



## Standard Guide for Examination and Evaluation of Pitting Corrosion<sup>1</sup>

This standard is issued under the fixed designation G46; 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 covers the selection of procedures that can be used in the identification and examination of pits and in the evaluation of pitting (See Terminology [G15](#)) corrosion to determine the extent of its effect.

1.2 *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. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

[E3](#) Guide for Preparation of Metallographic Specimens

[G1](#) Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens

[G15](#) Terminology Relating to Corrosion and Corrosion Testing (Withdrawn 2010)<sup>3</sup>

[G16](#) Guide for Applying Statistics to Analysis of Corrosion Data

2.2 *National Association of Corrosion Engineers Standard: [NACE RP-01-73](#) Collection and Identification of Corrosion Products<sup>4</sup>*

### 3. Significance and Use

3.1 It is important to be able to determine the extent of pitting, either in a service application where it is necessary to predict the remaining life in a metal structure, or in laboratory test programs that are used to select the most pitting-resistant materials for service.

### 4. Identification and Examination of Pits

4.1 *Visual Inspection*—A visual examination of the corroded metal surface is usually beneficial, and this is done under ordinary light, with or without the use of a low-power magnifying glass, to determine the extent of corrosion and the apparent location of pits. It is often advisable to photograph the corroded surface at this point so that it can be compared with the clean surface after the removal of corrosion products.

4.1.1 If the metal specimen has been exposed to an unknown environment, the composition of the corrosion products may be of value in determining the cause of corrosion. Follow recommended procedures in the removal of particulate corrosion products and reserve them for future identification (see [NACE RP-01-73](#)).

4.1.2 To expose the pits fully, use recommended cleaning procedures to remove the corrosion products and avoid solutions that attack the base metal excessively (see Practice [G1](#)). It may be advisable during cleaning to probe the pits with a pointed tool to determine the extent of undercutting or subsurface corrosion ([Fig. 1](#)). However, scrubbing with a stiff bristle brush will often enlarge the pit openings sufficiently by removal of corrosion products, or undercut metal to make the pits easier to evaluate.

4.1.3 Examine the cleaned metal surface under ordinary light to determine the approximate size and distribution of pits. Follow this procedure by a more detailed examination through a microscope using low magnification (20×).

4.1.4 Determine the size, shape, and density of pits.

4.1.4.1 Pits may have various sizes and shapes. A visual examination of the metal surface may show a round, elongated, or irregular opening, but it seldom provides an accurate indication of corrosion beneath the surface. Thus, it is often necessary to cross section the pit to see its actual shape and to determine its true depth. Several variations in the cross-sectioned shape of pits are shown in [Fig. 1](#).

4.1.4.2 It is a tedious job to determine pit density by counting pits through a microscope eyepiece, but the task can be made easier by the use of a plastic grid. Place the grid, containing 3 to 6-mm squares, on the metal surface. Count and record the number of pits in each square, and move across the grid in a systematic manner until all the surface has been covered. This approach minimizes eyestrain because the eyes can be taken from the field of view without fear of losing the area of interest.

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee [G01](#) on Corrosion of Metals and is the direct responsibility of Subcommittee [G01.05](#) on Laboratory Corrosion Tests.

Current edition approved May 1, 2013. Published July 2013. Originally approved in 1976. Last previous edition approved in 2005 as G46–94 (2005). DOI: 10.1520/G0046-94R13.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> Insert in *Materials Protection and Performance*, Vol 12, June 1973, p. 65.