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Corrosion risk assessment for structures using BS EN ISO 9223 (2012) and BS EN ISO 9224 (2012)

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Abstract

Corrosion in service environments limits the durability of many metals. Historically, assessment of that risk adopted a qualitative approach based on generic descriptors such as rural, urban, industrial or coastal environments. These terms are ill-defined and open to interpretation. BS EN ISO 9223 (2012) provides three methods to evaluate risk for several different metals including structural steel and zinc. Two of the methods are quantitative whilst the third remains qualitative. The qualitative method is the most commonly used in engineering because the quantitative methods require data collection over a minimum period of 12 months. This paper provides a methodology to improve risk assessment by use of the quantitative method in BS EN ISO 9223 (2012) to estimate the first-year corrosion rate using historic data sets. Long-term corrosion loss estimation uses the equations in BS EN ISO 9224 (2012).

Keywords: Atmospheric corrosion, BS EN ISO 9223, BS EN ISO 9224, Long term corrosion loss, First-year corrosion rate

1. Introduction

Historically, corrosion risk assessment and selection of a mitigation strategy used a qualitative approach based on common lay terms (rural, urban, industrial or coastal) to classify the environment. Typically, these terms are ill-defined and open to interpretation. A common feature of such assessments is to overestimate risk, leading to conservative approaches to mitigation that often unduly penalise the use of metals for certain structures.

ISO 9223 (1992) [1] provided a potential method to adopt a quantitative approach to assess the risk. It introduced the concept of corrosivity classes C1 to C5 (most severe) with an annual first-year corrosion rate associated with each class, Table 1. The rate data for the classes came from the International Atmospheric Exposure Program (ISOCORRAG) [2] which used standardized corrosion coupons [3] and methodologies for collecting environmental data including time of wetness (TOW), sulphur dioxide (SO_2) deposition rate (P_d) and chloride deposition rates (S_d) [4]. Unlike the current version of the standard [5], the original publication [1] did not provide a method to calculate rates directly from the environmental data but did include a semi-quantitative method to estimate the corrosivity class using an interpretation of the "likely" environmental parameters. Few made use of this method, preferring to rely on the familiar qualitative descriptors also given in the standard.

BS EN ISO 9223 [5], published in 2012, relegated the qualitative descriptors to an informative Annex and included two normative sections to assess the corrosion risk:

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