



Standard Practice for Determining the Inclusion or Second-Phase Constituent Content of Metals by Automatic Image Analysis¹

This standard is issued under the fixed designation E1245; 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.

INTRODUCTION

This practice may be used to produce stereological measurements that describe the amount, number, size, and spacing of the indigenous inclusions (sulfides and oxides) in steels. The method may also be applied to assess inclusions in other metals or to assess any discrete second-phase constituent in any material.

1. Scope

1.1 This practice describes a procedure for obtaining stereological measurements that describe basic characteristics of the morphology of indigenous inclusions in steels and other metals using automatic image analysis. The practice can be applied to provide such data for any discrete second phase.

NOTE 1—Stereological measurement methods are used in this practice to assess the average characteristics of inclusions or other second-phase particles on a longitudinal plane-of-polish. This information, by itself, does not produce a three-dimensional description of these constituents in space as deformation processes cause rotation and alignment of these constituents in a preferred manner. Development of such information requires measurements on three orthogonal planes and is beyond the scope of this practice.

1.2 This practice specifically addresses the problem of producing stereological data when the features of the constituents to be measured make attainment of statistically reliable data difficult.

1.3 This practice deals only with the recommended test methods and nothing in it should be construed as defining or establishing limits of acceptability.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *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:*²

E3 Guide for Preparation of Metallographic Specimens

E7 Terminology Relating to Metallography

E45 Test Methods for Determining the Inclusion Content of Steel

E768 Guide for Preparing and Evaluating Specimens for Automatic Inclusion Assessment of Steel

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this practice, see Terminology E7.

3.2 *Symbols:*

$\bar{A}$	= the average area of inclusions or particles, μm^2 .
A_A	= the area fraction of the inclusion or constituent.
A_i	= the area of the detected feature.
A_T	= the measurement area (field area, mm^2).
H_T	= the total projected length in the hot-working direction of the inclusion or constituent in the field, μm .
$\bar{L}$	= the average length in the hot-working direction of the inclusion or constituent, μm .
L_T	= the true length of scan lines, pixel lines, or grid lines (number of lines times the length of the lines divided by the magnification), mm.
n	= the number of fields measured.
N_A	= the number of inclusions or constituents of a given type per unit area, mm^2 .

¹ This practice is under the jurisdiction of ASTM Committee E04 on Metallography and is the direct responsibility of Subcommittee E04.14 on Quantitative Metallography.

Current edition approved May 1, 2016. Published May 2016. Originally approved in 1988. Last previous edition approved in 2008 as E1245 – 03(2008). DOI: 10.1520/E1245-03R16.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.