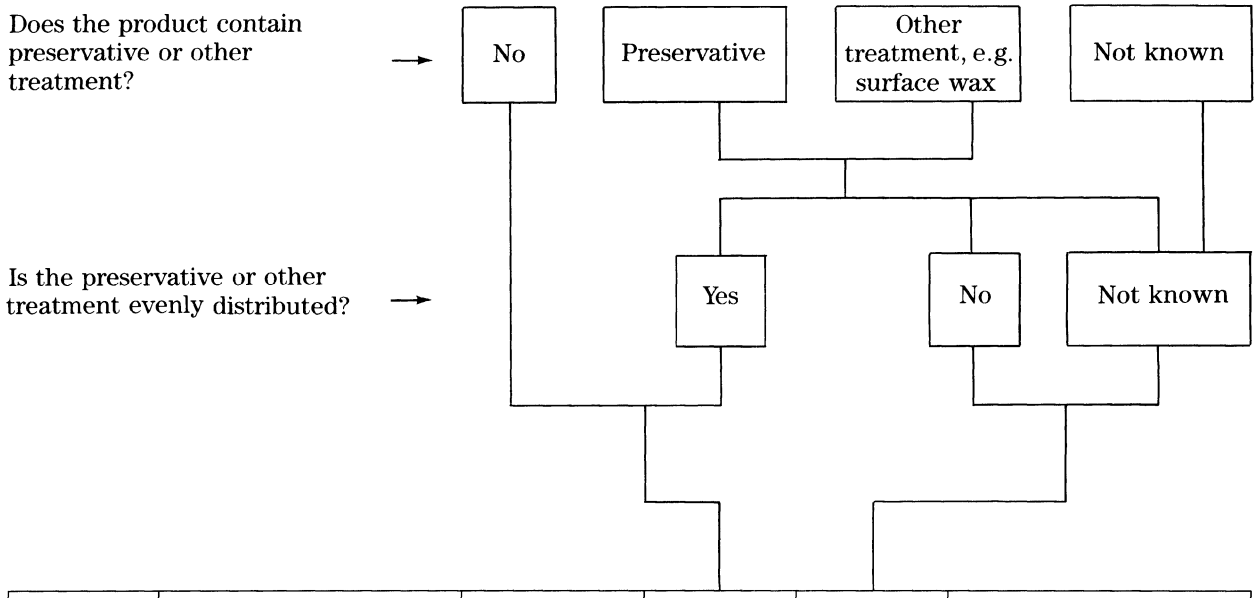
Appendix C Rapid soil virulence test

Expose untreated cotton cloth[2)] to direct contact with the prepared soil substrate (**8.1**) by partial burial for a period of 14 days. If at the end of this time the cloth has deteriorated to the point where it can be broken by a gentle hand pull, the soil may be considered sufficiently active.

A minimum of five test strips of cotton cloth measuring 150 mm × 25 mm folded in half around a blunt knife and inserted vertically to half their length is a satisfactory way of performing this test.

[2)] A control cloth of mass/unit area of 230 g/m^2 which has been found to be suitable is available from the Shirley Institute, Shirley Towers, Didsbury, Manchester M20 8RX.

Appendix D Flow chart for sizes and numbers of samples



Material	Nature of sample	Exposure to substrate	Sample numbers[1)]	Sample numbers[1)]	Sample size[2)]
Panel product	Unsealed test stake	Yes	12	12	mm 100 × 10
	Edge-sealed test stake	Yes	—	12	
	Edge-sealed check stake	No	—	6	
	Wetting check[3)]	No	6	6	
Beech	Unsealed size control stake	Yes	6	6	100 × 10 × thickness of product under test
	Edge-sealed size control stake	Yes	—	6	
	Edge-sealed size check stake	No	—	6	
Beech[4)]	Virulence control	Yes	6	6	100 × 10 × 5
Beech[4)]	Moisture monitoring	Yes	6	6	100 × 10 × 5

[1)] For panel products the 12 samples comprise 4 from each of 3 sheets; the 6 samples comprise 2 from each of 3 sheets.

[2)] For panel product samples the third dimension is the thickness of the product.

[3)] Needed only for dense products or those containing water-repellent additives.

[4)] Minimum requirement (see **6.3**).

Appendix E Calculations

E.1 Required values

The following values will have been established during the test procedure:

m_1, the initial mass in grams, after conditioning;

m_2, the mass in grams, after edge-sealing (where appropriate);

m_3, the final wet mass in grams, including edge-seal when present;

m_4, the final conditioned mass in grams, including edge-seal when present.

E.2 Final moisture content and percentage loss in mass (stakes without edge-sealing)

Calculate the final moisture content, % (m/m), as follows:

$$\frac{m_3 - m_4}{m_1} \times 100$$

Calculate the loss in mass, % (m/m), as follows:

$$\frac{m_1 - m_4}{m_1} \times 100$$

E.3 Uptake of edge-seal

Calculate the mass of edge-seal (m_5) taken up by test and check stakes as follows:

$$m_2 - m_1$$

E.4 Retention of edge-seal by check stakes

For each check stake, calculate the percentage (m/m) of edge-seal retained after final conditioning (R_c) according to the following formula:

$$\frac{m_4 - m_1}{m_5} \times 100$$

Calculate the mean value ($\overline{R}_c$) for each set of replicate check stakes.

E.5 Retention of edge-seal by test stakes

For each test stake, calculate the mass of edge-seal retained after final conditioning (m_6) according to the following formula:

$$\frac{m_5}{100} \times \overline{R}_c$$

where

$\overline{R}_c$ is the mean percentage retention of edge-seal by the appropriate set of check stakes.

E.6 Final moisture content and percentage loss in mass (edge-sealed stakes)

Calculate the final moisture content, % (m/m), as follows:

$$\frac{(m_3 - m_5) - (m_4 - m_6)}{(m_4 - m_6)} \times 100$$

Calculate the loss in mass, % (m/m), as follows:

$$\frac{m_1 - (m_4 - m_6)}{m_1} \times 100$$

Appendix F Calculation of decay susceptibility index (DSI)

F.1 Principle

The mass loss of each test stake is expressed as a percentage of the mean mass loss of the appropriate size controls. For edge-sealed test stakes, use the mean mass loss of the appropriate edge-sealed size controls in the calculation.

F.2 Calculation

Calculate the DSI from the following formula:

$$\frac{P_1}{P_2} \times 100$$

where

P_1 is the % mass loss of a test stake;

P_2 is the mean % mass loss of the appropriate set of size controls.

Appendix G Example of test report including table of results

Test report

Number and date of this Part of this British Standard	BS 1982-2:1990
Title of this method	Method for determination of resistance to cellulose-decomposing microfungi
Name of applicant	Company Z
Name of panel product, country of origin and producer	Product X produced in Finland by Company Y
Product type	MF/UF bonded chipboard, mainly softwood furnish
Identifying mark(s)	Red stripe
Product thickness	9.5 mm
Product density	695 kg/m^3
Added biocides	None
Ageing procedures	None
Duration and temperature of exposure to fungal attack	16 weeks at 28 °C
Mean mass loss % of virulence control stakes	35.4
Mean mass loss % of size control stakes	See table
Mean mass loss % of test stakes	See table

Table of results

Test material	Mean mass loss	
	Unsealed	Edge-sealed
	%	%
Size controls	36.0	19.5
Product X	5.6	2.4 (1 block at 3.3 %)

Assessment of results	Product X is not resistant to decay by cellulose-decomposing microfungi unless edged-sealed. Unsealed product X has a DSI of 15.6
This report has been prepared by	Laboratory L, Location N, 1987-11-30, Mr M.

NOTE The interpretation and practical conclusions that can be drawn from a test report demand a specialized knowledge of the subject of wood preservation and, for this reason, this test report cannot of itself constitute an approval certificate.

Publication(s) referred to

BS 1982, *Fungal resistance of panel products made of or containing materials of organic origin.*
BS 1982-0, *Guide to methods for determination.*
BS 2011, *Environmental testing.*
BS 2011-2.2J, *Test J. Mould growth.*
BS 3978, *Specification for water for laboratory use.*
BS 5761, *Wood preservatives. Accelerated ageing of treated wood prior to biological testing.*
BS 5761-1, *Evaporative ageing procedure.*
BS 5761-2, *Leaching procedure.*

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