



Designation: D5479 – 94 (Reapproved 2020)

# Standard Practice for Testing Biofouling Resistance of Marine Coatings Partially Immersed<sup>1</sup>

This standard is issued under the fixed designation D5479; 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 ( $\epsilon$ ) 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 SI 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

**D3623** Test Method for Testing Antifouling Panels in Shallow Submergence

**D4938** Test Method for Erosion Testing of Antifouling Paints Using High Velocity Water

**D4939** Test Method for Subjecting Marine Antifouling Coating to Biofouling and Fluid Shear Forces in Natural Seawater

**D5108** Test Method for Organotin Release Rates of Anti-

fouling Coating Systems in Sea Water (Withdrawn 2016)<sup>3</sup>

## 3. Terminology

3.1 *Definitions:*

3.1.1 *antifouling coatings, n*—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, n*—polymeric applied films, engineered to prevent secured or permanent attachment of marine fouling organisms due to certain surface characteristics.

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

3.1.4 *system, n*—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.

<sup>1</sup> 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 Coatings.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).



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 30 cm (12 in.) 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 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 15 by 46 cm (6 wide by 18 in. long) with a minimum thickness of 3 mm ( $\frac{1}{8}$  in.) for metal panels while fiberglass and wood panels shall have a minimum thickness of 5 to 13 mm ( $\frac{3}{16}$  to  $\frac{1}{2}$  in.). Each panel shall have four holes, each 8 mm ( $\frac{5}{16}$  in.) in diameter, drilled prior to coating application. Each of the holes shall be

centered at approximately 19 mm ( $\frac{3}{4}$  in.) from each corner. The holes will be utilized for the purpose of attaching the test panels to the racks.

## 7. Safety Hazards

7.1 **Warning**—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 18 mm ( $\frac{3}{4}$  in.) 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 10 cm (4 in.) of each panel above the water surface. Expose simultaneously an equal number of test panel replicates totally immersed in accordance with Test Method **D3623**.

8.4 *Data Results*—Conduct systematically performance reports in a timely fashion following all of the specific requirements established in accordance with Test Method **D3623**.

8.5 For further information see Test Methods **D4938**, **D4939**, and **D5108**.

## 9. Keywords

9.1 biofouling; immersed; resistance

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