SUN CITY FIRE DISTRICT – Compressed Gas system requirements

2018 IFC - SECTION 5307 has Significant changes and is retroactively required in all buildings in accordance with the following amendments:

Section 5307 Compressed Gases is hereby amended with the following language:

These requirements are retroactive to existing locations. Existing locations that do not have a construction permit issued by Sun City Fire District are required to comply with the same requirements as a new project.

5307.1 General. *Compressed gases* in storage or use including asphyxiant, irritant and radioactive gases, shall comply with this section in addition to other requirements of this chapter.

5307.2 Gas Detection. A Carbon Dioxide gas detection system ***shall*** be provided. Carbon dioxide and other simple asphyxiant gas systems with more than 50 pounds in use, per system, shall comply with this section. *See Section 5307.2.4*

Exception: One (1) additional 50lb DOT 3AA cylinder of carbon dioxide may be connected to the same system provided an isolation valve is in place, and only one cylinder can be in use at a time.

5307.2.1 Permits. Permits for a Gas Detection System are required from Sun City Fire District as set forth in Section 105.6 through 105.12.

5302.2.1.1 Equipment. The storage use, and handling of liquid carbon dioxide shall be in accordance with IFC Chapter 53 and the applicable requirements of NFPA 55, Chapter 13. Insulated liquid carbon dioxide systems shall have pressure relief devices vented in accordance with NFPA 55.

5307.2.1.2 Protection from damage. Carbon dioxide and other simple asphyxiant gas systems shall be installed so the storage tanks, cylinders, piping fittings, detection and notification devices are protected from falling or damage by occupants or equipment during normal facility operations, in accordance with IFC Section 5303.5 and 5303.6

5307.2.1.3 General CO-2 System Requirements:

1. The fill port (on liquid cylinders) is to be piped to the outside atmosphere.
2. All venting is to be piped to the outside atmosphere.
3. When used, insulated liquid carbon dioxide containers are to be anchored to the slab.
4. When used, high pressure compressed gas carbon dioxide cylinders shall be secured from tipping, and only one cylinder can be connected into a beverage system at a time. A second cylinder can be connected provided a 3-way transfer switch (isolation valve) is used so that no more than one (1) cylinder can be used at a time.

5307.2.2 Gas Ventilation Requirements. When any ASME pressure vessels containing liquified carbon dioxide or other simple asphyxiant gas of two or more 50 lb. DOT AA3 gaseous cylinders per system are connected to a piping system and located *within* the structure, a mechanical exhaust ventilation system ***shall*** be provided in accordance with the International Mechanical Code designed to maintain the room containing the asphyxiant gas at a negative pressure in relation to the surrounding area. *A separate plan submittal for the installation of this mechanical exhaust ventilation system is required by the Sun City Fire & Medical Department.*

5307.2.2.1 Exhaust. The mechanical exhaust ventilation system shall be designed at a rate not less than one cubic foot per minute, per square foot of floor area in the room where the cylinders are located. The ventilation system shall be designed to operate at a negative pressure in relation to the surrounding area.

5307.2.2.2 Exhaust intake. The exhaust intake shall be taken from a point within 12 inches (305mm) of the floor. The exhaust system intake shall be located a minimum of 2 feet away from any gas detector or located on the opposite wall of any gas detector.

5702.2.2.3 Exhaust termination. The termination point of exhaust outlets and ducts discharging to the outdoors shall be located a minimum of 10 feet from property lines, a minimum of 3 feet above the roof line and a minimum of 10 feet from operable openings into the building and minimum of 10 feet above adjoining grade.

5307.2.2.4 Automatic activation. The exhaust system shall automatically activate when:

1. The concentration of carbon dioxide reaches 3% (30,000 ppm), or
2. The concentration of oxygen reaches 19.5% in an oxygen deficient environment, or

Exception: Continuous ventilation.

5307.2.2.5 Manual activation. A manual activation switch for the ventilation system shall be provided at the entrance of the area where the vessel or cylinders are located. This manual activation switch shall be clearly marked with its function.

5307.2.3 Equipment venting. On all new and existing installations, emergency relief vents, burst disks and pump vents shall be terminated outside the building and at least 10 feet from openings into the building or property lines.

5307.2.4 Gas detection. Compressed gasses such as Carbon Dioxide, Helium, Argon, Nitrogen and other compressed gasses that are classified as an asphyxiant ***shall*** be provided with a gas detection and alarm system.

For buildings that are constructed new, the building fire alarm system shall be designed to monitor two (2) points on the gas detection system. The building fire alarm system shall be capable of reporting specific signals to the Central Station for alarm signals in accordance with 5307.2.4.5 or 5307.2.4.6 (below).

For existing buildings, the building fire alarm is to be evaluated to determine the capability of monitoring the gas detection system and shall be installed as per the new building requirements.

For buildings without a fire alarm system, in addition to the CO-2 alarms inside the building, an alarm device is to be located outside the building at the Fire Dept. entrance to notify personnel of a CO-2 activation. This device shall be labeled as a CO-2 alarm and shall activate upon activation of the CO-2 sensor.

The gas detection and alarm systems shall be installed, inspected, tested, calibrated and maintained per the manufacturer's instructions or at a minimum annually and have an inspection card attached identifying the date of inspection by a third party.

5307.2.4.1 Gas detectors. Gas detectors shall be field tested at the time of final inspection and annually, or as required per the manufacturer. Testing inspection and maintenance of detection devices shall be performed with an approved test gas. All test gas shall have a recognized certification that documents the type and percentage of gas.

5307.2.4.2 Records. Records of inspections and maintenance shall be available for review upon request by the Sun City Fire & Medical Department.

5307.2.4.3 Specific gas detection. When the gas is carbon dioxide, the gas detection systems shall be designed to detect carbon dioxide. All other simple asphyxiants shall use an oxygen sensor.

5307.2.4.4 Location. Gas detection shall be provided at each point of use and at vessels or cylinders inside structures. Carbon dioxide sensors shall be provided within 12 inches of the floor in the area where the gas is expected to accumulate or other *Fire Code Official* approved locations. A minimum of one (1) detector is to be placed by the cylinder inside the building, or where pressure regulators are located if the cylinder(s) are outside the building. Basements and or subterranean

spaces that could be physically entered and have product lines, shall have gas detection. Additional detection devices are required where pure CO-2 is piped into the building. This includes remote stations for beer storage or remote serving locations. If the carbonator is located in a different location than the cylinders, a second detector shall be installed at the carbonator as required by the *Fire Code Official*.

Exception: CO-2 that has been mixed with product; i.e.: after the carbonator, is exempt.

5307.2.4.5 Carbon dioxide two tier detection. The Carbon Dioxide detection system shall be capable of two-tier detection.

1. Tier one (low level) shall be set at 0.5% carbon dioxide or 5,000 ppm and shall provide a supervisory signal in accordance with 5307.2.5 (below).
2. Tier two (high level) shall be set at 3% carbon dioxide or 30,000 ppm, and shall provide an alarm signal in accordance with 5307.2.6 (below).

5307.2.4.6 Simple asphyxiant two tier detection. The Simple Asphyxiant detection system shall be capable of two-tier detection. Tier one (low level) shall be set at 19.5% oxygen in an oxygen deficient environment. Tier two (high level) shall be set at 18% in an oxygen deficient environment.

5307.2.4.6.1 System Activation. Activation of the low-level gas detection system alarm shall automatically:

1. stop the flow of carbon dioxide to the piping system,
2. activate the mechanical exhaust system
3. activate the audible and visible supervisory alarm signal at an *approved* location within the building. (Reference 5307.2.5)

Activation of the high-level gas detection system alarm shall automatically:

1. stop the flow of carbon dioxide to the piping system,
2. activate the mechanical exhaust system
3. activate an audible and visible evacuation alarm signal within the building as required by the *Fire Code Official*. (Reference 5307.2.6)

5307.2.4.7 Installation. Asphyxiant gas detection systems or appropriate gas detection for the gas, shall be installed per the manufacture's manual.

5307.2.4.8 Power. The power supply to the gas detection system shall be circuit locked and labeled. Battery backup is required for CO-2 detectors that reset to an alarm condition upon loss of primary power.

5307.2.5 Supervisory signal. At 0.5% (5,000 ppm) carbon dioxide or 19.5% oxygen a local warning/supervisory signal with visible and audible indication shall occur at a constantly attended location and shall be transmitted off-site in a UL approved third party monitoring station as a supervisory signal alarm when the facility has a system that monitors signals off-site.

5307.2.6 Evacuation alarm. At 3% (30,000 ppm) carbon dioxide or 18% oxygen, an evacuation alarm shall sound for the occupancy and shall transmitted off-site to a UL approved third party monitoring station as a gas specific alarm.

Exception: When the facility does not have a system capable of transmitting signals off site then established approved protocols shall be in place to call 911.

5307.2.6.1 Monitoring. Connection to a fire alarm panel or monitoring panel shall be completed by an approved fire protection company. A separate permit obtained by an approved fire alarm contractor from the Sun City Fire & Medical Department is required.

5307.2.7 Notification. Evacuation notification devices with audible and visible notification shall be provided:

1. Near every point-of-use.
2. In the area or room where the asphyxiant gas cylinders are located.
3. In the common area where public gathers.
4. At the entrance to the room with required detection.
5. When asphyxiant gas is present so it is clear to the responders upon approach to the hazard.
6. As required by the Fire Code Official.

5307.2.7.1 Notification devices. Notification devices shall comply with the following:

1. The notification device shall be rated a minimum of 100 candela rating for a visual effect and 75 decibels for an audible effect.
2. The notification devices shall be identified and labeled for the gas being detected.
   Use of the building fire alarm notification devices for evacuation is acceptable, provided the asphyxiant gas detection has visible and audible clear indicators in the hazard area upon both the warning level and alarm level of the gas.

5307.3 Tank and Piping Requirements. Piping systems shall be designed and constructed and tested in accordance with ASME/ANSI B31.3 - Process Piping Code.

5307.3.1 Piping and marking. Piping and tubing shall be identified in accordance with ASME A13.1 to indicate the material conveyed. 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 repeated at not less than every 20 feet (6096 mm) or fraction thereof throughout the piping run.

5307.3.2 Piping design. Gas piping systems shall be designed as follows:

1. Piping systems shall be designed to a bursting pressure of at least four times the system design pressure.
2. All fittings used in the piping system shall be designed for a working pressure not to exceed 125% of designed pressure of the hose.

5307.3.3 Piping materials. Carbon Dioxide Gas piping systems shall be of listed and approved materials for each specific gas in use. *Rigid plastic piping shall not be allowed*.

Exceptions:

1. Non-listed materials require a special report by an Arizona registered engineer on the piping material and shall be submitted to the Fire Code Official for approval.
2. A special report on the piping material shall not be required if the piping material has been listed by a third-party testing group such as UL or FM for the intended use.

5307.3.4 Leak tests. All piping systems shall be leak tested in accordance with the following:

1. Piping systems shall be tested by a pneumatic pattern at a pressure equal to the working pressure for 15 minutes or as long as it takes to check each joint; the test medium shall be carbon dioxide, and,
2. Soap testing of all fittings shall be witnessed at time of inspection.