



National Institute for Occupational Safety and Health  
National Personal Protective Technology Laboratory  
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Procedure No. RCT-ASR-STP-0105

Revision: 1.1

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DETERMINATION OF AIRFLOW - CONTINUOUS-FLOW,  
TYPE C AND CE, SUPPLIED-AIR RESPIRATORS  
STANDARD TESTING PROCEDURE (STP)

1. PURPOSE

This test establishes the procedures for ensuring that the level of protection provided by the air flow requirements on Type C and CE, Continuous Flow Supplied-Air Respirators 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 J, Section 84.150, Table 8; Volume 60, Number 110, June 8, 1995.

2. GENERAL

This STP describes the Determination of Airflow - Continuous Flow, Type C and CE, Supplied-Air Respirators test in sufficient detail that a person knowledgeable in the appropriate technical field can select equipment with the necessary resolution, 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 follows:

3.1.1. A 300 cubic foot gas cylinder of compressed air or equivalent.

3.1.2. A Helicoid calibrated pressure gauge and connecting fittings or equivalent.

3.1.3. Air regulator, Model 8, from Matheson Gas Products or equivalent.

3.1.4. An air tight container (35 Liter test tank with a depth and diameter of approximately 36 centimeters) that has an inlet and outlet. The inlet can accept various ten centimeter rubber gaskets with openings varying according to breathing tube size diameters. The container must have a removable cover on the inlet side to facilitate connecting the respirator inlet covering connection to the breathing tube inside of the container.

3.1.5. A Teledyne Hastings-Raydist Mass Flow meter Model AHL-25 or equivalent.

Approvals:	<u>1st</u> Level	<u>2nd</u> Level	<u>3rd</u> Level
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#### 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. The compressed gas cylinder must meet all applicable Department of Transportation requirements for cylinder approval as well as for retesting/requalification.
- 4.3. Normal laboratory safety practices must be observed. This includes all safety precautions described in the current Pittsburgh Facility Laboratory Safety Manual.
  - 4.3.1. Safety glasses, lab coats, and hard-toe shoes must be worn at all times.
  - 4.3.2. Work benches must be maintained free of clutter and non-essential test equipment.
  - 4.3.3. 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.

Note: The source of compressed air can be either from a cylinder with a two stage pressure regulator attached, or from an in-house compressed-air system with an in-line pressure regulator capable of providing a uniform output pressure independent of supply pressure variations. In either case, a calibrated pressure gauge must be in line on the downstream side of the regulator.

- 5.1. Turn on the mass-flow meter. Most mass-flow meters need from 15 to 30 minutes warm up time.
- 5.2. Insert the respirator into the 35 liter tank.
- 5.3. Pull the air inlet tube (breathing tube) through the rubber gasket in the lid of the tank and attach it to the respiratory inlet covering, if not already attached, then secure the lid onto the tank. To insure that no air escapes, the hole of the rubber gasket should have a smaller diameter than the diameter of the air inlet tube, and then sealed with caulking or wax.
- 5.4. Attach two straight pipe sections approximately 2 inches long to a pipe tee and connect the entire assembly to the downstream side of the pressure regulator. Both sections of

pipe and the pipe tee are to have the same nominal diameter as the air-supply hose being tested. Insert a calibrated pressure gauge in the pipe tee assembly. (See diagram.)

- 5.5. Attach one end of the air-supply hose to the pipe tee assembly and the other end to the air regulating valve or orifice. When the air-regulating valve is encountered, it should be closed when the maximum length of air-supply hose is used and open when the minimum is used. Make certain that the air-supply hose is nearly straight when the minimum length (25 feet or less) is being used. When the maximum length of hose is being used, the hose is coiled in a large circle (10 foot diameter) or ellipse.
- 5.6. Connect the mass-flow meter to the outlet of the 35 liter tank.
- 5.7. Adjust the regulator until the desired pressure is reached using the minimum pressure with the maximum hose length and the maximum pressure with the minimum hose lengths specified in the manufacturer's user manual.
- 5.8. Readings are taken directly from the mass flow meter.

Note: This test should be done on a minimum of two respirators, or more if additional testing is required (42 CFR, Part 84, Section 84.12, 84.30, and 84.60).

## 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 J, Section 84.150, Table 8; 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.

84.150 Air-supply line tests; minimum requirements.

Air supply lines employed on Types C and CE supplied-air respirators shall meet the minimum test requirements set forth in Table 8 of this subpart.

The air-supply hose with air regulating valve or orifice shall permit a flow of not less than 115 liters (4 cubic feet) per minute to tight-fitting and 170 liters (6 cubic feet) per minute to loose-fitting respiratory inlet coverings through the maximum length of hose for which approval is granted and at the minimum specified air-supply pressure. The maximum flow shall not exceed 425 liters (15 cubic feet) per minute at the maximum specified air-supply pressure with the minimum length of hose for which approval is granted.

## 7. RECORDS\TEST SHEETS

- 7.1. All test data will be recorded on the AIRFLOW - CONTINUOUS FLOW, TYPE C AND CE, SUPPLIED-AIR 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.

**AIRFLOW - CONTINUOUS FLOW, TYPE C AND CE,  
SUPPLIED-AIR RESPIRATORS**

Project No : \_\_\_\_\_ Date: \_\_\_\_\_

Company: \_\_\_\_\_

Respirator Type: \_\_\_\_\_

Reference: 42 CFR, Part 84, Subpart J, Section 84.150, Table 8.

Requirement: The air-supply hose with air regulating valve or orifice shall permit a flow of not less than 115 liters (4 cubic feet) per minute to tight-fitting and 170 liters (6 cubic feet) per minute to loose-fitting respiratory-inlet coverings through the maximum length of hose for which approval is granted and at the minimum specified air-supply pressure. The maximum flow shall not exceed 425 liters (15 cubic feet) per minute at the maximum specified air-supply pressure with the minimum length of hose for which approval is granted. These flows shall be maintained regardless of the position of the air-regulating valve (i.e., open or closed).

Equipment: Mass Flow (SN): \_\_\_\_\_

Gauge (SN): \_\_\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Test Engineer: \_\_\_\_\_ PASS \_\_\_\_\_ FAIL \_\_\_\_\_



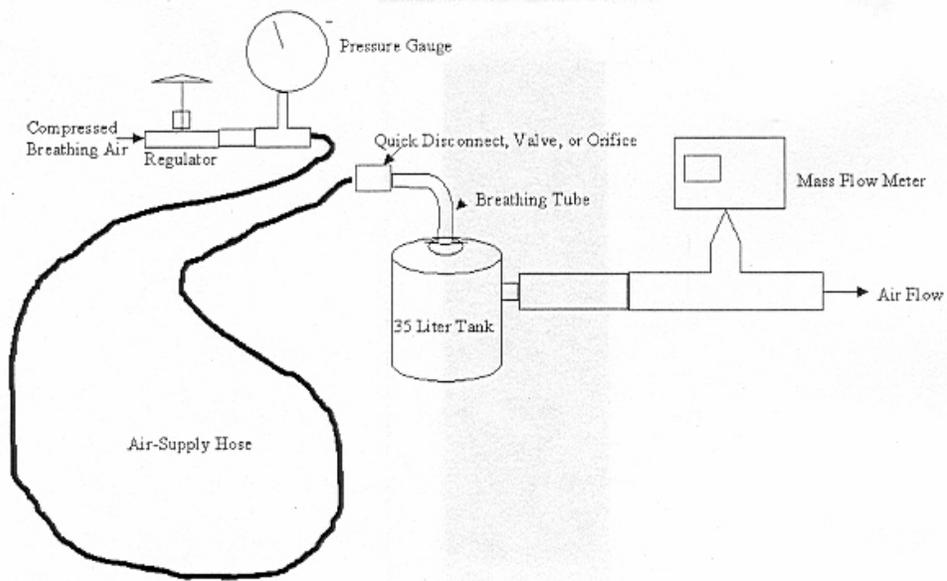


Figure 1. Determination of Airflow - Continuous Flow Supplied-Air Respirators

### Revision History

<b>Revision</b>	<b>Date</b>	<b>Reason for Revision</b>
1.0	12 June 2001	Historic document
1.1	26 September 2005	Update header and format to reflect lab move from Morgantown, WV No changes to method