Ga. Smoke Diver

Self Contained Breathing Apparatus and Emergency Procedures Manual

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Breathing Apparatus History

The need for respiratory protection became evident after leather fire hose was invented. Once firefighters were able to move water through hoses the need to get to the seat of the fire became the next obstacle.

Breathing Apparatus Time Line

1825 – Apparatus Aldini was tested in France (Asbestos Hood)

1863 – Lacour's Improvised breathing apparatus (Self Contained – Bag of air carried on the wearers back)

1915 – Gibbs SCBA (First successful SCBA used in the U.S.)

1945 – Scott Aviation introduces the AirPak

Early American firefighters had to face not only fire and the effects of heat with little or no water supply, but also the debilitating effects of smoke with nothing at all to protect them. As was the case for firemen all over the world, they could not effectively operate under the heavy smoke conditions encountered during structure fires. Fire service folklore recounts the practice of firemen growing long beards to help them breathe heavy smoke. The theory was a fireman would dip his whiskers in a pail of water, then clinch his wet beard between his teeth and breathe through his mouth, using the wet beard as a filter.

The scientific testing by Aldini was ground breaking. He conducted tests of his apparatus under actual fire conditions. This was the start of serious efforts to protect firefighters from smoke as they operated at fires.

In 1863, a patent was granted to A. Lacour for his invention, the "improved respiring apparatus." This was actually a self-contained breathing apparatus of sorts and consisted of an airtight bag made of two thicknesses of canvas, separated by a lining of India rubber. The device was carried on the fireman's back and held in place by two shoulder straps and a belt around the waist. The bag was filled with pure air inflated with a pair of bellows, and came in different sizes for air durations of 10 to 30 minutes.

The first successful American self-contained breathing apparatus was the Gibbs. Experiments with this unit began in 1915 and by 1918 they were being manufactured by Edison Laboratories in Orange, NJ.

Toward the end of World War II, Scott Aviation was manufacturing breathing equipment that allowed air crews to operate at extreme altitudes. One story goes that a number of Scott engineers watched a smoky fire being fought in a nearby building. They were amazed that the firemen had to operate in such a severe smoke condition and they decided to see if they could adapt their equipment to suit firefighting. Working with the Boston and New York City fire departments, Scott introduced the AirPac in late 1945 after a year of field testing

The Georgia Smoke Diver Program

The Georgia Smoke Diver Program was developed in 1977 to teach firefighters the necessary skills needed to use a fairly new and highly technical piece of firefighting equipment…the SCBA. The fire service was quite nervous about firefighters relying on a manmade piece of machinery inside the fire environment. At fire stations around the country the SCBA was a piece of equipment that was kept in a case in the back of a compartment and only to be used by those who were weak or on rare occasions when it was “really bad”.

Veteran firefighters warned that the Self Contained Breathing Apparatus would lead to injuries because firefighters wouldn’t be able to use their senses as they did before. They were also concerned with the possibility of equipment failure while deep into the structure.

Georgia Smokes Divers believe that the Self Contained Breathing Apparatus is to the firefighter what the rifle is to the Marine. You cannot expect to be adaptable in various situations and be able to trouble shoot problems that you might encounter with this piece of equipment unless you are intimately familiar with all the parts and how they work.

The breathing apparatus is a critical life-support system that allows firefighters to work in smoke-filled environments or areas containing noxious fumes or gases. The breathing apparatus is used to rescue civilians from life-threatening environments and allow firefighters to minimize or prevent damage to property. The lungs and respiratory tract are the most susceptible to injury during these conditions.

Case Studies

Incident date: 10/27/97
Age: 27/ 43
Sex: Male
Rank: Firefighter & Lieutenant
Department: Philadelphia Fire Department, Philadelphia, Pa.

Summary by USFA: Lt. McElveen and Firefighter Hynes died as a result of smoke inhalation at the scene of a residential structure fire. The fire was a result of wires that had come down on the roof during a heavy rain. The firefighters were operating in the interior of a two-story occupied dwelling with a fire in the basement. They both ran out of air, removed their SCBA masks, and remained inside the dwelling. The two firefighters were found near the back door with their SCBA's on, but their masks off.

NIOSH recommendations: Fire departments should ensure that fire fighters advise dispatch on any change of conditions that would warrant a change in the status of unit's responding to a specific condition. Fire departments should strictly enforce the wearing and use of PASS devices when fire fighters are involved in fire fighting, rescue, and other hazardous duties.

Incident date: 01/21/98
Age: 24
Sex: Male
Rank: Firefighter
Department: Fairlea Volunteer Fire Department, Fairlea, W.Va.

Summary by USFA: Firefighter Carter responded to a report of smoke in a supermarket. The market was contained in a strip mall which also included a post office and a photo-processing store. Firefighter Carter had been employed at the supermarket in the past. Firefighter Carter and a Captain entered the front of the store in full protective clothing and SCBA to search for the fire. They became disoriented while trying to exit the store. The Captain alerted other firefighters by radio that he and Firefighter Carter were lost and in need of rescue. Firefighter Carter ran out of air and placed the breathing tube from his SCBA into his coat in an attempt to breathe. The Captain was able to escape without significant injury. Immediate attempts were made by on scene firefighters to rescue Firefighter Carter but rescuers were driven back by intense heat and smoke. Firefighter Carter was wearing a PASS device but it was not turned on. No hose line or search rope was used. The cause of death was smoke and soot inhalation, carbon monoxide

poisoning, and complete body charring. This was an accidental fire caused by an electrical malfunction in a wall.

Incident date: 03/04/00
Age: 27
Sex: Male
Rank: Firefighter
Department: Fraser Department of Public Safety, Fraser, Mich.

Summary by USFA: Firefighter Sutton responded, along with other members of his public safety department, to a working apartment fire. While they were engaged in suppression of the first fire, another apartment fire was reported in a building across the street from the original fire. Since no fire apparatus was available to respond, Firefighter Sutton and other firefighters responded in a van to the scene. Police officers were in the process of evacuating the building. A resident in need of rescue had been spotted at a second story window. Mutual aid fire companies were responding but not yet on the scene.

The smoke conditions at the entrance to the apartment building were light, with heavier smoke and heat on the second floor. Fire at the top of the stairs was observed by one firefighter. Firefighter Sutton and another firefighter, equipped with full-protective clothing and SCBA, entered the building to effect the rescue. Witnesses outside the building reported that the resident disappeared from the window as if she had been reached by firefighters. Within seconds, a flashover occurred, trapping the resident and the two firefighters. Both firefighters managed to reach a bathroom at the rear of the apartment, but they were unable to get through the window with their SCBA in-place.

Firefighter Sutton was observed by other firefighters at the window, and a rescue effort was mounted. Two firefighters shed their SCBA and entered the bathroom from ground ladders. Firefighter Sutton was removed after his SCBA was cut from him. The low pressure hose on his SCBA had burned through. The other firefighter was located in the bathtub and removed. Both firefighters were transported to the hospital. Firefighter Sutton was pronounced dead at the hospital. The cause of death was listed as asphyxiation. The injured firefighter sustained major burns and was hospitalized for 6 months. The resident of the apartment also died. The fire was caused when an arsonist(s) ignited combustibles on the first and second floors of the apartment building. This fire was one of six arson fires that occurred in the same general area over 2 days.

Immediately Dangerous to Life and Health

Self Contained Breathing Apparatus (SCBA) are used to allow firefighters to work in atmosphere that are not suitable for sustaining life. These atmospheres are know as Immediately Dangerous to Life and Health (IDLH). SCBA's should be worn at all times while you are operating in IDLH or potential IDLH environments.

IDLH Environments

Oxygen Deficiencies

Normal Oxygen levels in the atmosphere are 20.8%. Due to changing atmospheric conditions caused by the combustion process, bacterial action, rusting, chemical reaction, human consumption or displacement this level can be reduces. Once an atmosphere declines to 19.5% it is considered Oxygen deficient.

Effects of Oxygen deficiency

- *15-19% = Decreased ability to work*
- *15% = non-flaming combustion*
- *8-10% = Mental failure, unconsciousness, nausea & vomiting.*
- *4-6% = Coma, seizures, death*

Elevated Temperatures

Today's fires burn at higher temperatures that they did in the early days of breathing apparatus. This is due to the massive amount of petroleum products used in building materials and building contents.
Wood – BTU's 9000 BTU's per pound

Plastic – BTU's 20686 BTU's per pound

Temperatures that exceed 130° result in damage to the respiratory tract, such as pulmonary edema.

Smoke

Smoke is created by incomplete combustion. The particles of matter are suspended in the atmosphere where they can be ingested. Smoke particles carry dangerous materials such as asbestos, chemical deposits.

Toxic Gases

Toxic gases are produced during combustion. Researchers continue to study the products of combustion and are constantly indentifying additional gases that are produced from various products.

Some of these toxic gases and there source:

- Carbon Monoxide = Plastics
- Hydrogen Chloride = Vinyl
- Hydrogen Cyanide = Carpeting
- Nitrogen Oxides = Foam rubber
- Phosgene = Refrigerants contact flame

Toxic gases will affect the body in various ways, which are dependant on the chemical the user is exposed to.

Acute symptoms

- Burns
- Irritation
- Coughing
- Watering eyes
- Headache
- Increased respiration
- Decreased blood pressure
- Lack of coordination
- Nausea & vomiting
- Unconsciousness
- Seizure
- Death

Chronic symptoms

- Lung disease
- Hypertension
- Tremors “shakes”
- Skin lesions
- Tumors
- Seizures
- Organ failure
- Death

Types of Self Contained Breathing Apparatus

Open Circuit Positive Pressure

The use and function of a DEMAND pressure SCBA is prohibited for operation in an IDLH environment.

Open Circuit SCBA – Positive Pressure Method of Operation

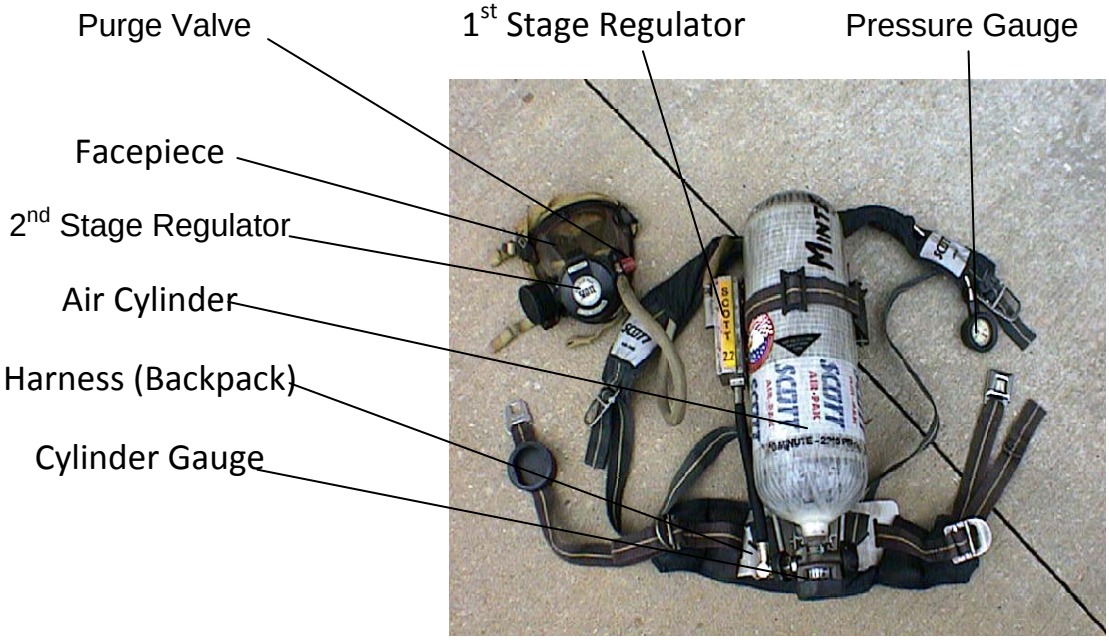
1. Compressed air from cylinder is supplied to wearer
    - Inhalation opens valve in regulator
    - Regulator allows air to flow to facepiece
    - Exhalation closes valve in regulator, stopping flow and opens exhalation valve in facepiece to atmosphere
2. Air from cylinder is allowed to pass through regulator. Upon inhalation, pressure is reduced in facepiece. Regulator supplies more air to compensate for pressure drops. Exhalation valve forced closed by spring tension causing slight pressure buildup inside facepiece
    - Maintains slightly higher than atmosphere pressure
    - Prevents leaks from outside into facepiece

Closed Circuit SCBA – Positive Pressure Method of Operation

1. Compressed oxygen from cylinder is supplied to wearer
    - Inhalation opens valve in regulator
    - Regulator allows air to flow to facepiece
2. Exhalation closes valve in regulator, stopping flow and opens exhalation valve in facepiece to return the exhaled air back to the scrubber where it is cleaned and additional oxygen is added from the cylinder to the air where it returns through the regulator.

The BioPak Closed Circuit Breathing Apparatus.

Basic SCBA Components



Scott AirPak 50

ISI Viking

Survivair

MSA

SCBA Daily Maintenance Inspection

The Georgia Smoke Diver is extremely concerned with the readiness of all equipment. This is an individual responsibility regardless of rank. YOU ARE RESPONSIBLE for checking the readiness and operation of you SCBA. This inspection should be the first priority of you shift change ritual. Upon reporting to your station and placing you gear in service you must check you SCBA for the following:

- Cleanliness / damage
- Full cylinder (4500 or 2216 Full means full not close to full)
- Low pressure alarm (sounds at the ¼ capacity)
- Gauges (make sure cylinder gauge and chest mounted gauge indicate a close pressure)
- Hoses (check for leaks, bubbles or cuts)
- Facepiece (check for glazing or cracks, head gear assembly)
- Backpack/Harness assembly (straps fully loosened)
- Regulator (hook to your face piece and take a breath)

SCBA Physical Requirements

- Be in sound physical condition
- Posses good agility
- Proper fit
- Have good motor coordination
- Possess adequate strength and size

OSHA 1910.134 is the standard for an annual medical evaluation. Facial hair is not allowed on any part of the face that would be in direct contact with the seal of the face piece.

SCBA Limitations

Each individual reacts differently to the following limitations of the SCBA:

- Added weight / reduced mobility
- Reduced visibility
- Decreases ability to communicate
- Limited duration of air supply

Special and Additional SCBA Features

- PASS integration
- Universal RIC connection
- HUD
- Redundant low air alarm
- Buddy breathing systems
- Quick Fills

ISI Viking

Donning and Doffing

Donning is the act of placing the SCBA on oneself for use. Doffing is the act of removing the SCBA for reducing the profile of yourself, for access to vital components during equipment failure, or for servicing and placing the unit back in its storage area.

Common Methods of Donning and Doffing

- Over the head
- Coat
- Seated position (SCBA is mounted in an apparatus seat)
- SCBA stored in a compartment

Air Supply & Duration of Use

The User

The users **physical condition, level of exertion, level of stress and emotion** along with their **level of training and experience** contribute to the duration of the users air supply.

4 Individual Factors Effecting Work Duration

Conditioning
Exertion
Stress / Emotions
Training & Experience

The SCBA

The **condition of the SCBA, cylinder capacity and atmospheric conditions** all effect the work duration of a user wearing the SCBA. A poorly maintained SCBA does not breathe as efficiently and may even experience small leaks that are not obvious to the user. One of the most common maintenance mistakes is not to have a full cylinder. The cylinder capacity is the amount of air that the cylinder will hold. Fire service air cylinders typically are rated at 30 minutes, 45 minutes or 1 hour. The two operating pressures are 2216 psi and 4500 psi. The volume of air is measured in cubic feet.

SCBA Factors Effecting Work Duration

Condition of the SCBA
Cylinder Capacity
Atmospheric Conditions

Cylinder Size / Pressure and Cubic Feet
30 min 2216 psi = 45 cubic feet
30 min 4500 psi = 45 cubic feet
45 min 4500 psi = 66 cubic feet
60 min 4500 psi = 87 cubic feet

SCBA Air Conservation

Georgia Smoke Divers pride themselves on their ability to conserve air in all situations. Air conservation takes repetitive training, experience and a strong ability to remain oriented to your air management. One of the easiest ways to conserve air is to make sure that the last thing you do before entering an IDLH environment is to connect or go on air and the first thing you do when you are out it is to disconnect and shut your cylinder off. Another air conservation technique is to avoid lingering in the environment. Too many firefighters stay in the IDLH environment after their assignment is complete. Your job is to always be the guy with air who can adapt and react quickly when needed. Complete your assignment and get out unless reassigned. Upon being relieved or assigned to rehab IMMEDIATELY replace your air cylinder with a full one before you do anything else. This ensures that if needed you are ready to go.

Breathing Patterns to Conserve Air

Physical and mental stress contributes greatly to you ability to conserve air. Your breathing patterns can help you cope with this stress. Martial Arts instructors teach a breathing technique called Autogenic Breathing. The technique is to breathe in through your nose for a count of three, hold for a two count, and then breathe out through your mouth for a three count. Research has shown that if you perform this technique for a three cycle count, you will decrease your heart rate up to 30% for up to 40 seconds. If your heart rate was around 175 bpm, autogenic breathing would bring it down into a target range of 145 bpm. Siddle found that a person with a 115-145 bpm range is a maximum performance range. In other words, 115-145 bpm is where your fighting skills and reaction time are maximized.

Other Suggested Breathing Methods for Conserving Air

- **Consciously slow down breathing**
- **Breathe in through nose, exhale through the mouth**
- **Skip breathing (2 breaths in and 1 long exhale)**
- **Forceful exhalation while working**

SCBA EMERGENCY PROCEDURES (USER)

Today's SCBA undergo strenuous testing and must meet rigorous standards. Even with these standards there is potential for mechanical failure due to several factors. These factors include a lack of maintenance, damage during fire conditions and improper use. The Georgia Smoke Diver Instructors have developed several procedures for mitigating these emergencies. The basic process of accessing the problem is a universal procedure for trouble shooting your problem. The advanced methods are not approved by any standard and are offered as an alternative to giving up which could ultimately result in death.

Rule #1

Do Not Panic

Panic is a result of stress. Stress causes the heart rate to increase and as this increase occurs your decision making abilities. If you do not gain control you will quickly experience the following symptoms:

Reprinted from Dale Stewart: Fear and Stress and How They Relate To Survival Training

Dr. LeDoux explains what happens in our brain when the fear emotion is activated, he believes that once the fear system of the brain detects and starts responding to danger, the brain will begin to assess what is happening, and try to figure out what to do about it through the following process: Information of the threat stimulus is detected via the senses of the body; sight, sound, touch, smell, taste. Information from one or all of these senses is then routed to the thalamus (*a brain structure near the amygdala that acts like an air traffic controller or a mail sorting station that sorts out incoming sensory signals. In a non-spontaneous threat situation, the thalamus will direct information received to the appropriate cortex of the brain (such as the visual cortex*), which consciously thinks about the impulse, assessing the danger, and making sense of it.

Once a decision has been made as to what to do, the information is then downloaded to the amygdala, which creates emotion and action through the body to either perpetuate a physical response or to abort a physical response. In addition to Dr. LeDoux's work I have studied the research of Bruce Siddle and Dr. Hal Breedlove and their work dealing with "Survival Stress Reaction" or SSR.

Siddle defines SSR as "a state where a "perceived" high threat stimulus automatically engages the parasympathetic nervous system. The parasympathetic

nervous system is an autonomic response process, which, when activated, there is little you can do to control it. Some of the effects of SSR include an increase in your heart rate, which will cause you to lose certain motor skills starting at around 115 beats per minute or bpm. At around 175 bpm you experience tunnel vision and visual tracking becomes difficult along with difficulty focusing on close objects. Your hearing starts to shut down at approx 145 bpm and as a result people may not hear what you say. At 175 bpm you may have difficulty remembering what took place or what you did during the situation. At 185 bpm, most people go into a state of hyper vigilance. This state is also commonly known as the “deer in the headlights look”. During this state you may do things that are not effective or show irrational behavior. This is also the state in which people describe that they can’t move, speak, or scream.

Remember that SSR is an autonomic response, which happens without thought on your part. Siddle did find that a person can manage SSR during a survival situation in the following ways:

- Visualization is commonly known as “spinal tuning” and we know that the upper part of the spinal column holds short term memory. For this reason I teach my first responder students to visualize both their plan A and plan B strategy while responding to an incident.

- Simulation Training helps build experience and confidence through realistic stimulus/response based training. The more real the training the better. To all you instructors out there, skills should be separated into progressive steps, rather than taught all at once. Many instructors teach physical techniques by having the students practice the entire process from beginning to end when first learning a new skill set. This is a big mistake. The brain learns first in pictures and through modeling. By teaching a skill from A to Z all at once, the student may not fully get the whole picture needed to perform the skill properly. You must insure that the student understands step A fully, before moving on to step B and so on. By doing this, frustration on the part of the student and the instructor goes down, while confidence and skill level go up. (This is classic Smoke Diver Methodology)

Autogenic Breathing is when you breathe in through your nose for a count of three, hold for a two count, and then breathe out through your mouth for a three count. Research has shown that if you perform this technique for a three cycle count, you will decrease your heart rate up to 30% for up to 40 seconds. If your heart rate was

around 175 bpm, autogenic breathing would bring it down into a target range of 145 bpm. Siddle found that a person with a 115-145 bpm range is a maximum performance range. In other words, 115-145 bpm is where your fighting skills and reaction time are maximized.

Heart Rate Effects on Senses

Heart Rate	Effects
115	Loss of certain motor skills
145	Loss of hearing
175	Extreme tunnel vision, visual tracking is difficult, difficulty focusing on close objects
185	Hyper vigilance “deer in the headlights”

Rule #2

Stop and Think

- Check cylinder valve
- Open emergency by-pass/purge valve
  - take breath then close
- Filter breath as last result

DO NOT Remove Facepiece

Radio for help and activate your PASS but do not stop trying to save yourself

SCBA ADVANCED EMERGENCY PROCEDURES (USER)

The following options are not manufacturer or NFPA approved procedures. They are advanced techniques that must be mastered and practiced during advanced level training. They are to be utilized **ONLY** as a last resort and should never be utilized as to extend operations in IDLH environments. These options are presented with hands on training components as an alternative to doing nothing and dying.
PROPER AIR MANAGEMENT IS THE CORNERSTONE FOR PREVENTING SCBA EMERGENCIES.

These techniques were developed for situations in which you are not close to an exit or if you were to become physically trapped. As with all rescue techniques you must let the circumstances dictate the procedure to use.

Mask failure

Numerous firefighters have experienced having their mask knocked off while in an IDLH environment. Others have experienced glazing and melting of the face piece. Smoke Divers always make every attempt to salvage their protective equipment. If you face piece is knocked off get as low as you can and PUT IT BACK ON. If you experience a lens failure due to melting or if a break occurs simply cover your mask and try to plug the leaks with your glove. Remember the positive pressure will keep you safe and breathing good. But if the hole is too big you will loose air rapidly. You must make and attempt to minimize this loss to buy you time on your way out.

Breathing from a low pressure hose

If your face piece is knocked off, melts or is damaged in way that it is no longer useful or hampers your ability to get out you should discard it. However if you still use the older low pressure chest mounted regulators with a low pressure hose you can keep the hose and breath through it. This will require you to disconnect it from the mask. You can cut the hose off the mask if you need to. Then simply hold your nose and place the low pressure hose in your mouth. Breathe in through your mouth and out through your nose.

Regulator breathing

This technique is used when the mask has been destroyed and gloved hand or extra hood cannot sufficiently seal the hole or damage to the mask to allow you to get good air. Different brands of SCBA require different hand position but the idea is the same. Crack the purge and hold the regulator in your hands with your hands cupped

over your mouth. Use your fingers to pinch your nose. The free flowing air inside the cup of your hands will allow you to breathe the air. Again breathe in through the mouth and out through the nose.

Breathing from a cylinder

Should you experience a total SCBA failure but you still have air in your cylinder you can still survive. While it is more difficult than the regulator breathing techniques you can still use the same basic technique with practice. Remove the cylinder from the SCBA harness and discard the pack. Cradle the cylinder under your arm with your hand on the cylinder valve. Crack open the cylinder valve so that a small amount of air is coming out. Use your thumb and index finger to pinch your nose and wrap you other three fingers around the cylinder threads. Your middle finger should be higher than the edge of the cylinder valves. Place you mouth on top of your cupped fingers to get air. Maintain this position and adjust the flow so you are not wasting air. Remember the cylinder will empty very quickly if not regulated so you have to regulate it with the cylinder valve. Once you get it right you should not have to make any other adjustment, just GO. You can maintain your room orientation by using your shoulder to maintain contact with the wall.

IDLH cylinder swap

As another emergency survival technique we must become proficient in an IDLH bottle swap. This IS NOT A TACTIC TO STAY IN LONGER. This procedure was developed for emergencies in which you are trapped and your rescuers have passed you a full cylinder while they continue to remove debris or force a larger entry point. Straddle and sit on the full cylinder with the valve in front of you. Remove your SCBA using the coat doffing method. Swing it around your left side and place it in front of you with the bottom of the unit close to your knees. Loosen the cylinder strap and or disconnect all locking mechanisms that hold the cylinder. Take a couple of deep breaths and fill you lungs. Exhale slightly and then take a deep breath in and hold it. Turn off the cylinder valve and inhale again to bleed off the system. Disconnect the cylinder and remove it. Replace the cylinder with the full one while holding your breath. As soon as you have the cylinder connected turn it back on and begin breathing again. This process requires you to hold you breath anywhere from 30 seconds to a minute depending on how proficient you are in the swap. Once you are breathing again lock down the cylinder to the back pack and re-don the SCBA.

SCBA EMERGENCY PROCEDURES (TEAM-MEMBER)

<u>These skills will be taught in the field</u>

- **The NFPA approved Universal RIC connection**
- **Use of the NFPA approved buddy breathing system**
- **Sharing a regulator – Not NFPA Approved**
- **Sharing a facepiece – Not NFPA Approved**
- **Sharing incompatible regulators – Not NFPA Approved**

Use of the URC is preferred due to the ability to detach from the victim.

The buddy breathing system function and controls will vary from SCBA to SCBA.

Additional Safety Considerations

- Have a SCBA setup for RIT use
- SCBA are still needed during overhaul
- SCBA CANNOT protect you from:
    - Radioactive materials
    - Toxic exposure by absorption

Carbon Monoxide levels far exceed permissible exposure limits during overhaul. Not to mention the presence of other toxic chemicals that you cannot smell, see or taste. Air monitoring should be done to determine when the atmosphere is safe and no longer IDLH. Prior to overhaul operations ventilate the structure with electric fans help reduce the level of toxic gasses.

A RIT pack can be fashioned by utilizing a durable bag which contained hand tools, a streamlined SCBA and facepiece, PASS device and search rope.

SCBA CHANGING AIR CYLINDER

- Close the cylinder valve
- Bleed remaining pressure
- Disconnect hi-pressure hose from cylinder
- Remove cylinder
- Replace cylinder and secure
- Reconnect high pressure hose (hand-tight)
- Open the cylinder valve and check gauges and leaks

Removal of the high pressure hose connection while under pressure will cause the o-ring to blow out.

Do not fill cylinders while they are still attached to the user. The EXCEPTION if for the URC which is designed for a controlled fill.

Do not over tighten the high pressure hose connection.

FILLING SCBA CYLINDERS

- Compressor / Purifier System
- Cascade System

The use of an explosion resistant chamber is preferred while filling the cylinders.

When filling from a cascade system, fill from the lowest pressured cylinder and work your way up to the highest pressured cylinder. Be sure to close the cascade cylinder valves as you change between each cascade cylinder.

Air quality requirements for SCBA must meet Grade “D” specifications:

- Dew point of -65°
- 5 ppm of condensed hydrocarbons per m3
- 20 ppm Carbon Monoxide
- 1000 ppm Carbon Dioxide
- Air quality tested at least every 3 months

Conclusion

Most firefighters fail to recognize the importance, functionality and capability of their SCBA. It is the most important piece of protective equipment that we have. It is our responsibility as Smoke Divers to ensure that we are competent in the use, safety and emergency procedures regarding the use of the SCBA. These skills ARE lost over time if not practiced. **Repetition is the mother of skill**.

SCBA Maintenance is critical to preventing mechanical failures. Simply checking your equipment each shift can prevent numerous problems but your department should have an SCBA preventative maintenance program in addition to these readiness checks. Department programs should include fit testing, bench testing, hydrostatic testing of cylinders and air quality testing.

You are responsible for your physical fitness level and the better shape you are in the more efficient you will be in the SCBA. Training is never over for a Smoke Diver so practice what you learn here for the rest of your career.