



National Institute for Occupational Safety and Health  
 National Personal Protective Technology Laboratory  
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Procedure No. TEB-CBRN-ASR-STP-0219	Revision: 0.1	Date: 30 January 2014
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**DETERMINATION OF OPEN-CIRCUIT, SELF-CONTAINED BREATHING APPARATUS (SCBA)  
 EMERGENCY BREATHING SAFETY SYSTEMS (EBSS) FUNCTIONALITY DURING LOW-  
 TEMPERATURE OPERATION,  
 STANDARD TESTING PROCEDURE (STP)**

1. PURPOSE

This test establishes the procedures for ensuring that two Open-Circuit, Self -Contained Breathing Apparatus (SCBA) equipped with Emergency Breathing Safety Systems (EBSS) provided by the same manufacturer can be connected together and function properly during low temperature operations 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 84.98; Volume 60, Number 110, June 8, 1995.

2. GENERAL

This STP describes the Determination of Open-Circuit SCBA EBSS Functionality during Low-Temperature Operation 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. Environmental Room, Model D69 (Tenney Engineering, Inc.) or equivalent.

3.1.2. Electric Timer, calibrated to hundredths of a minute (Precision Scientific Co.) or equivalent.

Approvals: First Level	Second Level	Third Level	Fourth Level

- 3.1.3. Two test subjects meeting requirements of the NIOSH Human Subject Review Board (HSRB) approved Protocol. Refer to HSRB-73-DSR-01, "Protocol for the Testing of Respiratory Protective Devices" for the proper consent form and complete details on the use of human test subjects in respirator certification testing.

#### 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 Appalachian Laboratory for Occupational Safety and Health (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. Operate the environmental chamber to bring the interior temperature to the minimum operating temperature specified by the applicant.
- 5.2. Place two test samples, both complete SCBA equipped with EBSS to be evaluated, in the precooled environmental chamber for at least 4 hours prior to testing.
- 5.3. Two test subjects will enter the environmental room. Each will simultaneously don one of the SCBA and breathe normally for 2 minutes in a normal, standing posture.

Note: The test subjects shall be constantly monitored during the test to determine that the units are functioning satisfactorily and that they are not experiencing undue discomfort because of air flow restrictions or other physical or chemical changes in the operation of

the apparatus.

- 5.4 The test subjects will extend their EBSS air lines, and test subject #1 will connect the two SCBA EBSS air lines as per the manufacturer's instructions. The test technician will verify the connection is secure and both systems are operating properly. This configuration will be held for 2 minutes while the subjects continue to breathe normally in a standing posture.
- 5.5 The test technician will securely close the air cylinder supply valve for subject #1 and verify both subjects are breathing off subject #2's air supply. This configuration will be held for 2 minutes while the subjects continue to breathe normally in a standing posture.
- 5.6 The test technician will open the air cylinder supply valve for subject #1, disconnect the EBSS air line connection and verify that both quick connect fittings reseal after disconnection, then reconnect the EBSS air lines and verify the connection is secure and both system are operating properly.
- 5.7 The test technician will securely close the air cylinder supply valve for subject #2 and verify both subjects are breathing off subject #1 air supply. This configuration will be held for 2 minutes while the subjects continue to breathe normally in a standing posture.
- 5.8 The test technician will open the air cylinder supply valve for subject #2, notifying both subjects when finished. Test subject #2 will then disconnect the two SCBA EBSS air lines via the quick disconnect. The test technician will verify the quick connect fittings reseal after disconnection. This configuration will be held for 2 minutes while the subjects continue to breathe normally in a standing posture.

5.9 Data Analysis

Record remarks concerning unit operation and test subject's comments on test data sheet.

Note: This test will require two respirators and should be completed only once, 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(c); 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.

#### ***EBSS testing during low temperature operation***

(a) The applicant shall specify the minimum temperature for safe operation and two persons will perform the tests described in paragraphs (c) and (d) of this section wearing the apparatus according to applicant's directions. At the specified temperature, both apparatus shall meet all the requirements described in paragraph (e) of this section.

(b) Both apparatus will be pre-cooled at the specified minimum temperature for 4 hours.

(c) The apparatus will be worn in the low temperature chamber for time required to complete the test.

(d) Both test subjects will evaluate the operation of the SCBA EBSS during operation as described in section 5.3 to 5.8.

(e) (1) The apparatus shall function satisfactorily at the manufacturers specified minimum temperature.

(2) The wearer shall not experience undue discomfort because of air flow restriction or other physical or chemical changes in the operation of the apparatus.

(f) Auxiliary low-temperature parts which are commercially available to the user may be used on the apparatus to meet the requirements described in paragraph (e) of this section.

## 7. RECORDS\TEST SHEETS

7.1. All test data will be recorded on the COLD TEMPERATURE TEST, OPEN-CIRCUIT, SELF-CONTAINED BREATHING APPARATUS EMERGENCY BREATHING SAFETY SYSTEM EVALUATION 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.

- 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.

**COLD TEMPERATURE TEST, OPEN-CIRCUIT, SELF-CONTAINED BREATHING APPARATUS EMERGENCY BREATHING SAFETY SYSTEM EVALUATION**

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

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

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

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

**Requirement:**

- (a) The applicant shall specify the minimum temperature for safe operation and two persons will perform the tests described in paragraph (c) of this section, wearing the apparatus according to applicant's directions. At the specified temperature, the apparatus shall meet the requirements described in paragraph (e) of this section.
- (b) Both apparatus will be precooled at the specified minimum temperature for 4 hours.
- (c) Both test subjects will evaluate the operation of the SCBA EBSS during connection as described in section 5.3 to 5.8.
- (d) 1. The apparatus shall function satisfactorily at the manufacturer's specified minimum temperature on duplicate tests.  
 2. The wearer shall not experience undue discomfort because of airflow restriction or other physical or chemical changes in the operation of the apparatus.
- (e) Auxiliary low-temperature parts which are commercially available to the user may be used on the apparatus to meet the requirements described in paragraph (d) of this section.

**Results:**

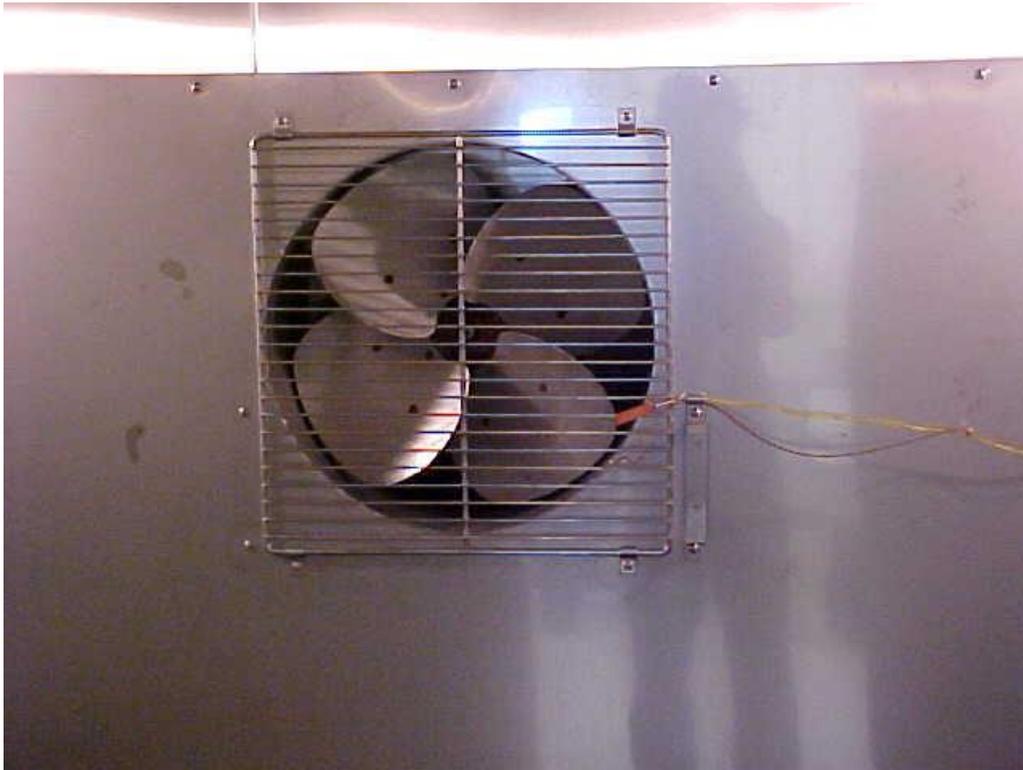
Subject #1: \_\_\_\_\_ Chamber Temp. \_\_\_\_\_ °F SCBA Cylinder Pressure \_\_\_\_\_

Test Subject Comments: \_\_\_\_\_

Subject #2: \_\_\_\_\_ Chamber Temp. \_\_\_\_\_ °F SCBA Cylinder Pressure \_\_\_\_\_

Test Subject Comments: \_\_\_\_\_





### Revision History

<b>Revision</b>	<b>Date</b>	<b>Reason for Revision</b>
0.0	6 January 2014	Establishment of STP
0.1	30 January 2014	Adjustment of test activity durations as a result of validation testing.