

PURPOSE

This section provides general information on the Holiday (Continuity) Testing of Protective Coatings.

INTRODUCTION

Holiday (Continuity) Testing is a test method applied on-site to Protective Coatings in order to detect unacceptable discontinuities in the film. A discontinuity can be described as a flaw, void, pinhole, holiday, crack, thin spot, foreign inclusion or some kind of contamination that results in a significant lowering of the dielectric strength of the protective coating film. Discontinuities may lead to premature coating breakdown and corrosion, therefore detection of discontinuities is important in ensuring the integrity of the coating is maintained.

The applied voltage used when conducting holiday testing can have significant impact on the coating, therefore due consideration should be made when determining how the testing should be conducted.

The level of the voltage applied can vary as a result of any of the following considerations:

- Method of test (low voltage wet sponge tester versus high voltage spark tester)
- Standard followed whilst conducting the test
- Applied thickness of the coating (DFT- dry film thickness)
- Solids content of the coating

While conducting Holiday testing, it is well known that the protective coating may be damaged; that is, discontinuities may arise from the application of the voltage to the coating during the testing. Application of higher voltages therefore increases the risk of damaging the coating.

Please find outlined various standards related to Holiday Testing in order to ascertain the ideal testing conditions. This will ensure the coatings integrity whilst minimising the risk of damaging the coating which would potentially reduce its protective nature.

HOLIDAY TESTING STANDARDS - TESTING VOLTAGES APPLIED**Australian Standard AS3894.1-2002**

The following equation is utilised in the Australian Standard for determining the voltage to be applied to a particular coating:

$$V = \frac{250\sqrt{T}}{F}$$

Where:

- V = test voltage applied in volts
- T = specified DFT of cured coating, in μm
- F = rating of a coating's generic type and the volume solids content (as referred to in Table D1 of AS3894.1-2002)

ASTM International D-5162-08

The ASTM International standard for Holiday Testing utilises two test methods based on two types of equipment:

- Test Method A – Low Voltage Wet Sponge – for coatings with a DFT < 500 μm
- Test Method B – High Voltage Spark Testers – for coatings with a DFT > 500 μm

For the high voltage spark testing, ASTM International utilises the following equation to determine the voltage to be applied:

$$V = M\sqrt{T_c}$$

Where:

- V = test voltage applied in volts
- T_c = coating thickness in mm
- M = a constant dependant on the thickness range and the units of thickness (as detailed in D-5162-08)

NACE International SP0188-2006

Similar to the ASTM International standard, the NACE standard for Holiday testing recommends the utilisation of two test methods depending on the DFT of the coating, these methods are:

- Low-Voltage Wet Sponge Testing – for coatings with a DFT < 500 μm
- High-Voltage Spark Testing – for coatings with a DFT > 500 μm

For the high voltage spark testing, there is a table within the NACE standard which recommends the voltage to be applied as determined from the total dry film thickness of the coating. To summarise this table, the NACE standard applies on average ~4.66 Volts per 1 μm of a coatings (DFT). This is a similar recommendation to that of the European industry's general rule of thumb which is 4 Volts per 1 μm .

ALL STANDARDS SUMMARISED WITH APPLICATION EXAMPLES

To illustrate the varying voltages recommended across the standards, examples of voltages required for the testing of an 80% volume solids coating applied at various film builds is detailed in the table below:

DFT	AS3894.1-2002	ASTM D-5162-08	NACE SP0188-2006	Wattyl Industrial Recommended
400 µm	5000 Volts	2083 Volts	2000-2500 Volts	1600 Volts
500 µm	5590 Volts	2329 Volts	2500-3000 Volts	2000 Volts
800 µm	7071 Volts	2946 Volts	3000 Volts	3200 Volts
1000 µm	7906 Volts	7843 Volts	3000-4000 Volts	4500 Volts
1000 µm*	3953 Volts	7843 Volts	3000-4000 Volts	4500 Volts

* Volume solids content of 79% rather than 80%

WATTYL INDUSTRIAL RECOMMENDATION FOR HOLIDAY TESTING VOLATAGES

In general, Wattyl Industrial therefore recommends the following guide when determining the voltage to be applied when conducting Holiday Testing of our coatings:

For coatings < 500 µm – Low Voltage Wet Sponge testing
For coatings > 500 µm – High Voltage Holiday Testing
Where the voltage is calculated at 4 Volts per 1 µm of the coatings DFT.



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