AEROSPACE INDUSTRIES ASSOCIATION

NATIONAL AEROSPACE STANDARD

NATIONAL AEROSPACE STANDARDS

FED. SUPPLY CLASS

TABLE OF CONTENTS

TABLE

① Completely Revised

The initial release of this document supersedes MIL-STD-1312-1. Designation for this test method remains MIL-STD-1312-1.

THIRD ANGLE PROJECTION	CUSTODIAN NATIONAL AEROSPACE STANDARDS COMMITTEE	REVISION **1**
PROCUREMENT SPECIFICATION NONE	TITLE **FASTENER TEST METHODS METHOD 1 – SALT SPRAY**	CLASSIFICATION STANDARD PRACTICE **NASM1312-1** SHEET 1 OF 5

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC
1000 WILSON BLVD.
ARLINGTON, VA 22209

THIS DRAWING SUPERSEDES ALL ANTECEDENT STANDARD DRAWINGS FOR THE SAME PRODUCT AND SHALL BECOME EFFECTIVE NO LATER THAN SIX MONTHS FROM THE LAST REVISION DATE.

FORM 08-02

REVISION DATE: JUNE 30, 2010

ISSUE DATE: AUGUST, 1997

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC
1000 WILSON BLVD.
ARLINGTON, VA 22209

1. SCOPE

1.1. Applicability. This standard sets forth a standard test method to simulate highly humid and salt atmospheric conditions to determine a fastener's relative resistance to corrosion. The designation for this test method remains MIL-STD-1312-1.

2. REFERENCED DOCUMENTS. Not applicable.

3. DEFINITIONS. Not applicable.

4. GENERAL REQUIREMENTS

4.1. Test apparatus. Test apparatus used in the salt spray test shall include the following:

a. Exposure chamber with racks for supporting specimens.
b. Salt solution reservoir.
c. Means for atomizing salt solution, including suitable nozzles and compressed air supply.
d. Means for heating the exposure chamber and controlling its temperature.
e. Means for cleaning the air and humidifying it at a temperature above that of the exposure chamber.

4.1.1 Exposure chamber. The chamber and all accessories shall be made of material such as glass, hard rubber, plastic, or suitably coated wood that will not affect the corrosiveness of the fog. In addition, all parts that come in contact with test specimens shall be made of materials that will not cause galvanic or electrolytic corrosion. The chamber and accessories shall be constructed and arranged as follows:

a. There shall be no direct impinging of the spray, or dripping of the condensate on the specimens.
b. The spray shall circulate freely about all specimens to the same degree.
c. No liquid, which has entered the exposure chamber and has come into contact with the test specimens, shall return to the salt solution reservoir.
d. The chamber shall be properly vented.

4.1.2 Atomizers. The atomizer(s) used shall be of such design and construction as to produce a finely divided, wet, dense fog.

4.1.3. Air supply. The compressed air entering the atomizer(s) shall be essentially free of all impurities, such as oil and dirt. Means shall be provided to humidify and warm the compressed air as required to meet the operating conditions. The air pressure shall be suitable to produce a finely divided, dense fog with the atomizer(s) used. To avoid any substantial difference between the salt concentration in the fog particles and that of the salt solution before atomization, the atomizing air must have a relative humidity between 95 percent and 98 percent. Thus, it is necessary to saturate the air at a higher temperature and cool it to 95 °F (35 °C) in the chamber. A satisfactory method is to pass the air in very fine bubbles through a tower containing water maintained at the proper temperature. Temperatures usually found to be satisfactory for various values of air pressure are given in Table I.

TABLE I–Air pressure and temperature range

Air pressure (lb/in^2)	Temperature	
	°F	°C
12	114	46
14	117	47
16	119	48
18	121	49

① Completely Revised

4.1.4. <u>Salt solution.</u> The salt used shall be substantially free of nickel and copper and containing on the dry basis not more than 0.1 percent sodium iodide and not more than 0.3 percent of total impurities. A 5 percent solution shall be prepared by dissolving 5 ± 1 parts, by weight, of salt in 95 parts, by weight, of distilled water, or deionized water containing not more than 200 parts soluble solids per million. The solution shall be kept free from solids by filtration or decantation. The solution shall be adjusted to and maintained at a specific gravity (SPGR) between 1.0268 to 1.0413 when measured at a temperature of 95 °F (35 °C), or, from 1.0255 to 1.0400 when measured at 77 °F (25 °C).

4.1.4.1 The pH of the salt solution shall be so maintained that solution atomized at 95 °F (35 °C) will be in the pH range of 6.5 to 7.2. The pH measurement shall be made at room temperature after the collected sample is removed from the exposure chamber. The pH shall be measured electrometrically, using a glass electrode with a saturated potassium chloride bridge; or colorimetrically, using bromthymol blue as indicator. Only diluted analytical reagent grade hydrochloric acid or cp sodium hydroxide shall be used to adjust the pH.

4.1.4.2 When the pH of a salt solution is adjusted at room temperature and atomized at 95 °F (35 °C), the pH of the collected solution will be higher than that of the original solution due to the loss of carbon dioxide at the higher temperature. The following three methods have been found satisfactory for adjusting the pH of a sample collected after atomization at 95 °F (35 °C) within the pH range of 6.5 to 7.2.

a. Prepare the salt solution at room temperature and adjust the pH so that a 50 milliliter (ml) sample will have a pH between 6.5 and 7.2 after being boiled gently for 30 seconds and cooled to room temperature. The pH of the sample should be measured immediately after it is cooled. It is necessary for the pH of the original solution to be below 6.5 if this method is followed.
b. Heat the salt solution to boiling and cool to 95 °F (35 °C) and maintain the solution at 95 °F (35 °C) for approximately 48 hours before adjusting the pH to the required range of 6.5 to 7.2.
c. Heat the water from which the salt solution is to be prepared to 95 °F (35 °C) or above to expel the carbon dioxide. Prepare the solution and adjust the pH to within the range of 6.5 to 7.2.

4.1.4.3 Salt solution should be added to the test apparatus immediately after it is prepared. If salt solution is stored, the pH shall be verified and adjusted using one of the above methods before it is added to the chamber. Salt solution storage should be in inert containers made of plastic or glass.

4.2 <u>Test specimens.</u>

4.2.1 <u>General.</u> Specimens shall be given a minimum of handling, particularly on the significant surfaces, and shall be prepared for test immediately before exposure. Cleaned specimens should be handled with clean lintless gloves.

4.2.1.1 Unless otherwise specified, uncoated metallic specimens and metallic-coated specimens shall be thoroughly cleaned and free of oil, dirt, and grease. Specimens shall be cleaned with an appropriate detergent and rinsed with deionized water to obtain a water-break-free surface. The specimen shall then be rinsed with isopropyl alcohol, acetone, or methanol, and air or blow dried. No halogenated solvents or abrasives of any type are permitted. Cleaning must be done within one hour previous to the initiation of test, and shall be processed with a minimum of handling.

4.2.1.2 The specimens will be racked or supported in such a manner that the spray will not condense and gather in recesses or other features of the fastener and will circulate freely about all specimens to the same degree.

① Completely Revised

5. DETAIL REQUIREMENTS

5.1 Test procedures.

5.1.1 Location of specimens. Whenever practicable, the specimen shall be supported from the bottom or the side. When specimens are suspended from the top, suspension shall be by means of nylon cord, glass hooks, or waxed string. The use of metal hooks is not permitted. Specimens shall be so positioned that:

a. They do not contact each other or any metallic material or any material capable of acting as a wick.
b. They are not shielded from the freely settling fog.
c. Corrosion products and condensate from one specimen does not fall upon another specimen or return to the solution reservoir.

5.2 Operating conditions.

5.2.1 Temperature. The test shall be conducted with a temperature in the exposure zone maintained at 95 °F, ±3 °F (35 °C, ±2 °C). Satisfactory methods for controlling the temperature accurately are by housing the apparatus in a properly controlled constant temperature room, by thoroughly insulating the apparatus and preheating the air to the proper temperature prior to atomization, or by jacketing the apparatus and controlling the temperature of the water or of the air used in the jackets. No surface in the chamber shall become overheated enough to cause evaporation of the fog followed by condensation of that moisture on the other fog droplets, thereby diluting them. The use of immersion heaters within either (a) the chamber, for the purpose of maintaining the temperature within the exposure zone, or (b) in the salt solution reservoir, is prohibited, except that suitable heating units may be used in larger exposure chambers, provided they do not cause the temperature within the exposure zone to vary outside the permissible range of operating temperature.

5.2.2 Atomization.

5.2.2.1 The conditions maintained in all parts of the exposure zone shall be such that a suitable receptacle placed at any point in the exposure zone will collect from 1.0 to 2.0 milliliter (ml) of solution per hour for each 80 square centimeters (sq cm) of horizontal collecting area (10 centimeter diameters) based on an average run of at least 16 hours. The solution, thus collected, shall have a sodium-chloride content from 4 percent to 6 percent, specific gravity (SPGR) or from 1.0268 to 1.0413 when measured at a temperature between 93 °F (34 °C) and 97 °F (36 °C), or 1.0255 to 1.0400 when measured at a temperature between 75 °F (24 °C) and 79 °F (26 °C). At least two clean fog-collecting receptacles shall be used; one placed as near to any nozzle as any specimen is placed and one as far from all nozzles as any specimen is placed. Receptacles shall be so placed that they are not shielded from the freely settling fog and so that no drops of solution from specimens or from other sources will be collected.

5.2.2.2 Nozzles shall be made of material nonreactive to the salt solution. Glass or methyl-methacrylate nozzles with nylon filters are suggested. Suitable atomization has been obtained in boxes having a volume of less than 12 cubic feet with the following conditions:

a. Nozzle pressure of 12 to 16 pounds per square inch.
b. Orifices of from 0.02 to 0.03-inch in diameter.
c. Atomization of approximately 3 quarts of the salt solution per 10 cubic feet of box volume per 24 hours.

5.2.2.3 When using boxes having a volume in excess of 12 cubic feet, the above conditions may have to be modified to meet the requirements for operating conditions.

① Completely Revised

5.3 Length of test. The length of the salt spray test shall be 96 hours except 2 hours for bare stainless steel. Unless otherwise specified, the test shall be run continuously for the time indicated or until definite indication of failure is observed, with interruption only for adjustment of the apparatus and inspection of the specimen. Operations shall be so scheduled that interruptions are held to a minimum.

5.4 Examination of specimens. At the end of the test, the specimens shall be examined immediately to determine compliance with the standard of acceptability specified in the detail specification or drawing. If necessary to aid in examination, a gentle wash or dip in clean running water not warmer than 100 °F (38 °C) and blowing with clean dry air may be used. Examination at stated intervals during the test may be required. Oxidation such as rust on the base metal or corrosion of the galvanic protection is not allowed on the threads, shank, or bearing surface unless otherwise specified.

6. NOTES

6.1 Test report. Unless otherwise prescribed in the detail specification or drawing for the material or product being tested, the test report shall include the following data:

a. Solution concentration.
b. Type of salt and water used in preparing the salt solution.
c. All readings of temperature within the exposure zone of the chamber.
d. Record of daily test made on each fog-collecting device, including the following:

  1. Volume of salt solution collected in milliliters (ml) per hour per 80 sq cm of horizontal collecting area.
  2. Sodium chloride content or specific gravity (including temperature at which specific gravity measurement was made) of the collected solution.
  3. pH of collected solution.

e. Type of specimen and its dimensions, or number or description of product or part tested.
f. Method of supporting specimen in the salt spray chamber.
g. Description of protection used on cut edges and other surfaces not required to be tested.
h. Length of exposure period.
i. Cause and duration of any interruptions during test.
j. Results of all inspections.
k. Method of specimen surface preparation.

NOTE: For quality assurance testing, the report shall only specify:

1. The part number
2. Lot identification
3. Manufacturer
4. That the test was conducted in accordance with NASM1312-1
5. The exposure time
6. The results of final inspection reported

① Completely Revised

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC
1000 WILSON BLVD.
ARLINGTON, VA 22209

THIS DRAWING SUPERSEDES ALL ANTECEDENT STANDARD DRAWINGS FOR THE SAME PRODUCT AND SHALL BECOME EFFECTIVE NO LATER THAN SIX MONTHS FROM THE LAST REVISION DATE.