
**Practice for dosimetry in an X-ray
(bremsstrahlung) facility for radiation
processing**

*Pratique de la dosimétrie dans une installation de traitement de produits
alimentaires par des rayons X (Bremsstrahlung)*



Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 15567 was prepared by the American Society for Testing and Materials (ASTM) Subcommittee E10.01 (as E 1608-94) and was adopted, under a special “fast-track procedure”, by Technical Committee ISO/TC 85, *Nuclear energy*, in parallel with its approval by the ISO member bodies.

A new ISO/TC 85 Working Group WG 3, *High-level dosimetry for radiation processing*, was formed to review the voting comments from the ISO “Fast-track procedure” and to maintain these standards. The USA holds the convenership of this working group.

International Standard ISO 15567 is one of 20 standards developed and published by ASTM. The 20 fast-tracked standards and their associated ASTM designations are listed below:

ISO Designation	ASTM Designation	Title
15554	E 1204-93	<i>Practice for dosimetry in gamma irradiation facilities for food processing</i>
15555	E 1205-93	<i>Practice for use of a ceric-cerous sulfate dosimetry system</i>
15556	E 1261-94	<i>Guide for selection and calibration of dosimetry systems for radiation processing</i>
15557	E 1275-93	<i>Practice for use of a radiochromic film dosimetry system</i>
15558	E 1276-96	<i>Practice for use of a polymethylmethacrylate dosimetry system</i>
15559	E 1310-94	<i>Practice for use of a radiochromic optical waveguide dosimetry system</i>
15560	E 1400-95a	<i>Practice for characterization and performance of a high-dose radiation dosimetry calibration laboratory</i>
15561	E 1401-96	<i>Practice for use of a dichromate dosimetry system</i>

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15562	E 1431-91	<i>Practice for dosimetry in electron and bremsstrahlung irradiation facilities for food processing</i>
15563	E 1538-93	<i>Practice for use of the ethanol-chlorobenzene dosimetry system</i>
15564	E 1539-93	<i>Guide for use of radiation-sensitive indicators</i>
15565	E 1540-93	<i>Practice for use of a radiochromic liquid dosimetry system</i>
15566	E 1607-94	<i>Practice for use of the alanine-EPR dosimetry system</i>
15567	E 1608-94	<i>Practice for dosimetry in an X-ray (bremsstrahlung) facility for radiation processing</i>
15568	E 1631-96	<i>Practice for use of calorimetric dosimetry systems for electron beam dose measurements and dosimeter calibrations</i>
15569	E 1649-94	<i>Practice for dosimetry in an electron-beam facility for radiation processing at energies between 300 keV and 25 MeV</i>
15570	E 1650-94	<i>Practice for use of cellulose acetate dosimetry system</i>
15571	E 1702-95	<i>Practice for dosimetry in a gamma irradiation facility for radiation processing</i>
15572	E 1707-95	<i>Guide for estimating uncertainties in dosimetry for radiation processing</i>
15573	E 1818-96	<i>Practice for dosimetry in an electron-beam facility for radiation processing at energies between 80 keV and 300 keV</i>

For the purposes of this International Standard, the following amendments to the ASTM text apply.

Page 1, subclause 1.3

Replace subclause 1.3 by the following.

1.3 Dosimetry is only one component of a total quality assurance program for an irradiation facility. Other controls besides dosimetry may be required for specific applications such as medical device sterilization and food preservation.

1.4 For the irradiation of food and the radiation sterilization of health care products, other specific ISO standards exist. For food irradiation, see ISO 15562:1998, *Practice for dosimetry in electron and bremsstrahlung irradiation facilities for food processing* (ASTM Practice E 1431). For the radiation sterilization of health care products, see ISO 11137:1995, *Sterilization of health care products — Requirements for validation and routine control — Radiation sterilization*. In those areas covered by ISO 11137, that standard takes precedence.

Page 1, subclause 1.4

Renumber this subclause as 1.5.



Designation: E 1608 – 94

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Standard Practice for Dosimetry in an X-Ray (Bremsstrahlung) Facility for Radiation Processing¹

This standard is issued under the fixed designation E 1608; 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 practice covers dosimetric procedures to be followed in facility characterization, process qualification, and routine processing using X-rays (bremsstrahlung) to ensure that the entire product has been treated within an acceptable range of absorbed doses. Other procedures related to facility characterization, process qualification, and routine processing that may influence absorbed dose in the product are also discussed. The establishment of effective or regulatory dose and X-ray energy limits are not within the scope of this practice.

1.2 In contrast to monoenergetic gamma rays, the bremsstrahlung energy spectrum extends from low values up to the maximum energy of the electrons incident on the X-ray target (see Section 5 and the Appendix).

1.3 Dosimetry is only one component of a total quality assurance program for an irradiation facility. Other controls besides dosimetry may be required for specific applications such as medical device sterilization and food preservation (see Sections 8, 9, and 10 and Note 8).

NOTE 1—For guidance in the selection, calibration, and use of specific dosimeters and interpretation of absorbed dose in the product from dose measurements, see the documents listed in 2.1 and 2.2.

NOTE 2—Bremsstrahlung characteristics are similar to gamma rays from radioactive isotopes. See Practice E 1204 for the applications of dosimetry in the characterization and operation of gamma-ray irradiation facilities. For information concerning electron beam irradiation technology and dosimetry, see Practice E 1431.

1.4 *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:

- E 170 Terminology Relating to Radiation Measurements and Dosimetry²
- E 1026 Practice for Using the Fricke Reference Standard Dosimetry System²
- E 1204 Practice for Dosimetry in Gamma Irradiation Facilities for Food Processing²

- E 1205 Practice for Use of a Ceric-Cerous Sulfate Dosimetry System²
- E 1261 Guide for the Selection and Application of Dosimetry Systems for Radiation Processing of Food²
- E 1275 Practice for Use of a Radiochromic Film Dosimetry System²
- E 1276 Practice for Use of a Polymethylmethacrylate Dosimetry System²
- E 1310 Practice for Use of a Radiochromic Optical Waveguide Dosimetry System²
- E 1400 Practice for Characterization and Performance of a High-Dose Gamma-Radiation Dosimetry Calibration Laboratory²
- E 1401 Practice for Use of a Dichromate Dosimetry System²
- E 1431 Practice for Dosimetry in Electron and Bremsstrahlung Irradiation Facilities for Food Processing²
- E 1538 Practice for Use of the Ethanol-Chlorobenzene Dosimetry System²
- E 1539 Guide for Use of Radiation-Sensitive Indicators²
- E 1540 Practice for Use of a Radiochromic Liquid Dosimetry System²
- E 1607 Practice for Use of the Alanine-EPR Dosimetry System²
- 2.2 ICRU Reports:³
 - Report 14 Radiation Dosimetry: X Rays and Gamma Rays with Maximum Photon Energies Between 0.6 and 50 MeV
 - Report 33 Radiation Quantities and Units
 - Report 35 Radiation Dosimetry: Electron Beams with Energies Between 1 and 50 MeV
 - Report 37 Stopping Powers for Electrons and Positrons

3. Terminology

3.1 *Definitions*—Definitions of terms used in this practice may be found in Terminology E 170 and ICRU Report 33.

3.2 *Descriptions of Terms Specific to This Standard*—Definitions of some terms specific to this practice are listed below.

3.2.1 *absorbed dose, D*—the quotient of de by dm , where de is the mean energy imparted by ionizing radiation to matter of mass dm (see ICRU Report 33):

$$D = de/dm$$

The special name of the unit for absorbed dose in the International System of Units (SI) is the gray (Gy).

¹ This practice is under the jurisdiction of ASTM Committee E-10 on Nuclear Technology and Applications and is the direct responsibility of Subcommittee E10.01 on Dosimetry for Radiation Processing.

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² Annual Book of ASTM Standards, Vol 12.02.

³ Available from International Commission on Radiation Units and Measurements, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814.