



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

Procedure No. RCT-ASRS-STP-0111	Revision: 1.1	Date: 20 September 2005
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DETERMINATION OF AIR VELOCITY AND NOISE LEVELS - SOUND LEVEL,
 TYPE C AND CE, SUPPLIED-AIR RESPIRATORS
 STANDARD TESTING PROCEDURE (STP)

1. PURPOSE

This test establishes the procedures for ensuring that the level of protection provided by the air velocity and noise level requirements for hoods and helmets used on Type C and CE, Supplied-Air Respirators submitted for Approval or Extension of Approval, meets the minimum certification standards set forth in 42 CFR, Part 84, Subpart G, Section 84.63(a)(c)(d), and Subpart J, Section 84.140; Volume 60, Number 110, June 8, 1995.

2. GENERAL

This STP describes the Determination of Air Velocity and Noise Level - Sound Level, Type C and CE, Supplied-Air Respirator 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. A 300 cubic foot gas cylinder of compressed Grade D air or equivalent.

Approvals:	<u>1st</u> Level	<u>2nd</u> Level	<u>3rd</u> Level



3.1.2. Air regulator, Model 8, from Matheson Gas Products or equivalent.



3.1.3. A Helicoid calibrated pressure gauge and connecting fittings or equivalent.



3.1.4. Noise dosimeter, Model 1954, GenRad or equivalent.



3.1.5. Mannequin.

- 3.1.6. Respirator under test with the hose length and pressure range that supply the highest airflow rate to the respirator. (See air flow data sheets for this information).
- 3.1.7. Associated couplings and fittings.
- 3.1.8. Three 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. Mannequin Test

In order to insure that test subjects are not exposed to noise levels that are excessively high, a screening test will be run to eliminate those respirators whose noise levels exceed 85 dBA.

- 5.1.1. Assemble the equipment shown in Figure 1 with the exception of the GR1954 noise dosimeter and the respirator under test.

- 5.1.2. Achieve the following initial conditions:
 - a. Air cylinder valve - closed (clockwise).
 - b. Regulator control valve - closed (counter clockwise).
 - c. Regulator outlet valve - open (counter clockwise).
- 5.1.3. Use the pressure gauge with the appropriate range.
- 5.1.4. Perform the following operations according to the respective paragraphs in the GR1954 Noise Dosimeter Instruction Manual on both dosimeters:
 - a. Battery Installation.
 - b. Installation of Monitor in Indicator Housing.
 - c. Battery Check.
 - d. Calibration of Monitor.
- 5.1.5. Install the respirator under test on the mannequin according to the manufacturer's instructions. Install the GF1954 microphones on each ear of the mannequin.
- 5.1.6. Insert the round end of the calibration screwdriver into the groove on the RANGE switch of the GenRad 1954 monitor and select the 60 - 110 dB range. (Note: The exchange rate is 5 dB and the microphone is calibrated for random incidence responses.)
- 5.1.7. Open the air cylinder valve fully by turning completely counter clockwise.
- 5.1.8. Open the regulator valve slowly by turning clockwise until the pressure gauge indicates the maximum delivery pressure specified by the manufacturer. This pressure must be held constant during the test. Once the cylinder pressure falls below 500 psi a recharged cylinder must be used.
- 5.1.9. Once the delivery pressure is stabilized, depress and hold the reset button of each GR1954 indicator. After 30 seconds a display will appear on each indicator. Record the respective reading for the right and left ear of the mannequin.
- 5.1.10. Close the air cylinder valve by turning clockwise. Close the regulator valve by turning counterclockwise.
- 5.1.11. Convert the GenRad 1954 dosimeter readings to the equivalent OSHA continuous sound level in dBA by using the nomograph on the case of the dosimeter. Locate the reading on the graph. Read the equivalent continuous sound level opposite this value. Record the result. The equation for the nomograph is in the GR1954 Dosimeter Instruction Manual and the dBA result

may be calculated.

5.1.12. Perform the following operations according to the respective paragraphs in the GR1954 Dosimeter Instruction Manual on both dosimeters:

- a. Battery Check.
- b. Calibration Check of Monitor.

The calibrator and battery checks must be positive or the test rerun.

5.2. Human Subject Test

The test subjects employed in the supplied air respirator noise level test will be given a pure tone air conduction hearing test prior to participation, every 12 months during participation and at the conclusion of participating in the testing program. Also, an external auditory canal examination shall be administered by a physician. Based on these examinations and tests the physicians will recommend which subjects can participate in the supplied air respirator noise level test.

5.2.1. The evaluation is made on three test subjects instead of a single mannequin.

It is recommended that both males and females be employed as test subjects and that a wide variation in body size and shape of subjects be sought.

5.2.2. The GR1954 dosimeter microphones are attached to plastic clips around the individual's ears. (See page XV of the GR1954 Noise Dosimeter Instruction Manual, photograph entitled, "Microphone positioned at the ear").

5.2.3. The three test subjects must meet the requirements of HSRB.

5.2.4. The test subjects will be allowed to wear ear-insert type hearing protectors, which do not interfere with the positioning of the microphones, if they desire. A choice of protectors will be provided for this purpose.

5.2.5. Two readings are taken on each subject at both ears and averaged.

5.2.6. The respirator will be considered to pass the evaluation if none of the averaged measurements exceed 80 dBA. Otherwise it fails.

5.2.7. Record results on data sheet.

5.3. Data Analysis

5.3.1. Sound levels may not exceed 80 dBA for average of two measurement determinations.

5.3.2. In accordance with the Instruction Manual--After average allow + 0.5 dB to result as per Manual Accuracy Specification.

Note: This test should be performed in a location with a minimum of background noise.

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), and Subpart J, Section 84.140; 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.

84.140 Air velocity and noise levels; hoods and helmets; minimum requirements. Noise levels generated by the respirator will be measured inside the hood or helmet at maximum airflow obtainable within pressure and hose length requirements and shall not exceed 80 dBA.

7. RECORDS\TEST SHEETS

7.1. All test data will be recorded on the SOUND LEVEL DETERMINATION, TYPE C AND 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

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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.

**SOUND LEVEL DETERMINATION, TYPE C AND CE,
SUPPLIED-AIR RESPIRATORS**

Project No : _____ Date: _____

Company : _____

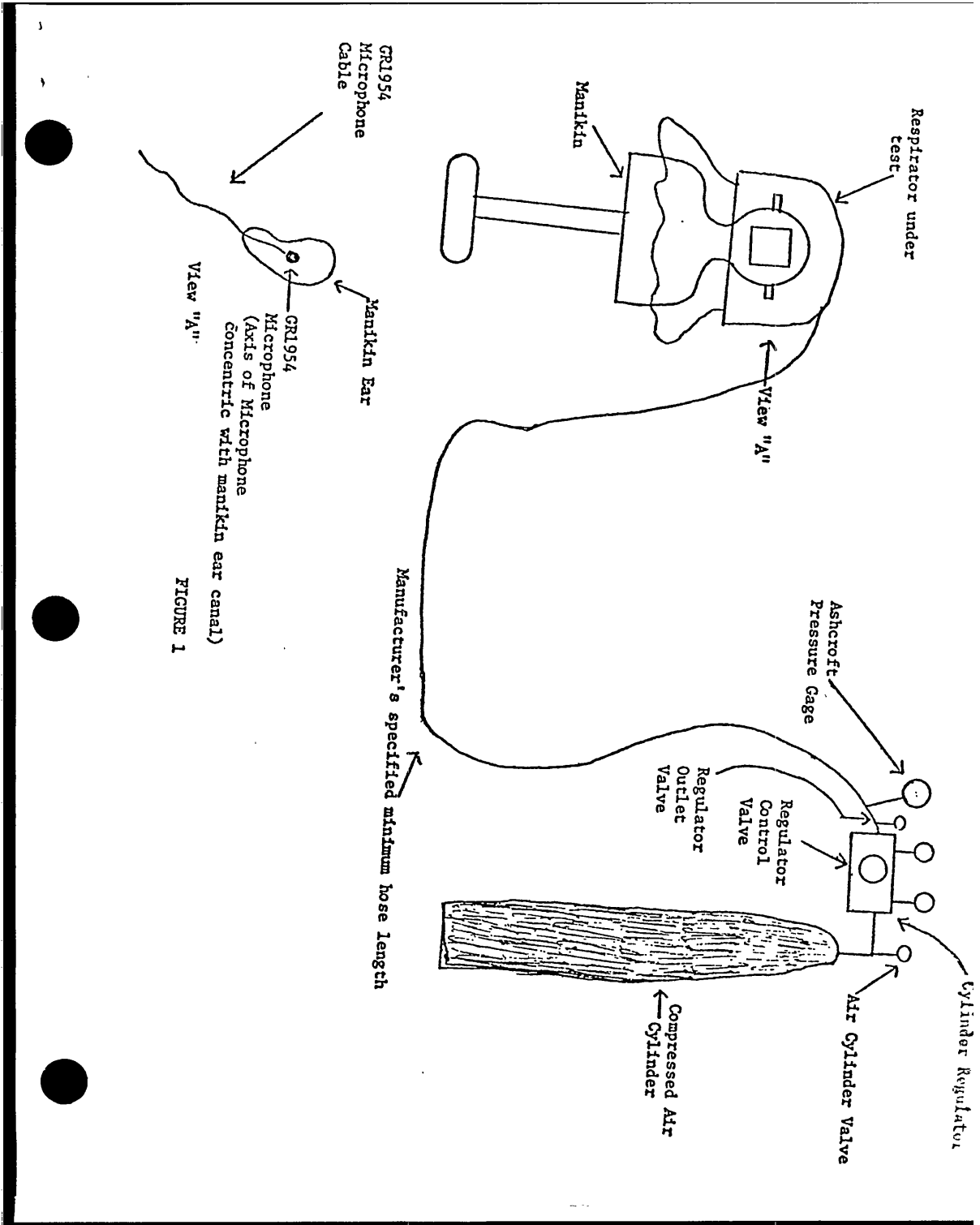
Respirator Type: _____

Reference: 42 CFR, Part 84, Subpart J, Section 84.140

Requirement: Noise levels generated by the respirator will be measured inside the hood or helmet at the maximum airflow obtainable within pressure and hose length requirements shall not exceed 80 dBA.

Comments:

Test Engineer: _____ PASS _____ FAIL _____









Revision History

Revision	Date	Reason for Revision
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