



Designation: G 101 – 97

## Standard Guide for Estimating the Atmospheric Corrosion Resistance of Low- Alloy Steels<sup>1</sup>

This standard is issued under the fixed designation G 101; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This guide presents two methods for estimating the atmospheric corrosive resistance of low-alloy weathering steels, such as those described in Specifications A 242/A 242M, A 588/A 588M, A 606 Type 4, A 709/A 709M grades 50W, 70W, and 100W, A 852, and A 871. One method gives an estimate of the long term thickness loss of a steel at a specific site based on results of short-term tests. The other gives an estimate of relative corrosion resistance based on chemical composition.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

A 242/A 242M Specification for High-Strength Low-Alloy Structural Steel<sup>2</sup>

A 588/A 588M Specification for High-Strength Low-Alloy Structural Steel with 50 Ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick<sup>2</sup>

A 606 Specification for Steel, Sheet and Strip, High Strength, Low-Alloy, Hot-Rolled and Cold Rolled, With Improved Atmospheric Corrosion Resistance<sup>3</sup>

A 709/A 709M Specification for Carbon and High-Strength Low-Alloy Structural Steel Shapes, Plates, and Bars and Quenched-and-Tempered Alloy Structural Steel Plates for Bridges

A 852/A 852M Specification for Quenched and Tempered Low-Alloy Structural Steel Plate with 70 ksi (485 MPa) Minimum Yield Strength to 4 in (100 mm) Thick<sup>2</sup>

A 871/A 871M Specification for High Strength Low-Alloy Structural Steel Plate With Atmospheric Corrosion Resistance<sup>2</sup>

G 1 Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens<sup>4</sup>

G 16 Guide for Applying Statistics to Analysis of Corrosion Data<sup>4</sup>

G 50 Practice for Conducting Atmospheric Corrosion Tests on Metals<sup>4</sup>

### 3. Terminology

#### 3.1 Definitions of Terms Specific to This Standard:

3.1.1 *low-alloy steels*—Iron-carbon alloys containing greater than 1.0 % but less than 5.0 %, by mass, total alloying elements.

NOTE 1—Most “low-alloy weathering steels” contain additions of both chromium and copper, and may also contain additions of silicon, nickel, phosphorus, or other alloying elements which enhance atmospheric corrosion resistance.

### 4. Summary of Guide

4.1 In this guide, two general methods are presented for estimating the atmospheric corrosion resistance of low-alloy weathering steels. These are not alternative methods; each method is intended for a specific purpose, as outlined in 5.2 and 5.3.

4.1.1 The first method utilizes linear regression analysis of short-term atmospheric corrosion data to enable prediction of long-term performance by an extrapolation method.

4.1.2 The second method utilizes predictive equations based on the steel composition to calculate indices of atmospheric corrosion resistance.

### 5. Significance and Use

5.1 In the past, ASTM specifications for low-alloy weathering steels, such as Specifications A 242/A 242M, A 588/A 588M, A 606 Type 4, A 709/A 709M Grade 50W, 70W, and 100W, A 852, and A 871 stated that the atmospheric corrosion resistance of these steels is “approximately two times that of carbon structural steel with copper.” A footnote in the specifications stated that “two times carbon structural steel with copper is equivalent to four times carbon structural steel without copper (Cu 0.02 maximum).” Because such statements relating the corrosion resistance of weathering steels to that of other steels are imprecise and, more importantly, lack significance to the user (**1 and 2**)<sup>5</sup>, the present guide was prepared to describe more meaningful methods of estimating the atmospheric corrosion resistance of weathering steels.

<sup>5</sup> The boldface numbers in parentheses refer to the list of references at the end of this guide.

<sup>1</sup> This guide 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.

Current edition approved April 10, 1997. Published July 1997. Originally published as G 101 – 89. Last previous edition G 101 – 94.

<sup>2</sup> *Annual Book of ASTM Standards*, Vol 01.04.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 01.03.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 03.02.