



Designation: D2017 – 05

Standard Test Method of Accelerated Laboratory Test of Natural Decay Resistance of Woods¹

This standard is issued under the fixed designation D2017; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the evaluation of the natural decay resistance of wood. The test method may also be used to evaluate the resistance of wood products or of other organic materials subject to decay by wood-destroying fungi, such as those employed in the test.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D1413 Test Method for Wood Preservatives by Laboratory Soil-Block Cultures

D3507 Test Methods for Penetration of Preservatives in Wood and for Differentiating Between Heartwood and Sapwood (Withdrawn 2008)³

3. Summary of Test Method

3.1 Wood samples in the form of small blocks that represent the timber species or product to be evaluated are exposed in decay chambers to pure cultures of decay fungi. The decay fungi are grown on a feeder strip of decay-susceptible wood or on filter paper placed on the substrate in the chamber. The test blocks are weighed before and after exposure, and any loss in weight is the measure of decay susceptibility or resistance of the wood. The test is terminated when nondurable, wood reference blocks indicate a weight loss of 50% or greater, or

after 16 weeks. It is permitted to extend the test beyond the 16-week period for special investigations.

4. Significance and Use

4.1 This test method is useful in determining the relative decay resistance between various species of wood. It is an initial means of estimating the ability of a wood species to resist severe microbial attack and, thereby, qualifying the performance level of a wood species.

4.2 This test method is not intended to provide quantifiably reproducible values. It is a qualitative test method designed to provide a reproducible means of establishing relative decay resistance between various species of wood.

5. Apparatus

5.1 *Conditioning Chamber or Room*, maintained at a selected temperature between 20 and 30°C and a selected relative humidity between 25 and 75%. The selected temperature shall not vary more than $\pm 1^\circ\text{C}$ and the selected humidity not more than $\pm 2\%$. It may be advantageous to have the same temperature and relative humidity as specified for the incubation room (5.2)⁴.

5.2 *Incubation Room* (or cabinets), with temperature maintained at a selected temperature between 25 and 27°C and a relative humidity between 65 and 75%. The selected temperature shall not vary more than $\pm 1^\circ\text{C}$ and the relative humidity by $\pm 2\%$.

5.3 *Balance*, direct-reading type preferred, sensitive to 0.01 g.

5.4 *Trays*, made from screening that permits free air movement around each block during initial drying and for convenient handling of the test blocks.

5.5 *Culture Bottles*, cylindrical or square 225 mL, or cylindrical 450 mL with a mouth diameter of at least 32 mm and fitted with metal screw caps free of cap liners (Fig. 1). An

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ For a simple apparatus for relative humidity control, see Scheffer, T. C., "Humidity Controls for Conditioning Rooms," *Forest Products Laboratory Report* No. 2048, USDA, Forest Service, January 1956. Small centrifugally actuated mist dispensers used for humidification in homes have been found satisfactory for this purpose.

alternate lid using a 25 mm autoclavable filter with a pore size of 0.2 microns is acceptable to reduce or prevent mite infestation for the duration of the test. The lids are prepared by first drilling a centered 0.64 mm hole, then lightly sanding the interior of the lid with medium grit paper to ensure adhesion. The filter is glued on the inside using a small amount of high temperature silicon or slow curing epoxy. Allow the adhesive to cure overnight.

5.6 Steam Sterilizer

5.7 Conventional equipment and glassware for culturing and aseptic handling of fungi and test material, such as drying oven, autoclave, refrigerator, nutrient medium, transfer needles, forceps, Petri dishes, and test tubes.

6. Test Fungi

6.1 Test fungi shall consist of cultures of the following wood-rotting fungi:⁵

6.1.1 *For Testing Softwoods: Gloeophyllum trabeum* Pers. ex. Fr. (ATCC No. 11539), and *Postia placenta* (Fr.) M. Lars. Et Lomb. (ATCC No. 11538).

6.1.2 *For Testing Hardwoods: P. placenta* (Fr.) M. Lars. Et Lomb. (ATCC No. 11538). *G. trabeum* Pers. ex. Fr. (ATCC No. 11539), and *Trametes versicolor* (L. ex. Fr.) Pilát. (ATCC No. 42462).

7. Culture Media

7.1 *Malt Agar Substrate*—The nutrient medium, which shall be used for the stock test tube cultures and for Petri dish cultures of the test fungi, shall be 2% malt extract and 1.5% agar by weight or an equivalent nutrient. It shall be sterilized at 103 kPa steam for 20 minutes.

7.2 *Soil Substrate*—A supply of loam soil to provide a substrate for the fungus. The soil shall have the following characteristics as described and evaluated in Test Method **D1413**, section 8.2.

7.2.1

7.2.2 water holding capacity between 20 and 40%.

7.2.3 pH between 5.0 and 8.0.

7.2.4 oven dry weight of 120 cm³ is 90 g or better.

8. Sampling

8.1 *Species of Wood* should be identified by standard procedures.

8.2 *Samples from Trees*—In sampling a timber species for standard evaluation of decay resistance, only the heartwood shall be used. No sapwood is durable where conditions are favorable for decay. For general appraisal of a timber species, select samples of wood from the lower most 4.5 m of the trunk, and insofar as possible, from the outer third of the heartwood radius, and from both sides of the trunk. The wood should be of representative quality for the species in respect to freedom from defects, rate of growth, and density. Enough trees and areas should be sampled to reveal any significant within-species variation in decay resistance. The more important the

species and the wider its growing range, the greater the number of trees that usually will be needed to accomplish this; the minimum number for standard evaluation should in any case be 20. Tree diameters (D.B.H.), specific gravity and age of the sample trees, if determinable, should be included in the record.

8.2.1 Decay resistance of heartwood in some species varies markedly according to position in the trunk. It is important, therefore, that the approximate position of sampling be uniform. The outer heartwood of the lower trunk represents, better than any other place that might be sampled, the bulk of the heartwood in a tree, and the wood there is typically the most decay resistant.

8.2.2 In some instances, particularly in tropical hardwoods, there may be no visible heartwood and sapwood zones. With such woods, the sampling should extend across the outer one-third of the entire radius. The presence of any sapwood may be apparent in the results and can be grouped accordingly.

8.2.3 For all comparisons of decay resistance involving different trees, select the test samples of wood of different species from trees of comparable diameters and normal growth rates.

8.3 *Samples from Lumber*—If the decay resistance of wood from trees of strictly sawlog size is of primary interest, a species may be evaluated on heartwood obtained from lumber. The sample board should be randomly selected for normal quality from storage piles to make it probable that each board is from a different tree. Sampling procedures should ensure that the principal areas on which the species is grown are represented. The total number of boards and sampling areas needed per species depends on the importance of the species and the expanse of the growing region. The minimum number of boards for any species should be 40.

8.4 *Samples from Wood Products*—When it is necessary to sample a wood product as a means of evaluating a species, the objectives of sampling should be the same as noted in **8.3** for lumber. Unless wood product sampling accurately represents the wood species, this source of samples should be avoided unless the product itself is of chief interest.

9. Test Specimens

9.1 *Preparation of Specimens (Test Blocks)*—The samples shall be sawed into block specimens 25 by 25 by 9 mm in size, with the 9-mm dimension in the grain direction (see **Fig. 1**). The blocks shall be of normal growth rate and density, and be free of knots and abnormal amounts of resin or gums, and be without visible evidence of fungus infection. The blocks shall be labeled as to source promptly after sawing. A waterproof, ballpoint pen or a steel die are very satisfactory for this.

9.2 *Number of Blocks*—If the source of material for evaluation is from trees, then at least 20 samples shall be used. Each sample shall produce six blocks for each of the appropriate test fungi.

9.2.1 If the source materials are from boards or lumber, then samples shall be obtained from a minimum of 40 sample boards. Each sample board shall provide at least three (3) blocks for each of the appropriate test fungi.

⁵ These test fungi are available from the American Type Culture Collection, 1549 Manassas VA (www.atcc.com).