National Institute for Occupational Safety and Health National Personal Protective Technology Laboratory P.O. Box 18070 Pittsburgh, PA 15236		
Procedure No. RCT-APR-STP-0012	Revision: 1.1	Date: 6 June 2005

DETERMINATION OF AIR FLOW FOR
POWERED AIR-PURIFYING RESPIRATORS
STANDARD TESTING PROCEDURE (STP)

l. PURPOSE

This test establishes the procedure for ensuring that the level of protection provided by the air flow test requirements on powered air-purifying respirator submitted for Approval, Extension of Approval, or examined during Certified Product Audits, meet the minimum certification standards set forth in 42 CFR, Part 84, Subpart G, Section 84.63(a)(c)(d), and Subpart KK, Section 84.1157(a); Volume 60, Number 110, June 8, 1995.

2. GENERAL

This procedure describes the Determination of Air Flow For Powered Air-Purifying Respirators test in sufficient detail that a person in the appropriate technical field can conduct the test and determine whether or not the product passes the test.

3. EQUIPMENT/MATERIALS

3.1. The list of necessary test equipment and materials is as follows:

3.1.1. Air tight chamber - approximately 24 inches by 24 inches by 16 inches with a hinged door, a 3 inch diameter inlet for accepting breathing tubes and adapters, a one inch diameter outlet, and a 1/4 inch outlet for a manometer probe.

3.1.2. Setra electronic manometer.

3.1.3. Tubing and connectors.

3.1.4. Dry test meter - 10 cubic feet per revolution.

3.1.5. Vacuum source - Spencer turbo compressor Model 075-1/3.

3.1.6. Digital stopwatch.

Approvals:	1st Level	2nd Level	3rd Level

4. TESTING REQUIREMENTS AND CONDITIONS

4.1. Prior to beginning any testing, all measuring equipment to be used must have been calibrated in accordance with the manufacturer's calibration procedure and schedule. At a minimum, all measuring equipment utilized for this testing must have been calibrated within the preceding 12 months using a method traceable to the National Institute of Standards and Technology (NIST).

4.2. Normal laboratory safety practices must be observed. This includes safety precautions described in the current ALOSH Facility Laboratory Safety Manual.

4.2.1. Safety glasses, lab coats, and hard-toe shoes must be worn at all times.

4.2.2. Work benches must be maintained free of clutter and non-essential test equipment.

4.2.3. When handling any glass laboratory equipment, lab technicians and personnel must wear special gloves which protect against lacerations or punctures.

5. PROCEDURE

Note: Reference Section 3 for equipment, model numbers and manufacturers. For calibration purposes use those described in the manufacturer's operation and maintenance manuals.

5.1. Set up the equipment as show in Figure 1.

5.2. Connect the respirator to the chamber. On units with breathing tubes, the blower is placed outside of the chamber and the breathing tube is attached to an adapter identical to the manufacturer’s connector on the facepiece, helmet, or hood. On units where the blower is in the helmet, an adapter is attached to the helmet and inserted through the inlet of the chamber and sealed.

5.3. Close the door of the chamber.

5.4. Check the electric manometer for zero, adjust to zero if necessary.

5.5. Turn on the PAPR and the vacuum pump.

5.6. Attach the tubing to the electric manometer and adjust to zero using the valve on the vacuum pump.

5.7. Check all connections for leaks.

5.8. If a leak is detected, reseal and readjust the vacuum.

5.9. Time 1 minute on a stopwatch and count the number of CFM on the dry test meter. 1 revolution equals 10 CFM.

5.10. Calculate the airflow of the respirator using equation #1 (Listed in 6.3).

5.11. Disconnect manometer tubing.

5.12. Turn off the PAPR and vacuum pump.

6. PASS/FAIL CRITERIA

6.1. The criterion for passing this test is set forth in 42 CFR, Part 84, Subpart G, Section 84.63(a)(c)(d), and Subpart KK, Section 84.1157(a); Volume 60, Number 110, June 8, 1995.

6.2. This test establishes the standard procedure for ensuring that:

84.63. Test requirements; general.

(a) Each respirator and respirator component shall when tested by the applicant and by the Institute, meet the applicable requirements set forth in subparts H through L of this part.

(c) In addition to the minimum requirements set forth in subparts H through L of this part, the Institute reserves the right to require, as a further condition of approval, any additional requirements deemed necessary to establish the quality, effectiveness, and safety of any respirator used as protection against hazardous atmospheres.

(d) Where it is determined after receipt of an application that additional requirements will be required for approval, the Institute will notify the applicant in writing of these additional requirements, and necessary examinations, inspections, or tests, stating generally the reasons for such requirements, examinations, inspections, or tests.

84.1157. Chemical cartridge respirators with particulate filters; performance requirements; general. Chemical cartridge respirators with particulate filters and the individual components of each such device shall, as appropriate, meet the following minimum requirements for performance and protection:

(a) Breathing resistance test. (1) Resistance to airflow will be measured in the facepiece, mouthpiece, hood, or helmet of a chemical cartridge respirator mounted on a test fixture with air flowing at a continuous rate of 85 liters per minute, both before and after each test conducted in accordance with paragraphs (d) through (f) of this section

(2) The maximum allowable resistance requirements for chemical cartridge respirators are as follows:

Maximum Resistance
[mm. water-column height]

Type of chemical cartridge respirator	Inhalation		Exhalation
		Final[1]	
For gases, vapors, or gases and vapors, and dusts, fumes, and mists	50	70	20
For gases, vapors, or gases and vapors, and mists of paints, lacquers, and enamels	50	70	20

[1]Measured at end of service life specified in Table 11 in subpart L of this part.

6.3. Equation #1: Airflow (LPM) = $\frac{(28.32 \text{ LPM}) * (\text{number of CFM})}{1 \text{ min}}$

7. RECORDS/TEST SHEETS

7.1. Test data collected shall be recorded on the DETERMINATION OF AIR FLOW FOR POWERED AIR PURIFYING RESPIRATORS test data sheet.

7.2. All videotapes and photographs of the actual test being performed, or of the tested equipment shall be maintained in the task file as part of the permanent record.

7.3. All equipment failing any portion of this test will be handled as follows:

7.3.1. If the failure occurs on a new certification application, or extension of approval application, send a test report to the RCT Leader and prepare the hardware for return to the manufacturer.

7.3.2. If the failure occurs on hardware examined under an Off-the-Shelf Audit the hardware will be examined by a technician and the RCT Leader for cause. All equipment failing any portion of this test may be sent to the manufacturer for examination and then returned to NIOSH. However, the hardware tested shall be held at the testing laboratory until authorized for release by the RCT Leader, or his designee, following the standard operating procedures outlined in Procedure for Scheduling, and Processing Post-Certification Product Audits, RB-SOP-0005-00.

National Institute for Occupational Safety and Health
Respirator Branch
Test Data Sheet

NIOSH

Task Number:
Test:
Manufacturer:
Item Tested:

Reference No.:
STP No.:

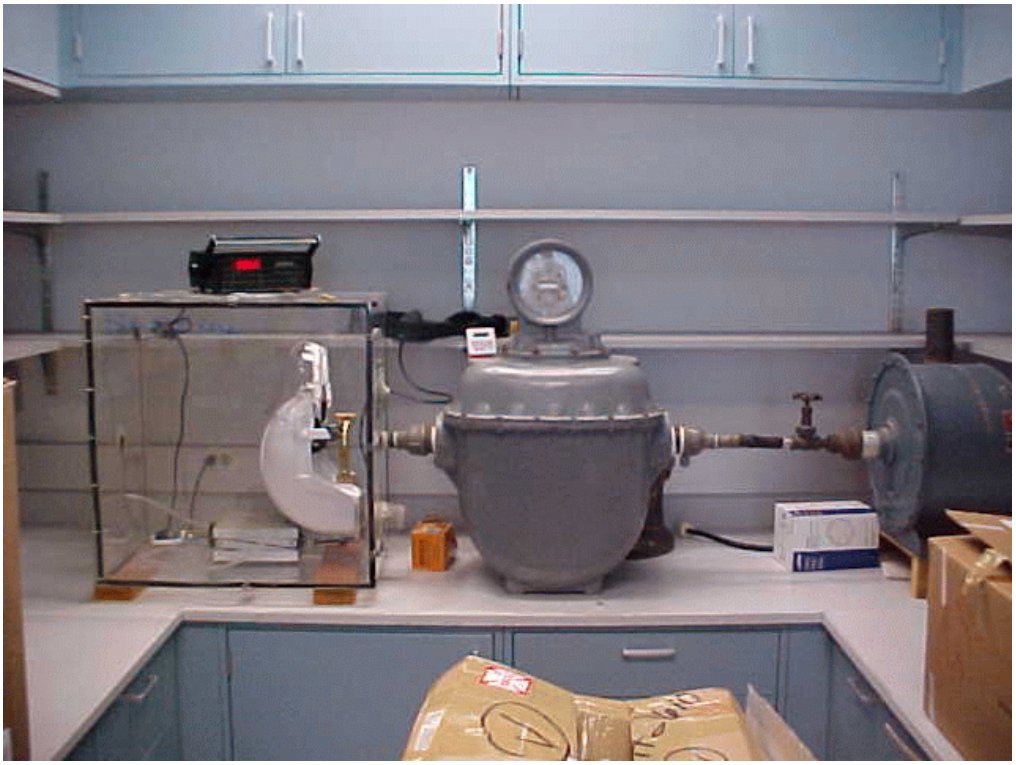
Mask Type:

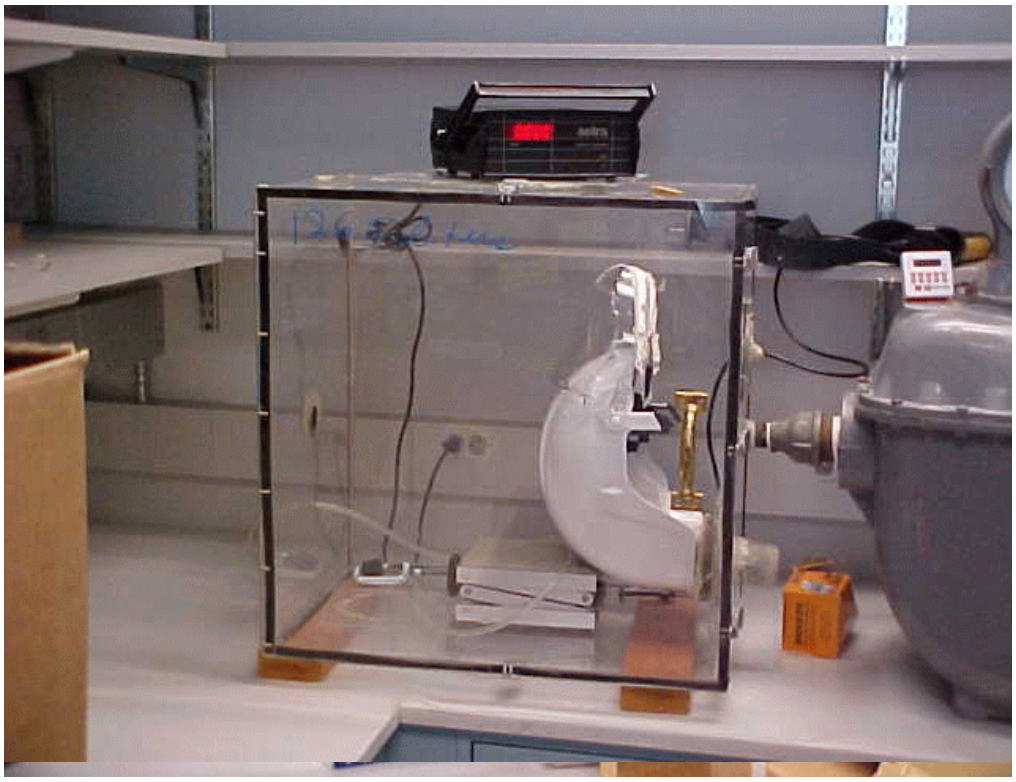
AIR FLOW			
Sample	Minimum Allowed (Lpm)	Actual (Lpm)	Result
Initial Final			
Overall Result:			

Signature:

Date: _____

Engineering Technician





Revision History

Revision	Date	Reason for Revision
1.0	12 July 2001	Historic document
1.1	6 June 2005	Update header and format to reflect lab move from Morgantown, WV No changes to method