Marijuana Facilities
Building Codes and Hazards

By
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Technical Resources

• ASHRAE 2015 HVAC Applications Handbook, Chapter 24 ENVIRONMENTAL CONTROL FOR ANIMALS AND PLANTS

• [www.denvergov.org](http://www.denvergov.org), Fire Department
  – Marijuana Facilities permits and guidelines
Topics for Discussion

• The Legal Landscape

• Building Codes, Equipment Operation, and Hazards
  – Commercial Grow Rooms
  – Processing Labs (Butane Hash Oil Extraction)
  – Residential Issues

• Questions and Answers
The Legal Landscape - 2016

Not legal under Federal Law!
The Legal Landscape - 2017

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Commercial Grow Facilities – Typical Equipment
Grow Facilities – High Energy Usage

Typical Electric Energy Usage for a Grow House
- 70 to 170 kWh / sq. ft. / year
- Half of new demand in Colorado in 2014

Typical Electric Energy Usage for an Average Hospital
- 28 kWh / sq. ft. / year

(From ASHRAE Applications Handbook 2015, Chapt. 36, Energy Use and Management, 2003 data)
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$6 Billion for indoor marijuana grow operations
$1 Billion for pharmaceutical companies
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Grow Facilities – Possible Hazards

Lighting

- High intensity lamps
- 1000 watt bulbs are common
- High electrical demand
- Can reach 500 deg F
- Emit a great deal of heat.
Grow Facilities – Possible Hazards

CO2 Enrichment

Requires Installation Permit

2 major system types:
• CO2 gas cylinder
• Gas burner (Nat. gas)

Asphyxiation hazards!

Increase growth rate by 25% and crop yields by 40%.

Room CO2 is normally maintained at about 1500 ppm. (Only when grow lights are on)
CO2 sensors, safety controls, alarms, and warning signs are required.

Gas burner type also presents a CO hazard.
Is a non-vented fuel-fired appliance under the International Fuel Gas Code.
Requires an oxygen depletion sensor interlocked with an exhaust fan.
Grow Facilities – Possible Hazards

Fumigation
Regulated by fire codes and requires **operational permit** and **hazard signage**.

Common types:
- Sulfur burners to control mold and mildew.
- CO₂ fumigation to control pests.

Sulfur burners create sulfur dioxide.
Need PPE: Gas mask and goggles.

CO₂ fumigation done at 40,000 ppm or higher.
Above OSHA's immediately dangerous to life or health level.

Concerns:
- Some growers fumigate overnight without permits.
- Workers entering the space.
- Adjacent tenants unaware of this fumigation activity.
- First responders entering in the event of a fire.
Grow Facilities – Possible Hazards

Electrical

Overloaded electrical wiring has caused fires in some grow facilities.

• Increased electric demand due to added grow lights and HVAC units.
• In remodeled buildings, may need to upgrade the electric service.

Governed by the National Electric Code (NEC).

• Extension cords cannot serve as permanent wiring to equipment, lighting, fans, etc.
• Wiring can’t pass through doors, walls, or ceilings.
Grow Facilities – Possible Hazards

Heating, Ventilation, and Air Conditioning
Governed by International Mechanical Code (IMC)

Ventilation
Exhaust systems remove contaminants and odors from the air. Marijuana plants emit a very strong “skunk like” odor.

Common methods of odor control:
• Charcoal filter in exhaust duct
• Ozone generators in exhaust duct
• Ionizers
Grow Facilities – Odor Control
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D/T = 30

D/T = 15
Grow Facilities – Odor Control
Grow Facilities – HVAC

Control of Indoor Environment

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• 68 to 75 degrees F
• 50% to 60% relative humidity
Grow Facilities – HVAC

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Walls and ceilings:
- Should be constructed of corrosion resistant materials
- Should include air and vapor barriers
- Should be well insulated
Grow Facilities – Possible Hazards

Plumbing

Governed by the International Plumbing Code (IPC).

• Water supply lines for irrigation must have back-flow protection to prevent contamination of domestic water supply.

• Grow rooms should have floor drains.
  – Remove spilled water and nutrient solutions.
  – Drains should be equipped with screens to catch plant material or other debris.
Grow Facilities – Possible Hazards

Fire Protection

National Fire Protection Association (NFPA)
International Fire Code (IFC)
International Building Code (IBC)

Grow facilities are classified under IBC as an F-1 Occupancy, Factory Industrial, Moderate Hazard. If over 12,000 sq. ft., then a fire sprinkler system is required.

Also required:

- Fire walls with one-hour separation between facility and adjacent occupancy.
- Wall and ceiling finishes with a flame spread index within the specified limits.
- **Means of Egress** as required in IBC, Chapter 10.
  - Growers typically do not grow in one large open room.
  - Need to isolate the plants that are at different stages of growth.
  - Large converted warehouses can be maze-like with multiple rooms.
Processing Facilities for Marijuana Infused Products

Oil can be extracted from marijuana plant leaves and buds that is highly concentrated with THC, and is commonly known as “hash oil.”

Extract oil is used in:
• Edible goods (brownies, candy, etc...).
• Oil can be smoked.
• Vapor cigarettes.
• Balms and Transdermal patches for pain relief.

Local building and fire code officials will review the extraction process and issue an operational permit.

Most extraction methods use hazardous materials for solvents. The most common solvents used are:
• Butane
• CO₂
• Alcohol
Processing Facilities for Marijuana Infused Products

Butane Hash Oil (BHO) Extraction

- Cost effective
- Dangerous
- Used legally in licensed commercial facilities
- Used illegally in homes

Pressurized liquid solvent is passed thru marijuana leaves or buds, removing the THC from the plant. The liquid is then boiled off, leaving the oil behind.

Open releases of butane into the atmosphere are prohibited!

In 2014, there were 32 reported butane hash-oil explosions in Colorado!
Hash oil extraction blamed for Black Hawk explosion, fire

December 1, 2014
Hash oil explosion rocks Broker Inn in Boulder

April 13, 2016
Hash oil explosion rocks Broker Inn in Boulder

April 13, 2016
Bailey, Colorado home explosion tied to butane hash oil extraction

March 10, 2017
May 12, 2016

Parliament Apartments
South Quebec Street
Denver Tech Center
Processing Facilities for Marijuana Infused Products

Legal Butane Extraction

• Requires an operational permit.
• Must be done with an approved closed system.

Requirements for Approval in Denver, Colorado

• The facility may be classified under IBC as a Group H, High Hazard Occupancy.

• Engineering analysis, signed and sealed by a licensed PE. Based on NFPA 58, *Liquefied Petroleum Gas Code*.

• Hazardous material exhaust system with hydrocarbon detector.
Residential Facilities Pose Many Concerns

Colorado law allows people 21 and older to grow up to 6 plants.

Lighting and equipment are not always installed by licensed contractors or according to code, and many concerns have arisen.

- Unsafe electrical practices.
- Heat from grow lights.
- Venting gas-fired appliances into grow rooms.
- Humid grow environment ideal for mold.

Butane hash oil extraction is illegal in residential buildings.

Limit for a single person or house can be greatly increased by:

- Obtaining a doctor’s recommendation for medical marijuana
- Multiple adults living in the same house.

Can lead to **home invasions**.
Questions and Answers?

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