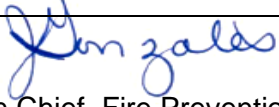


CITY AND COUNTY OF DENVER		POLICY	DENVER FIRE DEPARTMENT
Subject: CARBON DIOXIDE (CO₂) GAS ENRICHMENT SYSTEMS			
Reference: IFC, Denver Amendments, NFPA			
Approved:		 Joseph L. Gonzales, Division Chief, Fire Prevention Division	
Number: IFC- 2009	Effective Date: March 9, 2014	Page 1 of 8	

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. Questions can be addressed to the Fire Prevention Division office between 6:30 a.m. and 4:30 p.m. Monday thru Friday at (720) 913-3474 or at DFDFPB@DENVERGOV.ORG. Permits may ONLY be obtained Monday thru Friday, between 6:30 a.m. and 9:00 a.m. from the 1st floor at 745 West Colfax Avenue.

I. 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 and County of Denver 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.

II. PERMITS

An annual operational permit shall be obtained from the Denver Fire Department's Fire Prevention Division for a carbon dioxide (CO₂) enrichment system as defined in the scope.

A separate annual compressed gas storage/use permit will be required for 650 cu/ft or more of an "other health hazard." (1 pound of CO₂ = 8.74 cu/ft)

All permits shall be kept on site for inspection. To obtain a permit, the following information must be provided:

- 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.

CITY AND COUNTY OF DENVER	POLICY	DENVER FIRE DEPARTMENT
Subject: CARBON DIOXIDE (CO₂) GAS ENRICHMENT SYSTEMS		
Number: IFC- 2009	Effective Date: March 9, 2014	Page 2 of 8

- **Diagram of site location indicating gas or super cooled liquid use/storage area**
- Location of all alarms and shut offs

To obtain the required permit(s), the business owner or company representative must complete and sign the Carbon Dioxide (CO₂) Gas Enrichment System Permit application form and provide the documentation required. All carbon dioxide (CO₂) gas enrichment system plans must be reviewed by Denver Fire Department Fire Protection Engineers and Building Department Engineering staff as required. Upon approval, applicable Building Department permits shall be issued and systems shall be inspected and approved prior to the issuance of the operational permit. Building Department offices are located on the second floor of the Webb Building, 201 West Colfax Avenue.

Make check payable to: **Denver Manager of Finance.**

Mail-in to:

Denver Fire Department
 Fire Prevention Division - Permits
 745 W. Colfax Avenue
 Denver, CO 80204

Walk-in permits: Monday – Friday, 6:30 a.m. to 9:00 a.m. **ONLY** at 745 W. Colfax Ave.

PERMIT COST

See Permit Fee Table at denvergov.org/Fire Department for current fees.

III. SITE INSPECTION

Upon approval of the Carbon Dioxide System permit, a Denver Fire Department Fire Prevention 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 Denver Fire Code.

CITY AND COUNTY OF DENVER	POLICY	DENVER FIRE DEPARTMENT
Subject: CARBON DIOXIDE (CO₂) GAS ENRICHMENT SYSTEMS		
Number: IFC- 2009	Effective Date: March 9, 2014	Page 3 of 8

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 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 *International Mechanical Code*.
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 will 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

CITY AND COUNTY OF DENVER	POLICY	DENVER FIRE DEPARTMENT
Subject: CARBON DIOXIDE (CO₂) GAS ENRICHMENT SYSTEMS		
Number: IFC- 2009	Effective Date: March 9, 2014	Page 4 of 8

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:

- 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 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. 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.”*
- All systems must have valves that positively close in the event of a loss of electrical power to the CO₂ sensors.

CITY AND COUNTY OF DENVER	POLICY	DENVER FIRE DEPARTMENT
Subject: CARBON DIOXIDE (CO₂) GAS ENRICHMENT SYSTEMS		
Number: IFC- 2009	Effective Date: March 9, 2014	Page 5 of 8

- A minimum of one (1) portable CO₂ meter shall be in use during business hours.
8. 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.

9. 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.
10. 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

CITY AND COUNTY OF DENVER	POLICY	DENVER FIRE DEPARTMENT
Subject: CARBON DIOXIDE (CO₂) GAS ENRICHMENT SYSTEMS		
Number: IFC- 2009	Effective Date: March 9, 2014	Page 6 of 8

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.”*
 - 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:



CITY AND COUNTY OF DENVER	POLICY	DENVER FIRE DEPARTMENT
Subject: CARBON DIOXIDE (CO₂) GAS ENRICHMENT SYSTEMS		
Number: IFC- 2009	Effective Date: March 9, 2014	Page 7 of 8

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.

CITY AND COUNTY OF DENVER	POLICY	DENVER FIRE DEPARTMENT
Subject: CARBON DIOXIDE (CO₂) GAS ENRICHMENT SYSTEMS		
Number: IFC- 2009	Effective Date: March 9, 2014	Page 8 of 8

CARBON DIOXIDE SYSTEM PERMIT APPLICATION

THIS FORM SHALL BE COMPLETED AND SIGNED BY A REPRESENTATIVE OF THE PROPERTY (SITE) APPLYING FOR THE PERMIT(S). IT SHALL BE RETURNED TO THE FIRE PREVENTION DIVISION OFFICE AT 745 W. COLFAX AVENUE.

MAKE CHECK PAYABLE TO “DENVER MANAGER OF FINANCE.”

NAME OF BUSINESS: _____

BUSINESS ADDRESS: _____ CITY, STATE, ZIP _____

PERMIT SITE ADDRESS: _____ DENVER, CO. ZIP _____

CONTACT'S NAME: _____

CONTACT'S PHONE NUMBER: _____ FAX: _____

INSTALLATION CONTRACTOR: _____

CYLINDER(S) SIZE _____ GENERATOR(S) SIZE: _____

OF CYLINDERS INSIDE _____ # OUTSIDE _____ # OF GENERATORS _____

INTENDED USE _____ TOTAL QUANTITY _____

MAXIMUM ALLOWABLE WORKING PRESSURE: _____

CYLINDERS ABOVE OR BELOW GRADE: _____

PROVIDE A PLOT DIAGRAM (SKETCH OF SITE) SHOWING THE LAYOUT OF THE PROPERTY AND BUILDING, INCLUDING PROPERTY LINES, BUILDING FLOOR LAYOUT, ROADS, AND VEHICLE ACCESS POINTS.

I UNDERSTAND THAT DENVER FIRE PREVENTION DIVISION PERSONNEL WILL CONDUCT A SITE INSPECTION, AND IF THE INSTALLATION DOES NOT COMPLY WITH THE DENVER FIRE CODE (2009 INTERNATIONAL FIRE CODE WITH CITY AMENDMENTS), THE PERMIT MAY BE REVOKED WITHOUT A REFUND.

SIGNATURE: _____ DATE: _____

END OF DOCUMENT
