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Kennecott Utah Copper Corporation Safety and Health Standards		Standard No. 16.15 Compressed Gas

16.15.1 **INTRODUCTION**

16.15.1.1 This standard addresses general requirements to minimize the risk of accident or injury for those involved in handling, storing, and using compressed gases. Because of the number of gases and gas mixtures available, and the variety of hazardous properties of these gases, it is not possible to cover all safety precautions in one standard.

16.15.1.2 The applicable safety precautions for all compressed gases must be followed. Knowing the hazards associated with each type of compressed gas is critical.

- Fuel gases in general are potentially hazardous because they burn and can explode when mixed with air or oxygen,
- Gases such as chlorine, hydrogen cyanide, arsine and hydrogen sulfide have toxic properties,
- Inert gases such as argon, helium, carbon dioxide, and nitrogen can cause asphyxiation,
- Oxygen supports and can greatly accelerate combustion,
- Cryogenic liquids may cause freeze burns.

16.15.1.3 Specific information on a compressed gas can be found in Material Safety Data Sheets (MSDS), Compressed Gas Association safety publications and guidelines, or from the vendor.

16.15.2 **REQUIREMENTS**

Pressurized Cylinders

16.15.2.1 All compressed gas cylinders shall be securely stored in an upright position in a cylinder truck, rack, or other sturdy device in a well-ventilated location suitable for the purpose. When transported or stored, the regulators must be removed and the valves protected.

16.15.2.2 Cylinders may be rolled on their bottom edge, but should not be dragged. Cylinders weighing more than 40 pounds should be transported by hand trucks or motorized trucks and be adequately secured to prevent falling. Cylinders shall not be lifted directly with an electromagnet, sling or chain, or hoisted by attachment of the valve. A suitable cradle or rack shall be used.

16.15.2.3 Cylinders must be handled with care and not be dropped or otherwise roughly handled, nor be permitted to strike each other violently. Cylinders may never be used as rollers or supports.

16.15.2.4 Handle all cylinders as though they are full. Residual pressure in "empty" cylinders is often

References:					
NFPA Standards 45, 54, 58, and 59.					
MSHA 30 CFR 57 Subpart C.					
OSHA 29 CFR 1910.101, 252, 253, 1018 and the lead standard, 29 CFR 1910.1025					
ANSI A-13.1 "Scheme for the Identification of Piping Systems", and B31.1, "Code for Pressure Piping"					
ASME Boiler and Pressure Vessel Code					
KUCC Safety and Health Standard 15.6 – Color Code Requirements					
Signatures					
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sufficient to cause a serious accident if mishandled. Empty and full cylinders shall be stored separately. Valves on empty cylinders will be kept closed and valve caps will be in place.

- 16.15.2.5 Cylinders must be legibly marked with either the chemical or the trade name of the gas. Never use a cylinder unless the gas it contains is clearly stenciled on it or marked with a decal. Do not rely on the color of a cylinder to identify the gas inside. Return unidentified cylinders to the supplier.
- 16.15.2.6 Never bring cylinders into confined spaces such as tanks, vessels, pits, unventilated rooms, etc.
- 16.15.2.7 If a gas cylinder develops a leak it must be handled as follows:
- Close the valve and carefully and move the cylinder outdoors away from sources of ignition and from other cylinders.
 - Properly tag the cylinder with a warning tag and notify the supplier.
 - A regulator may be kept in place on a leaking valve temporarily to stop a leak through the valve seat. If a leak occurs at the fuse plug, take the cylinder outdoors well away from sources of ignition, tag the cylinder, and open the cylinder valve slightly to permit the cylinder to empty slowly. Post "No Smoking" signs when appropriate and notify the supplier.
- 16.15.2.8 Safety devices in valves on cylinders must not be tampered with or repairs attempted. If problems arise, the supplier should be promptly notified indicating the nature of the trouble and the cylinder's serial number. The supplier's instructions must then be followed.
- 16.15.2.9 A hammer or wrench may not be used to open cylinder valves. If valves cannot be opened by hand, the supplier must be notified. Where a special wrench is required it must be left in position on the stem of the valve while the cylinder is in use, so that the gas flow can be quickly turned off in case of emergency. In the case of manifold or coupled cylinders, at least one such wrench must always be available for immediate use.
- 16.15.2.10 Pressure-reducing regulators must be used only for the gas and pressures for which they are intended. Make certain threads on regulator or union match threads on the cylinder valve outlet. Do not force a connection that does not fit. Wipe the all mating threads with a clean cloth. All connections shall be tested for leaks. Always close the cylinder valve and release pressure in attachments before removing regulators and other attachments from the cylinder valve. All repairs to regulators, or parts of regulators, including gages, must be performed by properly trained and qualified personnel.
- 16.15.2.11 Only use attachments and tools approved for the particular gases being used. All attachments and tools for use with compressed gases will be regularly inspected prior to each use to assure they are free from defects. Faulty equipment will be properly tagged and taken out of service.
- 16.15.2.12 Cylinders, cylinder valves, couplings, regulators, hose and apparatus must be kept free from oily or greasy substances. Never use grease or oil to lubricate attachments to or valves on a cylinder. Do not handle cylinders and fittings with oily hands, gloves, or clothing. This rule is especially important when oxygen cylinders are involved. Grease and oil that oxidize very slowly in air will spontaneously combust in pure oxygen.
- 16.15.2.13 The cylinder storage location shall be properly signed, and kept free of flammable substances such as oil, solvents, gasoline, combustible materials, etc. Cylinders should not be stored near elevators, stairwells, or traffic areas. Storage rooms for cylinders containing compressed gases should be well ventilated to prevent the accumulation of flammables, oxygen, or inert gases. Sources of ignition and smoking shall be prohibited in storage rooms containing flammable gases or oxygen. Signs indicating "No Smoking" shall be clearly posted.
- 16.15.2.14 Cylinders stored in the open must be protected from contact with the ground or corrosive

materials to prevent rusting and corrosion. Do not permit sparks, molten metal, electric currents / arcs, excessive heat, or flames to come in contact with the cylinder or attachments. Cylinders should not be stored where temperature exceeds 130 degrees F., i.e., near heaters, furnaces, or other heat-producing devices. Cylinders must not be kept in unventilated enclosures such as lockers and cabinets.

16.15.2.15 Oxygen cylinders shall not be stored within 20 feet of flammable gas cylinders such as acetylene, LPG, or propane unless such storage is separated by a fire resistant partition at least five feet high and having a fire resistance rating of at least 30 minutes.

16.15.2.16 The total capacity of acetylene cylinders stored in one location shall not exceed 2,500 cu. ft. unless protected by automatic sprinklers or separated by at least 100 feet for each volume of 2500 cu ft.

16.15.3 **Compressed Gas Piping**

16.15.3.1 When installing piping, provide adequate pressure reducing regulators and pressure relief safety valves to prevent over-pressurization of piping and equipment. Piping must be of suitable material for the type, pressure, and temperature of gas to be handled. Piping on pressure vessel systems shall comply with the standards set forth in ANSI B31.1, "Code for Pressure Piping".

16.15.3.2 All piping carrying compressed gases shall be clearly marked to indicate contents, direction of flow, and color-coded as to the kind of gas in accordance with the American National Standards Institute "Scheme for the Identification of Piping Systems" and KUCC Safety and Health Standard 15.6.

16.15.3.3 A backflow valve shall be used at every point of use where acetylene is drawn from a distribution piping system.

16.15.3.4 Use manifolds and parts only with the gasses they are approved to handle. All fuel-gas manifolds and high pressure (> 250 psig) oxygen manifolds must be approved by Factory Mutual or Underwriters Laboratories for the gas used.

16.15.3.5 All gas lines must be equipped with the appropriate fitting for the gas being used.

16.15.4 **Compressed Air**

16.15.4.1 Compressed air can be extremely dangerous and must be handled with care. Air hose and hose connections used for compressed air shall be designed for the pressure and service to which they are subjected.

16.15.4.2 Compressed air shall not be directed at any part of the body. Never aim or spray compressed air at a fellow employee for any reason. Compressed air should not be used for cleaning machinery or equipment when brooms, brushes, a vacuum cleaner, etc. can do the job.

16.15.4.3 The use of compressed air is prohibited for cleaning floors and other accessible surfaces in any area affected by the OSHA Lead or Arsenic Standard. (29CFR 1910.1018 and the lead standard, 29 CFR 1910.1025)

16.15.4.4 Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psi and then only with effective chip guarding and personal protective equipment. OSHA Instruction describes the intent and application of this standard as the use of compressed air for cleaning purposes at pressures at or greater than 30 psi is permissible if the outlet or source is fitted with a relief device that drops the pressure to less than 30 psi if the flow is dead-ended. Appropriate personal protective equipment shall be worn.

- The requirements for dynamic flow are such that in the case when dead-ending occurs a static pressure at the main orifice shall not exceed 30 psi. This requirement is necessary in order to prevent a backpressure buildup in case the nozzle is obstructed or dead-ended.
- "Effective chip guarding" means any method or equipment which will prevent a chip or particle (of whatever size) from being blown into the eyes or unprotected skin of the operator or other workers. Effective chip guarding may be separate from the air nozzle as in the case where screens or barriers are used. The use of protective cone air nozzles are acceptable in general for protection of the operator but barriers, baffles or screens may be required to protect other workers if they are exposed to flying chips or particles.

- 16.15.4.5 Except where automatic shutoff valves are used, safety chains or other suitable locking devices shall be used at connections to machines and between high-pressure hose lines.
- 16.15.4.6 All pneumatic power tool compressed air hoses exceeding 1/2-inch inside diameter are required to have a safety device at the source of the supply or branch line to reduce pressure in case of hose failure. Safety device, as mentioned above, means a device that will automatically cut off the flow of compressed air, if a hose line ruptures or becomes disconnected.
- 16.15.4.7 Compressed air will not be turned into a hose unless the discharge end is held or properly secured in place. All flexible airlines and hoses must be secured to prevent whipping in the case of a broken line. Air hose sections must be tied together or if using Chicago type fittings they must be pinned or wired before the line is pressurized. Always return an air hose to its proper storage place after use.
- 16.15.4.8 When connecting pneumatic equipment, the user must ensure that the source connection is identified as a compressed air line. Before disconnecting an air hose from any pneumatic equipment or breaking a hose connection the air supply must be shut off and the line bled by opening the air control of the tool.
- 16.15.4.9 Never use oxygen or any other compressed gas as a substitute for compressed air.
- 16.15.4.10 The manufacturer's safe operating pressure for hoses, valves, and fittings shall not be exceeded. No vessel may be pressurized unless it has been designed, constructed, installed, tested, and maintained in accordance with the ASME Boiler and Pressure Vessel Code.

16.15.5 **RESPONSIBILITIES**

- 16.15.5.1 It is the responsibility of the user to know the safety properties of the compressed gas that they are using, inspect prior to use each attachment and / or tool used with a compressed gas to assure that they are free from defects, and report any defect to the supervisor. Faulty equipment will be properly tagged and taken out of service at the first sign of a leak or mechanical problem.

REVISION HISTORY

Revision #	MOC#	Description of Change	Prepared By	Date
4	TS00111	General review and revision of standard	KUCC Safety and Health Standards Committee	01 / 2007