



INTERPRETATIONS & PROCEDURES

FIRE PEVENTION DIVISION

SUBJECT: Carbon Dioxide (CO ₂) Gas Enriched Systems		CODE SECTION(S): 2015 IFC 5307 2013 NFPA 55, Chapter 13 Occupational Health & Safety Standards Part 1910, Table Z-1
ISSUED BY		
NAME: Ken Carlson	SIGNATURE: 	ISSUE DATE: June
TITLE: Fire Marshal		NUMBER: 2014-1

ATTACHMENTS

SUPERSEDES _____

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 Prevention Officer during a premises inspection. Questions can be addressed to the Fire Prevention Division office at (425) 452-6872.

I. SCOPE

This policy covers the safety requirements as they pertain to the use and storage of carbon dioxide (CO₂) gas enrichment systems for any system storing and using more than 100 pounds of carbon dioxide **or** any natural gas CO₂ generators.

II. PERMITS

An annual operational permit shall be obtained for a carbon dioxide (CO₂) enrichment system as defined in the scope.

All permits shall be kept on site for inspection. To obtain a permit, the following information must be provided when submitting the [permit application](#):

- 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; include inside and outside use and/or storage.
- Diagram of site location indicating gas or super cooled liquid use/storage area
- Location of all alarms and shut offs.

IV. 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 National Fire Protection Association Standard 55 (NFPA 55, Compressed Gases and Cryogenic Fluids Code, 2013 Edition) and the manufactures installation instructions.

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 International Mechanical Code.

Owners and operators of marijuana production or processing facilities should also be mindful of compliance with Puget Sound Clean Air Agency requirements. For additional information please visit their web site:
<http://www.pscleanair.org/marijuana/index.aspx>

4. CO₂ tanks must be located outside the building in an approved location or in an interior room equipped with a continuously operating mechanical ventilation system in accordance with the *International Mechanical Code* and shall comply with all of the following:
 - Mechanical ventilation shall be provided at a rate of not less than 1 cfm per square foot [0.00508 m³/(s • m²)] of floor area over the storage area.
 - A manual start control shall be provided outside of the room in a position adjacent to the access door to the room or in another approved location. The

switch shall be a break-glass or other approved type and shall be labeled: VENTILATION SYSTEM EMERGENCY ON-ONLY.

- Exhaust shall be taken from a point within 12 inches (305 mm) of the floor.
 - The ventilation system shall be designed to operate at a negative pressure in relation to the surrounding area.
5. 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. Stationary tanks must be located on an acceptable foundation.
 6. 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.
 7. 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.
 8. Emergency alarm systems shall be provided as follows ([permit](#) required prior to installation)
 - Equipment (meters or gauges or sensors) shall be provided to indicate CO₂ levels in each grow cultivation area/room and interior CO₂ storage locations.
 - Interior CO₂ storage room 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 ([Permissible Exposure Limit for Carbon Dioxide](#) – NFPA 55, Section 13.2.2) . CO₂ store rooms will require an amber strobe and audible horn inside and outside the room at each entrance when the sensor exceeds 5,000 ppm in that room. The notification devices shall be rated a minimum of 100cd for a visible effect and 75 dBA for an audible effect. A CO₂ sensor with an integral audible visual 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 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.”*
 - Grow cultivation area/room meters shall be calibrated and inter-connected to a gas supply valve (that positively closes) located at the storage container(s) or a gas supply valve (that positively closes) for each grow room to limit CO₂ levels to a maximum of 5,000 ppm. Each grow area/room will require an amber strobe and

audible horn inside the room when the sensor exceeds 5,000 ppm in that room. The notification devices shall be rated a minimum of 100cd for a visible effect and 75 dBA for an audible effect. A CO₂ sensor with an integral audible visual will be allowed inside the grow room in lieu of a dedicated notification device. *There must be signage within 4 inches beneath all amber strobes that state: (inside the room) "FLASHING LIGHT MEANS CARBON DIOXIDE LEAK DETECTED – EVACUATE ROOM."*

When cultivating operations using Carbon Dioxide enriched environments are located in multi-tenant buildings, the cultivating operations must be atmospherically separated from adjacent tenants or the adjacent tenant spaces must be equipped with interconnected CO₂ sensors, strobes and signage as describe above. Atmospheric separations must be tested by a qualified 3rd party testing agency to ensure that it is leak tight and reported in writing to the Bellevue Fire Department.

- 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 grow cultivation room/area utilizing CO₂ and in each room storing CO₂ stating:



NFPA 704 Simple Asphyxiant placards shall also be provided at the exterior main entrance and at rooms where CO₂ is used or stored.

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 Building Department Mechanical Engineering Section. 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.
 - Grow 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 5,000 ppm. Grow cultivation area/rooms will require an amber strobe and audible horn inside and outside the room at each entrance when the sensor exceeds 5,000 ppm in that room. The notification devices shall be rated a minimum of 100cd for a visible effect and 75 dBA for an audible effect. A CO₂ sensor with an integral audible visual 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.”***

When cultivating operations using Carbon Dioxide enriched environments are located in multi-tenant buildings, the cultivating operations must be atmospherically separated from adjacent tenants or the adjacent tenant spaces must be equipped with interconnected CO₂ sensors, strobes and signage as describe above. Atmospheric separations must be tested by a qualified 3rd party testing agency to ensure that it is leak tight and reported in writing to the Bellevue Fire Department.

- 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) CO₂ meter shall be in use during business hours.

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



NFPA 704 Simple Asphyxiant placards shall also be provided at the exterior main entrance and at rooms where CO2 is used or generated.

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.