



National Institute for Occupational Safety and Health  
National Personal Protective Technology Laboratory  
P.O. Box 18070  
Pittsburgh, PA 15236

Procedure No. RCT-ASR-STP-0141	Revision: 1.1	Date: 12 September 2005
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MAN TEST NUMBER 5 CLOSED-CIRCUIT, SELF-CONTAINED BREATHING APPARATUS  
STANDARD TESTING PROCEDURE (STP)

1. PURPOSE

This test establishes the procedure for ensuring that the level of protection provided by the Man test 5 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), and Subpart H, Section 84.101, Volume 60, Number 110, June 8, 1995.

2. GENERAL

This STP describes the Man Test Number 5 Closed-Circuit, 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/MATERIAL

3.1. The list of necessary test equipment and materials follows:



3.1.1. One B-D Yale (2317 100YL) 100cc (Becton, Dickson and Co.) syringe or equivalent.

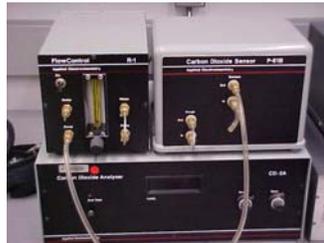
Approvals:	<u>1st</u> Level	<u>2nd</u> Level	<u>3rd</u> Level
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- 3.1.2. Electric timer, calibrated to hundredths of a minute (Precision Scientific Co.) or equivalent



- 3.1.3. Multiple outlet box with 6 receptacles.



- 3.1.4. Applied Electrochemistry CO<sub>2</sub> Analyzer - Model CD-3A or equivalent.



- 3.1.5. Applied Electrochemistry Oxygen Analyzer - Model S-3A 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:
  - 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. Test subject will manipulate the unit according to the instruction manual while he is sitting at rest.
- 5.2. Oxygen and Carbon Dioxide samples (80-100 cc) taken from the unit with a syringe will be analyzed at intervals specified in Section 84.101.
- 5.3. Oxygen level must meet requirement set forth in Section 84.79.
- 5.4. Carbon Dioxide maximum level shall not exceed those specified in Section 84.97.
- 5.5. Data Analysis
  - 5.5.1. Oxygen and Carbon Dioxide results will be taken directly from the respective analyzers and recorded on the man-test No. 5 test sheet.
  - 5.5.2. The time a test subject's respiratory needs are met by the unit will also be noted.
  - 5.5.3. Any remarks made by the test subject regarding SCBA comfort and performance will be noted on the test sheet.
  - 5.5.4. All sample values must be within the regulations requirements/ranges.

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

- 6.2. 84.63(a)(c)(d), and Subpart H, Section 84.101, Volume 60, Number 110, June 8, 1995. 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.

84.101 Man Test 5; requirements

(a) Test 5 will be conducted to determine the maximum length of time the apparatus will supply the respiratory needs of the wearer while he is sitting at rest.

(b) The wearer will manipulate the devices controlling the supply of breathing gas to the advantage of the apparatus.

(c) Samples of inspiration from within the apparatus facepiece or mouthpiece shall be taken once every 15 minutes, and shall meet the minimum requirement for oxygen specified in 84.79 of this part, and the maximum allowable average concentration of carbon dioxide specified in 84.97.

(d) One sample of inspiration will be taken in the case of 3-, 5-, and 10-minute apparatus.

7. RECORDS/TEST SHEETS

7.1. All test data collected will be recorded on the MAN TEST #5, CLOSED-CIRCUIT, SELF-CONTAINED BREATHING APPARATUS 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.

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- 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.

**MAN TEST #5, CLOSED-CIRCUIT, SELF-CONTAINED BREATHING APPARATUS**

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

Subject: \_\_\_\_\_ Age : \_\_\_\_\_

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

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

Observers: \_\_\_\_\_

Requirement: The test will be conducted to determine the maximum length of time the apparatus will supply the respiratory needs of the wearer while he is at rest.

Sampling Schedule

<u>Time/Min.</u>	<u>CO<sub>2</sub>%</u>	<u>O<sub>2</sub>%</u>	<u>Remarks</u>
2	_____	_____	_____
5	_____	_____	_____
15	_____	_____	_____
30	_____	_____	_____
45	_____	_____	_____
60	_____	_____	_____
75	_____	_____	_____
90	_____	_____	_____
105	_____	_____	_____
120	_____	_____	_____
135	_____	_____	_____
150	_____	_____	_____
165	_____	_____	_____
180	_____	_____	_____

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Sampling Schedule (cont.)

<u>Time/Min.</u>	<u>CO<sub>2</sub>%</u>	<u>O<sub>2</sub>%</u>	<u>Remarks</u>
210	_____	_____	_____
225	_____	_____	_____
240	_____	_____	_____
255	_____	_____	_____
310	_____	_____	_____
325	_____	_____	_____
340	_____	_____	_____
355	_____	_____	_____
410	_____	_____	_____
425	_____	_____	_____
440	_____	_____	_____
455	_____	_____	_____
470	_____	_____	_____
485	_____	_____	_____

Comments :

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TEST ENGINEER: \_\_\_\_\_ Pass: \_\_\_\_\_ Fail: \_\_\_\_\_

### Revision History

<b>Revision</b>	<b>Date</b>	<b>Reason for Revision</b>
1.0	9 November 2001	Historic document
1.1	12 September 2005	Update header and format to reflect lab move from Morgantown, WV No changes to method