



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

Procedure No. RCT-APR-STP-0030	Revision: 1.1	Date: 14 June 2005
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DETERMINATION OF NOISE LEVEL TEST,
POWERED AIR-PURIFYING RESPIRATOR WITH HOODS OR HELMETS
STANDARD TESTING PROCEDURE (STP)

1. PURPOSE

This test establishes the procedure for ensuring that the level of protection provided by the noise level requirements on powered air-purifying respirators with hoods or helmets 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), Subpart L, Section 84.202, and Subpart KK, Section 84.1139; Volume 60, Number 110, June 8, 1995.

2. GENERAL

This STP describes the Determination of Noise Level Test, Powered Air-Purifying Respirators with Hoods or Helmets 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. Complete powered air purifying hood or helmet respirator in the configuration as worn by the user with fully charged battery and new air purifying elements.

3.1.2. Life size mannequin.

3.1.3. Noise dosimeter, Model 1954, GenRad or equivalent. For OSHA use, the dosimeter must have a 5 dB exchange rate, use a 90 dBA criterion level, be set at slow response, and use either an 80 dBA or 90 dBA threshold gate, or a dosimeter that has both capabilities, whichever is appropriate for the evaluation.

3.1.4. Three test subjects meeting requirements of the NIOSH Human Subject Review Board (HSRB) approved Protocol. Refer to HSRB-81-DSR-03, "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.

Approvals:	<u>1st</u> Level	<u>2nd</u> Level	<u>3rd</u> Level
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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. Normal laboratory safety practices must be observed. This includes safety precautions described in the current ALOSH Facility Laboratory Safety Manual.
 - 4.2.1. Safety glasses, lab coats, and hard-toe shoes must be worn at all times.
 - 4.2.2. Work benches must be maintained free of clutter and non-essential test equipment.
 - 4.2.3. When handling any glass laboratory equipment, lab technicians and personnel must wear special gloves which protect against lacerations or punctures.
- 4.3. THE NOISE LEVEL TEST SHOULD BE PERFORMED IN A LOCATION WITH A MINIMUM OF BACKGROUND NOISE.

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. Prior to the use of the test subjects, a noise level screening test will be performed on the complete respirator assembly affixed to a mannequin. This screening is to eliminate any respirator which may exceed noise levels of 85 dBA.
 - 5.1.1. Position the microphones of the GR1954 on each ear of the mannequin. Following the respirator manufacturer's instructions, mount the respirator assembly onto the mannequin.
 - 5.1.2. Perform the following operations according to the respective paragraphs in the GR1954 Noise Dosimeter Instruction Manual on both dosimeters:
 - 5.1.2.1. Battery Installation.
 - 5.1.2.2. Installation of Monitor in Indicator Housing.
 - 5.1.2.3. Battery Check.
 - 5.1.2.4. Calibration of Monitor.
 - 5.1.3. Turn on blower assembly unit of the respirator.

- 5.1.4. 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.)
- 5.1.5. 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.
- 5.2. Convert the GenRad 1954 dosimeter reading to the equivalent OSHA continuous sound level in dBA by the following formula or enter readings into the DEIMS electronic data sheet where it is calculated automatically:

$$\left[\left(\frac{D}{100} \right) \left(\frac{8}{T} \right) \right] + 16.61 \log C$$

Where:

- D= dosimeter reading
- T= time in hours (30 seconds equals 0.00833 hrs.)
- C= 50, 70, or 90 (low, middle, or high scale)

- 5.3. Once the dBA noise level has been calculated and is determined to be below the 85 dBA limit, test subject testing may begin.
 - 5.4. The evaluation is made on three test subjects instead of a single mannequin.
 - 5.5. 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.
 - 5.6. 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").
 - 5.7. 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.
 - 5.8. Follow steps 5.1.2 through 5.1.5 for noise level measurement.
 - 5.9. Two readings are taken on each subject at both ears and the results averaged.
 - 5.10. Record and calculate the results as per section 5.2 or enter the readings onto the DEIMS electronic data sheet.
6. PASS/FAIL CRITERIA

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6.1. The criterion for passing this test is set forth in 42 CFR Part 84, Subpart G, Section 84.63(a)(c)(d), Subpart L, Section 84.202 and Subpart KK, Section 84.1139; 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.

84.202 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 and shall not exceed 80 dBA.

84.1139 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 and shall not exceed 80 dBA.

7. RECORDS\TEST SHEETS

7.1. All test data will be recorded on the DETERMINATION OF AIR PURIFYING RESPIRATOR NOISE LEVEL 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.

8. ATTACHMENTS

8.1 Data Sheet

National Institute for Occupational Safety and Health



NIOSH Respirator Branch

Test Data Sheet

Task Number: _____ Sound Level Test STP No.: [____] Reference No.: 84.
 Manufacturer: _____ Item Tested:

	Trial 1 (dBa)		Trial 1 (dBa)		Trial 1 (dBa)		Max. Allowable (dBa)	RESULTS
	Left ear	Right ear	Left ear	Right ear	Left ear	Right ear		
Subject								
Mannequin							85	
1							80	
2							80	
3							80	

Overall Results: Pass ___ Fail ___ Comment:
Was all testing equipment in calibration throughout all testing: Yes ___ No
Signature: _____ Date: _____

Additional Comments:

Signature: _____
Date: _____

Revision History

Revision	Date	Reason for Revision
1.0	7 March 2002	Historic document
1.1	14 June 2005	Update header and format to reflect lab move from Morgantown, WV No changes to method