	Carbon Dioxide (CO_2) Enrichment Systems	510-935
	AUTHORED BY: Life Safety Chief Ty Drage	**EFFECTIVE DATE:** 10/01/2017
	APPROVED BY: Fire Chief Ron Bateman	**REVISION DATE:** Scheduled 01/01/2019

This policy is meant to provide basic information based on information currently available regarding the use of carbon dioxide (CO_2) gas enrichment systems in most common conditions and situations of plant growing (husbandry) applications. In any given occupancy, all other Fire Code requirements will be enforced. Owners and operators, along with their employees, agents, and assigns, assume all risks arising from or related to the operation or maintenance of a marijuana and/or hemp facility. Front Range Fire Rescue assumes no liability for any such operation or maintenance through the adoption and enforcement of this policy. If a specific Front Range Fire Rescue policy does not exist, then the appropriate policy/procedure from the Denver Fire Department will be used as a guiding document to determine appropriate code requirements. Any costs associated with compliance with any and all fire code interpretations and/or inspections are the responsibility of the applicant. This policy does not alleviate the applicant's responsibility for obtaining and complying with any necessary permits from the municipality.

Scope:

This policy covers requirements for the installation, maintenance, operation and permitting pertaining to all carbon dioxide (CO_2) gas enrichment systems used in plant growing (husbandry) applications in new and existing facilities within the Front Range Fire Rescue response area, as follows:

A. The use and storage of CO_2 compressed gas systems with more than 100 pounds (45.4 kg) of CO_2 or any system using any amount of CO_2 below grade.
B. The use of natural gas burners.

Definitions:

Asphyxiation – To lose consciousness by impairment of normal breathing, to suffocate or smother

Dewar – A vacuum flask that holds a cryogenic or liquefied gas

Carbon Dioxide (CO_2) Detector – A device to measure the concentration of CO_2 in the air

Carbon Dioxide (CO_2) Generator – A machine used to enhance CO_2 levels in the air in order to promote plant growth in greenhouses and other enclosed areas

Liquid Carbon Dioxide (CO_2) Gas Systems – An assembly of equipment consisting of one or more CO_2 containers, interconnecting piping, pressure regulators, and pressure relief devices

Natural Gas Burner – A device to generate a flame using natural gas fuel to emit CO_2 gas (commonly referred to as a CO_2 generator)

PEL – Permissible Exposure Limit. The legal limit, as established by OSHA, for employee exposure to a chemical substance or physical agent. For the purposes of this policy, the OSHA PEL for CO_2 is 5000 ppm TWA (time-weighted average) at 8 hours per day, 40 hours per week.

STEL – Short-Term Exposure Limit. The acceptable average exposure over a short period of time, usually 15 minutes, as long as the time-weighted average is not exceeded, as established by the American Conference of Governmental Industrial Hygienists (ACGIH). For the purposes of this policy, the STEL for CO_2 is 30,000 ppm for less than 15 minutes.

IDLH – Immediately Dangerous to Life and Health. Exposure to airborne contaminants is likely to cause death or immediate or delayed permanent adverse health effects or prevent escape from such an environment. For the purposes of this policy, the IDLH for CO_2, as defined by OSHA, is 40,000 ppm.

TWA – Time-Weighted Average. A value used to calculate a worker's daily exposure to a hazardous substance, averaged to an 8-hour workday, taking into account the average levels of the substance or agent and the time spent in the area. For the purposes of this policy, the TWA for CO_2, as established by the American Conference of Governmental Industrial Hygienists (ACGIH) is 10,000 ppm.

Permits and Fees:

The following section must be followed in its entirety, with complete information submitted to Front Range Fire Rescue. Any business or facility seeking to implement any type of carbon dioxide (CO_2) enrichment shall submit a complete application, including all required supplemental information, to Front Range Fire Rescue. Payment of the Hazardous Materials/Processes Inventory or Plan Review Fees shall be due upon completion of the plan review process. It may be necessary for the applicant to obtain additional plan review services from a third party. All fees associated with third party involvement are the responsibility of the applicant.

CONSTRUCTION PERMITS

The owner or responsible party shall complete and submit all appropriate permit applications, including payment of applicable fees, to Front Range Fire Rescue as well as to the municipality prior to commencing any work or implementing any processes or process changes.

1. **Carbon Dioxide (CO_2) Compressed Gas Systems**

   Construction permits are required to install, repair damage to, abandon, remove, place temporarily out of service, or close or substantially modify any CO_2 system with more than 100 pounds (45.4 kg) of CO_2 or any system using any amount of CO_2 below grade, used in plant growing (husbandry) applications.

   A separate tank installation permit is required for bulk tanks in excess of 2,000 pounds.

   Front Range Fire Rescue (FRFR) shall review all CO_2 system used in plant growing (husbandry) applications, including bulk tanks in excess of 2,000 pounds. It may be necessary for the applicant to obtain additional plan review services from a third party. All fees associated with third party involvement are the responsibility of the applicant.

Construction permits will only be issued upon written approval by Front Range Fire Rescue. Construction permits will only be issued to Licensed Contractors.

Inspections shall be performed by Front Range Fire Rescue before any operational permits may be issued. If inspections are required by third party entities, all associated fees for those inspections shall be the responsibility of the applicant.

Construction drawings and specifications shall be complete and of sufficient clarity to indicate the entire work proposed and shall show in detail that the carbon dioxide (CO_2) system conforms to the provisions of the adopted Fire and Building Codes, all relevant laws, ordinances, rules and regulations, including those of the Denver Fire Department. Each set of drawings and specifications shall, at a minimum, contain the following information, architectural, structural, mechanical, electrical drawings, specifications and analyses:

a. Completed Carbon Dioxide (CO_2) Gas Enrichment Systems Permit Application and remittance of the required plan review fee.
b. Exact address, legal description, and specific location of the work to be performed
c. Name and physical address of the person or firm responsible for the preparation of the drawings and specifications. If after review of the construction drawings and specifications, the Fire Code Official determines that the proposed carbon dioxide (CO_2) system is inadequately designed, the Fire Code Official may require that the construction drawings and specifications bear the seal of a licensed Colorado professional engineer. All associated costs are the responsibility of the applicant.
d. Digital documents shall be accepted in PDF format only. All electronic submittals shall include all of the information referenced below for printed submittals, but shall only require one (1) copy of each.
e. If printed documents are submitted, two (2) complete sets of construction documents showing the construction, structural, mechanical, plumbing and electrical arrangements.
f. One copy of specifications or notes that clearly describe the type, quality and finish of materials and the method of assembly, erection and installation of equipment to be installed with proper reference to accepted standards.
g. Except for entirely exterior installation, a to-scale plot plan showing the location of the proposed construction (i.e., tanks) and the location of every adjacent existing building on the property, roads, walks, utilities, and other site improvements, all property lines, streets, alleys, easements, and other public areas.
h. Bulk tank installations over 2,000 pounds shall require an engineered structural foundation with a separate tank installation permit. Complete sets of structural drawings, specifications and analysis (calculations) shall be provided and shall bear the seal of a Colorado licensed professional engineer. Printed submittals shall require two (2) complete sets.

2. Natural Gas Burners

Construction permits are required to install, repair damage to, abandon, remove, place temporarily out of service, or close or substantially modify carbon dioxide (CO_2) generators using natural gas burners in plant growing (husbandry) applications.

Front Range Fire Rescue (FRFR) shall review all natural gas burner systems used in plant growing (husbandry) applications. It may be necessary for the applicant to obtain additional plan review services from a third party. All fees associated with third party involvement are the responsibility of the applicant.

Construction permits will only be issued upon written approval by Front Range Fire Rescue. Construction permits will only be issued to Licensed Contractors.

Inspections shall be performed by Front Range Fire Rescue before any operational permits may be issued. If inspections are required by third party entities, all associated fees for those inspections shall be the responsibility of the applicant.

Construction drawings and specifications shall be complete and of sufficient clarify to indicate the entire work proposed and shall show in detail that the natural gas burner system conforms to the provisions of the adopted Fire and Building Codes, all relevant laws, ordinances, rules and regulations, including those of the Denver Fire Department. Each set of drawings and specifications shall, at a minimum, contain the following information, architectural, structural, mechanical, electrical drawings, specifications and analyses:

a. Completed Carbon Dioxide (CO_2) Gas Enrichment Systems Permit Application and remittance of the required plan review fee.
b. Exact address, legal description, and specific location of the work to be performed
c. Name and physical address of the person or firm responsible for the preparation of the drawings and specifications. If after review of the construction drawings and specifications, the Fire Code Official determines that the proposed natural gas burner system is inadequately designed, the Fire Code Official may require that the construction drawings and specifications bear the seal of a licensed Colorado professional engineer. All associated costs are the responsibility of the applicant.
d. Digital documents shall be accepted in PDF format only. All electronic submittals shall include all of the information referenced below for printed submittals, but shall only require one (1) copy of each.
e. If printed documents are submitted, two (2) complete sets of construction documents showing the construction, structural, mechanical, plumbing and electrical arrangements.
f. One copy of specifications or notes that clearly describe the type, quality and finish of materials and the method of assembly, erection and installation of equipment to be installed with proper reference to accepted standards.
g. Except for entirely exterior installation, a to-scale plot plan showing the location of the proposed construction (i.e., tanks) and the location of every adjacent existing building on

the property, roads, walks, utilities, and other site improvements, all property lines, streets, alleys, easements, and other public areas.

h. Bulk tank installations over 2,000 pounds shall require an engineered structural foundation with a separate tank installation permit. Complete sets of structural drawings, specifications and analysis (calculations) shall be provided and shall bear the seal of a Colorado licensed professional engineer. Printed submittals shall require two (2) complete sets.

Carbon Dioxide (CO_2) Gas Enrichment System Requirements:

All sections of the adopted International Fire Code, as well as applicable NFPA standards and other applicable state regulations and national standards, shall be enforced in all buildings within the Front Range Fire Rescue response area.

1. **Requirements for Carbon Dioxide (CO_2) Gas Enrichment Systems using On-Site Supply Tanks and/or Cylinders**

   Specifics and Conditions:

   A. Equipment. The storage,use and handling of CO_2 shall be in accordance with all applicable sections of the adopted International Fire Code and NFPA 55. All equipment utilized in compressed gas systems shall be compatible with the intended gas and use.

      1. **Containers, Cylinders and Tanks.** Gas storage containers, cylinders and tanks shall be designed, fabricated, tested, labeled, and installed per manufacturer specifications and shall be maintained in accordance with the regulatinos of DOTn 49 CFR, Parts 100-185, or the ASME Boiler and Pressure Vessel Code, Section VIII.
         i. Location – Placement of gas storage containers, cylinders and tanks, inside or outside the building, shall be at an approved location.
         ii. Security – Gas storage containers, cylinders and tanks shall be secured in an approved manner to prevent overturning. Containers, cylinders and tanks located outside shall be secured and safeguarded against tampering and protected from physical damage if exposed to vehicle traffic.
         iii. Design and Construction – Bulk tank installations in excess of 2,000 pounds shall require an engineered foundation and construction permit, as determined by the municipality.

      2. **Piping Systems.** Piping, tubing, fittings, valves and pressure regulating devices shall be designed and installed in accordance with approved standards and manufacturer recommendations.
         i. Piping, Tubing and Hoses – Piping, tubing and hose materials shall be compatible with CO_2 and rated for the temperaturs and pressures encountered with the system. All hoses and tubing used in CO_2 service shall be designed for a bursting pressure of at least four (4) times their design

pressure. PVC/ABS and other types of rigid plastic piping are not approved materials. Acceptable piping for CO_2 shall be:

- Stainless steel A269 grade, which is either seamless or welded drawn over mandrel,
- Copper K grade, hard drawn seamless
- Copper ACR grade (1/2 inch outside diameter or less) annealed seamless
- Plastic/polymer materials rated for use with CO_2
- Additional approved piping, tubing and houses found in the Compressed Gas Association (CGA) standards for CO_2

ii. Fitting, Joints and Connections – Fittings, joints and connections shall be subject to the approval of the fire and building departments.

- Fittings and joints between gas supply containers and automatic shutoff valves shall be threaded, compression or welded.
- Unused piping or tubing connected to the supply system shall be capped, plugged or removed. A closed valve shall not allowed in lieu of cap, plug or removal.

iii. Valves – Piping systems shall be provided with valves as follows:

- Pressure relief valves shall be provided and piped to the outdoors.
- An automatic system shutoff valve shall be provided as near to the supply pressure regulator as possible and shall be designed to fail to a closed condition or close on loss of electrical power.
- Each appliance shall be provided with a shutoff valve within three (3) feet of the appliance. All shutoff valves shall be capable of being locked or tagged in the closed position for servicing.
- Valves and controls shall be readily accessible at all times. Normal and emergency shutoff valves shall be clearly identified. Every valve shall be designed or marked to indicate clearly whether it is in the open or closed position.

iv. Venting – Venging of gases shall be directly to an approved location outside the building. Insulated CO_2 systems shall have pressure relief devices vented in accordance with NFPA 55.

3. **Protection from Damage**. CO_2 systems shall be installed so the storage tanks, cylinders, piping and fittings are protected from damage by occupants or equipment during normal facility operations.

   Vehicle impact protection shall be provided where required in accordance with Chapter 3 of the adopted International Fire Code.

4. **Required Protection.** Where CO_2 storage tanks, cylinders, piping and equipment are located indoors, rooms or areas containing CO_2 storage tanks, cylinders, piping and fittings and grow rooms/areas where CO_2 is released and can collect shall be provided with an emergency alarm as follows:

i. Emergency Alarm System – An emergency alarm system shall comply with all of the following:

- Continous gas detection shall be provided to monitor areas where CO_2 can accumulate. Detection equipment shall be provided to indicate CO_2 levels in each grow cultivation area/room and interior CO_2 storage location.
- Detectors shall be:
    a. Listed or approved devices
    b. Permanently mounted
    c. Installed at a height of no more than 48 inches above the floor or as approved by the Fire Code Official
    d. Directly to connected to building electrical and fire alarm systems and protected from accidental disconnection or damage
    e. Located within manufacturer specified detection range for each point of use and storage location
    f. Auto calibrating and self "zeroing" devised are not permitted unless they can zeroed and spanned
- Activation of the emergency CO_2 alarm system shall initiate amber strobes and audible horns provided in the vicinity of each interior storage container, cylinder or tank and each point of release. The notifaction devices shall be rated a minimum of 80cd for a visible effect and 75dBA for an audible effect and shall be mounted per NFPA 72 requirements. Audible and visual devices shall be provided at the following locations:
    a. Inside each interior storage room/area and outside the room/area at each entrance
    b. Inside each grow cultivation room/area
- Local alarm set points shall be set at 5,000 ppm – Latching Alarm
    a. Visual and audible notification in approved locations at room or area in alarm
    b. Activation of the automatic system shutoff valve

  Upon activation of the local alarm, evacuate the room in alarm and contact a qualified service company to investigate and address the condition.

  Reset of the emergency alarm to be conducted only be qualified personnel.

ii. Signage – Signs shall be required adjacent to and within four (4) inches of each horn/strobe, as follows:

Storage Area/Room – "DO NOT ENTER WHEN LIGHT IS FLASHING – CARBON DIOXIDE LEAK DETECTED"

Grow Cultivation Room/Area Dispensing – "FLASHING LIGHT MEANS CARBON DIOXIDE LEAK DETECTED – EVACUATE ROOM"

All signs shall have a minimum 2-inch block lettering with a minimum ½-inch stroke width. The sign shall be on a contrasting surface of black letters on yellow background and shall be of durable construction.

A minimum of one (1) portable CO_2 meter shall be in use during normal business hours.

NFPA 704 placards for Simply Asphyxiants shall be provded at the exterior main entrance and each entrance to storage rooms/areas.

Signage shall be provided at each entrance door to grow cultivation rooms/areas and at each entrance to storage rooms/areas, as follows:

5. **Transfilling.** Filling and transfilling of gases between storage containers, cylinders and tanks and delivery vehicles shall be performed by qualified personnel using equipment and operating procedures in accordance with CGA P-1. Interior storage containers, cylinders and tanks shall be filled via remote fill ports on the exterior of the building at grade level. Exterior remote fill ports shall be fitted with a vent line to the outside. Delivery personnel shall have access to interior storage areas to inspect valves and piping prior to initiating filling procedures.

6. **Inspection and Testing.** All piping installations shall be visually inspected, calibrated and pressure tested to determine that the materials, design, fabrication and installation practices comply with the requirements of the adopted Fire Code.

    i. Records – A written record of all required inspections, testing, calibration, and maintenance shall be kept in a log book on the premises containing the three (3) most recent years plus the current year of records and shall be available for review by fire department personnel.
        - Required Inspections and Testing – All piping installations shall be tested and inspected as follows:

a. Acceptance Testing. Appliances and equipment shall not be placed in operation until after the piping system has been checked for leakage and detectors have been tested by a qualified service company. All piping installations shall be visually inspected and pressure tested prior to initial operation. The test pressure downstream of the pressure regulator shall be not less than 110% of the operating pressure. Joints shall be checked with a bubble-forming solution. Acceptance testing is required to be witnessed by Fire and Building Code officials.
b. Daily Testing. All detectors and alarms shall be visibly inspected daily. These inspections are permitted to be conducted by trained employees.
c. Monthly Inspections. All storage vessels, piping and appurtenances shall be visibly inspected monthly. These inspections are permitted to be conducted by trained employees.
d. Semi-Annual Inspections. Systems shall be visually inspected, tested for leaks, gas detectors calibrated per manufacturer specification, and alarms tested semi-annually by a qualified and licensed service company.
e. Alterations and Repairs. All effected piping shall be retested by a qualified and licensed service company if any alterations, repairs or additions are made.

- Calibration – Detectors shall be checked for accuracy, calibrated to a referenced gas concentration, and span reset semi-annually.
- Pressure Testing – Pipe joints shall be exposed for examination during the inspection and/or test.
    a. Test Medium. The test medium shall be air, nitrogen, carbon dioxide, or other inert gas.
    b. Section Testing. Piping systems shall be permitted to be tested as a complete unit or in sections. A valve shall not be subjected to the test pressure unless it can be determined that the valve, including the valve-closing mechanism, is designed to safely withstand the test pressure.
    c. Regulators and Valve Assemblies. Regulator and valve assemblies fabricated independently of the piping systems in which they are to be installed shall be permitted to be tested with inert gas or air at the time of fabrication. Test records shall be maintained.
    d. Test Preparation. All joints and fittings shall be exposed for examination during and after the test.
        - Pipe Clearing – Prior to testing, the interior of the pipe shall be cleared of all foreign material.

- Appliance and Equipment Isolation – Appliances and equipment that are not to be included in the test shall be isolated from the piping by closing the appliance shutoff valve.
- Test Pressure Measurement – Test pressure shall be measured with a pressure-measuring device designed and calibrated to read, record or indicate a pressure loss caused by leakage during the pressure test period. The source of pressure shall be isolated before the pressure tests are made. Mechanical gauges used to measure test pressures shall have a range such that the highest end of the scale is not greater than five (5) times the test pressure.
- Test Pressure – The test pressure downstream of the pressure regulator shall be not less than 110% of the operating pressure. Where the test pressure exceeds 125 psig (862 kPa gauge), the test pressure shall not exceed a value that produces a hoop stress on the piping greater than 50% of the specified minimum yield strength of the pipe or tubing. Pressure shall be adjusted smoothly and slowly to avoid pressure spikes.

e. Test Duriation. The test duration shall not be less than ten (10) minutes.

f. Visual Inspection and Cleaning. After testing is complete and the pressure is reduced to at or below operating pressure, all joints shall be cleaned of bubble-forming solution and visually inspected.

g. Detection of Leaks and Defects. The piping system shall withstand the test pressure specified without showing any evidence of leakage or other defects. Any reduction in test pressures as indicated by pressure gauges shal be deemed to indicate the presence of a leak.

h. Corrections. Where leakage or other defects are located, the affected portion of the piping system shall be repaired or replaced and retested.

7. Training. All employees shall receive annual training in hazard identification, physical properties, inspection, and emergency procedures. Training records shall be maintained on site and be available for examination by fire department personnel.

2. Requirements for Carbon Dioxide (CO_2) Gas Enrichment Systems Using a Natural Gas Burner

Specifics and Conditions:

a. **Equipment.** Natural gas burners shall be listed, labeled and installed in accordance with the manufacturer installation instructions. Piping systems, combustion and ventilation air and venting for natural gas appliances shall be designed in accordance with approved standards, the International Fuel Gas Code, and manufacturer recommendations.

b. **Required Protection.** Where natural gas burners are located indoors for CO_2 enrichment, grow rooms/areas shall be provided with an emergency alarm system as follows:

i. Emergency Alarm System – An emergency alarm system shall comply with all of the following:

- Continous gas detection shall be provided to monitor areas where CO_2 can accumulate. Detection equipment shall be provided to indicate CO_2 levels in each grow cultivation area/room and interior CO_2 storage location.
- Detectors shall be:
    a. Listed or approved devices
    b. Permanently mounted
    c. Installed at a height of no more than 48 inches above the floor or as approved by the Fire Code Official
    d. Directly to connected to building electrical and fire alarm systems and protected from accidental disconnection or damage
    e. Located within manufacturer specified detection range for each point of use and storage location
    f. Auto calibrating and self "zeroing" devised are not permitted unless they can zeroed and spanned
- Activation of the emergency CO_2 alarm system shall initiate amber strobes and audible horns provided in the vicinity of each interior storage container, cylinder or tank and each point of release. The notifaction devices shall be rated a minimum of 80cd for a visible effect and 75dBA for an audible effect and shall be mounted per NFPA 72 requirements. Audible and visual devices shall be provided at the following locations:
    a. Inside each interior storage room/area and outside the room/area at each entrance
    b. Inside each grow cultivation room/area
- Local alarm set points shall be set at 5,000 ppm – Latching Alarm
    a. Visual and audible notification in approved locations at room or area in alarm
    b. Activation of the automatic system shutoff valve

Upon activation of the local alarm, evacuate the room in alarm and contact a qualified service company to investigate and address the condition.

Reset of the emergency alarm to be conducted only be qualified personnel.

ii. Signage – Signs shall be required adjacent to and within four (4) inches of each horn/strobe, as follows:

Storage Area/Room – "DO NOT ENTER WHEN LIGHT IS FLASHING – CARBON DIOXIDE LEAK DETECTED"

Grow Cultivation Room/Area Dispensing – "FLASHING LIGHT MEANS CARBON DIOXIDE LEAK DETECTED – EVACUATE ROOM"

All signs shall have a minimum 2-inch block lettering with a minimum ½-inch stroke width. The sign shall be on a contrasting surface of black letters on yellow background and shall be of durable construction.

A minimum of one (1) portable CO_2 meter shall be in use during normal business hours.

NFPA 704 placards for Simply Asphyxiants shall be provded at the exterior main entrance and each entrance to storage rooms/areas.

Signage shall be provided at each entrance door to grow cultivation rooms/areas and at each entrance to storage rooms/areas, as follows:

iii. Carbon Monoxide (CO) Detection – Carbon monoxide (CO) gas detection shall be provided to continuously monitor for products of incomplete combustion.

- Detectors shall be:
    a. Listed or approved devices
    b. Permanently mounted
    c. Installed at a height of no more than 48 inches above the floor or as approved by the Fire Code Official

d. Directly to connected to building electrical and fire alarm systems and protected from accidental disconnection or damage

- CO detection shall be set at 35 ppm and upon activation shall initiate the following:
  a. Close the valve to each burner
  b. Activate the mechanical exhaust system
- All carbon dioxide (CO2) burner systems shall shut down in the event of a total loss of electrical power to the carbon monoxide (CO) detectors.
- A minimum of one (1) portable carbon monoxide (CO) meter shall be in use during business hours.

c. **Inspection and Testing.** All detectors, alarms and carbon dioxide (CO_2) burners shall be visually inspected, calibrated, and tested to determine that the materials, design, fabrication and installation practices comply with the requirements of this code.

i. Records – A written record of all required inspections, testing, calibration, and maintenance shall be kept in a log book on the premises containing the three (3) most recent years plus the current year of records and shall be available for review by fire department personnel.

- Required Inspections and Testing – All detectors, alarms and carbon dioxide (CO_2) burner equipment shall be tested and inspected as follows:
  a. Acceptance Testing. Appliances and equipment shall not be placed in operation until after the detectors, alarms, gas control valves and mechanical exhaust system have been tested by a qualified service company. Acceptance testing shall be witnessed by Fire and Building Code officials.
  b. Daily Inspections. All detectors and alarms shall be visibly inspected daily. These inspections are permitted to be conducted by trained employees.
  c. Monthly Inspections. All carbon dioxide (CO_2) burners and appurtenances shall be visibly inspected monthly. These inspections are permitted to be conducted by trained employees.
  d. Semi-Annual Inspections. Systems shall be visually inspected and gas detectors calibrated per manufacturer specification semi-annually by a qualified and licensed service company.
  e. Annual Testing. All detectors, alarms, gas control valves, and mechanical exhaust systems shall be tested annually by a qualified and licensed service company.
  f. Alterations and Repairs. If any alterations, repairs or additions are made, the affected equipment shall be retested by a qualified and licensed service company.

- Calibration – Detectors shall be checked for accuracy, calibrated to a referenced gas concentration, and span reset semi-annually.

d. **Training.** All employees shall receive annual training in hazard identification, physical properties, inspection, and emergency procedures. Training records shall be maintained on site and be available for examination by fire department personnel.

Permits May Be Revoked Without Refund If:

1. The permit is used for a location or establishment than the one to which it was issued,
2. The permit is used for a condition or activity other than that listed on the permit,
3. Conditions and limitations set forth in the permit are violated,
4. False statements or misrepresentations are discovered in the application for permit, inventory statement, or plans submitted as a condition of the permit,
5. The permit is used by a person(s) or firm other than that listed on the permit,
6. Failure, refusal or neglect to comply with orders or notices duly served in accordance with provisions of the adopted fire code in the time provided therein,
7. The permit was issued in error or in violation of any ordinance, regulation or provision of the fire or building code.
8. The required permit fee(s) are not paid within 30 days of permit issue.

Refer to the Front Range Fire Rescue adopted fee schedule for current permit fee amounts.

Annual Operational Permits:

Annual operational permits shall only be issued upon approval, issuance, and final inspections of required construction permits.

A separate annual compressed gas storage/use permit shall be required for 6,000 cubic feet or more of carbon dioxide (CO_2) as an "inert gas." (1 pound of CO_2 = 8.74 cubic feet)

Operational permits shall be renewable annually upon inspection by Front Range Fire Rescue.

Operational permits shall be posted on site and available for inspection.

To obtain required annual operational permit(s), the owner or responsible person shall complete and sign the Carbon Dioxide (CO_2) Gas Enrichment Systems Permit Application and remit the required annual permit fee. Refer to the Front Range Fire Rescue Fee Schedule for permit fees.

Site Inspection:

Upon issuance of the carbon dioxide system construction permit, and after final installation of the system, the carbon dioxide vendor shall notify Front Range Fire Rescue of the need for an acceptance test. It may be necessary for an inspection by a third party entity prior to approval by Front Range Fire Rescue. The applicant shall be responsible for all costs associated with third party involvement.

Installation of carbon dioxide burners will require a mechanical permit that is issued by the municipality, in addition to any construction permits. Such permit shall be completed and closed by inspection prior to any inspection by Front Range Fire Rescue.

Front Range Fire Rescue will conduct a final inspection and acceptance test prior to closing any outstanding permits and/or issuing any operational permits. Upon successful final inspection, an operational permit will be issued to the business/property owner. Compliance with all applicable codes, standards and regulations shall be maintained at all times. The permit shall be posted on site and available for inspection at all times. The permit shall be valid for the business/property owner, site address, time frame, and activity as indicated on the permit. Permits shall be revoked, with no refund given, if:

1. Any of the conditions or limitations set forth in the permit has been violated,
2. Compliance with written orders has not been achieved,
3. False statements or misrepresentation of information provided in the permit application is discovered,
4. The permit is issued in error or in violation of municipal code or the adopted Fire Code.
5. The required annual operational permit fee(s) are not paid within 30 days of permit issue.

Revision History:

08/02/2017 Original documented developed

References:

Denver Fire Department – Carbon Dioxide (CO_2) Gas Enrichment Systems in Plant Growing (Husbandry) Applications

FRONT RANGE FIRE RESCUE

CARBON DIOXIDE (CO_2) GAS ENRICHMENT SYSTEMS PERMIT APPLICATION

THIS FORM SHALL BE COMPLETED AND SIGNED BY THE BUSINESS OWNER OR A REPRESENTATIVE OF THE PROPERTY OWNER APPLYING FOR THE PERMIT(S). PLEASE SUBMIT COMPLETED FORM TO FRONT RANGE FIRE RESCUE FOR REVIEW, APPROVAL, AND ISSUANCE OF A COPY FOR YOUR USE. REFER TO CURRENT FEE SCHEDULE FOR APPLICABLE FEES.

Business Name: _____

Physical Address: _____

City: _____ State: _____ ZIP: _____

Mailing/Billing Address: _____

City: _____ State: _____ ZIP: _____

Contact Name: _____

Phone: _____ Email: _____

Installation Contractor: _____

Type of CO_2 System (Gas System / Burners): _____

Total # and Size of Cylinders/Containers: _____

Total Quantity (cubic feet) of CO_2 Gas On-Site: _____

Check all that apply: Indoor Outdoor Enclosed Room Above Grade Below Grade

Indicate location(s) of CO_2 gas storage on attached to-scale drawing.

Provide detailed description of CO_2 enrichment room(s).

I HAVE READ AND UNDERSTAND THE FRONT RANGE FIRE RESCUE POLICIES REGARDING CARBON DIOXIDE (CO2) GAS ENRICHMENT SYSTEMS AND NATURAL GAS BURNERS. I ALSO UNDERSTAND THAT FRONT RANGE FIRE RESCUE WILL CONDUCT A SITE INSPECTION, AND THAT IF I FAIL TO COMPLY WITH THE ADOPTED FIRE CODE, BUILDING CODE OR NFPA STANDARDS, MY PERMIT(S) AND/OR APPROVALS MAY BE REVOKED WITHOUT A REFUND.

PRINTED NAME: _____

SIGNATURE: _____ DATE: _____