



## Menlo Park Fire Protection District Fire Prevention Bureau

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### *MENLO PARK FIRE PROTECTION DISTRICT Guideline for the Installation of Firefighter Air Systems*

**511.1 Scope.** The design, installation, and maintenance of firefighter air systems shall be in accordance with this section.

**511.2 Required installations.** When required by the fire code official, a firefighter air system shall be installed in new buildings four or more stories in height and in existing buildings greater than 75 feet in height not later than December 31, 2005, and any underground structures that are two or more floors below grade.

#### **511.3 Permits, plans and fees.**

**511.3.1 Permits.** A permit is required to install or modify a firefighter air system.

**511.3.2 Plans.** Prior to the installation of a firefighter air system, a minimum of two sets of plans and specifications shall be submitted to the Fire District for review and approval. Plans shall demonstrate compliance with the requirements of this section and shall include calculations prepared by a registered professional engineer demonstrating that the design criteria for all pressure containing components is satisfied plus a minimum safety factor of 25%. The plans submittal shall also include specifications for the tubing, fittings, and manufacturer data sheets for valves, pressure regulators, pressure relief devices, gauges, RIC universal air connections and cylinder filling hoses.

**511.3.3 Fees.** Plan check fees shall be paid when plans are submitted. Plan check and inspection fees may be found in the Menlo Park Fire District Fee Schedule.

**511.3.4 Contractor qualification.** The firefighter air system shall be installed by a State of California licensed contractor.

#### **511.4 Design criteria.**

**511.4.1** The system shall be designed to fill, at each interior cylinder filling panel one 66 standard cubic foot compressed breathing air cylinder to a maximum pressure of 3,000 and 4,500 PSIG.

**511.4.2** The filling operation shall be completed in not more than two minutes upon connection of the cylinder to the fill hose.

**511.4.3** The minimum design flow of the breathing air piping system shall be calculated using two interior cylinder filling panels operating simultaneously and located at the highest level above the fire department access.

**511.5 Operating pressure.** All components used in the system shall be rated to operate at a minimum pressure of 5,000 PSIG at 70°F.

**511.6 Marking.** System piping, gauges, valves and air outlets shall be clearly marked by means of steel or plastic labels or tags indicating their function. Markings used for piping systems shall consist of the content's name and include a direction of flow arrow. Markings shall be provided at each valve; at wall, floor or ceiling penetrations; at each change of direction; and at a minimum of every 20 feet (6096 mm) or fraction thereof throughout the piping system.

#### **511.7 Base Station exterior fire department connection panel and enclosure.**

**511.7.1 Location.** A fire department connection panel shall be attached to the building or on a remote monument at the exterior of the building. The panel shall be secured inside of a weather resistant enclosure. The panel shall be within 50 feet (15240 mm) of an approved roadway or driveway, or other location approved by the Fire District. The enclosure shall be visible and accessible on approach to the building.

**511.7.2 Construction.** The fire department connection panel shall be installed in a cabinet constructed of minimum 18-gauge carbon steel. When constructed of steel, the cabinet shall be provided with a coating to protect the cabinet from corrosion. When the enclosure is constructed of non-metallic materials, the enclosure shall be resistant to ultraviolet and infrared solar radiation.

**511.7.3 Vehicle protection.** When the panel is located in an area subject to vehicle traffic, impact protection shall be provided in accordance with this Code.

**511.7.4 Base Station enclosure marking.** The front of the enclosure shall be marked "FIREFIGHTER AIR SYSTEM" on a securely attached steel, plastic engraved or painted plate. The lettering shall be in a color that contrasts with the enclosure front and in letters that are a minimum of 2 inches high with 3/8-inch brush stroke. The marking of the enclosure shall be visible.

**511.7.5 Base Station enclosure components.** The components in the base station panel shall consist of the necessary components to provide air to the air substations located on upper and/or lower building levels. The fire department air supply source shall be designed to connect to the base station panel. The following components shall be installed in the Base Station Enclosure:

1. One - Male RIC UAC fitting. When connected to a female fitting, the assembled UAC shall meet the construction, performance and dimensional requirements of NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Fire and Emergency Services 2002 Edition*.
2. One – downstream shut-off valve.
3. One – pressure gauge to check pressure of the piping distribution to Air Substations located on upper and lower building levels.
4. One – pressure relief valve designed for 1.25 times the design discharge of the fire department air supply or air supply trucks. All fittings, hoses and hard piping in the Base Station supply panel and distribution piping to Air Substations supply panels, shall be designed for an air pressure of 1.5 times the pressure of the fire department air delivery system.
5. Base Station can be designed for a dual air pressure supply piping system for supply of air to Air Substations. The dual air supply lines will require an intermediate regulator to provide air pressure for a 4500 psig system and a 3000 psig system. Each of these air supply lines will be fitted with separate pressure relief valves set at 1.25 times the working pressure of the air supply line and the operating pressure of each of the separate pressurized lines.
6. The relief valve, piping, pressure regulator, pressure gauges, fittings and connection hoses shall meet the requirement of the ASME Boiler and Pressure Code, Section VIII, Unified Pressure Vessel Code. The installation of the piping system, as a minimum, will be based on ASME B31.3-2004 Code.
7. Mechanical supports for piping, hoses, gauges and pressure components, will be designed and built to provide a solid rigid structure.

**511.7.6 Security.** To prevent unauthorized access to or tampering with the system, the fire department connection panel enclosure shall be maintained locked by an approved means.

**511.7.7 Fire department key box.** A fire department key box shall be provided adjacent to the fire department connection panel and enclosure. A key for the enclosure shall be provided in the key box.

## **511.8 Interior cylinder fill panels and enclosure.**

### **Air Substation.**

**511.8.1 Location.** Cylinder fill panels shall be installed in the interior of buildings as follows:

1. An interior air substation cylinder fill panel and enclosure shall be installed adjacent to standpipe outlets in all stairwells of buildings commencing on the second floor above grade and below grade and every other floor thereafter.
2. Underground Structures. An interior air substation cylinder fill panel and enclosure shall be installed in all stairwells on the second level below grade and every other below grade level thereafter. The panel shall be located a minimum of 36 inches but not more than 60 inches above the finished floor or a stairway landing.

**511.8.2 Cabinet requirements.** Each air substation cylinder fill panel shall be installed in a cabinet constructed of minimum 18-gauge carbon steel. The depth of the cabinet shall not create an exit obstruction when installed in building stairways. With the exception of the shutoff valve, pressure gauges, fill hoses and ancillary components, no system components shall be visible and shall be contained behind a minimum 18-gauge interior panel.

**511.8.3 Door.** Hinges for the cabinet door shall be located inside of the cabinet. The door shall be arranged such that when the door is open, it does not reduce the required exit width or create an obstruction in the path of egress. A minimum of 80% of the door surface area shall be constructed of tempered glass. The thickness of the glass shall not be greater than 1/8-inch .

**511.8.4 Cabinet marking.** The front of each cylinder fill panel shall be marked "FIREFIGHTER AIR SYSTEM". The lettering shall be in a color that contrasts with the cabinet front and in letters that are a minimum of 2 inches (50 mm) high with 3/8-inch (5 mm) brush stroke. The marking of the cabinet shall be visible to emergency response personnel.

**511.8.5 Air substation cabinet components.** The cabinet shall be of sufficient size to allow for the installation of the following components:

1. One – isolation valve located between the air discharge line to the next Air Substation and the downstream line to the Air Base Station supply or the Air Substation immediately below to the next substation above the Air Base Station.
2. The fill hoses and isolation valves shall be installed between the air bottle connection line and the fresh air supply.
3. Excess bleed valves shall be located between the air bottle fill hose and the next Air Substation.
4. When multiple bottle fill hoses are required at a single Air Substation, the air supply lines shall be identified as 4500 psig pressure and 3000 psig pressure and shall be controlled by a single valve between the air supply and air bottle. The SCBA fill hoses shall be designed with RIC UAC fittings. A protective cap to be provided for each hose.
5. Mechanical supports for piping, hoses, gauges and pressure components, shall be designed and built to provide a solid rigid structure.

**511.8.6 Cylinder filling hose.** The design of the cabinet shall provide a means for storing the hose to prevent kinking. When the hose is coiled, the brackets shall be installed so that the hose bend radius is maintained at 4 inches or greater. The discharge outlet of each cylinder filling hose shall have a female RIC UAC. The female fitting shall be designed to connect to a male RIC UAC. The assembled RIC UAC shall meet the construction, performance and dimensional requirements of NFPA 1981, *Standard on Open Circuit Self-Contained Apparatus for Fire and Emergency Services*, 2002 Edition, Section 6.4.

**511.8.7 Security.** To prevent unauthorized access to or tampering with the system, each panel cover shall be maintained locked by an approved means.

#### **511.9 Installation of components.**

**511.9.1 Pressure monitoring switch.** An electric low pressure monitoring switch shall be installed in the piping system to monitor the air pressure. The pressure switch shall be connected to the building's fire alarm system. The pressure switch shall transmit a supervisory signal when the pressure of the breathing air system is less than 3,000 PSIG at 70° F, + 100 PSIG. If the building is not equipped with a fire alarm system, activation of the pressure switch shall activate an audible alarm located at the building's main entrance. A weather resistant sign shall be provided adjacent to the audible alarm stating "FIREFIGHTER AIR SYSTEM – LOW AIR PRESSURE ALARM." The lettering shall be in a contrasting color and the letters shall be a minimum of 2 inches high with 3/8-inch brush stroke.

**511.9.2 Tubing.** Piping shall be constructed of stainless steel or other approved materials that are compatible with breathing air. The use of nonmetallic materials shall be compatible with breathing air. When stainless steel tubing is used, it shall meet ASTM A-269, Grade 316 or an equal standard. Stainless steel fitting shall be a minimum .375 inches (9.5 mm) outside diameter x .065 inches (1.6 mm) wall Grade 316 fully annealed seamless. Stainless steel fittings shall be at least Grade 316 and meet the requirements of ASTM A-479 or equal. Routing of tubing and bends shall be such as to protect the tubing from mechanical damage.

**511.9.3 Support** Piping shall be supported at maximum intervals of 5 feet (1524 mm). Individual tubing clamps and mounting components shall be mechanically secured to the building support-members in accordance with manufacturers specifications.

**511.9.4 Fittings.** Fittings shall be constructed of stainless steel or other approved materials that are compatible with breathing air. The use of nonmetallic materials shall be compatible with breathing air. Stainless steel fittings shall be at least Grade 316 and meet the requirements of ASTM A-479 or an equal standard.

**511.9.5 Prohibition.** The use of carbon steel, iron pipe, malleable iron, high strength gray iron, or alloy steel is prohibited.

**511.10 System assembly requirements.** The system shall be all welded system except where the tubing joints are readily accessible and at the individual air fill panels. When mechanical high-pressure tube fittings are used, they shall be approved for the type of materials to be joined and rated for the maximum pressure of the system. Welding procedures shall meet ASME B31.1-1989, Part 4 and Chapter V (Exhibit VI). Prior to and during the welding of sections of tubing, a continuous, regulated dry nitrogen or argon purge at three PSIG shall be maintained to eliminate contamination with products of the oxidation or welding flux. The purge shall commence a minimum of 2 minutes prior to welding operations and continue until the welded joint is at ambient temperature 60° - 80°F (15.5° - 26.6°C).

**511.11 Prevention of contamination.** The installing contractor shall ensure that, at all times, the system components are not exposed to contaminants, including but not limited to, oils, solvents, dirt and construction materials. When contamination of system components has occurred, the affected component shall not be installed in the system.

**511.12 Testing and inspection.**

**511.12.1 Testing.** Following fabrication, assembly, and installation of the piping distribution system, exterior connection panel and interior cylinder fill panels, the Fire Department shall witness the pneumatic testing of the complete system at a minimum test pressure of 5,500 PSI using oil free dry air, nitrogen or argon. A minimum 24 hour pneumatic or hydrostatic test shall be performed. During this test all fittings, joints and system components shall be inspected for leaks. A solution compatible with the system component materials shall be used on each joint and fitting. Any defects in the system or leaks detected shall be documented on an inspection report, repaired or replaced. As an alternate, a pressure decay test in accordance with ASME B31.3 is allowed. A test of the low pressure monitoring switch shall be performed. Each air fill panel shall be tested for compatibility with the Fire District's SCBA RIC UAC. The pipe or tubing manufacturer mill report shall be provided to the Fire District.

**511.12.2** A minimum of two samples shall be taken from separate air fill panels and submitted to an independent certified gas analysis laboratory to verify the system's cleanliness and that the air is certified as breathing air. The laboratory shall submit a written report of the analysis to the Fire District documenting that the breathing air complies with this section.

**511.12.3** During the period of air quality analysis, the air fill panel inlet shall be secured so that no air can be introduced into the system and each air fill panel shall be provided with a sign stating "AIR QUALITY ANALYSIS IN PROGRESS, DO NOT FILL OR USE ANY AIR FROM THIS SYSTEM." This sign shall be a minimum of 8 ½ X 11 inches (215 mm x 279 mm) with minimum of 1 inch (25.4 mm) lettering.

**511.12.4 Inspection.** Annually, the breathing air within the system shall be inspected in accordance with this section. Annually one air sample shall be taken and certified as breathing air in accordance with the section. The laboratory test results shall be maintained available for review by the Fire District.

**511.13 System acceptance and certification** Prior to the final acceptance of the air system, the building owner shall provide for the testing and certification of the system. As a minimum, this shall include; verifying the system's compatibility with the Fire District's SCBA apparatus, the system's ability to maintain 5,000 PSI working pressure, the operability of the low pressure monitoring switch and that the system's air quality complies with the requirements of section 511.12. Prior to final acceptance, the building owner shall provide the Fire District with written verification of a testing and certification contract. Upon satisfactory completion of all tests and verification of air quality, the system shall be considered complete.