



National Institute for Occupational Safety and Health  
National Personal Protective Technology Laboratory  
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Procedure No. RCT-ASR-STP-0127	Revision: 1.1	Date: 20 September 2005
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DETERMINATION OF BY-PASS VALVE FLOW TEST - CLOSED-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 Closed-Circuit, 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 By-Pass Valve Flow Test for Closed-Circuit SCBA 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.

Approvals:	<u>1st</u> Level	<u>2nd</u> Level	<u>3rd</u> Level
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- 3.1.2. Electric timer, calibrated to hundredths of a minute (Precision Scientific Company) or equivalent.



- 3.1.3. Singer Dry Test Meter (Model 806) one cubic foot per revolution or equivalent.

#### 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 during all testing.
- 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. Fully pressurize the oxygen cylinder to service pressure of the respirator.
- 5.2. Mount the facepiece on an anthropometric head form. Connect a dry test meter to the outlet port at the rear of the head form.
- 5.3. Use the tool provided by the manufacturer to override the relief valve.
- 5.4. Open by-pass valve fully.
- 5.5. Open cylinder valve and simultaneously start timer.
- 5.6. When cylinder is down to 500 psig stop timer and turn off cylinder valve.
- 5.7. Record number of revolutions on dry test meter and time on timer on test data sheet.
- 5.8. Refer to data analysis.
- 5.9. Data Analysis

One revolution on dry test meter is equal to 28.32 liters per minute. Take number of revolutions recorded in Step 5.7 and multiply by 28.32. Divide this number by the time also recorded in Step 5.7.

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 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 by-pass valves for closed circuit SCBA shall deliver a minimum average flow rate of 30 lpm in the fully open position from full service pressure down to and including 500 psig.

## 7. RECORDS\TEST SHEETS

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

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

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

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

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

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

Requirement: All by-pass valves for closed circuit SCBA shall deliver a minimum flow rate of 30 lpm in the full open position when tested from full cylinder pressure down to 500 psig.

Results:

Unit #1 - \_\_\_\_\_

Unit #2 - \_\_\_\_\_

Comments :

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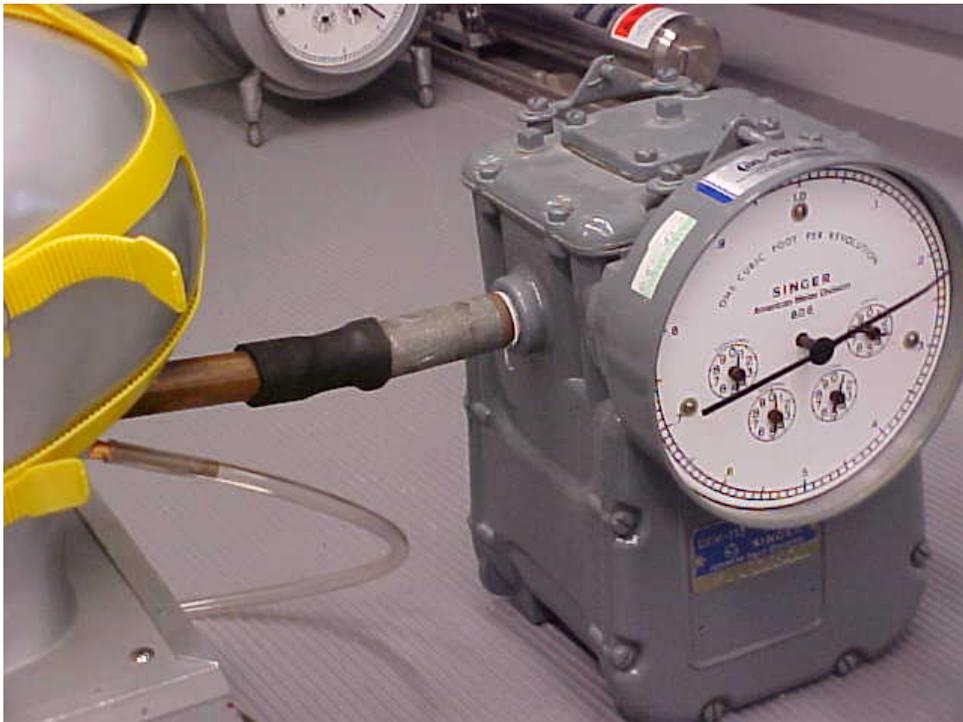
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Test Engineer: \_\_\_\_\_ PASS \_\_\_\_\_ FAIL \_\_\_\_\_





### Revision History

<b>Revision</b>	<b>Date</b>	<b>Reason for Revision</b>
1.0	13 November 2000	Historic document
1.1	20 September 2005	Update header and format to reflect lab move from Morgantown, WV No changes to method