



Designation: C1572/C1572M – 23

Standard Guide for Dry Lead Glass and Oil-Filled Lead Glass Radiation Shielding Window Components for Remotely Operated Facilities¹

This standard is issued under the fixed designation C1572/C1572M; 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 Intent:

1.1.1 The intent of this standard is to provide guidance for the design, fabrication, quality assurance, inspection, testing, packaging, shipping, installation, and maintenance of radiation shielding window components. These window components include wall liner embedments, dry lead glass radiation shielding window assemblies, oil-filled lead glass radiation shielding window assemblies, shielding wall plugs, barrier shields, view ports, and the installation/extraction table/device required for the installation and removal of the window components.

1.2 Applicability:

1.2.1 This standard is intended for those persons who are tasked with the planning, design, procurement, fabrication, installation, and operation of the radiation shielding window components that may be used in the operation of hot cells, high level caves, mini-cells, canyon facilities, and very high level radiation areas.

1.2.2 This standard applies to radiation shielding window assemblies used in normal concrete walls, high-density concrete walls, steel walls and lead walls.

1.2.3 The values stated in SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the standard. Common nomenclature for specifying some terms; specifically shielding, uses a combination of metric units and inch-pound units.

1.2.4 This standard identifies the special information required by the Manufacturer for the design of window components. [Table A1.1](#) shows a sample list of the radiation source spectra and geometry information, typically required for shielding analysis. [Table A2.1](#) shows a detailed sample list of specific data typically required to determine the physical size,

glass types, and viewing characteristics of the shielding window, or view port. [Annex A3](#) shows general window configuration sketches. Blank copies of [Table A1.2](#) and [Table A2.1](#) are found in the respective Annexes for the Owner–Operator’s use.

1.2.5 This standard is intended to be generic and to apply to a wide range of configurations and types of lead glass radiation shielding window components used in hot cells. It does not address glovebox, water, X-ray glass, or zinc bromide windows.

1.2.6 Supplementary information on viewing systems in hot cells may be found in Guides [C1533](#) and [C1661](#).

1.3 Caveats:

1.3.1 Consideration shall be given when preparing the shielding window designs for the safety related issues discussed in the Hazard Sources and Failure Modes, Section [11](#); such as dielectric discharge, over-pressurization, radiation exposure, contamination, and overturning of the installation/extraction table/device.

1.3.2 In many cases, the use of the word “shall” has been purposely used in lieu of “should” to stress the importance of the statements that have been made in this standard.

1.3.3 *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, health, and environmental practices and determine the applicability of regulatory requirements prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *Industry and National Consensus Standards—*Nationally recognized industry and consensus standards which may be applicable in whole or in part to the design, fabrication, quality assurance, inspection, testing, packaging, shipping,

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installation and maintenance of radiation shielding window components are referenced throughout this standard and include the following:

2.2 *ASTM Standards:*²

A27/A27M Specification for Steel Castings, Carbon, for General Application

A36/A36M Specification for Carbon Structural Steel

A48/A48M Specification for Gray Iron Castings

A240/A240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A747/A747M Specification for Steel Castings, Stainless, Precipitation Hardening

C859 Terminology Relating to Nuclear Materials

C1533 Guide for General Design Considerations for Hot Cell Equipment

C1661 Guide for Viewing Systems for Remotely Operated Facilities

D1533 Test Method for Water in Insulating Liquids by Coulometric Karl Fischer Titration

D3703 Test Method for Hydroperoxide Number of Aviation Turbine Fuels, Gasoline and Diesel Fuels

D6304 Test Method for Determination of Water in Petroleum Products, Lubricating Oils, and Additives by Coulometric Karl Fischer Titration

E165/E165M Practice for Liquid Penetrant Testing for General Industry

E170 Terminology Relating to Radiation Measurements and Dosimetry

E299 Test Method for Trace Amounts of Peroxides in Organic Solvents

E2024 Practice for Atmospheric Leaks Using a Thermal Conductivity Leak Detector

ASTM/IEEE SI-10 Standard for Use of the International System of Units

2.3 *American Concrete Institute (ACI) Standards:*³

ACI C-31 Seismic Requirements

2.4 *American Institute of Steel Construction (AISC) Standard:*⁴

Manual of Steel Construction

2.5 *American National Standards Institute (ANSI) Standards:*⁵

ANSI Y 14 Engineering Drawing and Related Documentation Practices

ANSI/ASME NQA-1 Quality Assurance Requirements for Nuclear Facility Applications

ANSI/AWS A2.4 Standard Symbols for Welding, Brazing and Nondestructive Examination

ANSI/AWS B2.1 Specification for Welding Procedure and Performance Qualification

ANSI/AWS D1.1/D1.1M Structural Welding Code—Steel

ANSI/AWS D1.6/D1.6M Structural Welding Code—Stainless Steel

ANSI/ISO/ASQ 9001 Quality Management Standard Requirements

2.6 *American Society for Nondestructive Testing (ASNT) Standards:*⁶

ASNT-SNT-TC-1A Recommended Practice for Qualification and Certification of Nondestructive Testing

2.7 *Steel Structures Painting Council (SSPC):*⁷

SSPC-SP1 Solvent Cleaning

SSPC-SP5 White Metal Blast Cleaning

SSPC-PA1 Shop, Field, and Maintenance Painting of Steel

2.8 *Federal Standards (FS):*⁸

QQ-C-40 Caulking, Lead Wool, and F7 Lead Pig

2.9 *Federal Regulations (FR):*⁸

10 CFR20.1003 Definitions

10 CFR50, Appendix B Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants

10 CFR830.120 Subpart A Nuclear Safety Management, Quality Assurance Requirements

2.10 *International Building Code (IBC):*⁸

IBC Section 2314 Earthquake Regulations

2.11 *Other Standards:*

NCRP Report No. 82 SI Units in Radiation Protection and Measurements⁹

ICRU Report 10b Physical Aspects of Irradiation¹⁰

3. Terminology

3.1 General Considerations:

3.1.1 The terminology employed in this guide conforms with industry practice insofar as practicable.

3.1.2 For definitions of general terms used to describe nuclear materials, hot cells, and hot cell equipment, refer to Terminology **C859**.

3.2 Definitions:

3.2.1 *air dryer cartridge, n*—a cloth bag containing moisture-absorbent crystals.

3.2.1.1 *Discussion*—The bag is inserted into the dryer assembly. The crystals are used to absorb moisture from the contained environment.

3.2.2 *anti-reflection treatment, n*—a process applied to the surface of the glass that reduces reflection and increases the light transmission through the glass.

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.

³ Available from American Concrete Institute (ACI), P.O. Box 9094, Farmington Hills, MI 48333-9094, <http://www.concrete.org>.

⁴ Available from American Institute of Steel Construction (AISC), One E. Wacker Dr., Suite 700, Chicago, IL 60601-2001, <http://www.aisc.org>.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁶ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

⁷ Available from Society for Protective Coatings (SSPC), 40 24th St., 6th Floor, Pittsburgh, PA 15222-4656, <http://www.sspc.org>.

⁸ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, <http://www.access.gpo.gov>.

⁹ Available from National Council of Radiation Protection and Measurements, 7910 Woodmont Avenue, Suite 400, Bethesda, MD 20814-3095.

¹⁰ Available from International Commission on Radiation Units and Measurements, Inc., 7910 Woodmont Avenue, Suite 400, Bethesda, MD 20814-3095.