

SCBAs & Respiratory Program

CHAPTER 10.2

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SELF CONTAINED BREATHING APPARATUS

- SCBAs are to be worn during all initial attack stages of structural or automotive fires, as well as during overhaul and salvage operations and during any operation where hazardous airborne contaminants exist or there is potential for inhalation related injuries. Any personnel not wearing a SCBA are to remain out of the area where hazardous airborne contaminants exist as determined by the O/C and/or air monitoring devices. Driver Operators or any personnel operating downwind from the incident where there may be a potential for exposure will operate in SCBA.
- All SCBAs worn at any emergency scene will have an integrated PASS (Personal Alert Safety System) Device activated.
- It is the responsibility of each ACFR employee at the beginning of their duty shift to inspect the SCBA assigned to all apparatus at their station for the period of that duty shift. Documentation of this inspection will be done on the Daily Apparatus Check Sheet and Target Solutions. All inspections shall be conducted in accordance with the section entitled RESPIRATOR CARE in the Department's RESPIRATORY PROTECTION PROGRAM POLICY. Each Wednesday a detailed inspection form shall be completed for the SCBA assigned to all apparatus at each station, to include any spare apparatus stored there. This will be documented in Target Solutions. If any problem is found with an SCBA, it should be sent for repair with a repair form completed and attached to the SCBA. The District Chief in charge of the SCBA program will also be notified via email of the problem with the SCBA. The unit shall be replaced with a spare from CSW. All units needing repair are to be delivered to CSW. The District Chief issuing the spare SCBA shall reprogram the SCBA to the seat assignment of the SCBA being replaced. If the spare SCBA is issued by CSW it shall be the Company Officer's responsibility to meet with a District Chief to have the SCBA properly programmed prior to its use.
- All SCBAs, and masks, sent for repair will have the SCBA Repair Form, (properly filled out), located on Target Solutions, completed and assigned to the District Chief in charge of the SCBA Program.
- All SCBAs shall remain intact when sending the unit in for evaluation/repairs. The only exception to this is the voice amplifier, (which is issued to the employee), and the cylinder which may be removed if not suspected of contributing to the problem. A replacement will be issued, (SCBA or mask), and logged into the sign out sheet located at CSW. All replacements will be issued either by a DC or CSW staff only.

- Any SCBA that is dropped from any height, falls from an apparatus, is exposed to excessive heat, covered in a ceiling or wall collapse, exposed to caustics or corrosives, etc... shall be removed from service immediately and sent to CSW for an extensive inspection by the Air Program Team.
- Bottles (when not in use at an emergency scene) shall be refilled when the pressure falls below 3800 psig. No bottles will be exchanged at non ACFR stations. ACFR bottles (SCBA) are not to be left at non- ACFR stations, placed on non-ACFR apparatus not currently maintained by ACFR, or otherwise loaned or exchanged with any other agency.

RESPIRATORY PROTECTION PROGRAM

Purpose

To meet the guidelines established by the US Department of Labor, OSHA Regulation 29 CFR 1910.134 Respiratory Protection.

To reduce exposure to personnel, acute and chronic, from airborne toxins and to provide breathable air in oxygen deficient atmospheres.

To establish Departmental Guidelines and policies for all personnel required to use Self Contained Breathing Apparatus. This will include training in the proper use, care maintenance and storage of the Department issued SCBAs.

Responsibilities

District Chief, Air Program Manager

- Overall management and support of the Department's Respiratory Protection Program.
- Work with the Chief of Department, other County Officials, Medical Director, supervisors and other personnel to develop and administer related policies and practices needed to support the effective implementation of this plan.
- Act as Department liaison during compliance inspections.
- Review Respiratory Protection Plan periodically as to assure plan is up-to-date with latest standards and guidelines.
- Conduct spot inspections of on-scene and station operations to ensure compliance with Respiratory Protection Plan.
- Oversee maintenance operations and quality control procedures used in the repair and service of SCBAs, Air filling station, and remote cascade units.

District Chiefs

- Enforce Departments SOGs and policies in regards to the use of Department issued SCBAs.
- Ensure SCBAs are inspected on a daily basis.
- Coordinate the replacement of any SCBA or mask determined unfit for safe use by field personnel.
- Oversee that all cylinders used on shift, found to be below Department acceptable level (3800 psig) are filled by personnel trained in the operations of the filling station or remote cascade unit.
- Conduct spot inspections of on-scene and station operations to ensure compliance with Respiratory Protection Plan.
- Issue replacement SCBA or mask as needed per the policy.

Health & Safety Officer

- Assigns Department approved mask to new employees.
- Conducts quantitative fit test to assure proper fit.
- Maintains Department records of fit test results, repairs, service and annual testing of SCBA and components.

Lieutenant Assigned Air Program

- Oversees maintenance of department approved SCBAs.
- Maintains inventory of all SCBAs and components.
- Oversees training of personnel assigned by the Department to repair SCBAs.
- Provides budget request to the District Chief assigned SCBA Program Management.
- Oversees maintenance and compliance with Breathing Air Purity standards for air compressor and remote air filling stations.
- Forwards records on all service to the Departments Health and Safety Officer for filing and storage.
- Oversees training of personnel designated by the Department to operate the air compressor and/or remote filling stations.

Training Division

- Provides detailed information and training specific to the SCBA used by the Department.
- Ensures personnel trained in compliance with Federal and State standards.
- Maintains training records.

Department Personnel

- Attend training sessions.
- Know and adhere to current Department SOGs and policies.
- Conduct daily inspection of SCBAs, and personal assigned mask
- Decontaminate and inspect SCBAs after each use.
- Remove from service units not deemed safe or operable.
- Tag units deemed not safe or operable for service, with a description of compliant on the Department SCBA Repair Form located on Target Solutions and assign to the District Chief in charge of the Air Program.

Personnel Designated to wear SCBAs

The following Departmental job classification are expected to know and be trained in accordance with the Department Respiratory Protection Plan, as the job requires the use of the SCBA on a regular basis or in the process of supervising an incident a need may arise which requires the use of a SCBA for protection.

Department Chief

Deputy Chief

Assistant Chief(s)

District Chief(s)

Captains

Fire Marshal

Lieutenants

Rescue Lieutenants

Driver Operators

Firefighters

Paramedics

EMTs

Personnel Training

Department personnel designated to wear an SCBA will be provided detailed training specific to the Department approved SCBA. This will include, but not be limited to training for:

- Recognition of emergency situations requiring the use of a SCBA.
- Instruction and demonstration for donning the SCBA.
- Handling situations in which the unit may fail to perform.
- Instructions on emergency air sharing.
- Familiarization of SCBA parts and their function.
- Approved methods of inspecting, cleaning and storage of the SCBA and personal assigned mask.
- Review updates of Department's SOGs and policies.

Training shall be conducted at a minimum, on an annual basis utilizing any of the following:

- Department SOG, Chapter 10.2
 - IFSTA manual titled, Self-Contained Breathing Apparatus.
 - Donning and Field maintenance instructions provided by the manufacturer.
 - NFPA Standards:
 - 1404 - F.D. SCBA Program
 - 1500 - F.D. Occupational Safety & Health Program
 - 1981 - SCBA
 - 1982 - PASS for firefighters

Medical Examinations

Per OSHA Standard 1910.134, employees assigned to tasks that require the use of a respirator must be physically able to perform the work while using the respirator.

Respirator Selection

The Department has elected to use the SCOTT X3 Snap Change open-circuit type Self Contained Breathing Apparatus. SCOTT APR (air purifying respirator) adapters and filters are provided for specific uses as noted in this plan.

The approved models supplied are:

- SCOTT Air-Pak X3 Snap Change

Selection of type of SCBA supplied by the Department and its method of use and care will be in accordance with the following:

- Certified by NIOSH (National Institute for Occupational Safety & Health)
- Certified by MSHA (Mine Safety & Health Association)
- Compliant with NFPA 1981 - SCBA Performance (1992)
- Manufacturer instructions for care and use.
- OSHA 29 CFR 1910.134
- NFPA, 1404 - F.D. Self Contained Breathing Apparatus Program (1989)
- ANSI, z88.2 - Practice for Respiratory Protection
- ANSI, z88.5 - Practice for Respiratory Protection for the Fire Service

Mask fit will be as current approved standards for quantitative fit-testing. The Department currently utilizes an appropriate unit for quantitative test.

Air Quality

- Breathable air must meet the minimum requirements for Grade E breathable air as described by the CGA (Compressed Gas Association).
- Breathable air must be supplied to respirators from cylinders or air compressors intended for the sole purpose of storing or creating breathable air.
- Such air shall be filtered and monitored for minimum requirements as specified below:

Oxygen - 20 - 22%	Water Vapor - 24 ppm
Carbon Dioxide - 500 ppm	Oil Mist - 5.0 mg/m ³
Carbon Monoxide - 10 ppm	Odor - None

The compressor for supplying air shall be equipped with required safety devices and alarms.

- The compressor shall be located to avoid any entry of contaminated air and must be equipped with air purifying filters and dryers. **SEE also AIR FILL OPERATIONS.**
- The Department will only use air that has been tested and certified to meet or exceed CGA Grade E specifications in the SCBA bottles intended for breathing air purposes.
- The Department SCBA cylinder shall be as follows:
 - Visually inspected prior to filling
 - Serviced according to the manufacturers specifications
 - Remove from service for hydrostatic testing every 3 years in accord with CFR Title 49, part 173.34. In **no** case, shall the service life of the composite cylinder exceed 15 years.
 - Log cylinder property tag number, last hydro date and name/ID number of individual filling the cylinder in the Fill Log, (form located on Firenet).
 - This log will be made available for review at any time requested.

Respirator Care

Use/Inspections/Care/Maintenance

SCOTT AV3000HT Face piece

NOTE: Personnel should only use their assigned mask, which has been determined to be of proper fit as a result of quantitative fit-testing. Any significant changes in facial structure, and/or significant weight gain or loss should result in re-testing as per OSHA and NIOSH guidelines. Contact Health & Safety if this is an issue.

- Carefully inspect face piece and head harness for aging rubber parts, and worn, damaged, missing or loose components. Any mask exposed to a hazardous material where the possibility of degradation of the material is a potential, should be marked **CONTAMINATED**, bagged and sent in for inspection.
- The lens should be inspected for cracks, severe scratches, and for a seal in the mask housing. If there is any question regarding the integrity of the lens, the mask should be removed from service immediately and sent for evaluation.
- The KEVLAR head harness should not be removed or serviced in the field.
- Cleaning of the mask is accomplished using warm water and a mild soap solution. **NO BLEACH** is to be added. Mask can be disinfected with a solution of 70% Isopropyl alcohol, or the Department approved disinfecting solution at its proper dilution rate.
- Eyeglass retainers are available upon request.

Electronic Voice Amplifier

This is an intrinsically safe, removable component; it is designed to enhance voice communications while wearing the AV3000HT mask.

- Batteries are replaced on an as need bases or at a minimum of every 4 months. Batteries can be replaced in the field. Care should be taken to see that water tight lid is properly sealed, and exercise caution as to not over tighten retaining screws.
- Care should be taken to assure unit is not accidentally activated and left on while not being worn.
- Unit is water resistant, not waterproof, remove before washing mask.
- Mask is still in service if EVA is not working. Replace battery as needed or at a minimum every 4 months. If unit does not function, send to the Health & Safety Officer for evaluation.
- Do not remove EVA mounting bracket from mask.

Cylinder

- The Department minimum pressure for the 4500 psig carbon-fiber cylinder is 3800 psig.
- The tank gauge and the regulator gauge (with regulator pressurized) should not vary by more than 300 psig, however it is often difficult without additional gauges to determine which one is inaccurate.
- The valve assembly should be tight in the cylinder. If it will move by hand remove from service immediately.
- Inspect the cylinder body for severe damage, gouging, exposed fiber or heavy peeling of the fiberglass wrap. If the protective coating on the arms of the vehicle SCBA brackets are worn or missing, notify the Lieutenant in charge of the Air Program. This protective coating is essential to prevent gouging while removing or returning SCBA or cylinder into the vehicle bracket.

Back frame/Harness/Regulators/Alarms

- Inspection of the back frame should include; the cylinder latching hanger, the cylinder retainer band release, and PASS Sensor Module release to see if they are in working order.
- Inspection of the Harness should include; all screws are tight, and all buckles and latches operate properly. Units with damaged harness straps or buckles should be removed from service. The bottle retainer should lock down on the bottle and hold it firmly in place.
- Inspection of mask mounted regulator should include; sealing gasket in place, donning-doffing switch operable, *Vibralert* operates as unit reaches low pressure (approx. 1500 psig).
- The mask mounted regulator can be washed and sanitized using warm water and the Department approved disinfecting solution at its proper dilution rate.

Methods:

- With regulator still attached; charge system with air, leaving donning switch off, submerge regulator in cleaning solution, remove and shake dry, shut tank valve and open purge valve to evacuate trapped water in regulator
- Inspect the high pressure hoses for cuts and abrasions.

The SEMS II PASS System is an integrated PASS and distress alarm system. The sensor module located in the lower part of back frame, on the right side, can be removed to change batteries. There are 6 “AA” batteries for sensor & alarm. Low

Battery indicator is a continuous audible beep. All six batteries need to be changed utilizing one of the following: Duracell Alkaline MN1500; Duracell Alkaline MX1500; Duracell Alkaline PC1500 or Eveready Energizer Alkaline EN91; Eveready Energizer Alkaline E91. No "mixing" of battery types is recommended. Check Red & Green L.E.D. to see if they flash.

- For low pressure air warning, the SCOTT X3 Snap Change is equipped with the audible & vibrating *Vibralert* system on mask mounted regulator and a redundant low pressure alarm, along with a shoulder mounted pressure gauge. These should be part of the daily SCBA check.

NOTE: activation of the *Vibralert* without activation of the redundant alarm and more than a 1500 psi in the tank is an indication of possible reducer problem - return for service.

SCOTT SCBA regulators will be flow tested at least bi-annually as per manufacturer recommendation. Date of last test will be affixed to back frame, behind the back pad. This service is via contract with an outside vendor.

Air Fill Station Operations

Alachua County Fire Rescue currently maintains three systems for filling SCBA bottles. The systems are: the cascade air system on SQ23, the compressor located at Station23, and the compressor located at St. 62. These policies and procedures will establish guidelines for training personnel in the operation of each and hopefully serve as a reminder as to the potential for serious bodily injury or death should safety precautions here be ignored. Cylinders may also be filled at St. 29 in High Springs or by SQ29's cascade system.

Purpose:

To establish Department guidelines and procedures for personnel using a Department Air Filling Station such as a compressor or cascade tank system.

To meet current Federal and State guidelines regarding the use and operation of such stations.

To help insure the safety of the operators and upkeep of the equipment.

General Precautions and Procedures

The following applies to filling operations of either the cascade system or compressor. Each operator is responsible for knowing these precautions and procedures in order to assure the safety of him/herself and of those in the area. Although rare, accidents do happen, and with the pressures being dealt with they can be extremely unforgiving.

- **NO** unnecessary personnel should be in the immediate area of the filling operation. Generally it only takes one individual to fill the bottles. Other individuals may transport bottles to and from the filling location and thus have to enter, however they should limit the time in the area to the purpose.
- When filling SCBA bottles, bottles should be placed in the fragmentation tank. The fragmentation tank should be placed remotely from the operator, and at no time should the operator or anyone else stand in such a way as to be over the fragmentation tank during the filling operation.

Before filling any SCBA bottle the following should be observed:

- Hydro date; fiberglass wrapped or aluminum cylinders have a hydro period of 3 years, or 5 years for carbon fiber bottles with a maximum service life of 15 years.-Steel bottles have a hydro period of 5 years with a maximum service of 25 years. The original approved service date of the bottle is on the label. The company which does the hydrostatic test is required to mark or label the bottle with an ID number and date. We have found these do not last on fiberglass wrapped bottles, so ACFR_bottles have the last hydro date rewritten at the neck of the bottle. Records are maintained at ACFR HQ should questions arise. Steel bottles will have the ID and date stamped in the bottle near the neck.
- Bottles with damage or excessive wear such as tank gauges with bent needles or face plates which prohibit gauge operation, damaged bottle threads, and fiberglass tanks that are peeling fiberglass strands should not be filled. Return these to CSW with a Departmental SCBA Repair form for inspection.
- The ACFR Property Tag number, hydro date and ID number/initials of the individual filling the cylinder will be recorded on the departments fill log form.

In addition to inspecting the SCBA tanks, the charging hoses should also be inspected for damage. Signs of damage would include deep cuts or gouges in the hose. A bulge in the hose may indicate a weakening of the hose. The charging hoses ACFR employs have what is called a soft seat connector (at SCBA bottle connection), this comes in the form of a plastic tip that screws on the charging hose tip or a rubber O-ring that slips over the charging hose tip. These need to be in place.

Control valves and knobs which operate air flow almost always have some type of soft seat surface for sealing, over tightening these valves/knobs while shutting down leads to damage of the valve and leaks. For a valve with an undamaged seat it takes very little effort to seal and shut off the flow. If after shutting off the system and the air is bled, a small leak is detected, simply tighten with a little more pressure. Any leaking valves should be reported to the air officer.

The filling rate of bottles is a debatable subject, however remember that the faster a bottle fills the more the air heats in the bottle and expands. When the bottle cools, it can have substantially less pressure. A good rule to judge a fill rate for SCBA bottles is to allow about 3 minutes per fill (4500 bottle) from empty, or not to exceed 1500psi per minute while filling. Naturally this time period would be adjusted according to what pressure the bottle had when you started. Another condition that might affect filling time is scene demands, it may be necessary to fill the bottles much faster, however crews should be reminded that **the gauge readings are inaccurate until the air cools**. We have found that rapid fills damage the gauge and occasionally cause a burst disc to blow, which can be a startling event and puts the bottle out of service until it can be repaired. Should this occur, tag the cylinder as out of service and return to CSW for evaluation/repairs.

Bottles should not be filled above the rated capacity. Currently ACFR SCBA bottles are 4500 psi carbon fiber cylinders. The cascade tanks on SQ23 fill to 4500 psi. The maximum fill capacity is controlled by the regulator on the compressor or cascade system. Fill 2216 psi bottles, 3000 psi bottles and 4500 psi bottles in separate operations so as not to overcharge the lower psi bottles.

Cascade Operations

Components

The Cascade system on SQ23 contains the following:

- 6 - Supply Tanks, capacity: 4500 psi, the control valves on these tanks are left open.

Panel:

- 6 - Bank Gauges, each constantly registers the psi of the supply tank it is connected to.
- 6 - Bank Valves, these valves control the flow from and to the supply tank.
- 1 - Supply Pressure Gauge, registers the same pressure as the Bank gauge which is being used.
- 1 - Regulator, controls the discharge pressure, cannot create pressure that is not there, (if Bank 1 gauge shows 1500 psi, that is all the regulator can deliver, turning it up further will not increase the pressure), should be bled off when finished.

1 - Regulator Pressure Gauge, pressure regulator is set at (i.e.; 4500) provided the supply pressure is above this range.

2 - SCBA Pressure Gauges registers the pressure in the SCBA bottle once the valve on the SCBA bottle is open. During the filling process this gauge and the gauge on the SCBA bottle will read differently primarily because the SCBA tank gauge is reading hot expanded air.

2 - SCBA Valves, this controls the flow (rate) of air in to the bottle.

2 - Charging Hoses, also equipped with bleed valves to relieve pressure after filling to help remove charging hoses.

To operate, select a bank with suitable pressure to permit filling.

- Open the corresponding bank valve. The supply pressure gauge will show the pressure available.
- Turn the regulator knob clockwise to set the desired filling pressure, this will register on the regulator pressure gauge (2216 is blue zone, no indicator for 3000 or 4500 psi).
- After placing tanks to be filled in fragmentation tank, connect fill hose(s) open tank valve(s) and then slowly open the SCBA Valves on the panel to deliver a slow constant pressure.
- When tank has completed filling, shut off the SCBA Valve(s) on the panel, shut the SCBA tank valves and open bleeders. [Note; if bleed does not stop in a few seconds, you have left one or more valves open].
- When bank selected no longer will bring the tanks up to fill pressure it is time to begin cascading. This simply means use the bank you initially selected to bring the tanks up to whatever pressure is available in that bank (ie1800 psi), and then select the bank with the next lowest psi but more than the initial selection (i.e.; 2600 psi), this would then complete a fill for a 2216 psi tank, however for a 3000 psi fill you would have to continue after this second bank fill to yet a third bank (i.e.; 3800 psi). This process continues until the supply tanks can no longer meet the demands.

REMEMBER: Opening more than one bank valve simultaneously will result in those supply tanks equalizing to a reduced pressure and thus decreasing the total number of fills the system can provide.

Air Compressor - STATION 23

The air compressor is also equipped with a cascade tank system. However, it has only 2 banks rather than 6. The procedures for this operation are the same. The Bank Valves are labeled FROM BANK [ONE or TWO].

The valves labeled TO BANK [ONE or TWO] are to fill these banks from the compressor. They are not to be open during the process of filling SCBA bottles from the banks. Like having both FROM valves open simultaneously, both TO valves open will equalize the bank pressures.

Another valve on the compressor is labeled BY-PASS, this valve allows a tank to be filled directly from the compressor motor by-passing the cascade banks. Filling the cascade tanks on SQ23 would be an example of this operation.

To operate the compressor motor:

- Check the oil level, the full level is when a small air bubble is all that is visible in the sight the sight glass. The sight glass is located on left hand side of the compressor (facing the panel). To add synthetic oil, remove cap on stem located above the sight glass, pour slowly and stop occasionally to observe level in glass. Give a minute for oil to settle before taking a reading. DO NOT over fill.
- Turn switch to AUTO, [Do not operate in manual mode]. The motor is set to turn off when a 4th stage air pressure of 4600 psig is obtained.
- To fill compressor cascade banks, open the TO BANK [ONE or TWO] valve(s).

Note: [It is possible to fill a cascade bank while filling SCBA bottles off of the other bank, it requires a careful manipulation of the valves. The TO BANK valve would be open to which ever bank you are filling and the FROM BANK valve of this same bank should be closed, while the FROM BANK valve would be open on the other bank to fill the SCBA bottles and the TO BANK valve of this bank would be closed].

- To fill using the BY-PASS valve, turn the compressor motor on, after the compressor shuts off because it has reached an air pressure of 4600 psig, set the regulator to the desired fill pressure [i.e.; 4500]. Connect compressor charging hose(s) to tank(s) to be filled (for SQ23 this would be the extension hose which would be connected to the charging port on the panel) an open the charging hose valve(s) on the compressor bank along with tank valve of the bottle being filled, the compressor will cut on automatically and shut off when the pressure designated by the compressor regulator is achieved.
- ADDITIONAL NOTE FOR FILLING SQ23 TANKS: When filling two or more tanks on SQ23, fill each bank individually to capacity of 4500 psi. After finishing fill, allow a short cool down period then open all banks that were just filled simultaneously and allow the compressor to run and top all the banks together. The compressor must register a significant drop in pressure before it will come back on (about 500 psi) opening all these valves at once should allow this drop.
- If the compressor shuts off because; (1) low oil pressure [as indicated by light] - add oil, (2) High CO detected [CO alarm activates], (3) High temperature [as indicated by light], other, or if excessive vibration or an unusual noise is heard, DO NOT resume use - shut off immediately.

Air Compressor – St. 62

The air compressor at Station 62 is a 6000 psi compressor equipped with a 4 bank cascade system, Revolve-Air and “Smart-Fill” technology. Once the compressor is set to fill the Departments 4500 psi bottles, no adjustments are required by the user.

The system should be used and left in the manual mode. While set in this mode the system will automatically refill the cascade cylinders during the filling of SCBA cylinders.

No cylinder should be filled at more than 1500 psi per minute. This can be adjusted by use of the smaller knob located on the front of the fill station. Counterclockwise reduces the fill rate and clockwise increases the rate.

To fill the 4500 psi cylinders place them onto the threaded connectors using the one way threaded valve on the cylinder, ensure the bleeder valve is closed, unlock the blast tank chamber and rotate the cylinders to the back. Place the lever into the lock position and the cylinders will fill automatically and shut off when full. While the first 2 cylinders are filling 2 more may be placed onto the system and when filling is complete and the tank is rotated they will start to fill. Bleed the valve and disconnect the full cylinders.

No adjustments need to be made to the system unless you are filling non-ACFR cylinders that are above or below 4500 psi.

If filling cylinders other than the 4500 psi cylinders the large valve will need to be adjusted, (counter-clockwise), to the desired pressure, (2216 or 3000 psi).