

PPE CASE



Personal Protective Equipment Conformity Assessment Studies and Evaluations

Evaluation of Six Self-Contained Breathing Apparatus for Potential Contribution to a Fatal Event in the Fire Service

Wilmington Delaware Fire Department Request for five MSA Model Firehawk® M7 and one MSA Model G1 units

The National Institute for Occupational Safety and Health (NIOSH) conducts a Fire Fighter Fatality Investigation and Prevention Program (FFFIPP) executed by its Division of Safety Research (DSR). In support of this Program, NIOSH's National Personal Protective Technology Laboratory (NPPTL) inspects and evaluates the personal protective equipment (PPE) used by firefighters during fatal events.

This report provides a summary of NPPTL's inspection and evaluation methods and findings for the six self-contained breathing apparatus (SCBAs) used by the Wilmington Fire Department fire fighters during a fatal event. The SCBAs being used were five MSA Model Firehawk® M7, 4500 psi, 45 minute units and one MSA Model G1, 4500 psi, 45 minute unit. The Wilmington Fire Department was advised that NIOSH NPPTL would provide a written report of the investigation and any applicable test results.

NIOSH evaluated six SCBAs used by six firefighters involved in a fatal event. The SCBAs were not found to contribute to the fatality.

A qualified service technician must inspect, repair, test, clean, and replace damaged components of any SCBA involved in an incident before it may be returned to service.

What NIOSH Did to Protect the Worker

Upon receipt of the SCBAs, NPPTL managed the custody of evidence throughout the entire inspection and evaluation process at its Morgantown, West Virginia facility. NPPTL staff inspected all SCBA components and documented their findings with written and photographic evidence. NIOSH assigned Task Number TN-21198 to identify the units. NPPTL also tested the SCBAs to determine conformance to NPPTL's approval requirements as outlined in Title 42, Code of Federal Regulations, Part 84 (42 CFR 84). Further testing was conducted to provide an indication of the conformance of each SCBA to the National Fire Protection Association (NFPA) Airflow Performance requirements of NFPA 1981, Standard on Open-Circuit Self-Contained Breathing Apparatus for the

Fire Service, 1997 Edition. If the inspection or evaluation data suggested that the SCBA units may have contributed to the fatal event, NPPTL would have engaged in corrective action to ensure that no other users of the product would experience a fatal event. In this case, no such corrective action was necessary. NPPTL then managed the disposition of the SCBAs.

Chain of Custody

The SCBA units were delivered by NIOSH investigators, from DSR, who were assigned to investigate the Wilmington Fire Department's fatal event. They delivered the units to Lab H1513 for secure storage at the NIOSH facility in Morgantown, West Virginia on October 25, 2016.

From February 10th to 22nd, 2017, NPPTL employees Jeremy Gouzd and Angie Andrews inspected the SCBA units. The SCBA units remained in secure storage in Lab H1513 throughout the entire inspection and testing process.

Components and Observations for SCBA Unit #12 (Figure 1) (“Right” or “left” are from the user’s perspective) (see Figures in Appendix)

Facepiece (Figures 2 - 5)

- Facepiece rim assembly 10156459; M/N: MSA G1
- Facepiece seal P/N: 10144167; M/N: 7-2774-1; MFG date: 8/14
- Nosecup P/N: 10144170; M/N: 7-2774-1; MFG date: 7/14
- Overall condition: fair, dirty with scratches
- Lens was scratched and dirty. Upper lens ring was slightly melted
- Lens retaining ring was intact
- MMR housing was clean and in good condition
- HUD was present and intact
- Communication device was present and in good condition
- Hairnet was in good condition. All straps and buckles functioned properly.

Mask-Mounted Regulator (MMR) (Figure 6)

- MMR label on front: MSA; M/N: 7-2779-1
- Overall condition was good
- MMR was secured to low pressure line
- Bypass closed
- Inside flange had normal wear and in good condition
- Sealing area was clean and in good condition
- Regulator could be attached and removed
- Locking assembly functioned

Low Pressure Regulator Hose (Figures 7-8)

- Secured at all attachment points
- Line was in good condition
- Line passed through the shoulder strap to the reducer

Pressure Reducer Assembly (Figure 9)

- Overall condition was good
- All airline connections were secure
- Could not visually inspect due to casing, but all lines going to the pressure reducer were in good condition

MSA Control Module (Figures 10 - 11)

- Lines to control module looked good
- Gauge lens was readable
- Protective casing was good and in place

High Pressure Hose and Cylinder Attachment (Figures 12 - 13)

- High pressure S/N: 7-2844-1
- High pressure line was in fair condition, dirty
- Cylinder quick connect attachments were in good condition

Auxiliary Hose

- N/A

PASS Power Module (Figures 14 -15)

- SEI label:07-2015; P/N 10148687 4500 psi
- PASS met requirements of NFPA 1982: Standard on Personal Alert Safety Systems (PASS) 2013 edition
- FCC ID: P9R-10154953
- Overall condition was good, but very dirty with debris and melted in spots
- Held securely to backframe
- Battery for power module was attached and looked good with debris and small melted spots around it

Backframe Assembly (Figure 16-18)

- S/N: 7-2180-1
- SEI label 1981-2013 edition
- NIOSH Approval Number label: TC-13F-0798CBRN
- Overall condition was fair
- Melting of the left railing was present
- Debris was found everywhere
- Shoulder straps were attached to the frame

Straps and Buckles (Figure 18 -26)

- Overall condition of straps was good, but dirty
- Hose lines passed through shoulder straps
- All adjustable buckles moved and held in place
- Waist area buckle latched

Compressed Air Cylinder and Cylinder Valve Assembly (Figures 27 - 28)

- DOT-SP 10915-4500; TC-SU-5134-310; ACU106039
- Luxfer P/N: L65G-98; REE 125
- Hydrostatic date: 10/2014; 45 minute, 4500 PSI
- Marking on stem: 804722-BC0318
- Overall condition was good, but really dirty; some surface scratches
- Gauge was readable
- Threads were good; attached to the threads was the male quick connect
- O-ring was present and in good condition
- Rubber bumper at base of cylinder valve was in good condition
- Sticker on cylinder: property of “The Fire Store” Witmer Public Safety Group

As received (pictured below) SCBA unit #13

- SCBA unit #13 was hand delivered in a black trash bag to Lab H1513 by NIOSH DSR investigators
- Cylinder received with 1500 psi and bypass closed
- Cylinder was not completely threaded to the cylinder attachment
- Mask-mounted regulator (MMR) was connected to facepiece
- Facepiece was included and regulator housing was attached to mask



SCBA unit #13 facepiece and cylinder as received

Components and Observations for SCBA Unit #13 (Figure 30) (“Right” or “left” are from the user’s perspective) (see Figures in Appendix)

Facepiece (Figures 31-34)

- Facepiece assembly Model: Ultra Elite; Size: Medium
- Nosecup assembly P/N: 7-901-1; MFG date: 10/2011
- Seal US Patent P/N: 5020193I; MFG date: 4th quarter of 2011
- Other markings: #260 on lens retaining ring
- Lens was extremely dirty; hard to see through
- Hairnet was good, straps all worked, but very dirty
- Overall condition was: dirty, scratched, soiled with bodily fluid
- Lens and rings were in place
- Lens appeared to be in good condition, but covered in bodily fluid
- Lens retaining ring was intact
- Hairnet dirty, but was in good shape
- Additional markings on lens 01-01-640 (aftermarket scribe)
- Communication speaker had 8488 painted on it

Mask-Mounted Regulator (MMR) (Figures 35 - 36)

- MMR Firehawk® FS1 Firehawk® 10047602 CBRN
- Other MMR markings: APZ24 1981
- MMR S/N: 10026003
- Secured to low pressure line
- Bypass closed and dirty
- Inside flange had some scratches
- Melting on locking clips
- Sealing area was dirty
- Regulator could be attached and removed
- Locking assembly functioned

Low Pressure Regulator Hose (Figure 37)

- Secured at all attachments points
- Very dirty
- No Quick Disconnect
- Line passed through the shoulder strap to the reducer

Pressure Reducer Assembly (Figures 38 - 39)

- Other markings: ZS028103; 488885
- Overall condition was good, but very dirty with scratches
- All airline connections were secure
- “The Fire Store” sticker stamped July 2016

High Pressure Hose and Cylinder Attachment (Figures 40 - 42)

- Overall condition was good, but dirty
- Melted debris was on the high pressure line

- Cylinder attachment threads were clean, threaded on and off, O-ring was in place
- Relief valve looked good, 0036292; 0904
- High pressure Quick-Fill Eaton FD17-1002-10-04; P/N: 10038031
- High pressure cylinder attachment MSA10038032

Auxiliary Hose

- N/A

Firehawk® M7 Control Module (Figures 44 and 45)

- Barcode: was not visible; US Patent#: 5,097,826; P/N: not found
- Model#: 7-2183-1I; FCC ID P9R-10075346
- Overall condition was dirty with scratches
- Melted debris/material was on the high pressure lines going to the PASS
- Gauge lens was partially readable
- Protective casing was very dirty
- Sticker: 10083540 Telemetry

PASS Control Module (Figures 46 and 47)

- Firehawk® M7 Power Module P/N: 10083225
- Overall condition was good, but very dirty
- Power module sticker was half way rubbed off
- Held securely to backframe

Backframe Assembly (Figures 48 and 49)

- SEI label NFPA 1981-2007ed
- NIOSH label: TC-13F-549CBRN
- Engine #1 sticker; Firehawk® sticker
- Painted on: 476; other: 7-2180-1
- MFG: Dec 09
- Overall condition was fair to good, some melted debris
- Shoulder straps were attached to the frame
- Cylinder was good and functioned
- Heat damage to shoulder straps

Straps and Buckles (Figure 50-52)

- Overall strap condition was dirty with debris and heat damage (dye sublimation), including the waist belt
- Hose lines passed through the shoulder straps
- All adjustable buckles moved and held in place
- Waist area buckle latched and released

Compressed Air Cylinder and Cylinder Valve Assembly (Figures 53 - 56)

- DOT-E10915-4500; IL308339
- TC-SU-5134-310

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- Cylinder M/N: 7-1348-1
 - Luxfer P/N: L65G-16; MFG: 12/05; REE: 118
 - Hydro date: 2/2012; 45 minute, 4500 PSI
 - MSA logo was visible
 - Engine #1 sticker; written E 6 666
 - 666 etched in valve handle
 - Overall condition was fair to good as there were some surface scratches and dirt present
 - Gauge was partially readable
 - Threads were in ok condition, no signs of corrosion
 - Rubber bumper at base on cylinder valve was in good condition

As received (pictured below) SCBA unit #14

- SCBA unit #14 was hand delivered in a black trash bag to Lab H1513 by NIOSH DSR investigators
- Attached to bag was an evidence tag with #14 written on it
- Cylinder included was empty with valve open
- Bypass was closed
- Cylinder was completely threaded to the cylinder attachment
- Facepiece was included with mask-mounted regulator (MMR) housing attached to mask



SCBA unit #14 facepiece, and cylinder as received

Components and Observations for SCBA Unit #14 (Figure 57) (“Right” or “left” are from the user’s perspective) (see Figures in Appendix)

Facepiece (Figures 58 - 62)

- Facepiece assembly; MSA Ultra Elite, Medium
- Nosecup assembly P/N: 7-901-1; MFG date: 01/12
- Seal US Patent# 5020193; MFG date: 1st quarter of 2012
- Lens had an outward protruding bubble with a hole in it. Very dirty, could not see through lens because of dirt and melting of lens.
- Hairnet was good, but very dirty. All buckles worked and were intact, but one was unbuckled
- Overall condition: dirty, significant signs of heat damage
- HUD was present on facepiece
- Communication device was present
- Lens and rings were in place
- Lens retaining ring was intact, but very melted

Mask-Mounted Regulator (MMR) (Figure 63)

- MMR label on front: CBRN MSA
- Firehawk® 10145136 CBRN CCAJ006185 D1W
- Secured to low pressure line
- Bypass was closed and dirty
- Inside flange had normal wear/good condition
- Sealing area was dirty, but good
- Regulator could be attached and removed, but very difficult due to the melted plastic on the outside of the MMR
- Locking assembly functioned

Low Pressure Regulator Hose (Figure 64)

- Secured at all attachment points
- Line was in fair condition
- No Quick Disconnect
- Line passed through the shoulder strap to the reducer, but some melted plastic between shoulder strap and pressure reducer

Pressure Reducer Assembly (Figures 65-66)

- “The Fire Store” sticker stamped July 2016
- No readable identifying numbers
- Overall condition was fair, but very dirty with lots of debris
- All airline connections were secure

High Pressure Hose and Cylinder Attachment (Figures 69-72)

- Overall condition was poor; very dirty with debris
- Large piece of melted object between the bell and the Quick-Fill
- Cylinder attachment threads were in fair condition, threaded on and off, O-ring was in place
- Relief valve had melted objects all over it

- Cover on Quick-Fill was present, but could not be removed without damage due to melted debris attached to it

Auxiliary Hose

- N/A

Firehawk® M7 Control Module (Figures 73-75)

- Sticker was present, but unreadable due to being melted
- Low pressure line had severe burning between the shoulder strap and the backframe
- The medium pressure line was okay; extremely dirty
- Boot on the control module was dislodged and signs of melting
- Gauge lens was unreadable due to melting of gauge lens
- Protective casing was poor; melted in spots

PASS Control Module (Figures 76-78)

- P/N: 10083225; FCC ID is present, but unreadable
- Identifiers were not readable due to being melted and debris melted to it
- Overall condition was poor, very dirty and melted
- Power module sticker was covered with debris making it difficult to read identifiers/numbers
- Held securely to backframe

Backframe Assembly (Figures 79-82)

- NIOSH label: TC-13F-0770CBRN
- SEI label was present, but unreadable
- P/N: 7-2180-1; MFG date: November 2015
- Barcode sticker was unreadable; about to fall off
- Sticker: MSA this unit assembled and tested by DFT-1
- Sticker: Firehawk® M7 XT Air Mask
- Overall condition was poor; very dirty
- Shoulder straps were attached to the frame
- Right railing was completely melted
- Cylinder strap functioned and was very dirty with debris

Straps and Buckles (Figure 83-84)

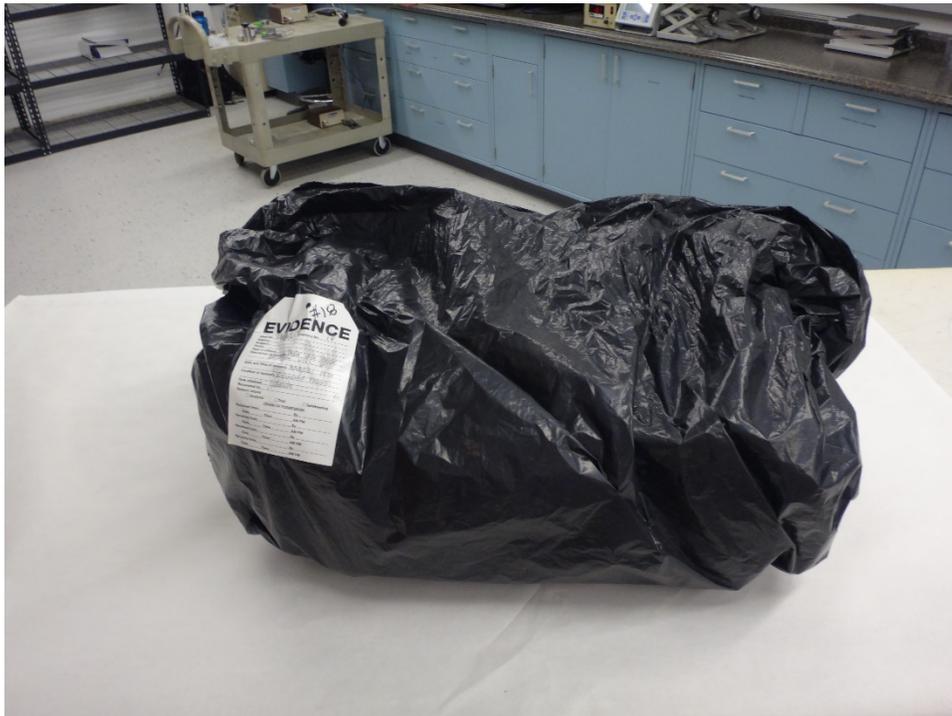
- Overall strap condition had debris all over and heat dye sublimation, including the waist belt
- Hose lines passed through shoulder straps
- All adjustable buckles moved and held in place
- Waist area buckle latched
- Heat dye sublimation to shoulder straps
- Chest strap was melted in half at buckle. Rescue rope was completely out of the bag.

Compressed Air Cylinder and Cylinder Valve Assembly (Figures 85-89)

- DOT-SP 10915-4500; ACU127496
- TC-SU-5134-310
- Cylinder M/N: was not readable
- MSA logo visible; REE: 122
- Luxfer P/N: was not readable; 45 minute, 4500 psi
- Hydrostatic date and MFG date: 9/15
- Overall condition was poor; unusable condition
- Gauge was unreadable
- Threads were okay
- Rubber bumper at base on cylinder valve was present with melted debris on it
- Valve stem hand wheel was melted, but worked

As received (pictured below) SCBA unit #18

- SCBA unit #18 was hand delivered in a black trash bag to Lab H1513 by NIOSH DSR investigators
- Attached to bag was an evidence tag with #18 written on it
- Cylinder included was empty with valve closed
- Bypass was closed
- Facepiece was included with mask-mounted regulator (MMR) housing attached to mask



SCBA unit #18 facepiece, and cylinder as received

Components and Observations for SCBA Unit #18 (Figure 90) (“Right” or “left” are from the user’s perspective) (see Figures in Appendix)

Facepiece (Figures 91-93)

- Facepiece assembly P/N: not visible; Model: MSA Ultra-elite; Size: Medium
- Facepiece seal P/N: 7-935-7; MFG date: N/A
- Nosecup P/N: 7-901-1; MFG date: 10/2011; Size: Medium
- Overall condition was very dirty, shard of glass found in nosecup, missing part of a dislodged communication unit on left side of mask
- Hairnet straps condition were good, but dirty; straps moved freely held in place and held securely to facepiece
- Attachment points for straps were good
- Other marking: 5889
- Facepiece seal was good
- HUD was present in facepiece

Mask-Mounted Regulator (MMR) (Figure 94)

- MMR Identification: MSA CBRN Firehawk®
- Regulator assembly P/N: 1007030
- Overall condition was fair, but dirty
- Outer case was good with normal wear
- MMR cover was good with normal wear
- MMR was secured to low pressure line
- Bypass was in the closed position and worked
- Inside flange had normal wear, but dirty
- Locking assembly functioned
- Regulator interface area was good, but dirty

Low Pressure Regulator Hose (Figure 95)

- Overall condition was good, but dirty
- Secured at all attachment points
- Right shoulder strap was burnt in two
- Line passed through the shoulder strap to the reducer

Pressure Reducer Assembly (Figures 96-97)

- P/N: LZ191185CJK; Sticker: MSA 10051240
- Painted# 490; “The Fire Store” sticker stamped for testing in July 2016
- Overall condition was good shape, dirty, debris
- All airline connections were secure

High Pressure Hose and Cylinder Attachment (Figure 98)

- Cylinder Attachment P/N: 10037312; OZ180963 JP
- Overall condition was good, but dirty with normal wear
- Cylinder attachment threads were clean, threaded on and off, and O-ring was in place
- Quick-Fill cap was off and a little burnt
- Identifiers: Eaton FD 17-1082-10

- Pressure relief valve condition was good

Auxiliary Hose

- N/A

Firehawk® M7 Control Module (Figures 99-100)

- Model#: 7-2183-1; FCC ID: P9R-10078565
- Overall condition was dirty with scratches
- Pressure and electrical lines were in good shape
- Some corrosion on metal connections
- Gauge lens was readable
- Protective casing was dirty and intact

PASS Control Module (Figure 101)

- Part Number: 10083225; MFG date: 6/15/10; FCC ID: RPN10069330
- Other numbers/markings: In paint 499
- Firehawk® M7 air mask power module with telemetry
- SEI Label: certified model NFPA 1981 edition 2007
- Overall condition was good, dirty
- Module held securely to backframe
- Wire connection was connected to PASS device
- Wire passed through backframe to console assembly

Backframe Assembly (Figures 102-107)

- P/N: 7-2180-1; MFG date: 12/09
- NIOSH label: TC-13F-549CBRN
- Other markings: paint 490; engine #5 sticker on it
- Overall condition was fair to good
- Bottom left corner was cracked, dirty with debris
- Shoulder straps were attached to the frame
- Cylinder strap was functional

Straps and Buckles (Figures 108-109)

- Overall strap condition was very poor
- Only right side was functional with heat damage
- Buckles were hard to move, barely functional
- Left side was completely missing
- Waist band buckle worked, but very hard to move, signs of heat damage and rust
- Left side waist buckle was ripped off of waist band
- Left side of shoulder strap was attached at backframe, but was burned in two, where it attaches to waist belt
- Right shoulder strap attached and functioned, but was beginning to rip at the top with signs of burning

Compressed Air Cylinder and Cylinder Valve Assembly (Figures 110-113)

- TC-SU-5134-310; DOT-E 10915-4500; IL 1501 41; LUXFER
- Cylinder M/N: 7-1348-1; Luxfer P/N: L65G-16; REE: 118
- MSA logo visible: MSA Stealth H-45 Low Profile
- MFG date: 9/11; 45 minute, 4500 PSIG; Hydrostatic date: 2/15
- Other markings: Engine #5; 481 written on it
- Overall condition was fair to good; surface scratches and dirt present
- Gauge was readable
- Threads were ok
- Rubber bumper at base on cylinder valve was slightly dislodged around gauge

As received (pictured below) SCBA unit #19

- SCBA unit #19 was hand delivered in a black trash bag to Lab H1513 by NIOSH DSR investigators
- Cylinder was included with 2000 psi of air with valve closed
- Bypass was closed
- Cylinder was not completely threaded to the cylinder attachment
- Facepiece was included with mask-mounted regulator (MMR) locked into mask



SCBA unit #19 facepiece, and cylinder as received

Components and Observations for SCBA Unit #19 (Figure 114) (“Right” or “left” are from the user’s perspective) (see **Figures in Appendix**)

Facepiece (Figures 115-117)

- Facepiece assembly; MSA Ultra Elite, Medium
- Nosecup assembly P/N: 7-901-1; MFG date: 08/08
- Seal US Patent# 5020193; MFG date: 4th quarter of 2009
- Other markings: partially could read 1290 on bottom of communication device
- Lens was scratched and dirty, but could see through it
- Hairnet was good, but very dirty. All buckles worked and were intact. Debris was found in all of it.
- Overall condition: dirty, scratches
- HUD was missing from facepiece
- Communication device was broken off from lens retaining ring
- Lens and rings were in place
- Lens appeared to be in fair condition, dirty
- Lens retaining ring was intact
- Hairnet was very dirty well-worn, but in fair condition

Mask-Mounted Regulator (MMR) (Figure 118)

- MMR label on front: CBRN MSA
- Firehawk® 10047602 CBRN APAF347359 FS
- Other MMR markings: APZ24 1981
- MMR S/N: 10077030
- Secured to low pressure line
- Bypass was closed and dirty
- Inside flange had normal wear/good condition
- Sealing area was dirty
- Regulator could be attached and removed
- Locking assembly functioned

Low Pressure Regulator Hose (Figures 119-120)

- Secured at all attachment points
- One secure point was a zip tie
- Line was in good condition
- Line passed through the shoulder strap to the reducer

Pressure Reducer Assembly (Figures 121-122)

- “The Fire Store” sticker stamped July 2016
- MSA S/N: 10051240; 602 was etched into it; HPLAF347569FS
- Overall condition was good, but very dirty
- All airline connections were secure

High Pressure Hose and Cylinder Attachment (Figures 123-124)

- Threaded sheathing was fraying at cylinder attachment and bearing wire
- Overall condition was poor with dents, scratches, and debris

- Cylinder attachment threads were in fair condition, threaded on and off, O-ring was in place
- Relief valve did not look good. Sticker was coming off of it and appeared like it could have burst; #3712
- High pressure Quick-Fill Eaton FD17-1002-10-04; P/N: 10038031
- Cover was on Quick-Fill adapter

Auxiliary Hose

- N/A

Firehawk® M7 Control Module (Figures 125-127)

- Sticker was present, but unreadable due to being melted
- FCC ID: unreadable numbers (include 6) 85740
- Sticker: 10083540 Telemetry
- Lines looked good
- Gauge lens was readable
- Protective casing was good and in place

PASS Control Module (Figures 128-129)

- P/N: 10083225
- Firehawk®M7 Power Module
- Overall condition was good, but very dirty and scratched up
- Power module sticker was covered with debris making it difficult to read identifiers/numbers
- Held securely to backframe

Backframe Assembly (Figures 130-132)

- NIOSH label: TC-13F-549CBRN45
- SEI label NFPA 1981-2007ed
- MFG date: April 2010
- Painted on: 602; Other sticker: 7-2180-1; Sticker: MSA this unit assembled and tested by DFT-1; Sticker: Wilmington Fire Department Squad 1
- Overall condition was good
- Shoulder straps were attached to the frame
- Cylinder strap was good and functioned
- Heat dye sublimation on shoulder straps

Straps and Buckles (Figure 133)

- Overall strap condition had debris all over with heat dye sublimation, including the waist belt
- Hose lines passed through shoulder straps
- All adjustable buckles moved and held in place
- Waist area buckle would not latch
- Overall strap condition was dirty with some dye sublimation

Compressed Air Cylinder and Cylinder Valve Assembly (Figures 134-137)

- DOT-SP 10915-4500; TC-SU-5134-310
- ACU13758; IL308339
- Cylinder M/N #: 7-1348-1
- MSA logo visible; Luxfer; REE: 123
- Luxfer P/N: L65R-4; MFG date: 11/12; 45 minute, 4500 psi
- Other marking: written in permanent marker or paint: 708
- Hydrostatic date and MFG date: 11/2012
- Halfway ripped off Wilmington Fire Department Squad 1 sticker
- Overall condition was good; normal wear as there were some surface scratches
- Gauge was readable
- Threads were in ok condition
- Rubber bumper at base on cylinder valve was in good condition
- 708 was etched into the valve stem

As received (pictured below) SCBA unit #Unknown

- SCBA unit #Unknown was hand delivered in black trash bag to Lab H1513 by NIOSH DSR investigators
- No evidence tag attached to it
- Cylinder was included with 3500 psi of air
- Bypass was closed
- Facepiece was included with mask-mounted regulator (MMR) locked into mask



SCBA unit #Unknown facepiece, and cylinder as received

Components and Observations for SCBA Unit #Unknown (Figure 138) (“Right” or “left” are from the user’s perspective) (see Figures in Appendix)

Facepiece (Figures 139-140)

- Facepiece assembly: Model: Ultra-Elite; Size: Medium; Seal P/N: 7-935-4; Nosecup P/N: 7-901-1; MFG date: 4/09; Size: Medium
- Painted on HUD and speaking communication module 5847
- Overall condition was good
- Lens and rings were in place
- Lens appeared to be in good condition; little dirty
- Lens retaining ring was intact
- Hairnet was in good shape
- Straps and buckles were all in good shape and moved

Mask-Mounted Regulator (MMR) (Figure 141)

- MMR Firehawk® CBRN 10077030
- Secured to low pressure line
- Bypass was closed
- Inside flange was in good shape; slightly dirty
- Sealing area was good
- Regulator could be attached and removed
- Locking assembly functioned properly

Low Pressure Regulator Hose (Figure 142)

- Overall condition was good
- Secure at all attachments points
- Line runs through the shoulder strap to the reducer

Pressure Reducer Assembly (Figures 143-144)

- “The Fire Store” sticker stamped July 2016
- Markings: EW176006; 10026233MAM
- Overall condition was good
- All airline connections were secure

High Pressure Hose and Cylinder Attachment (Figures 145-146)

- Overall condition was good
- Cylinder attachment threads clean; threaded on and off; O-ring in place
- Pressure relief valve looks good; with marking 0036292 on it
- Quick-Fill protector was on; with marking: Eaton FD17-1002-10-04
- Bell assembly P/N: 9W174014MJ
- MSA sticker: ##003803#

Auxiliary Hose

- N/A

Console Assembly PASS (Figures 147-148)

- Console P/N: 7-1219-1
- FCC ID: ###-10060782
- Overall condition was very good
- Pressure and electrical lines were in good shape
- Gauge lens was readable
- Protective casing was good

Backframe Assembly (Figures 149-152)

- NIOSH label: TC-13F-302
- SEI Label: unreadable
- Technical Services Safeware: Flow tested 7/2009
- Overall condition was very good
- Shoulder straps were attached to the frame
- Cylinder strap was in good condition; label with “Engine 1” printed on it
- 459 etched in backframe

Straps and Buckles (Figure 153)

- All straps and buckles functioned
- Some heat dye sublimation on straps
- Hose lines passed through shoulder straps
- All adjustable buckles moved and held in place
- Waist buckle latched and released

Compressed Air Cylinder and Cylinder Valve Assembly (Figures 154-158)

- DOT-E-10915-4500
- TC-SU-5134-310 45 minute, 4500 psi
- IL150074; Model#: 7-1348-1; P/N: L65G-16
- MSA logo visible; Luxfer; REE: 118
- Hydro date: 2/15; MFG date: 2/04
- Other marking: written with marker 475
- Overall condition was good; normal wear
- Gauge was readable
- Threads were good, clean, threaded on and off
- Rubber bumper at base on cylinder valve condition was good

SCBA Testing

The SCBA unit was tested using the six NIOSH test methods and one NFPA test method as described in **Table 1**.

Table 1. Summary of results from testing SCBA unit #12 against established NIOSH SCBA certification tests.

NIOSH Tests	Description of Results	PASS/ FAIL
<p>Positive Pressure Test - NIOSH Standard Test Procedure Number 120, 42 CFR Part 84 Reference: Subpart H, § 84.70 (a)(2)(ii) Requirement: <i>The pressure inside the facepiece in relation to the immediate environment is positive during both inhalation and exhalation.</i> Procedure: A breathing machine with a 622 kg.-m./min cam operating at 24 RPM with a 40 liters 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.</p>	<p>The unit met the test requirement. The inhalation breathing resistance did not become negative during the test. *A stock G1 mask was used for this test. *The corresponding cylinder was used. Inhalation Breathing Resistance: (inches of water column) = 0.225</p>	<p>PASS</p>
<p>Rated Service Time Test - NIOSH Standard Test Procedure Number 121, 42 CFR Part 84 Reference: Subpart F, § 84.53 (a) and Subpart H, § 84.95 (a) and (b) Requirement: <i>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.</i> 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.</p>	<p>The SCBA met the test requirement. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. The PASS unit functioned during the test. The SCBA did not go negative on inhalation; therefore, maintained positive pressure in the facepiece. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. The PASS functioned. Measured Service Time: 49 Minutes 67 Seconds</p>	<p>PASS</p>

<p>Static Pressure Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (d)</p> <p>Requirement: <i>The static pressure (at zero flow) in the facepiece shall not exceed 38 mm (1.5 inches) water column height.</i></p> <p>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.</p>	<p>The SCBA met the test requirement.</p> <p>*A stock G1 mask was used for this test.</p> <p>Facepiece Static Pressure:(inches of water column)= 1.02</p>	<p>PASS</p>						
<p>Gas Flow Test - NIOSH Standard Test Procedure Number 123, 42 CFR Part 84 Reference: Subpart H, § 84.93 (b) and (c)</p> <p>Requirement: <i>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 gauge pressure in the facepiece.</i></p> <p>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.</p>	<p>The SCBA met the test requirement.</p> <p>*A stock G1 mask was used for this test.</p> <table border="0"> <tr> <td>Applied Pressure</td> <td>Airflow (liters per minute)</td> </tr> <tr> <td>4500 psig</td> <td>308.7</td> </tr> <tr> <td>500 psig</td> <td>370.9</td> </tr> </table>	Applied Pressure	Airflow (liters per minute)	4500 psig	308.7	500 psig	370.9	<p>PASS PASS</p>
Applied Pressure	Airflow (liters per minute)							
4500 psig	308.7							
500 psig	370.9							
<p>Exhalation Resistance Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (c)</p> <p>Requirement: <i>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.</i></p> <p>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 airflow through the apparatus is adjusted to a rate of 85 liters per minute and the exhalation resistance is recorded.</p>	<p>The SCBA met the test requirement.</p> <p>*A stock G1 mask was used for this test.</p> <p>Exhalation Breathing Resistance: (inches of water column)= 2.23 Static Pressure: (inches of water column)= 1.02 Difference: (inches of water column)= 1.21</p>	<p>PASS</p>						

<p>Remaining Service Life Indicator Test - NIOSH Standard Test Procedure Number 124, 42 CFR Part 84 Reference: Subpart H, § 84.83 (f) and Subpart G, § 84.63 (c)</p> <p>Requirement: <i>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 33 to 37 percent of its rated service time or pressure.</i> <i>This requirement is modified under § 84.63(c) as follows: For apparatus which do not have a method of manually turning off remote gauge in the event of a gauge or gauge line failure the remaining service life indicator is required to be set at 33% + 4% of the rated service time or pressure.</i></p> <p>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.</p>	<p>As these SCBA models do not have a remote gauge shutoff, the test requirement is 33% + 4%.</p> <table border="1" data-bbox="1283 289 1858 609"> <thead> <tr> <th></th> <th>Electric</th> <th>Bell</th> </tr> </thead> <tbody> <tr> <td>Run #</td> <td>Alarm Point (psi)</td> <td>Alarm Point (psi)</td> </tr> <tr> <td>1</td> <td>1510</td> <td>1540</td> </tr> <tr> <td>2</td> <td>1500</td> <td>1580</td> </tr> <tr> <td>3</td> <td>1510</td> <td>1580</td> </tr> <tr> <td>4</td> <td>1510</td> <td>1580</td> </tr> <tr> <td>5</td> <td>1510</td> <td>1580</td> </tr> <tr> <td>6</td> <td>1510</td> <td>1580</td> </tr> <tr> <td>Average</td> <td>1508</td> <td>1573</td> </tr> </tbody> </table>		Electric	Bell	Run #	Alarm Point (psi)	Alarm Point (psi)	1	1510	1540	2	1500	1580	3	1510	1580	4	1510	1580	5	1510	1580	6	1510	1580	Average	1508	1573	<p>PASS PASS</p>
	Electric	Bell																											
Run #	Alarm Point (psi)	Alarm Point (psi)																											
1	1510	1540																											
2	1500	1580																											
3	1510	1580																											
4	1510	1580																											
5	1510	1580																											
6	1510	1580																											
Average	1508	1573																											

National Fire Protection Association (NFPA) Test (in accordance with NFPA 1981, 1997 Edition):

NFPA Test	Description of Results	PASS/FAIL
<p>NFPA Airflow Performance Test - NFPA 1981 (1997 Edition) Reference: Chapter 5, Performance Requirements, Sec. 5-1.1</p> <p>Requirement: <i>SCBA shall be tested for airflow performance as specified in Section 6-1, Airflow Performance Test, and the SCBA facepiece pressure shall not be less than 0.0 in (0.0 mm) water column and nor greater than 3½ in (89 mm) water column above ambient pressure from the time the test begins until the time the test is concluded.</i></p> <p>Procedure: The required equipment specified in the NFPA standards were used to conduct the tests on this unit. 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.</p>	<p>The SCBA passed this test. PASS unit was functional, HUD was functional and Alarm systems were functional.</p> <p>*A stock G1 mask was used for this test.</p> <p>Maximum Facepiece Pressure: (inches of water column)= 2.69 Minimum Facepiece Pressure: (inches of water column)= 0.25</p>	<p>PASS PASS</p>

SCBA Testing

The SCBA unit was tested using the six NIOSH test methods and one NFPA test method as described in **Table 2**.

Table 2. Summary of results from testing SCBA unit #13 against established NIOSH SCBA certification tests.

NIOSH Tests	Description of Results	PASS/ FAIL
<p>Positive Pressure Test - NIOSH Standard Test Procedure Number 120, 42 CFR Part 84 Reference: Subpart H, § 84.70 (a)(2)(ii) Requirement: <i>The pressure inside the facepiece in relation to the immediate environment is positive during both inhalation and exhalation.</i> Procedure: A breathing machine with a 622 kg.-m./min cam operating at 24 RPM with a 40 liters 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.</p>	<p>The unit met the test requirement. The inhalation breathing resistance did not become negative during the test.</p> <p>*The corresponding mask and cylinder was used.</p> <p>Inhalation Breathing Resistance: (inches of water column) = 0.25</p>	<p>PASS</p>
<p>Rated Service Time Test - NIOSH Standard Test Procedure Number 121, 42 CFR Part 84 Reference: Subpart F, § 84.53 (a) and Subpart H, § 84.95 (a) and (b) Requirement: <i>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.</i> 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.</p>	<p>The SCBA met the test requirement. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. The PASS unit functioned during the test. The SCBA did not go negative on inhalation; therefore, maintained positive pressure in the facepiece. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. PASS functioned.</p> <p>Measured Service Time: 48 Minutes 8 Seconds</p>	<p>PASS</p>

<p>Static Pressure Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (d)</p> <p>Requirement: <i>The static pressure (at zero flow) in the facepiece shall not exceed 38 mm (1.5 inches) water column height.</i></p> <p>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.</p>	<p>The SCBA met the test requirement.</p> <p>*The corresponding mask and cylinder was used.</p> <p>Facepiece Static Pressure:(inches of water column)= 1.13</p>	<p>PASS</p>						
<p>Gas Flow Test - NIOSH Standard Test Procedure Number 123, 42 CFR Part 84 Reference: Subpart H, § 84.93 (b) and (c)</p> <p>Requirement: <i>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 gauge pressure in the facepiece.</i></p> <p>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.</p>	<p>The SCBA met the test requirement.</p> <p>*The corresponding mask and cylinder was used.</p> <table border="0"> <tr> <td>Applied Pressure</td> <td>Airflow (liters per minute)</td> </tr> <tr> <td>4500 psig</td> <td>351.0</td> </tr> <tr> <td>500 psig</td> <td>348.0</td> </tr> </table>	Applied Pressure	Airflow (liters per minute)	4500 psig	351.0	500 psig	348.0	<p>PASS PASS</p>
Applied Pressure	Airflow (liters per minute)							
4500 psig	351.0							
500 psig	348.0							
<p>Exhalation Resistance Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (c)</p> <p>Requirement: <i>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.</i></p> <p>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 airflow through the apparatus is adjusted to a rate of 85 liters per minute and the exhalation resistance is recorded.</p>	<p>The SCBA met the test requirement.</p> <p>*The corresponding mask and cylinder was used.</p> <p>Exhalation Breathing Resistance: (inches of water column)= 1.75 Static Pressure: (inches of water column)= 1.13 Difference: (inches of water column)= 0.62</p>	<p>PASS</p>						

<p>Remaining Service Life Indicator Test - NIOSH Standard Test Procedure Number 124, 42 CFR Part 84 Reference: Subpart H, § 84.83 (f) and Subpart G, § 84.63 (c)</p> <p>Requirement: <i>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.</i> <i>This requirement is modified under § 84.63(c) as follows: For apparatus which do not have a method of manually turning off remote gauge in the event of a gauge or gauge line failure the remaining service life indicator is required to be set at 25% ± 2% of the rated service time or pressure.</i></p> <p>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.</p>	<p>As these SCBA models do not have a remote gauge shutoff, the test requirement is 25% ± 2%.</p> <table border="1" data-bbox="1283 289 1858 609"> <thead> <tr> <th></th> <th>Electric</th> <th>Bell</th> </tr> </thead> <tbody> <tr> <td>Run #</td> <td>Alarm Point (psi)</td> <td>Alarm Point (psi)</td> </tr> <tr> <td>1</td> <td>1115</td> <td>1100</td> </tr> <tr> <td>2</td> <td>1120</td> <td>1100</td> </tr> <tr> <td>3</td> <td>1120</td> <td>1100</td> </tr> <tr> <td>4</td> <td>1120</td> <td>1100</td> </tr> <tr> <td>5</td> <td>1120</td> <td>1100</td> </tr> <tr> <td>6</td> <td>1120</td> <td>1100</td> </tr> <tr> <td>Average</td> <td>1119</td> <td>1100</td> </tr> </tbody> </table>		Electric	Bell	Run #	Alarm Point (psi)	Alarm Point (psi)	1	1115	1100	2	1120	1100	3	1120	1100	4	1120	1100	5	1120	1100	6	1120	1100	Average	1119	1100	<p>PASS PASS</p>
	Electric	Bell																											
Run #	Alarm Point (psi)	Alarm Point (psi)																											
1	1115	1100																											
2	1120	1100																											
3	1120	1100																											
4	1120	1100																											
5	1120	1100																											
6	1120	1100																											
Average	1119	1100																											

National Fire Protection Association (NFPA) Test (in accordance with NFPA 1981, 1997 Edition):

NFPA Test	Description of Results	PASS/FAIL
<p>NFPA Airflow Performance Test - NFPA 1981 (1997 Edition) Reference: Chapter 5, Performance Requirements, Sec. 5-1.1</p> <p>Requirement: <i>SCBA shall be tested for airflow performance as specified in Section 6-1, Airflow Performance Test, and the SCBA facepiece pressure shall not be less than 0.0 in (0.0 mm) water column and nor greater than 3½ in (89 mm) water column above ambient pressure from the time the test begins until the time the test is concluded.</i></p> <p>Procedure: The required equipment specified in the NFPA standards were used to conduct the tests on this unit. 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.</p>	<p>The SCBA passed this test. PASS, HUD, and Alarm systems were functional.</p> <p>*Tested with #Unknown facepiece.</p> <p>*The corresponding mask cylinder was used.</p> <p>Maximum Facepiece Pressure: (inches of water column)= 2.4 Minimum Facepiece Pressure: (inches of water column)= 0.25</p>	<p>PASS/FAIL PASS</p>

SCBA Testing

The SCBA unit was tested using the six NIOSH test methods and one NFPA test method as described in **Table 3**.

Table 3. Summary of results from testing SCBA unit #14 against established NIOSH SCBA certification tests.

NIOSH Tests	Description of Results	PASS/ FAIL
<p>Positive Pressure Test - NIOSH Standard Test Procedure Number 120, 42 CFR Part 84 Reference: Subpart H, § 84.70 (a)(2)(ii) Requirement: <i>The pressure inside the facepiece in relation to the immediate environment is positive during both inhalation and exhalation.</i> Procedure: A breathing machine with a 622 kg.-m./min cam operating at 24 RPM with a 40 liters 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.</p>	<p>The unit first failed at 1072 cycles at 45:00 and “-Off Chart” INWC.</p> <p>*The unit was tested with #Unknown cylinder.</p> <p>*The unit was tested with #13 facepiece.</p> <p>Inhalation Breathing Resistance: (inches of water column) = “-Off Chart”</p>	<p>FAIL</p>
<p>Rated Service Time Test - NIOSH Standard Test Procedure Number 121, 42 CFR Part 84 Reference: Subpart F, § 84.53 (a) and Subpart H, § 84.95 (a) and (b) Requirement: <i>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.</i> 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.</p>	<p>The SCBA met the test requirement. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. The PASS unit functioned during the test. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. PASS functioned.</p> <p>Measured Service Time: 48 Minutes 8 Seconds</p>	<p>PASS</p>

<p>Static Pressure Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (d) Requirement: <i>The static pressure (at zero flow) in the facepiece shall not exceed 38 mm (1.5 inches) water column height.</i> 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.</p>	<p>The SCBA met the test requirement. *The unit was tested with #Unknown cylinder. *The unit was tested with #13 facepiece. Facepiece Static Pressure:(inches of water column)= 1.43</p>	<p>PASS</p>						
<p>Gas Flow Test - NIOSH Standard Test Procedure Number 123, 42 CFR Part 84 Reference: Subpart H, § 84.93 (b) and (c) Requirement: <i>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 gauge pressure in the facepiece.</i> 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.</p>	<p>The SCBA did not meet the test requirement. *The unit was tested with #Unknown cylinder. *The unit was tested with #13 facepiece. <table border="0"> <tr> <td>Applied Pressure</td> <td>Airflow (liters per minute)</td> </tr> <tr> <td>4500 psig</td> <td>141.585</td> </tr> <tr> <td>500 psig</td> <td>116.0</td> </tr> </table> </p>	Applied Pressure	Airflow (liters per minute)	4500 psig	141.585	500 psig	116.0	<p>FAIL FAIL</p>
Applied Pressure	Airflow (liters per minute)							
4500 psig	141.585							
500 psig	116.0							
<p>Exhalation Resistance Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (c) Requirement: <i>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.</i> 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 airflow through the apparatus is adjusted to a rate of 85 liters per minute and the exhalation resistance is recorded.</p>	<p>The SCBA met the test requirement. *The unit was tested with #Unknown cylinder. *The unit was tested with #13 facepiece. Exhalation Breathing Resistance: (inches of water column)= 1.87 Static Pressure: (inches of water column)= 1.43 Difference: (inches of water column)= 0.44</p>	<p>PASS</p>						

<p>Remaining Service Life Indicator Test - NIOSH Standard Test Procedure Number 124, 42 CFR Part 84 Reference: Subpart H, § 84.83 (f) and Subpart G, § 84.63 (c)</p> <p>Requirement: <i>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 33 to 37 percent of its rated service time or pressure.</i> <i>This requirement is modified under § 84.63(c) as follows: For apparatus which do not have a method of manually turning off remote gauge in the event of a gauge or gauge line failure the remaining service life indicator is required to be set at 33% + 4% of the rated service time or pressure.</i></p> <p>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.</p>	<p>As these SCBA models do not have a remote gauge shutoff, the test requirement is 33% + 4%. The SCBA unit did not meet the test requirement.</p> <table border="1" data-bbox="1293 370 1860 695"> <thead> <tr> <th></th> <th>Electric</th> <th>Bell</th> </tr> <tr> <th>Run #</th> <th>Alarm Point (psi)</th> <th>Alarm Point (psi)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1580</td> <td>1430</td> </tr> <tr> <td>2</td> <td>1580</td> <td>1480</td> </tr> <tr> <td>3</td> <td>1580</td> <td>1450</td> </tr> <tr> <td>4</td> <td>1580</td> <td>1450</td> </tr> <tr> <td>5</td> <td>1580</td> <td>1450</td> </tr> <tr> <td>6</td> <td>1580</td> <td>1450</td> </tr> <tr> <td>Average</td> <td>1580</td> <td>1452</td> </tr> </tbody> </table>		Electric	Bell	Run #	Alarm Point (psi)	Alarm Point (psi)	1	1580	1430	2	1580	1480	3	1580	1450	4	1580	1450	5	1580	1450	6	1580	1450	Average	1580	1452	<p>PASS FAIL</p>
	Electric	Bell																											
Run #	Alarm Point (psi)	Alarm Point (psi)																											
1	1580	1430																											
2	1580	1480																											
3	1580	1450																											
4	1580	1450																											
5	1580	1450																											
6	1580	1450																											
Average	1580	1452																											

National Fire Protection Association (NFPA) Test (in accordance with NFPA 1981, 1997 Edition):

<p>NFPA Test</p>	<p>Description of Results</p>	<p>PASS/FAIL</p>
<p>NFPA Airflow Performance Test - NFPA 1981 (1997 Edition) Reference: Chapter 5, Performance Requirements, Sec. 5-1.1</p> <p>Requirement: <i>SCBA shall be tested for airflow performance as specified in Section 6-1, Airflow Performance Test, and the SCBA facepiece pressure shall not be less than 0.0 in (0.0 mm) water column and nor greater than 3½ in (89 mm) water column above ambient pressure from the time the test begins until the time the test is concluded.</i></p> <p>Procedure: The required equipment specified in the NFPA standards were used to conduct the tests on this unit. 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.</p>	<p>The SCBA unit did not meet the test requirement. PASS and Alarm systems were functional.</p> <p>*The unit was tested with #Unknown cylinder.</p> <p>*The unit was tested with #Unknown facepiece.</p> <p>Maximum Facepiece Pressure: (inches of water column)= 2.45 Minimum Facepiece Pressure: (inches of water column)= “-Off Chart”</p>	<p>PASS FAIL</p>

SCBA Testing

The SCBA unit was tested using the six NIOSH test methods and one NFPA test method as described in **Table 4**.

Table 4. Summary of results from testing SCBA unit #18 against established NIOSH SCBA certification tests.

NIOSH Tests	Description of Results	PASS/ FAIL
<p>Positive Pressure Test - NIOSH Standard Test Procedure Number 120, 42 CFR Part 84 Reference: Subpart H, § 84.70 (a)(2)(ii) Requirement: <i>The pressure inside the facepiece in relation to the immediate environment is positive during both inhalation and exhalation.</i> Procedure: A breathing machine with a 622 kg.-m./min cam operating at 24 RPM with a 40 liters 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.</p>	<p>The unit first failed at 1071 cycles at 45:00 and “-Off Chart” INWC.</p> <p>*The unit was tested with corresponding cylinder.</p> <p>*The unit was tested with #13 facepiece.</p> <p>Inhalation Breathing Resistance: (inches of water column) = “-Off Chart”</p>	<p>FAIL</p>
<p>Rated Service Time Test - NIOSH Standard Test Procedure Number 121, 42 CFR Part 84 Reference: Subpart F, § 84.53 (a) and Subpart H, § 84.95 (a) and (b) Requirement: <i>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.</i> 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.</p>	<p>The SCBA met the test requirement. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. The PASS unit functioned during the test. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. PASS functioned.</p> <p>Measured Service Time: 50 Minutes 24 Seconds</p>	<p>PASS</p>

<p>Static Pressure Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (d) Requirement: <i>The static pressure (at zero flow) in the facepiece shall not exceed 38 mm (1.5 inches) water column height.</i> 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.</p>	<p>*The unit was tested with corresponding cylinder. *The unit was tested with #13 facepiece. Facepiece Static Pressure:(inches of water column)= 0.90</p>	<p>PASS</p>						
<p>Gas Flow Test - NIOSH Standard Test Procedure Number 123, 42 CFR Part 84 Reference: Subpart H, § 84.93 (b) and (c) Requirement: <i>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 gauge pressure in the facepiece.</i> 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.</p>	<p>The SCBA did not meet the test requirement. *The unit was tested with corresponding cylinder. *The unit was tested with #13 facepiece. <table border="0"> <tr> <td>Applied Pressure</td> <td>Airflow (liters per minute)</td> </tr> <tr> <td>4500 psig</td> <td>189.72</td> </tr> <tr> <td>500 psig</td> <td>138.75</td> </tr> </table> </p>	Applied Pressure	Airflow (liters per minute)	4500 psig	189.72	500 psig	138.75	<p>FAIL FAIL</p>
Applied Pressure	Airflow (liters per minute)							
4500 psig	189.72							
500 psig	138.75							
<p>Exhalation Resistance Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (c) Requirement: <i>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.</i> 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 airflow through the apparatus is adjusted to a rate of 85 liters per minute and the exhalation resistance is recorded.</p>	<p>The SCBA met the test requirement. *The unit was tested with corresponding cylinder. *The unit was tested with #13 facepiece. Exhalation Breathing Resistance: (inches of water column)= 1.77 Static Pressure: (inches of water column)= 0.90 Difference: (inches of water column)= 0.87</p>	<p>PASS</p>						

<p>Remaining Service Life Indicator Test - NIOSH Standard Test Procedure Number 124, 42 CFR Part 84 Reference: Subpart H, § 84.83 (f) and Subpart G, § 84.63 (c)</p> <p>Requirement: <i>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.</i> <i>This requirement is modified under § 84.63(c) as follows: For apparatus which do not have a method of manually turning off remote gauge in the event of a gauge or gauge line failure the remaining service life indicator is required to be set at 25% ± 2% of the rated service time or pressure.</i></p> <p>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.</p>	<p>As these SCBA models do not have a remote gauge shutoff, the test requirement is 25% ± 2%.</p> <p>*This SCBA unit did not meet the test requirements. Unit would not turn on or pressurize fully during test.</p> <table border="1" data-bbox="1295 410 1858 727"> <thead> <tr> <th></th> <th>Electric</th> <th>Bell</th> </tr> <tr> <th>Run #</th> <th>Alarm Point (psi)</th> <th>Alarm Point (psi)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> <td>1070</td> </tr> <tr> <td>2</td> <td></td> <td>1090</td> </tr> <tr> <td>3</td> <td></td> <td>1090</td> </tr> <tr> <td>4</td> <td></td> <td>1090</td> </tr> <tr> <td>5</td> <td></td> <td>1090</td> </tr> <tr> <td>6</td> <td></td> <td>1090</td> </tr> <tr> <td>Average</td> <td></td> <td>1088.3</td> </tr> </tbody> </table>		Electric	Bell	Run #	Alarm Point (psi)	Alarm Point (psi)	1		1070	2		1090	3		1090	4		1090	5		1090	6		1090	Average		1088.3	<p>FAIL PASS</p>
	Electric	Bell																											
Run #	Alarm Point (psi)	Alarm Point (psi)																											
1		1070																											
2		1090																											
3		1090																											
4		1090																											
5		1090																											
6		1090																											
Average		1088.3																											

National Fire Protection Association (NFPA) Test (in accordance with NFPA 1981, 1997 Edition):

<p>NFPA Test</p>	<p>Description of Results</p>	<p>PASS/FAIL</p>
<p>NFPA Airflow Performance Test - NFPA 1981 (1997 Edition) Reference: Chapter 5, Performance Requirements, Sec. 5-1.1</p> <p>Requirement: <i>SCBA shall be tested for airflow performance as specified in Section 6-1, Airflow Performance Test, and the SCBA facepiece pressure shall not be less than 0.0 in (0.0 mm) water column and nor greater than 3½ in (89 mm) water column above ambient pressure from the time the test begins until the time the test is concluded.</i></p> <p>Procedure: The required equipment specified in the NFPA standards were used to conduct the tests on this unit. 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.</p>	<p>The SCBA did not pass this test. Alarm systems were functional.</p> <p>*Tested with #Unknown facepiece.</p> <p>*The corresponding mask cylinder was used.</p> <p>Maximum Facepiece Pressure: (inches of water column)= 2.55 Minimum Facepiece Pressure: (inches of water column)= “-Off Chart”</p>	<p>PASS</p> <p>FAIL</p>

SCBA Testing

The SCBA unit was tested using the six NIOSH test methods and one NFPA test method as described in **Table 5**.

Table 5. Summary of results from testing SCBA unit #19 against established NIOSH SCBA certification tests.

NIOSH Tests	Description of Results	PASS/ FAIL
<p>Positive Pressure Test - NIOSH Standard Test Procedure Number 120, 42 CFR Part 84 Reference: Subpart H, § 84.70 (a)(2)(ii) Requirement: <i>The pressure inside the facepiece in relation to the immediate environment is positive during both inhalation and exhalation.</i> Procedure: A breathing machine with a 622 kg.-m./min cam operating at 24 RPM with a 40 liters 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.</p>	<p>The unit met the test requirement. The inhalation breathing resistance did not become negative during the test. *The unit was tested with corresponding cylinder. *The unit was tested with #13 facepiece. Inhalation Breathing Resistance: (inches of water column) = 0.40</p>	<p>PASS</p>
<p>Rated Service Time Test - NIOSH Standard Test Procedure Number 121, 42 CFR Part 84 Reference: Subpart F, § 84.53 (a) and Subpart H, § 84.95 (a) and (b) Requirement: <i>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.</i> 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.</p>	<p>The SCBA met the test requirement. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. The PASS unit functioned during the test. The SCBA did not go negative on inhalation; therefore, maintained positive pressure in the facepiece. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. PASS, HUD, and Alarm systems were functional. Measured Service Time: 49 Minutes 07 Seconds</p>	<p>PASS</p>

<p>Static Pressure Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (d) Requirement: <i>The static pressure (at zero flow) in the facepiece shall not exceed 38 mm (1.5 inches) water column height.</i> 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.</p>	<p>*The unit was tested with corresponding cylinder. *The unit was tested with #13 facepiece. Facepiece Static Pressure:(inches of water column)= 0.94</p>	<p>PASS</p>						
<p>Gas Flow Test - NIOSH Standard Test Procedure Number 123, 42 CFR Part 84 Reference: Subpart H, § 84.93 (b) and (c) Requirement: <i>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 gauge pressure in the facepiece.</i> 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.</p>	<p>The SCBA met the test requirement. *The unit was tested with corresponding cylinder. *The unit was tested with #13 facepiece. <table border="0"> <thead> <tr> <th>Applied Pressure</th> <th>Airflow (liters per minute)</th> </tr> </thead> <tbody> <tr> <td>4500 psig</td> <td>410.6</td> </tr> <tr> <td>500 psig</td> <td>433.3</td> </tr> </tbody> </table> </p>	Applied Pressure	Airflow (liters per minute)	4500 psig	410.6	500 psig	433.3	<p>PASS PASS</p>
Applied Pressure	Airflow (liters per minute)							
4500 psig	410.6							
500 psig	433.3							
<p>Exhalation Resistance Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (c) Requirement: <i>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.</i> 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 airflow through the apparatus is adjusted to a rate of 85 liters per minute and the exhalation resistance is recorded.</p>	<p>The SCBA met the test requirement. *The unit was tested with corresponding cylinder. *The unit was tested with #13 facepiece. Exhalation Breathing Resistance: (inches of water column)= 1.86 Static Pressure: (inches of water column)= 0.94 Difference: (inches of water column)= 0.92</p>	<p>PASS</p>						

<p>Remaining Service Life Indicator Test - NIOSH Standard Test Procedure Number 124, 42 CFR Part 84 Reference: Subpart H, § 84.83 (f) and Subpart G, § 84.63 (c)</p> <p>Requirement: <i>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.</i> <i>This requirement is modified under § 84.63(c) as follows: For apparatus which do not have a method of manually turning off remote gauge in the event of a gauge or gauge line failure the remaining service life indicator is required to be set at 25% ± 2% of the rated service time or pressure.</i></p> <p>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.</p>	<p>As these SCBA models do not have a remote gauge shutoff, the test requirement is 25% ± 2%.</p> <table border="1" data-bbox="1293 305 1860 618"> <thead> <tr> <th></th> <th>Electric</th> <th>Bell</th> </tr> <tr> <th>Run #</th> <th>Alarm Point (psi)</th> <th>Alarm Point (psi)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1110</td> <td>1090</td> </tr> <tr> <td>2</td> <td>1110</td> <td>1090</td> </tr> <tr> <td>3</td> <td>1110</td> <td>1090</td> </tr> <tr> <td>4</td> <td>1110</td> <td>1100</td> </tr> <tr> <td>5</td> <td>1110</td> <td>1090</td> </tr> <tr> <td>6</td> <td>1110</td> <td>1090</td> </tr> <tr> <td>Average</td> <td>1110</td> <td>1092</td> </tr> </tbody> </table>		Electric	Bell	Run #	Alarm Point (psi)	Alarm Point (psi)	1	1110	1090	2	1110	1090	3	1110	1090	4	1110	1100	5	1110	1090	6	1110	1090	Average	1110	1092	<p>PASS PASS</p>
	Electric	Bell																											
Run #	Alarm Point (psi)	Alarm Point (psi)																											
1	1110	1090																											
2	1110	1090																											
3	1110	1090																											
4	1110	1100																											
5	1110	1090																											
6	1110	1090																											
Average	1110	1092																											

National Fire Protection Association (NFPA) Test (in accordance with NFPA 1981, 1997 Edition):

NFPA Test	Description of Results	PASS/ FAIL
<p>NFPA Airflow Performance Test - NFPA 1981 (1997 Edition) Reference: Chapter 5, Performance Requirements, Sec. 5-1.1</p> <p>Requirement: <i>SCBA shall be tested for airflow performance as specified in Section 6-1, Airflow Performance Test, and the SCBA facepiece pressure shall not be less than 0.0 in (0.0 mm) water column and nor greater than 3½ in (89 mm) water column above ambient pressure from the time the test begins until the time the test is concluded.</i></p> <p>Procedure: The required equipment specified in the NFPA standards were used to conduct the tests on this unit. 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.</p>	<p>The SCBA passed this test. PASS, HUD, and Alarm systems were functional.</p> <p>*Tested with #Unknown facepiece.</p> <p>*The corresponding mask cylinder was used.</p> <p>Maximum Facepiece Pressure: (inches of water column)= 2.45 Minimum Facepiece Pressure: (inches of water column)= 0.55</p>	<p>PASS PASS</p>

SCBA Testing

The SCBA unit was tested using the six NIOSH test methods and one NFPA test method as described in **Table 6**.

Table 6. Summary of results from testing SCBA unit #Unknown against established NIOSH SCBA certification tests.

NIOSH Tests	Description of Results	PASS/ FAIL
<p>Positive Pressure Test - NIOSH Standard Test Procedure Number 120, 42 CFR Part 84 Reference: Subpart H, § 84.70 (a)(2)(ii) Requirement: <i>The pressure inside the facepiece in relation to the immediate environment is positive during both inhalation and exhalation.</i> Procedure: A breathing machine with a 622 kg.-m./min cam operating at 24 RPM with a 40 liters 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.</p>	<p>The unit did not meet the test requirement. The inhalation breathing resistance did become negative during the test.</p> <p>*The corresponding mask and cylinder was used.</p> <p>Inhalation Breathing Resistance: (inches of water column) = -0.05</p>	<p>FAIL</p>
<p>Rated Service Time Test - NIOSH Standard Test Procedure Number 121, 42 CFR Part 84 Reference: Subpart F, § 84.53 (a) and Subpart H, § 84.95 (a) and (b) Requirement: <i>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.</i> 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.</p>	<p>The SCBA met the test requirement. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. The PASS unit functioned during the test. The measured service time (adjusted to correspond with the recorded breathing cycles) was more than the rated service time of 45 minutes. PASS, HUD, and Alarm systems were functional.</p> <p>Measured Service Time: 49 Minutes 42 Seconds</p>	<p>PASS</p>

<p>Static Pressure Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (d) Requirement: <i>The static pressure (at zero flow) in the facepiece shall not exceed 38 mm (1.5 inches) water column height.</i> 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.</p>	<p>*The corresponding mask and cylinder was used.</p> <p>Facepiece Static Pressure:(inches of water column)= 0.65</p>	<p>PASS</p>						
<p>Gas Flow Test - NIOSH Standard Test Procedure Number 123, 42 CFR Part 84 Reference: Subpart H, § 84.93 (b) and (c) Requirement: <i>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 gauge pressure in the facepiece.</i> 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.</p>	<p>The SCBA met the test requirement.</p> <p>*The corresponding mask and cylinder was used.</p> <table border="0" data-bbox="1285 722 1871 836"> <tr> <td>Applied Pressure</td> <td>Airflow (liters per minute)</td> </tr> <tr> <td>4500 psig</td> <td>257.68</td> </tr> <tr> <td>500 psig</td> <td>419.09</td> </tr> </table>	Applied Pressure	Airflow (liters per minute)	4500 psig	257.68	500 psig	419.09	<p>PASS PASS</p>
Applied Pressure	Airflow (liters per minute)							
4500 psig	257.68							
500 psig	419.09							
<p>Exhalation Resistance Test - NIOSH Standard Test Procedure Number 122, 42 CFR Part 84 Reference: Subpart H, § 84.91 (c) Requirement: <i>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.</i> 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 airflow through the apparatus is adjusted to a rate of 85 liters per minute and the exhalation resistance is recorded.</p>	<p>The SCBA met the test requirement.</p> <p>*The corresponding mask and cylinder was used.</p> <p>Exhalation Breathing Resistance: (inches of water column)= 1.84 Static Pressure: (inches of water column)= 0.65 Difference: (inches of water column)= 1.19</p>	<p>PASS</p>						

<p>Remaining Service Life Indicator Test - NIOSH Standard Test Procedure Number 124, 42 CFR Part 84 Reference: Subpart H, § 84.83 (f) and Subpart G, § 84.63 (c)</p> <p>Requirement: <i>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.</i> <i>This requirement is modified under § 84.63(c) as follows: For apparatus which do not have a method of manually turning off remote gauge in the event of a gauge or gauge line failure the remaining service life indicator is required to be set at 25% ± 2% of the rated service time or pressure.</i></p> <p>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.</p>	<p>As these SCBA models do not have a remote gauge shutoff, the test requirement is 25% ± 2%.</p> <table border="1" data-bbox="1293 305 1860 618"> <thead> <tr> <th></th> <th>Electric</th> <th>Bell</th> </tr> <tr> <th>Run #</th> <th>Alarm Point (psi)</th> <th>Alarm Point (psi)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1120</td> <td>1110</td> </tr> <tr> <td>2</td> <td>1120</td> <td>1110</td> </tr> <tr> <td>3</td> <td>1120</td> <td>1120</td> </tr> <tr> <td>4</td> <td>1120</td> <td>1100</td> </tr> <tr> <td>5</td> <td>1120</td> <td>1090</td> </tr> <tr> <td>6</td> <td>1120</td> <td>1090</td> </tr> <tr> <td>Average</td> <td>1120</td> <td>1103.3</td> </tr> </tbody> </table>		Electric	Bell	Run #	Alarm Point (psi)	Alarm Point (psi)	1	1120	1110	2	1120	1110	3	1120	1120	4	1120	1100	5	1120	1090	6	1120	1090	Average	1120	1103.3	<p>PASS PASS</p>
	Electric	Bell																											
Run #	Alarm Point (psi)	Alarm Point (psi)																											
1	1120	1110																											
2	1120	1110																											
3	1120	1120																											
4	1120	1100																											
5	1120	1090																											
6	1120	1090																											
Average	1120	1103.3																											

National Fire Protection Association (NFPA) Test (in accordance with NFPA 1981, 1997 Edition):

NFPA Test	Description of Results	PASS/ FAIL
<p>NFPA Airflow Performance Test - NFPA 1981 (1997 Edition) Reference: Chapter 5, Performance Requirements, Sec. 5-1.1</p> <p>Requirement: <i>SCBA shall be tested for airflow performance as specified in Section 6-1, Airflow Performance Test, and the SCBA facepiece pressure shall not be less than 0.0 in (0.0 mm) water column and nor greater than 3½ in (89 mm) water column above ambient pressure from the time the test begins until the time the test is concluded.</i></p> <p>Procedure: The required equipment specified in the NFPA standards were used to conduct the tests on this unit. 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.</p>	<p>The SCBA passed this test. PASS, HUD, and Alarm systems were functional.</p> <p>*Tested with #Unknown facepiece.</p> <p>*The corresponding mask cylinder was used.</p> <p>Maximum Facepiece Pressure: (inches of water column)= 2.45 Minimum Facepiece Pressure: (inches of water column)= 0.2</p>	<p>PASS PASS</p>

Disposition of SCBA

Following testing, the six SCBA units were returned to the black trash bags that they were delivered in and returned to secure storage in Lab H1513 at the NIOSH facility in Morgantown, West Virginia.

Synopsis of Findings

The SCBA units inspected and evaluated by NPPTL were identified as five MSA Model Firehawk® M7, 4500 psi, 45 minute units and one MSA Model G1, 4500 psi, 45 minute unit, with NIOSH Approval Numbers TC-13F-0798CBRN, TC13F-549CBRN, TC-13F0770CBRN, and TC-13F-302. The corresponding facepieces and cylinders were provided with all units.

Unit #12, TC-13F-0798CBRN 45 minute, 4500 psi, was delivered in a black trash bag with an attached corresponding cylinder and facepiece. As received the cylinder was empty with the valve closed and the MMR bypass was found in the open position. Overall condition of this unit was fair with normal wear and tear. This unit met the requirements of the NIOSH Positive Pressure Test, as the unit did maintain a positive pressure for the 45 minute minimum duration of the unit. The unit passed all of the other NIOSH tests as well as the NFPA airflow test.

Unit #13, TC-13F-549CBRN 45 minute, 4500 psi, was delivered in a black trash bag with an attached corresponding cylinder and facepiece. As received the cylinder was still pressurized to 1500 psi with the valve closed and the MMR bypass was found in the closed position. Overall condition of this unit was fair with normal wear and tear. There was some heat damage found on the straps as well as some melted debris found on the unit. This unit met the requirements of the NIOSH Positive Pressure Test, as the unit did maintain a positive pressure for the 45 minute minimum duration of the unit. The unit passed all of the other NIOSH tests as well as the NFPA airflow test.

Unit #14, TC-13F-0770CBRN 45 minute, 4500 psi, was delivered in a black trash bag with an attached corresponding cylinder and facepiece. As received the cylinder was empty with the valve closed and the MMR bypass was found in the closed position. Unit had severe heat damage and melting of parts. Melted debris had to be removed from around unit to conduct evaluation. Lens showed severe heat damage with a protruding bubble with a hole in it. Gauges on both the PASS device and cylinder were unreadable due to heat damage. Overall condition was poor and in an unusable condition. This unit did not meet the requirements of all six NIOSH SCBA certification tests. The unit failed the NIOSH Positive Pressure Test (Standard Test Procedure Number 120, 42 CFR Part 84 Reference: Subpart H, 84.70 (a)(2)(ii)), the NIOSH Gas Flow Test (Standard Test Procedure Number 123, 42 CFR Part 84 Reference: Subpart H, § 84.93 (b) and (c)), the NIOSH Remaining Service Life Indicator Test (Standard Test Procedure Number 124, 42 CFR Part 84 Reference: Subpart H, § 84.83 (f) and Subpart G, § 84.63 (c)), and NFPA Airflow Performance Test - NFPA 1981 (1997 Edition) Reference: Chapter 5, Performance Requirements, Sec. 5-1.1.

Unit #18, TC-13F-549CBRN, 45 minute, 4500 psi, was delivered in a black trash bag with an attached corresponding cylinder and facepiece. As received the cylinder was empty with the valve closed and the MMR bypass was found in the closed position. Overall condition of this unit was fair to poor with severe heat

damage found on the straps as well as some melted debris found on the unit. The back frame also showed signs of damage with a cracked left railing. This heat damage would cause the unit to be unusable. This unit's PASS and electronics did not function. This unit did not meet the requirements of all six NIOSH SCBA certification tests. The unit failed the NIOSH Positive Pressure Test (Standard Test Procedure Number 120, 42 CFR Part 84 Reference: Subpart H, 84.70 (a)(2)(ii)), the NIOSH Gas Flow Test (Standard Test Procedure Number 123, 42 CFR Part 84 Reference: Subpart H, § 84.93 (b) and (c)), the NIOSH Remaining Service Life Indicator Test (Standard Test Procedure Number 124, 42 CFR Part 84 Reference: Subpart H, § 84.83 (f) and Subpart G, § 84.63 (c)), and NFPA Airflow Performance Test - NFPA 1981 (1997 Edition) Reference: Chapter 5, Performance Requirements, Sec. 5-1.1.

Unit #19, TC-13F-549CBRN 45 minute, 4500 psi, was delivered in a black trash bag with an attached corresponding cylinder and facepiece. As received the cylinder was still pressurized to 2000 psi with the valve closed and the MMR bypass was found in the closed position. Overall condition of this unit was fair with normal wear and tear. There was some heat damage found on the straps as well as some melted debris found on the unit. This unit met the requirements of the NIOSH Positive Pressure Test, as the unit did maintain a positive pressure for the 45 minute minimum duration of the unit. The unit passed all of the other NIOSH tests as well as the NFPA airflow test.

Unit #Unknown, TC-13F-302 45minute, 4500 psi, was delivered in a black trash bag with an attached corresponding cylinder and facepiece. As received the cylinder was still pressurized to 3500 psi with the valve closed and the MMR bypass was found in the closed position. This unit MSA Firehawk® M7, NFPA 1981, 2002 edition was upgraded to NFPA 2007, TC-13F-302. Overall condition of this unit was fair with normal wear and tear and some heat dye sublimation on straps. This unit did not meet the requirements of all six NIOSH SCBA certification tests. The unit failed the NIOSH Positive Pressure Test (Standard Test Procedure Number 120, 42 CFR Part 84 Reference: Subpart H, 84.70 (a)(2)(ii)). The unit passed the NFPA airflow test.

In light of the information obtained during this investigation, NIOSH NPPTL has proposed no further action on its part at this time.

CASE Conclusion

No evidence was identified to suggest that the SCBA units inspected and evaluated contributed to the fatality. NIOSH determined that there was no need for corrective action with regards to the approval holder or users of SCBAs manufactured under the approval numbers granted to these products.

Actions to be Taken by the Fire Departments With SCBAs Involved in an Incident

- Any SCBA unit involved in an incident may not be placed back in service until the SCBA has been repaired, tested, cleaned, and any damaged components replaced and inspected by a qualified service technician, including such testing and other maintenance activities as prescribed by the schedule from the SCBA manufacturer
- All SCBA units, even those not involved in an incident, must undergo a flow test on at least an annual basis

Actions the PPE Users, Selectors, and Purchasers May Take to Further Protect Themselves and Others from Hazards

- Sign up for NPPTL's Listserv at <https://www.cdc.gov/niosh/npptl/sub-NPPTL.html> to receive email notifications relevant to PPE

To request additional information about this report, contact NPPTL at ppeconcerns@cdc.gov, and reference NIOSH Task Number 21198 in your request.

For more information related to personal protective equipment, visit the NIOSH website www.cdc.gov/niosh/npptl.

To receive documents or other information about occupational safety and health topics, contact NIOSH:

Telephone: 1-800-CDC-INFO (1-800-232-4636)

TTY: 1-888-232-6348

CDC INFO: www.cdc.gov/info

Or visit the NIOSH website at www.cdc.gov/niosh.

For a monthly update on news at NIOSH, subscribe to *NIOSH eNews* by visiting www.cdc.gov/niosh/eNews.

Appendix Photographs to Support Inspection Findings for SCBA unit #12, unit #13, unit #14, unit #18, unit #19, and unit #Unknown

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Figure 1: All components of SCBA unit #12 to be examined



Figure 2: Top view of facepiece



Figure 3: Facepiece hairnet and straps



Figure 4: Side view of facepiece, skirt, and nosecup



Figure 5: MMR attached to facepiece

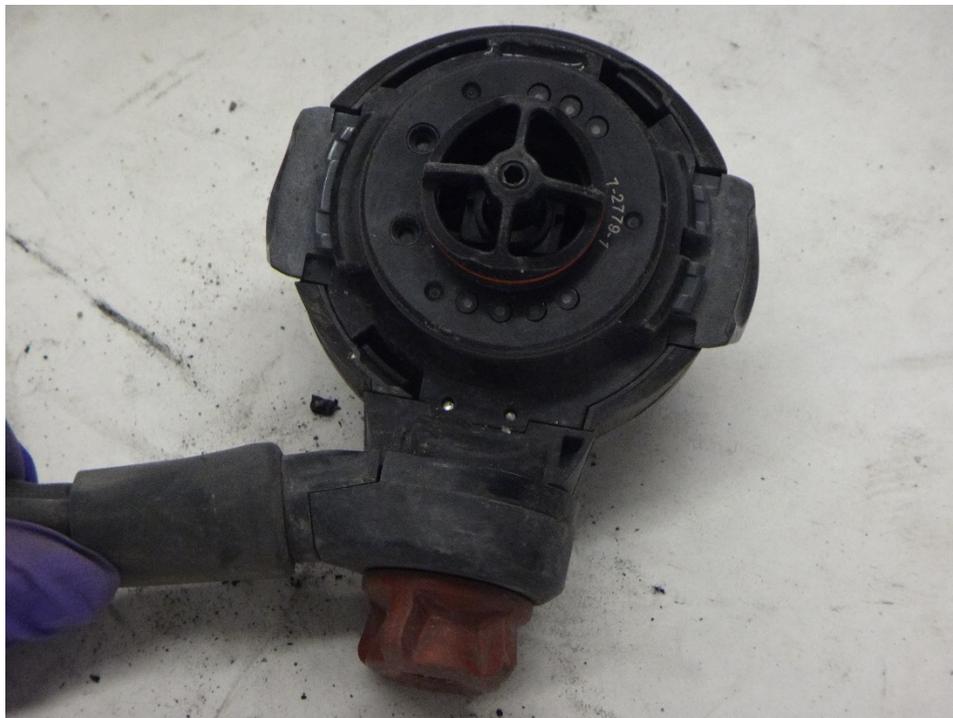


Figure 6: MMR with identifying markings



Figure 7: MMR and low pressure line



Figure 8: Low pressure line through shoulder strap



Figure 9: Low pressure hose attachment to SCBA



Figure 10: PASS console and medium pressure line



Figure 11: Back of PASS



Figure 12: High pressure hose and cylinder attachment



Figure 13: Cylinder attachment

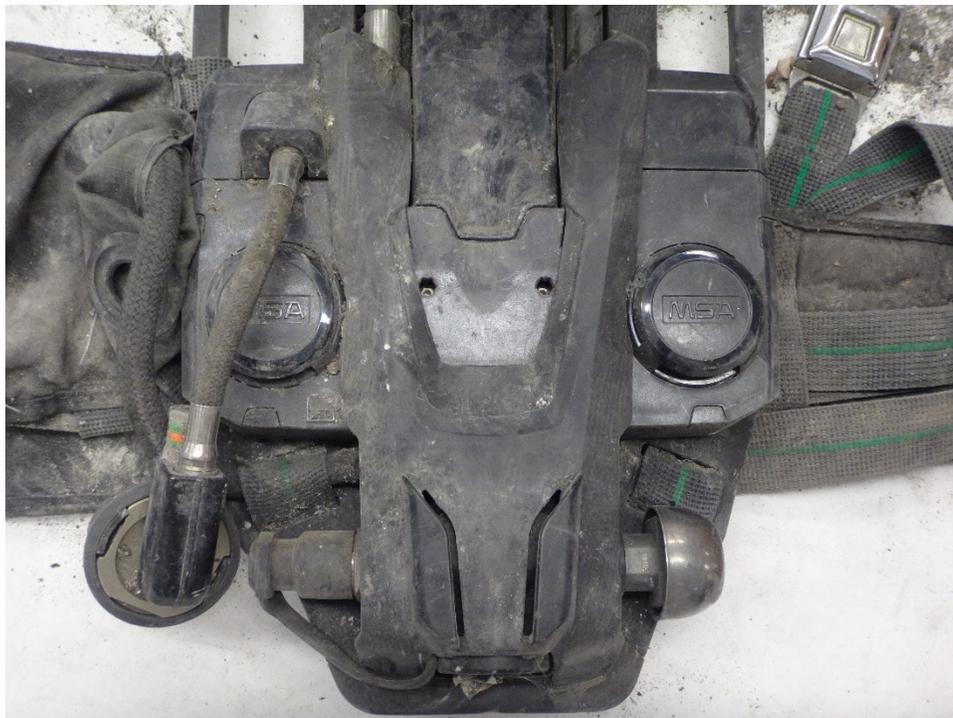


Figure 14: Top view of power module



Figure 15: Bottom view of power module



Figure 16: Quick-Fill adapter



Figure 17: Bell assembly



Figure 18: Top view of cylinder strap



Figure 19: Cylinder strap and backframe



Figure 20: Heat damage to side rail



Figure 21: Right side straps and buckles



Figure 22: Communication device and left side straps and buckles



Figure 25: Overall of waist belt, straps, and buckles



Figure 26: Top view of shoulder straps, waist belt, and buckles



Figure 27: Cylinder gauge



Figure 28: Cylinder assembly and quick connect adapter



Figure 29: Top view of cylinder



Figure 30: All components of SCBA unit #13 to be examined



Figure 31: Facepiece nosecup and inside view



Figure 32: Facepiece side view



Figure 33: Facepiece hairnet and straps



Figure 34: Top view of facepiece with MMR attached



Figure 35: Top view of MMR



Figure 36: Inside flange of MMR



Figure 37: Low pressure line and MMR



Figure 38: Inside view of pressure reducer assembly with “The Fire Store” Sticker

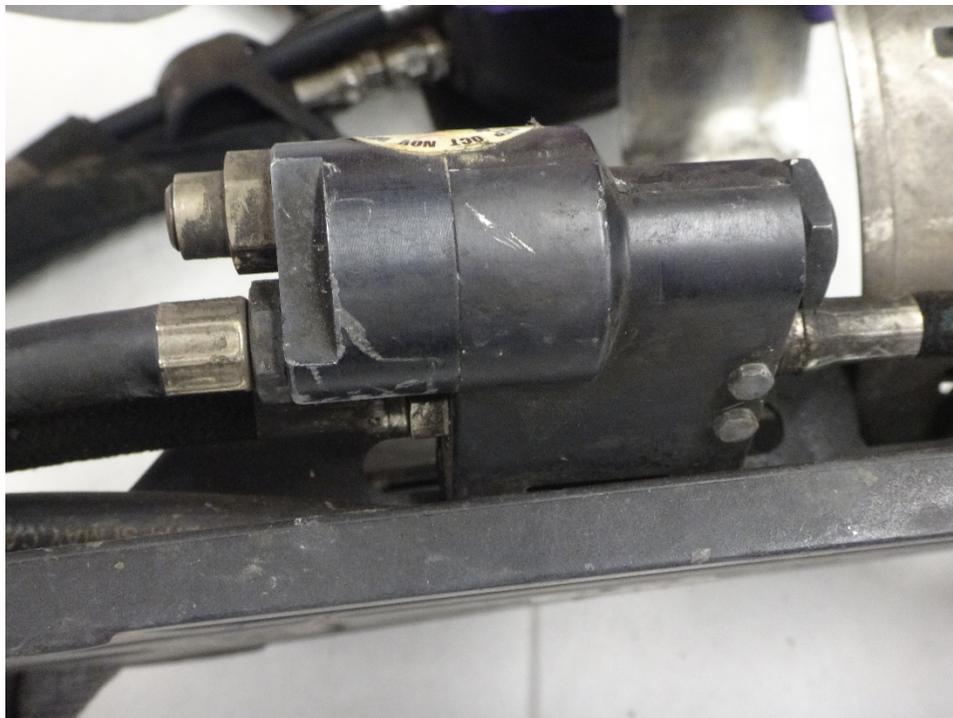


Figure 39: Bottom view of pressure reducer assembly



Figure 40: High pressure hose and cylinder attachment

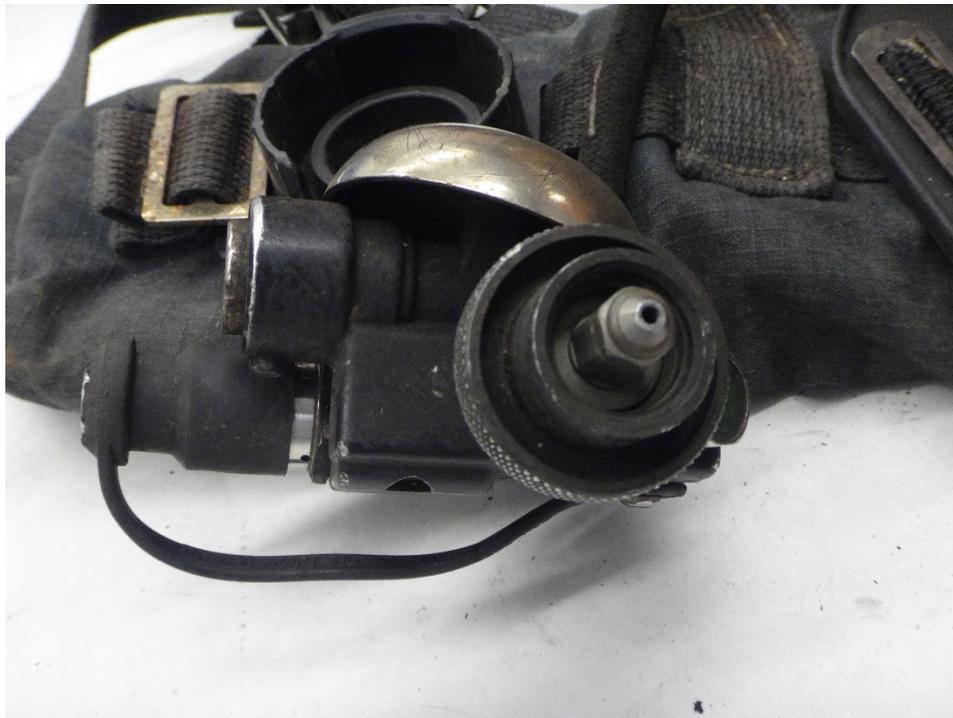


Figure 41: Cylinder attachment threads



Figure 42: Dust cap for the RIC UAC system connector



Figure 43: Heat damage and melted debris on medium pressure lines to PASS console



Figure 44: PASS control console



Figure 45: SEI label on the back of the PASS console

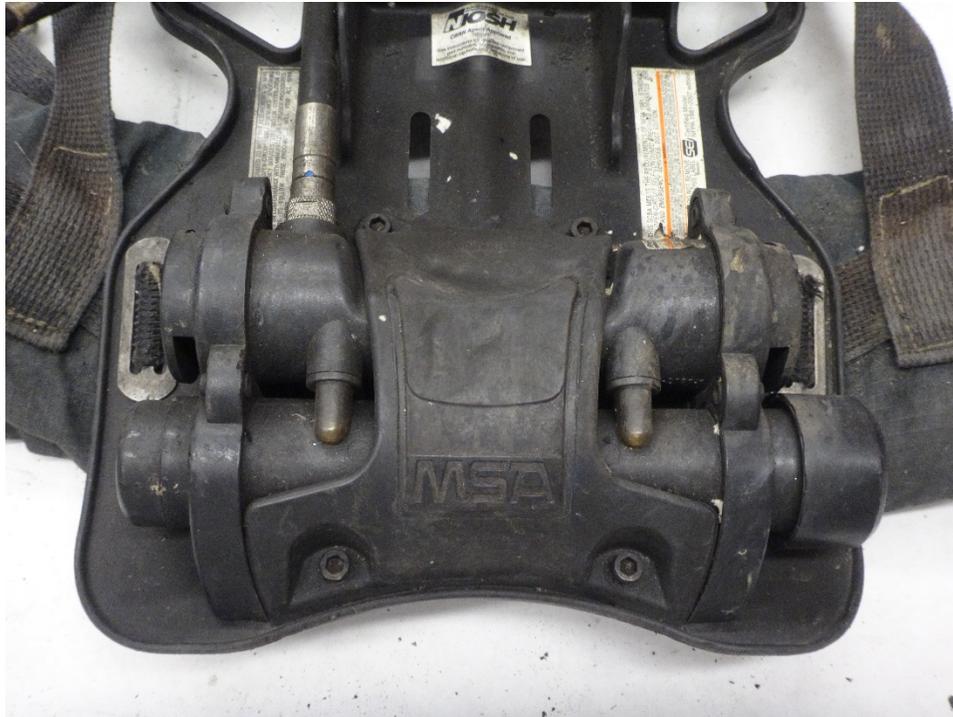


Figure 46: Control module



Figure 47: Side view of control module

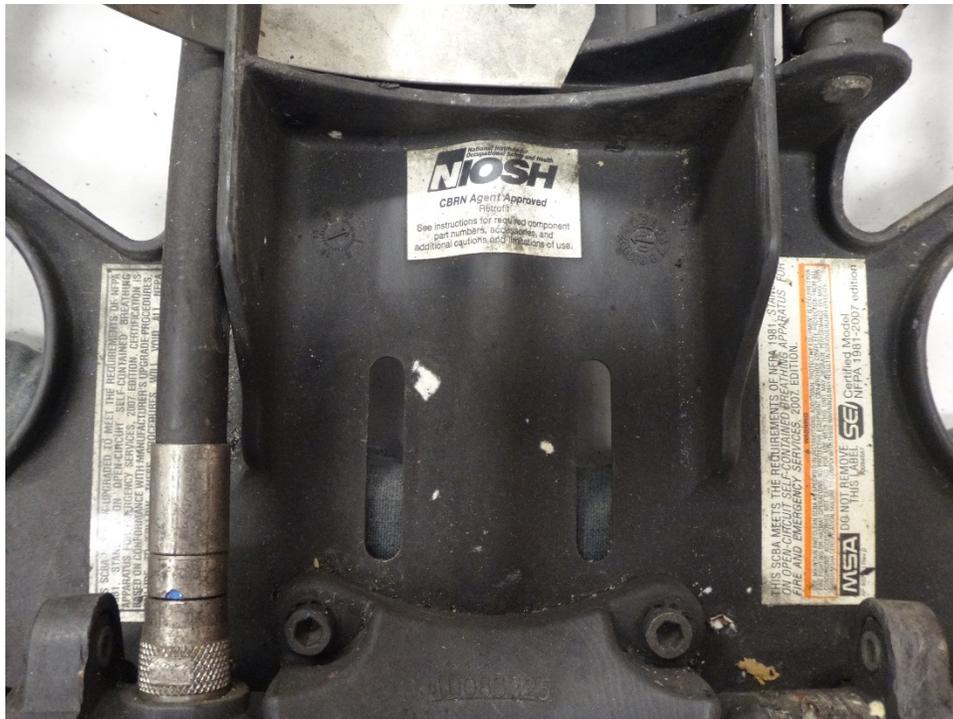


Figure 48: Labels on backframe

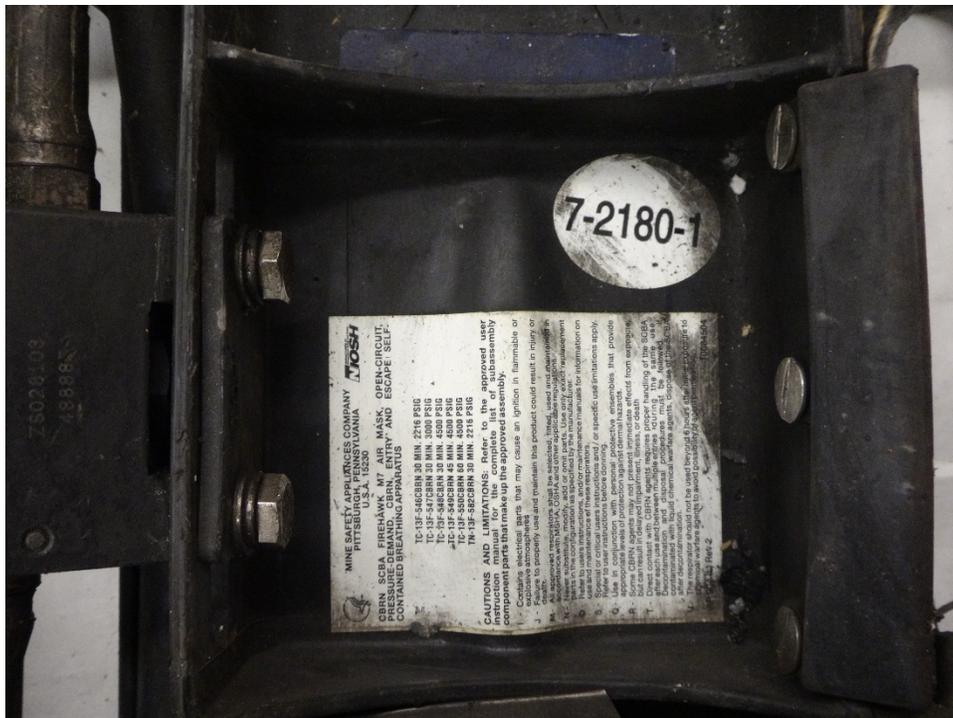


Figure 49: Backframe and NIOSH label



Figure 50: Heat damage to waist belt



Figure 51: Top view of waist belt



Figure 52: Top view of backframe, straps, and buckles



Figure 53: Cylinder gauge



Figure 54: View of cylinder threads

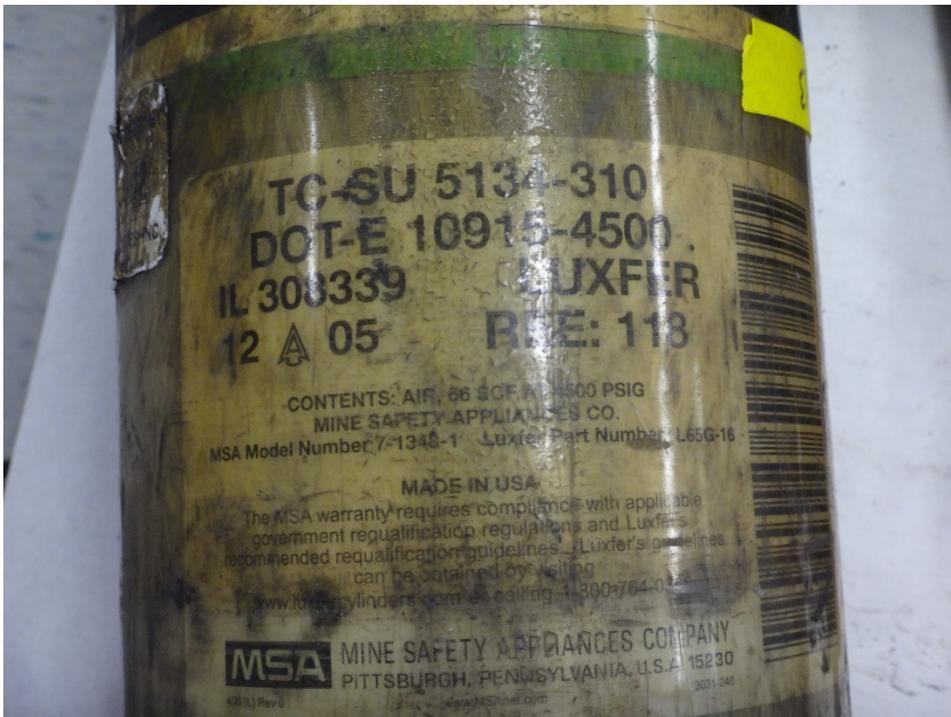


Figure 55: Cylinder information label



Figure 56: Top view of cylinder



Figure 57: All components of SCBA unit #14 to be examined



Figure 58: Top view of facepiece



Figure 59: Side view of facepiece



Figure 60: Facepiece hairnet and straps



Figure 61: Inside view of facepiece and nosecup



Figure 62: MMR attached to facepiece



Figure 613: Sealing flange of MMR and low pressure line



Figure 624: Low pressure line connecting link and shoulder strap



Figure 65: Pressure reducer assembly inside view



Figure 66: Pressure reducer assembly and "The Fire Store" sticker



Figure 637: Debris melted to bottom of unit



Figure 648: Melted debris removed



Figure 659: High pressure line and cylinder attachment attached



Figure 70: Cylinder attachment removed



Figure 71: Damaged medium pressure line and shoulder strap



Figure 72: Cylinder attachment threads and bell assembly



Figure 73: Side view of PASS console



Figure 74: Back view of PASS console



Figure 75: Top view of PASS console



Figure 666: Control module



Figure 677: Left view of damage to control module and backframe



Figure 688: Right view of damage to control module and backframe



Figure 699: Top view of backframe and NIOSH sticker



Figure 8070: Labels on backframe



Figure 81: Cylinder strap



Figure 82: Labels on back of backframe



Figure 8371: Corroded buckles



Figure 84: Top view of waist belt, straps, and buckles



Figure 85: Top view of cylinder



Figure 726: Damaged cylinder gauge



Figure 737: Cylinder labels



Figure 748: Cylinder threads



Figure 759: Melted debris on cylinder



Figure 9076: All components of SCBA unit #18 to be examined



Figure 91: Top view of facepiece with attached MMR



Figure 92: Inside view of facepiece and nosecup



Figure 93: Side view of facepiece and hairnet



Figure 774: Inside flange of MMR



Figure 95: Low pressure line, connecting link, and damaged shoulder strap



Figure 786: Side view of pressure reducer with labels



Figure 797: Pressure reducer with "The Fire Store" sticker



Figure 808: High pressure line, bell assembly, and cylinder attachment



Figure 99: Medium pressure line and PASS console



Figure 81: Back of PASS console



Figure 10182: Top view of control module



Figure 102: NIOSH approval sticker on backframe

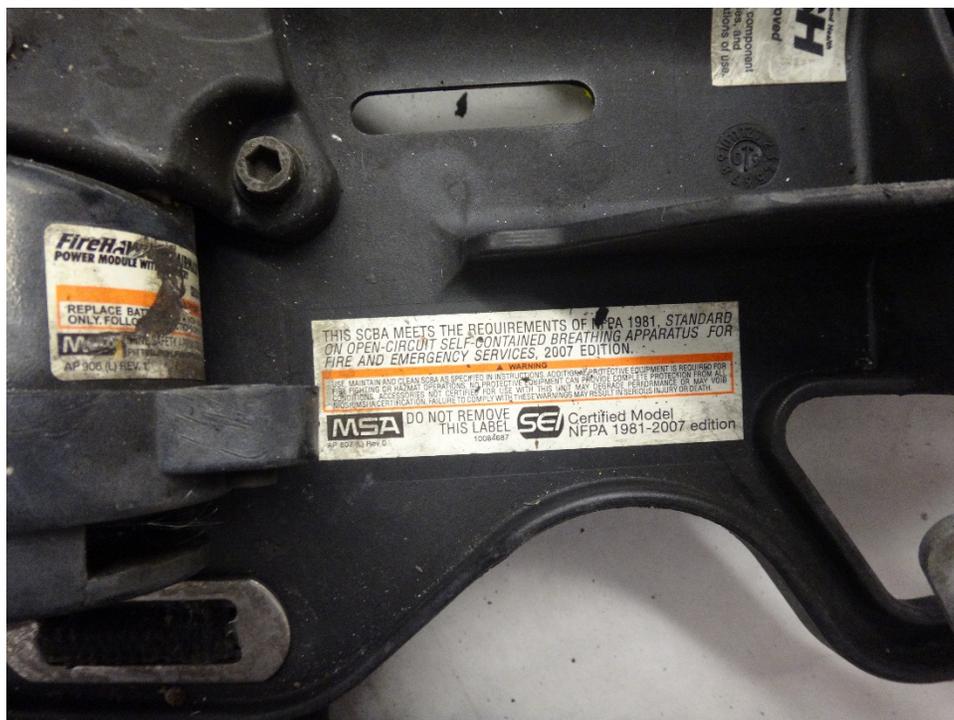


Figure 10383: Labels on backframe

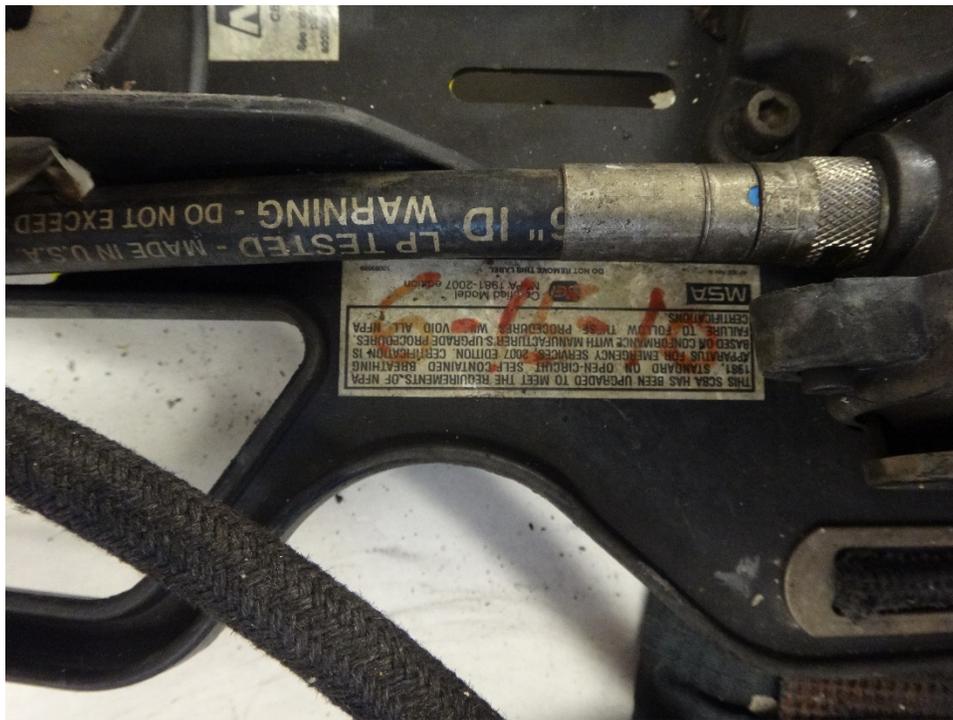


Figure 104: Other markings on backframe



Figure 105: Cylinder strap



Figure 846: CBRN label and other stickers



Figure 857: Top view of back of backframe



Figure 868: Top view of damage to waist belt



Figure 879: Damage of left shoulder strap

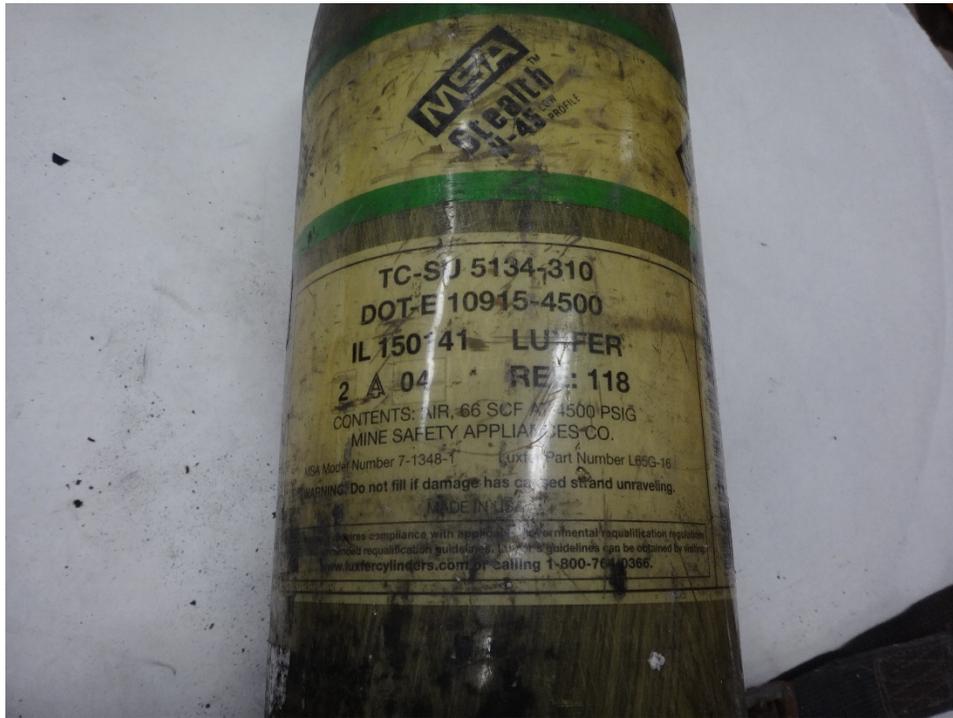


Figure 8810: Cylinder label information

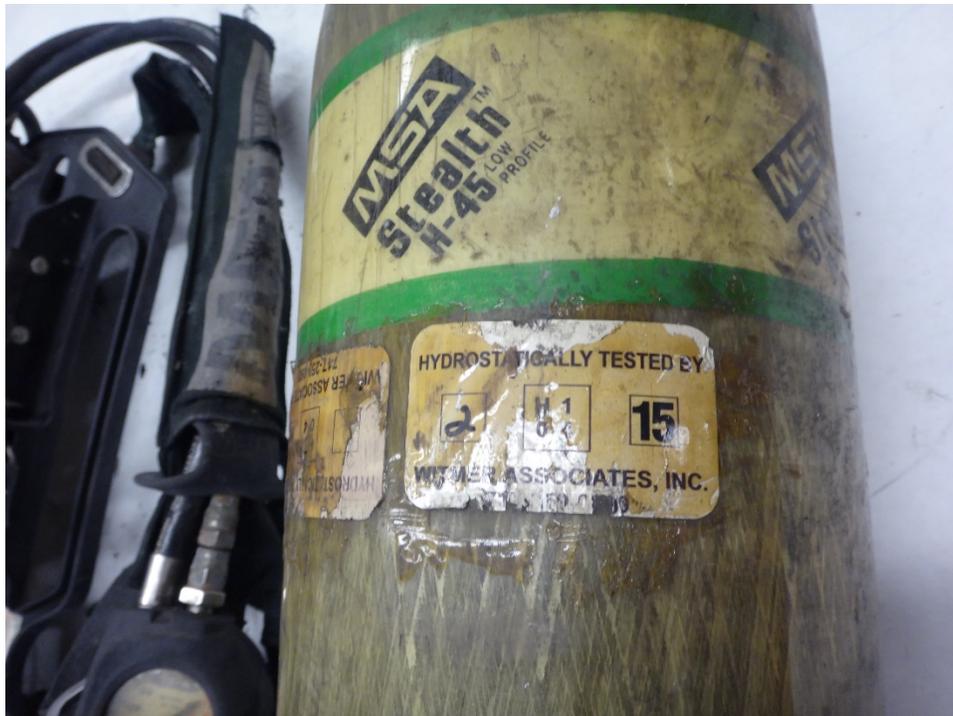


Figure 8911: Other markings and stickers on cylinder



Figure 9012: Cylinder gauge



Figure 9113: Top view of cylinder



Figure 9214: All components of SCBA unit #19 to be examined



Figure 9315: Top view of facepiece



Figure 946: Side view of facepiece, hairnet, and straps



Figure 957: Inside view of facepiece and nosecup



Figure 968: Inside flange of MMR with identifying markings



Figure 979: Low pressure line and connecting link



Figure 9820: Low pressure line running through shoulder strap

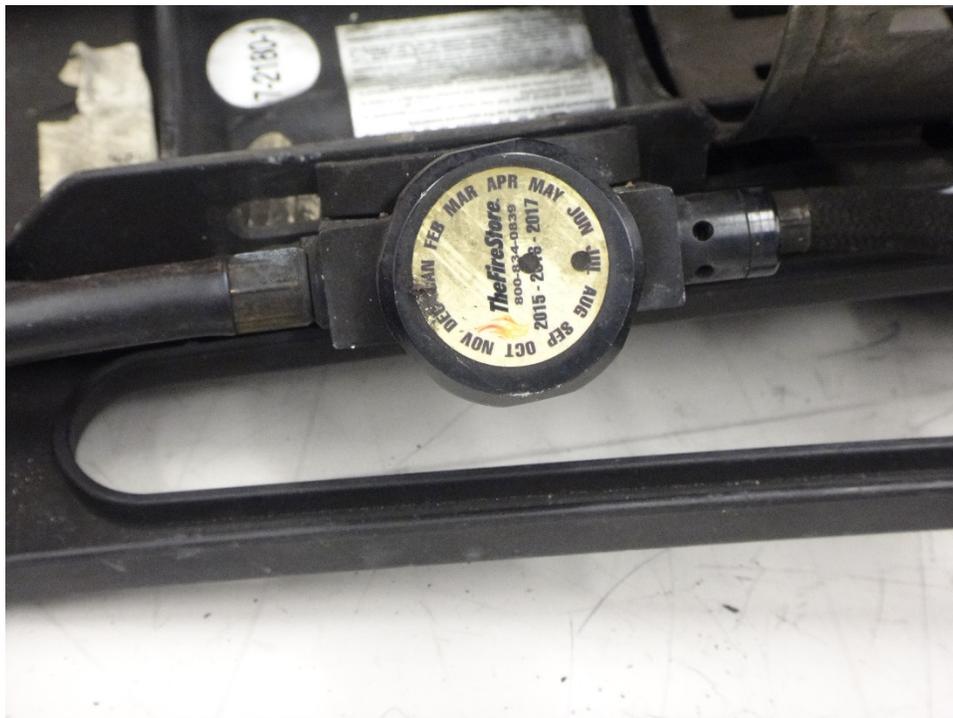


Figure 9921: Pressure reducer assembly with "The Fire Store" sticker

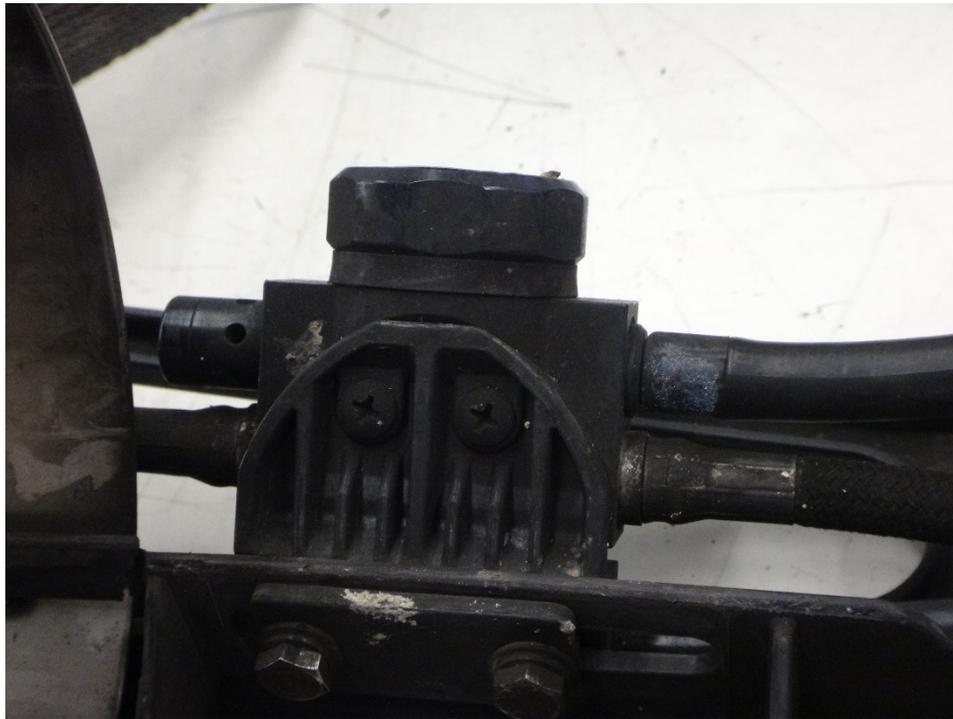


Figure 10022: Inside view of pressure reducer assembly



Figure 10123: High pressure hose, bell assembly, and cylinder attachment



Figure 10224: Dust cap for the RIC UAC system connector



Figure 10325: Top view of shoulder strap and PASS console



Figure 1046: Top view of PASS console



Figure 1057: Back view of PASS console



Figure 1068: Top view of control module



Figure 1079: Side view of control module



Figure 10830: Top view of top of backframe with identifying labels



Figure 10931: Cylinder strap



Figure 11032: Identifying labels on back of backframe



Figure 11133: Top view of waist belt, straps, and buckles

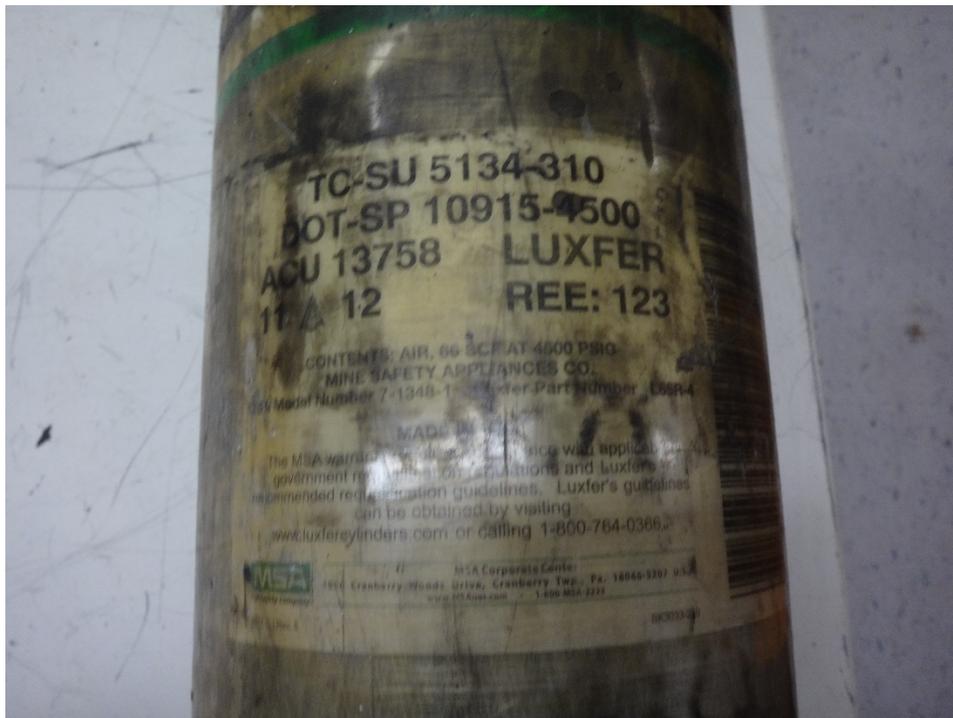


Figure 11234: Cylinder information label



Figure 11335: Cylinder gauge



Figure 1146: Cylinder threads



Figure 1157: Top view of cylinder



Figure 1168: All components of SCBA unit #Unknown to be examined



Figure 1179: Top view of facepiece with attached MMR



Figure 1180: Inside view of facepiece and nosecup



Figure 11941: Inside flange of MMR with identifying markings



Figure 12042: Low pressure hose and connecting link



Figure 121: Pressure reducer assembly with "The Fire Store" sticker



Figure 12244: Outside view of pressure reducer assembly



Figure 12345: High pressure hose, cylinder attachment, and bell assembly



Figure 1246: Cylinder attachment threads and O-ring



Figure 1257: PASS console



Figure 12850: View of SEL label on back of backframe



Figure 12951: Top view of backframe



Figure 13052: Cylinder strap



Figure 13153: Top view of straps and buckles

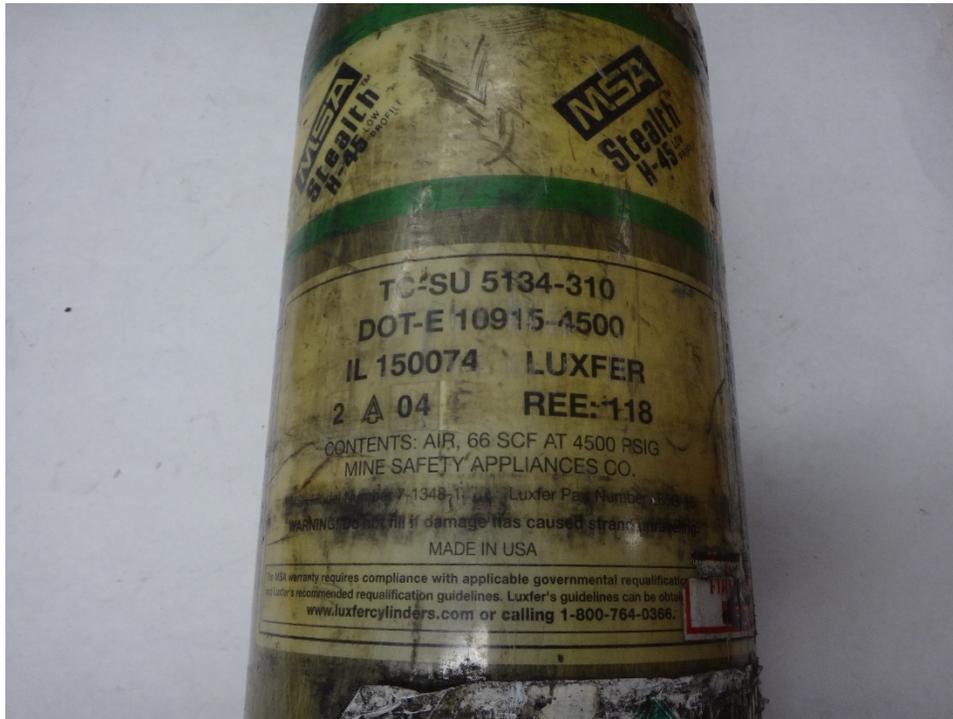


Figure 132: Cylinder label



Figure 1335: Hydrostatic test sticker



Figure 1346: Cylinder gauge



Figure 1357: Cylinder threads



Figure 1368: Top view of cylinder

Disclaimer

The purpose of this effort was to determine the conformance of a 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.

