Applying the Codes to Cannabis Facilities

ICC PREFERRED EDUCATION PROVIDER

CONTINUING EDUCATION AIA

Applying the Codes to Cannabis Facilities

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- Colorado Regional Manager, Education Director for Shums Coda Associates, Inc.
- 40 years experience in code administration
- ICBO Committees
  - Small Jurisdictions
  - Fire & Life Safety Code Development
  - Means of Egress Review
- ICC Means of Egress Code Committee
- Author of Building Code Basics, based on 2009 & 2012 IBC, Building Code Essentials 2015 IBC
- Author of Applying the Codes to Cannabis Facilities

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What are we going to talk about?

- What are These Things
- Types of Facilities
- Building Code Issues
- Fire Code Issues
- Energy Code Issues
- Plumbing, Mechanical, Electrical Code Issues
- Open Discussion

MARIJUANA LEGALIZATION ON CALIFORNIA BALLOT—NEWS ITEM

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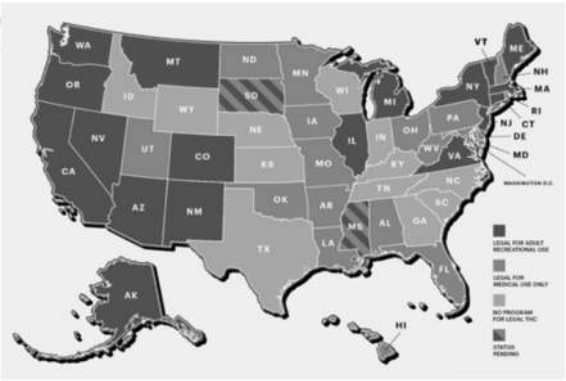
Nationwide Legalization



Source: Rolling Stones Magazine – 4/2021

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Profitable Business

- The table below shows medical and retail cannabis tax and fee collections totals by calendar year starting in 2014. Although sales of medical cannabis began prior to 2014, the Department of Revenue did not report tax collection data until February of 2014, after retail cannabis sales began.

Marijuana Sales by Calendar Year	
2021	$2,228,994,553
2020	$2,191,091,679
2019	$1,747,990,628
2018	$1,545,691,080
2017	$1,307,702,219
2016	$1,307,203,473
2015	$995,591,255
2014	$683,523,739

Source: Colorado.gov

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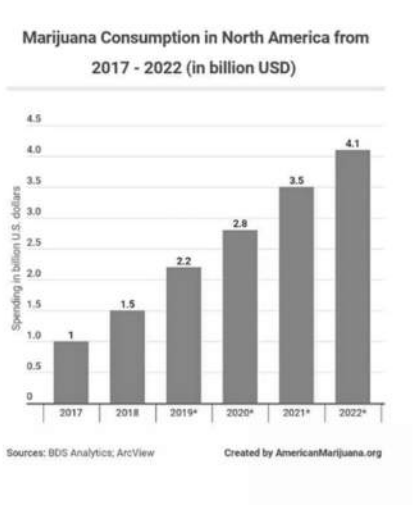

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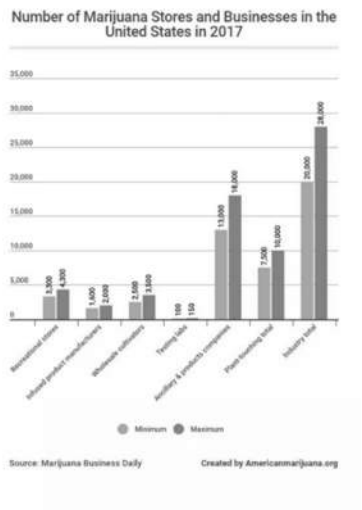

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What is Cannabis?

- The plant family, Cannabis has two primary classifications—Indica and Sativa.
- Marijuana is a member of both Indica and Sativa but Hemp is only a member of the Sativa family.
- Being in the Sativa family, Hemp and Marijuana do indeed share some similarities but because the plants are different they do share crucial differences, as well.

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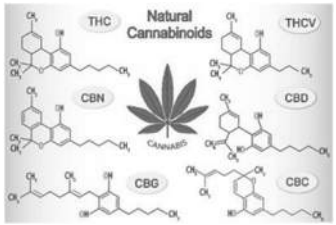
Cannabinoids

- The Cannabis family of plants contains a multitude of compounds called Cannabinoids.
- The two richest and most dominant forms are known as: Tetrahydrocannabinol (THC) and Cannabidiol (CBD).
- THC and CBD are well known for their beneficial effects on the human body.
- The major distinction between the two cannabinoids lay in their ability to induce psychoactive effects.
- Only THC has the ability to do this and the end result is a "high" that we associated with smoking cannabis.



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Marijuana vs Hemp

Marijuana is abundant in THC with concentrations between 15-40%

Hemp has scarce concentrations of THC (0.3% or less)

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HEMP vs MARIJUANA

HEMP AND MARIJUANA BOTH DERIVE FROM THE CANNABIS SATIVA FAMILY, THEY DO SHARE CERTAIN SIMILARITIES, HOWEVER, DUE TO EACH PLANT'S BIOLOGICAL STRUCTURE, THEY HAVE SEVERAL VERY DISTINCT AND CRUCIAL DIFFERENCES.

HEMP

Product
- CBD oil
- Hemp oil
- Cannabis oil (made from hemp)

Contains
- 0.3 % or less of tetrahydrocannabinol (THC)

Characteristic
- Hemp and industry hemp refer to the strain of cannabis plant that is grown for agricultural products such as textiles, seeds and oils.
- Can grow in most climates, bunched together with orther plants, requires little care.
- Can grow as high as 20 feet with leaves bunched near the top of stem.
- No psychoactive properties

MARIJUANA

Product
- THC oil
- Marijuana oil
- Cannabis oil (made from marijuana)

Contains
- 15 - 20 % of tetrahydrocannabinol (THC)

Characteristic
- Marijuana is known for its flowering tops of the plant. The flowers are typically bared to have a high THC.
- Growth is carefully monitored, controlled in an isolated, warm, humid area to maximize psychoactive uses. Cross-pollination can ruin THC content.
- Shorter, resembles a bush, with more leaves and buds surrounding the plant's body
- Psychoactive side effects.

LifeCannMD

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Sativa vs. Indica


Sativia

SATIVA
Properties and Effects
- High THC level
- Best suited for day use
- Energetic and uplifting
- Spacey, cerebral or hallucinogenic
- Stimulates appetite
- Relieves depression
- Slender-leaf shape
- Grows tall – up to 20 feet
- Flavor is typically earthy

INDICA
Properties and Effects
- High CBD level
- Best suited for night use
- Calming, sedating and relaxing
- "Couch lock" or body buzz
- Stimulates appetite
- Reduces anxiety and pain
- Wide-leaf shape
- Grows 3-4 feet typically
- Flavor is typically sweet


Indica

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Facilities Categories

- Cultivation/Grow Facilities
- Drying/Curing/Trimming/Processing
- Bakeries/Food Products (Edibles)
- Retail Shops (Dispensaries)
- Grow Supply Stores
- Testing Labs
- Coffeehouses
- Vacation/Spa Experiences
- Personal Grow Operations
- Legal/Illegal Facilities

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Cultivation/Grow Facilities

- Indoor Facilities
  - Warehouses converted to grow facilities
  - Artificial Illumination
  - Hydroponic watering system
  - Single level of plants or multiple levels of plants
  - Germination
    - Seeds
    - Cloning
  - CO_2 Enrichment

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Cultivation/Grow Facilities

- Greenhouses
  - Defined as "A structure or thermally isolated area of a building that maintains a specialized sunlit environment used for and essential to the cultivation, protection or maintenance of plants".
  - Light Transmitting Plastics
  - Artificial Lighting
  - Hydroponic watering system
  - CO_2 Enrichment

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Cultivation/Grow Facilities

- Outdoor Facilities
  - Not regulated by the building codes
  - High security

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Extraction Facilities

- Hydrocarbon Extraction (butane & propane)
- Alcohol Extraction
- Supercritical CO_2 Extraction
- Screw Press
- Rosin Technique (heat and pressure)
- Ice Water, Dry Ice

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Bakeries/Cooking Facilities

- Manufacture edibles infused with either THC or CBD
- Commercial Kitchens

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Dispensaries

- Retail Stores
  - Medical
  - Recreational
- Edibles
- Buds for smoking
- Vaping Cartridges

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Laboratories

- Testing labs
  - Potency
  - Comply with State Standards
  - Quality of Product

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Grow Supply Stores

- Retail Stores
  - Hydroponic equipment
  - Grow lighting
  - Grow Medium
  - Butane
  - CO_2 tanks

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Illegal Facilities

- Code enforcement issue
- Improper electrical installations
- Improper ventilation
- Disconnected appliance vents
- Fire hazards

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What is it and why do we care?

- Issues for building departments
  - Occupancy classification
  - Security (State Laws)
  - Electrical (High Demand)
  - Ventilation (Odors)
  - Political Pressure
- Legal Issues
- Vulnerable Neighbors

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State Regulations

- Licensing
  - Retail Cannabis Establishments
  - Medical Cannabis Business
  - Retail Cultivation Facilities
  - Testing Laboratories

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Retailers

- Permitted to dispense cannabis
- Permitted to sell edible food products using medical cannabis

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Cannabis Facilities

- Each Licensed Premises shall have a Security Alarm System, installed by an Alarm Installation Company, on all perimeter entry points and perimeter windows.

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Cannabis Facilities

- Each Licensee must ensure that all of its Licensed Premises are continuously monitored.
- Licensees may engage the services of a Monitoring Company to fulfill this requirement.

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Cannabis Facilities

- At all points of ingress and egress, the Licensee shall ensure the use of a commercial-grade, nonresidential door locks.

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Cannabis Facilities

- Prior to exercising the privileges of a Retail Cannabis Establishment, an Applicant must install a fully operational video surveillance and camera recording system.
- The recording system must record in digital format and meet the requirements outlined in this rule.

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Waste Disposal

- Retail Cannabis and Retail Cannabis Product waste must be made unusable and Unrecognizable prior to leaving the Licensed Premises.

MARIWASTE

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Waste Disposal

- Grinding and incorporating the cannabis waste with non-consumable, solid wastes listed below such that the resulting mixture is at least 50 percent non-cannabis waste:
  a. Paper waste;
  b. Plastic waste;
  c. Cardboard waste;
  d. Food waste;
  e. Grease or other compostable oil waste;
  f. Bokashi or other compost activators;
  g. Soil;
  h. Sawdust; and
  i. Other wastes approved by the Division that will render the Retail Cannabis, Retail Cannabis Concentrate and Retail Cannabis Product waste unusable and Unrecognizable.

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Waste Disposal

- Rendered waste shall be:
  1. Disposed of at a solid waste site and disposal facility that has a Certificate of Designation from the local governing body;
  2. Deposited at a compost facility that has a Certificate of Designation from the Department of Public Health and Environment; or
  3. Composted on-site at a facility owned by the generator of the waste and operated in compliance with the Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2, Part 1) in the Department of Public Health and Environment.

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Waste Disposal

- A Licensee shall not dispose of Retail Cannabis and Retail Cannabis Product waste in an unsecured waste receptacle not in possession and control of the Licensee.

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How do they grow it!

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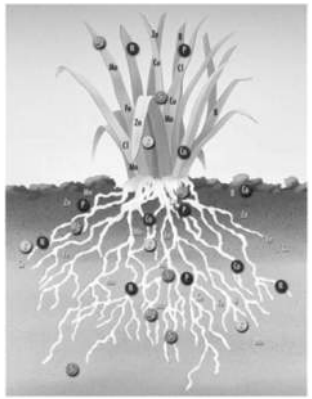
Plant Growth Process

- Osmosis
  - The plant takes up water and minerals from the soil through its roots and transfers it to the leaves through the stem and branches.
- Photosynthesis
  - The plant uses absorbed light and air to transform water and minerals received through osmosis into plant tissue.



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Plant Life Cycle

- Germination
- Seedling
- Vegetative Growth
- Pre-Flowering
- Flowering

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Reproduction

- Plants can be reproduced by:
  - Germination of seeds, or
  - Cloning
    - A clone is always taken from an adolescent female plant
    - Will have the same characteristics of the mother plant

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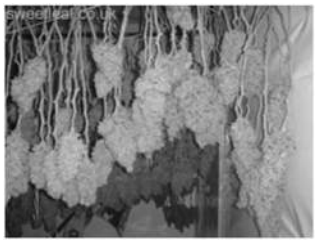
Harvesting/Drying

- Hang plants upside down
- Place buds in canning jars



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Harvesting/Drying

- Ovens
  - 125-140 degrees F
- Flat piece of foil under 100 watt lamp within 2-4 inches
- Wrap in paper and place over water heater, radiator or back of television
- Microwave oven

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How Do They Grow It?

- Lighting
  - Metal Halide (Blue Spectrum)
  - High Pressure Sodium (Red Spectrum)
  - 400 – 1,000 Watt bulbs

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How Do They Grow It?

- Heat and Temperature Control
  - Ventilation
  - Fans
  - Air Conditioning
- Temperature Control is KING
- Lights & ballasts give off lots of heat

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What Does It Need To Grow?

- Water
- Air
  - Often enriched with CO^2
- Medium
- Nutrients
- Chemicals
  - To control ph levels

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Ventilation

- Large amounts of plants, photosynthesis uses up all the carbon dioxide and fills the room with oxygen
- Plants need a fresh supply of CO^2 in the room or they stop growing

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Temperature

- Cannabis grows best at 68 – 72 degrees and will stop growing at temps above 90 degrees

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Concerns

- Heat
- Electrical Loads
- Ventilation Rate
- Carbon Dioxide
- Egress
- Humidity
- Odor

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Ventilation Equipment

- Large Squirrel Cage Fans
- Inline Fans
- Blowers
- Induction Fans
- Flex Hose Insulated Ducts

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Ventilation Equipment

- CO^2 Bottles
- CO^2 Generators
- Environmental Controls
  - Temp
  - Humidity
  - CO^2 Levels
- Carbon Filters

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Ventilation Equipment

- Charcoal Filters
  - Reduce Odors
- Ionizers
  - Reduce Odors
- Ozone Generators
  - Odor Control
  - Humidity Control
- De-Humidifiers

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Ventilation Equipment

- Oscillating Fans
  - Move the CO^2
  - Strengthen the stalks
  - Cool the plants
- Exhaust fans to eliminate the heat and excess oxygen

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Stages of Growth

- 4 Stages
  - Germination
    - 24 hours to 7 days
  - Seedling
    - 2 to 4 weeks
  - Vegetation
    - 2-3 weeks
  - Flowering
    - 4 to 12 weeks

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Lighting Schedules

- Vegetative – Seedling or clone leads to Vegetative Stage
  - 18-24 hours of light a day
- Flowering – Flowering Stage leads to Harvest
  - 12 hours light & 12 hours dark each day

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Lighting

- High Intensity Discharge (HID) Grow Lights
  - High pressure sodium
  - Metal halide
  - 250-1,000 watt bulbs
  - Requires ballast
    = increased heat and fire hazard

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Lighting

- Compact Fluorescent Grow Lights
  - 300 W
- LED Grow Lighting
  - Lower temperature

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Lighting

- Lighting Reflectors
  - Ceiling and walls
  - Directs lights onto plants
  - Reduces waste of lighting
  - Mylar used on walls

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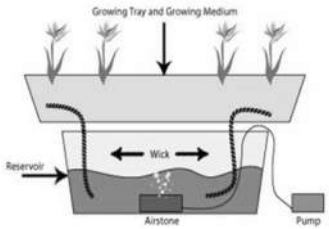
Hydroponics

- Grow plants in an inert, sterile growing medium instead of soil.
  - Rockwool
  - Perlite
  - Clay pellets



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Hydroponics

- Nutrients
  - Nitrogen (N)
  - Phosphorus (P)
  - Potassium (K)
- Basic plant food
  - Liquid
  - powder

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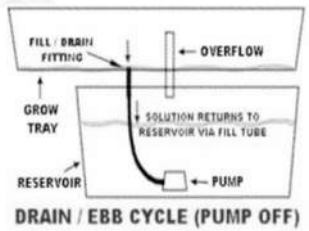
Hydroponics



- Ebb & flow system
  - Reservoir with solution
  - Pump on timer
  - Pumps water and nutrient solution to the plants
  - Solution drains back to reservoir

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Illegal Grow Issues

- Electrical
  - Unsafe electrical practices
  - Open wiring
  - Inadequate fuses or circuit breakers
  - Bad connections
  - Overloading of circuits
  - 24 more times likely to catch fire

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Illegal Grow Issues

- Carbon Dioxide Poisoning
  - Propane CO_2 generators
  - Vent furnaces and water heaters into grow rooms
  - Normal levels
    - 300 – 600 ppm
  - Desired grow levels
    - 1,000 – 3,000 ppm
  - Lethal Level
    - 100,000 ppm
  - OSHA
    - 30,000 ppm

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Illegal Grow Issues

- Ozone Gas
  - Eliminates odor
  - Consumes excess oxygen from plants
  - Reduces mold growth

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Illegal Grow Issues

- Chemical Hazards
  - Explosive/toxic fumes from "weed oil" extraction
  - Butane, Sulfuric Acid, Methanol, Isopropyl Alcohol, Toluene
  - Fertilizers
  - Plant & water conditioners

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Illegal Grow Issues

- Mold
  - Heat
  - Humidity
  - Cellulose
- Optimal conditions for mold growth
- Mitigation issues

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Illegal Grow Issues

- Lighting Hazards
  - Grow light surface temperature
    - Approximately 500 degrees
  - Grow lights are under pressure
- Stolen power from neighbors

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Commercial Grow Issues

- Power Consumption
  - HID Grow lamps
  - Usually obtain proper permits
  - Work performed by electrical contractors

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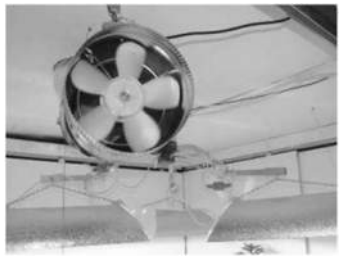
Commercial Grow Issues

- Ventilation
  - High humidity issues
  - Odor control



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Commercial Grow Issues

- Means of Egress
  - Security control
  - Limited access
  - Occupant Loads
  - Common Path of Egress

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Commercial Grow Issues

- CO_2 Generation
- Ozone Generation
- Fertilizers
- Extraction operations

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Big Picture…

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Occupancy Classifications

- Dispensaries
- Laboratories
- Social Clubs
- Grow Facilities
- Processing and Packaging

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Dispensaries, Grow Supply Stores

- Mercantile Group M occupancy includes, among others, the use of a building or structure or a portion thereof, for the display and sale of merchandise and involves stocks of goods, wares or merchandise incidental to such purposes and accessible to the public.

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Social Clubs, Smoking Lounges

- Group B
  - Less than 50 occupant assembly area
- Over 50 Occupants?
- Group A-2 or A-3?

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Laboratories

- Group B
  - Offices
  - Laboratories: testing and research
  - Need list of hazardous materials

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Bakeries & Cooking Facilities

- Group F-1

  Food processing establishments and commercial kitchens not associated with restaurants, cafeterias and similar dining facilities more than 2,500 square feet in area.

  Less than 2,500 square feet in area is classified as a Group B

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Grow Facilities

- Group F-1

  Factory Industrial Group F occupancy includes, among others, the use of a building or structure, or a portion thereof, for assembling, disassembling, fabricating, finishing, manufacturing, packaging, repair or processing operations that are not classified as a Group H hazardous or Group S storage occupancy.

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Grow Facilities

- Group U

  Buildings and structures of an accessory character and miscellaneous structures not classified in any specific occupancy shall be constructed, equipped and maintained to conform to the requirements of this code commensurate with the fire and life hazard incidental to their occupancy. Group U shall include, but not be limited to, the following:

  - Agricultural buildings
  - Greenhouses

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Could it be a Group H Occupancy?

- 307.1
- High-hazard Group H occupancy includes, among others, the use of a building or structure, or a portion thereof, that involves the manufacturing, processing, generation or storage of materials that constitute a physical or health hazard in **quantities in excess** of those allowed in control areas complying with Section 414, based on the **maximum allowable quantity limits for control areas set forth in Tables 307.1(1) and 307.1(2).**

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Hazardous materials 414.1.3 information required

- A report SHALL be submitted to CBO that identifies:
  - Maximum expected amounts
  - Identify if it's stored, use-open or use-closed
  - Identify classification categories
  - Methods of protection to be used
- Must be a report prepared by an approved person or agency

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Combustible Fibers

- Readily ignitable and free-burning materials in a fibrous or shredded form, such as cocoa fiber, cloth, cotton, excelsior, hay, **hemp**, henequen, istle, jute, kapok, oakum, rags, sisal, Spanish moss, straw, tow, wastepaper, certain synthetic fibers or other like materials.
- This definition does not include densely packed baled cotton.

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Processing and Packaging

(F) TABLE 307.1(1)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD[a, b, c, d, e]

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE[b]			USE-CLOSED SYSTEMS[b]			USE-OPEN SYSTEMS[b]	
			Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas (cubic feet at NTP)	Solid pounds (cubic feet)	Liquid gallons (pounds)	Gas (cubic feet at NTP)	Solid pounds (cubic feet)	Liquid gallons (pounds)
Combustible liquid[g, i]	II IIIA IIIB	H-2 or H-3 H-2 or H-3 N/A	N/A	120[g, i] 330[g, i] 13,200[g, i]	N/A	N/A	120[g] 330[g] 13,200[g]	N/A	N/A	30[g] 80[g] 3,300[g]
Combustible fiber	Loose baled[g]	H-3	(100) (1,000)	N/A	N/A	(100) (1,000)	N/A	N/A	(20) (200)	N/A

- Group H-3
  - Buildings and structures containing materials that readily support combustion or that pose a physical hazard shall be classified as Group H-3. Such materials shall include, but not be limited to, the following:
    - Combustible fibers, other than densely packed baled cotton

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Is it a Group H Occupancy?

- Maybe
  - Marijuana – probably not
  - Hemp - probably
- Section 414 still applies
  - Control Areas
  - Ventilation
  - Explosion control
  - Storage, dispensing and use
- IFC Requirements

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Extraction

- A solvent is used to extract the oil from the dried plant.
- The product is soaked, mixed and stirred in the solvent.
- The solvent/oil solution is then boiled to evaporate the solvent to leave the oil.

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Extraction

- Solvents include
  - Alcohol
  - Naphtha
  - Ether
  - Butane
- All flammable liquids or gases

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Table 307.1(1)

TABLE 307.1(1)
MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA OF HAZARDOUS MATERIALS POSING A PHYSICAL HAZARD[a, j, m, n, p]

MATERIAL	CLASS	GROUP WHEN THE MAXIMUM ALLOWABLE QUANTITY IS EXCEEDED	STORAGE[b]			USE-CLOSED SYSTEMS[b]			USE-OPEN SYSTEMS[b]	
			Solid pounds (cubic feet)	Liquid gallons (pounds)[c]	Gas cubic feet at NTP	Solid pounds (cubic feet)	Liquid gallons (pounds)[c]	Gas cubic feet at NTP	Solid pounds (cubic feet)	Liquid gallons (pounds)[c]
Flammable gas	Gaseous Liquefied	H-2	NA	NA (150)[d, e]	1,000[d, e] NA	NA	NA (150)[d, e]	1,000[d, e] NA	NA	NA
Flammable liquids	IA IB and IC	H-2 or H-3	NA	30[d, e] 120[d, e]	NA	NA	30[d] 120[d]	NA	NA	10[d] 30[d]
Flammable liquid, combination (IA, IB, IC)	NA	H-2 or H-3	NA	120[d, e, f]	NA	NA	120[d, f]	NA	NA	30[d, f]

Butane = Flammable Gas
Ethyl Alcohol = Class IB Flammable Liquid

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Maximum Allowable Quantities MAQ

- Butane
  - 150 pounds storage
  - 150 pounds closed use
  - N/A open use
- Ethyl Alcohol
  - 120 gallons storage
  - 120 gallons closed use
  - 30 gallons open use

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Table Footnotes

- d. Maximum allowable quantities shall be increased 100 percent in buildings equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. Where Note e also applies, the increase for both notes shall be applied accumulatively.
- e. Maximum allowable quantities shall be increased 100 percent when stored in approved storage cabinets, day boxes, gas cabinets, gas rooms or exhausted enclosures or in listed safety cans in accordance with Section 5003.9.10 of the International Fire Code. Where Note d also applies, the increase for both notes shall be applied accumulatively.

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footnote "e"; what makes an approved cabinet or SAFETY can?

- Cabinets are allowed for liquids, solids, gas bottles
- Liquids in cabinets in IFC 5704.3.2 & Solids in cabinets in IFC 5003.8.7
- Gas cylinder in cabinets in IFC 5003.8.6

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Footnote "e"; what is a safety can?

- Safety Cans: IFC 5003.9.10
- Must be metal and meet UL 30 to increase amounts
- May be non-metallic and meet UL 1313 if not increasing amounts

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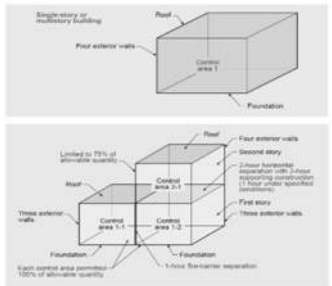
Footnote "a" control areas

- IBC 202 Definition of CONTROL AREA.
- Spaces within a building where quantities of hazardous materials not exceeding the maximum allowable quantities per control area are stored, dispensed, used or handled. See the definition of "Outdoor control area" in the International Fire Code.



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414.2 Control areas

- The control area can be the whole building, the whole floor or the whole room or rooms.
- Separated by fire barriers or horizontal assemblies
- Floors & supporting construction must be 2 hr rated
  - Exceptions for 1 hr in Type IIA, IIIA, VA sprinkled buildings of 3 stories or less

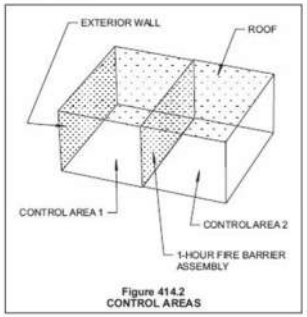


Figure 414.2
CONTROL AREAS

IBC Commentary 4-73

 89

89

Construction requirements

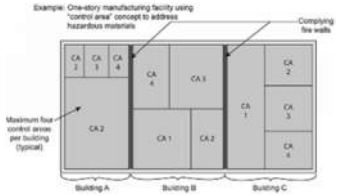
- Control areas shall be separated from each other by fire barriers constructed or horizontal assemblies, or both.

 90

90

414.2.3 Number

- The maximum number of control areas within a building shall be in accordance with Table 414.2.2.
- For the purposes of determining the number of control areas within a building, each portion of a building separated by one or more fire walls shall be considered a separate building.



 91

91

Number of control areas Table 414.2.2

[F] TABLE 414.2.2
DESIGN AND NUMBER OF CONTROL AREAS

STORY		PERCENTAGE OF THE MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA[a]	NUMBER OF CONTROL AREAS PER STORY	FIRE-RESISTANCE RATING FOR FIRE BARRIERS IN HOURS[b]
Above grade plane	Higher than 9	5	1	2
	7–9	5	2	2
	6	12.5	2	2
	5	12.5	2	2
	4	12.5	2	2
	3	50	2	1
	2	75	3	1
	1	100	4	1
Below grade plane	1	75	3	1
	2	50	2	1
	Lower than 2	Not Allowed	Not Allowed	Not Allowed

a. Percentages shall be of the maximum allowable quantity per control area shown in Tables 307.1(1) and 307.1(2), with all increases allowed in the notes to those tables.
b. Separation shall include fire barriers and horizontal assemblies as necessary to provide separation from other portions of the building.

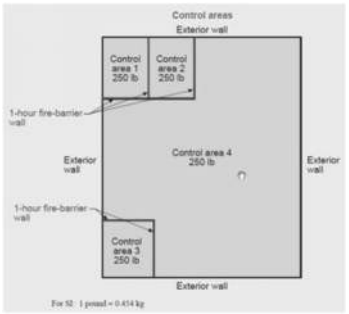
Note: Table 5003.8.3.2 of the IFC is the same as Table 414.2.2 in the IBC.

 92

92

414.2.4 Control areas fire resistance ratings

- The required fire-resistance rating for fire barriers shall be in accordance with Table 414.2.2. The floor assembly of the control area and the construction supporting the floor of the control area shall have a minimum 2-hour fire-resistance rating .



IBC Handbook

 93

93

414.2.4 Control areas fire resistance ratings

- Exception:
- The floor assembly of the control area and the construction supporting the floor of the control area are allowed to be 1-hour fire-resistance-rated in buildings of Types IIA, IIIA, IV and VA construction, provided that both of the following conditions exist:
  - 1. The building is equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1; and
  - 2. The building is three stories or less above grade plane .

 94

94

Extraction

- Depending on the amount of solvent that is used and the process used, the extraction area could be classified as a Group H-2 or H-3.
- Ventilation is required regardless of occupancy classification.

 95

95

High-hazard group H-2

- Buildings and structures containing materials that pose a deflagration hazard or a hazard from accelerated burning shall be classified as Group H-2.
- Such materials shall include, but not be limited to, the following:
  - Class I, II or IIIA flammable or combustible liquids that are used or stored in normally open containers or systems, or in closed containers or systems pressurized at more than 15 pounds per square inch gauge.
  - Combustible dusts
  - Flammable gases

 96

96

High hazard group H-3

- Buildings and structures containing materials that readily support combustion (it burns) or that pose a physical hazard shall be classified as Group H-3.
- Such materials shall include, but not be limited to, the following:

 97

97

High hazard group H-3

- Class I, II or IIIA flammable or combustible liquids that are used or stored in normally closed containers or systems pressurized at 15 pounds per square inch gauge or less

 98

98

Is it a Group H Occupancy?

- Maybe
  - Depends on amounts of flammable liquids and the processes being used.
- Section 414 still applies
  - Control Areas
  - Ventilation
  - Explosion control
  - Storage, dispensing and use
- IFC Requirements

 99

99

CO_2 Extraction

- Equipment isolates cannabinoid oils with a CO_2 extraction process.
- No part of the cannabis plant is wasted.
- The cannabis by-products that would usually be discarded as waste are used in the extraction process.
- The CO_2 equipment uses cannabis "trim" to produce a clean oil extract that can be used in food products and vape pens.

 100

100

CO_2 Extraction

- Compressed gas
  - Building Code only regulates CO_2 Extinguishing systems.
- No Group H Classification
- IFC Requirements
  - Chapter 53
  - Storage
  - Use & Handling

 101

101

Building Code Compliance

- It is just a plant
- It is an industrial processing facility
- Facilities are reviewed just like any other type of building once you know what the occupancy classification and type of construction is.

 102

102

Height & Area Calculations

- Just like any other buildings
  - Occupancy Classification
  - Type of Construction
  - Open space increase
  - Fire sprinkler increase

 103

103

Fire-resistance rated construction

- Typical of other buildings
  - Type of Construction
  - Fire walls
  - Fire barriers
  - Control areas

 104

104

Fire Protection Systems

- F-1 exceeding 12,000 square feet
- All Group H Occupancies
- Group M Occupancies fire area exceeds 12,000 square feet.

 105

105

Accessibility

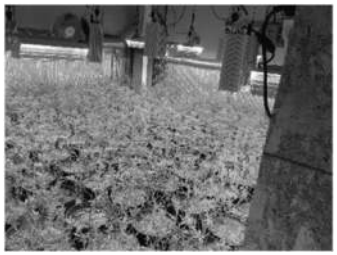
- Just like any other building
  - Must have accessible entrance
  - Must have accessible routes
  - Accessible toilet and bathing rooms

 106

106

Means of Egress Occupant Loads

- Grow Facilities
  - Warehouse Function
  - 500 SF per occupant
- Processing Area
  - Industrial function
  - 100 SF per occupant
- Dispensaries
  - Retail function
  - 60 SF per occupant
- Laboratories
  - Business function
  - 150 SF per occupant

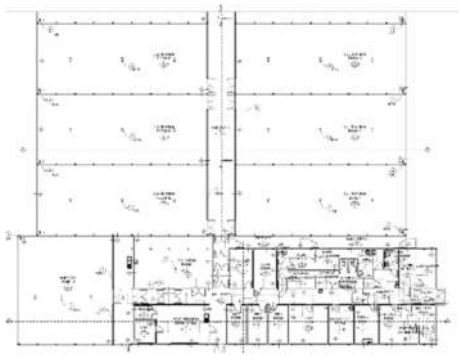


 107

107

Means of Egress Design

- Same as any other building
  - Egress from spaces
  - Common path of travel
  - Number of exits
  - Capacity of exits
  - Travel distance



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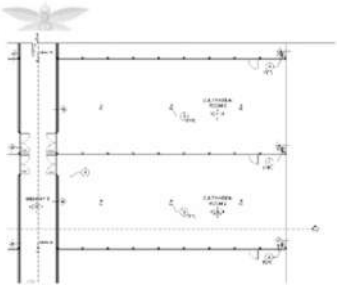
Egress through adjoining spaces



- Egress from a room or space shall not pass through adjoining or intervening rooms or areas, except where such adjoining rooms or areas and the area served are accessory to one or the other, are not a Group H occupancy and provide a discernible path of egress travel to an exit.

 109

109

Means of Egress Door Operation

- Security Issues
- Egress doors shall be readily openable from the egress side without the use of a key or special knowledge or effort.

 110

110

Means of egres illumination

- Illumination shall be provided in the means of egress in accordance with Section 1008.2.
- Under emergency power, means of egress illumination shall comply with Section 1008.3.

 111

111

1013 Exit signs

Plant Safe Exit Sign
Does not adversely affect plant growth during dark cycles.

- Exits and exit access doors shall be marked by an approved exit sign readily visible from any direction of egress travel.
- The path of egress travel to exits and within exits shall be marked by readily visible exit signs to clearly indicate the direction of egress travel in cases where the exit or the path of egress travel is not immediately visible to the occupants.
- Intervening means of egress doors within exits shall be marked by exit signs.
- Exit sign placement shall be such that any point in an exit access corridor or exit passageway is within 100 feet or the listed viewing distance of the sign, whichever is less, from the nearest visible exit sign.
- Except rooms required only one exit

 112

112

Fire Code Requirements

- Plant Extraction
- Handling of Hazardous Materials
  - CO_2 Enrichment
  - Flammable and Combustible Liquids
  - Flammable Gases and Flammable Cryogenic Fluids
  - Liquefied Petroleum Gases

 113

113

PROCESSING AND EXTRACTION FACILITIES Chapter 39

- Plant processing or extraction facilities shall comply with this chapter and the IBC.
- The extraction process includes the act of extraction of the oils and fats by use of a solvent, desolventizing of the raw material, production of the miscella, distillation of the solvent from the miscella and solvent recovery.
- The use, storage, transfilling and handling of hazardous materials in these facilities shall comply with this chapter, other applicable provisions of this code and the IBC.

 114

114

3901.2 Existing buildings or facilities

- Existing buildings or facilities used for the processing of plants shall comply with this chapter.
- Existing extraction processes where the medium of extraction or solvent is changed shall comply with this chapter.

 115

115

3901.3 Permits

- Permits shall be required as set forth in Sections 105.5 and 105.6.

 116

116

105.5.40
Plant extraction systems

- An operational permit is required to use plant extraction systems.


FIRE OPERATIONAL PERMIT APPLICATION

NOTICE

 117

117

105.6.17
Plant extraction systems

- A construction permit is required for installation of or modification to plant extraction systems.
- Maintenance performed in accordance with this code is not considered to be a modification and does not require a permit.

 118

118

Definitions
202

- Desolventizing
  - The act of removing a solvent from a material
- Miscella
  - A mixture, in any proportion, of the extracted oil or fat and the extracting solvent.

 119

119

3903.2
Prohibited occupancies

- Extraction processes utilizing flammable gases or flammable cryogenic fluids shall not be located in any building containing a Group A, E, I or R occupancy.
- Intended to apply to buildings covered by IRC as well.

 120

120

3903.3 Location

- The extraction equipment and extraction processes utilizing hydrocarbon solvents shall be located in a room or area dedicated to extraction.

 121

121

3903.4 Post-process purification and winterization

- Post-processing and winterization involving the heating or pressurizing of the miscella to other than normal pressure or temperature shall be approved and performed in an appliance listed for such use.
- Domestic or commercial cooking appliances shall not be used.

 122

122

3903.5 - Use of flammable and combustible liquids

- The use of flammable and combustible liquids for liquid extraction processes where the liquid is boiled, distilled or evaporated shall be located within a hazardous exhaust fume hood, rated for exhausting flammable vapors.
- Electrical equipment used within the hazardous exhaust fume hood shall be rated for use in flammable atmospheres.
- Heating of flammable or combustible liquids over an open flame is prohibited.

 123

123

3903.5 - Use of flammable and combustible liquids

- Exception:
- The use of a heating element not rated for flammable atmospheres, where documentation from the manufacture, or approved testing laboratory indicates the element is rated for heating of flammable liquids.

 124

124

3903.6
Liquefied petroleum gas

- Liquefied petroleum gases shall not be released to the atmosphere except where released in accordance with Section 7.3 of NFPA 58.

 125

125

3904
Systems and equipment

- General requirements. Systems and equipment used with the processing and extraction of oils and products from plants shall comply with Sections 3904.2 through 3904.4 and 5003.2, and other applicable provisions of this code, the International Building Code and the International Mechanical Code.

 126

126

3904.2
Systems and equipment

- Systems or equipment used for the extraction of oils from plant material shall comply with Section 3904.2.1 or 3904.2.2.

 127

127

3904.2.1
Listings

- Systems or equipment used for the extraction of oils from plant material shall be listed and labeled in accordance with UL 1389 and installed in accordance with the listing and the manufacturer's installation instructions.

 128

128

3904.2.2 Approvals

- Systems or equipment used for the extraction of oils from plant material shall be approved for the specific use.
- The system shall be reviewed by a registered design professional.
- The registered design professional shall review and consider any information provided by the system's designer or manufacturer.

 129

129

3904.2.2 Approvals

- A technical report in accordance with Section 3904.2.2.1 shall be prepared and submitted to the fire code official for review and approval.
- The firm or individual preparing the technical report shall be approved by the fire code official prior to performing the analysis.

 130

130

3904.2.2.1 Technical report

- A technical report, reviewed and approved by the fire code official as required by Section 3904.2, is required prior to the equipment being located or installed at the facility.
- The report shall be prepared by a registered design professional or other professional approved by the fire code official.

 131

131

3904.2.2.2 Report content

- The technical report shall contain all of the following:
- 1. Manufacturer information.
- 2. Preparer of record of the technical report.
- 3. Date of review and report revision history.
- 4. Signature page, including all of the following:
  - 4.1.Author of the report.
  - 4.2.Date of report.
  - 4.3.Date and signature of registered design professional of record performing the design or peer review.

 132

132

3904.2.2.2 Report content

- 5. Model number of the item evaluated. If the equipment is provided with a serial number, the serial number shall be included for verification at the time of site inspection.
- 6. Methodology of the design or peer review process used to determine minimum safety requirements. Methodology shall consider the basis of design, and shall include a code analysis and code path to demonstrate whether specific codes or standards are applicable.

 133

133

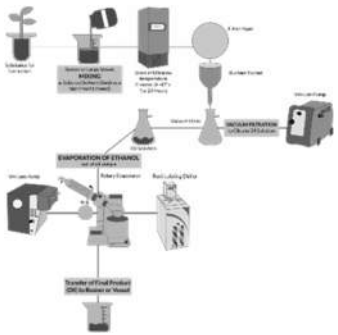
3904.2.2.2 Report content

- 7. Equipment description. A list of every component and subassembly, such as fittings, hose, quick disconnects, gauges, site glass, gaskets, valves, pumps, vessels, containers and switches, of the system or equipment, indicating the manufacturer, model number, material and solvent compatibility. Manufacturer's data sheets shall be provided.

 134

134

3904.2.2.2 Report content



- 8. A general flow schematic or general process flow diagram of the process. Post-processing or winterization shall be included in this diagram. Primary components of the process equipment shall be identified and match the equipment list required in Item 7. Operating temperatures, pressures and solvent state of matter shall be identified in each primary step or component. A piping and instrumentation diagram (PID or P&ID) shall be provided.

 135

135

3904.2.2.2 Report content

- 9. Analysis of the vessel(s) if pressurized beyond standard atmospheric pressure. Analysis shall include purchased and fabricated components.
- 10. Structural analysis for the frame system supporting the equipment.
- 11. Process safety analysis of the extraction system, from the introduction of raw product to the end of the extraction process.

 136

136

3904.2.2.2 Report content

- 12. Comprehensive process hazard analysis considering failure modes and points of failure throughout the process. The process hazard analysis shall include a review of emergency procedure information provided by the manufacturer of the equipment or process and not that of the facility, building or room.

 137

137

3904.2.2.2 Report content

- 13. Review of the assembly instructions, operational and maintenance manuals provided by the manufacturer.
- 14. List of references used in the analysis.

 138

138

3904.2.2.3 Site inspection

- Prior to operation of the extraction equipment, where required by the fire code official, the engineer of record or approved professional, as approved in Section 3904.2, shall inspect the site of the extraction process once equipment has been installed for compliance with the technical report and the building analysis.

 139

139

3904.2.2.3 Site inspection

- The engineer of record or approved professional shall provide a report of findings and observations of the site inspection to the fire code official prior to the approval of the extraction process.

 140

140

3904.2.2.3 Site inspection

- The field inspection report authored by the engineer of record shall include the serial number of the equipment used in the process and shall confirm that the equipment installed is the same model and type of equipment identified in the technical report.

 141

141

3905.1 Gas detection

- For extraction processes utilizing flammable gases as solvents, a gas detection system complying with Section 916 shall be provided.

 142

142

3905.1.1 Operation

- Activation of the gas detection system shall result in all the following:
  - 1. Initiation of distinct audible and visual alarm signals in the extraction room.
  - 2. Deactivation of all heating systems located in the extraction room.
  - 3. Activation of the mechanical ventilation system, where the system is interlocked with gas detection.
  - 4.De-energize all light switches and electrical outlets.

 143

143

3905.1.4 - Failure of the gas detection system

- Failure of the gas detection system shall result in the deactivation of the heating system; activation of the mechanical ventilation system where the system is interlocked with the gas detection system; and initiation of a trouble signal to sound in an approved location.

 144

144

3905.2
Emergency shutoff

- Extraction processes utilizing gaseous hydrocarbon-based solvents shall be provided with emergency shutoff systems in accordance with Section 5803.1.3.

 145

145

5803.1.3
Emergency shutoff

- Compressed gas systems conveying flammable gases shall be provided with approved manual or automatic emergency shutoff valves that can be activated at each point of use and at each source.

 146

146

5803.1.3.1
Shutoff at source

- A manual or automatic fail-safe emergency shutoff valve shall be installed on supply piping at the cylinder or bulk source.
- Manual or automatic cylinder valves are allowed to be used as the required emergency shutoff valve where the source of supply is limited to unmanifolded cylinder sources.

 147

147

5803.1.3.2
Shutoff at point of use

- A manual or automatic emergency shutoff valve shall be installed on the supply piping at the point of use or at a point where the equipment using the gas is connected to the supply system.

 148

148

Handling Hazardous Materials

- Chapters 50-67 covers hazardous materials
- Applicable to cannabis facilities
  - 53 – Compressed Gases
  - 57 – Flammable and Combustible Liquids
  - 58 – Flammable Gases and Flammable Cryogenic Fluids
  - 61 Liquefied Petroleum Gases

 149

149

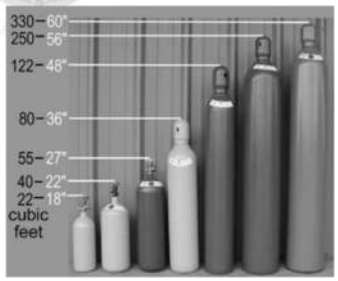
5301.1 Compressed Gases

- Storage, use and handling of compressed gases in compressed gas containers, cylinders, tanks and systems shall comply with this chapter and NFPA 55, including those gases regulated elsewhere in this code.
  - Exception 4. LP-gas shall comply with Chapter 61 and the International Fuel Gas Code.

 150

150

5303 General Requirements



- Containers, cylinders and tanks
- Design and construction
- Pressure relief devices
- Marking
- Security
- Valve protection
- Separation from hazardous conditions
- Wiring and equipment

 151

151

5303 General Requirements

- Service and repair
- Unauthorized use
- Exposure to fire
- Leaks, damage or corrosion
- Surface of unprotected storage or use areas
- Overhead cover
- Lighting
- Vaults

 152

152

5303.5 Security

- Compressed gas containers, cylinders, tanks and systems shall be secured against accidental dislodgement and against access by unauthorized personnel in accordance with Sections 5303.5.1 through 5303.5.3.

 153

153

5303.5.2 Physical protection

- Compressed gas containers, cylinders, tanks and systems that could be exposed to physical damage shall be protected.
- Guard posts or other approved means shall be provided to protect compressed gas containers, cylinders, tanks and systems indoors and outdoors from vehicular damage and shall comply with Section 312.

 154

154

5303.5.3 - Securing compressed gas containers, cylinders and tanks

- Compressed gas containers, cylinders and tanks shall be secured to prevent falling caused by contact, vibration or seismic activity. Securing of compressed gas containers, cylinders and tanks shall be by one of the following methods:

 155

155

5303.5.3 - Securing compressed gas containers, cylinders and tanks

- 1. Securing containers, cylinders and tanks to a fixed object with one or more restraints.
- 2. Securing containers, cylinders and tanks on a cart or other mobile device designed for the movement of compressed gas containers, cylinders or tanks.

 156

156

5303.5.3 - Securing compressed gas containers, cylinders and tanks

- 3. Nesting of compressed gas containers, cylinders and tanks at container filling or servicing facilities or in sellers' warehouses not open to the public. Nesting shall be allowed provided that the nested containers, cylinders or tanks, if dislodged, do not obstruct the required means of egress.

 157

157

5303.5.3 - Securing compressed gas containers, cylinders and tanks

- 4. Securing of compressed gas containers, cylinders and tanks to or within a rack, framework, cabinet or similar assembly designed for such use.
- Exception: Compressed gas containers, cylinders and tanks in the process of examination, filling, transport or servicing.

 158

158

5303.6 Valve protection

- Compressed gas container, cylinder and tank valves shall be protected from physical damage by means of protective caps, collars or similar devices in accordance with Sections 5303.6.1 and 5303.6.2.

 159

159

5303.7 - Separation from hazardous conditions

- Compressed gas containers, cylinders and tanks and systems in storage or use shall be separated from materials and conditions that pose exposure hazards to or from each other. Compressed gas containers, cylinders, tanks and systems in storage or use shall be separated in accordance with Sections 5303.7.1 through 5303.7.11.2.

 160

160

5304.1 Upright storage

- Compressed gas containers, cylinders and tanks, except those designed for use in a horizontal position, and all compressed gas containers, cylinders and tanks containing nonliquefied gases, shall be stored in an upright position with the valve end up.
- An upright position shall include conditions where the container, cylinder or tank axis is inclined as much as 45 degrees from the vertical.

 161

161

5307 - Compressed gases not otherwise regulated

- Compressed gases in storage or use not regulated by the material-specific provisions of Chapters 6, 54, 55, and 60 through 67, including asphyxiant, irritant and radioactive gases, shall comply with this section in addition to other requirements of this chapter.

 162

162

5307.2 Ventilation

- Indoor storage and use areas and storage buildings shall be provided with ventilation in accordance with Section 5004.3.
- Where mechanical ventilation is provided, the systems shall be operational during such time as the building or space is occupied.

  Exceptions:
  - 1. A gas detection system complying with Section 5307.2.1 shall be permitted in lieu of mechanical ventilation.
  - 2. Areas containing insulated liquid carbon dioxide systems used in beverage dispensing applications shall comply with Section 5307.3.

 163

163

5307.2.1 Gas detection system

- In rooms or areas not provided with ventilation in accordance with Section 5307.2, a gas detection system complying with Section 916 or, where approved, an oxygen depletion alarm system, either of which initiates audible and visible alarm signals in the room or area where sensors are installed, shall be provided.

 164

164

5307.4
Carbon dioxide enrichment systems

- The design, installation and maintenance of carbon dioxide enrichment systems with more than 100 pounds of carbon dioxide, and carbon dioxide enrichment systems with any quantity of carbon dioxide having a remote fill connection, shall comply with Sections 5307.4.1 through 5307.4.7.

 165

165

5307.4.1
Documentation

- The following information shall be provided with the application for permit:
- 1. Total aggregate quantity of liquid carbon dioxide in pounds or cubic feet at normal temperature and pressure.
- 2. Location and total volume of the room where the carbon dioxide enrichment operation will be conducted. Identify whether the room is at grade or below grade.

 166

166

5307.4.1
Documentation

- 3. Location of containers relative to equipment, building openings and means of egress.
- 4. Manufacturer's specifications and pressure rating, including cut sheets, of all piping and tubing to be used.
- 5. A piping and instrumentation diagram that shows piping support and remote fill connections.

 167

167

5307.4.1
Documentation

- 6. Details of container venting, including but not limited to vent line size, material and termination location.
- 7. Alarm and detection system and equipment, if applicable.
- 8. Seismic support for containers.

 168

168

5307.4.2 Equipment

- Pressure relief, vent piping, fill indicators, fill connections, vent terminations, piping systems and the storage, use and handling of the carbon dioxide shall be in accordance with Chapter 53 and NFPA 55.

 169

169

5307.4.3 Gas detection system

- A gas detection system complying with Section 916 shall be provided in rooms or indoor areas in which the carbon dioxide enrichment process is located, in rooms or indoor areas in which container systems are located, and in other areas where carbon dioxide is expected to accumulate.
- Carbon dioxide sensors shall be provided within 12 inches of the floor in the area where the gas is expected to accumulate or leaks are most likely to occur.

 170

170

5307.4.3 Gas detection system

- The system shall be designed as follows:
  - 1. Activates a low-level alarm upon detection of a carbon dioxide concentration of 5,000 ppm.
  - 2. Activates a high-level alarm upon detection of a carbon dioxide concentration of 30,000 ppm.

 171

171

5307.4.3.1 System activation

- Activation of the low-level gas detection system alarm shall automatically:
  - 1. Stop the flow of carbon dioxide to the piping system.
  - 2. Activate the mechanical exhaust ventilation system.
  - 3. Activate an audible and visible supervisory alarm signal at an approved location within the building.

 172

172

5307.4.4 Pressurization and ventilation

- A mechanical ventilation system shall be provided in accordance with the International Mechanical Code that complies with all of the following:
  - 1. Mechanical ventilation in the room or area shall be at a rate of not less than 1 cfm per square foot.

 173

173

5307.4.4 Pressurization and ventilation

- 2. When activated by the gas detection system, the mechanical ventilation system shall remain on until manually reset.
- 3. The exhaust system intakes shall be taken from points within 12 inches of the floor.
- 4. The ventilation system shall discharge to the outdoors in an approved location.

 174

174

5307.4.5 Signage

- Hazard identification signs shall be posted at the entrance to the room and indoor areas where the carbon dioxide enrichment process is located, and at the entrance to the room or indoor area where the carbon dioxide containers are located.
- The sign shall be not less than 8 inches in width and 6 inches in height and indicate:

CAUTION – CARBON DIOXIDE GAS

VENTILATE THE AREA BEFORE ENTERING.

A HIGH CARBON DIOXIDE (CO_2) GAS CONCENTRATION IN THIS AREA CAN CAUSE ASPHYXIATION.

 175

175

5307.4.6 Seismic and structural design

- Carbon dioxide system containers and piping shall comply with the seismic design requirements in Chapter 16 of the International Building Code and shall not exceed the floor loading limitation of the building.

 176

176

5307.4.7 Container refilling

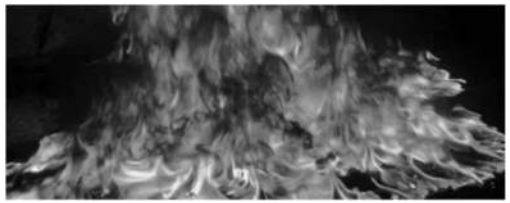
- Carbon dioxide containers located indoors shall not be refilled unless filled from a remote connection located outdoors.

 177

177

Chapter 57 flammable and combustible liquids

- Prevention, control and mitigation of dangerous conditions related to storage, use, dispensing, mixing and handling of flammable and combustible liquids shall be in accordance with Chapter 50 and this chapter.



 178

178

5703.1.1 – Electrical classified locations for flammable liquids

- Areas where flammable liquids are stored, handled, dispensed or mixed shall be in accordance with Table 5703.1.1.
- A classified area shall not extend beyond an unpierced floor, roof or other solid partition.
- The extent of the classified area is allowed to be reduced, or eliminated, where sufficient technical justification is provided to the fire code official that a concentration in the area in excess of 25 percent of the lower flammable limit (LFL) cannot be generated.

 179

179

5703.1.1 – Electrical classified locations for flammable liquids

- Table 5703.1.1
- Indoor equipment where flammable vapor/air mixtures could exist under normal operations
- Class 1, Division 1
  - Area within 5 feet of any edge of such equipment, extending in all directions.
- Class 1, Division 2
  - Area between 5 feet and 8 feet of any edge of such equipment, extending in all directions, and the area up to 3 feet above floor or grade level within 5 feet to 25 feet horizontally from any edge of such equipment.

 180

180

5703.4 Spill control and secondary containment

- Where the maximum allowable quantity per control area is exceeded, and where required by Section 5004.2, rooms, buildings or areas used for storage, dispensing, use, mixing or handling of Class I, II and IIIA liquids shall be provided with spill control and secondary containment in accordance with Section 5004.2.

 181

181

5004.2.1 - Spill control for hazardous material liquids

- Rooms, buildings or areas used for the storage of hazardous material liquids in individual vessels having a capacity of more than 55 gallons, or in which the aggregate capacity of multiple vessels exceeds 1,000 gallons, shall be provided with spill control to prevent the flow of liquids to adjoining areas.
- Floors in indoor locations and similar surfaces in outdoor locations shall be constructed to contain a spill from the largest single vessel by one of the following methods:
  - 1. Liquid-tight sloped or recessed floors in indoor locations or similar areas in outdoor locations.
  - 2. Liquid-tight floors in indoor locations or similar areas in outdoor locations provided with liquid-tight raised or recessed sills or dikes.
  - 3. Sumps and collection systems.
  - 4. Other approved engineered systems.

 182

182

5704.3 Container and portable tank storage

- Storage of flammable and combustible liquids in closed containers that do not exceed 60 gallons in individual capacity and portable tanks that do not exceed 660 gallons in individual capacity, and limited transfers incidental thereto, shall comply with Sections 5704.3.1 through 5704.3.8.5.

 183

183

5704.3.1 - Design, construction and capacity of containers and portable tanks

- The design, construction and capacity of containers for the storage of Class I, II and IIIA liquids shall be in accordance with this section and Section 9.4 of NFPA 30.
- Only approved containers and portable tanks shall be used.

 184

184

5704.3.3 Indoor storage

- Storage of flammable and combustible liquids inside buildings in containers and portable tanks shall be in accordance with Sections 5704.3.3.1 through 5704.3.3.10.
- Portable fire extinguishers
- Incompatible materials
- Clear means of egress
- Empty containers or portable tank storage
- Shelf storage
- Rack Storage
- Pile or palletized storage
- Limited combustible storage
- Idle combustible pallets
- Container in piles

 185

185

5704.3.5 Storage in control areas

- Storage of flammable and combustible liquids in control areas shall be in accordance with Sections 5704.3.5.1 through 5704.3.5.4.
  - Basement storage
  - Storage pile heights
  - Storage distance from ceilings and roofs
  - Combustible materials

 186

186

5704.4 Outdoor storage of containers and portable tanks

- Storage of flammable and combustible liquids in closed containers and portable tanks outside of buildings shall be in accordance with Section 5703 and Sections 5704.4.1 through 5704.4.8. Capacity limits for containers and portable tanks shall be in accordance with Section 5704.3.

 187

187

5704.4.2 Location on property

- Outdoor storage of liquids in containers and portable tanks shall be in accordance with Table 5704.4.2. Storage of liquids near buildings located on the same lot shall be in accordance with this section.

TABLE 5704.4.2
OUTDOOR LIQUID STORAGE IN CONTAINERS AND PORTABLE TANKS

CLASS OF LIQUID	CONTAINER STORAGE—MAXIMUM PER PILE		PORTABLE TANK STORAGE—MAXIMUM PER PILE		MINIMUM DISTANCE BETWEEN PILES OR RACKS (feet)	MINIMUM DISTANCE TO LOT LINE OF PROPERTY THAT CAN BE BUILT UPON[c, d] (feet)	MINIMUM DISTANCE TO PUBLIC STREET, PUBLIC ALLEY OR PUBLIC WAY[d] (feet)
	Quantity[a, b] (gallons)	Height (feet)	Quantity[a, b] (gallons)	Height (feet)			
IA	1,100	10	2,200	7	5	50	10
IB	2,200	12	4,400	14	5	50	10
IC	4,400	12	8,800	14	5	50	10
II	8,800	12	17,600	14	5	25	5
III	22,000	18	44,000	14	5	10	5

For SI: 1 foot = 304.8 mm, 1 gallon 3.785 L.
a. For mixed class storage, see Section 5704.4.2.
b. For storage in racks, the quantity limits per pile do not apply, but the rack arrangement shall be limited to not more than 50 feet in length and two rows or 9 feet in depth.
c. If protection by a public fire department or private fire brigade capable of providing cooling water streams is not available, the distance shall be doubled.
d. Where the total quantity stored does not exceed 50 percent of the maximum allowed per pile, the distances are allowed to be reduced 50 percent, but not less than 3 feet.

 188

188

5704.4.2.4 Storage adjacent to buildings

- Not more than 1,100 gallons of liquids stored in closed containers and portable tanks is allowed adjacent to a building located on the same premises and under the same management, provided that one of the following requirements is met:
- 1. The building does not exceed one story in height. Such building shall be of fire-resistance-rated construction with noncombustible exterior surfaces or noncombustible construction and shall be used principally for the storage of liquids.
- 2. The exterior building wall adjacent to the storage area shall have a fire-resistance rating of not less than 2 hours, having no openings to above-grade areas within 10 feet horizontally of such storage and no openings to below-grade areas within 50 feet horizontally of such storage.

 189

189

5704.4.2.4 Storage adjacent to buildings

- The quantity of liquids stored adjacent to a building protected in accordance with Item 2 is allowed to exceed 1,100 gallons, provided that the maximum quantity per pile does not exceed 1,100 gallons and each pile is separated by a 10-foot-minimum clear space along the common wall.
- Where the quantity stored exceeds 1,100 gallons adjacent to a building complying with Item 1, or the provisions of Item 1 cannot be met, a minimum distance in accordance with Table 5704.4.2, column 7 ("Minimum Distance to Lot Line of Property That Can Be Built Upon") shall be maintained between buildings and the nearest container or portable tank.

 190

190

5704.4.3 - Spill control and secondary containment

- Storage areas shall be provided with spill control and secondary containment in accordance with Section 5703.4.
  - Exception: Containers stored on approved containment pallets in accordance with Section 5004.2.3 and containers stored in cabinets and lockers with integral spill containment.

 191

191

5801 - Flammable gases and flammable cryogenic fluids

- The storage and use of flammable gases and flammable cryogenic fluids shall be in accordance with this chapter, NFPA 2 and NFPA 55. Compressed gases shall also comply with Chapter 53 and cryogenic fluids shall also comply with Chapter 55. Flammable cryogenic fluids shall comply with Section 5806.
  - Exception 2: Liquefied petroleum gases and natural gases regulated by Chapter 61. (propane and butane)

 192

192

6101
Liquefied petroleum gases

- Storage, handling and transportation of liquefied petroleum gas (LP-gas) and the installation of LP-gas equipment pertinent to systems for such uses shall comply with this chapter and NFPA 58.
- Properties of LP-gases shall be determined in accordance with Appendix B of NFPA 58.

 193

193

6103.2
Use of LP-gas containers in buildings

- The use of LP-gas containers in buildings shall be in accordance with Sections 6103.2.1 and 6103.2.2.
- Portable LP-gas containers, as defined in NFPA 58, shall not be used in buildings except as specified in NFPA 58 and Sections 6103.2.1.1 through 6103.2.1.7.

 194

194

6103.2.1.3
Group F occupancies

- In Group F occupancies, portable LP-gas containers are allowed to be used to supply quantities necessary for processing, research or experimentation.
- Where manifolded, the aggregate water capacity of such containers shall not exceed 735 pounds per manifold.
- Where multiple manifolds of such containers are present in the same room, each manifold shall be separated from other manifolds by a distance of not less than 20 feet.

 195

195

6104.1
Location of LP-gas containers

- The storage and handling of LP-gas and the installation and maintenance of related equipment shall comply with NFPA 58 and be subject to the approval of the fire code official, except as provided in this chapter.

 196

196

6104.3 Container location

- LP-gas containers shall be located with respect to buildings and lot lines of adjoining property that can be built upon, in accordance with Table 6104.3.

TABLE 6104.3
LOCATION OF LP-GAS CONTAINERS

LP-GAS CONTAINER CAPACITY (water gallons)	MINIMUM SEPARATION BETWEEN LP-GAS CONTAINERS AND BUILDINGS, PUBLIC WAYS[g] OR LOT LINES OF ADJOINING PROPERTY THAT CAN BE BUILT UPON		MINIMUM SEPARATION BETWEEN LP-GAS CONTAINERS[b, c] (feet)
	Mounded or underground LP-gas containers[e] (feet)	Above-ground LP-gas containers[b] (feet)	
Less than 125[c, d]	10	5[e]	None
125 to 250	10	10	None
251 to 500	10	10	3
501 to 2,000	10	25[e, f]	3
2,001 to 30,000	50	50	5
30,001 to 70,000	50	75	(0.25 of sum of diameters of adjacent LP-gas containers)
70,001 to 90,000	50	100	
90,001 to 120,000	50	125	

 197

197

Mechanical Code Requirements

- Humidity
- Ventilation
- Exhaust Systems
- Odors

 198

198

High Humidity

- No Code Requirements for excessive humidity

 199

199

401.2 Ventilation required

- Every occupied space shall be ventilated by natural means in accordance with Section 402 or by mechanical means in accordance with Section 403.

 200

200

403.2
Outdoor air required

- The minimum outdoor airflow rate shall be determined in accordance with Section 403.3.
  - Exception: Where the registered design professional demonstrates that an engineered ventilation system design will prevent the maximum concentration of contaminants from exceeding that obtainable by the rate of outdoor air ventilation determined in accordance with Section 403.3, the minimum required rate of outdoor air shall be reduced in accordance with such engineered system design.

 201

201

403.3.1.1
Outdoor airflow rate

- Ventilation systems shall be designed to have the capacity to supply the minimum outdoor airflow rate, determined in accordance with this section.
- In each occupiable space, the ventilation system shall be designed to deliver the required rate of outdoor airflow to the breathing zone.
- The occupant load utilized for design of the ventilation system shall be not less than the number determined from the estimated maximum occupant load rate indicated in Table 403.3.1.1.

 202

202

403.3.1.1
Outdoor airflow rate

- Ventilation rates for occupancies not represented in Table 403.3.1.1 shall be those for a listed occupancy classification that is most similar in terms of occupant density, activities and building construction; or shall be determined by an approved engineering analysis.
- The ventilation system shall be designed to supply the required rate of ventilation air continuously during the period the building is occupied, except as otherwise stated in other provisions of the code.

 203

203

Table 403.3
Ventilation

- Grow facility (Warehouse)
  - 10 cfm per person for people outdoor airflow rate in breathing zone (no occupant density in table. Use IBC occupant load.)
  - 0.06 cfm per square foot for area outdoor airflow rate in breathing zone

 204

204

403.3 Ventilation

- Dispensary (Retail)
  - 15 cfm per person for people outdoor airflow rate in breathing zone
  - 15 people per 1,000 SF Occupant Density
  - 7.5 cfm per SF for area outdoor airflow rate in breathing zone

 205

205

502 Required exhaust systems

- An exhaust system shall be provided, maintained and operated as specifically required by this section and for all occupied areas where machines, vats, tanks, furnaces, forges, salamanders and other appliances, equipment and processes in such areas produce or throw off dust or particles sufficiently light to float in the air, or emit heat, **odors, fumes**, spray, gas or smoke in such quantities so as to be irritating or injurious to health or safety.

 206

206

Odor Ventilation

- Local requirements
  - Ventilation rates
  - Charcoal filters
  - Exhaust termination
  - Effect on neighboring properties

 207

207

City of Boulder Odor Requirements

- Ventilation Required. A recreational marijuana business shall be ventilated so that the odor of marijuana cannot be detected by a person with a normal sense of smell at the exterior of the recreational marijuana business or at any adjoining use or property.

 208

208

City of Boulder Odor Requirements

- (a) No person, tenant, occupant, or property owner shall permit the emission of marijuana odor from any source to result in detectable odors that leave the premises upon which they originated and interfere with the reasonable and comfortable use and enjoyment of another's property.
- (b) Whether or not a marijuana odor emission interferes with the reasonable and comfortable use and enjoyment of a property shall be measured against the objective standards of a reasonable person of normal sensitivity.
- (c) A marijuana odor emission shall be deemed to interfere with the reasonable and comfortable use and enjoyment of property if marijuana odor is detectable outside the premises.

 209

209

502.8 - Hazardous materials—general requirements

- Exhaust ventilation systems for structures containing hazardous materials shall be provided as required in Sections 502.8.1 through 502.8.5.

 210

210

502.8.1 - Storage in excess of the maximum allowable quantities

- Indoor storage areas and storage buildings for hazardous materials in amounts exceeding the maximum allowable quantity per control area shall be provided with mechanical exhaust ventilation or natural ventilation where natural ventilation can be shown to be acceptable for the materials as stored.

 211

211

502.8.1.1 System requirements

- Exhaust ventilation systems shall comply with all of the following:
- 1. The installation shall be in accordance with this code.
- 2. Mechanical ventilation shall be provided at a rate of not less than 1 cfm per square foot of floor area over the storage area.
- 3. The systems shall operate continuously unless alternate designs are approved.

 212

212

502.8.1.1 System requirements

- 4. A manual shutoff 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 SHUTOFF.

 213

213

502.8.1.1 System requirements

- 5. The exhaust ventilation shall be designed to consider the density of the potential fumes or vapors released. For fumes or vapors that are heavier than air, exhaust shall be taken from a point within 12 inches of the floor. For fumes or vapors that are lighter than air, exhaust shall be taken from a point within 12 inches of the highest point of the room.

 214

214

502.8.1.1 System requirements

- 6. The location of both the exhaust and inlet air openings shall be designed to provide air movement across all portions of the floor or room to prevent the accumulation of vapors.

 215

215

502.8.1.1 System requirements

- 7. The exhaust air shall not be recirculated to occupied areas if the materials stored are capable of emitting hazardous vapors and contaminants have not been removed. Air contaminated with explosive or flammable vapors, fumes or dusts; flammable, highly toxic or toxic gases; or radioactive materials shall not be recirculated.

 216

216

502.8.3 Indoor dispensing and use

- Indoor dispensing and use areas for hazardous materials in amounts exceeding the maximum allowable quantity per control area shall be provided with exhaust ventilation in accordance with Section 502.8.1.

 217

217

502.8.4 - Indoor dispensing and use—point sources

- Where gases, liquids or solids in amounts exceeding the maximum allowable quantity per control area and having a hazard ranking of 3 or 4 in accordance with NFPA 704 are dispensed or used, mechanical exhaust ventilation shall be provided to capture gases, fumes, mists or vapors at the point of generation.
  - Exception: Where it can be demonstrated that the gases, liquids or solids do not create harmful gases, fumes, mists or vapors.

 218

218

502.9.5 - Flammable and combustible liquids

- Exhaust ventilation systems shall be provided as required by Sections 502.9.5.1 through 502.9.5.5 for the storage, use, dispensing, mixing and handling of flammable and combustible liquids.
- Unless otherwise specified, this section shall apply to any quantity of flammable and combustible liquids.
  - Exception: This section shall not apply to flammable and combustible liquids that are exempt from the International Fire Code.

 219

219

502.9.5.4 Use, dispensing and mixing

- Continuous mechanical ventilation shall be provided for the use, dispensing and mixing of flammable and combustible liquids in open or closed systems in amounts exceeding the maximum allowable quantity per control area and for bulk transfer and process transfer operations.
- The ventilation rate shall be not less than 1 cfm/ft2 of floor area over the design area.
- Provisions shall be made for the introduction of makeup air in a manner that will include all floor areas or pits where vapors can collect.
- Local or spot ventilation shall be provided where needed to prevent the accumulation of hazardous vapors.
  - Exception: Where natural ventilation can be shown to be effective for the materials used, dispensed or mixed.

 220

220

503
Motors and fans

- Motors and fans shall be sized to provide the required air movement.
- Motors in areas that contain flammable vapors or dusts shall be of a type approved for such environments.
- A manually operated remote control installed at an approved location shall be provided to shut off fans or blowers in flammable vapor or dust systems.
- Electrical equipment and appliances used in operations that generate explosive or flammable vapors, fumes or dusts shall be interlocked with the ventilation system so that the equipment and appliances cannot be operated unless the ventilation fans are in operation.
- Motors for fans used to convey flammable vapors or dusts shall be located outside the duct or shall be protected with approved shields and dustproofing.
- Motors and fans shall be provided with a means of access for servicing and maintenance.

 221

221

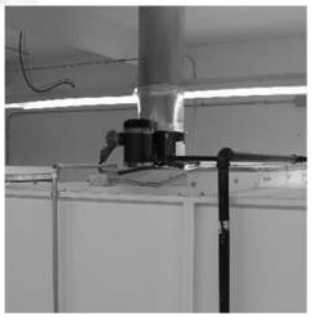
503.2
Fans

- Parts of fans in contact with explosive or flammable vapors, fumes or dusts shall be of nonferrous or nonsparking materials, or their casing shall be lined or constructed of such material.
- Where the size and hardness of materials passing through a fan are capable of producing a spark, both the fan and the casing shall be of nonsparking materials.

 222

222

503.2
Fans



- Where fans are required to be spark resistant, their bearings shall not be within the airstream, and all parts of the fan shall be grounded.
- Fans in systems-handling materials that are capable of clogging the blades, and fans in buffing or woodworking exhaust systems, shall be of the radial-blade or tube-axial type.

 223

223

510
Hazardous exhaust systems

- A hazardous exhaust system shall be required wherever operations involving the handling or processing of hazardous materials, in the absence of such exhaust systems and under normal operating conditions, have the potential to create one of the following conditions:
  - 1. A flammable vapor, gas, fume, mist or dust is present in concentrations exceeding 25 percent of the lower flammability limit of the substance for the expected room temperature.

 224

224

510.3 Design and operation

- The design and operation of the exhaust system shall be such that flammable contaminants are diluted in noncontaminated air to maintain concentrations in the exhaust flow below 25 percent of the contaminant's lower flammability limit.

 225

225

IFGC 301.3 Listed and labeled

- Appliances regulated by this code shall be listed and labeled for the application in which they are used unless otherwise approved in accordance with Section 105.
- The approval of unlisted appliances in accordance with Section 105 shall be based on approved engineering evaluation.

 226

226

Plumbing Code Requirements

- Backflow Protection
- Wastewater

 227

227

608.17.5 - Connections to lawn irrigation systems

- The potable water supply to lawn irrigation systems shall be protected against backflow by an atmospheric vacuum breaker, a pressure vacuum breaker assembly or a reduced pressure principle backflow prevention assembly.
- Valves shall not be installed downstream from an atmospheric vacuum breaker. Where chemicals are introduced into the system, the potable water supply shall be protected against backflow by a reduced pressure principle backflow prevention assembly.

 228

228

608.17.7 Chemical dispensers

- Where chemical dispensers connect to the potable water distribution system, the water supply system shall be protected against backflow in accordance with Section 608.14.1, 608.14.2, 608.14.5, 608.14.6, 608.14.8 or 608.14.9.

 229

229

701.5 - Damage to drainage system or public sewer

- Waste detrimental to the public sewer system or to the functioning of the sewage-treatment plant shall be treated and disposed of in accordance with Section 1003 as directed by the code official.

- (Check with local sanitation authority)

 230

230

Energy Code Requirements

- Thermal Envelope
- Interior lighting power requirements

 231

231

C402.1.1 Low-energy buildings

- The following low-energy buildings, or portions thereof separated from the remainder of the building by building thermal envelope assemblies complying with this section, shall be exempt from the building thermal envelope provisions of Section C402.
  - 1. Those with a peak design rate of energy usage less than 3.4 Btu/h • SF or 1.0 watt per square foot of floor area for space conditioning purposes.
  - 2. Those that do not contain conditioned space.

 232

232

C402.1.1.1 Greenhouses

- Greenhouse structures or areas that are mechanically heated or cooled and that comply with all of the following shall be exempt from the building envelope requirements of this code:
- 1. Exterior opaque envelope assemblies comply with Sections C402.2 and C402.4.5.
  - Exception: Low energy greenhouses that comply with Section C402.1.1.

 233

233

C402.1.1.1 Greenhouses

TABLE C402.1.1.1
FENESTRATION THERMAL ENVELOPE
MAXIMUM REQUIREMENTS

COMPONENT	*U*-FACTOR (BTU/h × ft² × °F)
Skylight	0.5
Vertical fenestration	0.7

- 2. Interior partition building thermal envelope assemblies that separate the greenhouse from conditioned space comply with Sections C402.2, C402.4.3 and C402.4.5.
- 3. Fenestration assemblies that comply with the thermal envelope requirements in Table C402.1.1.1. The U-factor for a roof shall be for the roof assembly or a roof that includes the assembly and an internal curtain system.
  - Exception:Unconditioned greenhouses.

 234

234

C405.3.1 - Total connected interior lighting power

- The total connected interior lighting power shall be determined in accordance with Equation 4-10.
- The connected power associated with the following lighting equipment and applications is not included in calculating total connected lighting power.
  - 11. Task lighting for plant growth or maintenance.

 235

235

C505 Change of occupancy or use

- Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.
- Where the use in a space changes from one use in Table C405.3.2(1) or C405.3.2(2) to another use in Table C405.3.2(1) or C405.3.2(2), the installed lighting wattage shall comply with Section C405.3.
- Where the space undergoing a change in occupancy or use is in a building with a fenestration area that exceeds the limitations of Section C402.4.1, the space is exempt from Section C402.4.1 provided that there is not an increase in fenestration area.

 236

236

Electrical Code Requirements

- Power usage
- GFCI Protection
- Wet/damp locations
- Security
- Listing of equipment
- Hazardous wiring

 237

237

Power Usage

- Large services
  - 3,000 amps or larger
- Possible generator to maintain power
- One-line diagram
  - Existing system
  - Proposed electrical system
  - Include main electrical service
  - Fault current calculations

 238

238

Ground-fault protection

- Cultivation area considered a wet location.
  - GFCI protection is required
- Equipment
  - Each feeder disconnect rated 1,000 amperes or more and installed on solidly grounded wye electrical systems of more than 150 volts to ground, but not exceeding 600 volts phase-to-phase, must be provided with ground-fault protection.

 239

239

Wet/Damp Locations

- Cultivation areas may qualify as damp or wet locations.
- Wiring methods installed in a manner listed for such areas, including but not limited to, the installation of boxes, cords and cables, luminaires, raceways and enclosures.
- Boxes for general wiring may need to be listed as dampproof and installed per the provisions of the electrical code.

 240

240

Hazardous Wiring

- Hydrocarbon extraction rooms are considered to be a Class I, Division 1 hazardous location.
- Areas outside of the extraction room or 3 feet from openings are considered to be a Class I, Division 2 hazardous location.

 241

241

Class I, Division 1

- Those areas in which flammable gases, flammable liquid–produced vapors, or combustible liquid–produced vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.
- Class I, Division 1 locations include the following:

 242

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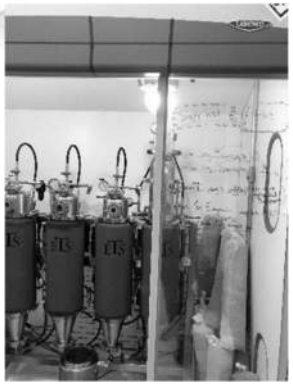
Class I, Division 1



- (1) in which ignitable concentrations of flammable gases, flammable liquid–produced vapors, or combustible liquid–produced vapors can exist under normal operating conditions, or;

 243

243

Class I, Division 1

- (2) in which ignitable concentrations of such flammable gases, flammable liquid–produced vapors, or combustible liquids above their flash points may exist frequently because of repair or maintenance operations or because of leakage, or;

 244

244

Class I, Division 1

- (3) in which breakdown or faulty operation of equipment or processes might release ignitable concentrations of flammable gases, flammable liquid–produced vapors or combustible liquid–produced vapors and might also cause simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition.

 245

245

Class I, Division 2

- Class I, Division 2 locations include the following:
- (1) in which volatile flammable gases, flammable liquid–produced vapors or combustible liquid–produced vapors are handled, processed or used, but in which the liquids, vapors or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems or in case of abnormal operation of equipment, or;

 246

246

Class I, Division 2

- (2) in which ignitable concentrations of flammable gases, flammable liquid–produced vapors or combustible liquid–produced vapors are normally prevented by positive mechanical ventilation and which might become hazardous through failure or abnormal operation of the ventilating equipment, or;

 247

247

Class I, Division 2

- (3) that is adjacent to a Class I, Division 1 location, and to which ignitable concentrations of flammable gases, flammable liquid–produced vapors or combustible liquid–produced vapors above their flash points might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

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