



## Standard Practice for Metallographic Laboratory Evaluation<sup>1</sup>

This standard is issued under the fixed designation E 807; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This practice covers specific guidelines for the evaluation of laboratories performing metallographic services. The sources of criteria for this practice are ISO/IEC Guide 25 and Guide E 548. If inconsistencies exist between this practice and these documents, the criteria listed in this practice should have precedence.

1.2 The specific criteria assess the organization, facilities, personnel, testing, procedures, and record keeping of a metallographic laboratory.

### 2. Referenced Documents

#### 2.1 ASTM Standards:

E 7 Terminology Relating to Metallography<sup>2</sup>

E 548 Guide for General Criteria Used for Evaluating Laboratory Competence<sup>3</sup>

E 1187 Terminology Relating to Laboratory Accreditation<sup>3</sup>

#### 2.2 ISO Standards:

ISO/IEC Guide 25 General Requirements for the Competence of Calibration and Testing Laboratories<sup>4</sup>

ISO/IEC Guide 30 Terms and Definitions Used in Connection with Reference Materials<sup>4</sup>

### 3. Terminology

3.1 *Definitions:* For definitions of terms used in this practice, refer to Terminology E 7, E 1187, ISO/IEC Guide 30, and the Compilation of ASTM Definitions.

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

3.2.1 *calibration*—the comparison of measuring and test equipment, or the comparison of a measurement standard of unknown accuracy, to a measurement standard of known accuracy in order to detect, correlate, report, or minimize, by adjustment, any variation in the accuracy of the measuring and test equipment or measurement standard being compared. Calibrations may be performed directly or indirectly.

3.2.1.1 Direct calibration involves comparison with standards of known value which have an unbroken chain of

traceability to national standards.

3.2.1.2 Indirect calibration involves comparison with materials having known properties but no traceability.

3.2.2 *evaluator*—accrediting bodies, certification bodies, and others concerned with making judgments about the technical competence of laboratories.

3.2.3 *laboratory*—the metallographic organization being evaluated.

3.2.4 *quality manual*—all documents, notebooks, or files which describe or record the operations or components of the quality system.

3.2.5 *reference material*—a substance, one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials (ISO Guide 30).

3.2.6 *reference standard*—an apparatus which can be used routinely to calibrate or verify measuring instruments.

3.2.7 *verification*—checking or testing of the measuring and test equipment to ensure conformance to the specified requirements. As with calibrations, verifications can be completed directly or indirectly (see 3.2.1.1 and 3.2.1.2).

### 4. Significance and Use

4.1 This practice provides specific guidelines to be used in the evaluation of metallographic laboratories.

4.2 The practice defines the duties of the laboratory and the evaluator.

### 5. Responsibilities of the Evaluator

5.1 The evaluator should present to the agency a written statement defining the purpose of the intended evaluation.

5.2 The evaluator should only investigate those resources and facilities of the laboratory applicable to the evaluation.

5.3 The evaluator should be knowledgeable in the fields of metallography being evaluated.

5.4 The evaluator shall not disclose any results of the evaluation or any proprietary information of the laboratory acquired during the evaluation, except to an authorized representative of the laboratory.

### 6. Quality System

6.1 The laboratory shall establish and maintain a quality system documented in a quality manual which is available for use by the laboratory staff. The quality manual shall be maintained relevant and current by a designated member of the laboratory staff (see 7.1.3). The quality manual may consist of

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 03.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 14.02.

<sup>4</sup> Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.

more than one document, notebook, or file.

6.2 The quality manual, including all related quality documentation, notebooks, or files should state the policies, organizational structure, and procedures established by the laboratory to meet the requirements of this practice.

6.3 The quality system should be reviewed at least annually by the laboratory staff to ensure its continuing pertinence, and to introduce any necessary changes or improvements.

## **7. Organization**

7.1 The following information about the laboratory should be made available to the evaluator.

7.1.1 The identity, address, scope of operation, and location of the laboratory to be evaluated.

7.1.2 A list or chart showing the relevant equipment used in the laboratory.

7.1.3 A written outline or chart delineating job titles and respective responsibilities, including a person who has overall responsibility for the technical operations of the laboratory and the quality system. This person should be designated by laboratory management and have direct access to top management.

7.1.4 The laboratory should have adequate security provisions for the protection of a customer's specimens, proprietary rights, and confidential information.

## **8. Personnel**

8.1 The following information, as a part of the quality system and manual, should be made available to the evaluator.

8.1.1 An outline listing the responsibility and authority of each relevant position.

8.1.2 A description or record of the education and training programs completed by the laboratory members.

8.2 An evaluator may ask the person to demonstrate competency by performing or discussing specific operations or test methods. A person working in the laboratory (that is, a metallographer), should be capable of the following.

8.2.1 The person should demonstrate a detailed knowledge of the operations of all the appropriate preparation equipment used in the laboratory.

8.2.2 The metallographer should demonstrate a detailed knowledge of all the appropriate test methods and the operation of any necessary testing equipment.

8.2.3 The metallographer should demonstrate a familiarity with, and a depth of understanding of, any applicable quantitative metallographic measurements or calculations.

8.2.4 The metallographer should demonstrate a familiarity with, and a depth of understanding of, the interpretation of pertinent microstructures.

8.2.5 The metallographer should have access to advice from a technical leader who can answer questions regarding interpretation of test methods, operating procedures, or repeatability of results.

8.3 A person in training should only perform tests under the guidance of a qualified member of the laboratory.

8.3.1 When the person in training is judged competent, by performance, examination, or both, an entry should be made in the training record stating the dates of training and the completion date. Other information may be included such as

the results of examination or the number of tests performed while in training. The report should be signed by the qualified technical member who acted as trainer.

8.4 At the implementation of a quality system, any person already deemed competent should be listed as experienced in the training records. Any subsequent education or training should be listed accordingly.

8.5 The qualifications and training of the technical leader should include the following:

8.5.1 A knowledge of the tests and procedures being evaluated, including testing technique, theoretical basis of the calculation(s), and operating principles of the equipment; and,

8.5.2 A sufficient knowledge of metallography, material science and elementary statistics to identify out-of-control conditions, set schedules for verification and organize collaborative test programs.

8.6 Information on the relevant qualifications, training and experience of the technical staff should be maintained in the quality manual.

## **9. Facilities, Maintenance and Repair**

9.1 The laboratory should have in its possession all preparation, measuring, and test equipment required to complete all of the test methods being evaluated. Operating instructions for all pertinent equipment in the laboratory should be listed in the quality manual and available to all personnel.

9.2 The laboratory environment shall not invalidate the test results or adversely affect the required accuracy of measurement. The facilities should be sufficiently spacious to limit the risk of damage or danger and to allow operators to make practical and precise movements.

9.3 Adequate measures should be taken to ensure good housekeeping in the laboratory.

9.4 All facilities and equipment should be properly maintained and repaired when necessary. Appropriate maintenance procedures for laboratory equipment should be listed in the quality manual and should be available to all operators. Maintenance and repair records should be maintained for each major piece of equipment, and should include the following:

9.4.1 The name of the item, the location, the manufacturer, the type or model number, and the serial number,

9.4.2 For new equipment, the dates the items were received and put into service; and,

9.4.3 The details of all maintenance and repairs performed on a specific piece of equipment.

9.5 When a piece of equipment that has been subjected to mishandling, gives suspect results or is shown by verification or other means to be defective, it should be taken out of service and clearly labelled until it has been repaired, recalibrated or replaced.

## **10. Calibration and Verification of Equipment**

10.1 Where appropriate, equipment should be calibrated before being put into service, and, thereafter, calibrated and verified according to an established program listed in the quality manual.

10.2 Whenever possible, the calibration and verification procedures should follow those outlined in the specific test method being used. All calibration and verification procedures