



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

Procedure No. RCT-ASR-STP-0112	Revision: 1.1	Date: 20 September 2005
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DETERMINATION OF THE LEVEL OF PROTECTION PROVIDED BY ABRASIVE BLAST,  
TYPE CE, SUPPLIED-AIR RESPIRATORS USING A CHALLENGE AEROSOL  
OF NaCl (SODIUM CHLORIDE) OR CORN OIL  
STANDARD TESTING PROCEDURE (STP)

1. PURPOSE

This test establishes the procedures for ensuring that the level of protection provided by the abrasive blast requirements on Type CE, Supplied-Air Respirators submitted for Approval, Extension of Approval, or examined during Certified Product Audits using a challenge aerosol of NaCl (Sodium Chloride) or Corn Oil, 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 Level the of Protection Provided by Abrasive Blast Type CE, Supplied-Air Respirators using a Challenge Aerosol of NaCl (Sodium Chloride) or Corn Oil tests 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. Air regulator, Model 8, from Matheson Gas Products or equivalent.

3.1.2. NaCl Generator Model FE 560A (Frontier Enterprises) or equivalent.

Approvals:	<u>1st</u> Level	<u>2nd</u> Level	<u>3rd</u> Level
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- 3.1.4. Man-Test Chamber (LASL Laboratory) or equivalent.
- 3.1.4. Dehumidifier Model FE 562 (Frontier Enterprises) or equivalent.
- 3.1.5. Omniscrite Recorder (Houston Instruments) or equivalent.



- 3.1.6. Corn Oil Generator Model 260 (Dynatech Frontier Enterprises - may be substituted for No. 3.1.2., 3.1.4., and 3.1.5. above) or equivalent.



- 3.1.7. A 300 cubic foot gas cylinder of compressed Grade D air or equivalent.



- 3.1.8. A Helicoid calibrated pressure gauge and connecting fittings or equivalent.
- 3.1.9. 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 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. Connect the maximum length of hose requested by the manufacturer.
  - 5.2. One end of the hose is connected to a regulated source of Grade D or better air supply (cylinder or compressor).

- 5.3. The other end is connected to the supplied-air respirator being tested. The facepiece fit and ability of the wearer to breathe normally is verified before proceeding with the test.
- 5.4. Test subject enters man-test chamber wearing the supplied-air respirator to be tested.
- 5.5. The air supply system is turned on and adjusted with the air regulated to the minimum respirator service pressure as requested by the manufacturer.
- 5.6. Calibrate the NaCl generation system with the man-test chamber for the challenge concentration.
- 5.7. Test subject begins a sequence of head exercises for 1 minute each exercise as follows:
  - A. Normal Breathing
  - B. Deep Breathing
  - C. Turn head from side to side
  - D. Nod head up and down
  - E. Read Rainbow Passage
  - F. Frown and smile
  - G. Normal Breathing
- 5.8. The concentration of NaCl test aerosol inside the hood or helmet is continuously recorded on a Houston Instrument Recorder or the Corn Oil Generator Model 260 Strip Chart Recorder.
- 5.9. The lab technician will record any comments of the test subjects regarding encumbrances or discomfort caused by the hood or helmet during the test..
- 5.10. This test is repeated with two different test subjects.
- 5.11. This test will be conducted at the minimum pressure with the maximum hose length.
- 5.12. The Abrasive Blasting Supplied-Air Respirator shall be unacceptable when a leakage is recorded in excess of 0.05% NaCl (Sodium Chloride) or Corn Oil in a challenge concentration of 100% NaCl or Corn Oil aerosol.

Note: When using corn oil this procedure remains the same.

## 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)(b)(c); Volume 60, Number 110, June 8, 1995, and as is listed in Section 5.12.
- 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. The leakage of NaCl (Sodium Chloride) or corn oil into the Abrasive Blasting Hood or Helmet shall not exceed a maximum percent leakage of 0.05% in a challenge concentration of 100% NaCl or corn oil aerosol.
- 6.4. The wearer of the respirator in this test shall not experience undue encumbrance and discomfort because of the fit, air delivery, or other features of the respirator.
- 6.5. The head and shoulder covering shall adequately protect the wearer from discomfort or injury due to impact or abrasion from rebounding material during the test.

## 7. RECORDS\TEST SHEETS

- 7.1. All test data will be recorded on the SPECIAL TEST - ABRASIVE BLAST - CORN OIL, TYPE CE, SUPPLIED-AIR RESPIRATORS 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.

**SPECIAL TEST - ABRASIVE BLAST - CORN OIL, TYPE CE,  
SUPPLIED-AIR RESPIRATORS**

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

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

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

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

Requirement: These requirements listed in the above sections are to be substituted and replaced with Sodium Chloride (NaCl) or Corn Oil Performance test requirements as follows:

Challenge concentration of NaCl or Corn Oil Aerosol with an AMMD of 0.6 micrometers. A maximum leakage of 0.05%.

Results:

Data: Hose Length - feet: \_\_\_\_\_ Pressure - psig: \_\_\_\_\_

Test Subject: # 1. \_\_\_\_\_ Test Subject: #2. \_\_\_\_\_

	<u>Event</u>	<u>% Leakage</u>	<u>% Leakage</u>
1.	Normal Breathing	_____	_____
2.	Deep Breathing	_____	_____
3.	Turn head, side to side	_____	_____
4.	Nod head, up and down	_____	_____
5.	Talk, read passage	_____	_____
6.	Frown and smile	_____	_____
7.	Normal breathing	_____	_____

Comments:

\_\_\_\_\_  
\_\_\_\_\_

Test Engineer: \_\_\_\_\_ Pass \_\_\_\_\_ Fail \_\_\_\_\_

Figure 1.  
Schematic of Abrasive Blast SAR in NaCl Aerosol Test

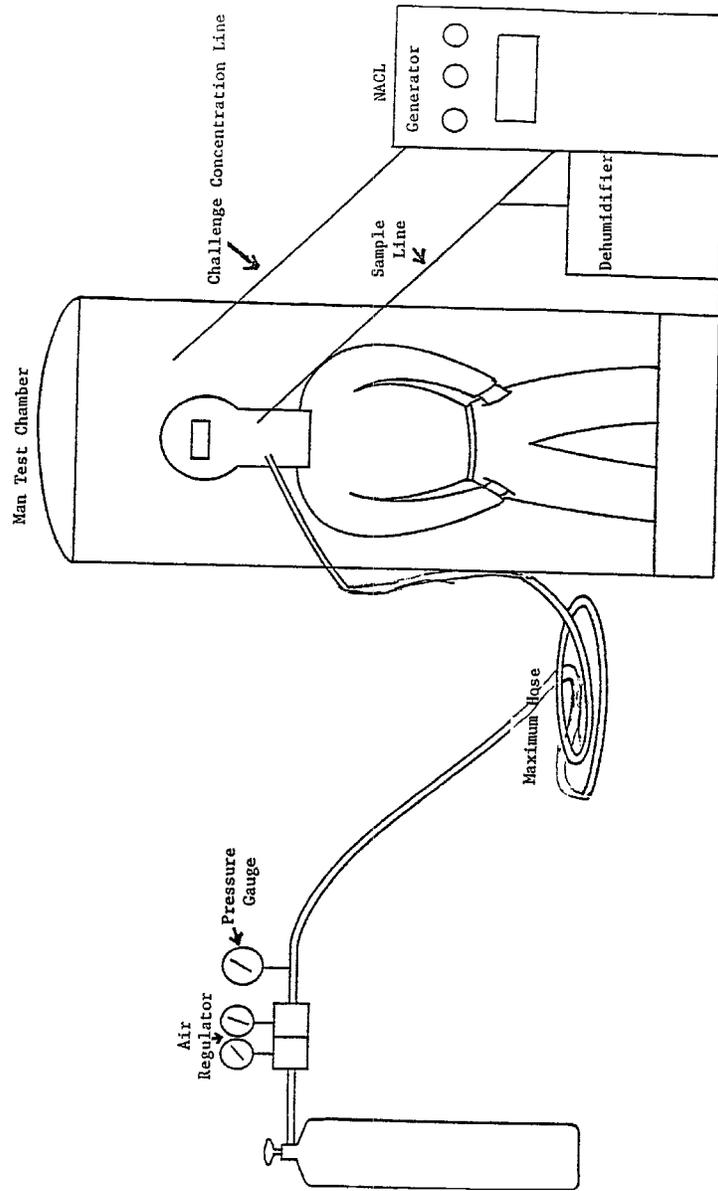


Figure 1. Schematic of Abrasive Blast SAR in NaCl Aerosol Test.





### Revision History

<b>Revision</b>	<b>Date</b>	<b>Reason for Revision</b>
1.0	23 February 2001	Historic document
1.1	20 September 2005	Update header and format to reflect lab move from Morgantown, WV No changes to method