

Institute of Environmental Sciences and Technology

IEST-RP-CC021.5

Contamination Control Division

Recommended Practice 021.5

Testing HEPA and ULPA Filter Media



827 W. Linden Office Square, Suite 400
Scottsdale, IL 60173
Phone: (847) 981-0100 • Fax: (847) 981-4130
E-mail: information@iest.org • Web: www.iest.org

This Recommended Practice was prepared by and is under the jurisdiction of Working Group 21 of the IEST Contamination Control Division (WG-CC021). The following WG voting members contributed to the development of this edition of this Recommended Practice.

Donna Kasper, Hollingsworth & Vose Company
WG-CC021 Chair

Taguhi Arakelian, Jet Propulsion Laboratory

Eugene Bryan, QVA Test Solutions, LLC

Keith Flyzik, Controlled Environment Certification Services, Inc.

Nick Karlowski, Filtech, Inc.

Don Largent, AAF Flanders

Tim McDiarmid, Air Techniques International

Mark Renn, AAF Flanders

Andrew Stillo, Camfil USA, Inc.

R. Vijayakumar, Aerfil

The Working Group also wishes to acknowledge the contributions of members who prefer to remain anonymous.

Copyright © 2024 by the Institute of Environmental Sciences and Technology

First printing, March 2024

ISBN: 978-1-937280-62-8 (Electronic format)

ISBN: 978-1-937280-61-1 (Print format)

PROPOSAL FOR IMPROVEMENT: The Working Groups of the Institute of Environmental Sciences and Technology are continually working on improvements to their Recommended Practices and Reference Documents. Suggestions from users of these documents are welcome. If you have a suggestion regarding this document, please use the online Proposal for Improvement form found on the IEST website at www.iest.org.

Institute of Environmental Sciences and Technology
1827 Walden Office Square, Suite 400
Schaumburg, IL 60173
Phone: (847) 981-0100 • Fax: (847) 981-4130
E-mail: information@iest.org • Web: www.iest.org

NOTICE AND DISCLAIMER: This Recommended Practice is published by the Institute of Environmental Sciences and Technology (IEST) to advance the technical and engineering sciences. Use of this document is entirely voluntary, and determination of its applicability and suitability for any particular use is solely the responsibility of the user. Use of this Recommended Practice does not imply any warranty or endorsement by IEST.

The information in this publication was considered technically sound by the consensus of persons engaged in the development and approval of the document at the time it was developed. Consensus does not necessarily mean that there is unanimous agreement among all persons participating in the development of this document.

IEST standards, recommended practices, and guideline publications, of which the document contained herein is one, are developed through a voluntary consensus standards development process. This process brings together volunteers and seeks out the views of persons who have an interest in the topic covered by this publication. While IEST administers the process to promote fairness in the development of consensus, the organization does not write the document and does not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in IEST standards, recommended practices, and guideline publications.

IEST disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. IEST disclaims and makes no guaranty or warranty, express or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfill any of the particular purposes or needs of users of the document. IEST does not guarantee the performance of any individual manufacturer or seller's products or services by virtue of this standard or guide.

In publishing and making this document available, IEST is not undertaking to render professional or other services for or on behalf of any person or entity, nor is IEST undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

IEST has no power, nor does it undertake to police or enforce compliance with the contents of this document. IEST does not certify, test, or inspect products, designs, or installations for safety or health purposes. Any certification or other statement of compliance with any health or safety-related information in this document shall not be attributable to IEST and is solely the responsibility of the certifier or maker of the statement.

RP-CC021.5 WHAT IS NEW AND IMPROVED

New:

- Appendix C, **HEPA Filter penetration test “cold” photometric method** merged into Section 4.2 of the document. Previously “hot” and “cold” DOP methods were described separately although they utilize the same method. This is a more economical way to include both methods in the document.
- Added section 4.5 “**Testing Electrostatically Charged Media**” to address the use of this media type in place of traditional mechanical media for high efficiency filters in certain applications.

Improved:

- Appendix A, **Calibration Period Summary**, edited for improved clarity.
- Appendix B, revised calculations in tables B2 and B3.

Testing HEPA and ULPA Filter Media

IEST-RP-CC021.5

CONTENTS

SECTION

1	SCOPE AND LIMITATIONS	5
2	REFERENCES.....	5
3	TERMS AND DEFINITIONS	7
4	TEST METHODS.....	9
5	REPORTING AND MARKING.....	24

FIGURES

FIGURE 1. BASIC COMPONENTS FOR THE HEPA FILTER MEDIA PENETRATION TEST— PHOTOMETRIC METHOD.	11
FIGURE 2. BASIC COMPONENTS FOR THE HEPA AND ULPA FILTER MEDIA PENETRATION TEST—PARTICLE COUNT METHOD.....	15
FIGURE B1. IMPACT SCORE DEVICE.....	32
FIGURE B2. RILL PENETRATION.....	32

TABLES

TABLE B1. UPPER AND LOWER CONFIDENCE LIMITS FOR UPSTREAM AND DOWNSTREAM COUNTS.....	27
TABLE B2. SINGLE DETERMINATION ANALYSIS.....	35
TABLE B3. DUAL DETERMINATION ANALYSIS.....	36

APPENDIXES

APPENDIX A—CALIBRATION PERIOD SUMMARY	25
APPENDIX B—GENERAL INFORMATION	26
APPENDIX C—BIBLIOGRAPHY	37

Testing HEPA and ULPA Filter Media

IEST-RP-CC021.5

1 SCOPE AND LIMITATIONS

1.1 Scope

This Recommended Practice (RP) discusses test methods for physical and filtration properties of high-efficiency particulate air (HEPA) and ultra-low penetration air (ULPA) filtration media.

Application of this RP is by mutual agreement between the customer and the supplier. Use of this RP should be applied to the following:

- a) Acceptance criteria for test methods
- b) Test aerosol and particle size
- c) Test face velocity

1.2 Limitations

This RP does not include discussion of special applications testing, such as nuclear, biological, chemical, and other such testing. Although the general approach to testing media outlined in this RP may be used for testing media with lower efficiencies than HEPA media, the user is cautioned that specific recommendations noted on aerosols, statistics, instrumentation, and other factors may not be appropriate.

NOTE: Testing in accordance with this RP may involve hazardous materials, operations, and equipment. This RP does not purport to address all the safety problems associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to determine the applicability of regulatory limitations before use.

2 REFERENCES

The following documents are incorporated into this RP to the extent specified herein. Users should apply the most recent editions of the references.

2.1 Reference Documents

ASME F78-63 2007: *Standard Methods for Gas Flow Resistance Testing of Filtration Media*

ASME D2986: *Standard Practice for Evaluation of Air Assay Media by the Monodisperse DOP (Diocetyl Phthalate) Smoke Test*

IEST-RP-CC001: *HEPA and ULPA Filters*

IEST-RP-CC007: *Testing ULPA Filters*