



Standard Practice for Testing Biofouling Resistance of Marine Coatings Partially Immersed¹

This standard is issued under the fixed designation D 5479; 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 practice covers a procedure to test a biofouling resistant coating systems or antifouling systems, or both, when subjected to in-situ partial immersion exposure. This enhances settlement of certain marine fouling organisms and increase the rate of possible physical deterioration.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *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:

D 3623 Method of Testing Antifouling Panels in Shallow Submergence²

D 4938 Test Method for Erosion Testing of Antifouling Paints Using High Velocity Water²

D 4939 Test Method for Subjecting Marine Antifouling Coating to Biofouling and Fluid Shear Forces in Natural Seawater²

D 5108 Test Method for Organotin Release Rates of Antifouling Coating Systems in Sea Water²

3. Terminology

3.1 Definitions:

3.1.1 *antifouling coatings*—polymeric applied films engineered to prevent marine fouling settlement due to inclusion of antifouling compounds within its formulated matrix.

3.1.2 *biofouling-resistant coatings*—polymeric applied films, engineered to prevent secured or permanent attachment of marine fouling organisms due to certain surface characteristics.

3.1.3 *film(s)*—each layer or coat of paint as applied to the substrate or on top of another applied coat.

3.1.4 *system*—cumulative total number of coating films,

which includes application of a primary film(s) for the purpose of protecting the substrate from possible deterioration, or enhancing the adhesion of the biofouling resistant coating or antifouling coating to the primary film(s), or both.

3.2 Biofouling resistant coatings and antifouling coatings are interrelated; thus they are used in this practice interchangeably.

4. Significance and Use

4.1 This test method is designed as a screening test to evaluate the performance of applied coating systems and other materials designed to resist biofouling settlement.

4.2 The degree and type of fouling will vary depending on the environment. Differences in geographic location of test sites, time of year when panels are exposed, and weather conditions from one year to the next, can affect results. Such variables are accounted taking a fouling census on a nontoxic surface. For the exposure to be valid, the nontoxic surface should show heavy fouling accretion.

5. Apparatus

5.1 *Floating Raft*—The test panels shall be mounted on a floating raft to maintain the correct position in the water.

5.1.1 The floating raft shall be constructed with a minimal amount of decking to maximize sunlight exposure on the test panel's surfaces.

5.2 *Exposure Rack*—Each rack will provide firm vertical installation of several (4 to 8) test panels that must be positioned in such a manner that the prevailing tidal currents will move parallel to the panels' surfaces.

5.2.1 The method of rack installation must provide a means of easy but dependable height adjustment. The movement of the lower (immersed) end of each rack is limited to 20° from the vertical.

5.2.2 Test panel racks should be constructed of plastic materials, or insulators must be utilized to prevent test panels from metallic contact.

5.2.3 The distance between two racks (from panels' surface) shall be a minimum of 12 in. (30 cm) to allow sufficient sunlight on the coating surface.

6. Materials

6.1 *Test Panels*—The substrate(s) for application of the experimental coating system shall be one or more of the

¹ This practice is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.45 on Marine Solvents.

Current edition approved Mar. 15, 1994. Published May 1994.

² *Annual Book of ASTM Standards*, Vol 06.02.

materials that would simulate the end use of the biofouling resistant or antifouling coating system, or both. The most commonly used substrates are as follows:

6.1.1 Medium low-carbon steel plate,

6.1.2 Reinforced polyester with at least one molded face exposing a polyester gel coat,

6.1.3 Marine aluminum alloy No. 5086 or newer version, or

6.1.4 Other materials that are appropriate for marine exposure.

6.2 *Panel*—The panels shall be approximately 6 wide by 18 in. long (15 by 46 cm) with a minimum thickness of $\frac{1}{8}$ in. (3 mm) for metal panels while fiberglass and wood panels shall have a minimum thickness of $\frac{3}{16}$ to $\frac{1}{2}$ in. (5 to 13 mm). Each panel shall have four holes, each $\frac{5}{16}$ in. (8 mm) in diameter, drilled prior to coating application. Each of the holes shall be centered at approximately $\frac{3}{4}$ in. (19 mm) from each corner. The holes will be utilized for the purpose of attaching the test panels to the racks.

7. Safety Hazards

7.1 **Caution**—Biofouling resistant or antifouling coatings, or both, may contain toxic materials that could cause skin and eye irritation on contact and adverse physiological effects if inhaled. In the preparation of panels and the application of various types of these coatings, the use of appropriate protective clothing and equipment is required consistent with local, state, and federal government regulations and recognized

industrial and technical standards. Do not flush spills, overspray, and unused materials down the drain, but dispose of as designated. Refer to material safety data sheets (MSDS) application instructions and panel labels.

8. Procedure

8.1 *Testing Exposure*—Expose simultaneously a minimum of two duplicate test panels per coating system and per each different substrate to be tested (see 8.3).

8.2 Install the test panels on each rack, side by side separated by a minimum of $\frac{3}{4}$ in. (18 mm) from each other. All fasteners must be made out of plastic or nonconductive material (cable-bundle-straps have proven to be successful).

8.3 Install on the raft the rack with its test panels attached, partially immersed, leaving approximately 4 in. (10 cm) of each panel above the water surface. Expose simultaneously an equal number of test panel replicates totally immersed in accordance with Method D 3623.

8.4 *Data Results*—Conduct systematically performance reports in a timely fashion following all of the specific requirements established in accordance with Method D 3623.

8.5 For further information see Test Methods D 4938, D 4939 and D 5108.

9. Keywords

9.1 biofouling; immersed; resistance

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).