



Standard Practice for Measurement of Time-of-Wetness on Surfaces Exposed to Wetting Conditions as in Atmospheric Corrosion Testing¹

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€¹ NOTE—Section 9 was editorially deleted in October 1999.

1. Scope

1.1 This practice covers a technique for monitoring time-of-wetness (TOW) on surfaces exposed to cyclic atmospheric conditions which produce depositions of moisture.

1.2 The practice is also applicable for detecting and monitoring condensation within a wall or roof assembly and in test apparatus.

1.3 Exposure site calibration or characterization can be significantly enhanced if TOW is measured for comparison with other sites, particularly if this data is used in conjunction with other site-specific instrumentation techniques.

1.4 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Summary of Practice

2.1 This practice describes a technique for detecting and recording surface moisture conditions. The moisture serves as an electrolyte to generate a potential in a moisture sensing element galvanic cell that consists of alternate electrodes of copper and gold, silver and platinum, or zinc and gold. The spacing of the electrodes may be 100 to 200 μm , the width dimension is not considered critical (Fig. 1). However, when zinc is used as an electrode material, the effects of the hygroscopic nature of the corrosion products on the performance of the sensor should be kept in mind. Also, the use of copper as a sensor material should be avoided in sulfur dioxide-laden atmospheres to avoid premature deterioration of the sensor's copper substrate. The output (potential) from this cell is fed through a signal conditioning circuit to an indicating or recording device. The objective is to record the time that moisture is present on the sensing element during any given period. The fact that a potential is generated is critical to this

technique. As pertains to this practice, the absolute value of the potential generated is essentially of academic interest.

2.2 This practice describes the moisture-sensing element, procedures for conditioning the elements to develop stable films on the electrodes and verifying the sensing-element function, and use of the element to record TOW.

3. Significance and Use

3.1 This practice provides a methodology for measuring the duration of wetness on a sensing element mounted on a surface in a location of interest. Experience has shown that the sensing element reacts to factors that cause wetness in the same manner as the surface on which it is mounted.

3.2 Surface moisture plays a critical role in the corrosion of metals and the deterioration of nonmetallics. The deposition of moisture on a surface can be caused by atmospheric or climatic phenomena such as direct precipitation of rain or snow, condensation, the deliquescence (or at least the hygroscopic nature) of corrosion products or salt deposits on the surface, and others. A measure of atmospheric or climatic factors responsible for moisture deposition does not necessarily give an accurate indication of the TOW. For example, the surface temperature of an object may be above or below both the ambient and the dew point temperatures. As a result condensation will occur without an ambient meteorological indication that a surface has been subjected to a condensation cycle.

3.3 Structural design factors and orientation can be responsible for temperature differences and the consequent effect on TOW as discussed in 4.2. As a result, some surfaces may be shielded from rain or snow fall; drainage may be facilitated or prevented from given areas, etc. Therefore various components of a structure can be expected to perform differently depending on mass, orientation, air flow patterns, etc. A knowledge of TOW at different points on large structures can be useful in the interpretation of corrosion or other testing results.

3.4 In order to improve comparison of data obtained from test locations separated on a macrogeographical basis, a uniform orientation of sensor elements boldly exposed in the direction of the prevailing wind, at an angle of 30° above the

¹ This practice is under the jurisdiction of ASTM Committee G-1 on Corrosion of Metals and is the direct responsibility of Subcommittee G01.04 on Atmospheric Corrosion.

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