CARSON CITY FIRE DEPARTMENT

"Service with Pride, Commitment, and Compassion"

Carson City FD Guideline

CARBON DIOXIDE (CO2) GAS ENRICHMENT SYSTEMS

Effective Date: January 1, 2019

Purpose:

This policy is meant to provide basic information based on currently available information regarding the use of carbon dioxide gas enrichment systems for most common conditions and situations. In any given occupancy, many other Fire Code requirements may be enforced. These will be addressed by the Fire Inspector during a premises inspection.

Scope:

This policy covers the safety requirements as they pertain to the use and storage of carbon dioxide (CO2) gas enrichment systems within the City of Carson City for any system storing and using more than 100 pounds of carbon dioxide **or** any system storing **or** using any amount of CO2 below grade, including a basement **or** crawl space or any natural gas CO2 generators.

Permits:

An annual operational permit will be issued by the Carson City Fire Department's Fire Prevention Division for a carbon dioxide (CO2) enrichment system as defined in the scope.

All permits shall be kept on site for inspection. The following information must be provided for the permit:

- Installation/maintenance contractor's business name and address, phone number, fax number
- Contact name and phone number
- Property/business owner name, phone number, fax number, and address
- Site address
- Type of carbon dioxide in use (compressed gas, super cooled liquid or natural gas burner).
- Total cubic feet and equivalent pounds or gallons of gas or super cooled liquid on site at normal temperature and pressure; include inside and outside use and/or storage.
- Location and total volume of the room where the carbon dioxide enrichment operation will be conducted. Provide this for every room where CO2 will be discharged.
- Location of containers relative to equipment, building openings and means of egress.

- Manufacturer's specifications and pressure rating, including cut sheets, of all piping and tubing to be used.
- A piping and instrumentation diagram that shows piping support and remote fill connections.
- Details of container venting, including but not limited to vent line size, material and termination location.
- Seismic support for containers if applicable.
- Diagram of site location indicating gas or super cooled liquid use/storage area
- Location of all alarms and shut offs

All carbon dioxide (CO2) gas enrichment system plans must be reviewed by Carson City Fire Department Fire Prevention Division. Upon approval, applicable Fire Department permits shall be issued and systems shall be inspected and approved prior to the issuance of the operational permit.

ALL CO2 ENRICHMENT SYSTEMS MUST COMPLY WITH IFC SECTION 916 AND SECTION 5307

Site Inspection:

Upon approval of the Carbon Dioxide System permit, a Fire Inspector will conduct a field inspection of the site. Compliance with all Fire Code requirements shall be maintained at all times. Permit shall be posted on site. Permit is valid for business/property owner, time frame, and site address indicated on the permit. Permit will be revoked if:

1) Any of the conditions or limitations set forth in the permit has been violated.
2) Compliance with written order has not been achieved.
3) False statements or misrepresentation of information provided in the permit application are found.
4) The permit is issued in error, in violation of City ordinance or the Carson City Fire Code.

Basic Carbon Dioxide (CO2) Gas Enrichment System Requirements:

A. Carbon Dioxide (CO2) Gas Enrichment Systems Using On Site Supply Tanks And/Or Cylinders

Specifics and Conditions

1. Compressed gas containers, cylinders and tanks shall be designed, fabricated, tested, marked with the specifications of manufacture and maintained in accordance with the regulations of DOTn 49 CFR, Parts 100-185 or the ASME Boiler and Pressure Vessel Code, Section VIII.

2. Piping, including tubing, valves, fittings and pressure regulators, shall be designed and installed in accordance with approved standards. Piping, tubing, pressure regulators, valves and other apparatus shall be kept gas tight to prevent leakage. Valves utilized on compressed gas systems shall be suitable for the use intended and shall be accessible. Valve handles or operators for required shutoff valves shall not be removed or otherwise altered to prevent access.

3. Venting of gases shall be directed to an approved location outside the building. Venting shall comply with the Uniform or International Mechanical Code as adopted by the Carson City Building Division.

4. Location (inside or outside the building) of containers, cylinders and tanks shall be at an approved location. Compressed gas containers, cylinders and tanks shall be secured in an approved manner to prevent falling caused by contact or vibration. Containers, cylinders and tanks stored outside shall be secured and safeguarded against unauthorized entry and protected from physical damage when exposed to vehicle traffic. Outside stationary tanks may require an engineered foundation.

5. Filling and transferring of gases between containers, cylinders and tanks shall be performed by qualified personnel using equipment and operating procedures in accordance with CGA P-1. Inside storage containers, cylinders or tanks must be filled from a connection made on the outside of the building or safely exchanged using an approved method.

6. Compressed gas system controls shall be designed to prevent materials from entering or leaving process or reaction systems at other than the intended time, rate or path. Automatic controls shall be designed to be fail safe. All systems must have valves that positively close in the event of a loss of electrical power to the building.

7. Emergency alarm systems shall be provided as follows:

A. Continuous gas detection shall be provided to monitor areas where carbon dioxide (CO2) can accumulate. Detection equipment shall be provided to indicate carbon dioxide (CO2) levels in each cultivation area/room and interior carbon dioxide (CO2) storage location.

B. Detectors shall be:

1. Listed devices
2. Permanently mounted
3. Installed at a height of no more than 12 inches above the floor
4. Directly connected to building electrical or fire alarm systems and protected from accidental disconnection or damage.
5. Auto calibrating and self "zeroing" devices are not permitted unless they can be zeroed and spanned
6. Located within manufacturers specified detection range for each point of use and storage location

C. Activation of the emergency alarm system shall initiate amber strobes and audible horns provided in the vicinity of each interior storage container, cylinder or tank and at each point of release. The notification devices shall be rated the minimum candela rating per NFPA 72 for a visible effect and 80 dBA for an audible effect and shall be mounted in accordance with NFPA 72

requirements.
Provide audible/visual devices at the following locations:

1. Inside an interior storage room/area and outside the room/area at each entrance.
2. Inside cultivation room/areas.

D. Local alarm set points shall be set at:

1. Low level alarm-5,000 ppm
   - The flow of CO2 to the piping system shall stop
   - The mechanical exhaust ventilation system shall activate
   - The visible and audible supervisory alarm signal will activate at an approved location in the building. Typically this is inside and outside the enriched room.
2. High level alarm-30,000 ppm
   - The flow of CO2 to the piping system shall stop
   - The mechanical exhaust ventilation system shall activate
   - The visible and audible supervisory alarm signal will activate both inside and outside the CO2 enrichment area, and the area where the CO2 is stored.
3. Employee actions when alarm is activated
   - Evacuate the room in alarm and have qualified personnel investigate and address the condition.
   - Reset of the emergency alarm to be conducted by qualified personnel.

8. Equipment:
   - Interior storage room meters and cultivation area meters shall be calibrated and inter-connected to a gas supply valve (that positively closes) located at the storage container(s) to limit CO2 levels to a maximum of 5000 ppm. CO2 store rooms will require an amber strobe and audible horn inside and outside the room at each entrance to activate when the sensor exceeds 5000 ppm in that room. The notification devices shall be rated with the minimum candela rating per NFPA 72 for a visible effect and 80 dBA for an audible effect and shall be mounted in accordance with NFPA 72 requirements. A CO2 sensor with an integral audible visual will be allowed inside the storage or cultivation room in lieu of a dedicated notification device. Signage will be required adjacent to these horn strobes. There must be signage within 4 inches beneath all amber strobes that state: (outside the room) :**DO NOT ENTER WHEN LIGHT IS FLASHING – CARBON DIOXIDE LEAK DETECTED"** and (inside the room) **"FLASHING LIGHT MEANS CARBON DIOXIDE LEAK DETECTED – EVACUATE ROOM."**
   - All systems must have valves that positively close in the event of a loss of electrical power to the CO2 sensors.
   - A minimum of one (1) portable CO2 meter shall be in use during business hours.

9. Signage shall be provided on the exterior door of each cultivation room/area utilizing CO2 and in each room storing CO2, stating:

CAUTION-CARBON DIOXIDE GAS
VENTILATE THE AREA BEFORE ENTERING
A HIGH CARBON DIOXIDE (CO2) GAS CONCENTRATION
IN THIS AREA
CAN CAUSE ASPHYXIATION

The sign must be not less than 8" in width and 6" in height

NFPA 704 Simple Asphyxiate placards shall also be provided at the exterior main entrance.

10. Inspection and testing of equipment. All sensors, alarms and storage containers must be inspected and tested annually or as prescribed by the manufacturer. A written record of all required inspection and testing shall be maintained on the premises for a period of three years. Testing of emergency devices or systems required by this policy shall be conducted by persons trained and qualified in these systems.

11. Training. All employees shall receive annual training in hazard identification, physical properties and emergency procedures. Training records shall be available to inspectors upon request.

B. CARBON DIOXIDE (CO2) GAS ENRICHMENT SYSTEMS USING A NATURAL GAS BURNER

SPECIFICS AND CONDITIONS:

1. Natural gas burners that are utilized to generate CO2 shall be approved by the Carson City Building and Fire Departments. Mechanical drawings, specifications and analysis as follows: typical isometrics of gas piping, BTU rating of gas units, method of combustion and ventilation air supply and manufacturers specifications for all equipment.

2. Emergency alarm systems shall be provided as follows:
   - Equipment (meters or gauges or sensors) shall be provided to indicate CO2 levels in each grow cultivation area/room.
   - Cultivation area/room meters shall be calibrated and inter-connected to each natural gas burner stopping the generation of CO2 in each grow room to limit CO2 levels to a maximum of 5000 ppm. Cultivation area/rooms will require an amber strobe and audible horn inside and outside the room at each entrance to activate when the sensor exceeds 5000 ppm in that room. The notification

devices shall be rated the minimum candela rating per NFPA 72 for a visible effect and 80 dBA for an audible effect and shall be mounted in accordance with NFPA 72 requirements. A CO2 sensor with an integral audible visual indicator will be allowed inside the storage room in lieu of a dedicated notification device. Signage will be required adjacent to these horn strobes. There must be signage within 4 inches beneath all amber strobes that states: (outside the room) **"DO NOT ENTER WHEN LIGHT IS FLASHING – CARBON DIOXIDE LEAK DETECTED"** and (inside the room) **"FLASHING LIGHT MEANS CARBON DIOXIDE LEAK DETECTED – EVACUATE ROOM."**

- All CO2 burner systems must shut down in the event of a loss of electrical power to the CO2 sensors.
- A minimum of one (1) portable CO2 meter shall be in use during business hours.

3. Signage shall be provided on the exterior door of each cultivation room/area utilizing CO2:

CAUTION-CARBON DIOXIDE GAS
VENTILATE THE AREA BEFORE ENTERING
A HIGH CARBON DIOXIDE (CO2) GAS CONCENTRATION
IN THIS AREA
CAN CAUSE ASPHYXIATION

The sign must be not less than 8" in width and 6" in height

NFPA704 Simple Asphyxiate placards shall also be provided at the exterior main entrance.

4. Inspection and testing of equipment. All sensors, alarms and CO2 burners must be inspected and tested annually or as prescribed by the manufacturer. A written record of all required inspection and testing shall be maintained on the premises for a period of three years. Testing of emergency devices or systems required by this policy shall be conducted by persons trained and qualified in these systems.
5. Training. All employees shall receive annual training in hazard identification, physical properties and emergency procedures. Training records shall be available to inspectors upon request.