



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

Procedure No. RCT-ASR-STP-0100	Revision: 1.1	Date: 3 June 2005
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DETERMINATION OF STRENGTH OF HOSES AND COUPLINGS,
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 strength of hoses and couplings requirements on Types C and CE Supplied-Air Respirators 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 J, Section 84.150, Table 8; Volume 60, Number 110, June 8, 1995.

2. GENERAL

This STP describes the Determination of Strength of Hose and Coupling 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. A source of compressed air (a 300 cubic foot gas cylinder) capable of delivering 250 psig or higher.
- 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. Two sections of applicant's supplied-air hose.
- 3.1.5. A four-inch pulley, or equivalent.
- 3.1.6. An American Chain and Cable Company Model E Overhead Chain Hoist, or equivalent.
- 3.1.7. A 45 kilogram (100 pound) weight.

Approvals:	<u>1st</u> Level	<u>2nd</u> Level	<u>3rd</u> Level
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- 3.1.8. Two 2-foot sections of strong rope with breaking strength above 250 lb or equivalent.
- 3.1.9. A safety cable capable of securing both ends of the hose at the coupling or equivalent.
- 3.1.10. Electric timer, calibrated to hundredths of a minute (Precision Scientific Co.) or equivalent.
- 3.1.11. A calibrated Tinius Olsen, Model LTCM, compression/tension strain gauge, or equivalent, may be substituted for the pulley, chain hoist, and weights.

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 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. Use the test operating procedure as follows:
 - 5.1.1. Connect two sections of the applicant's supplied-air hose with coupling (be sure to use the safety cable).
 - 5.1.2. Secure one end of connected hoses to the proper test weight (45 kilograms-100 pounds), or to the Tinius Olsen strain gauge (within 1-foot of the coupling).
 - 5.1.3. Place air-supply hose over a four-inch pulley held suspended with a short rope

from an overhead chain hoist, or connect the hose coupling on the other end of the hose to the opposite end of the strain gauge (within 1-foot of the coupling).

- 5.1.4. Attach one end of connected hoses to a two-stage regulator and compressed air source; attach a female quick connect coupling to the opposite end of the connected hoses.
- 5.1.5. Slowly increase air pressure within connected hoses until desired pressure is reached and check for signs of possible rupture.
- 5.1.6. Pull air-supply hose across the pulley until hose becomes taut, making certain that the coupling of the hoses is between the hoist and the weight, or both couplings and the strain gauge is between the hoist and the anchor point (See Figure 1).
- 5.1.7. Secure remaining end of the connected hoses.
- 5.1.8. Slowly raise the hook of the overhead hoist and start the timer when weight leaves the laboratory floor, or when the required weight has been reached on the strain gauge.
- 5.1.9. After five minutes, stop the timer and release the pull on the hose couplings.
- 5.1.10. Remove pressure from within connected air-supply hoses.
- 5.1.11. Examine the couplings and hoses for any indications of separation or failure.

Note: Photographs may be taken for records documentation.

Note: If the hoses pass this test then the same hoses and couplings must be used on the Tightness of Hose and Couplings and Gasoline Permeation tests.

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.

Air-supply-lines used with Types C and CE, hose and couplings shall not exhibit any separation or failure when tested with a pull of 45 kg. (100 pounds) for 5 minutes and when simultaneously subjecting them to an internal air pressure of 2 times the maximum respirator-supply pressure that is specified by the applicant or at 173 kN/m.² (25 pounds per square inch) gauge, whichever is higher.

7. RECORDS\TEST SHEETS

- 7.1. All test data will be recorded on the STRENGTH OF HOSES AND COUPLINGS, 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.

**STRENGTH OF HOSES AND COUPLINGS, 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: Hose and couplings shall not exhibit any separation or failure when tested with a pull of 45 kg. (100 pounds) for 5 minutes and when simultaneously subjecting them to an internal air pressure of 2 times the maximum respirator-supply pressure that is specified by the applicant or at 173 kN/m.² (25 pounds per square inch) gauge, whichever is higher.

Test Apparatus Used: 100 lb. weight _____ / Strain Gauge

Test Data: : Hose internal air pressure - _____ (psig)

: Pounds of pull or tension - _____ (lbs.)

: Test time period - _____ (min - sec)

Evaluation: : Separation or failure occurred at a coupling: YES _____ / NO

: Separation or failure occurred in the hose: YES _____ / NO

Comments :

Test Engineer: _____ PASS _____ FAIL

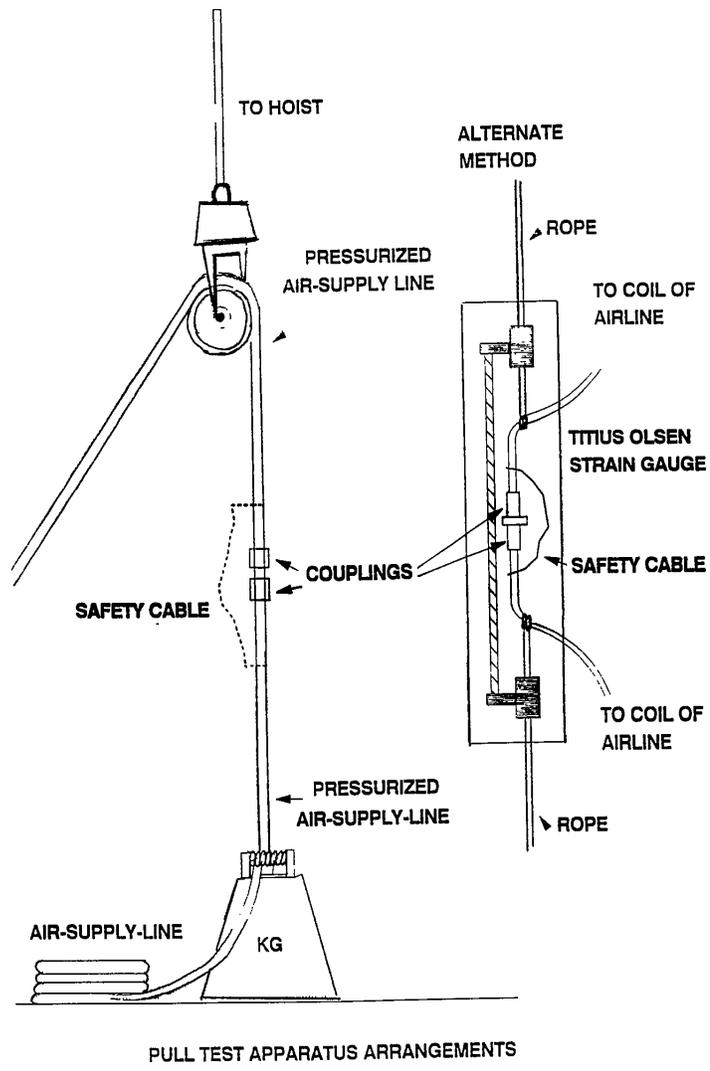


Figure 1

Pull Test Apparatus Arrangement

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