

1.6 Self Contained Breathing Apparatus and Cascade System



City of Oak Point Department of Public Safety Fire Department

TITLE: SCBA and Cascade System

SECTION/TOPIC: General Administration

NUMBER: 1.6

ISSUE DATE: 01.21.2015

APPROVED BY:

Michael Shackelford

Director DPS

REVISIONS BY:

X

Approver

These SOPs/SOGs are based on FEMA guidelines FA-197

1.0 POLICY REFERENCE

This guideline establishes requirements for the selection, care, and maintenance of self-contained breathing apparatus (SCBA) and SCBA as required by the respiratory protection program in NFPA 1500. All SCBA equipment and Cascade Systems of this department shall comply with the provisions of the NFPA 1852 and State standards as established by guidelines distributed by the Texas Commission on Fire Protection (TCFP).

2.0 PURPOSE

Fire services utilize a self contained breathing apparatus, referred to as SCBA, for the purpose of ensuring the breathing of non-hazardous atmosphere within a hazardous environment. For the purposes of this policy, the SCBA consists of all the separate component parts to an individual's SCBA system, including but not limited to: air bottle, face mask, regulator, lines, and back pack as well as any departmental peripheral systems related to the SCBA, including but not limited to: cascade system, air compressor, and mobile cascades.

3.0 SCOPE

This SOP/SOG pertains to all personnel in this organization.

4.0 DEFINITIONS

Decontaminate- refers to the complete removal of any contaminants, and it does not necessarily carry the same definition as clean.

5.0 PROCEDURES/GUIDELINES & INFORMATION

5.1 Responsibilities:

1. The Director, - is responsible to ensure the SCBA program administration, consistent with the guidelines contained herein, and for appointing a designated fire fighter to provide collateral duty of servicing and maintaining the SCBA equipment.
2. Fire Fighting Personnel- All personnel authorized, as fire fighters are responsible for knowing the proper technique for the use and care of the SCBA. Such personnel maintain the equipment in a clean and properly working condition. Personnel promptly report and correct any deficiencies found with any piece of SCBA equipment before its use, and if such equipment cannot be immediately repaired, the equipment is taken out of service.

5.2 Inspection

SCBA equipment is inspected periodically to determine the readiness of the equipment and to discover and repair any deficiency caused by damage or excessive wear sustained by the unit. The frequency and degree of inspection conducted as stated herein. Any unit or component that is determined to be damaged, defective, inoperative, or otherwise substandard is immediately repaired or removed from service and placed in a visible location to provide a visual alert that the equipment is out of service with an out of service tag explaining the problem in detail.

Daily inspection of SCBA is to be completed by personnel assigned to the apparatus prior to completion of apparatus checks. Each individual is responsible for inspecting their assigned SCBA for completeness, cleanliness, and operational readiness. The FOIC is responsible for inspecting his/her SCBA and any unassigned SCBA.

Monthly SCBA inspections are performed on the first Monday of each month.

1. **Pre-use Inspection:** Before each use, the SCBA is inspected for cylinder pressure. The minimum pressure is not to be below 4000psi of the full cylinder pressure capacity.
2. **Post-use inspection: after each use, the SCBA is inspected for:**
 - a) Low or empty cylinder- cylinders are cleaned, low or empty cylinders are recharged or exchanged with fully charged cylinders.
 - b) Face piece- the face piece is fully cleaned, sanitized and inspected for damage.
 - c) Regulator/Valve System- The regulator, exhalation valve, and bypass valve are cleaned and inspected for operational integrity.
 - d) Back pack and all peripheral components are cleaned and inspected for operational integrity.
 - e) If any SCBA is operated in a contaminated or HAZ-MAT environment, the unit is completely decontaminated prior to being returned to service.
 - f) Check apparatus cylinder pressure, physical condition and replace if necessary.
 - g) Examine apparatus. Look for missing, damaged, or broken parts. Visually inspect for damage from heat exposure.

- h) Clean the face mask in cool to warm soapy water using a non-detergent. Dish soap such as joy. Rinse mask thoroughly in clean running water allowing the water to flow through the exhalation valve. Shake out excess water and dry with a clean, lint free cloth (Do not use paper towels). Wipe facemask with department approved solution. Store mask away from excess heat and direct sunlight.
- i) If water enters the demand valve, connect the unit to full cylinder and activate the bypass valve to blow the excess water out. It is critical that the facemask, inhalation valve, exhalation valve, and the demand valve are dry when the air temperature is below freezing.
- j) Assemble the apparatus and inspect by sight and sound for normal operation. All connections are check for tightness.
- k) If any problems or repair needs are identified, the SCBA is removed from service. A tag is place on the equipment for reason of repair needed. The Company officer is notified of repair needed.
- l) Complete department approved SCBA inspection record(s).

3. Daily Inspections:

- a) Each piece of SCBA equipment assigned to an apparatus or to a firefighter is to be inspected at the beginning of each shift and after every use.
- b) The inspection is conducted to ensure that the SCBA is fully charged, clean, free from damage, fully operational, straps are let all the way out and a mask with the apparatus.
- c) The officer conducting the inspection completes the daily inspection record.
- d) Check the cylinder air gauge for a minimum acceptable pressure of 4000 PSI.
- e) Check the PASS device for proper operation.
- f) Conduct a visual check. Visually inspect all PASS enclosures, lenses, and wire conduits for cracks, wear or other damage.
- g) Check the PASS manual alarm feature by pressing the manual alarm button. The manual alarm will sound a loud almost continuous 3-tone chirp accompanied by flashing of the red signal light. Reset the manual alarm.
- h) Open the cylinder valve. The PASS will sound 3 quick chirps and the light on the control console will begin flashing green approximately once a second. The 3 tone chirps will sound approximately the same time the low pressure alert in the mask mounted regulator actuates briefly.
- i) Check pre-alert. With respirator pressurized but non-flowing, leave SCBA motionless for 20 seconds. The green flashing light will be replaced by a red flashing light. Two quick chirps will sound with each flash of light.
- j) Check pre-alert reset. Move the respirator within 8 seconds of pre-alert. The PASS will reset and the red flashing light will be replaced by a green light. The chirping will stop.

- k) Check manual reset of the pre-alert. With the respirator pressurized but non-flowing leave the SCBA motionless until pre-alert condition occurs. Within 8 seconds press and hold reset button. Three chirps will sound, and then release the button. The PASS will reset to the automatic mode and the flashing red light will be replaced by a flashing green light.
- l) Check full alarm. Again, as in step “i” above, leave the SCBA motionless until pre-alert condition occurs. Do not reset. Within 10 seconds a loud, almost continuous 3-tone chirping will begin, accompanied by the flashing of the red light on the control console.
- m) Check alarm reset. While in full alarm, fully depress reset button, release, and depress again. The PASS will reset to automatic mode. The loud alarm will stop and the red flashing light will be replaced by a green flashing light.
- n) Check continuing operation of the PASS. After finishing all respirator checks involving airflow, turn off the cylinder valve; purge all residual pressure in the respirator. The PASS will remain active with the green light flashing. Do not move the SCBA; pre-alarm will occur within 20 seconds. Move the SCBA slightly. Pre-alarm will reset, green light will start flashing again.
- o) Turn the PASS off. With cylinder valve closed and all residual air purged from the respirator, depress reset button twice. The green flashing light will go out and a clicking sound will be heard from the sensor module.
- p) Remove from service, tag unit and notify Company Officer for repair if not in proper working order.
- q) Visually inspect the complete SCBA for worn, aging, or damaged parts. Check for hydrostatic test date on cylinder; this date must be within the last three years of present date. (Note: date indicates last test, not expiration date.)
- r) Check to see that the demand valve and bypass valves are off. Open cylinder valve slowly and check the harness gauge to see that the cylinder is fully charged. The air whistle should sound momentarily. No air should be escaping from the apparatus.
- s) Hold the demand valve and quickly turn it to the on position and back to off. Ensure that there is a rush of air when the valve is on and that it is not leaking when the switch is off.
- t) Close the cylinder valve. Watch needle on the harness mounted pressure gauge for one minute to ensure that it does not fall by more than $1/8$ ".
- u) Open cylinder valve. Don the face piece and attach demand valve. Insert two fingers at the side of the facemask and lift the seal away from the face. A good outward flow of air indicates that the positive pressure system is functioning properly.
- v) Open bypass valve to check for proper function. Close bypass valve.

- w) Close cylinder valve and check vibrating alert. The vibrating alert will sound when the needle on the shoulder gauge enters the red zone below $\frac{1}{4}$. Continue breathing air until mask collapses slightly and hold breath while listening for leak.
- x) Any SCBA that fails inspection is removed from the apparatus and placed out of service. The person shall fill a tag detailing the problem. Then the Supply Officer is notified of the repair needed.

4. Monthly Inspection:

- a) Each SCBA is inspected monthly as required by the TCFP. The inspection consists of those items listed on the monthly checklist, and includes all spare cylinders and SCBA units.
- b) The monthly inspections are conducted on the first Monday of each month.
- c) The person conducting the inspection completes the daily inspection record and forwards it to the person in charge of the SCBAs.

5. Semi- Annual Inspection:

- a) All SCBA are inspected and serviced every six months by the authorized repair facility.
- b) The inspection includes the following:
 - Disassembling and cleaning of the regulator and other major components such as the low air alarm and face piece.
 - Replacement of all worn parts.
 - Reassembly and testing of the SCBA.
- c) The SCBA activities are recorded.

6. Annual Inspection:

- a) The person in charge of the SCBA conducts the annual inspection, or causes the inspection to be conducted by a qualified SCBA service technician on an annual basis.
- b) The annual inspection and service includes those recommended by the manufacturer and as recommended or required by NFPA or TCFP standards, including but not limited to the following:
 - 1. Internal inspections of SCBA cylinders are performed annually in order to determine any condition, which may contribute to the deterioration of a cylinder.
 - 2. Disassembly of the SCBA into major components groups.
 - 3. Disassembly, cleaning and flow testing of the regulator.
 - 4. Replacement of worn parts, or those suggested by manufacturer, in regulator assemblies.
 - 5. Disassembling of low-air alarm, cleaning, and replacement of necessary components.

6. Cleaning and replacement of needed components of the face piece, and harness assembly, and replacement of components as needed or scheduled.
 7. Reassembly of the entire SCBA and testing for proper operation of all its components.
- c) Proper record all maintenance performed on the SCBA.

5.3 Breathing Air Supplies

1. All breathing air produced for or used in a SCBA complies with testing and quality requirements of the Compressed Gas Association G-7.1 Commodity Specifications for Air for grade D air. Tests are conducted quarterly by a qualified independent testing service to determine if the air quality meets or exceeds these requirements. The test results are filled and posted.
2. Personnel must refrain from using the Departments standard air compressor, which does not meet the minimal air quality standards for SCBA or SCUBA tanks.
3. Any air cylinder suspected of containing contaminated air or air that does not meet the Department's air quality standards is emptied, purged, and inspected before refilling.
4. Any cylinder that is not used within a period of 90 days is emptied and refilled. This is done as part of the assigned weekly check. Starting with October as the fiscal year.
5. All SCBA cylinders are maintained at 85% of their rated storage capacity as stamped on the cylinder.
6. The Company Officer ensures that all fire personnel are capable of properly operating all breathing air compressors and the cascade system.
7. The Supply Officer ensures that air compressors and the cascade system operation procedures and precautions are prominently posted at the fill station.
8. Prior to filling a cylinder, personnel visually inspects all cylinders to insure that the cylinder is not damaged or defective and is within the current hydrostatic test date. Defective or out-dated cylinders are not filled and are tagged and removed from service.
9. All cylinders are refilled in accordance with the recommendation of the manufacturer and consistent with the standards set by NFPA and TCFP.
10. Breathing air compressors are operated only in a contaminated free atmosphere. Prior to the operation, personnel ensure that the intake area is free of obvious contaminants and that no apparatus or other combustible motors are operated within the proximity to the intake area.

5.4 Records

1. The Supply Officer causes the following records to be maintained:
 - a) A complete inventory of all SCBA units, cylinders, cascades, fill stations, special tools, spare parts, and related equipment.

- b) Individual records for each regulator and harness assembly. The records include inventory and serial number, date of purchase, vendor, manufacturer, purchase order number, assigned location, and maintenance and repair history, history of parts replacement, upgrades, and performance tests.
- c) Individual records are kept for each cylinder. The records include inventory or serial numbers, date of purchase, vendor, manufacturer, purchase order number, assigned location, hydrostatic test dates, and history of inspection and repairs.
- d) Individual maintenance and repair records for each breathing air compressor, cascade system, fill station, purification system, and any equipment used to produce or store breathing air.

5.5 SCBA Availability

The OPDPS Fire Department furnishes SCBA for all personnel on duty. The SCBA is positive pressure and meets the requirements of NFPA 1404.

5.6 When to use the SCBA:

1. All personnel fully don and utilize SCBA when encountering situations involving potentially hazardous or flammable atmospheres. Examples are including but not limited to:
 - a) Structure fires
 - b) Halon or Toxic leaks or Spills
 - c) Fixed system discharges
 - d) Overhaul operation with CO levels exceeding 36ppm.
 - e) Oxygen deficient atmospheres
 - f) Fuel spills
 - g) Dumpster fires
 - h) Vehicle fires
 - i) Natural gas leaks
2. All personnel who don an SCBA will be the ready for immediate utilization in situations where it is possible that the atmosphere may become contaminated. Examples included but limited to:
 - a) Smoke investigations
 - b) Hazardous material standby
 - c) Alarm investigations
 - d) Odor investigations
3. The SCBA is not to be removed until the atmosphere has been determined to be safe. This determination will be made by the Incident Commander. Until such time the SCBA will

remain in place to prevent OPDPS or other fire personnel from inhaling toxic gases or other products of combustion.

5.7 SCBA use procedure

****Safety****

Whenever possible, firefighters arrive at the scene in full PPE and SCBA, ready for an immediate assignment. SCBA may be donned while en-route if safety is not compromised.

1. The following steps are to be followed in donning SCBA entering a potentially hazardous or flammable atmosphere.
2. The SCBA may be put on using either of the following methods:
 - a) En-route while seated and belted in a SCBA jump seat.
 - b) On location utilizing the coat method to the over the head method.
3. Donning procedures
 - a) Check the cylinder pressure gauge to insure that the cylinder is full. (Min. of 4000psi.)
 - b) Fully open the cylinder valve.
 - c) Check the PASS for proper operation.
 - d) Don SCBA and adjust the shoulder and waist straps as needed.
 - e) Put on face piece and tighten straps from bottom to top.
 - f) Pull up Nomex hood and adjust to face piece.
 - g) Don helmet and tighten chinstrap.
 - h) Press demand valve into face piece and perform a 5 second negative pressure check.
 - i) Lock demand valve to mask by quarter turn.
 - j) Test for positive pressure by lifting edge of mask with 2 fingers.
 - k) Check chest mounted pressure gauge to verify pressure.
 - l) Check bypass valve for proper operation.
 - m) Check partner's protective ensemble prior to entering a hazard zone.
 - a. The user should not expect to obtain the exact 30-minute duration as when tested by NIOSH. More strenuous work shortens the time frame, possibly to 10 minutes.
 - b. Periodically check the regulator gauge and monitor the cylinder pressure. When the gauges needle reaches 25%, the vibrating alert will activate. There is approximately 3 to 5 minutes reserve time remaining to get to a safe atmosphere. Do not rely on the vibrating alert for egress.

- c. Teams should be aware of the time needed to exit and do not pass that **point of no return**. Leave the hazardous area immediately. Do not remove the face piece except until in a safe, non-hazardous, non-toxic atmosphere.

SCBA Repair

1. Any SCBA found to be functioning improperly is immediately taken out of service, tagged with the proper problem, and then reported to the Company Officer who then reports it to the Supply Officer. The unit is repaired as soon as possible and then placed back in service.
2. Any SCBA taken out of service will be placed in the tool room or office at Station 520. The Supply Officer is responsible for its placement back in service. If the SCBA cannot be repaired by department personnel, a qualified repairperson will be contacted.
3. Any repair of SCBA must be documented.

Semi-annual and annual flow testing and repairs are performed by certified repair personnel only.

Manufacturing breathing air for human consumption

1. Due to the danger of breathing air becoming contaminated, the following is performed:
 - a) All compressors used to fill SCBA or SCUBA will be tested quarterly for air quality and moisture by a private testing laboratory.
 - b) Filters will be changed; as required, by manufacturer's recommendations or as required by contaminate readings from the testing laboratory, (every 10hrs).
 - c) The Supply Officer is responsible for assuring that tests are performed at the prescribed times and filters are changed as required.
 - d) Manufactured air meets NFPA Standard # 1404, Chapter 7, Air Quality Control.

Cascade System

The OPDPS has a cascade system with the capabilities of filling air cylinders to 5,000 PSI or higher. The following procedures were developed for this system's safe operation.

Policy:

General Information:

- All system connections tightened to finger tight strength only. Over tightening may result in the damage to the valves and related components.
- The cascade system is intended to refill certified air cylinders only with current hydrostatic test.
- Only OPDPS personnel who have successfully completed training on its operation will be allowed to operate the cascade system.

- Each time a SCBA bottle or Cascade Cylinder is filled off of the cascade system, it shall be recorded in a log book. Date, bottle number, and person performing the refill shall be logged.

Filling Procedure:

- Place the SCBA bottle into the filling rack.
- Check the filler hose connection and ensure an o-ring is in place.
- Connect the filler hose(s) to the bottle(s).
- Turn off the bleeder valve(s) on the filler hose.
- Slowly open the SCBA bottle(s) valve(s) until completely open.
- Close the filler rack and lock the blast chamber.
- Slowly open the filler hose valve(s) until completely open and let the system equalize.
- Never move the regulator pressure valve; it is set to a certain pressure as a pressure relief valve.
- Open bank 1 valve first and slowly fill the bottle(s) between 4000 PSI and 4500 PSI, or until filling process stops.
- If desired pressure is reached proceed to next step. If filling process stops, close bank 1 valve, open next bank valve and repeat the filling process until desired pressure is reached. Use each bank until desired pressure is reached.
- Once desired pressure is obtained, close all bank valve(s).
- Close all filler hose valve(s)
- Unlock the blast chamber and open the filler rack.
- Close SCBA bottle(s) valve(s)
- Open the bleeder valve(s) and disconnect the SCBA bottle(s)
- Remove the SCBA bottle(s), close the filler rack and lock the blast chamber.