I. INTRODUCTION

A. Purpose: To provide Department personnel with the instructions, regulations, and guidelines pertaining to the use of air cylinders.

B. Scope: This instruction applies to all personnel where air cylinders will be employed as part of a work related task.

C. Author: The Deputy Chief of the Special Operations Bureau, through the Training Services Section, shall be responsible for the content, revision, and review of this instruction.

II. RESPONSIBILITY

A. Station Captains shall:

1. Ensure that all air cylinders are maintained in serviceable condition at all times.

2. Ensure that personnel are trained on transfill procedures.

B. All Personnel shall:

1. Adhere to the requirements set forth in the Breathing Apparatus Policy. In addition:

   a. Backup air cylinders shall be maintained full and capped with the appropriate protective cap.

   b. Breathing air recharging stations shall be inspected weekly and prior to each use.

III. POLICY

A. Cylinders shall not be filled without the proper stamped identification markings.

B. Breathing air recharging stations shall be installed and located in areas approved by the Regional Operations Deputy Chief.

C. Mandatory Safety Requirements: Air cylinders charged with high pressure can be dangerous and must be treated with care at all times. Adhering to the recommended precautions will ensure the safety of personnel.

1. Storage:

a. Cylinders shall be stored, filled, and maintained in a safe manner.

b. Store cylinders in clean, dry locations away from direct sunlight.

c. Cylinders shall not be stored empty or with the valve left open.

(1) Humid atmospheric air will enter the cylinder resulting in interior corrosion and contamination.

d. Air cylinders shall not be stored partially charged. The safety relief device is designed specifically to protect a fully charged cylinder from the effects of fire.

e. Cylinders shall be stored upright with the valve protected from impact or contamination.

f. Cylinders shall be stored together and restrained with a chain, pin, or holder.

2. Filling:

a. Filling procedures shall only be performed by properly trained personnel.

b. Air cylinders shall be recharged or replaced with full bottles as soon as practical after use.

c. If used without recharge, the service duration of the cylinder is reduced.

d. Valve orifices and seals shall be free of all dirt or residue prior to filing the cylinder.

3. Other Safety Requirements:

a. Cylinders shall never be pressurized with any product other than that indicated for its use.

b. Cylinders shall not be pressurized above their pressure rating.

c. Cylinders shall be filled from authorized transfill equipment only.

d. Do not allow post valves, regulators, gauges, and fittings to come into contact with oils, greases, organic lubricants, rubber, or any other combustible substance.

(1) Cylinder valves shall not be lubricated.

e. Cylinders that have been dropped or otherwise damaged shall be sent to the vendor for a hydrostatic test via the Pacoima Breathing Air Shop.

f. Do not use ordinary tools to work with breathing air equipment. Use designated or special tools. Keep tools clean and store them separately for use with breathing air equipment only.

D. Personal Hygiene:

1. Scrub hands and arms with soap and hot water before beginning the filling operation.

2. Be certain that all contaminates have been removed, especially residual hydrocarbons.

E. Identification:

1. Never charge or use a cylinder without the American Society of Mechanical Engineers (ASME), Department of Transportation (DOT) or Interstate Commerce Commission (ICC) markings.

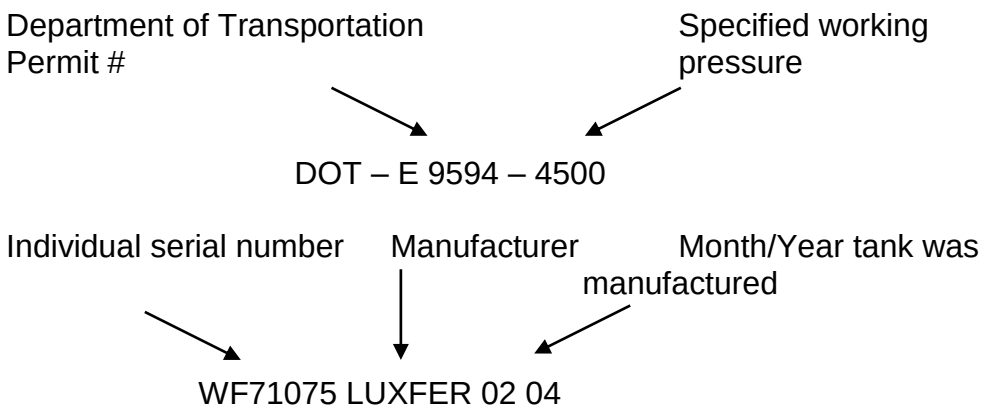
2. These markings are plainly and permanently stamped on the shoulder, head, or neck areas of the cylinder.

3. The following markings are plainly and permanently stamped on the valve end of the cylinder.

a. The markings will usually be stamped in this order:

DOT-E 9894 – 4500 WF71075 LUXFER 02 04

4. Definitions of these markings:



IV. PROCEDURES

A. Cylinders:

1. Inspection:

(a) Inspect the cylinder for the last date of hydrostatic testing. The last testing agency will stamp their mark, month and year of the last hydrostatic test. As a result, several dates may be marked on the cylinder.

(b) Fiberglass reinforced aluminum cylinders: Do not fill if the current date stamped on the cylinder exceeds three (3) years, and that the cylinder is less then 15 years old.

(1) The cylinder must be sent to the vendor for a hydrostatic test via the Pacoima Breathing Air Shop.

(c) Composite cylinders: Do not fill if the current date stamped on the cylinder exceeds three years, and that the cylinder is less then 15 years old.

(1) The cylinder must be sent to the vendor for a hydrostatic test via the Pacoima Breathing Air Shop.

(d) Cylinders that have not been stamped with AMSE, DOT, or ICC markings shall not be filled.

2. Damaged Cylinders: Cylinders with damage must be sent to the vendor via the Pacoima Breathing Air Shop for repair.

   a. Inspect for damage to cylinder valve, gauge, and threads.

   b. Examine all exterior surfaces for rust, corrosion, pitting, cuts, gouges, dents, or digs.

      (1) Consult the Pacoima Breathing Air Shop if there is question as to the extent of damage and required repair.

   c. Fiberglass reinforced aluminum cylinders may have the following acceptable levels of damage:

      (1) Minor abrasions such as scuffs, unless the damage is deep enough to expose groups of fibers.

      (2) Cuts of scratches less than .005” deep.

      (3) Dents of bruises existing in localized areas of the fiberglass reinforcement only.

         (a) Consult the Pacoima Breathing Air Shop if there is question as to the extent of damage and required repair.

   d. Fiberglass reinforced aluminum cylinders may not have the following unacceptable levels of damage:

      (1) De-lamination of fiberglass reinforcement.

      (2) Structural damage with visual evidence of changes in envelope configuration including dents, bulges, or cocked fittings.

      (3) Any sign of fire damage, i.e. discoloration of metal or fiberglass reinforcement.

   e. Valve orifices and faces shall be inspected for dirt and residue.

      (1) Carefully clean with a dry paper towel prior to filling.

3. Leaking Cylinders: Cylinders suspected of leaking may be checked by submersing into clean, clear water. After testing for leaks, dry thoroughly with a clean paper towel.

   a. Saliva shall not be used to test for leaks. Saliva can cause fungus growth and internal contamination of the cylinder.

   b. Soap and water shall not be used to test for leaks.

4. Contaminated cylinders shall be tagged and sent to the vendor via the Pacoima Breathing Air Shop.

   a. Air cylinders are contaminated when:

      (1) They have been allowed to become completely empty with the stop valve left open.

      (2) Detectable odors are present in the air.

      (3) Valves or cylinders have come into contact with any hydrocarbons, i.e., gasoline, diesel residual, or engine oil.

5. Maintenance and repair:

   a. Cylinders with valves in need of repair or replacement shall be sent to the Pacoima Breathing Air Shop.

   b. Cylinders requiring hydrostatic testing, decontamination, damage evaluation, or repair shall be sent to the Pacoima Breathing Air Shop.

      (1) The cylinder shall be tagged and a Form 47 “Transfer of Property” shall be filled out.

      (2) The following information must be included on the tag and Form 47:

         (a) The cylinder serial number.

         (b) If the cylinder is contaminated, the words “contaminated cylinder: clean and purge before filling” shall be written in legible, bold printing.

B. Breathing Air Recharging Stations:

1. General information: When using the breathing air recharging station, safety is of primary importance.

   a. The same filling procedures are used for 4500 PSI fiberglass reinforced aluminum cylinders and 4500 PSI composite cylinders.

2. System Overview: The Los Angeles County Fire Department primarily utilizes the Bauer Compressors Unicus II Prodigy Series breathing air recharging station. The following is an overview of the Unicus II Prodigy series.

   a. If another breathing air recharging station is being used, utilize the individual operators manuals provided with the specific unit when filling cylinders.

   b. The Unicus II Prodigy series intergraded high pressure breathing air recharging stations are used for application in the high pressure range, up to 6000 psig. These units feature a five-stage, four cylinder, air-cooled high pressure compressor block.

      (1) The approximate weight of the Unicus II with standard equipment is 3600 lbs.

3. Compressor Unit Pneumatic Sequence:

   a. Ambient air is drawn into the compressor unit through the intake filter by the compressor first stage (I) where it is compressed to a pressure of approximately 44 psi.

   b. Compressed air from the first stage (I) then passes through an intercooler to the second stage (II) where it is further compressed to approximately 203 psi.

   c. The compressed air leaving the second stage (II) is routed through another intercooler and an inter-filter before entering the third stage (III) where it is compressed to approximately 609 to 653 psi.

   d. After compression in the fourth stage (IV), the air flows through an intercooler and an inter-filter to the fifth stage (V) where it is compressed to the final pressure of the system.

   e. Air from the fifth stage (V) then flows through an after-cooler, a coalescing separator and a check valve to the purification system.

(1) A pressure maintaining valve/check valve is located downstream of the purification.

(2) After the pressure maintaining valve, the compressed air flows to a three-way ball valve by which the air-flow can be directed to either the air storage system cylinders or through the fill hoses to the fill adapters.

4. Air Delivery:

Note: Supervisors shall ensure that personnel utilizing the breathing air recharging stations are familiar with procedures and safety requirements prior to working with the equipment.

a. Visually inspect each cylinder and valve for signs of damage before filling. Do not fill any cylinders which appear to be damaged.

b. The compressor is capable of generating pressures in excess of the normal cylinder fill pressure. It is important not to overfill cylinders.

c. Every cylinder is stamped with a maximum pressure and the last inspection date. Do not fill a cylinder with an outdated inspection stamp.

d. Be sure the regulator and safety valves are properly set.

e. The fill station is designed to offer the operator protection against resultant explosive forces should a cylinder fail during the filling operation and, at the same time, contain resulting shrapnel.

5. Fill station features:

a. Scuff guard strips.

b. Three fill hoses complete with bleed valves and Self-Contained Breathing Apparatus (SCBA) adapters.

c. Pneumatic fill door safety interlock.

d. Illuminated stainless steel fill control panel with individual pressure gauges.

6. Electronic Control Module:

a. When the compressor is started, the electronic control compensates for low oil pressure fault signals for approximately 40 seconds to allow the compressor to establish oil pressure.

(1) If the operational conditions at the monitored positions are not established during this period, the electronic control will shut down the drive motor or engine.

b. During operation, shut-down of the compressor occurs immediately after the fault signal has been applied to the monitoring unit.

(1) The unit is designed to fail safe, i.e., any interruption of the control or monitoring circuit results in the system being disabled, thus protecting the monitoring and control system against wire breakage or loose terminals.

c. After correcting the fault, the fault signal must be cancelled by switching the on-off switch first to “Off,” then back to “On.”

(1) On units with a push-button type switch, switching from the center position to “On” will not start the compressor unit again.

(a) After correcting the fault, the fault signal must be cancelled by switching the off/on switch first to “Off,” then back to “On.”

d. Off/On Switch:

(1) The off/on selector switch controls the operation of the compressor unit.

(2) If the selector switch is in the “Off” position, the unit will not operate.

(3) When the selector switch is turned to the “On” position, the unit will automatically start and stop to maintain the final pressure between the high and low set points of the final pressure switch.

e. Start-up and Shut-down:

NOTE: Audible knocking during start-up is due to the final stage floating piston. This knocking disappears as soon as there is pressure between the stages and the piston is running

synchronous with the other pistons. This knocking can be ignored.

(1) To Start:

(a) Energize the main power source.

(b) Turn the selector switch to “On.”

(2) To Stop:

(a) Turn the selector switch to “Off.”

(b) Disconnect the main power source.

(3) Emergency Stop:

(a) Depress the emergency stop push-button.

(b) Unit will shut down.

f. Operation:

Note: Always use approved hearing protection when performing fill procedures.

(1) Close all fill and bank valves.

(2) Unlatch the fill station door by flipping the fill station door interlock control lever to the down position and pull the door open by the handle.

(3) Place the cylinder(s) to be filled into the holder.

(a) Insert the proper size ring, supplied with your system, into the bottom of the cylinder holder to adjust the height of your SCBA cylinder.

(i) A proper adjustment will leave the cylinder valve slightly below the rim of the bottle holder.

(ii) Different SCBA cylinders have different lengths.

(iii) For some smaller cylinders, it may be best to turn the large spacer on its side.

(4) Connect the fill hose(s) to the cylinder(s) to be filled.

(5) Close the fill hose bleed valve(s).

(6) Open the cylinder valve(s).

(7) Close and latch the fill station door by flipping the fill station interlock control lever to the up position.

NOTE: The Unicus II integrated breathing air recharging station will not fill the cylinders unless the door is closed and latched.

(a) By closing the door, the cylinder holders are returned to their upright position.

(8) For cascade filling from air storage, open the desired bank valve. Adjust the fill pressure with the fill pressure regulator to the desired pressure.

(9) Open the fill valve(s) to fill the cylinder(s). The pressure indication on the fill pressure gauge will drop while cylinders are filling.

(10) Filling is completed when the fill pressure gauge returns to the desired pressure.

(11) If the pressures between the bank and the fill gauge equalize before the desired fill pressure is reached, close the bank valve in use and open another bank valve.

(12) Repeat this procedure as necessary.

(13) When filling is completed, close the bank valve and the fill valve(s).

(14) Unlatch the fill station door by flipping the fill station interlock control lever back to the down position.

(15) Open the safety door.

(a) The cylinders are now in a diagonal position.

(16) Close the cylinder valve(s).

(17) Open the fill hose bleed valve(s).

(18) Remove the fill adapter(s) from the filled cylinder(s) and connect them to the hose holder(s).

(19) Repeat procedure to charge additional cylinders.

(20) Close the fill station door.

g. Maintenance of Breathing Air Recharging System:

(1) Weekly and Prior to Use:

(a) Inspect condensation bottle and empty as necessary. Discard contents containing oil residue in an appropriate manner.

(b) Check the oil level.

(c) Check the fill connector threads for damage.

(d) Check the fill hoses for wear or damage.

(e) Run the compressor for 15 minutes. Draining tanks and refilling them will meet this requirement.

(2) Periodically:

(a) Wipe down interior and exterior surfaces. Maintaining cleanliness will help to detect leaks or other problems.

(3) Annually or 100 hours of use:

(a) Arrange for service by an authorized technician.