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National Personal Protective Technology Laboratory
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DETERMINATION OF EXHALATION BREATHING RESISTANCE - OPEN-CIRCUIT, DEMAND AND PRESSURE-DEMAND, SELF-CONTAINED BREATHING APPARATUS STANDARD TESTING PROCEDURE (STP)

1. PURPOSE

This test establishes the procedures for ensuring that the exhalation breathing resistance requirements for an Open-Circuit, Demand and Pressure-Demand, Self-Contained Breathing Apparatus (SCBA) meet the performance requirements set forth in 42 CFR, Part 84, Subpart H, Section 84.91(a)(b)(c)(d).

2. GENERAL

This STP describes the Determination of Exhalation Breathing Resistance - 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. Dwyer Slant Manometer 0-3", F. W. Dwyer Manufacturing Co., Michigan City, Indiana or equivalent.

3.1.2. Setra Datum 2000 Model 239 digital manometer with an accuracy of ±0.04%R ±1 digit or equivalent.

3.1.3. ISI Anthropometric Test heads with tube for measuring breathing resistance and air flows - Model SR-085 or equivalent.

3.1.4. Brooks Instrument Co. model 5853S Mass Flow Controller with Brooks Control and Read-out Unit model 0154 – accuracy ±0.70%R ±0.20% f.s 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.

5.2. Mount facepiece on an anthropometric head and check for leakage. Block outlet of head with rubber stopper.

5.3. Turn on cylinder then connect resistance port to slant manometer. Wait for the reading to stabilize. This reading is the static pressure.

5.4. Ensure the positive pressure source has been calibrated at a flow of 85 ± 1.4 lpm.

5.5. Insert the connection of the headform to the connection of the positive pressure source, without the respirator mounted. Set the manometer to read zero.

5.6. Disconnect the headform from the positive pressure source and mount the respirator facepiece on the headform.

5.7. To measure the exhalation resistance, insert the connection of the headform to the connection of the positive pressure source.

5.8. Read the exhalation resistance in inches of water directly from the manometer.

5.9. Data Analysis.

5.9.1. Record readings on test data sheets.

5.9.2. The exhalation resistance shall not exceed 1.0 inches of water column height for demand units.

5.9.3. The exhalation resistance shall not exceed the static pressure by more than 2.0 inches of water column height.

6. PASS\FAIL CRITERIA

6.1. The criterion for passing this test is set forth in 42 CFR, Part 84, Subpart H, Section 84.91(a)(b)(c)(d).

Reference: 84.91 Breathing resistance test; exhalation.

(a) Resistance to exhalation airflow will be measured in the facepiece or mouthpiece of open-circuit apparatus with air flowing at a continuous rate of 85 liters per minute.

(b) The exhalation resistance of demand apparatus shall not exceed 25 mm. (1 inch) water-column height.

(c) The exhalation resistance of pressure-demand apparatus shall not exceed the static pressure in the facepiece by more than 51 mm. (2 inches) water-column height.

(d) The static pressure (at zero flow) in the facepiece shall not exceed 38 mm. (1.5

inches) water-column height.

Note: See Test Procedure RCT-ASR-STP-0113 for additional testing requirements for SCBA with hoods.

7. RECORDS\TEST SHEETS

7.1. All test data will be recorded on the BREATHING RESISTANCE TEST - EXHALATION, OPEN-CIRCUIT, SELF-CONTAINED BREATHING APPARATUS test data sheet.

8. ATTACHMENTS

8.1. Sample Data Sheet

8.1. Sample Data Sheet

BREATHING RESISTANCE TEST - EXHALATION, OPEN-CIRCUIT, SELF-CONTAINED BREATHING APPARATUS

Project No.: _____ Date: _____

Company: _____

Respirator Type: _____

Reference: 42 CFR, Part 84, Subpart H, Section 84.91(a)(b)(c)(d) - Exhalation Resistance.

Requirements: 84.91(a) Resistance to exhalation airflow will be measured in the facepiece or mouthpiece of open-circuit apparatus with air flowing at a continuous rate of 85 liters per minute.

84.91(b) The exhalation resistance of demand apparatus shall not exceed 25 mm. (1 inch) water-column height.

84.91(c) The exhalation resistance of pressure-demand apparatus shall not exceed the static pressure in the facepiece by more than 51 mm. (2 inches) water-column height.

84.91(d) The static pressure (at zero flow) in the facepiece shall not exceed 38 mm. (1.5 inches) water-column height.

Results:

DEMAND UNIT	Unit 1 "H_2O	Unit 2 "H_2O
84.91(b) - Exhalation:	_____	_____
PRESSURE-DEMAND UNIT	Unit 1 "H_2O	Unit 2 "H_2O
84.91(c) - Exhalation:	_____	_____
84.91(d) - Static:	_____	_____

Comments:

_____

_____

_____

_____

Test Engineer: _____ Pass_____ Fail_____

Revision History

Revision	Date	Reason for Revision
1.0	23 May 2001	Historic document
1.1	20 September 2005	Update header and format to reflect lab move from Morgantown, WV. No changes to method
1.2	12 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.