



*National Personal Protective Technology Laboratory*  
*Technology Evaluation Branch*

Status Investigation Report of One  
Self-Contained Breathing Apparatus  
Submitted by the  
Washington Police Department  
Washington, Pennsylvania

NIOSH Task No. 15057

January 18, 2008

## **Disclaimer**

The purpose of Respirator Status Investigations is to determine the conformance of each respirator to the NIOSH approval requirements found in Title 42, *Code of Federal Regulations*, Part 84. A number of performance tests are selected from the complete list of Part 84 requirements and each respirator is tested in its “**as received**” condition to determine its conformance to those performance requirements. Each respirator is also inspected to determine its conformance to the quality assurance documentation on file at NIOSH.

In order to gain additional information about its overall performance, each respirator may also be subjected to other recognized test parameters, such as National Fire Protection Association (NFPA) consensus standards. While the test results give an indication of the respirator’s conformance to the NFPA approval requirements, NIOSH does not actively correlate the test results from its NFPA test equipment with those of certification organizations which list NFPA-compliant products. Thus, the NFPA test results are provided for information purposes only.

Selected tests are conducted only after it has been determined that each respirator is in a condition that is safe to be pressurized, handled, and tested. Respirators whose condition has deteriorated to the point where the health and safety of NIOSH personnel and/or property is at risk will not be tested.

## **Investigator Information**

The SCBA inspection and performance tests were conducted by Eric Welsh, Engineering Technician and Vance Kochenderfer, Quality Assurance Specialist, both of the Technology Evaluation Branch, National Personal Protective Technology Laboratory, National Institute for Occupational Safety and Health, located in Bruceton, Pennsylvania. This report was written by Vance Kochenderfer.

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**Background**

As part of the *National Institute for Occupational Safety and Health (NIOSH) Fire Fighter Fatality Investigation and Prevention Program*, the Respirator Branch agreed to examine and evaluate one Dräger Safety UK Ltd. 4500 psi, 30-minute, self-contained breathing apparatus (SCBA).

This SCBA status investigation was assigned NIOSH task number 15057. The Washington Police Department was advised that NIOSH would provide a written report of the inspections and any applicable test results.

The SCBA, sealed in a corrugated cardboard box, was delivered to the NIOSH facility in Bruceton, Pennsylvania on March 21, 2007 by Detective Chris Luppino of the City of Washington Police Department. The package was opened that day and stored data downloaded from the Sentinel remote pressure gauge and Personal Alert Safety System device. A copy of the data was provided to Detective Luppino at that time. The package was then taken to the Firefighter SCBA Evaluation Lab (building 108) and stored under lock until the time of the evaluation.

**SCBA Inspection**

The package was opened and the SCBA inspection was performed on October 2, 2007. The SCBA was examined, component by component, in the condition as received to determine its conformance to the NIOSH-approved configuration. The visual inspection process was videotaped. The SCBA was identified as the Dräger UK Limited AirBoss PSS100 model.

The complete SCBA inspection is summarized in **Appendix I**. The condition of each major component was also photographed with a digital camera. Images of the SCBA are contained in **Appendix IV**.

The SCBA generally appeared to be undamaged and overall in very good condition. The barrel of the lung demand valve was slightly separated from the housing body. Also, a few gouges were noted in the cylinder surface. Although this damage may require repair before the cylinder is returned to use, it was judged that the cylinder could safely be used for laboratory testing with appropriate precautions being observed.

### **Personal Alert Safety System (PASS) Device**

A combination Personal Alert Safety System (PASS) and remote air pressure gauge, known as a Sentinel device, was incorporated in the SCBA. On March 21, 2007, the Sentinel device was examined to determine if it contained any stored data. Data were obtained and three charts from the day of last use are attached as **Appendix II**. The data also indicate that the PASS device alarmed due to lack of motion at 11:37:15 on the date of last use and that the alarm had never been manually activated on that date. Although during the visual inspection the PASS device was activated and appeared to function normally, it was not tested against the specific performance requirements of NFPA 1982, *Standard on Personal Alert Safety Systems (PASS)*, 1998 Edition. Because NIOSH does not certify PASS devices, no further testing or evaluations were conducted on the PASS unit.

### **SCBA Testing**

The purpose of the testing was to determine the SCBA's conformance to the approval performance requirements of Title 42, *Code of Federal Regulations*, Part 84 (42 CFR 84).

The following performance tests were conducted on the SCBA:

#### **NIOSH SCBA Certification Tests** (in accordance with the requirements of 42 CFR 84):

1. Positive Pressure Test [§ 84.70(a)(2)(ii)]
2. Rated Service Time Test (duration) [§ 84.95]
3. Static Pressure Test [§ 84.91(d)]
4. Gas Flow Test [§ 84.93]
5. Exhalation Resistance Test [§ 84.91(c)]
6. Remaining Service Life Indicator Test (low-air alarm) [§ 84.83(f)]

#### **National Fire Protection Association (NFPA) Tests** (in accordance with NFPA 1981, 2002 Edition):

7. Air Flow Performance Test [Chapter 7, 7.1.1]

Testing was performed on October 3, 4, 9, and 17, 2007. All testing was videotaped with the exception of the Exhalation Resistance Tests and Static Pressure Tests.

The SCBA passed all performance tests with the exception of the Positive Pressure Test and Rated Service Time Test. The SCBA allowed the facepiece pressure to drop slightly below ambient during the Positive Pressure Test, then it dropped lower when the cylinder was exhausted one minute and three seconds prior to the rated time. The heads-up display incorporated in the facepiece did not function at all during testing.

**Appendix III** contains the complete NIOSH and NFPA test reports for the SCBA. **Tables One and Two** summarize the test results.

### **Summary and Conclusions**

The SCBA submitted to NIOSH by the Washington Police Department for evaluation was delivered to NIOSH on March 21, 2007 and inspected on October 2, 2007. The unit was identified as a Dräger UK Limited AirBoss PSS100 30-minute, 4500 psi SCBA (NIOSH approval number TC-13F-378). The unit was determined to be in a condition safe for testing.

The unit was subjected to a series of seven performance tests on October 3, 4, 9, and 17, 2007. The SCBA was able to meet the requirements of all tests except the Positive Pressure Test and Rated Service Time Test. The heads-up display was not functional. No maintenance or repair work was performed on the unit at any time.

In light of the information obtained during this investigation, NIOSH has proposed no further action at this time. Following inspection and testing, the SCBA was returned to the package in which it was received. It was returned to the Washington Police Department on December 13, 2007.

If the SCBA is to be placed back in service, it must be thoroughly inspected, repaired, and tested by a qualified service technician. The damage to the cylinder should be evaluated and, if necessary, repaired by a certified retester before it can be put back into use.

# **Appendix I**

## **SCBA Inspection Report**



National Personal Protective Technology Laboratory / Respirator Branch

**Respirator Field Problem**  
**Incoming Inspection Report Summary**

<b>Task Number:</b> 15057	<b>Requestor:</b> Washington Police Department
<b>Date Received:</b> 21 March 2007	
<b>Date Inspected:</b> 2 October 2007	<b>Description:</b> Fatality
<b>Manufacturer:</b> Dräger UK Ltd.	<b>Inspected by:</b> Vance Kochenderfer
<b>Approval Number:</b> TC-13F-378	<b>SCBA Type:</b> Open Circuit, Pressure-Demand

As received, the SCBA was packaged in a corrugated cardboard box (refer to **Figures 1 and 2** in **Appendix IV**).

**Components and Observations**

NOTE: All references to “right” or “left” are from the user’s perspective.

**1. Facepiece (Refer to **Figures 3 through 6** in **Appendix IV**):**

The facepiece appears to be a Dräger Panorama Nova EPDM facepiece assembly which consists of a rubber facepiece seal, lens, lens clamp, and rubber head harness. Overall the facepiece is in very good condition. The lens surface has a few scratches and is slightly dirty but remains intact. Visibility through the lens is very good to excellent. The number “**38**” is affixed to the bottom center of the lens. The lens clamp holds the lens to the faceseal. The clamp is intact and the two screws holding the clamp halves together appear to be fully tightened.

The assembly that houses the demand valve port, speech diaphragm, and exhalation valve sub-assemblies is in very good condition. The exhalation valve appears to be properly seated. A speech diaphragm is installed and appears normal. The demand valve can be easily attached to and removed from the housing. The clamp holding the housing to the faceseal is secure.

The black rubber facepiece seal is in excellent condition. The rubber face seal is pliable and has no cuts, tears or other damage. All five head harness attachment points are secure. There are no cuts, deformities, or any signs of damage to the seal. The text “**4052955**” and “**ARUE-0867**” is molded into the lower left attachment point. Molded into the right cheek area on the faceseal exterior is a Dräger logo and “**PANORAMA NOVA EPDM**”; the interior has a circular date code indicating the seal was molded in the **first half of 2004**.

There is a black rubber nosecup assembly installed in the facepiece. The nosecup is firmly

attached to the facepiece assembly and the rubber is flexible and appears undamaged. The two inhalation valves installed in the nose cup are undamaged. There is a small amount of yellowish debris inside the nose cup. Molded on the nose cup interior is the part number “**R52822**” and a circular date code indicating it was molded in the **first half of 2004**.

The black rubber head harness is in excellent condition. All five straps can be easily adjusted. Molded into the back of the head harness is a circular date code indicating it was molded in the **first half of 2004** along with the part number “**R54724**.” A black webbing neck strap is included with the facepiece. Although undamaged, the right side of the neck strap is detached from the facepiece.

A heads-up display is installed in the facepiece. It is undamaged and bears the serial number “**011369**.”

**2. Lung Demand Valve and Hose (Refer to Figures 7 through 10 in Appendix IV):**

The facepiece-mounted lung demand valve (also known as the second stage pressure demand regulator) assembly is in very good condition overall. The barrel which connects to the facepiece is slightly separated from the rest of the housing body on the left side. The serial number “**BRSJ 1852**” is marked at the bottom, along with the letter “**P**.” The bypass valve on the right side is in the fully open position and operates smoothly. The donning switch is not engaged, and it can be set and released properly. The o-ring seal is intact and slightly dirty. The low pressure hose swivels freely where it connects to the demand valve.

The low pressure hose is undamaged with no cuts, tears, or cracking. The quick-disconnect coupling is clean and can be easily joined and released. The hose is routed through the right shoulder strap and down the left side of the backframe and is securely fastened at the pressure reducer. The hose is marked “**Draeger R21034 08/02**” along its length. The hose is free to turn at the pressure reducer connection.

**3. Air Pressure Reducer and Supplied Air Line (Refer to Figures 11 through 13 in Appendix IV):**

The air pressure reducer (also known as the first stage regulator) appears to be in very good condition. The exterior of the metal housing is somewhat dirty but undamaged. The reducer is securely fastened to the backframe. The housing is marked with the serial number “**BRTM 4657**” along with the designations “**03**” and “**3351941**.” The low-air alarm whistle attached to the housing is intact and the whistle outlet is not blocked. The cylinder connector nut and handwheel are undamaged. There is a small amount of white powdery corrosion on the cylinder sealing nipple, and the o-ring is clean and intact.

The supplied air line is securely connected to the pressure reducer. The hose jacket is undamaged and is marked “**Draeger R21034 08/02**.” The hose extends along the left side of the waistbelt and ends in a female quick-disconnect fitting. The coupling is clean and



protected by a rubber dust cap.

4. **Remote Air Pressure Gauge and PASS Device** (Refer to Figures 14 and 15 in Appendix IV):

This SCBA is equipped with a Sentinel electronic remote air pressure gauge and PASS device. The gauge body is covered with a protective rubber boot. The lens is somewhat scratched and dirty, but the gauge still appears to be readable. The PASS device appeared to function normally. It was activated with the alarm button and went into full alarm, then was manually reset into the sensing mode. The device appeared to properly enter pre-alarm and was reset by motion. It was then allowed to proceed through pre-alarm to full alarm, which could not be reset by motion. Although NFPA 1982 contains specific requirements for the sensitivity, sound level, and other characteristics of PASS devices, these were not evaluated because NIOSH does not certify PASS devices. On the back of the unit is a label certifying the device to the **1998 edition of NFPA 1982** along with the serial number “**BRSL-1091**” and the manufacture date “**SEP/02.**”

The gauge hose is undamaged is routed through the left shoulder strap to the heads-up display transmitter housing mounted on the left side of the backframe. This hose is marked “**Draeger R21034 07/03**” along its length. The heads-up display transmitter housing is in very good to excellent condition. A blue circular label handwritten with “**007328**” is affixed to the front. The hose running from the housing to the pressure reducer is also undamaged and is marked “**Dräger R21034 10/03.**”

5. **Backframe and Harness Assembly** (Refer to Figures 16 through 19 in Appendix IV):

The backframe body is made of molded plastic. It is basically undamaged with not much evidence of wear and appears structurally sound. The cylinder retention webbing is in very good condition and properly secures the cylinder to the backframe.

Affixed to the back of the backframe is a NIOSH approval label showing that the SCBA was manufactured under the approval number **TC-13F-378**. Also on the back is a label indicating the unit is certified to the **2002 edition of NFPA 1981**; this label is hand-marked with the serial number “**BRSK-3813.**” A “**DrägerService**” label indicates that the unit was due for inspection in **November 2003.**

Both shoulder straps are in very good to excellent condition. They are securely fastened at the top of the backframe. The adjustment buckles work well, and both adjustment straps are undamaged and securely attached to the backframe at the bottom.

The waistbelt is securely fastened to the backframe, and its webbing and fabric components are also in very good to excellent condition. The waistbelt buckle and both adjustment mechanisms function properly. There is some whitish molten material adhered to the left side of the waistbelt near the backframe.

**6. Compressed Air Cylinder (Refer to Figures 20 through 26 in Appendix IV):**

The cylinder is fully wound with composite reinforcement. The cylinder exterior is generally in very good condition and shows few signs of wear, however there are a few gouges approximately 3/8" across. The cylinder is rated for a pressure of **4500 psi** and was manufactured by the Pressure Technology Division of Carleton Technologies Inc. under Department of Transportation (DOT) exemption **E11194**. The DOT label indicates that the cylinder is serial number "**6112-10633**," Dräger part number "**3338042**," and was produced in **November 2002**. A wraparound label under the composite reads "**WASHINGTON 010**" along with a Dräger logo.

The cylinder valve assembly is in very good to excellent condition. Visibility of the pressure gauge is excellent and the gauge reads empty. The valve handwheel operates smoothly. A burst disc assembly is installed in the valve. The cylinder outlet threads are slightly dirty but remain undamaged.

**Sentinel Evaluation**

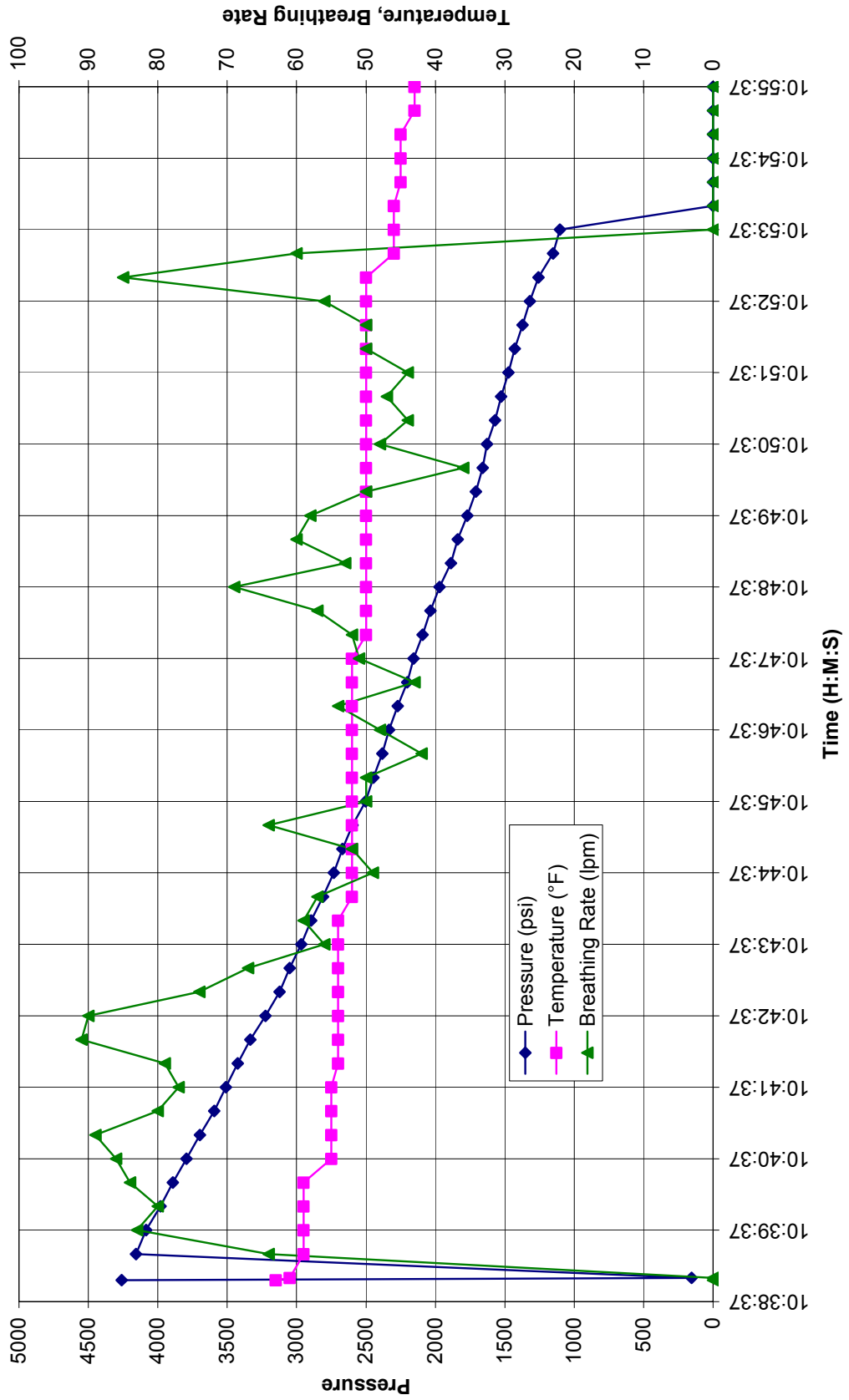
Upon receipt of the package on March 21, 2007, the Sentinel device on the SCBA was examined to determine if it held any useful data. Approximately every 20 seconds while the SCBA is in use, this device records the cylinder pressure, user's breathing rate, and temperature of the case. When the data are downloaded to a computer, the memory of the Sentinel device is wiped clean.

It was found that the unit contained usage data marked with the dates 12/31/1998, 7/5/2000, 7/12/2000, 7/16/2000, 8/6/2000, 8/10/2000, 8/25/2000, 9/6/2000, 9/13/2000, 9/19/2000, 9/25/2000, 9/27/2000, 10/5/2000, 11/23/2000, 11/24/2000, 12/20/2000, 12/27/2000, 2/11/2001, 2/13/2001, 2/15/2001, 2/17/2001, 3/26/2001, 5/18/2001, 5/19/2001, 6/7/2001, 6/18/2001, 7/8/2001, 7/15/2001, 8/11/2001, 10/11/2001, 10/18/2001, 12/30/2001, 12/31/2001, 12/30/2003, 5/11/2004, 5/25/2004, 5/27/2004, 7/30/2004, 8/17/2004, 9/7/2004, 11/8/2004, 1/4/2005, 3/9/2005, 3/24/2005, 3/29/2005, 4/20/2005, 4/27/2005, 5/17/2005, 7/27/2005, 10/12/2005, 11/23/2005, 12/30/2005, 12/31/2005, 1/19/2007, 1/30/2007, 2/1/2007, and 2/5/2007. Graphs of the data from 2/5/2007 are attached in **Appendix II**. According to the downloaded data, the PASS device alarmed due to lack of motion at 11:37:15 on 2/5/2007, and the alarm was never manually activated on that date. The full data file will be provided on disc along with this report. It could also be determined that the device's thermal alarm was not activated, the half-empty warning alarm was enabled at 2230 psi, and the device was configured for a 30-minute duration 4500 psi cylinder.

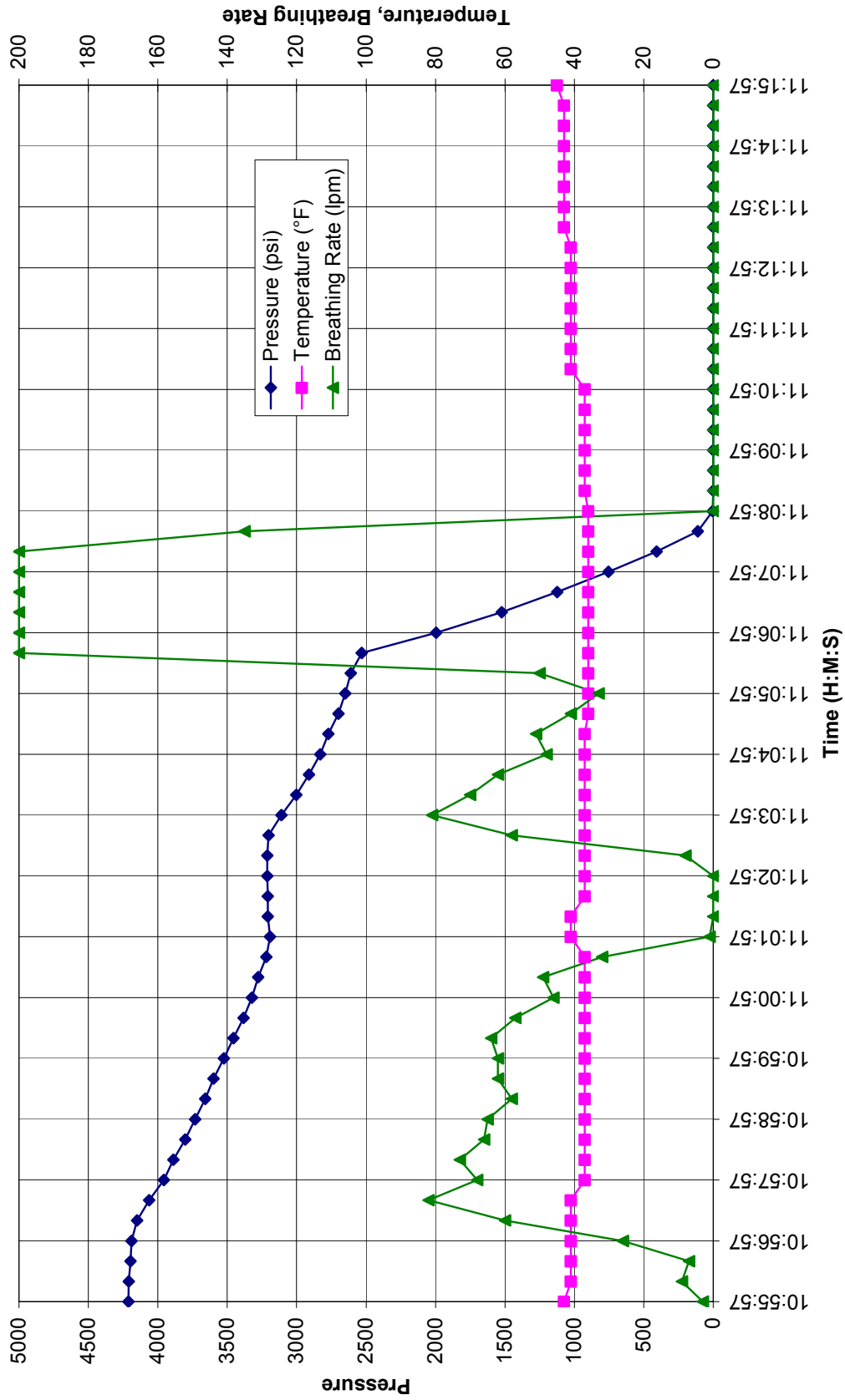
# **Appendix II**

## **Sentinel Data**

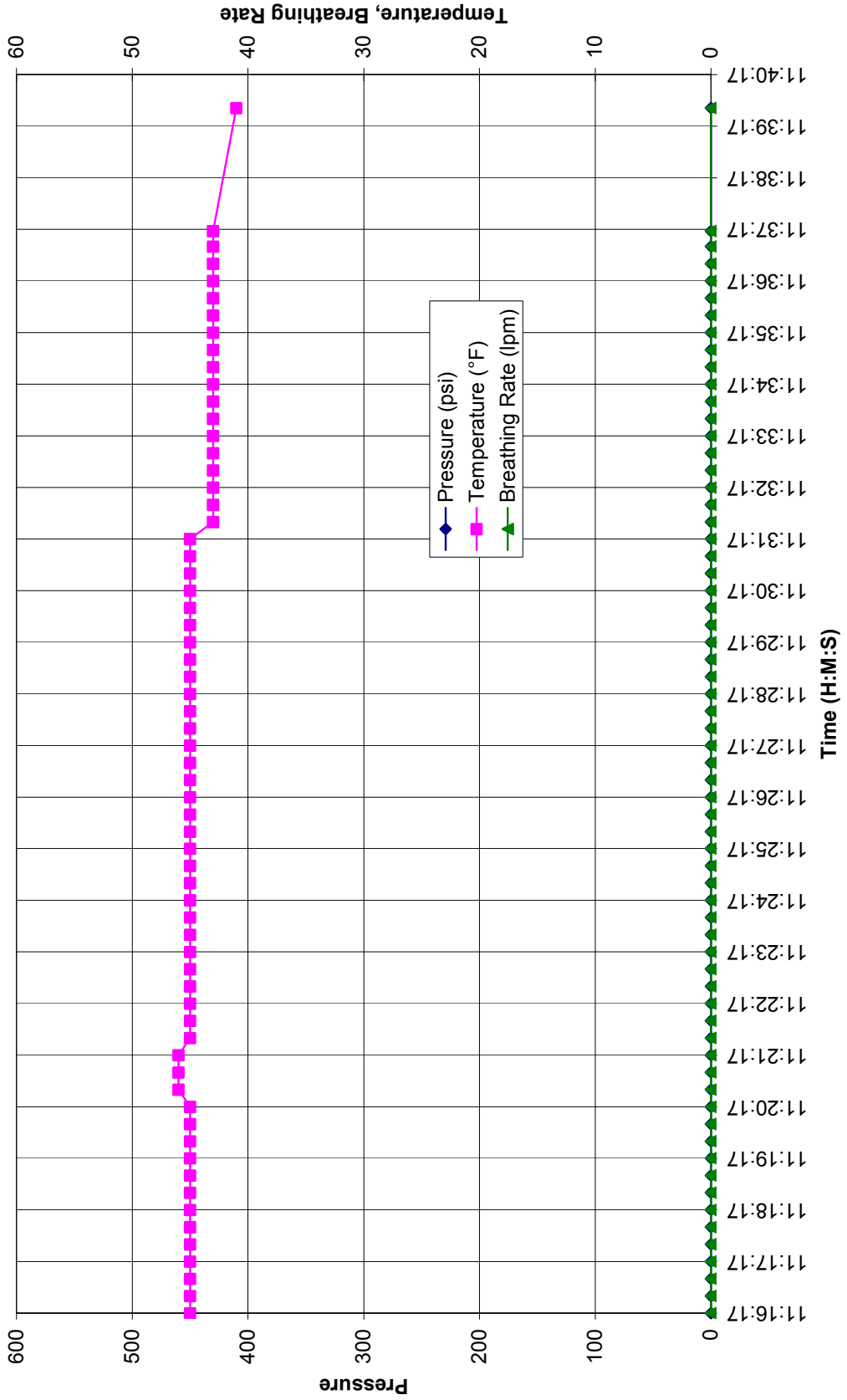
Sentinel Data, 5 February 2007, Use #1



Sentinel Data, 5 February 2007, First 20 min. of Use #2



Sentinel Data, 5 February 2007, Remainder of Use #2



# **Appendix III**

## **SCBA Test Results**



National Personal Protective Technology Laboratory / Technology Evaluation Branch

## SCBA Test Report

**Task Number:** 15057  
**Manufacturer:** Dräger Safety  
**NIOSH Approval Number:** TC-13F-378  
**Tests Performed by:** Eric Welsh and Vance Kochenderfer  
**Date of Report:** January 18, 2008

### **I. Background**

On March 21, 2007, a package from the Washington Police Department was delivered to NIOSH. Following an initial download of data from the Sentinel device, the package was taken to the Firefighter Self-Contained Breathing Apparatus (SCBA) Evaluation Lab (building 108) for secured storage. The SCBA was removed from its box and inspected on October 2, 2007. The SCBA inspection process was videotaped. It was determined that the SCBA was manufactured by Dräger Safety under NIOSH approval number TC-13F-378. It was found to be in a condition where it could be safely pressurized and tested. A series of performance tests was conducted on October 3, 4, 9, and 17, 2004. All performance tests, with the exception of the Exhalation Resistance Test and Static Pressure Test, were videotaped. The Positive Pressure Test and Rated Service Time Test are conducted simultaneously.

### **II. Test Outlines**

#### **A. POSITIVE PRESSURE TEST – NIOSH Test Procedure No. 120**

**42 CFR Part 84 Reference:** Subpart H, § 84.70 (a)(2)(ii)

**Requirement:**

*The pressure inside the facepiece in relation to the immediate environment is positive during both inhalation and exhalation.*

**Procedure:**

A breathing machine with a 622 kg.-m./min. cam operating at 24 RPM with a 40-liter per minute flow rate (115 liters per minute peak flow) is connected to an anthropometric head for cycling. A pressure tap in the head is connected to a transducer which in turn is connected to a strip chart recorder for determining the pressure in the facepiece.

**Results** – Tested on October 3, 2007, with SCBA in as-received condition.



The SCBA ran out of air before the end of the rated service time, causing the inhalation portion of the breathing curve to drop below ambient pressure. The SCBA **did not** meet the test requirement. The inhalation resistance prior to cylinder exhaustion also dropped below ambient to -0.30 INWC.

Inhalation Breathing Resistance: <b>n/a</b> INWC
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**B. RATED SERVICE TIME TEST – NIOSH Test Procedure No. 121**

**42 CFR Part 84 Reference:** Subpart F, § 84.53 (a) and Subpart H, § 84.95 (a) and (b)

**Requirement:**

*Service time will be measured while the apparatus is operated by a breathing machine as described in § 84.88. The open-circuit apparatus will be classified according to the length of time it supplies air or oxygen to the breathing machine. Classifications are listed in § 84.53.*

**Procedure:**

A breathing machine with a 622 kg.-m./min. cam operating at 24 RPM with a 40 liters per minute flow rate is connected to an anthropometric head for cycling. A pressure tap in the head is connected to a transducer which in turn is connected to a strip chart recorder for determining the pressure in the facepiece. The breathing machine is run until the inhalation portion of the breathing curve falls below the minimum requirement.

**Results** – Tested on October 3, 2007, with SCBA in as-received condition.

The measured service time (adjusted to correspond with the recorded breathing cycles) was less than the rated service time of 30 minutes. The SCBA **did not** meet the test requirement.

Measured Service Time: <b>28</b> Minutes <b>57</b> Seconds
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**C. STATIC PRESSURE TEST – NIOSH Test Procedure No. 122**

**42 CFR Part 84 Reference:** Subpart H, § 84.91 (d)

**Requirement:**

*The static pressure (at zero flow) in the facepiece shall not exceed 38 mm. (1.5 inches) water-column height.*

**Procedure:**

The facepiece is fitted to an anthropometric head for testing. A pressure tap in the head is connected to a calibrated manometer. Full cylinder pressure is applied to the unit at zero flow and a reading from the manometer is recorded.

**Results** – Tested on October 9, 2007, with SCBA in as-received condition.

The SCBA met the NIOSH requirement for static facepiece pressure.

Facepiece Static Pressure:	<b>0.90</b>	INWC
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**D. GAS FLOW TEST – NIOSH Test Procedure No. 123**

**42 CFR Part 84 Reference:** Subpart H, § 84.93 (b) and (c)

**Requirement:**

*The flow from the apparatus shall be greater than 200 liters per minute when the pressure in the facepiece of demand apparatus is lowered by 51 mm. (2 inches) water column height when full container pressure is applied. Where pressure demand apparatus are tested, the flow will be measured at zero gage pressure in the facepiece.*

**Procedure:**

A pressure tap in the anthropometric head is connected to a manometer for determining when the pressure inside the facepiece is at zero. A mass flow meter is connected in line between the anthropometric head and an adjustable vacuum source to measure flow. The SCBA cylinder is replaced by a test stand which is adjusted initially to full cylinder pressure. The vacuum source is adjusted during the test to maintain the desired pressure inside the facepiece. Once the proper facepiece pressure has stabilized, a flow reading is recorded. The procedure is then repeated with the test stand adjusted to 500 psig.

**Results** – Tested on October 3, 2007, with SCBA in as-received condition.

The SCBA achieved the required flow rate at both test points.

Applied pressure	Flow
2216 psig	<b>246</b> liters per minute
500 psig	<b>244</b> liters per minute

**E. EXHALATION RESISTANCE TEST – NIOSH Test Procedure No. 122**

**42 CFR Part 84 Reference:** Subpart H, § 84.91 (c)

**Requirement:**

*The exhalation resistance of pressure-demand apparatus shall not exceed the static pressure in the facepiece by more than 51 mm. (2 inches) water-column height.*

**Procedure:**

The facepiece is mounted on an anthropometric head form. A probe in the head form is connected to a slant manometer for measuring exhalation breathing resistance. The air

flow through the apparatus is adjusted to a rate of 85 liters per minute and the exhalation resistance is recorded.

**Results** – Tested on October 9, 2007, with SCBA in as-received condition.

The difference between the exhalation breathing resistance and static pressure for the SCBA fell within the NIOSH required range.

Exhalation Breathing Resistance:	<b>1.95</b>	INWC
Static Pressure:	<b>0.90</b>	INWC
Difference:	<b>1.05</b>	INWC

**F. REMAINING SERVICE LIFE INDICATOR TEST – NIOSH Test Procedure No. 124**  
**42 CFR Part 84 Reference:** Subpart H, § 84.83 (f) and Subpart G, § 84.63 (c)

**Requirement:**

*Each remaining service life indicator or warning device shall give an alarm when the remaining service life of the apparatus is reduced within a range of 20 to 25 percent of its rated service time or pressure.*

This requirement is modified under § 84.63(c) as follows: *For apparatus which do not have a method of manually turning off remote gage in the event of a gage or gage line failure the remaining service life indicator is required to be set at 25% ± 2% of the rated service time or pressure.*

**Procedure:**

A calibrated gauge is connected in line between the air supply and the first-stage regulator. The unit is then allowed to gradually bleed down. When the low-air alarm is activated, the pressure on the gauge is recorded. This procedure is repeated six times. The average of the six readings is calculated and recorded.

**Results** – Tested on October 4, 2007, with SCBA in as-received condition. As this SCBA does not have a remote gauge shutoff, the test requirement is 25% ± 2%. This unit incorporates two alarms—a whistle and an electronic alarm.

Both alarms activated within the required range (between 1035 and 1215 psig).

Test #	Whistle Alarm Point (psig)	Electronic Alarm Point (psig)
1.	1140	1200
2.	1140	1190
3.	1140	1190
4.	1140	1200
5.	1140	1200
6.	1140	1200
Avg.	<b>1140</b>	<b>1197</b>

**Comment:**

The SCBA also incorporated a heads-up display in the facepiece, which did not function during this or any other test.

**G. NFPA AIR FLOW PERFORMANCE TEST**

**NFPA 1981 (2002 Edition) Reference:** Chapter 7, Performance Requirements, Sec. 7.1.1

**Requirement:**

*SCBA shall be tested for air flow performance as specified in Section 8.1, Air Flow Performance Test, and the SCBA facepiece pressure shall not be less than 0.0 mm (0.0 in.) water column and shall not be greater than 89 mm (3½ in.) water column above ambient pressure from the time the test begins until the time the test is concluded.*

**Procedure:**

A breathing machine as specified in Section 8.1.4 operating at 30 ± 1 breaths/min with a 103 ± 3 L/min flow rate is connected to an anthropometric head for cycling. A pressure tap in the head is connected to a transducer which in turn is connected to a flatbed chart recorder for determining the pressure in the facepiece.

**Results** – Tested on October 17, 2007, with SCBA in as-received condition.

The facepiece pressure remained within the required range for the duration of the test. The SCBA met the NFPA test requirements.

Maximum Facepiece Pressure:	<b>3.25</b>	INWC
Minimum Facepiece Pressure:	<b>0.25</b>	INWC

**III. Disposition:**

Following testing, the SCBA was returned to the package in which it was shipped to NIOSH. It was returned to the Washington Police Department on December 13, 2007.

**The results of all tests are summarized in Tables One and Two which follow.**

**TABLE ONE – Summary of NIOSH Test Results**

**Task Number:** 15057  
**Manufacturer:** Dräger Safety  
**NIOSH Approval Number:** TC-13F-378  
**Tests Performed By:** Eric Welsh and Vance Kochenderfer  
**Dates of Tests:** October 3, 4, 9, and 17, 2007

<b>TEST / 42 CFR PART 84 REFERENCE</b>	<b>STANDARD</b>	<b>RESULT</b>	<b>PASS</b>	<b>FAIL</b>
<b>A. POSITIVE PRESSURE TEST</b> Reference: Subpart H, § 84.70 (a)(2)(ii)	> 0.00 INWC	Cylinder exhausted		<b>X</b>
<b>B. RATED SERVICE TIME TEST</b> Reference: Subpart F, § 84.53 (a), Subpart H, § 84.95 (a) and (b)	≥ 30 min.	28 min, 57 s		<b>X</b>
<b>C. STATIC PRESSURE TEST</b> Reference: Subpart H, § 84.91 (d)	≤ 1.50 INWC	0.90 INWC	<b>X</b>	
<b>D. GAS FLOW TEST (at Full Cylinder Pressure)</b> Reference: Subpart H, § 84.93 (b) and (c)	≥ 200 lpm	246 lpm	<b>X</b>	
<b>D. GAS FLOW TEST (at 500 psig)</b> Reference: Subpart H, § 84.93 (b) and (c)	≥ 200 lpm	244 lpm	<b>X</b>	
<b>E. EXHALATION RESISTANCE TEST</b> Reference: Subpart H, § 84.91 (c)	Difference ≤ 2.00 INWC	1.05 INWC	<b>X</b>	
<b>F. REMAINING SERVICE LIFE INDICATOR TEST (whistle)</b> Reference: Subpart H, § 84.83 (f) and Subpart G, § 84.63 (c)	Between 1035 and 1215 psig	1140 psig	<b>X</b>	
<b>F. REMAINING SERVICE LIFE INDICATOR TEST (electronic alarm)</b> Reference: Subpart H, § 84.83 (f) and Subpart G, § 84.63 (c)	Between 1035 and 1215 psig	1197 psig	<b>X</b>	

**NOTE: The Positive Pressure Test and Rated Service Life Test are run simultaneously.**

**TABLE TWO – Summary of NFPA Test Results**

<b>TEST / REFERENCE</b>	<b>STANDARD</b>	<b>RESULT</b>	<b>PASS</b>	<b>FAIL</b>
<b>G. NFPA AIR FLOW PERFORMANCE</b> Reference: NFPA 1981 (2002 Edition), Section 5-1.1	≤ 3.50 INWC Exhalation Resistance	3.25 INWC	<b>X</b>	
<b>G. NFPA AIR FLOW PERFORMANCE</b> Reference: NFPA 1981 (2002 Edition), Section 5-1.1	≥ 0.00 INWC Inhalation Resistance	0.25 INWC	<b>X</b>	

# **Appendix IV**

## **Images**



National Personal Protective Technology Laboratory / Technology Evaluation Branch

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## IMAGES

One Self-Contained Breathing Apparatus  
Submitted by the Washington Police Department  
Washington, Pennsylvania

NIOSH Task No. 15057

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- Figure 11: Pressure Reducer
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- Figure 13: Cylinder Connector Nut
- Figure 14: Remote Pressure Gauge/PASS Device
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- Figure 23: Gouge in Cylinder Dome
- Figure 24: Gouge in Cylinder Sidewall
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- Figure 26: Cylinder Valve

Figure 1 – SCBA as Received from the Washington Police Department



Figure 2 – SCBA Ready for Inspection





Figure 3 – Facepiece



Figure 4 – Visibility through Facepiece Lens

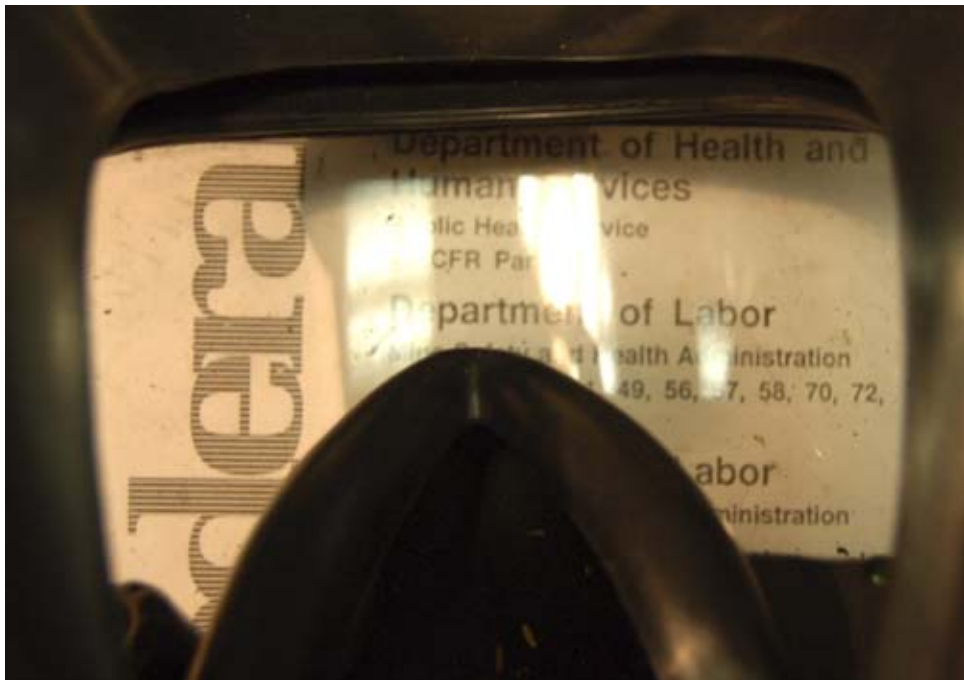


Figure 5 – Facepiece Demand Valve Port



Figure 6 – Nosecup Interior



Figure 7 – Lung Demand Valve



Figure 8 – Side View of Lung Demand Valve



Figure 9 – Rear View of Lung Demand Valve



Figure 10 – Separation of Barrel from Lung Demand Valve Housing





Figure 11 – Pressure Reducer



Figure 12 – Pressure Reducer

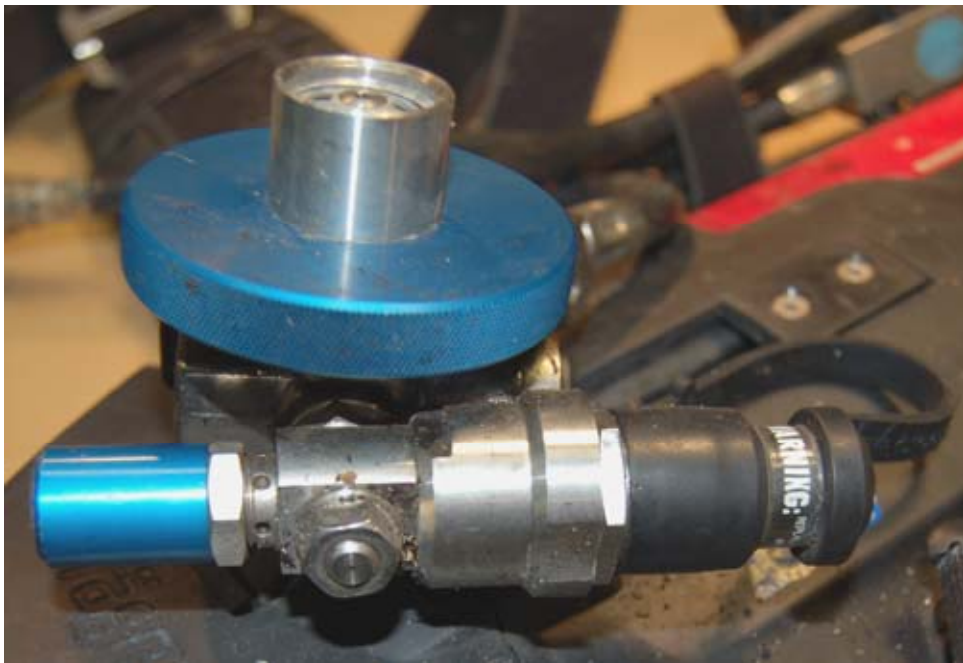


Figure 13 – Cylinder Connector Nut

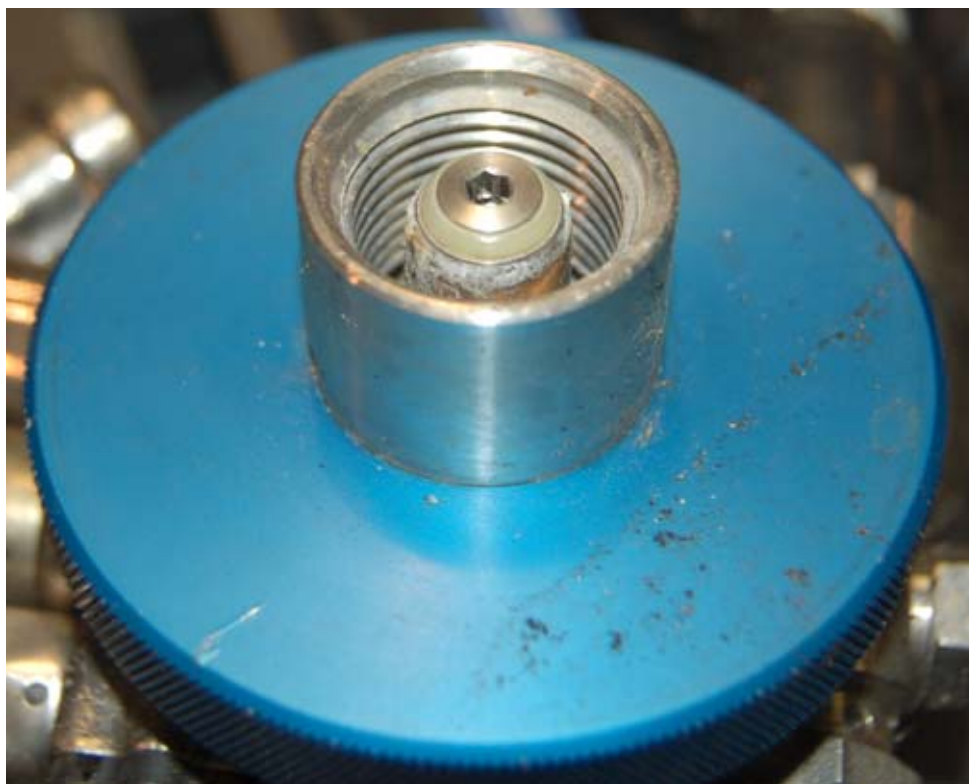


Figure 14 – Remote Pressure Gauge/PASS Device



Figure 15 – Heads-Up Display Transmitter



Figure 16 – Backframe





Figure 17 – NIOSH Approval Label



Figure 18 – NFPA Certification Label



Figure 19 – Left Side Waistbelt





Figure 20 – Cylinder Mounted on SCBA



Figure 21 – Cylinder Mounted on SCBA



Figure 22 – Cylinder DOT Label

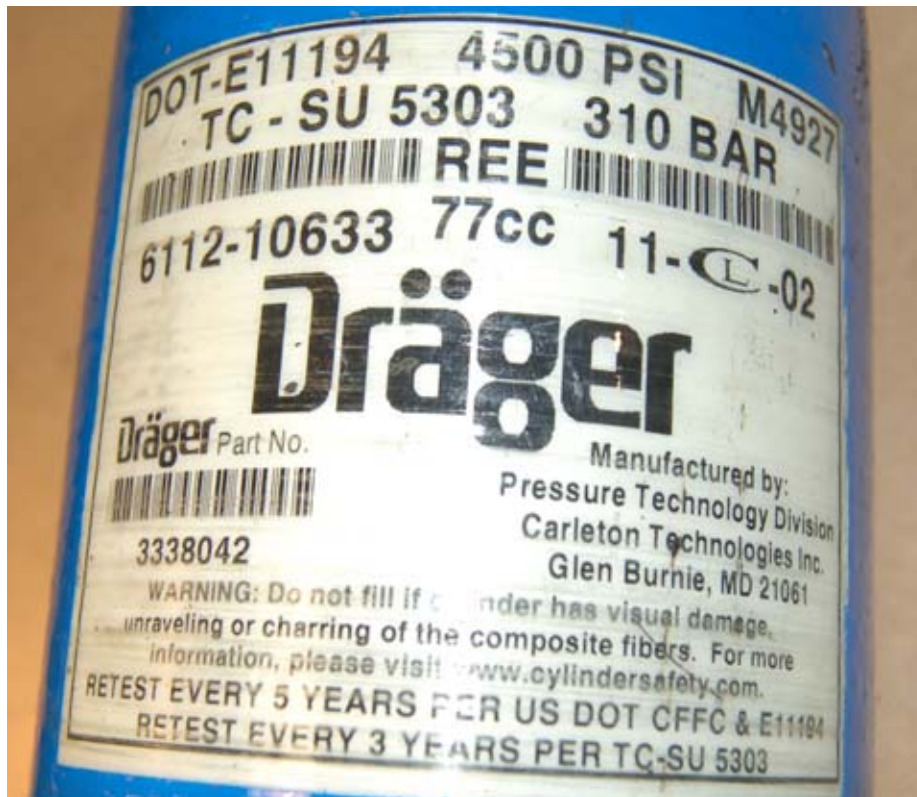


Figure 23 – Gouge in Cylinder Dome



Figure 24 – Gouge in Cylinder Sidewall



Figure 25 – Gouge in Cylinder Sidewall

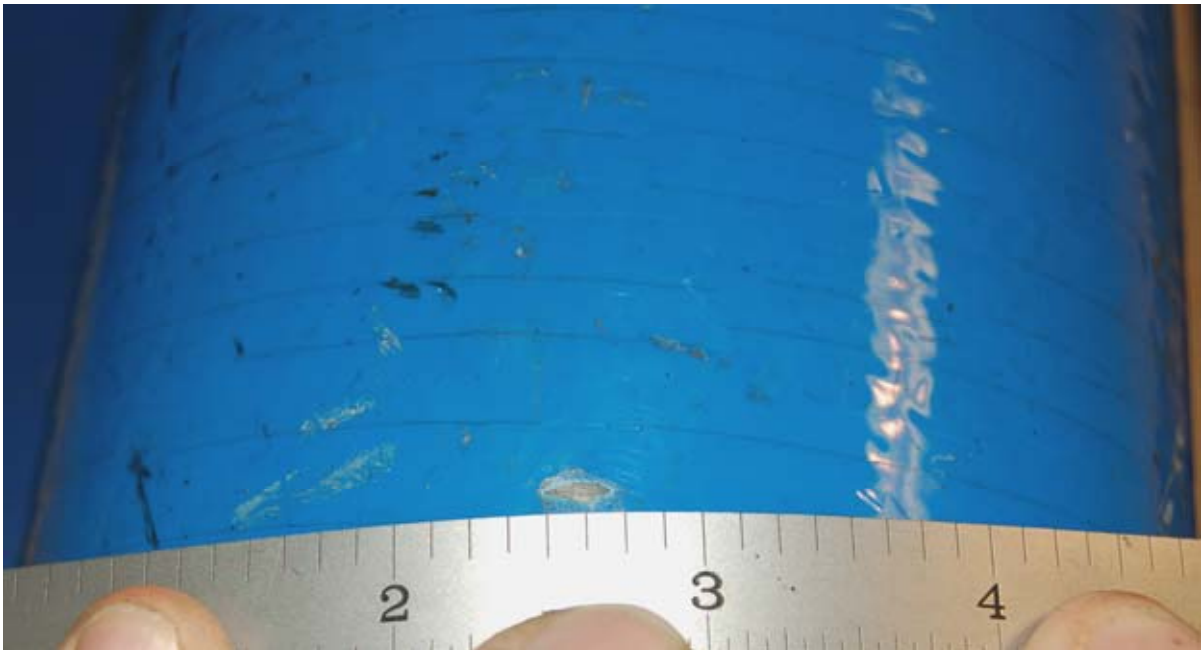


Figure 26 – Cylinder Valve

