



Standard Practice for Calibration of Transmission Densitometers¹

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1. Scope

1.1 This practice² covers the calibration of transmission densitometers used to perform radiographic film density measurements (see Note 1.)

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.*

NOTE 1—For further information on the design and use of densitometers, the following literature is suggested as additional background information: Guide E 94 and ANSI documents PH2.19 and PH2.36.

2. Referenced Documents

2.1 ASTM Standards:

E 94 Guide for Radiographic Examination³

E 1316 Terminology for Nondestructive Examinations³

2.2 ANSI Documents:

ANSI/NAPM IT 2.19–1994–Density Measurements—Part 2: Geometric Conditions for Transmission Density⁴

ANSI/IT 2.16–1996–Photography Density Measurements—Part 1: Terms, Symbols, and Notations⁴

3. Terminology

3.1 *Definitions*—For definitions of terms used in this practice, see Terminology E 1316.

4. Significance and Use

4.1 This practice provides a means for calibrating transmission densitometers used for the measurement of radiographic film density. A transmission densitometer calibrated in accordance with this practice provides the assurance that accurate density values of radiographs are obtained.

5. Apparatus

5.1 Apparatus should consist of the following:

5.1.1 A calibrated step tablet shall be used. The step tablet may be a NIST X-ray Step Tablet (Standard Reference Material SRM 1001)⁵ or alternately a step tablet from another supplier which is traceable to the NIST SRM 1001 X-ray Step Tablet. The step tablet shall have at least five step densities ranging from 0.3 through 3.9. The step tablet may have additional step densities less than 0.3 and greater than 3.9. A calibration certificate shall be provided with the step tablet indicating the tablet ID and recorded values for each step density. For suppliers of step tablets other than NIST, the certificate shall indicate conformance of traceability to NIST instrumentation used in the calibration process, applicable ANSI standards used, verification of measurement on a NIST SRM 1001 step tablet, the ID number of the SRM 1001 step tablet, and calibration date of the step tablet. Precautions should be taken in the storage, handling, and use of the step tablet. In the event it becomes scratched, blemished, or exhibits other signs of deleterious wear, it should be replaced immediately. The SRM 1001 (or alternate, if used) step tablet shall be replaced four years from the date of first use.⁶

5.1.2 *Transmission Densitometers*, with either direct-scale readout or digital readout displays specifically manufactured for the purpose of measuring the range of film densities described in 5.1.1 may be used.

5.1.3 *Manufacturer's Operating Instructions for Appropriate Transmission Densitometer*.

6. Calibration

6.1 Full-scale linearity calibration should be performed at least every 90 days during use as follows:

6.1.1 Allow a minimum of 30-min “warm-up” time (or the manufacturer's recommended warm-up time) to stabilize circuitry before starting the calibration procedure or the periodic verification checks described in Section 8. Adjust the “0” reading of the densitometer after the warm-up period.

¹ This practice is under the jurisdiction of ASTM Committee E07 on Nondestructive Testing and is the direct responsibility of Subcommittee E07.01 on Radiology (X and Gamma) Method.

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² For ASME Boiler and Pressure Vessel Code applications see related Practice SE-1079 in Section II of that Code.

³ *Annual Book of ASTM Standards*, Vol 03.03.

⁴ Available from American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036.

⁵ Standard Reference Material 1001 is available from the National Institute of Standards and Technology, Gaithersburg, MD.

⁶ Expiration interval of the SRM 1001 or alternate step tablet may be different than the requirements of this practice. Unless otherwise specified, requirements of this practice shall apply.

