National Institute for Occupational Safety and Health
National Personal Protective Technology Laboratory
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DETERMINATION OF GAS FLOW MEASUREMENTS - OPEN-CIRCUIT, DEMAND AND PRESSURE-DEMAND, SELF-CONTAINED BREATHING APPARATUS STANDARD TESTING PROCEDURE (STP)

1. PURPOSE

This test establishes the procedures for ensuring the gas flow requirements for an Open-Circuit, Demand and Pressure-Demand, Self-Contained Breathing Apparatus (SCBA) meet the minimum performance requirements set forth in 42 CFR, Part 84, Subpart H, Section 84.93.

2. GENERAL

This STP describes the Determination of Gas Flow Measurements - Open-Circuit, Demand and Pressure-Demand, Self-Contained Breathing Apparatus 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. ISI Anthropometric Test heads with tube for measuring breathing resistance and air flows - Model SR-085 or equivalent.

3.1.2. Hastings Mass Flow meter Model AHL-25 (Teledyne Hastings - Raydist) or equivalent.

3.1.3. Spencer Turbo Compressor (Catalog No. 075-1/3-Bushnell Machinery Co.) or equivalent.

3.1.4. Dwyer series 477 AV Digital Manometer, accuracy +/- 0.5% FS or equivalent.

3.1.5. High Pressure Test Stand. A test stand incorporating calibrated pressure gauges (one 0-10,000 psig and one 0-3,000 psig).

3.1.6. Dwyer Slant Manometer 0-3", F. W. Dwyer Manufacturing Co., Michigan City, Indiana or equivalent.

4. TESTING REQUIREMENTS AND CONDITIONS

4.1. Prior to beginning any testing, all measuring equipment employed has been calibrated in accordance with the testing laboratory's calibration procedure and schedule. All measuring equipment utilized for this testing must have been calibrated using a method

traceable to recognized international standards when available.

5. PROCEDURE

5.1. Assemble unit as per manufacturer's instructions with the facepiece mounted on an anthropometric head.

5.2. Connect a mass flow meter in line between the anthropometric head and an adjustable vacuum source, keeping airflow path as straight as possible.

5.3. Charge the test stand to a pressure equal to full cylinder pressure.

5.4. Connect the test stand in place of the cylinder.

5.5. Connect a pressure tap in the head to the slant manometer for determining facepiece pressure.

5.6. The vacuum source is adjusted during the test to maintain zero pressure inside the facepiece for pressure-demand units and minus (-) two inches of water pressure for demand units.

5.7. Flow measurements are taken directly from the mass flow meter.

5.8. Repeat the above procedure with the test stand charged to 500 psig.

5.9. Record the readings.

Note: This test should be done on a minimum of two respirators, or more if additional testing is required (42 CFR, Part 84, Sections 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 H, Section 84.93.

Reference: 84.93 Gas flow test; open-circuit apparatus.

(a) A static-flow test will be performed on all open-circuit apparatus.

(b) The flow from the apparatus shall be greater than 200 liters per minute when the pressure in the facepiece of demand-apparatus is lowered by 51 mm. (2 inches) water-column height when full container pressure is applied.

(c) Where pressure demand apparatus are tested, the flow will be measured at zero gage pressure in the facepiece.

(d) Where apparatus with compressed-breathing-gas containers are tested, the flow test shall also be made with 3,450 kN/m.^{2} (500 psig.) container pressure applied.

7. RECORDS\TEST SHEETS

7.1. Record the test data in a format that shall be stored and retrievable. Data shall be reported as shown in attached example data sheet.

8. ATTACHMENTS

8.1. Sample Data Sheet

8.2. Photograph of Test Setup

8.1. Sample Data Sheet

GAS FLOW TEST, OPEN-CIRCUIT, SELF-CONTAINED BREATHING APPARATUS

Project No : _____ Date: _____

Company : _____

Respirator Type: _____

Reference: 42 CFR, Part 84, Subpart H, Section 84.93.

Requirement: (a) A static-flow test will be performed on all open-circuit apparatus.

(b) The flow from the apparatus shall be greater than 200 liters per minute when the pressure in the facepiece of demand-apparatus is lowered by 51 mm. (2 inches) water-column height when full container pressure is applied.

(c) Where pressure demand apparatus are tested, the flow will be measured at zero gage pressure in the facepiece.

(d) Where apparatus with compressed-breathing-gas containers are tested, the flow test shall also be made with 3,450 kN/m.² (500 psig.) container pressure applied.

Results:

	Unit #1 lpm	Unit #2 lpm
Demand Unit:		
Full cylinder pressure:	_____	_____
500 psig:	_____	_____
Pressure-Demand Unit:		
Full cylinder pressure:	_____	_____
500 psig:	_____	_____

Comments:

_____

_____

_____

_____

Test Engineer: _____ Pass_____ Fail_____

8.2. Photograph of Test Setup

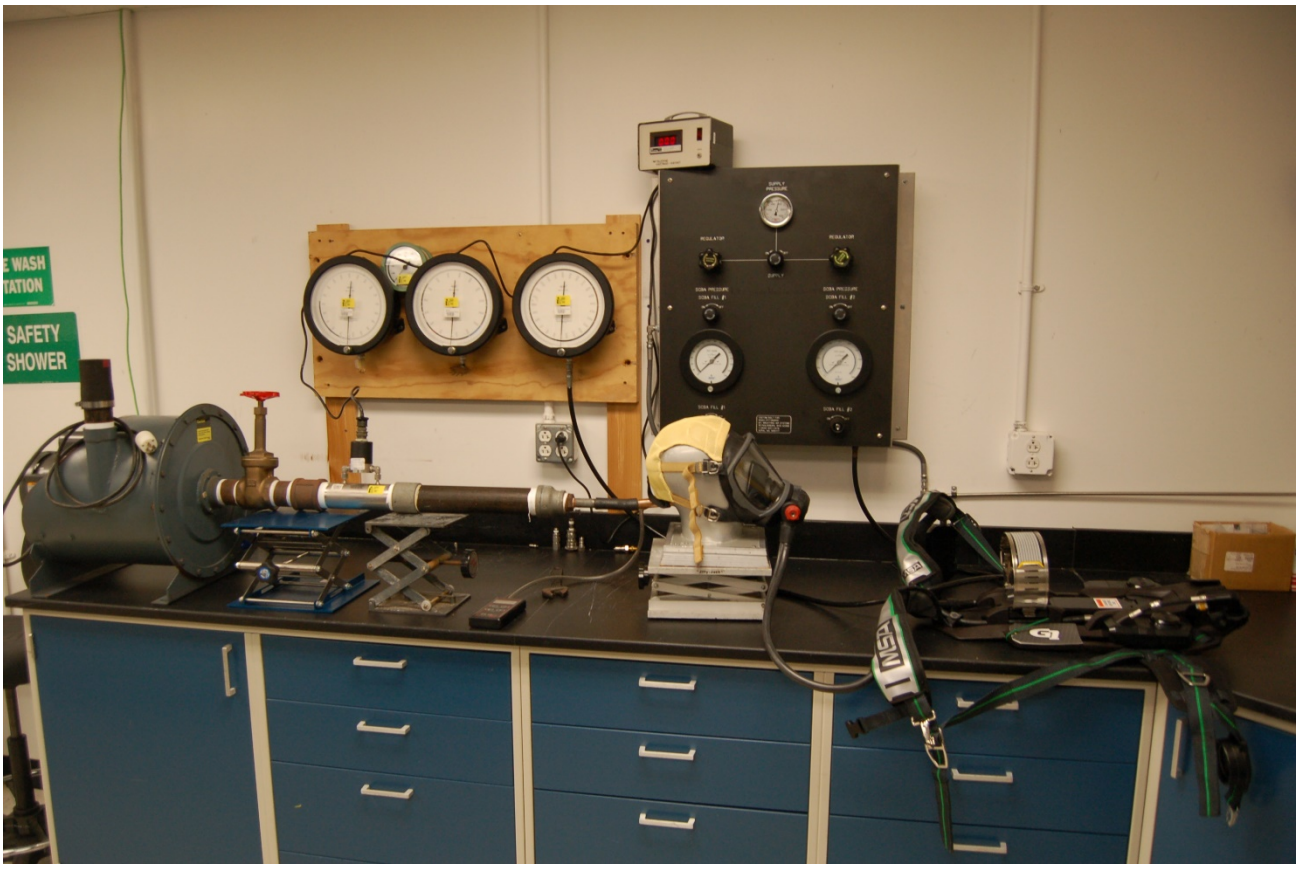

Figure 1: Photo of the test setup

Revision History

Revision	Date	Reason for Revision
1.0	23 August 2002	Historic document
1.1	21 September 2005	Update header and format to reflect lab move from Morgantown, WV. No changes to method
1.2	13 May 2020	Updated NIOSH Logo. Updated Sections 3, 4, 5, and 6, with changes related to equivalent equipment, outdated pictures (removed), calibration requirements, and the procedure.