THE ENVIRONMENTAL TECHNOLOGY VERIFICATION PROGRAM

U.S. Environmental Protection Agency

Research Triangle Institute

ETV Joint Verification Statement

TECHNOLOGY TYPE:	**VENTILATION MEDIA AIR FILTER**	
APPLICATION:	**FILTRATION EFFICIENCY OF BIOAEROSOLS IN HVAC SYSTEMS**	
TECHNOLOGY NAME:	**High Efficiency Mini Pleat**	
COMPANY:	**Columbus Industries**	
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The U.S. Environmental Protection Agency (EPA) has created the Environmental Technology Verification (ETV) Program to facilitate the deployment of innovative or improved environmental technologies through performance verification and dissemination of information. The goal of the ETV Program is to further environmental protection by accelerating the acceptance and use of improved and cost-effective technologies. ETV seeks to achieve this goal by providing high quality, peer-reviewed data on technology performance to those involved in the design, distribution, financing, permitting, purchase, and use of environmental technologies.

ETV works with recognized standards and testing organizations; stakeholder groups which consist of buyers, vendor organizations, permitters, and other interested parties; and with the full participation of individual technology developers. The program evaluates the performance of innovative and improved technologies by developing test plans that are responsive to the needs of stakeholders, conducting field or laboratory tests (as appropriate), collecting and analyzing data, and preparing peer-reviewed reports. All evaluations are conducted in accordance with rigorous quality assurance protocols to ensure that data of known and adequate quality are generated and that the results are defensible.

EPA's National Risk Management Research Laboratory contracted with the Research Triangle Institute (RTI) to establish a homeland-security-related ETV Program for products that clean ventilation air. RTI evaluated the performance of ventilation air filters used in building heating, ventilation and air-conditioning (HVAC) systems. This verification statement provides a summary of the test results for the Columbus Industries High Efficiency Mini Pleat media air filter.

VERIFICATION TEST DESCRIPTION

All tests were performed in accordance with RTI's "Test/Quality Assurance Project Plan: Biological Testing of General Ventilation Filters," which was approved by EPA. The following tests were performed:

- Bioaerosol filtration efficiency tests of the clean and dust-loaded filter. Three bioaerosols were used in the testing:
  - The spore form of the bacteria *Bacillus atrophaeus* (BG), a gram-positive spore-forming bacteria elliptically shaped with dimensions of 0.7 to 0.8 by 1 to 1.5 μm,
  - *Serratia marcescens*, a rod-shaped gram-negative bacteria with a size of 0.5 to 0.8 by 0.9 to 2.0 μm, and
  - The bacterial virus (bacteriophage) MS2 dispersed as a micrometer-sized polydisperse aerosol.
- Inert aerosol filtration efficiency tests consisting of an American National Standards Institute (ANSI)/American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 52.2-1999 type test (0.3 to 10 µm) and extended fractional efficiency measurements down to 0.02 µm particle diameter on both clean and dust-loaded filter.
- ASHRAE 52.2 test providing filtration efficiency results (average of the minimum composite efficiency) for three size ranges of particles: E1, 0.3 to 1.0 μm; E2, 1.0 to 3.0 μm; and E3, 3.0 μm to 10 μm.

VERIFIED TECHNOLOGY DESCRIPTION

As shown in Figure 1, the Columbus Industries High Efficiency Mini Pleat media air filter has nominal dimensions of 0.61 x 0.61 x 0.10 m (24 x 24 x 4 in.). The filter has a chipboard frame with white fiberglass media having 3.5 pleats per inch. The Columbus Industries part number is MP6524244.

Figure 1. Photograph of the Columbus Industries High Efficiency Mini Pleat media filter.

VERIFICATION OF PERFORMANCE

Verification testing of the Columbus Industries High Efficiency Mini Pleat media air filter began on September 22, 2003 at the test facilities of RTI and was completed on November 18, 2003. The results for the bioaerosol filtration efficiency tests are presented in Table 1 for the clean and dust-loaded filter. Table 2 presents the results of the ASHRAE 52.2 test. All tests were conducted at an air flow of 0.93 m3/sec (1970 cfm).

Table 1. Bioaerosol Filtration Results

Filter Condition	Pressure Drop Pa (in. H_2O)	Filtration Efficiency for Removal of *B. atrophaeus* , %	Filtration Efficiency for Removal of *S. marcescens, %*	Filtration Efficiency for Removal of MS2 phage, %
Clean	211 (0.85)	73	81	78
Dust loaded	428 (1.72)	93	93	89

Table 2. Summary of ASHRAE 52.2 Test

Filter	E1 0.3 to 1.0 μm, %	E2 1.0 to 3.0 μm, %	E3 3.0 to 10 μm, %	Minimum Efficiency Reporting Value (MERV)
Columbus Industries High Efficiency Mini Pleat	43	83	95	12 at 0.93 m^3/sec (1970 cfm)

The quality assurance officer reviewed the test results and the quality control data and concluded that the data quality objectives given in the approved test/QA plan were attained.

This verification statement addresses two performance measures of media air filters: filtration efficiency and pressure drop. Users of this technology may wish to consider other performance parameters such as service life and cost when selecting a media air filter for bioaerosol control. In accordance with the test/QA plan[1], this verification is valid for 3 years following the last signature added on the verification statement.

Original signed by E. Timothy Oppelt 2/11/2004
E. Timothy Oppelt Date
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