Safety Codes Council

Alberta Municipal Affairs

SAFETY TIPS

Compressed Gas Storage

What are the requirements for compressed gas storage?

The storage of dangerous goods classified as compressed gases is covered by the current fire code in force – National Fire Code -Alberta Edition (NFC(AE)). However, the storage of natural and liquefied petroleum gases (i.e. natural gas and propane) must conform to CSA B149.1, "Natural gas and propane installation code," and CSA B149.2, "Propane storage and handling code."

Although some provisions will apply to all, this document will discuss compressed gases only.

The NFC(AE) primarily speaks to the storage of cylinders of Class 2 gases that fall under 3 categories:

- 2.1 flammable (example – acetylene),
- 2.2 non-flammable and non-toxic (example – oxygen and helium),
- 2.3 toxic or corrosive (example – chlorine).

There are some general storage rules for these compressed gasses:

- Class 2 gases shall not be stored in an area where the ambient air temperature is higher than 52°C.
- cylinders and tanks of Class 2 gases shall be protected against mechanical damage.
- cylinders of Class 2 gases that are in storage shall be
    - protected against valve damage, and
    - firmly secured in a position that will not interfere with the operation of the cylinder valve assembly.
- cylinders of Class 2 gases shall be transported in devices designed to provide restraint against movement in any direction.
- except for portable fire extinguishers, cylinders of Class 2 gases shall not be stored
    - in any exit or corridor providing access to exits,
    - under any fire escape, outside exit stair, passage or ramp, or
    - within 1 m of any exit.

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Indoor Storage

The NFC(AE) and the National Building Code – Alberta Edition (NBC(AE)) require that the indoor storage of cylinders of flammable compressed gases must be in a room:

- is separated from the remainder of the building by a gas-tight fire separation having a fire resistance rating of 2 hours,
- is located on an exterior wall of the building,
- whose doors leading to the interior of the building are:
    - equipped with self-closing devices that keep the doors closed when not in use, and
    - constructed to prevent the migration of gases from the room into other parts of the building,
- is designed to prevent critical structural and mechanical damage from an internal explosion in conformance with good engineering practice such as that described in NFPA 68, “Standard on Explosion Protection by Deflagration Venting”,
- is provided with natural or mechanical ventilation,
- does not contain fuel-fired appliances or high-temperature heating elements, and
- is used for no purpose other than the storage of Class 2 gases.

Cylinders of Class 2.1 flammable, lighter-than-air gases are permitted to be stored outside of a room described above, provided that the aggregate capacity per fire compartment of expanded gas outside of the room is not more than:

- 60 m3 in an unsprinklered building of combustible construction that is not sprinklered, and
- 170 m3 in a sprinklered building or in a building of non-combustible construction.

Cylinders of Class 2.3 toxic or corrosive gases or Class 2.2 (5.1) oxidizing gases stored indoors shall be located in a room:

- that is separated from the remainder of the building by a gas-tight fire separation having a fire resistance rating of at least 1 hour,
- that is located on an exterior wall,
- that can be entered from the exterior,
- whose doors leading to the interior of the building are:
    - equipped with self-closing devices that keep the doors closed when not in use, and
    - constructed so as to prevent the migration of gases from the room into other parts of the building,
- is provided with ventilation to the outdoors.
- cylinders of 2.3 toxic or corrosive gases or Class 2.2 (5.1) oxidising gases shall not be stored in a room containing combustible materials.

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In buildings or areas where Cylinders of Class 2.3 toxic or corrosive gases or Class 2.2 (5.1) oxidizing gases are stored, a fire safety plan is required. This fire safety plan contains both general and specific measures. Generally, the fire safety plan shall

- be prepared in cooperation with the fire department and other regulatory authorities,
- be reviewed at intervals not greater than 12 months to ensure that it takes into account changes in the use and other characteristics of the building,
- include information on
    - the emergency procedures to be carried out in case of fire, including
        - sound the fire alarm,
        - notifying the fire department,
        - instructing occupants on the procedures to be followed when the fire alarm sounds,
        - evacuating occupants, including special provisions for persons requiring assistance, and
        - confining, controlling and extinguishing the fire.
    - the appointment and organization of designated supervisory staff to carry out fire safety duties,
    - the training of supervisory staff and other occupants on their responsibilities as regards to fire safety,
    - the type, location and operation of the building fire emergency systems, including diagrams,
    - the holding of fire drills,
    - the measures for controlling fire hazards in and around the building, and
    - the inspection and maintenance of building facilities provided for the safety of occupants

The specific requirements shall include:

- the product classifications for each part of the building where products of different classification are stored,
- the method of storage, including aisle widths for rack storage,
- the maximum permitted height of storage for the building or part of the building, if different,
- the maximum permitted size of individual storage areas,
- in sprinklered buildings, the sprinkler system design criteria, inside and outside hose allowances, and results of the benchmark sprinkler system main drain and water flow tests,
- the storage method and maximum height of storage shall be posted in the storage area and the signs shall have:
    - a minimum dimension of 200 mm, and
    - letters not less than 25 mm high
- the identification of the location and maximum quantity of product that is being stored.

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In addition to the information required in the fire safety plan, where dangerous goods are stored or handled, the fire safety plan shall include the names, addresses and telephone numbers of persons to be contacted in case of fire during non-operating hours.

As the requirements for the indoor storage of compressed gases can be complex, it is advised that a professional with expertise in the storage of dangerous goods be engaged for further assistance.

Outdoors

Cylinders of compressed gases are stored outdoors, they shall be:

- supported on raised concrete or other non-combustible platforms, and
- locate in an enclosure by a firmly anchored fence that is:
    - substantially constructed to discourage climbing and unauthorized entry,
    - not less than 1.8 m high, and
    - provided with gates that shall be locked when the storage area is not staffed.

If the gates above are in a required fire department access route, the gates shall be of adequate width and design, and in a location that readily permits the entry of fire department vehicles.

Cylinders of Class 2.1 flammable gases or Class 2.3 toxic or corrosive gases stored outdoors shall be not less than:

- 1.5 m from any building opening, if the aggregate capacity of expanded gas is not more than 170 m3
- 7.5 m from any building opening, if the aggregate capacity of expanded gas is more than 170 m3 but less than 500 m3, and
- 15 m from any building opening, if the aggregate capacity of expanded gas is 500 m3 or more.

Note, where the building opening (above) is into a specific built room for the storage of compressed gas, then the distances do not apply.

NOTE: Please contact the local Fire Department for any questions regarding this Safety Tip Sheet.