

ENVIRONMENTAL TEST RESULTS

August 13, 2009



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CODE S22

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I. SCOPE:

This report contains the reference to the test method, purpose, limitation, test procedure notes, preparation, and conditioning of specimens, calibration and reference samples, and description of materials, operating data, and test results.

II. TEST METHOD:

The test was conducted in accordance with ASTM Designation B-117, "Standard Practice for Operating Salt Spray (Fog) Apparatus".

III. PURPOSE:

The purpose of the test is to determine the effects of corrosion on different types of substrates during fog function of the QFOG. Cyclic corrosion tests are considered by many to be more realistic. In many cases, they degrade materials more realistically than conventional exposures. Current research indicates that, with cyclic corrosion tests the relative corrosion rates, structure and morphology are more similar to those seen outdoors.

IV. LIMITATIONS:

ASTM B117 is probably the most widely used corrosion test procedure. It is not a cyclic corrosion test. The samples remain wet at all times. In spite of 80 years of use, there has long been general agreement that B117 test results do not always correlate well with the corrosion seen in actual atmospheric exposures. Nevertheless, B117 has been generally accepted as the standard corrosion test method and is still widely specified for testing painted and plated finishes, military components and electrical components.



V. TEST PROCEDURE NOTES:

Panels are placed in the chamber with a 10 degree incline from the top downward. Each panel has a spacing of 1.0 inches between each panel.

V. TEST PRCEDURE NOTES (CON'T):

The following is the summary of the test procedure.

- (1) Salt Solution 5 ± 1 parts by mass of Sodium chloride (NaCl) in 95 parts by mass of Specification D 1193 Type IV water.
- (2) PH 6.5 to 7.2 of collected solution.
- (3) The exposures zone of the salt spray chamber shall be maintained at 35 + 1.1 - 1.7 °C (95 + 2 - 3 °F). Each set point and its tolerance represents an operation control point for equilibrium conditions at a single location in the cabinet which may not necessarily represent the uniformity of conditions throughout the cabinet.
- (4) Adjust pump speed to achieve a fog rate of 1.0 to 2.0 mL/hr per 80 cm² of horizontal collection area.
- (5) Set the spray pressure to 8 psi.
- (6) Record all readings of temperature within the exposure zone of the chamber, PH, exposure period, interruptions in exposure, cause, and length of time and results of all inspections.
- (7) Clean test panels immediately after exposure with deionized water to remove salt.

VI. PREPARATION OF TEST SAMPLES:

The specimens are pre-dried for 24 hours at room temperature. Clean specimens before testing with isopropyl alcohol, so that the surfaces are free of dirt, oil, other foreign matter that may influence the test.



VII. CALIBRATION:

The QFOG chamber has been calibrated using the procedures as outlined in ASTM B-117 and the QFOG operating manual. In addition to the periodic recalibration, NSWC PHD, conducts quarterly checks with a reference tool.

VIII. DISCLAIMER:

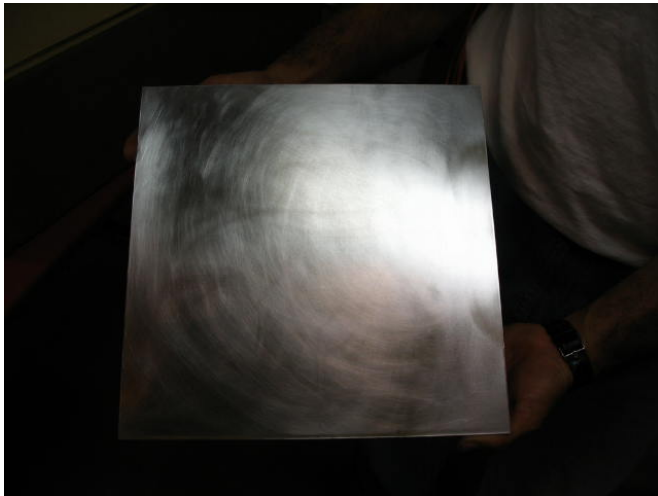
This is a factual report of the results obtained from the laboratory tests of sample products. The results may be applied only to the products tested and should not be construed as applicable to other similar products of the manufacture. The report is not a recommendation or a disapprobation by NSWC PHD of the material tested. While this report may be used for obtaining product acceptance, it may not be used in advertising. Materials are as tested for customer's final evaluation.

DATA: PANEL 1
12"x12" STEEL PLATE COMPARISON

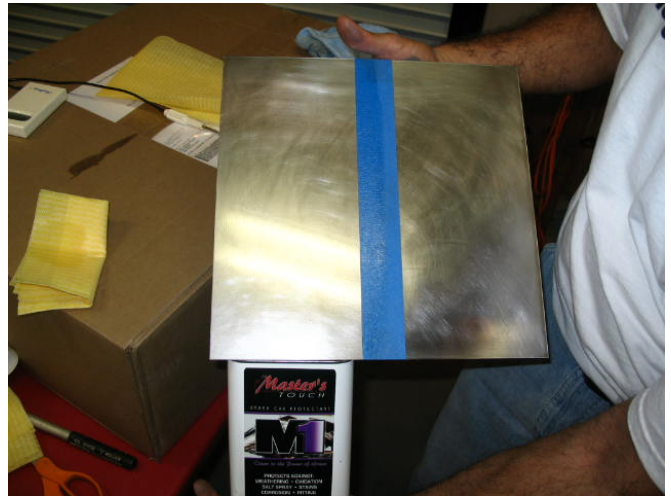
BEGAN SALT EXPOSURE: 04/23/2009
ENDED SALT EXPOSURE: 04/23/2009

EXPOSURE HOURS: 3

RESULTS: Heavy pitting to untreated side, no pitting on treated side.



Sanded steel plate with 220 grit



Treated one side with M1



After 3 hours in QFOG



Second panel after 3 hours in QFOG

DATA: PANEL 2
M1 TREATMENT, PRIMED, SCRATCHED SURFACE COMPARISON

BEGAN SALT EXPOSURE: 06/17/2009
ENDED SALT EXPOSURE: 06/25/2009

EXPOSURE HOURS: 191

RESULTS: Treated side was easily wiped clean with alcohol and water.



Prepped right side with M1, then primed the surface, and scoured the surface



24 hours exposure: Slight rusting on untreated side



191 hours exposure: Heavy rusting and pitting on untreated side, M1 has moderate rust



191 hours exposure: Cleaned with alcohol and water

DATA: PANEL 3

M1 TREATMENT COMPARISION ON 12"X12" STEEL PLATE

BEGAN SALT EXPOSURE: 07/17/2009

ENDED SALT EXPOSURE: 07/28/2009

EXPOSURE HOURS: 264

RESULTS: Heavy pitting and rusting on untreated side.



264 hours exposure: Heavy rusting and pitting on untreated side

DATA: PANEL 4
M1 TREATMENT COMPARISON 3"X3" STEEL PLATE

BEGAN SALT EXPOSURE: 07/27/2009
ENDED SALT EXPOSURE: 08/13/2009

EXPOSURE HOURS: 432

RESULTS: Heavy pitting and rusting on untreated side.



432 hours exposure: Heavy rusting and pitting on untreated side

432 hours exposure: Heavy rusting and pitting on untreated side, same panel, closer look





SUMMARY:

M1 product shows that it inhibits from corrosion. Continue application will prevent corrosion to build up over time. M1 product is very easy to use with the spray aerosol can or can be applied by a rag.

M1 takes 1- 2 minutes to dry for each coat. Two coats where applied by a rag.

Respectfully Submitted,

By: Quang Nguyen