



National Institute for Occupational Safety and Health
National Personal Protective Technology Laboratory
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Procedure No. RCT-ASR-STP-0102	Revision: 1.1	Date: 3 June 2005
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DETERMINATION OF NONKINKABILITY OF HOSES,
TYPE C AND CE, SUPPLIED-AIR RESPIRATORS
STANDARD TESTING PROCEDURE (STP)

1. PURPOSE

This test establishes the procedures for ensuring the level of protection provided by the nonkinkability of hoses requirements on Type C and CE Supplied-Air Respirators, and submitted for Approval, Extension of Approval, or examined during Approved Product audits meet the certification standards set forth in 42 CFR, Part 84, Subpart G, Section 84.63(a)(c)(d), and Subpart J, Section 84.150, Table 8; Volume 60, Number 110, June 8, 1995.

2. GENERAL

This STP describes the Determination of Nonkinkability of Hoses, Type C and CE, Supplied-Air Respirators 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. Air regulator, Model 8, from Matheson Gas Products or equivalent.

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

3.1.3. Teledyne Hastings Mass Flow Meter model NAHL-25 or equivalent.

3.1.4. A 300 cubic foot gas cylinder of compressed air 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).

Approvals:	<u>1st</u> Level	<u>2nd</u> Level	<u>3rd</u> Level
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- 4.2. The compressed gas cylinder must meet all applicable Department of Transportation requirements for cylinder approval as well as for retesting/qualification.
- 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 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. A source of compressed air is needed (a cylinder with a regulator and tee assembly for an in-line gauge) or equivalent.
 - 5.2. Connect the Helicoid calibrated pressure gauge, or equivalent, to the regulator and tee assembly.
 - 5.3. A 25-foot section of hose is connected to the regulator and tee assembly. The hose is placed on the floor in a 10-foot loop. (See Figure 1)
 - 5.4. The other end of the hose is connected to the Mass Flow Meter through a breathing tube. (See Figure 1)
 - 5.5. The cylinder valve is opened and the operating pressure is adjusted with the regulator to the minimum operating pressure specified by the manufacturer for the 25-foot, or minimum length, airline.
 - 5.5.1. Record the "open" flow reading on the Mass Flow Meter in "cfm" units on the test data sheet.
 - 5.6. The loop in the airline is tangentially pulled into a straight line along the floor while the flowrate is continuously monitored.
 - 5.6.1. Record the minimum flow reading observed or recorded in cfm units on the test data sheet.
 - 5.6.2. Record any other observations that would affect airline acceptance or failure.
 - 5.7. Repeat Steps 5.5 and 5.6 at least five times.

- 5.8. Calculate the minimum percentage decrease in the flow of air through the airline as follows:

$$\text{Airflow (minimum \%)} = \frac{\text{minimum flow reading}}{\text{open flow reading}} \times 100$$

- 5.9. Data Analysis

The air supply hose shall be considered unacceptable when the flow of air decreases to less than 90 percent when being unfolded from a spiral shape to a straight line.

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 84.150, Table 8; 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.

84.150 Air-supply line tests; minimum requirements.

Air supply lines employed on Types C and CE supplied-air respirators shall meet the minimum test requirements set forth in Table 8 of this subpart.

A 7.6m. (25 foot) section of the hose will be placed on a horizontal-plane surface and shaped into a one-loop coil with one end of the hose connected to an airflow meter and the other end of the hose supplied with air at the minimum specified supplied pressure. The connection shall be in the plane of the loop. The other end of the hose will be pulled tangentially to the loop and in the plane of the loop until the hose straightens. To meet the requirements of this test, the loop shall maintain a uniform near-circular shape and ultimately unfold as a spiral, without any localized deformation that decreases the flow of air to less than 90 percent of the flow when the hose is tested while remaining

in a straight line.

7. RECORDS\TEST SHEETS

- 7.1. All test data will be recorded on the NONKINKABILITY OF HOSES, 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 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.

NONKINKABILITY OF HOSES, TYPE C AND CE, SUPPLIED-AIR RESPIRATORS

Project No : _____ Date:

Company :

Respirator Type:

Reference: 42 CFR, Part 84, Subpart J, Section 84.150, Table 8.

Requirement: A 7.6m. (25 foot) section of the hose will be placed on a horizontal-plane surface and shaped into a one-loop coil with one end of the hose connected to an airflow meter and the other end of the hose supplied with air at the minimum specified supplied pressure. The connection shall be in the plane of the loop. The other end of the hose will be pulled tangentially to the loop and in the plane of the loop until the hose straightens. To meet the requirements of this test, the loop shall maintain a uniform near-circular shape and ultimately unfold as a spiral, without any localized deformation that decreases the flow of air to less than 90 percent of the flow when the hose is tested while remaining in a straight line.

Results:

	<u>PSIG</u>	<u>Flow Before Test (180 degree)</u>	<u>Flow During Test (360 degree loop)</u>
1.	_____	_____	
2.	_____	_____	
3.	_____	_____	
4.	_____	_____	
5.	_____	_____	

Comments:

Test Engineer: _____ Pass: _____ Fail:

Figure 1- Nonkinkability of Hose Test

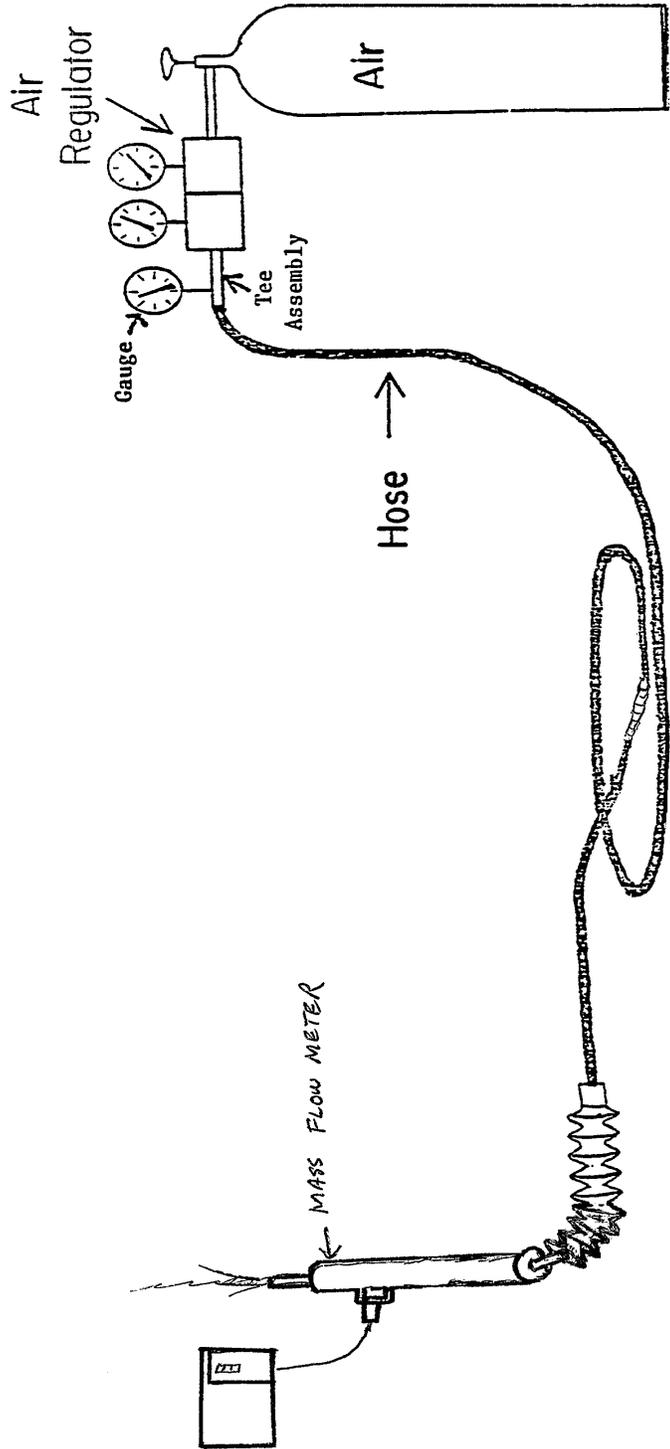


Figure 1. Schematic of Non Kink -- Ability Test.

Revision History

Revision	Date	Reason for Revision
1.0	27 June 2001	Historic document
1.1	3 June 2005	Update header and format to reflect lab move from Morgantown, WV No changes to method