Cylinder Business Training Course

Safe Storage, Handling & Use of Compressed Gases

Welders Supply
THREE TYPES OF GASES:

- COMPRESSED
- LIQUIFIED (CO2, N2-VGL, NO2)
- DISSOLVED (ACETYLENE)
TWO MAIN HAZARDS OF GASES:

- The Properties of the Gas Itself:
  - Poison/Corrosive
  - Flammable
  - Oxidizer
  - Asphyxiant (No Oxygen)

- The Physical Properties of the Gas
  - Cold (Cryogenic or extremely cold gas or liquid)
  - Pressure in the cylinder (Can exceed 3000 psig)
THREE CLASSES OF GASES (DOT):

• FLAMMABLE (2.1)

• NON-FLAMMABLE (2.2)

• POISON (2.3)
Flammable Gases

- Acetylene
- Hydrogen
- Propane
- Butane
SPECIAL PRECAUTIONS FOR FLAMMABLE GASES
Flammable Gases

• “NO SMOKING” NEAR FLAMMABLE GASES!

• USE SPARK PROOF TOOLS!!

• FLAMMABLE GASES SHOULD BE STORED 20 FEET AWAY FROM:
  • OXIDIZERS
  • COMBUSTIBLES
  • IGNITION SOURCES
Flammable Gases

LIMIT QUANTITIES OF FLAMMABLE GASES STORED INSIDE A BUILDING!!

- 2,000 CU/FT
- 300 LBS OF LPG

NOTE

THIS DOES NOT INCLUDE CYLINDERS IN ACTUAL USE OR ATTACHED FOR USE. [ OSHA, 1910.253 (B) (3) ]
Flammable Gases

STORAGE OF FLAMMABLE GASES IN EXCESS OF 2,000 CU/FT OR 300 LBS SHALL BE:

- IN A SEPARATE ROOM/FIREWALL
- IN A SEPARATE BUILDING
- OUTDOORS
Flammable Gases

ACETYLENE

- STORE UPRIGHT

- 15 PSI MAXIMUM ( > UNSTABLE)

- OPEN VALVE 1/2 TO 3/4 TURNS
Non-Flammable Gases

- Air
- Argon Nitrogen
- Carbon Dioxide
- Helium
- Oxygen
- Nitrogen
OXYGEN DEFICIENCY (ASPHYXIANTS)
ASPHYXIANT GASES

- INERT GASES (NON-TOXIC, NON-FLAMMABLE)
- MANY OF THE GASES PRODUCED AND HANDLED BY ALAC BELONG TO THE CATEGORY OF ASPHYXIANT GASES.
- MOST ASPHYXIANT GASES ARE:
  - COLORLESS
  - ODORLESS
  - TASTELESS
ASPHYXIANT GASES

- EXAMPLES OF ASPHYXIANT GASES INCLUDE:
  - Nitrogen
  - Argon
  - Helium
  - Carbon Dioxide
  - Sulphur Hexafluoride
  - HCFC’s (Halocarbons), including refrigerant gases such as R12 and R22 and those used in the semiconductor industry such as H116, H14, H23
GASES WHICH CREATE A HAZARD BY DISPLACING OXYGEN ARE CALLED SIMPLE ASPHYXIANTS.

GENERALLY THERE ARE NO WARNING SIGNS THAT AN ATMOSPHERE CONTAINS INCREASED CONCENTRATIONS OF OTHER GASES AND A DEFICIENCY OF OXYGEN.

ANY ENCLOSED AREA IN WHICH GASES ARE BEING STORED, PIPED, USED OR VENTED MAY BECOME DEFICIENT IN OXYGEN.
ASPHYXIANT GASES

• MANY GASES ARE HEAVIER THAN AIR.

Because many gases are heavier than air, and collect in pits and drains, even small hatchways and coverings may contain oxygen deficient atmospheres.
ASPHYXIANT GASES

Oxygen reduced from 21% to 14%

- The rate and volume of breathing increase and the pulse rate is accelerated.
- The ability to maintain attention and think clearly is diminished.
- Muscular coordination is somewhat disturbed.
ASPHYXIANT GASES

Oxygen content between 10 and 14%

• Consciousness continues, but judgment becomes faulty.

• Severe injuries may cause no pain.

• Muscular efforts lead to rapid fatigue.

• Emotions, particularly ill temper, are easily aroused.
ASPHYXIANT GASES

Oxygen content between 6 and 10%

- Nausea and vomiting may occur.
- The ability to perform vigorous muscular movements or even to move at all is lost.
- The victim may realize that he or she is dying, but not greatly care.
- The process is painless and fast. Even if resuscitation is possible, permanent damage to the brain may result.
ASPHYXIANT GASES

Oxygen content below 6%

• Breathing consists of gasps, separated by periods of increasing duration.

• Convulsive movements may occur.

• Breathing then stops, but the heart may continue to beat for a few minutes.
ASPHYXIANT GASES

• The video contains a recreation of an incident which occurred during maintenance work on an Air Separation Unit.
• Nitrogen gas was being released from the filter unit located inside the pit.
• Even though his face was not below the level of the pit, the employee was still overcome by the gas.
• He died of asphyxiation before help could reach him.
ASPHYXIANT GASES

• SO BE CAREFUL OUT THERE BECAUSE AT THE END OF THE WORK DAY WE WANT YOU TO GO HOME THE WAY YOU CAME “SAFELY”
Non-Flammable Gases - Optional

• Oxygen
SPECIAL PRECAUTIONS FOR OXYGEN AND OTHER OXIDIZERS
Oxygen

• KEEP AWAY FROM OIL AND GREASE!!

• KEEP OXYGEN SEPARATED FROM FLAMMABLE GASES:
  • BY A DISTANCE OF 20 FEET; or
  • BY A 30 MINUTE RATED FIREWALL
Poison Gas

Toxic
- Arsine
- Phosphine
- Hydrogen Sulfide

Corrosive
- Chlorine
- Hydrogen Chloride
SPECIAL PRECAUTIONS FOR POISON GASES (TOXIC & CORROSIVE)
Poison Gases

- HAVE A DETAILED EMERGENCY ACTION PLAN IN PLACE!!
- LIMIT QUANTITIES OF POISON AND CORROSIVE GASES IN USE AND STORAGE!!
- STORAGE OF POISON GASES:
  - OUTDOORS
  - INDOORS (FORCED VENTILATION GAS CABINET)
Poison Gases

• WEAR ALL REQUIRED RESPIRATORY PROTECTION AND/OR PROTECTIVE CLOTHING!!
• FOR CORROSIVE GASES;
  • SAFETY SHOWER & EYEWASH MUST BE READILY AVAILABLE
Cylinder Use

IDENTIFY THE GAS!!
READ THE LABEL! DO NOT DEPEND ON THE COLOR OF THE CYLINDER
Cylinder Use

NEVER REMOVE THE VALVE PROTECTION CAP UNTIL THE CYLINDER IS SECURED AND READY FOR USE!!
Cylinder Use

These Caps DO NOT have to be Removed before using the cylinders.
Cylinder Use

- NEVER USE AN ADAPTOR TO MAKE A CYLINDER FIT A REGULATOR OR OTHER EQUIPMENT!!
- OPEN VALVE SLOWLY!!
  - STAND TO THE SIDE OF THE REGULATOR WHEN OPENING, IN THE EVENT OF A REGULATOR FAILURE.
- IF A CYLINDER VALVE DOES NOT OPERATE EASILY, CONTACT YOUR GAS SUPPLIER FOR ASSISTANCE!!
- NEVER USE EXCESSIVE FORCE TO OPERATE A CYLINDER VALVE.
Cylinder Use

• LEAK CHECK CYLINDER CONNECTIONS WITH A SOAPY SOLUTION.
  • NEVER USE A FLAME!!
• NEVER STRIKE AN ELECTRICAL ARC ON A COMPRESSED GAS CYLINDER!!
• CLOSE CYLINDER VALVES WHEN NOT IN USE!!
• DO NOT SHIP A LEAKING CYLINDER!!
  • (CALL YOUR GAS SUPPLIER)
Reference Material on Gases:

- OSHA
  - 1910.101 - “Compressed Gases” (General Information)
  - 1910.102 - “Acetylene”
  - 1910.103 - “Hydrogen”
  - 1910.104 - “Oxygen”
  - 1910.105 - Nitrous oxide”
  - 1910.253 - “Oxygen-fuel gas welding and cutting”
- American National Standards Institute (ANSI)
  - Z-49.1 - “Safety in Welding and Cutting”
Reference Material on Gases:

- National Fire Protection Association (NFPA)
  - NFPA 50 - “Bulk Oxygen Systems at Customer Sites”
  - NFPA 50A - “Gaseous Hydrogen Systems at Customer Sites”
  - NFPA 51 - “Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes”
  - NFPA 51B - “Fire Prevention in Use of Cutting & Welding Processes”
  - NFPA 55 - “Storage, Use and Handling of Compressed & Liquefied Gases in Portable Cylinders”
  - NFPA 99 - “Health Care Facilities”
Reference Material on Gases:

- Uniform Fire Code (UFC)
  - Article 74 - “Compressed Gasses”
  - Article 75 - “Cryogenic Fluids”
  - Article 80 - “Hazardous Materials”
    - Section 80.303 - “Toxic and Highly Toxic Compressed Gases”
- Compressed Gas Association (CGA)
  - P-1 - “Safe Handling of Compressed Gasses in Containers”
    (This CGA Document is referenced in OSHA Standards.)
  - Numerous other pamphlets, posters, bulletins and videos are available from the CGA. Contact CGA for a current Catalogue which lists document information. (ALAC personnel can download CGA documents on line. See: www.cganet.com)
MOST CITED VIOLATIONS

- OSHA - Cylinder Violations
  - OXYGEN & FLAMMABLE GASES STORED TO CLOSE TOGETHER
    (Closer than 20 feet with no Fire Wall)
  - CYLINDER CAPS NOT IN PLACE
  - CYLINDERS NOT PROPERLY SECURED
CYLINDER STORAGE
Cylinder Storage

SEPARATE STORAGE AREAS BASED UPON:

• TYPES OF GASES
• FULL & EMPTY CYLINDERS
Cylinder Storage

SECURE THE CYLINDER WITH VALVE PROTECTION CAP IN PLACE!!
(CHAINED, TIED, ETC.)
Cylinder Storage

- STORE CYLINDERS IN WELL VENTILATED AREAS THAT DO NOT EXCEED 125 DEGREE FAREINHEIDT
- PROTECT CYLINDERS FROM PHYSICAL DAMAGE
- KEEP AWAY FROM ELECTRICAL CIRCUITS
- AVOID EXCESSIVE MOISTURE
CYLINDER HANDLING
Cylinder Handling

• DO NOT ROLL OR DRAG CYLINDERS
Cylinder Handling

• USE A HAND TRUCK TO MOVE CYLINDERS
Cylinder Handling

- KEEP VALVE PROTECTION CAPS IN PLACE WHILE IN STORAGE, DURING HANDLING, AND IN TRANSPORTATION!!

- NEVER ATTEMPT TO LIFT A CYLINDER BY THE VALVE PROTECTION CAP!!
Cylinder Handling

- NEVER TRANSPORT CYLINDERS IN CAR TRUNKS OR ENCLOSED VEHICLES!!
Summary

NEVER USE A GAS (ANY GAS) UNLESS YOU ARE TRAINED IN ITS USE AND UNDERSTAND ITS HAZARDS!!
Summary

• MATERIAL SAFETY DATA SHEETS (MSDS) ARE A GOOD SOURCE FOR EMPLOYEE TRAINING MATERIAL!!
• IT IS ALA’S RESPONSIBILITY TO PROVIDE OUR CUSTOMERS WITH UP-TO-DATE MSDS SHEETS.
  • ALA MSDS - FAX Line (1-800-231-1366)
  • MSDS on ALA Insite or ALA Website.