Designation: D3273 – 00 (Reapproved 2005)

Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber[1]

This standard is issued under the fixed designation D3273; 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.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This test method describes a small environmental chamber and the conditions of operation to evaluate reproducibly in a 4-week period the relative resistance of paint films to surface mold fungi, mildew growth in a severe interior environment. The apparatus is designed so it can be easily built or obtained[2] by any interested party and will duplicate results obtained in a large tropical chamber.

1.2 This test method can be used to evaluate the comparative resistance of interior coating to accelerated mildew growth. Performance at a certain rating (in accordance with Test Method D3274) does not imply any specific period of time for a fungal free coating. However, a better rated coating nearly always performs better in actual end use.

NOTE 1—This test method is intended for the accelerated evaluation of an interior coatings' resistance to fungal defacement. Use of this test method for evaluating exterior coatings' performance has not been validated, nor have the limitations for such use been determined. Should this test method be used for the testing of an exterior coating system, a precautionary statement regarding interpretation of results as being outside of the scope of this test method must be included. Any accelerated weathering (leaching, weathering machine exposure, etc.) should be reported and should also bear reference to the fact that it is beyond the current scope of this test method.

1.3 Temperature and humidity must be effectively controlled within the relatively narrow limits specified in order for the chamber to function reproducibly during the short test period. Severity and rate of mold growth on a film is a function of the moisture content of both the film and the substrate. A relative humidity of 95 to 98 % at a temperature of 32.5 ± 1°C (90 ± 2°F) is necessary for test panels to develop rapidly and maintain an adequate moisture level to support mold growth.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 *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:*[3]

D3274 Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation

3. Significance and Use

3.1 An accelerated test for determining the resistance of interior coatings to mold growth is useful in estimating the performance of coatings designed for use in interior environments that promote mold growth and in evaluating compounds that may inhibit such growth and the aggregate levels for their use (see also Note 1).

3.2 This test method should preferably be used by persons who have had basic microbiological training.

4. Apparatus

4.1 *Environmental Chamber*, capable of maintaining a relative humidity of 95 to 98 % at a temperature of 32.5 ± 1°C (90 ± 2°F) while providing a continuous inoculation of the surface of exposed panels with mold spores. The chamber should be kept in a room controlled to 21 to 24°C (70 to 75°F) so that heat loss from the cabinet is insignificant and that 95 to 98 % relative humidity is readily obtained at the test temperature. Alternatively the cabinet must be insulated with suitable materials to minimize heat loss.

[1] This test method is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.28 on Biodeterioration.

Current edition approved Dec. 1, 2005. Published February 2006. Originally approved in 1973. Last previous edition approved in 2000 as D3273 – 00. DOI: 10.1520/D3273-00R05.

[2] Additional specifications for construction of a chamber that has been found suitable for this method may be obtained from New Jersey Industrial Controls, P.O. Box 601, Rockaway, NJ 07866.

[3] 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.

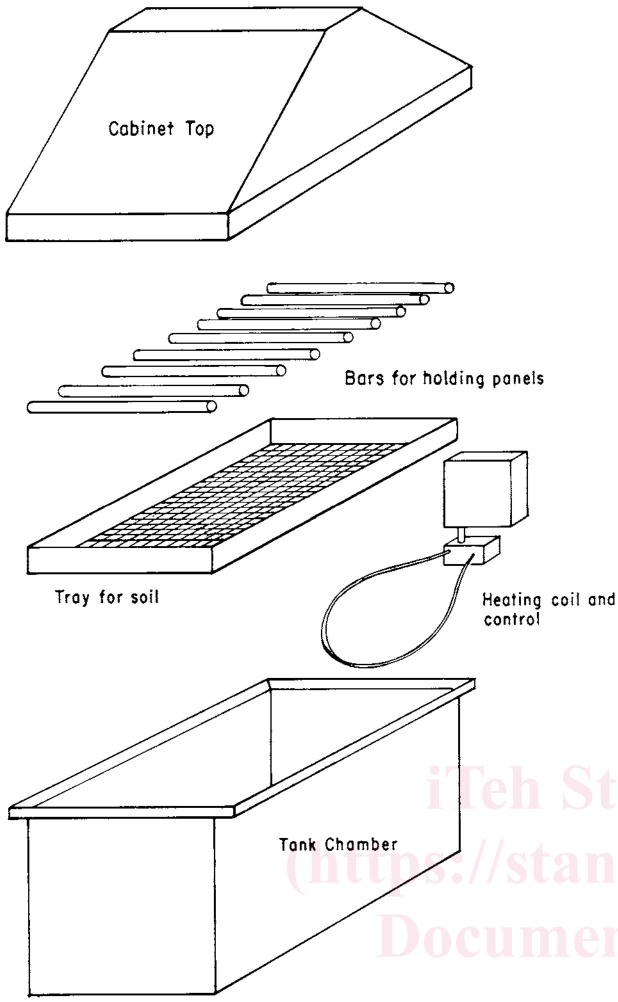

FIG. 1 Environmental Cabinet Assembly

4.2 *Cabinet*, suitable to accommodate the desired number of test panels [typically at least twenty-five 75 by 100-mm (3 by 4-in.) panels] under these test conditions can be constructed as follows (Fig. 1):

4.2.1 *Tank*, polypropylene or polyethylene, with an offset shoulder at the top rim is used as the chamber.[4] The minimum recommended tank size is 46 by 46 by 61 cm (18 by 18 by 24 in.). A pitched top with straight sides should be constructed out of acrylic plastic so moisture condensation will run down the sides and be recirculated instead of dripping onto the panels.

4.2.2 *Heating Coil*, [5,6] installed in the bottom of the chamber by water tight connections through the end wall. The heater should be sized to allow reasonable recovery time and uniform heating of the water when the chamber is opened and closed to place or inspect samples.[7] It is so placed that it is immersed when there are 50 to 75 mm (2 to 3 in.) of water in the bottom of the chamber. The temperature in the chamber should be monitored and controlled by placing a suitable thermocouple or RTD[8] in an area near the test panels. The temperature can be displayed and controlled by a solid state proportional controller.[9]

4.2.3 *Tray*, stainless steel or plastic, approximately 25 mm (1 in.) smaller than the inside dimensions of the chamber and 25 to 75 mm (1 to 3 in.) deep with a noncorrodible metal[10] mesh bottom should be supported 25 mm (1 in.) above the water level and centered in the chamber. One layer of fine plastic or fiberglass screen may be placed over the metal mesh, if needed for holding soil.

NOTE 2—It has been found that eliminating the plastic screen helps improve water vapor transfer into soil, and maintain active fungal cultures.

4.2.4 *Series of Wood, Glass, or Fiberglass Reinforced Plastic Bars*, suspended across the width of the chamber at a height and spacing that allows the use of test panels 75 by 100 mm (3 by 4 in.), hung vertically, with approximately 75-mm (3-in.) clearance above the inoculated soil with a suitable method of fastening. Screw eyes are used with the wooden panels while a wire frame or a large clip is used with the gypsum board panels. Other support systems may be utilized.

NOTE 3—Other angles of exposure may be used but may alter the rate and severity of mold growth.

4.3 *Psychrometer*, for measuring relative humidity in the test area.

5. Reagents and Materials

5.1 *Soil*—A good quality greenhouse-grade potting soil, suitable for plant propagation, containing 25 % peat moss. pH of the soil should fall from 5.5 to 7.6. Do not allow soil to become compacted.

5.2 *Cultures*:

5.2.1 *Aureobasidium pullulans,*[6,11] ATCC 9348

5.2.2 *Aspergillus niger,*[6,11] ATCC 6275

5.2.3 *Penicillium,*[6,11] Sp. 12667 or ATCC 9849

5.3 *Test Panels*:

5.3.1 *Ponderosa Pine (Pinus ponderosa Laws) Sapwood Panels*, 12.7 mm (½ in.) thick, 75 by 100 mm (3 by 4 in.), free of excessive resins, knots, growth rings or other abnormalities, surfaced smooth on four sides. Wood shall be kiln dried after sawing to avoid infestation of wood-rotting fungi, and any

---

[4] Tanks of this type available in dimensions approximating 69 by 46 by 46 cm (27 by 18 by 18 in.) are available from laboratory supply companies. Nalgene tanks have been found suitable.

[5] The sole source of supply of a ⅞-mm (0.315-in.) diameter inconel sheathed heater, Model STRI (STRI-1248/120), known to the committee at this time is Omega Engineering, Inc., One Omega Drive, Stamford, CT 06907, 800–848–4286.

[6] If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible committee,[1] which you may attend.

[7] For a 46 by 46 by 61-cm (18 by 18 by 24-in.) tank, a 250-watt heater is recommended. For a 61 by 61 by 91-mm (24 by 24 by 36-in.) tank, an 800-watt heater is recommended.

[8] A grounded 1.5 mm (1⁄16) or 2.4 mm (3⁄32-in.) "J" type stainless thermocouple gives good response for this application.

[9] A Eurotherm Model 91 controlling the heater via solid state relay has demonstrated that it can be calibrated and provide calibratable, accurate, and reliable performance.

[10] 150-mesh 316 stainless screen gives a high percentage of open area and will not allow dirt to contaminate the water.

[11] The sole source of supply of the cultures can be obtained from American Type Culture Collection, P.O. Box 1549, Manassas, VA 20108. Cultures can be maintained on malt agar or potato dextrose agar. Prepared slants can be obtained from microbiological supply companies.