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# Standard Test Method

# Evaluation of Organic-Based Conductive Coatings for Use as an Anode on Atmospherically Exposed Reinforced Concrete



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## Foreword

This standard provides a test method to evaluate organic-based conductive coatings for use as an anode on atmospherically exposed reinforced concrete. Organic-based conductive coatings are commonly applied to steel-reinforced concrete surfaces for the purpose of supplying cathodic protection (CP) current to the embedded steel. The conductive coating systems used for this purpose are intended to serve as an anode material and are not intended to provide a protective barrier coating to the concrete.

This standard is intended for use by consultants, suppliers, and users of CP systems intended to reduce corrosion of embedded steel in atmospherically exposed reinforced concrete. This standard is expected to be used primarily to qualify organic-based conductive coatings as an anode material, rather than as a quality control procedure.

This standard was originally prepared in 2005 and revised in 2012 by NACE Task Group (TG) 045,“Reinforced Concrete: Anode Test Procedures,” which is administered by Specific Technology Group (STG) 01, “Reinforced Concrete.” TG 045 also is sponsored by STG 05, “Cathodic/Anodic Protection.” This standard is issued by NACE under the auspices of STG 01.

In NACE standards, the terms *shall, must*, *should,* and *may* are used in accordance with the definitions of these terms in the *NACE Publications Style Manual.* The terms *shall* and *must* are used to state a requirement, and are considered mandatory. The term *should* is used to state something good and is recommended, but is not considered mandatory. The term *may* is used to state something considered optional.

# NACE International
# Standard Test Method

# Evaluation of Organic-Based Conductive Coatings for Use as an Anode on Atmospherically Exposed Reinforced Concrete

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## Section 1: General

1.1 This standard provides a test method to evaluate organic-based conductive coatings for use as an anode on atmospherically exposed reinforced concrete. The test method primarily consists of exposing concrete test panels coated with the organic-based conductive coating to an electrochemical (EC) test under defined laboratory conditions that are intended to simulate the conditions present when cathodic protection (CP) current discharges from the anode in a working CP system. The evaluation of the coating is based on determination of coating properties (i.e., appearance, adhesion, resistivity, visual inspection, and water vapor transmission) before and after the EC test.

1.2 Accelerated tests are not possible because of the nature of organic-based conductive coatings used as anodes. Therefore, this test does not reflect the accelerated whole-life performance of a conductive coating anode.

1.3 Full round-robin testing on a wide range of organic-based conductive coatings has not been performed, but a number of products were tested in the original test program on which this test method is based and by a laboratory in Europe.[1]

1.4 The results of this test method cannot be used to guarantee the performance of a product in any given field exposure condition. The product also should be field tested, or existing field performance data should be collected whenever possible to demonstrate its suitability for the particular application intended.

## Section 2: Test Panels

2.1 Three concrete test panels shall be prepared for each organic-based conductive coating to be tested.

2.2 The concrete mix used to prepare the test panels shall be as follows:

2.2.1 Cement (Type 1): 385 kg/m$^3$ (649 lb/yd$^3$). Reference ASTM[(1)] C150M.[2]

2.2.2 Potable Water: Water-to-cement ratio = 0.45.

2.2.3 Fine aggregate (silica sand): 961 kg/m$^3$ (1,620 lb/yd$^3$). Reference ASTM C33.[3]

2.2.4 Crushed limestone aggregate (nominal 10 mm): 777 kg/m$^3$ (1,310 lb/yd$^3$). Reference ASTM C33.

2.2.5 Chloride: 2.0% by weight of cement (7.7 kg/m$^3$ [13 lb/yd$^3$]) added as sodium chloride.

2.2.6 Air-entraining additive: Used in accordance with the air-entraining manufacturer's directions to provide an air content of 3 to 5%. Reference ASTM C260.[4]

2.3 Test panel size shall be 750 x 750 x 50 mm (30 x 30 x 2 in). A 13 x 13 mm (0.50 x 0.50 in) steel wire mesh grid shall be embedded near the top of the test panel on one 750 x 750 mm (30 x 30 in) side to act as the cathode. The cathode shall be placed near the top of the test panel, opposite the anode, which shall be applied to the bottom (form side) of the test panel. The spacing between the anode and the wire mesh grid shall be 32 mm (1.3 in) minimum. To make the electrical connection, a contact point for the wire mesh grid shall be allowed to extend beyond the edge of the test panel. Test panel construction details are shown in Figure 1.

2.4 The test panels shall be cured 28 days in accordance with the following cycle: 7 days wet cure (100% relative humidity [RH]) followed by 21 days at 50% RH).

2.5 After the concrete has been cured and removed from the form, the surface of the form side (the side next to the form during casting) of each test panel shall be prepared for coating with a light grit blast, or in accordance with the conductive coating manufacturer's recommendations to remove surface laitance and provide sufficient roughness to promote coating adhesion. The surface shall then be vacuum cleaned.

[(1)] ASTM International (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.