

## Piped Air SCBA Refilling System Standard

**SCOPE:** This specification describes the minimum requirements for the design, fabrication, engineering, installation, testing and maintenance of the Piped Air SCBA Refilling System.

**NOTE:** Any materials specified by a trade mark or product name within this specification necessary to design, fabricate, test, maintain and use the equipment described and regulated by this standard or code, may be substituted with a like product provided it meets or exceeds those specifications and be in accordance with nationally recognized and accepted standards, principals and tests.

### 1. Description

The SCBA Piped Air Refilling System is a permanently installed, self-contained high pressure air system with remote filling stations, supply standpipe and equipment/materials to isolate, interconnect and allow the remote filling of high pressure SCBA (Self Contained Breathing Apparatus) air bottles (5,500 psi) within the building/structure or accessory areas. Provisions shall be made to allow the Air Support Vehicle to interconnect directly to the system, allowing a continuous supply of air from the vehicle to the installed system.

A high pressure air maintenance tank shall be installed in such a manner as to keep constant air pressure on the entire installed system to prevent any contamination of the air within the system while in a static state.

The air supply from the Air Support Vehicle shall be able to be isolated from the on-site air pressure maintenance tank and be diverted directly to the main air piping riser by means of check valve(s), and a two way selector valve allowing the air to be supplied directly to the remote fill cabinets.

The building shall be equipped with intermediate filling station(s) installed in each fire department equipment storage room. Each filling station shall have the capability of manually being isolated from the remainder of system by means of valves and check valves should a leak failure occur from the filling station.

An additional valve shall be placed within the main riser allowing the individual isolation of all piping and filling stations above a leak or failure of the main piping riser.

### 2. SAFETY

This system shall be designed to provide a reliable, clean air source within the building/structure via the installed piping and associated equipment and materials for fire department personnel to refill SCBA bottles and perform firefighting, rescue or other type of incident requiring self-contained breathing apparatus. Nothing within the content of this specification shall be reduced in quality in any manner including but not limited to: materials, equipment, installation, design, testing, maintenance or construction. All portions of the system shall be designed to meet manufacture's specifications.

All components and material shall be listed by a recognized listing company for high pressure breathing air systems.

### **3. COMPONENTS (General overview)**

Every installed system shall have installed a minimum;

- A. Street level inlet control fill station
- B. Building piping and associated components
- C. Filling control station cabinet (every 5 floors)
- D. High pressure maintenance tank
- E. Low pressure air switch
- F. All associated valves,
- G. Gauges (0-7,500 psi oil filled)
- H. Check valves
- I. Isolation valves

### **4. PRESSURE RATING**

All components of the SCBA air refilling system shall be constructed of materials and equipment tested and certified for a minimum working pressure of 5000 P.S.I.

### **5. DESIGN ENGINEER**

The complete system shall be designed by a current State of California licensed mechanical engineer. The engineers license stamp and signature shall be provided on all submitted plans. (wet stamp)

### **6. CODES AND STANDARDS**

This system shall be installed in accordance with this standard and all applicable codes and nationally recognized standards for high pressure breathing air systems. If/when a requirement within this standard is not specific, then, the requirement/standard which is more specific shall apply. The following codes/standards shall apply but not be limited to:

- A. Chapter 53 of the 2013 Edition of the California Fire Code.
- B. Compressed Gas Association , Inc., Pamphlet CGA-G-7.1 Commodity Specification for Air.
- C. 2013 Edition of NFPA 1989 for Breathing Air Quality for Firefighter and Emergency Services Respiratory Protection.
- D. ANSI and ASTM standards may be used which are specific to high pressure breathing air systems

### **7. PLAN SUBMITTAL:**

The Sacramento Fire Department and the Mechanical division of the Sacramento Community Development Department (CDD) shall be provided with plans for review and approval. The plans shall provide the minimum information:

- A. Manufactures technical product data and installation data for all equipment, product and materials used.
- B. All piping, fittings, valves, gauges, hangers/supports and fasteners.

- C. System calculations to support the minimum required filling specification at the uppermost remote filling station.
- D. All technical data sheets and U.L. or nationally recognized listing agency for the products submitted for installation.
- E. Codes and standards to which the systems has been designed

Installation of the system shall not commence until plans have been submitted and approved and a permit issued by the authority having jurisdiction.

#### **8. CERTIFICATE OF INSTALLATION:**

A letter shall be submitted by the installer and engineer to the Sacramento Fire Department at the completion of the installation, to certify that all portions of the Piped Air System have been designed, installed, tested and inspected by the installer and is proper working order and free of defects.

#### **9. RECORD DRAWINGS:**

At the completion of the installation, a complete set of revisions shall be provided to the following:

- A. The Sacramento Fire Department
- B. The building owner

**NOTE:** Any changes to the originally approved plans shall be submitted to the building department and fire department for approval prior to the change being made to the system.

#### **10. TRAINING:**

The installer/contractor shall provide to the Sacramento Fire Department no less than 6 (six) hours of on-site training divided onto 3 separate and equal sessions for the use and operation of the system. Scheduling of the training shall be coordinated through the Sacramento Fire Department. A final shall not be granted for the installation of the system until the training has been completed.

#### **11. MAINTENANCE:**

The building owner and/or authorized agent shall provide for the regular testing and maintenance of the piping and air quality of the system. This may be performed by a State of California licensed mechanical engineer and be in accordance with the 2013 Edition of NFPA 1989 for air quality, and the 2013 edition of NFPA 1500. The system components shall be examined to ensure it is leak free and free of damage.

### **SYSTEM COMPONENTS**

#### **12. MATERIALS OF CONSTRUCTION**

A. All materials used in the construction of the system shall be rated for a minimum working pressure of 5000 p.s.i. and shall be built to manufacture's specifications. The internal surface of all components shall be free of all contaminants so that the air within the system meets all provisions of breathing air.

B. All materials with openings such as piping shall be shipped and remain sealed with approved caps until installed. Any/all piping, materials or equipment found not to be suitably

protected will not be used or installed, or properly cleaned in an approved manner prior to installation. Any material installed which has not been properly protected and installed will require the entire system to be properly cleaned and certified by an independent contractor that the system is free of contamination.

C. Should cleaning of the piping or other components be necessary, at no time shall an organic solvent be used.

### **13. PIPING:**

A. All piping shall be stainless corrosion resistant steel suitable for breathing air. All piping shall be welded except for the connection to the air filling cabinet. Welding shall not produce contaminants within the piping and be maintained cleaned as necessary.

B. All mechanical fittings when approved to join piping shall be listed for the minimum working pressure and listed for compatibility to the materials being joined. All piping shall be sized to provide the minimum SCBA filling time at the top most filling cabinet.

C. All piping shall be protected by a minimum listed 2 hour fire resistive construction and protected from physical damage. Piping below 6 feet from the finished floor shall be physically protected in a manner which will not allow any person to access the piping.

D. Any time the piping must pass through a fire rated wall or solid material, it shall be protected by a sleeve at least 3 times the diameter of the piping and properly filled with a listed fire stop material.

E. All piping shall be permanently labeled to identify its content and working pressure. Identification shall be placed at no less than 20 foot intervals or as is necessary to clearly identify whether in plain view or hidden from view, ie. such as within the cavity of a wall.

G. The SCBA system piping shall not share any penetration, opening or raceway with any other system or equipment.

### **14. FIRE DEPARTMENT EXTERIOR FILL RISER INLET**

A. A remote fill inlet shall be provided on the exterior of the building to the main riser and maintenance pressure tank. The filling inlet and associated parts shall be located in a locked, weather tight cabinet. Access to this connection shall not be obstructed in any manner and the location shall be approved by the fire department prior to installation.

B. When the location of this fill inlet is not possible to be located on the building, the inlet may be at a remote location as approved by the fire department. All piping shall be installed in a protected raceway or conduit to the building

C. The panel cabinet door shall be of solid construction and be permanently labeled, "Fire Department Air Connection". All lettering shall be a minimum 3 inch in height with ½ inch stroke block letters. The lettering shall be of contrasting color from the enclosure door.

D. Keys to the cabinet shall be provided in a KNOX box installed within 10 feet of the cabinet

E) The following items shall be provided within the inlet fill cabinet:  
1. Male inlet fitting (compatible with fire department equipment)

2. Inlet pressure gauge
3. System pressure gauge
4. Bleed valve
5. Safety whip attachment device.

## **15. ON-SITE PRESSURE MAINTENANCE TANK**

A. The on-site maintenance tank shall be listed for breathing air and be protected from back flow by means of a check valve on the supply inlet and discharge side of the system piping. All pressure tanks and related equipment and materials shall be installed within a room of no less than 2 hour fire rated construction and accessible directly from the exterior of the building.

B. No other equipment or storage not associated with this equipment will be stored in the room. The room shall be of sufficient size to permit the installation/removal and maintenance of the pressure maintenance tank and associated equipment.

C. An electronic low pressure switch shall be installed on the discharge side of the system and interconnected to the main fire alarm panel to indicate a supervisory signal when the pressure has dropped below 1000 psi within the system.

## **16. REMOTE FILLING CABINETS**

A. All remote filling cabinets shall be list by a recognized testing laboratory for the filling of high pressure air SCBA air bottles.

B. Each cabinet shall allow 2 (two) SCBA bottle to be simultaneously and the control valves, pressure gauges for each bottle filling compartment

C. Each cabinet shall be able to fill two 5,500 psi, 45 cubic foot SCBA bottles simultaneously.

D. Filling time for two tanks simultaneously shall take no more than two minutes with two filling stations being used simultaneously.

## **17. ACCEPTANCE TEST PROCEEDURES**

A. Pre-inspect all components for proper assembly.

B. Isolate the maintenance storage tank by closing all necessary isolation valves.

C. Verify that the emergency shut-off valves (isolation valves) at each fill station on each floor are closed.

D. Pressurize the entire system with oil free, breathing grade air or nitrogen to a pressure of 7,500 psi for a minimum of two hours. During this time, verification will be made by monitoring gauges placed at every outlet of the system. Any leak detected shall be documented and a copy of the report shall be submitted to the installer/contractor and the fire department.

E. After the system has satisfactorily passed the pneumatic pressure test and determined to be free of leaks/defects, the system shall be retested in the following manner:

1. Re-pressurize the entire system to 5,500 psi.
2. Close the main supply valve
3. Disconnect the test gas source

The entire system shall remain leak free for a minimum of 24 hours.

## 18. FINAL TESTING

Final testing shall be accomplished in the following manner:

- A. Place a sign at the fill station inlet and each filling cabinet to read: **DO NOT USE. AIR PURITY ANALYSIS TESTING IN PROGRESS. DO NOT FILL OR USE ANY AIR FROM THIS STATION.**
- B. The signs shall be a minimum of 8 1/2 X 11 inches in size with lettering in bold font a minimum 1 inch in height and 3/8 inch stroke.
- C. Pneumatically fill the entire system to 1000 psi.
- D. Calibrate and adjust the air pressure monitoring switch to the low pressure alarm point of 1000 psi.
- E. Fill the entire system to the normal operating pressure of 2,500 psi.
- F. A minimum of two air samples shall be taken from two separate filling stations and submitted to an independent certified gas analysis laboratory to verify the system cleanliness, and that the air meets or exceeds the minimum standard for breathing air for self-contained breathing air apparatus. This report shall be returned to the authority having jurisdiction in writing from the testing laboratory.
- G. When the testing results are satisfactory, the signs shall be removed from the main filling inlet and all filling cabinets and the system put into full and normal operation.
- H. A fire department fire prevention officer shall be present during all testing.

## 19. Maintenance

- A. The S.C.B.A. Refilling system shall be inspected annually and certified by the installer and/or licensed mechanical engineer specializing in high pressure breathing air systems to be in proper working condition and free of defects. All components of the system shall be included in the inspection.
- B. Air samples shall be taken at least quarterly to ensure the stored air meets or exceeds Grade "D" breathing air. A copy of the report shall be submitted to the Fire department.
- C. It is the intent that the requirement for "certification" as mentioned above is not to "certify" the SCBA breathing air system every year as if it were a newly installed system.

D. Should the system need repair and or modification, then a re-certification will be necessary as if the system was newly installed and described in the this standard.

A Fire Department SCBA refilling system installed in accordance with this standard shall be properly inspected, tested and maintained in accordance with this standard to provide at least the same level of performance and protection as designed. The owner shall be responsible for maintaining the system and keeping the system in good working order.