



Standard Test Method for Gravimetric Determination of Nonvolatile Residue (NVR) in Environmentally Controlled Areas for Spacecraft¹

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1. Scope

1.1 This test method covers the determination of nonvolatile residue (NVR) fallout in environmentally controlled areas used for the assembly, testing, and processing of spacecraft.

1.2 The NVR of interest is that which is deposited on sampling plate surfaces at room temperature; it is left to the user to infer the relationship between the NVR found on the sampling plate surface and that found on any other surfaces.

1.3 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

1.4 The values stated in SI units are to be regarded as the standard.

2. Referenced Documents

2.1 ASTM Standards:

D 1193 Specification for Reagent Water²

E 1234 Practice for Handling, Transporting, and Installing Nonvolatile Residue (NVR) Sample Plates Used in Environmentally Controlled Areas for Spacecraft³

F 50 Practice for Continuous Sizing and Counting of Airborne Particles in Dust-Controlled Areas and Clean Rooms Using Instruments Capable of Detecting Single Sub-Micrometre and Larger Particles³

2.2 ISO Standards:

14644-1 Cleanrooms and Associated Controlled Environments—Part 1: Classification of Air Cleanliness⁴

14644-2 Cleanrooms and Associated Controlled Environments—Part 2: Specifications for Testing and Monitoring to Prove Continued Compliance with ISO 14644-1⁴

14951-3 Space Systems—Fluid Characteristics—Part 3: Nitrogen⁴

2.3 U.S. Federal Standard:

FED-STD-209E Airborne Particulate Cleanliness Classes in Cleanrooms and Clean Zones⁵

2.4 Institute of Environmental Sciences and Technology:

IEST-RP-CC001.3 HEPA and ULPA Filters⁶

IEST-RP-CC007.1 Testing ULPA Filters⁶

IEST-RP-CC034.1 HEPA and ULPA Filter Leak Tests⁶

IEST-STD-CC1246 Product Cleanliness Levels and Contamination Control Program⁶

2.5 American National Standards Institute:

ANSI/ASME B46.1-1985 Surface Texture (Surface Roughness, Waviness, and Lay)⁴

2.6 Other:

Industrial Ventilation, A Manual of Recommended Practice, Latest Edition⁷

SMC-TR-95-28, *Nonvolatile Residue Solvent Replacement*, U.S. Air Force Space and Missile Systems Center, 1 March 1995⁵

3. Terminology

3.1 Definitions:

3.1.1 *ISO Class N (airborne particulate cleanliness class), n*—level of airborne particulate concentrations as defined in ISO 14644-1 and 14644-2, where 10^N is the maximum allowable concentration (particles/m³).

3.1.1.1 *Discussion*—The considered particle sizes (lower threshold values) applicable for classification with ISO 14644-1 are limited to the range from 0.1 through 5 μm. Particles larger than 5 μm (macroparticles) may be expressed in accordance with Annex E of ISO 14644-1.

3.1.2 *FS209 class, n*—the level of cleanliness specified by the maximum allowable number of particles/ft³ of air as defined in FED-STD-209E.

¹ This test method is under the jurisdiction of ASTM Committee E21 on Space Simulation and Applications of Space Technology and is the responsibility of Subcommittee E21.05 on Contamination.

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² *Annual Book of ASTM Standards*, Vol 11.01.

³ *Annual Book of ASTM Standards*, Vol 15.03.

⁴ Available from the American National Standards Institute, 25 W. 43rd St., 4th Floor, New York NY 10036.

⁵ Available from Standardization Documents Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA, 19111-5094, Attn.: NPODS.

⁶ Available from Institute of Environmental Sciences, 940 E. Northwest Highway, Mount Prospect, IL 60056.

⁷ Available from Committee on Industrial Ventilation, PO Box 16153, Lansing, MI 48901.