National Institute for Occupational Safety and Health
National Personal Protective Technology Laboratory
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DETERMINATION OF BY-PASS VALVE FLOW TEST - 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 level of protection provided by the by-pass valve flow requirements on Open-Circuit, Demand and Pressure-Demand, Self-Contained Breathing Apparatus (SCBA) 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) Volume 60, Number 110, June 8, 1995.

2. GENERAL

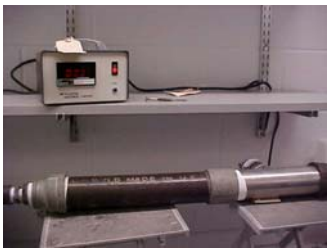
This STP describes the Determination of By-Pass Valve Flow Test - Open-Circuit, Demand and Pressure-Demand, Self-Contained Breathing Apparatus test in sufficient detail that a person knowledgeable in the appropriate technical field can select equipment with the necessary resolution, conduct the test, 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. Ingersoll-Rand BAP20TV3 breathing air compressor equipped with a vertical purifier system, or equivalent, capable of delivering 0-5200 psig, a minimum of 1125 psig.

Approvals:	1st Level	2nd Level	3rd Level



3.1.2. Teledyne-Hastings Raydist mass flow meter, Model NAHL-25, or equivalent

3.1.3. A test stand incorporating four Weksler calibrated pressure gauges (two 0-10,000 psig and two 0-3,000 psig), or equivalent. NOTE: Calibrated pressure gauges must be selected so that required readings fall near the midpoint, and never within the first or last 10%, of the gauge's pressure range.

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 ALOSH 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.

5.1. Adjust the test stand to 25% of the SCBA maximum operating pressure.

5.2. Fabricate a custom fitting and connect the test stand to the SCBA in place of the cylinder.

5.3. Open the regulator by-pass valve fully. If the SCBA being tested has a separate mainline valve then consult the User's Manual to determine if it is to remain open in case of failure, or closed.

5.4. If the regulator being tested has a donning switch then fabricate a fitting to go between the regulator and the inlet of the mass flow meter. If the regulator undergoing testing does not have a donning switch, then mount the facepiece and regulator combination on a headform and block all outlets of the headform.

5.5. If the regulator being tested has a donning switch, the donning switch must be set "ON". Then connect the regulator to the mass flow meter using the fitting fabricated in step 5.4. If the regulator being tested does not have a donning switch, then find a box or chamber that will accommodate the headform with the facepiece/regulator combination. Drill two holes in the chamber (one large enough to fit the high pressure hose through and one which can be used to attach the chamber to the mass flow meter.) Place the unit in the chamber, attach the chamber to the mass flow meter, and seal all outlets to the chamber.

5.6. Slowly pressurize the SCBA and readjust to 25% of SCBA maximum service pressure.

5.7. Check all connections for leakage. When connections are properly tightened and air pressure is properly adjusted, record the pressure level on the By-Pass Valve Flow test data sheet for Open-Circuit SCBA.

5.8. After the reading on the mass flow meter stabilizes, then allow an extra two minutes before recording the reading. Record the delivery flow rate of the test SCBA on the By-Pass Valve Flow test data sheet for Open-Circuit SCBA.

5.9. Repeat steps 5.1, through 5.8, three more times with the test stand adjusted to 20% of the SCBA maximum service pressure.

Note: This procedure covers the majority of the currently approved SCBA, however because of the many different designs each unit must be examined on its own merit to determine if this procedure is applicable in its current form or if modifications are required.

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 Subpart G, Section 84.63(a)(c)(d) 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.

6.3. All adjustable by-pass valves on Entry and Escape SCBA shall deliver minimum flow rate of 130 lpm in the fully open position at 20% to 25% of full service pressure.

6.4. All constant flow by-pass valves on Entry and Escape SCBA shall deliver a minimum flow rate of 85 lpm, and a maximum flow rate of 130 lpm constant flow at 20% to 25% of full service pressure.

6.5. All by-pass valves on Escape Only shall deliver a minimum flow rate of 85 lpm in the fully open position at 20% to 25% of full service pressure.

6.6. In addition, the by-pass valves must override donning switches, first breath activation switches, or any other special feature which in case of failure could cause the regulator to stop supplying air.

7. RECORDS\TEST SHEETS

7.1. All test data will be recorded on the SPECIAL TEST - BY-PASS FLOW - OPEN-CIRCUIT, SELF-CONTAINED BREATHING APPARATUS test data sheet.

7.2. All videotapes and photographs of the actual test being performed, or of the test 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.

SPECIAL TEST - BY-PASS FLOW - OPEN-CIRCUIT,
SELF-CONTAINED BREATHING APPARATUS

Project No. : _____ Date: _____

Company : _____

Respirator Type: _____

Reference: 42 CFR Part 84, Subpart G, Section 84.63(a)(c)(d).

Requirements:

1. All adjustable by-pass valves on Entry and Escape SCBA shall deliver minimum flow rate of 130 lpm in the fully open position at 20% to 25% of full cylinder service pressure.

2. All constant flow by-pass valves on Entry and Escape SCBA shall deliver a minimum flow rate of 85 lpm and no more than 130 lpm constant flow at 20% to 25% of full cylinder service pressure.

3. All by-pass valves on Escape Only shall deliver a minimum flow rate of 85 lpm in the fully open position at 20% to 25% of full cylinder service pressure.

4. In addition, the bypass valves must override donning switches, first breath activation switches, or any other special feature which in case of failure could cause the regulator to stop supplying air.

Results:

Unit No.	Supply Pressure (psig)	Flow (Lpm)
1	25%	_____
2	25%	_____
1	20%	_____
2	20%	_____

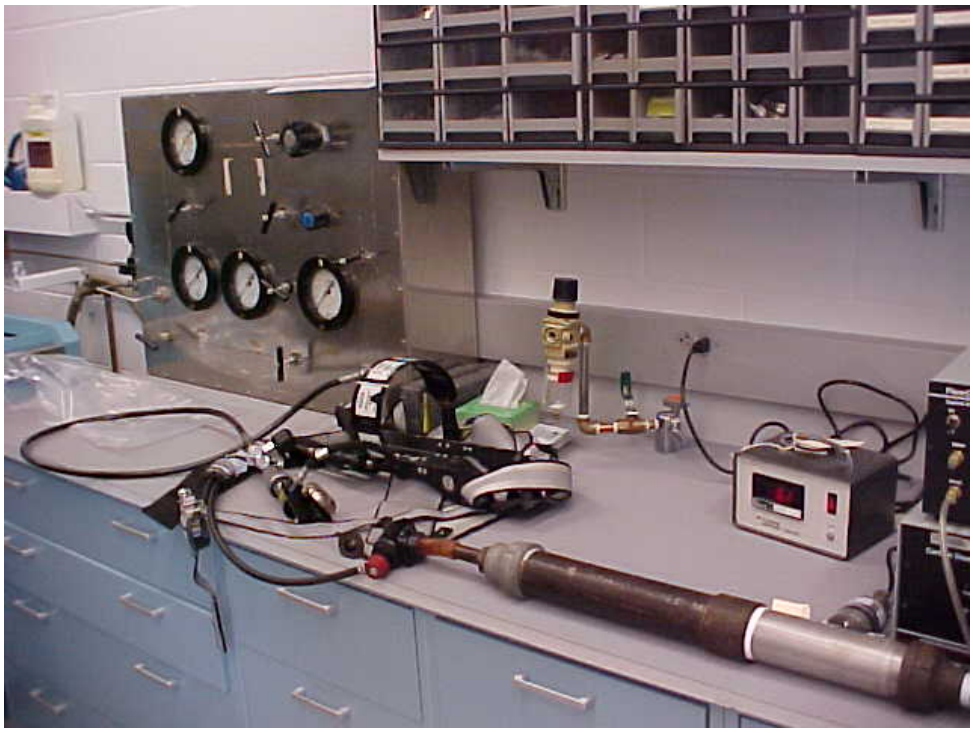
Comments:

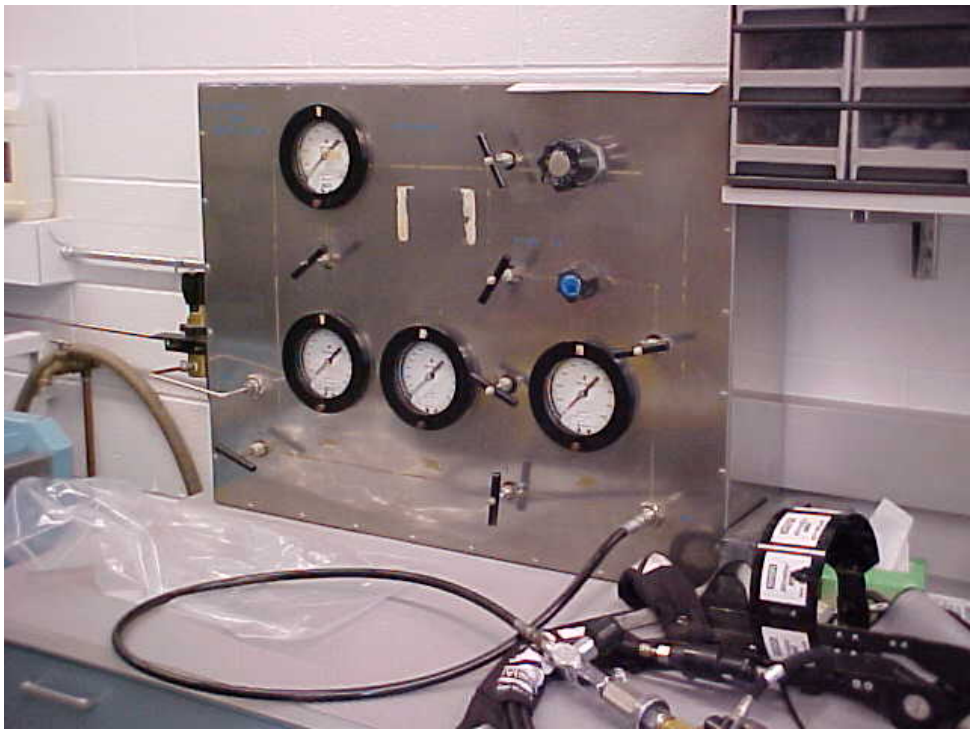
_____

_____

_____

Test Engineer: _____ Pass _____ Fail _____





Revision History

Revision	Date	Reason for Revision
1.0	23 August 2000	Historic document
1.1	20 September 2005	Update header and format to reflect lab move from Morgantown, WV No changes to method