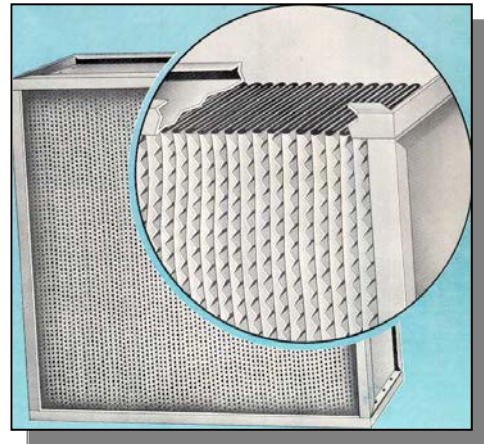


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- 2.0 Responsibilities**
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### **1.0 PURPOSE & SCOPE**

**Purpose:** This procedure defines the role of the IH group in the development and coordination of an effective high-efficiency particulate air HEPA Surveillance Testing Program. As a minimum, the program will comply with *ANSI N510-1995, Section 10 HEPA Filter Bank In-place Test* and the corresponding worker qualification requirements in *ASME/ANSI NQA-1-1997: Quality Assurance Requirements for Nuclear Facility Applications, Requirement 2* as required by DOE. This procedure provides methods for the in-place efficiency testing of HEPA filter systems and portable vacuum cleaners at BNL.

**Scope:** This program does not cover Acceptance Testing of HEPA filters as defined in *ANSI N510-1995, HEPA Testing of Nuclear Air Treatment Systems, Sections 6 –8 and 12 – 15*.

BNL policy is to substitute the hazardous challenge agent Di-Octyl Phthalate, a recognized carcinogen, with the safer synthetic oil (Emery 3004). The test described in this SOP involves Emery 3004 (poly-alpha-olefin) being injected into a HEPA filtered exhaust ventilation system during testing. Penetration of this challenge agent through the filter is measured downstream of the injection site and filter.

HEPA filters are manufactured to remove  $\geq 99.97\%$  of the particles with a mean diameter of 0.3  $\mu\text{m}$  from an air stream and are evaluated at a centralized DOE Filter Test Facility prior to release

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to end users such as BNL. Upon installation in the field, these filters must again be evaluated. This second phase of evaluation is known as “in-place” testing and is designed to measure not only the particle removal efficiency of the HEPA filter but also the seal of associated ductwork, gasketing, and the filter housing box. The criterion for the acceptance of an in-place test is a particle removal efficiency of  $\geq 99.97\%$ , unless the facility being tested has its own BNL approved performance specification.

## **2.0 RESPONSIBILITIES**

- 2.1 This program is implemented through the SHSD Industrial Hygiene Manager who may assign the duties to a *HEPA Filter Program Administrator*. Members of the SHSD Industrial Hygiene Group, the Radiation Control Division Facility Support Group, and Plant Engineering can potentially be qualified to perform certain tasks in this program. Personnel who have demonstrated competency in performing a certain role, in accordance with Section 7 of this procedure, will be qualified to serve in that role by the IH Manager or Program Administrator.
- 2.2 All filter testing will be conducted using properly trained personnel for their role who meet the requirements in *ANSI N510-1995 Section 10* and *ASME NQA-1, Requirement 2*
- 2.3 The IH Manager or HEPA Filter Program Administrator shall periodically review the BNL HEPA Filter Surveillance Program to access compliance. The periodic evaluation shall occur at least once each year and shall ensure that all filter testing is conducted to meet the requirements in *ANSI N510-1995*. Records of the assessment will be maintained for a minimum of 75 years.
- 2.4 It is the responsibility of the person conducting testing and his/her line supervisor to ensure that the appropriate personal protective equipment is worn while performing this procedure.
- 2.5 The person performing work under this program and his/her line supervisor are responsible to ensure that all required training and qualification for hazards that may be present in areas were this procedure will be used (such as respiratory protection or radiation contamination) have been met.

## **3.0 DEFINITIONS**

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*Acceptance Tests:* Tests that verify that systems have been correctly installed and meet the requirements of project specifications. These tests are made upon completion of fabrication, receipt, and installation, or after modification of an installed component, air cleaning unit, or system to verify that it meets the requirements specified.

*Filter Bank In-place Test:* A surveillance test that monitors penetration of a test agent through a filter and any gaps in the housing of the filter.

*HEPA Filter:* A high efficiency particulate filter having a fibrous medium with a particle removal efficiency of at least 99.97% for 0.3 micron particles of di-octyl phthalate.

*HEPA Filter Program Administrator:* A person, designated by the Industrial Hygiene Group Leader, to oversee compliance with the DOE Orders on HEPA filter testing for SHSD.

*Housing:* The portion of an air-cleaning unit that encloses air-cleaning components and provides connections to adjacent ductwork.

*Level 1 Tester:* A BNL defined title for the highest level of competency in qualified employees. The qualification requirements for this position are defined in the *Implementation and Training* portion of this SOP.

*Level 2 Assistant:* A BNL defined title for the lower level of competency for employees. These employees serve a role as a fully supervised assistant in field-testing. This position often represents a temporary assignment of very short duration (1-3 days). The qualification requirements for this position are defined in the *Implementation and Training* portion of this SOP.

*Surveillance Tests:* Tests that monitor the condition of systems that have previously passed an *Acceptance Test*. In particular, a *Surveillance Test* consists of an in-place leak test performed periodically to establish the current condition of a nuclear air treatment system and its components, with respect to bypasses and damage to filters and absorber.

## **4.0 PREREQUISITES**

- 4.1 A prerequisite for *ANSI N510 Section 10 Filter Bank In-place testing* is a measurement of air flow capacity in compliance with the *ACGIH Ventilation Manual* and the measurement of pressure drop across the filter bank. *ANSI N510 Section 10 Filter Bank In-place testing* shall not be performed by the *Level 1 Tester* on filters that have not had these two ventilation measurements recorded.

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4.2 *ANSI N510 Section 10 Filter Bank In-place tests* are valid for nuclear facilities only if the equipment meets the *ASME N509* requirements. The responsibility to ensure compliance with *ASME N509* lies on the owner of the equipment. Prior to *ANSI N510 Section 10 Filter Bank In-place testing*:

- The location of the upstream sample and injection ports should have been sited per *ANSI N510 Section 9 Air-Aerosol Mixing Uniformity Test*.
- An *ANSI N510 Section 9* test should have been performed at completion of initial system installation and after modification or major repair. Note: An *ANSI N510 Section 9 Air-Aerosol Mixing Uniformity Test* is not required in *ANSI N510* for single HEPA filter banks. Thus, it is not required for most laboratory hoods, most vacuum cleaners, and many local exhaust systems.
- Air cleaning equipment and components used in Nuclear Power Plants should meet *ASME N509-1996: Nuclear Power Plant Air-Cleaning Units and Components*, unless the system has met other appropriate criteria set in an approved system specification (technical specifications).

4.3 Prior to testing a HEPA filter system, verify the calibration and operability of the HEPA Filter test equipment.

4.4 Prior to testing a HEPA filter system, the Level 1 Tester contacts the appropriate RCD Facility Support Representative or Technician to obtain approval and clearance to enter the test area. This is to include RCD coverage for health physics issues as required by RCD.

## **5.0 PRECAUTIONS**

HEPA exhaust ventilation systems are very likely to have radiological or chemical contamination. Do not perform work described in this SOP until you contact persons knowledgeable with the system and have been informed all HEPA testers of the hazards of the equipment and measures to avoid inadvertent contamination of equipment and exposure to personnel. Only open the photometer in areas where radiological contamination can be contained and not result in surface contamination. Have the photometer surveyed for radiological contamination before handling internal parts.

### **5.1 Personal Protective Equipment**

- Hand: Contact with aerosol liquid (Emery 3004) does not pose a significant health risk. Use of this meter in areas of known or suspected chemical or radiological

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contamination requires the use of disposable gloves. Exam-style, splash gloves are acceptable. Acceptable elastomers are: Nitrile, PVC, and Natural Rubber.

- **Body:** If contact of the body with contaminated surfaces is anticipated, a disposable suit is to be used. Acceptable CPC materials include: Tyvek®, KleenGuard®, and cotton. Disposable garments must be discarded as hazardous waste if contact with contamination has occurred. If contact with potentially contaminated surfaces is not expected, protective body covering is optional. However, if personal clothing items become contaminated, they must be surrendered for BNL cleaning or disposal.
- **Foot:** Safety toes shoes are to be worn when handling gas cylinders. If contact of the feet with contaminated surfaces is anticipated, use disposable shoe coverings, boots or booties. Acceptable material include: Tyvek®, KleenGuard®, and rubber. If personal shoes become contaminated, they must be surrendered for BNL cleaning or disposal.
- **Respiratory:** Under normal use, respiratory protection is not required. If chemical or radiological levels from contamination in the area exceed the OSHA, ACGIH, or DOE standards, respirators are required. A half face or full face APR or PAPR respirator with appropriate cartridge or an air line respirators may be used up to assigned protection factor listed in the BNL's Respiratory Protection Selection and Issuance SOPs.
- **Eye:** Safety Glasses with side shields are required.

#### 5.2 **Environmental Management and Waste Disposal:**

- The operation converts all the Emery 3004 into an aerosol with compressed air. In a test of a passing filter, the aerosol is trapped on the filter. In a system with a leaking filter, some or all of the aerosol is discharged to the environment up the exhaust stack. The concentration of aerosol in the exhaust air has negligible environmental consequences.
- The Emery 3004 is used until it is all consumed in testing. If needed, the Emery 3004 is to be disposed of as a hazardous liquid. Dispose of unused Emery 3004 as per Attachment 9.2.

5.3 **Job Risk Assessment:** Consult the *Job Risk Assessment* [SHSD-JRA-01](#) for the risk analysis of this operation based on the hazards and controls of this SOP.

## 6.0 **PROCEDURE**

### Equipment:

- Emery 3004 or equivalent approved alternative

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- Aerosol generator
  - Aerosol detector
  - Sampling train (Tygon® tubing and probes)
  - Source of clean, medium-pressure (e.g., 50-75 PSI) air
- 6.1 Ensure the test detector m has been calibrated on an annual basis. Turn on detector power switch, allow 5-10 min. warm-up. (Warm-up photometer in the “clear” mode until a stable baseline reading is obtained.)
- 6.2 Prior to testing a potentially radiologically contaminated HEPA filter system, contact a RCD Facility Support Representative or FS Technician to obtain approval and clearance to enter the test area.
- 6.3 Identify the aerosol release and sampling point locations.
- In-Place System & Portable Air Handlers: The upstream filter sampling point should be at least 10 duct diameters from the aerosol release/system entry point to provide for a well-mixed suspension in the air mass. Similarly, the downstream sampling point should be located at least 10 duct diameters downstream from the filter housing. Where sampling points cannot be located at these distances due to the physical configuration of the ductwork, efforts should be made to maximize these distances to the greatest possible extent.
  - Vacuum Cleaners: Connect vacuum cleaner hose and power cord. Enclose top of vacuum cleaner in a large plastic bag and secure with duct tape. Put 4-20 pencil size holes to provide entry to test the air inside the bag (vacuum cleaner exhaust) and to prevent the bag from bursting when the unit is turned on.
- 6.4 Inspect the HEPA filter system and its associated ductwork and mechanical components for any obvious signs of damage, e.g., missing or damaged seals, breached ductwork, excessive rust, unusually loud motor noise. Notify Plant Engineering and the RCD Facility Support Representative of these conditions.
- 6.5 Activate the ventilation system or otherwise verify that the ventilation system is operating. Test the air cleaning system at standard operating conditions of airflow (design flow rate +/- 10%) and at normal operating pressure during testing. If more than one flow rate is used for operations, conduct a test at each flow rate. If the design has a variable flow rate, then test the system at the minimum and maximum (+/- 10%) flow.

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- 6.6 Attach sample collection tubing to the detector and warm-up the photometer in the “clear” mode until a stable baseline reading is obtained. Self-calibrate and zero the instrument according to manufacturer’s procedures. Insert the sample probes into the duct centerline at both the upstream and downstream sampling points.
- 6.7 Assemble the aerosol generator system, i.e., ensure adequate supply of aerosol-producing medium, attach inlet regulator and gauge, and affix aerosol release nozzle. Insert generator nozzle into air stream, upstream of HEPA filter, at a point as described above. For laboratory hood systems, it is often most expedient to release the challenge aerosol directly into the fume hood. In this case, position the generator so that the nozzle protrudes at least 6 inches into the hood.
- 6.8 Attach the compressed air supply line (from house air system or compressed gas cylinder) to the generator inlet regulator. Ensure that the generator regulator is open and delivering compressed air to the generator. The concentration of the challenge aerosol is a function of both the delivered air pressure and the volume of air exhausted through the ventilation system. For typical laboratory fume hood HEPA systems (e.g., air flows of about 1000-5000 ft<sup>3</sup>/min), the aerosol generator inlet regulator pressure should be adjusted to about 25 PSI. For significantly larger or smaller systems, the aerosol generator inlet pressure will need to be adjusted to provide at least a four order-of-magnitude difference between upstream (challenge) and downstream concentrations. Do not exceed an operating pressure of 100 PSIG.
- 6.9 Inject aerosol into ventilation system and observe the detector reading until a stable measurement is obtained.
- 6.10 Measure upstream and downstream aerosol concentrations as follows:
- Record static pressure drop across filter(s) if a gauge is present.
  - Measure upstream aerosol concentration.
  - Return to “clear” mode and re-zero instrument if necessary.
  - Measure downstream aerosol concentration.
  - Return to “clear” mode and re-zero instrument if necessary.
  - Repeat steps b - e until sequential upstream and downstream readings are within ±5% of their previous readings.
  - Record upstream and downstream concentrations.
  - Calculate particle removal efficiency of the filter as follows:

$$\text{Removal Efficiency (\%)} = \frac{C_u - C_d}{C_u} \times 100$$

Where:  $C_d$  = downstream aerosol concentration  
 $C_u$  = upstream aerosol concentration

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Unless other specified in the SBMS Subject Area: *Exhaust Ventilation* or the equipment operating specifications, the acceptable HEPA filter removal efficiency results are  $\geq 99.97\%$ .

- 6.11 If the testing equipment has been used on a radiological exhaust system(s), at the end of sampling, have a Facility Support Representative survey the equipment for radiological contamination. Then cap the hose and cap the inlet to the meter for storage.
- 6.12 Record data and findings on *HEPA Filter Test Report* form (see Attachment 9.4).
- 6.13 Affix results sticker at test location, fume hood face, or other appropriate location. The label should indicate the date of the test and the name or initials of the person performing the test. See Attachment 9.1 for a sample of an acceptable label.
- 6.14 Record-keeping: Provide a copy of the *HEPA Filter Test Report* to the ESH Coordinator, the RCD Facility Support Representative, and any other interested parties. Retain the original test report in accordance with the record keeping requirements of SHSD procedures.

## **7.0 IMPLEMENTATION & TRAINING**

- 7.1 The IH Group Leader, or his/her designee, shall qualify persons to perform fieldwork under this program.
- 7.2 Two levels of roles and tasks for employees are established under this program:
  - The *Level 1 Tester* is a person with a high level of proficiency demonstrated by a complete knowledge of the theory and practical aspects of the test program. *Level 1 Testers* are qualified to perform the *Surveillance tests* independent of direct supervision. The IH Group Leader or the *HEPA Filter Test Program Administrator* qualifies *Level 1 Testers*. Qualification is documented in Attachment 9.5 Job Performance Measure.
  - The *Level 2 Assistant* is a person with a no specific knowledge of the test procedure whose role is to assist a *Level 1 Tester*. A *Level 2 Assistant* is not qualified to

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perform the *Surveillance test* independently. The Level 2 Assistants demonstrates competency in performing their role in this test to the Level 1 They may be qualified on the day of fieldwork by the *Level 1 Tester*. Documentation of the *Level 2 Assistants* assignment shall consist of recording the name of the person on testing records.

## 8.0 REFERENCES

- 8.1 ANSI N510-1995, *Testing of Nuclear Air Cleaning System.*
- 8.2 ERDA 76-21, *Nuclear Air Cleaning Handbook.*
- 8.3 ASME N509-1996: *Nuclear Power Plant Air-Cleaning Units and Components.*
- 8.4 DOE *Radiological Control Manual*, Chapter 4.
- 8.5 Nucon Operation Manual
- 8.6 ATI 2H Photometer Instrument Manual
- 8.7 BNL SBMS Subject Area: *Exhaust Ventilation.*

## 9.0 ATTACHMENTS

- 9.1 *HEPA Filter System Test Results Sticker/Label*
- 9.2 *SHSD Environmental Evaluation of HEPA Filter Testing*
- 9.3 *HEPA Filter Set-up for Vacuum Cleaner Testing*
- 9.4 *In-Place HEPA Filter Test Report*
- 9.5 *Qualification Documentation Level 1 Tester form*

## 10.0 DOCUMENTATION

Document Development and Revision Control Tracking		
Prepared By: <i>(signature/date on file)</i> R. Selvey <b>3/12/00</b> Certified Industrial Hygienist	Reviewed By / Date: <i>(signature/date on file)</i> R. Wilson <b>3/12/00</b> HEPA Filter Tester Level 1 Administrator	Approved By / Date: <i>(signature/date on file)</i> R. Selvey <b>3/12/00</b> Industrial Hygienist Group Leader
ESH Coordinator/ Date:  <i>none</i>	Work Coordinator/ Date:  <i>none</i>	SHSD Manager / Date  <i>none</i>
QA Review / Date: <i>(signature/date on file)</i> S. Sengupta 3/23/99	Training Coordinator / Date:  <i>none</i>	Filing Code:  <b>IH52</b>
Facility Support Rep. / Date:	Environ. Compliance Rep. / Date:	Effective Date:

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<i>none</i>	<i>none</i>	<b>11/19/02</b>
ISM Review - Hazard Categorization <input type="checkbox"/> High <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Low/Skill of the craft	Validation: <input type="checkbox"/> Formal Walkthrough <input type="checkbox"/> Desk Top Review <input type="checkbox"/> SME Review Name / Date:	Implementation: Training Completed: Tracked in BTMS Document Control on forms: 09/11/09

Revision Log		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Revised on 07/07/00 to new SBMS format. No significant text changes made. SME Reviewer/Date: R. Selvey 07/07/00 (signature on file)		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Added Web Site banner and reviewed document for most recent format changes. No changes needed. SME Reviewer/Date: R. Selvey 01/31/01 (signature on file)		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Changed SOP number from IH-PP-8 to IH62200 under new format. Reviewed and made minor editorial and format changes. SME Reviewer/Date: R. Selvey 03/08/01 (signature on file)		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: SOP numbers revised to reflect new numbering, no significant changes to text necessary. Section numbers updated to most recent ESH&Q format. SME Reviewer/Date: R. Selvey 11/19/02 (signature on file)		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Review and minor corrections. Links to the revised wording in IH62300 made. Concurrence by R. Wilson, Level 1 tester. SME Reviewer/Date: R. Selvey 02/23/04 (signature on file)		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Added contamination survey precaution. Updated Qualification form to newer format and number. SME Reviewer/Date: R. Selvey 07/01/04 (signature on file)		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input checked="" type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Triennial review. Added JRA to Section 5. Revised Attachment 9.2 for Document Control. SME Reviewer/Date: R. Selvey 6/01/07 (signature on file)		
Purpose: <input type="checkbox"/> Temporary Change <input type="checkbox"/> Change in Scope <input checked="" type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Added Attachment 9.3 for EMS. SME Reviewer/Date: R. Selvey 02/06/09 (signature on file)		
Purpose: <input type="checkbox"/> Temporary Change <input checked="" type="checkbox"/> Change in Scope <input checked="" type="checkbox"/> Periodic review <input type="checkbox"/> Clarify/enhance procedural controls Changed resulting from: <input type="checkbox"/> Environmental impacts <input type="checkbox"/> Federal, State and/or Local requirements <input type="checkbox"/> Corrective/preventive actions to non-conformances <input checked="" type="checkbox"/> none of the above Section/page and Description of change: Rev 7: Merged IH62200, 62300 and 62350. Major text revisions to coordinate text. The form Attachment 9.4 was revised. SME Reviewer/Date: R. Selvey 09/11/09 (signature on file)		

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Purpose:  Temporary Change  Change in Scope  Periodic review  Clarify/enhance procedural controls  
Changed resulting from:  Environmental impacts  Federal, State and/or Local requirements  Corrective/preventive  
actions to non-conformances  none of the above  
Section/page and Description of change: Rev8: Changed "Building Manager" to "Facility Project Manager" in Attachment 9.3.  
Reviewed balance of SOP for needed changes. SME Reviewer/Date: R. Selvey 12/06/11

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## ATTACHMENT 9.1

### Sample of Acceptable HEPA Filter System Test Results Sticker/Label

<b>BNL - Safety &amp; Health Services Division - Industrial Hygiene Group</b>	
<b>HEPA FILTER TEST: FAILED</b> Do NOT Use Vacuum Cleaner for Hazardous Substances	
Test by: <input type="text"/>	Date: <input type="text"/>
Unit ID: <input type="text"/>	
Contact: Industrial Hygiene Group at x-3900	SHSD IH622000


<b>BNL - Safety &amp; Health Services Division - Industrial Hygiene Group</b>	
<b>HEPA Filter Test: PASSED</b>	
Test by: <input type="text"/>	Date: <input type="text"/>
Unit ID: <input type="text"/>	
Contact: Industrial Hygiene Group at x-3900	SHSD IH62200

The only official copy is on-line at the SHSD website.  
 Before using a printed copy, verify that it is current by checking the document issue date on the website.

<b>BROOKHAVEN NATIONAL LABORATORY</b> Safety & Health Services Division  <b>INDUSTRIAL HYGIENE GROUP</b> Standard Operating Procedure	NUMBER <b>IH62200</b>
	REVISION <b>Final Rev8</b>
SUBJECT:  <b>HEPA FILTER SURVEILLANCE TESTING</b>	DATE <b>12/06/11</b>
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## Attachment 9.2

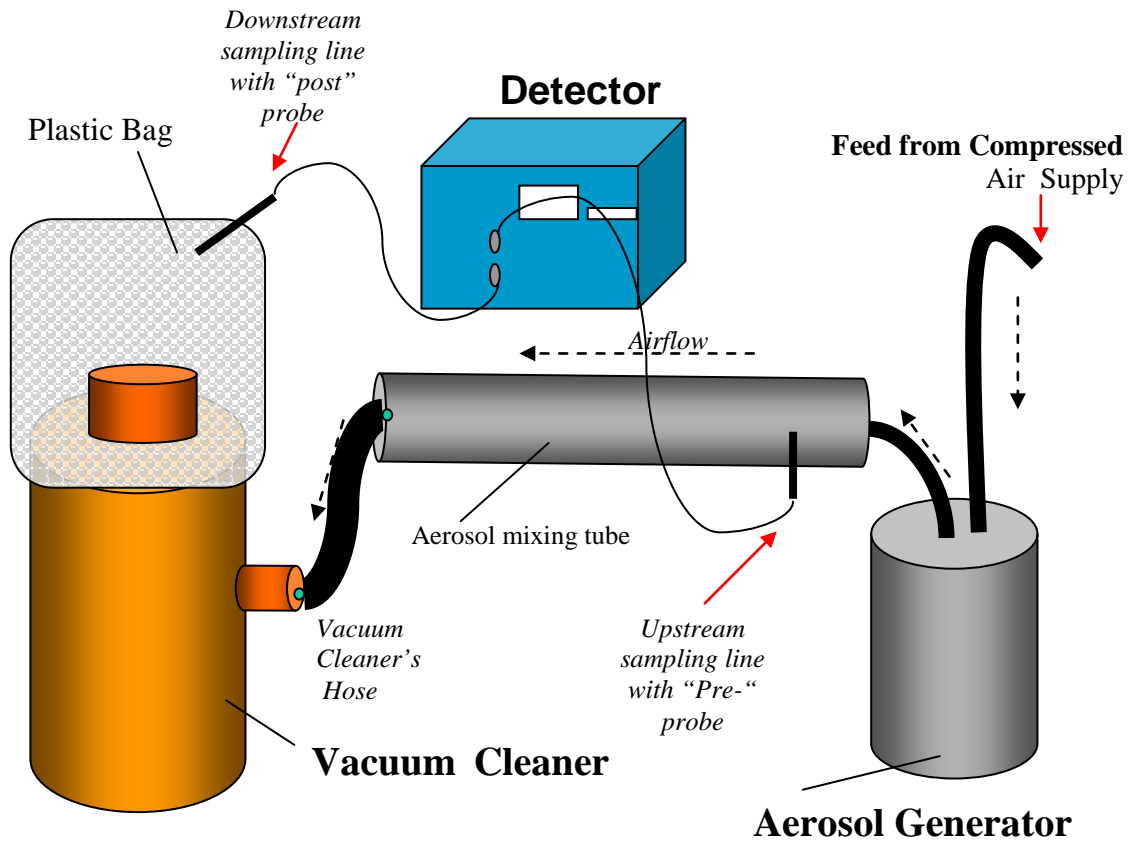
### Environmental Evaluation of HEPA Filter Testing

<p><b>Operation Description:</b> 100 -500 cc of Emery 3004 (poly-alpha-olefin) is injected into a HEPA filtered exhaust ventilation system during testing. Penetration of this challenge agent through the filter is measured downstream of the injection site and filter.</p>	
<p><b>Frequency of Operation:</b> 2-3 times per month</p>	
<p><b>Environmental impact:</b></p> <p>The IHG operation converts all the Emery 3004 into an aerosol with compressed air. In a test of a passing filter, the aerosol is trapped on the filter. In a system with a failed filter, some or all of the aerosol is discharged to the environment up the exhaust stack. The concentration of aerosol in the exhaust air has negligible environmental consequences.</p> <p>The Emery 3004 purchased by the IHG is used until it is all consumed in testing. If needed, the Emery 3004 would be disposed of as a hazardous liquid via ESWMD.</p>	
<p><b>Waste Disposal:</b> Emery 3004 is used until it is all consumed in testing. It can be used over and over without spoilage. It does not have an expiration date. If needed, the Emery 3004 would be disposed of as a hazardous liquid via EPD.</p>	

<b>BROOKHAVEN NATIONAL LABORATORY</b> Safety & Health Services Division <b>INDUSTRIAL HYGIENE GROUP</b> Standard Operating Procedure	NUMBER <b>IH62200</b>
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### Attachment 9.3

## HEPA Test Apparatus Set-up for Vacuum Cleaner Testing



Safety & Health Services Division  
Industrial Hygiene Group

DATABASE RECORD ID#	SHSD UNIT ID#	TEST DATE
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DIVISION	BUILDING	ROOM/AREA
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FACILITY PROJECT MANAGER	FS REP/TECH	OTHER CONTACT
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SYSTEM DESCRIPTION		
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SYSTEM TYPE <input type="checkbox"/> FIXED IN-PLACE <input type="checkbox"/> PORTABLE AIR HANDLR <input type="checkbox"/> VACUUM CLEANER	MANUFACTURER	FILTER NUMBER
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SITE OF FILTER		
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GENERATOR <input checked="" type="checkbox"/> Nucon F1000-SN-10	GENERATOR SN <input checked="" type="checkbox"/> 924SN1005392	AEROSOL <b>Emery 3004</b>
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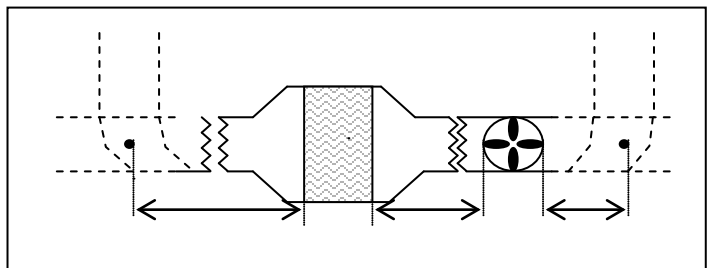
DETECTOR <input type="checkbox"/> Nucon F1000-DDF <input type="checkbox"/> ATI 2H	DETECTOR SN <input type="checkbox"/> 924DDF4592 <input type="checkbox"/> 822DDF106-97 <input type="checkbox"/> 19308 <input type="checkbox"/> 19309
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DETECTOR CALIB. DATE	COMMENTS
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TESTER <input type="checkbox"/> R.D. Wilson <input type="checkbox"/>	SIGNATURE
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Filter/Room Number	$\Delta P$	Upstream Reading	Downstream Reading	Removal Efficiency <sup>1</sup>	Comments

Optional Sketch of Sample Locations



## HEPA Filter Surveillance Level 1 Tester

### Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:
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Activities qualified to perform: Level 1 Tester in Penetration testing of fixed and portable HEPA filtration systems using ANSI N510 methodology.

#### Practical Skill Evaluation: Demonstration of Evaluation Methodology by Oral Exam

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
<b>1. Hazard Analysis</b>	Understands the need to perform a hazard analysis of the area and potential exposure to the self as sampler and workers in the area.			
<b>2. Personal Protective Equipment</b>	Understands the need to be aware of the potential surface contamination, airborne levels of contaminants, radiological hazards, and noise hazard. Knows how to determine the need for PPE.			
<b>3. Sampling Equipment</b>	Knows where equipment needed for the procedure is located and how to properly sign it out.			
<b>4. Pre-Testing Inspection</b>	Verifies the system to be monitored is operational and represents typical operation. Makes notation in sampling record if the operating conditions are atypical.			
<b>5. Aerosol Generator</b>	Demonstrates how to correctly operate the generator.			
<b>6. Photometer</b>	Demonstrates how to correctly operate the meter.			
<b>7. Measurement of HEPA challenge agent penetration</b>	Knows how to properly measure system performance			
<b>8. Operating Parameters</b>	Knows the theory to establish operating parameters (safety envelope) for the equipment.			
<b>9. Documentation</b>	Demonstrates correctly filling out IH HEPA Filter Test Record forms. Transfers appropriate info to IH databases			

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:
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I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date:
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