Suffolk, VA. Fire & Rescue

Near Miss Injury Report

Two Firefighters Injured by Wall Collapse during a Residential Garage Fire

144 Five Mile Road

March 11, 2019

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Suffolk, VA. Firefighters Injured in Wall Collapse

Executive Summary

Fire ground photo

(Courtesy of Suffolk Fire & Rescue)

On March 11, 2019, a 45-year-old Lieutenant and a 43-year-old firefighter sustained injuries when a wall collapsed during a fire at a detached, residential garage fire.

Crews arrived on scene to find heavy fire showing from 25’ x 40’ detached garage. There was an approximately 8-foot walkway separating the home from the garage. The fire was already encroaching on the main home and entering through the soffits. There were two automobiles in front of the garage, which were also beginning to burn, as well, as another home on the Delta side, which sustained minor thermal damage.

Crews had been operating for about 8 minutes when a wall collapsed, pinning the Lieutenant beneath the rubble. A subsequent “MAYDAY” was transmitted and crews sprang into action.

Suffolk, VA. Firefighters Injured in Wall Collapse

Contributing Factors

- *Well involved building fire upon arrival of firefighters (approximately 90% of the garage)*
- *Type 5 building construction with an unprotected steel beam*
- *Significant heat and direct flame impingement on construction materials*

Key Recommendations

- *Situational awareness and the identification of compromised building construction are paramount.*
- *The complete and proper use of personal protective gear (PPE) is needed to minimize firefighter injuries and fatalities.*
- *Company officers and Incident Commanders should consider the amount of fire, potential types of burning materials and building construction when determining the appropriate gallons per minute (GPM) needed to overcome the British Thermal Units (BTU) produced by the fire.*
- *Assignment of Rapid Intervention Team (R.I.T.) early in the event*

Suffolk, VA. Firefighters Injured in Wall Collapse

Introduction

On March 11, 2019, a 45-year-old Lieutenant and a 43-year-old firefighter sustained injuries when a wall collapsed during a fire at a detached, residential garage fire. On March 12, 2019, Fire Chief Mike Barakey ordered an internal investigation into the fire. He directed oversight to be coordinated by the department's Health and Safety Battalion Chief (HSC). The HSC, along with members of our operations division, turnout gear team, self-contained breathing apparatus (SCBA) technicians and the fire marshal's office (FMO) immediately launched the investigation.

Our Department

At the time of the fire, our career department operated out of 9 fire stations with 271 uniformed officers and firefighters and 30 part-time medics. We served a population just short of 100,000 within 432 square miles.

At the time of the incident, we operated 11 engines, 3 ladders, 1 heavy rescue, 4 tankers, 5 brush trucks, a rehab bus and 8 ALS medics. Our specialty teams included technical rescue, maritime incident response (MIRT) and communications teams.

Training and Experience

Suffolk Fire & Rescue requires all career firefighters to complete training equivalent to the National Fire Protection Association (NFPA) 1001, *Standard for Fire Fighter Professional Qualifications* [NFPA 2013]. This includes up to 8 months of fire recruit training at the Hampton Roads Regional Fire Academy. After academy graduation, new firefighters are placed on a 1 year, supervised probation and required to complete a probationary fire fighter red book training program. Additionally, all career firefighters are required to meet monthly and yearly training hour standards set forth by fire administration. This training regimen is based off the recommendations of the *Center for Public Safety Excellence Accreditation* manual, 9th edition, 2015.

144 Five Mile Road (aerial view)

(Courtesy of Suffolk Fire & Rescue)

Structure

The incident occurred outside of the detached, residential garage built in 1973. The 1 ½ story, 25’ x 40’, 2 car garage featured approximately 989 square feet of space, 2 separate garage doors and upstairs storage space supported by a full length (~25’) steel I-beam. Both the home and the garage were type 5 building construction with a brick veneer finishing.

Weather

At the time of the incident, sky conditions were mostly clear. The temperature was 64 degrees F. Dew point was 57 degrees with a relative humidity of 78%. Winds were West Southwest at 7 MPH (Norfolk International Airport).

The MAYDAY Event

On March 11, 2019, a 45-year-old Lieutenant and a 43-year-old firefighter sustained injuries when a wall collapsed during a fire at a detached, residential garage fire. The pair started their shift at 0800. The Lieutenant had been off for 19 hours following a brief 5-hour overtime stint on March 10, 2019, from 0800-1300. Her firefighter that day is assigned to B shift and had worked his regularly scheduled, 24-hour shift on March 10, 2019. He was starting day 2 of a 48-hour shift tour. He recalled getting a full night's sleep on March 10, 2019 and stated they didn't run any calls that entire shift.

First line placed into operation

(Courtesy of Suffolk Fire & Rescue)

At 0927, the station alarm sounded sending the crew of Engine 9 to a residential structure fire. The initial reports from dispatch indicated a detached garage on fire with heavy fire and smoke visible. The home is located in a partially rural area of the city, so the Lt. dropped her 4th firefighter and had him respond on Tanker 9. This is a normal practice

for this station. They are required to have a 4-person minimum staffing assignment due to the potential need of the tanker. Included in the response was 1 battalion chief, 2 additional engines, 1 aerial tower, 1 additional tanker, 1 safety officer, 1 EMS supervisor and 1 ALS medic. The fire chief, 2 additional battalion chiefs and 2 assistant fire marshals self-dispatched as well.

At 0934, Engine 9 arrived on scene and reported heavy fire from a detached garage with exposures. Within seconds of Engine 9's arrival, Battalion 3 (Battalion Chief J. Broglin) arrived on scene and established "Five Mile Road Command". Engine 9 had already stretched their Courtyard Lay toward the alpha side. This load consists of a 2.5" feeder hose, gated wye and 100' of 1.75" attack line. The line is equipped with an Akron, select-a-flow fog nozzle preset to 95 GPM. Command began ordering assignments to other units as they arrived. Ladder 6 was assigned as the Rapid Intervention Team (R.I.T.) and quickly set up in the front yard.

Engine 9 was directing their stream into an alpha side window and attempted to make their way down the narrow pathway to the bravo side garage door. As they began progressing that way, the Lt. realized they were not effectively stopping the fire's forward progress. She made the call to retreat back to the alpha side front yard. Seconds later, at 0942, the exterior walls of the garage came crashing down. Car 1 (Fire Chief Mike Barakey) witnessed the collapse and made the Mayday declaration. This prompted a series of events, including the activation of the R.I.T. The R.I.T. also witnessed the collapse, so they were among the first rescuers to get to the downed firefighter. Just prior to the collapse, the R.I.T. Captain (Captain K. Johnson) noticed the imminent wall failure and yelled "WALL" several times. This action prompted Engine 9's Lieutenant to

forcefully push her firefighter away. Her action likely kept both members from being pinned beneath the rubble. With the firefighter being pushed away by his Lieutenant, he was saved from the collapse, but not from injury. He immediately began the rescue operation of freeing his leader. While performing rescue operations, he received burns to his arms and hands. The rescue operation lasted less than a minute before the Lieutenant was removed from the debris and into the clear front yard. The Mayday event was then officially declared over.

Although the rescue lasted a short time, it will have lasting effects on our members. Engine 9's Lieutenant suffered a broken clavicle, bilateral leg burns, numerous abrasions and bruises, as well as, a possible rotator cuff injury. Her firefighter received compression burns to his arms and hands during the rescue. All members on scene, all of those listening to the radio, including our dispatchers, and of course our injured will forever be reminded of this event.

Investigation

Our Fire Marshal's office (FMO) was already on scene and working on their investigation when the Mayday occurred. They immediate began assisting our crews by securing the area and starting a chain-of-custody for all of the affected gear and equipment.

The investigation into the cause of fire now included the cause of the collapse, which injured our personnel. Data collection, including the scene examination and witness interviews, were conducted for several days and concluded on March 15th 2019. After an analysis of the available data, it is the conclusion of the investigators that the area of origin was in the front and middle area of the garage between the garage doors. The cause of the fire was not identified.

Investigators utilized the Scientific Method during the course of the investigation, as recommended by the 2014 edition of NFPA 921 Guide for Fire & Explosion Investigations, which defines the Scientific Method as: "The systematic pursuit of knowledge involving the recognition and definition of a problem; the collection of data through observation and experimentation; analysis of the data; the formulation, evaluation and testing of a hypothesis; and, when possible, the selection of a final hypothesis."

Investigators gathered available data (information) related to the event and, based on that data, investigators developed and tested hypotheses as to the origin and cause of the fire. When all reasonable theories had been vetted against the known data, a conclusion was drawn.

Fire Scene Examination

Investigators began the examination with the exterior of the structure. The front of the garage or alpha side (going clockwise to Bravo, Charlie,

and Delta) had no standing walls. The Bravo side towards the Alpha corner had collapsed but was caught approximately 3 feet above the ground which is the area where the Firefighter went down and the Mayday was called. Approximately 10 feet from the Alpha/Bravo corner is a total collapse of the Bravo side wall and past that it is standing, but leaning. The Charlie side wall was standing. The Delta wall had completely collapsed.

The interior of the structure was then examined. There was a panel box in the Bravo/Charlie corner; however, FM were unable to access it due to the unsafe and unstable structure. The I beam was found to run from side Bravo to side Delta but was twisted multiple times. There were multiple scooter remains found but mostly all interior items had been destroyed.

The area of fire origin included the void space above the hallway, above the white room, above the electrical room and above the two bathrooms on the south side of the parapet wall. The area of fire origin could not be specified any further based on the witness statements, fire patterns, arc mapping and an application of fire dynamics. The first fuel ignited could not be identified.

Hypothesis of the Mayday event is that the steel I beam began to expand and contort under the extreme heat and fire conditions, pushing the walls out. Once the crew began introducing cold water the beam began to shrink and contort at a much faster rate, which caused the failure and subsequent wall collapse.

It is the opinion of the investigators that the area of origin is in the middle of the Alpha side between the two garage doors. The ignition source could not be identified; however, long duration electrical faults such as failures of electrical components in the presence of wooden

building materials could not be eliminated. The first fuel could not be identified; however, large quantities of combustible materials were found throughout the structure.

Due to the severe fire, heat and smoke damage to the structure and the inability to identify an ignition source and first fuel, the cause of this fire is classified as undetermined.

Safety Equipment Testing and Inspections

Turnout Gear Inspections

All safety equipment, including turnout gear, SCBA's and face pieces of both firefighters were inspected by our in-house technicians. Our turnout gear inspectors determined that the Lieutenant's helmet was no longer able to be in service and was decommissioned. The rest of her gear was able to return to service; however, we were transitioning to a new gear manufacturer, so she will be issued new gear upon her return. The firefighter's gloves were not able to be completely checked without cutting them open. This occurred and they were deemed to have done their job, but were now no long useable. The rest of his gear returned to service. Since we were transitioning into the gear, which is what the firefighter was wearing, our technicians had not yet been fully trained to examine this gear.

Therefore, we had our dealer, Blue Ridge Rescue Suppliers, come to the station to examine and inspect this gear. This is the email we received upon completion of the inspection:

Suffolk, VA. Firefighters Injured in Wall Collapse

Chief Howard,

After examining and performing some testing on the PPE Coat that was damaged during a structure fire, I was able to determine that the coat is fit for use and able to be returned to service. The discoloration, or dye sublimation, is due to heat exposure. Either through direct contact or radiation, the fabric of the outer shell was exposed to temperatures at or above 550 degrees Fahrenheit. At this point the dye in the fabric began to sublime.

All outer shell fabrics in use today are made of inherently flame-resistant fibers — Nomex, Kevlar, PBI, etc. When fabrics constructed from these fibers are exposed to high heat, the first observable effect is loss of dye. The dye sublimes; that is, it goes from a solid to a vapor. Thus the fabric goes to its natural color, if it is dyed (not all shell fabrics are dyed).

This is why black fabrics turn brown or beige when exposed to high heat. When only small areas of the fabric are affected, dye sublimation by itself is not harmful to the protective qualities of the material. However, any signs of dye sublimation always warrant that the clothing be examined very closely for other forms of damage, particularly to trim and underlying material layers in the area of exposure. This is what we did today. In my professional opinion, your gear is fit to return to service.

Thank You,

***Jerry (*H. Jerry Hackney-Blue Ridge Rescue Suppliers - Regional Manager)**

SCBA Testing and Inspections

Background

On March 11th 2019, SCBA #SFD95 (E9 Officer's Position) was damaged during the collapse of a garage wall onto the user; Engine 9's Lieutenant. She stated she was "on air" when the event occurred and did not lose air flow after the collapse and subsequent damage to the SCBA unit. She also stated she continued to breathe effectively until she removed her face piece sometime after the collapse occurred.

SCBA Description: MSA NFPA 2007 Firehawk M7 4500psi
SCBA SFD Identification: SFD95
SCBA Serial Number: LAI205543KB.
M7 control module serial number: 4536607

Cylinder Description: Luxfer Carbon Wrap 45min 4500psi
Cylinder Manufacture Date: May 1st 2015
Cylinder SFD Identification: SFD 222
Cylinder Serial Number: ACU117811

SCBA Inspection

The SCBA was extensively examined, component by component in the conditioned received by the Suffolk Fire Marshal's office to determine the level of visual damage. The SCBA unit sustained major damage to the back plate assembly as the cylinder band was completely detached/broken (attachment 1). The cylinder sustained abrasions in several locations around the top portion/neck of the cylinder.

The overall condition of the face piece was fair to good with some dirt and debris, and no signs of visual damage. No other visual damage was noted to either of the remaining SCBA components as they were in good condition exhibiting only normal signs of wear and tear.

SCBA Testing

The purpose of the testing was to determine how well the SCBA conformed to the approval performance requirements of Title 42, *Code of Federal Regulations*, Part 84 (42 CFR 84). Further testing was conducted to provide an indication of the SCBA's conformance to the National Fire Protection Association (NFPA) Air Flow Performance requirements of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for the Fire Service*, 2013 Edition.

NIOSH SCBA Certification Tests (in accordance with the performance requirements of 42 CFR 84):
1. Positive Pressure Test [§ 84.70(a)(2)(ii)]
2. Rated Service Time Test (duration) [§ 84.95]
3. Static Pressure Test [§ 84.91(d)]
4. Gas Flow Test [§ 84.93]
5. Exhalation Resistance Test [§ 84.91(c)]
6. Remaining Service Life Indicator Test (low air alarm) [§ 84.83(f)]

National Fire Protection Association (NFPA) Tests (in accordance with NFPA 1981, 2013 Edition):
7. Air Flow Performance Test [Chapter 7, 7-1.1]

SCBA unit testing was performed by Fire Protection Equipment Company (FPEC). A representative from FPEC took possession of the SCBA unit with the cylinder from fire station 3's air maintenance room, on Wednesday, March 13th 2019. The cylinder was sent, by FPEC, to the Richmond office for testing. After testing, FPEC concluded the SCBA unit passed the NFPA flow tests with no adjustments needed (attachment 3). Data was downloaded from the SCBA control module, as related to the specific time frame for the incident. The findings were as follows:

Monday, March 3rd 2019
0745: SCBA unit turned on for approximately two minutes
0910: SCBA unit turned on with just over 4400 PSI of air. Regular breathing until 0918.

0918 to 0921: No air usage (SCBA Unit had approx. 3400 PSI of air)
0920: SCBA unit motion alarm activated
0921: SCBA unit turned off

After cylinder testing at the Richmond facility, it was concluded the abrasions were not deep enough to render the cylinder out of service. The cylinder also passed an interior inspection and it was noted the hydrostatic testing was within five years from the cylinder stamped date (May 1st 2015 – Manufactured Date), as required by DOT. All abrasions on the cylinder were coated with a poly for repair and the cylinder was hydro tested (new stamped date: March 17, 2019).

Attachment 1

(Photo courtesy of Suffolk Fire & Rescue)

Suffolk, VA. Firefighters Injured in Wall Collapse

FIRE PROTECTION EQUIPMENT CO.
7206 IMPALA DR.
RICHMOND, VA. 23228
PHONE: 1-800-296-5594
NORFOLK: 757-620-3768
FAX: 1-804-262-1023

DATE: 03/15/2019

SUFFOLK, VA FIRE – RESCUE

ATTN: B/C Wilson

RE: SCBA- MAYDAY

B/C Wilson,

On Wednesday March 13,2019 we picked up SCBA #SFD95, serial #LAI205543KB. M7 control module serial #4536607. MSA SCBA 45-minute 4500 PSI cylinder. (Cylinder was sent to our Richmond office. It is DOT certified to inspect and hydro cylinders)

The cylinder is being inspected at the Richmond office. We are waiting for the test results.

We inspected and flow tested the SCBA. The SCBA failed visual inspection due to the cylinder band being broken from the back frame. No other visual damage was noted.
SCBA passed NFPA flow test with no adjustments needed.

The data was downloaded from the control module. The data shows that the unit was turned on for a 2-minute check at 0745 hours on Monday 03/11/2019.
AT 0910 hours on 03/11/2019 the unit was turned on with just over 4400 PSI of air in the unit. The data shows regular breathing until 0918 hours. The data shows no air usage from 0918 until 0921. The unit had about 3400 PSI of air. At 0920 hours the motion alarm activated. The unit was turned off at about 0921 hours.

The unit has not been repaired.

Please let me know if there is anything else that you need.

Thank you
Herb Redfield

Suffolk, VA. Firefighters Injured in Wall Collapse

MSA
MMR/Firehawk 4500 PR14 S/N: LAI205543KB

Posi3 USB Test Results

3/15/2019 10:04:45 AM Complete SCBA Test

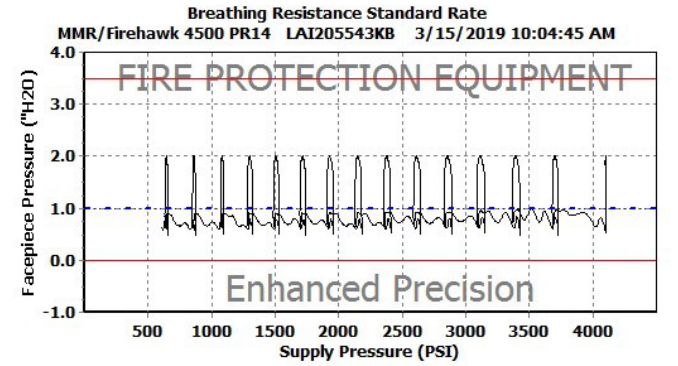
Suffolk Fire SFD95

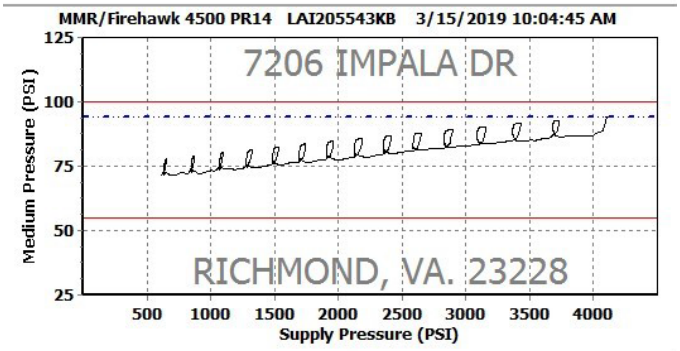
Posi3 USB serial # L05504 - Calibration was up to date when the test was performed

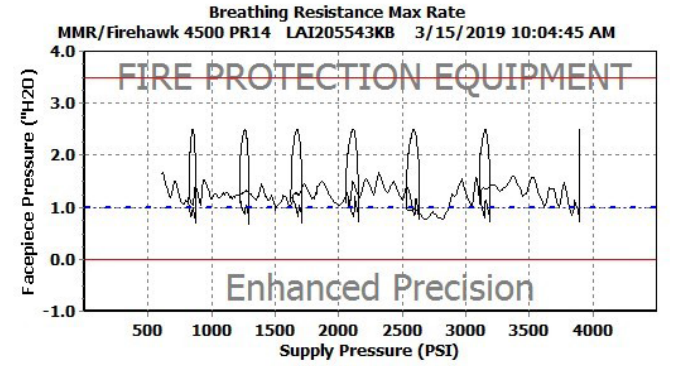
Auxiliary IDs	
Facepiece	
Second Stage	
First Stage/Reducer	
Low Pressure Alarm	
Cyl Connector	
Airline Attachment	
Harness	
Visual Inspection	
Facepiece	Not Perform
Backframe/Harness	Fail
Cylinder	Not Perform
Low Pressure Warning	Pass
Hoses	Pass
Manifold Volume: 0.098	

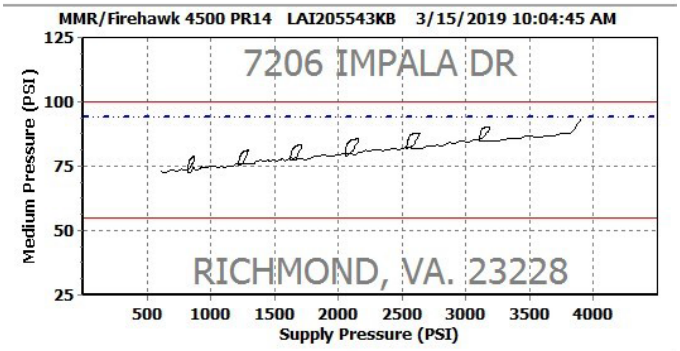
Functional Tests			
Exhalation Pressure	Pass	1.7	"H2O
Facepiece Leakage	Pass	0.1	"H2O
Static Facepiece Pressure	Pass	1.0	"H2O
Static Medium Pressure	Pass	94.1	PSI
Medium Pressure Creep	Pass	-1.3	PSI
1st Breath Activation	Pass	-6.9	"H2O
High Pressure Leakage	Pass	4	PSI
Bypass Pressure	Pass		
Alarm Activation Pressure			
MMR 4500 Bell	Pass	1174	PSI
Ringdown	Pass	86	PSI
Gauge Accuracy			
4500 PSI Numbers	Pass		

1000 ±225 PSI		2000 ±225 PSI		3000 ±225 PSI	
Pass	1113	Pass	2103	Pass	3125
MMR 4500 HUD			Pass		
25% (1125 ±85 PSI		50% (2250 ±100 P		75% (3375 ±100 P	
Pass	1172	Pass	2196	Pass	3282









Minimum	Maximum		***Breathing Results***	Minimum	Maximum	
0.5 "H2O	2.0 "H2O	Pass	Facepiece Pressure	0.7 "H2O	2.5 "H2O	Pass
71.3 PSI	94.2 PSI	Pass	Medium Pressure	72.5 PSI	93.3 PSI	Pass

Tested by: Tim Fletcher FPEC EP Page 1 Version 4

Suffolk, VA. Firefighters Injured in Wall Collapse

MSA

MSA
MMR/Firehawk 4500 PR14 S/N: LAI205543KB

Posi3 USB Test Results

3/15/2019 10:04:45 AM Complete SCBA Test

Suffolk Fire SFD95

Posi3 USB serial # L05504 - Calibration was up to date when the test was performed

Auxiliary IDs	
Facepiece	
Second Stage	
First Stage/Reducer	
Low Pressure Alarm	
Cyl Connector	
Airline Attachment	
Harness	
Visual Inspection	
Facepiece	Not Perform
Backframe/Harness	Fail
Cylinder	Not Perform
Low Pressure Warning	Pass
Hoses	Pass
Manifold Volume: 0.098	

Functional Tests			
Exhalation Pressure	Pass	1.7	"H2O
Facepiece Leakage	Pass	0.1	"H2O
Static Facepiece Pressure	Pass	1.0	"H2O
Static Medium Pressure	Pass	94.1	PSI
Medium Pressure Creep	Pass	-1.3	PSI
1st Breath Activation	Pass	-6.9	"H2O
High Pressure Leakage	Pass	4	PSI
Bypass Pressure	Pass		
Alarm Activation Pressure			
MMR 4500 Bell	Pass	1174	PSI
Ringdown	Pass	86	PSI
Gauge Accuracy			
4500 PSI Numbers	Pass		

1000 ±225 PSI		2000 ±225 PSI		3000 ±225 PSI	
Pass	1113	Pass	2103	Pass	3125
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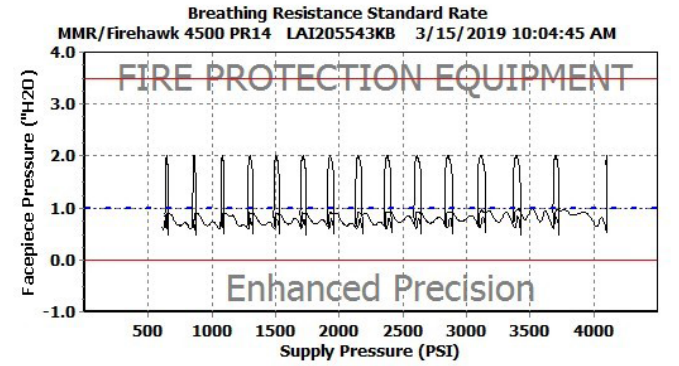

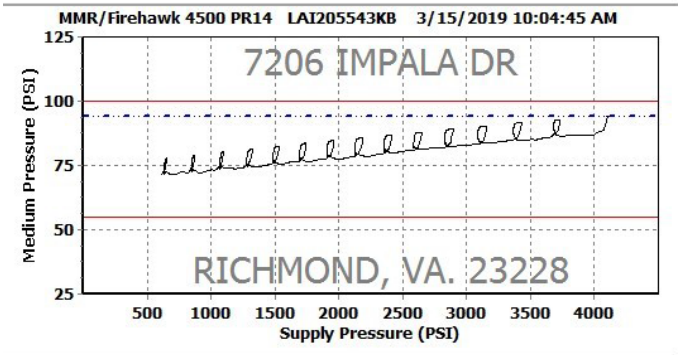

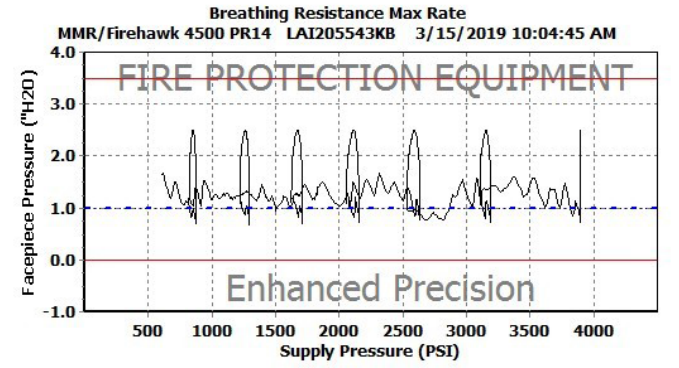

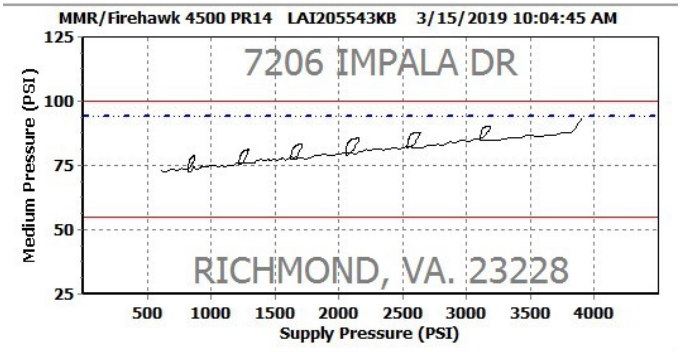

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Tested by: Tim Fletcher

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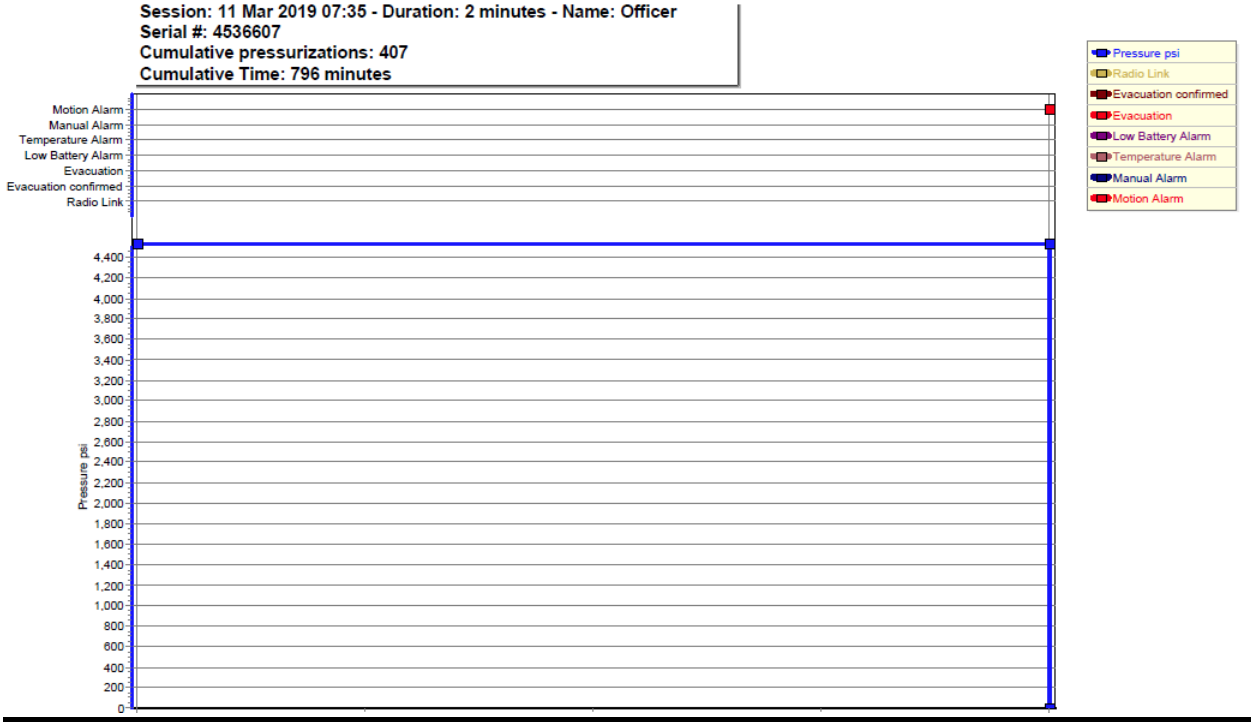

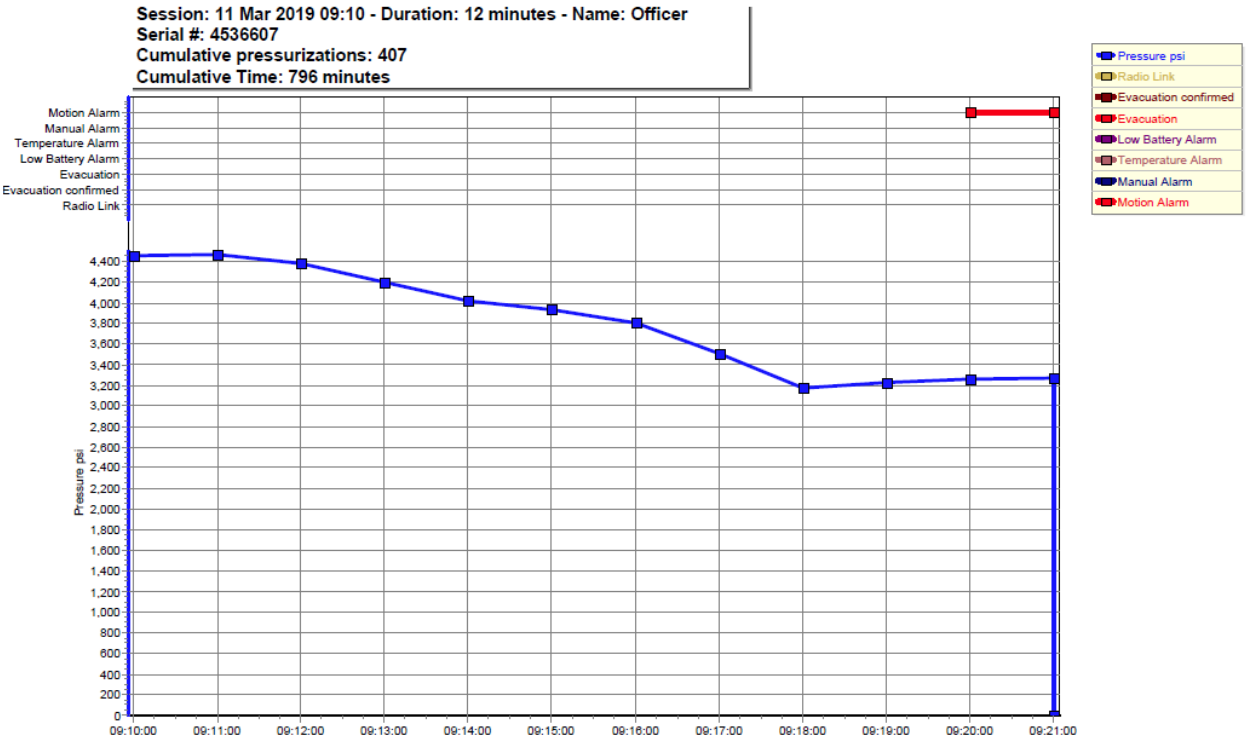

SCBA Conclusion

SCBA #95 will be placed back in service once it is cleaned and any damaged components replaced and inspected by a Suffolk Fire & Rescue qualified service technician, including such testing and other maintenance activities, as prescribed by the schedule from the SCBA manufacturer. The cylinder has been cleaned and placed back in service. The face piece was inspected and function tested by a SF&R qualified service technician and passed with no adjustments required. The face piece was cleaned and placed back in service.

Conclusion

This fire was a classic example of how quickly our job can become disastrous. These fires, the ones that seem “routine”, are the ones that kill and hurt more firefighters across our country. Our safety team at Suffolk Fire & Rescue believes that the key recommendations listed in this report will prevent further near misses, such as this one, while still allowing for effective and efficient fire suppression operations.

Our firefighter received follow up treatment for his injuries and returned to full, active duty on March 19.

Our Lieutenant remains out of work and under the care of skilled physicians. She continues to suffer from pain, but is working hard in rehab to regain her strength and flexibility. She is slowly healing and her prognosis of returning to active duty is hopeful.

This is reported was completed by Battalion Chief James Broglin, Suffolk Fire & Rescue’s Health and Safety Officer. Thank you Battalion Chief David Harrell, Battalion Chief John Wilson, Battalion Chief Barney Howard, Captain Nick Savage, Fire Investigator Chris Balassone, Fire Investigator Ed Kaczkowsky, Jerry Hackney (Blue Ridge Rescue Suppliers) and Herb Redfield (Fire Protection Equipment Company) for providing information and data for this report.