

Codes and

Cannabis

*2024 Fall - Montana EduCode
Inspection of Cannabis Cultivation
Facilities*

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TRAINING & EDUCATION

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Codes & Cannabis

Inspection of Cannabis Cultivation Facilities

Today's Presentation - Including Montana-specific guidance

- Overview
- Prior to inspection:
 - Permit searches
 - Compliancy of property
 - Check for plans
- Onsite inspection:
 - Life safety
 - Potable water protection
 - Proper equipment installation: plumbing and mechanical
 - Gas piping

Codes Referenced - General Information

- Mechanical Code – 2021 edition (UMC, IMC & California)
- Uniform Plumbing Code – 2024 edition
- International Building Code – 2021 edition
- International Fire Code – 2021 edition
- Electrical is not covered in this presentation

Also in this Presentation:

- Repellants – pests & fungi
- Irrigation – alternative water sources
- Humidity – evapotranspiration controls
- CO₂ – enrichment safety regulations

Cannabis - Federal Law

- "...Marijuana possession remains a federal offense, and the federal law applies to offenses committed on federal property, which includes the Capitol grounds and the mall within DC, as well as all national parks and military property nationwide, and other land under federal control...."

Tension - Federal VS. State

- Ultimately, no distinction between "medical" or "recreational", both are illegal
- Interstate commerce
- Cash only industry – banking & crime concerns
- Tax(es)/withholding on employees' pay

Airports - Federal control

- All airports fall under federal government jurisdiction



Cannabis - State Law

- 38 states, 4 territories & DC allow medical use
- 23 states, 3 territories & DC allow recreational use
 - Commercial distribution permitted except:
 - Virginia
 - DC
 - Personal cultivation permitted, except:
 - Delaware
 - Illinois
 - New Jersey
 - Washington

Montana Legislation - 67th Legislature

- HB 701 (signed 18 May 2021) amends recreational initiative I-190 & Montana Medical Marijuana Act
- Moves regulation to Montana Department of Revenue (DOR) Cannabis Control Division (CCD)
- Requires buildings comply with Building Code prior to occupancy:
 - New construction
 - Alteration
 - Change of use
- Form & possible site visit by Building Codes Bureau (BCB)

Recreational Marijuana - Federal VS. State disparity...

- Creates challenging issues
- Jurisdictional questions
- Regulatory structure
- Controlled substance VS. Agriculture product

Edibles

- Virtually anything one could imagine...

Hemp - Cannabis for industrial uses

- Under 0.3% THC
- Agricultural Act of 2014:
 - Allowed Universities & State Agriculture Departments to grow/study for potential
- Hemp Farming Act of 2018 Farm Bill permitted growing hemp in US



Hemp - Cannabis for industrial uses

- Plumbing:
 - Oakum
 - Hemp fiber
- Rope
- Clothing
 - Hemp shoes
- Food
 - Hemp seeds
- Hempcrete
- Hemp Bar

Introduction

How long has indoor agriculture been employed ?

- Russian botanist Andrei Famintsyn was the first to use artificial light for plant growing and research (1868).
- Grow lights are used for horticulture, indoor gardening, plant propagation & food production, including indoor hydroponics/aquatic plants. Although most grow lights are used on an industrial level, they can also be used in households.
- Every white button mushroom available today is grown indoors.

Is there a difference between floriculture and Cannabis?

- Both floriculture & cannabis grown indoors, use same process.
- Both extraction of essential oils from cannabis & flowers (fragrance, perfume) employ same essential processes.
- Indoor agriculture employs same processes as cannabis grow.
- What special rules do we have for permitted cannabis grow facilities?

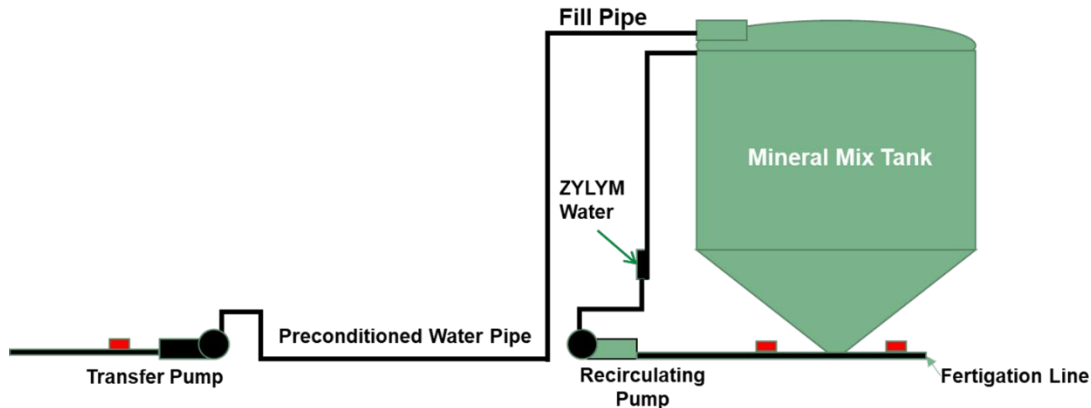
2024 UPC – New - Appendix Q Indoor Horticulture Facilities

- Q 101.0 Indoor Horticulture Facilities.
- Q 101.1 General. Plumbing for indoor horticulture facilities shall be in accordance with this code. This appendix shall apply to primary and secondary horticulture facilities.
- **Q 201.0 Definitions.**
- **201.1 General.** For the purpose of this appendix, the following definitions shall apply:
 - **Agricultural Water.** Water used in indoor horticulture activities where water is intended to contact plants.
 - **Cultivation Room.** A room of any size where plants are grown under controlled conditions. Also known as a grow room.
 - **Fertigation.** The process of adding nutrients into the irrigation water.



Mineral Fertigation Mix Tank

- Primary water tank preconditioning:
- UFB oxygen infusion
- ZYLYM catalytic water conditioning
- Mix tank conditioning:
- Continuous recirculation ZYLYM catalytic calcium carbonate solubility conditioning



Q 201.0 Definitions.

- **Horticulture Facility.** A business, facility, or establishment where indoor horticulture is grown, cultivated, dried, extracted, weighed, packaged, or processed.
- **Indoor Horticulture.** The cultivation and processing of plants in an indoor space.
- **Indoor Horticulture Water Distribution Systems.** A system to supply water from its primary source to its point of use, including but not limited to pipes, sprinklers, irrigation equipment, pumps, valves, storage tanks, meters, and fittings.
- **Nutrient.** Substances, chemicals, or ingredients used to promote growth, provide energy, and/or sustain plants.

Nutrient Water Tanks - General Information

- Control pH according to local treatment plant regulations (typically 6-8)
- Control odors from leaving permitted premises.
- Provide acceptable IAQ when grow rooms are occupied
- Control CO₂ levels
- Prevent mixing class 2 air into class 1 air areas
- Nutrient tanks are chemical tanks. Do not use clear or translucent tanks for water storage outside. (algae)
- **Plant.** A multicellular organism having cellulose cell walls intended for human consumption, ingestion, inhalation, or topical application.



- **Primary Horticulture Facility.** A facility devoted to the growing and/or harvesting of plants. Cultivation rooms are located within these facilities.
- **Secondary Horticulture Facility.** A facility devoted to harvesting (such as hulling or shelling), packing, and/or holding of plants.

Q 301.0 Classification of Facilities.

- **Q 301.1 General.** Facilities used for indoor horticultural cultivation and processing shall be in accordance with the applicable codes as mandated by the AHJ.
- **Q 301.2 Approved Locations.** Facilities used for indoor horticultural cultivation and processing shall be located in accordance with the building code and the AHJ.

Q 401.0 Documentation

- Q 401.1 General. Documentation for permitting shall be provided in accordance with the requirements of Section 104.0 and the AHJ. The documentation shall show compliance with this section and other requirements in accordance with the AHJ.

URL to pdf document for the Montana Department of Labor and Industry: Existing Cannabis Facility Evaluation For Building Code Compliance

- <https://bsd.dli.mt.gov/building-codes-permits/ExistingLicensedProviderEvalForm.pdf>

Montana – Scales - Medical Marijuana Facility

- Required
- Commercial transactions:
 - Licensed
 - Placed in service initially Weights & Measures Inspector
 - Annual accuracy inspection/certification
- Department of Revenue issues license



Overview – Building Code -General Information

Sample Grow House Inspection Check List

Scan the QR to download your editable copy of the check list.



Grow Facilities Check List
Add your Logo Here Add project name here

Prior to Inspection	No issues	Still Outstanding	Inspector Comment
Permit search for property all plumbing and mechanical			
Complaint check for property			
Check for plans			
Property Complaint Check Mechanical Plumbing Fire OSHA Building Safety			

Onsite inspection	No issues	Still Outstanding	Inspector Comment
Life Safety Check for Fire Extinguisher located in all required areas and they current with an inspection tag from Fire Department			
Smokefire doors not locked/obstructed self-closures not propped open doors must open 90°			
Exit Signs In all locations properly illuminated directional arrows			



Prior to Inspection

Property Complaint Check

- Check for code violations:
 - Mechanical
 - Plumbing
 - Fire
 - OSHA
 - Building Safety

103.3 Applications and Permits. UPC

- The Authority Having Jurisdiction shall be permitted to require the submission of plans, specifications, drawings, and such other information in accordance with the Authority Having Jurisdiction, prior to the commencement of, and at a time during the progress of, work regulated by this code. ...
- 104.3.1 Construction Documents. Construction documents, engineering calculations, diagrams, and other data shall be submitted in two or more sets with each application for a permit.

Life Safety

Life Safety Check List

- Check for Fire Extinguisher
 - located in all required areas
 - are they current with an inspection tag from Fire Department
- Smoke/fire doors
 - not locked/obstructed
 - self-closures not propped open
 - doors must open 90°
- Exit Signs
 - In all locations
 - properly illuminated
 - directional arrows correct
- Egress corridors
 - Clear
 - No obstruction
- Electrical Room
 - Clearly labeled panel
 - Nothing stored in room
- Hazardous Rooms
 - Are they locked and secured (EVS closets, mechanical, soiled utility, electrical, telecom)
 - Properly labeled
- No obstructions minimum clearance 3' (Emergency Items)
 - Fire pull boxes
 - Fire extinguishers



- Electrical boxes
- Stairwells free of obstructions
- Electrical cords, extension cords
 - Check cords and plugs to ensure no damage, frays, kinks.
 - Cords not to be trip hazard, draped over furniture, equipment, etc.
 - Power strips to be UL listed.
- Walking surface: Free of trip/slip hazards
- Hazardous materials:
 - handled, stored & labeled properly
- Emergency eyewash and shower equipment
 - Where required, must be present, and have clear & unobstructed path.
 - Signage required.
 - Completed weekly log for eyewash stations & showers
 - No evident damage.
 - Bottle systems are not compliant.
- **Sidewalks, drives, and parking lots: Free of hazards**

Signage for Rooms

Fire Code/ Building Code

- Certain equipment rooms contained within a building may require identifying signage to aid firefighters.
- Rooms containing fire protection equipment (fire alarm panels, fire sprinkler valves, etc.)
- Rooms containing controls for air-conditioning equipment
- Rooms containing utility equipment for gas or electrical service
- Rooms containing hazardous materials

What is an Occupancy?

International Building Code

- Uses are general functions occupants participate in (baking, millwork, auto assembly, etc.).
- Occupancies are umbrella classifications of similar Uses (F = baking, millwork, auto assembly, etc.).
- Activities are categories of services & actions for which occupants congregate (museum, exercise, etc.).
- 10 primary Occupancy classifications:
- Assembly, Business, Education, Factory, Hazardous, Institutional, Mercantile, Residential, Storage, Utility
- Occupancy, size (sq ft, stories), framing (combustible, non-combustible), determine building's fire rating



What are Cannabis Occupancies?

International Building Code

- Building Code does not (yet) have an Occupancy classification for Indoor Plant Cultivation, although Greenhouses = U.
- Jurisdictions typically classify Indoor Plant Cultivation the same as Processing: F (industrial manufacturing)
- Building Code subdivides F into F-1 (moderate hazard - fire sprinklers) and F-2 (low hazard – no fire sprinklers)
- Nurseries which do not use specialized equipment, treatments, or enrichment are customarily F-2. Flower Rooms are customarily F-1.

Montana - Existing Cannabis Facility Evaluation – Factors for classification

- Grow (only) = Utility (similar to greenhouse)
- Grow & Process (dry, harvest, package) = Factory
- Extraction = Factory, provided hazardous gases/liquids are limited
- Extraction = Hazardous, if hazardous gases/liquid limit is exceeded
- Chemical hood required over equipment to capture gases
- Electrical equipment in area must hazardous-rated
- Cooking Facility > 2500 square feet kitchen = Factory
- Cooking Facility < 2500 square feet kitchen = Business
- Both require fire suppression hood over cooking appliances
 - Disconnects all energy & fuels per IMC

Why are “Use” & “Activity” helpful? - Building Code

- Although Use & Activity are land use terms, their broad understanding by the development community provides a useful analogy using familiar Zoning protocols (use compatibility, activity limitation, etc.) to explain Building Code criteria (hazard thresholds, overcrowding, etc.).
- Building Code uses the term Use (function) to determine the Occupancy (purpose for which the room or space will be occupied).
- Building Code uses the term Activity (occupant “crowding”) to determine Occupant Load for exiting.

What is a Change of Occupancy?

- Understanding Change of Occupancy & how it links to a building’s original Occupancy is somewhat like the analogy of how a pistol (building) and a bullet (Occupancy) are linked:
 - A pistol is made to shoot a bullet, and a bullet is made to be shot in a pistol. Each is dependent on the other.
 - A different caliber bullet (Change of Occupancy) cannot be used without modifying the pistol (Code upgrades).
 - A pistol made in 1919, however, need not be modified to shoot the same caliber bullet made in 2022 (grandfathered for Code changes).



F-1 Occupancy – Definition

IBC 306.1

- Factory Industrial Group F occupancy includes, among others, use of a building or structure, or 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.
- **note growing & harvesting not included**

F-1 Occupancy – Uses

IBC 306.2

- Moderate-hazard Factory industrial, Group F-1, uses which are not classified as Factory Industrial F-2 – Low Hazard shall be classified as F-1. Moderate Hazard and shall include, but not be limited to, the following:
 - Aircraft (manufacturing, not to include repair)
 - Appliances
 - Athletic equipment
 - Automobiles and other motor vehicles
 - Electric generation plants
 - Electronics
 - Engines (including rebuilding)
 - Furniture
 - Hemp products
 - Jute products
 - Laundries
 - Leather products
 - Machinery
 - Metals
 - Millwork (sash & doors)
 - Musical instruments
 - Optical goods
 - Paper mills or products
 - Photographic film
 - Plastic products



- Printing or publishing
- Recreational vehicles
- Refuse incineration
- Shoes
- Soaps & detergents
- Textiles
- Tobacco
- Trailers
- Upholstering
- Wood: distillation
- Woodworking (cabinet)
- Movie & television production
- Food processing establishments & commercial kitchens not associated with restaurants, cafeterias, & similar dining facilities not more than 2,500 square feet in area

Cultivation Rooms - ADA Compliance

- Cultivation Rooms are not B or M Occupancies, are not used for assembly purposes, are not open to the public.
- While exit door should be ADA complaint, Cultivation Room is a work area thus need not be ADA complaint.
- **Aisles between cultivation tables serve fewer than 50 people and need not be wider than 28 inches (IBC 1018.3 – Exception).**
- Alarms should be ADA complaint (auditory & visual).

Retail store access

- ADA upgrades of existing buildings can be:
 - Costly
 - Challenging & Difficult

Why Not a High Hazard, Group H?

- Typically, cultivation does not store volatile fertilizers & pesticides, explosives or corrosives to qualify as an H occupancy
- Even extraction Labs are F1 occupancies unless MAQ (Maximum Allowable Quantities) of chemicals are exceeded. (butane, propane, ethanol etc..)

Appendix Q – Indoor Horticulture Facilities

Q 501.0 General

- Q 501.1 Mechanical Systems. Indoor horticulture mechanical systems shall be in accordance with the mechanical code.

102.2 Existing Installations - UMC

- Mechanical systems lawfully in existence at the time of the adoption of this code shall be permitted to have their use, maintenance, or repair continued where the use, maintenance, or repair is in accordance with the original design and location



and no hazard to life, health, or property has been created by such mechanical system.

104.1 Permits Required - UMC

- It shall be unlawful for a person, firm, or corporation to make an installation, alteration, repair, replacement, or remodel a mechanical system regulated by this code except as permitted in Section 104.2, or to cause the same to be done without first obtaining a separate mechanical permit for each separate building or structure.

Mechanical Requirements

- Common Inspection Items
- Flue termination strapping and clearances
- Combustion air
- CO₂ burners
- Gas piping
 - Strapping
 - Sizing
- Shutoffs

Grow Room Ventilation - Mechanical Code

Variable Refrigerant Flow (VRF) System Types

- Intake fan bring stale air from inside
- Intake fan bring fresh air from the outside
- Heat Exchanger

Typical Components

- Air handler
- Condenser/compressor
- Monitoring/Sample box for nutrient water testing
- Absorption chiller and cooling tower
- Air cooled chiller
- Water cooled chiller

Variable Refrigerant Flow (VRF) System Types

Mechanical Code

- Cooling only systems (less popular) – those systems can only cool. Heating is not available. Fan & Dry modes are available for each indoor unit independently.
- Heat Pump systems (most popular) – all the indoor units can either heat, or cool (not at the same time). Fan & Dry modes are available for each indoor unit independently.
- Variable Refrigerant Flow (VRF) System Types
- The term variable refrigerant flow, or VRF, refers to the system's ability to control amount of refrigerant flowing to each of these small air handlers.



- Heat Recovery systems (less popular) – those systems are the most sophisticated ones, where cooling and heating may be available by each indoor unit, independently, at the same time.

Direct Expansion Units (DX)

Mechanical Code

- A packaged DX system also contains all components of the system in a single unit, but in some packaged systems, the evaporator, compressor & condenser are located outside the building, and the unit pumps cooled air into the building through ducts.

Split Systems

- A split air conditioning system puts compressor & condenser outside the building and the evaporator and fans inside the building. (In a central air conditioning system, fans push cooled air from a centrally located evaporator through ducts to the entire building.)
- In a ductless split system, fans in a wall-mounted unit move the air from the evaporator into the room in much the same way that a window unit does. Because the split unit's noisy compressor is outside, a split ductless system is much quieter than a window unit.

Vapor Pressure Deficit

- Vapor-pressure deficit, or VPD, is the difference (deficit) between the amount of moisture in the air and how much moisture the air can hold when it is saturated. Once air becomes saturated, water will condense out to form clouds, dew or films of water over leaves.

What are Typical Components?

Grow lights	Air handlers
Dehumidifier	Condenser/Compressor
Carbon filters or scrubbers	Monitoring/Sample box for nutrient water testing
UV lights in air handler	Absorption chiller and colling tower
CO ₂ tank or burner	Air cooled chiller
	Water cooled chiller

Chilled Water Cooling - Mechanical Code

- A chilled water air conditioning unit uses liquid water, rather than condensed refrigerant, as a cooling medium. A chiller unit outside the building cools the water, then the unit pumps the water to heat exchangers inside the building.
- These units are well suited to cooling large buildings, but they are generally less efficient than DX systems and are not commonly used in homes.

Water Cooled Chillers



- Water-cooled water chillers are refrigeration systems that cool fluids to support industrial processes.
- Plant water (tower water, city water or well water) is used to dissipate process heat removed by the refrigerant system.
- These units are designed for indoor installations.
- For process fluid temperatures between 20° - 70°F.
- Water Cooled Chillers are accompanied by Cooling Towers to reject heat

Air Cooled Chillers

- Air-cooled water chillers are refrigeration systems that cool fluids to support industrial processes.
- Ambient air is used to dissipate the process heat removed by the refrigeration system.
- For process fluid temperatures between 20° - 70°F.
- These units are outdoor units and reject waste heat to the air.



Mechanical Ventilation

California Codes

- 2022 CMC Sec. 402.3, mechanical systems shall include controls to operate fans whenever the room is occupied
- Systems should be single zone to prevent contamination throughout facility
- 2018 IBC, sec. 1020.5, corridors shall not serve as ventilation, exhaust, return or relief ducts. There are exceptions, but they won't apply. This is one of the biggest mistakes we see in the field. Growers tend to use transfer grills from the grow rooms to transfer air into corridor and use a single exhaust duct with carbon filter for odor control.

Mechanical Ventilation

California Fire Code

- $R_p = 5$ cubic feet per minute (cfm) per person.
- California Fire Code
- Mechanical Ventilation
- P_z is the zone population. The designer is using the table's value because a seating chart is not available to use for the actual number.
- The table designates 60 persons per 1,000 square feet.
- $P_z = 60 \times 10,000 / 1,000 = 600$ occupants
- R_a is the outdoor airflow rate.
- $R_a = 0.06$ cfm per sq ft.

- A_z is the net floor area = 10,000 square feet.
- $V_{bz} = (5 \text{ cfm} \times 600) + (.06 \text{ cfm} \times 10,000)$
- Mech. Ventilation cont. 2018 UMC sec 403.2 and Table 402.1/ASHRAE 62.1 & Table 62.2.2.1
- It should be noted that this is a significant amount of outdoor air being introduced. Some method of relieving or exhausting air from the zones should be provided.

- $V_{bz} = 3,000 \text{ cfm} + 600 \text{ cfm}$
- $V_{bz} = 3,600 \text{ cfm}$
- Table 403.2.2 indicates that the effectiveness of air delivery
- (E_z) is 1.
- $V_{oz} = V_{bz} / E_z$
- $V_{oz} = 3,600 \text{ cfm}$ divided by 1
- $V_{oz} = 3,600 \text{ cfm}$
- There are five similar zones:
- $3,600 / 5 = 720 \text{ cfm}$ per air handler.



Exhaust Rates. Table 403.7 2022 UMC

- Table can also be found in ASHRAE 62.1
- Table 6.5
- These tables Include Air Class,

Mechanical Ventilation

- Remember, grow rooms have pollen, nutrient water, terpenes & CO2
- Remember, grow rooms have pollen, nutrient water, terpenes & CO2
- Air Locks
- Cleanroom Designations

Cannabis and the NEC

Disclaimer

- Information provided in this presentation is based on an individual interpretation of the 2020 National Electric Code (NEC) as it applies to different uses of cannabis facilities.
- Some quotes direct from NEC, are copyright protected and the property of the National Fire Protection Association (NFPA).
- Pay attention to upcoming NEC code cycle changes. The 2023 NEC added dedicated Article 512 to understand requirements for Cannabis Oil Equipment & Cannabis Oil Systems Using Flammable Materials.

Types of Cannabis Facilities

- Dispensaries:
 - Store front for selling product.
- Cultivation, Grow Facilities:
 - Greenhouses, open growing fields, etc.
- Processing:
 - Trimming, packaging, etc.
- Extraction:
 - Process of extracting the oils from the product to produce other products.

Dispensaries

- Dispensaries are store front operations classified as “M” occupancies by the International Building Code (IBC).
- Not subject to any special electrical requirements outside of normal NEC Chapter 3 wiring methods.

Cultivation & Grow Facilities

- Greenhouses, hoop frames, open field growing operations, etc.
- Keep in mind definitions in Article 100 when assessing requirements for each location:
 - Damp locations
 - Dry locations



- Wet locations
- Each location has its own set of wiring methods & requirements.

210.8 Ground-Fault-Circuit Protection for Personnel (GFCI)

- 210.8(B) Other than Dwelling Units.
- All 125-volt through 250-volt receptacles supplied by single phase branch circuits rated 150 volts or less to ground, 50 amps or less, and all receptacles supplied by three phase branch circuits rated 150 volts or less to ground, 100 amps or less, installed in the locations specified in 210.8(B)(1) through (B)(12) shall have ground-fault circuit-interrupter protection for personnel.

- 210.8(B)(4) Outdoors
- 210.8(B)(6) Indoor damp and wet locations
- 210.8(B)(8) Accessory buildings
- Among others.

410 Part XVI Special Provisions for Horticultural Lighting Equipment-New in 2017

- 410.172 – Lighting equipment shall be identified for horticultural use shall be listed.
 - You'll see a lot of equipment at these facilities that is purchased online from overseas that have no listing. Refer to NEC 110.3(A),(B)&(C).
- 410.178 – Flexible cord shall only be permitted when provided as part of listed lighting equipment identified for horticultural use for any of the following uses:
 1. Connecting a horticultural lighting luminaire directly to a branch circuit.
 2. Interconnection of horticultural lighting luminaires.
 3. Connecting a horticultural lighting luminaire to a remote power source.
- 410.180 – Fittings and connectors attached to flexible cords shall be provided as part of a listed horticultural lighting equipment device or system and installed per manufacture instructions.
- 410.184 – Lighting equipment identified for horticultural use employing flexible cords shall be by lighting outlets protected by a listed GFCI device. Note definition of outlet in Article 200.
- 410.186 – Special fittings identified for support of horticultural lighting equipment shall be designed specifically for the horticultural lighting equipment for which they are installed and shall be use in accordance with manufacture installations provided and shall be securely fastened.
- 410.188 – Where installed in hazardous locations, horticultural lighting equipment shall conform to Articles 500-517 in addition to this article.



Processing – Drying, Trimming & Packaging

- **Drying**
 - After plants are harvested, they are taken to an area to hang & dry.
- **Trimming**
 - After plants are dried, they are cleaned & trimmed for packaging.
- **Packaging**
 - Packaged into containers, bags or some other form & labeled for sale.

Extraction

- Oils extracted from cannabis are used in bakery items such as brownies, candies & other forms of edibles.
- Oils are also used to treat various medical conditions & ailments.
- Extraction of oils process involves use of various chemicals & flammable gases that are very volatile. Google depicts instances where explosions in facilities resulted from improper use in these operations. Understand risks involved & consider them in the inspection process.
- Extraction booths & rooms are used to extract oil from product.
- Extraction booths are usually premanufactured out of storage containers or similar enclosures. They come set up with different compartments based on the hazardous classifications used & are pre-equipped/pre-wired accordingly with respect to location. Commonly referred to as C1D1 booths.
- They may or may not be an actual listed product but rather designed, built & verified by a third-party engineering firm as meeting intent of the location as associated with risks involved.
- Other types of extraction process used are “slapped together” type. One can read about these all day long on the internet, with very dangerous & disastrous outcomes.
- Another option becoming more prevalent based on expense of purchasing a C1D1 booth is building an extraction room in the facility.
- Same wiring requirements used in a C1D1 booth apply in site-built extraction rooms. Difference? All wiring is installed on site, not in a factory.

Article 500 Hazardous (Classified) Locations

- 500.4 Documentation
- All areas designated as hazardous (classified) locations shall be properly documented. This documentation shall be available to those authorized to design, install, inspect, maintain or operate equipment at the location.
- This documentation is very important for the extraction of oils process but normally not available and therefore left up to the AHJ to determine.
- If you have any questions or concerns, you should discuss with your supervisor, plan reviewer and/or fire marshal.

- 500.5 Classification of Locations –
- 500.5(A) General



- Locations shall be classified depending on the properties of the flammable gas, flammable liquid-produced vapors, combustible dusts or fibers/flyings that could be present, and the likelihood a flammable or combustible concentration or quantity is present. Each room, section, or area shall be considered individually in determining its classification.
- 500.5(B)
- Class I locations are those in which flammable gasses, 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.
- 500.5(C)
- Class II locations are those that are hazardous because of the presence of combustible dust.
- 500.5(B) Class I Locations
- Extraction booths, rooms areas, etc. shall fall into either Class I Division 1 or Division 2 areas.
- Wiring methods for Class I locations shall be in accordance with Article 501.10.
- 500.5(C) Class II Locations
- Depending on the size of the operation, some processing areas could possibly fall into requirements for Class II Locations.
- Wiring methods for Class II locations shall be in accordance with Article 502.10.

Automatic Shutoffs

609.0 Automatic Shutoffs. 2021 UMC

609.1 Air-Moving Systems and Smoke Detectors.

- Air moving systems supplying air in excess of 2000 cubic feet per minute (ft³/min) (0.9439 m³/s) to enclosed spaces within buildings shall be equipped with an automatic shutoff.
- Automatic shutoff shall be accomplished by interrupting the power source of the air-moving equipment upon detection of smoke in the I main supply-air duct served by such equipment.
- Duct smoke detectors shall comply with UL 268A, shall be labeled by an approved agency, approved and listed by California State Fire Marshal, and shall be installed in accordance with the manufacturer's installation instructions. Such devices shall be compatible with the operating velocities, pressures, temperatures, and humidifies of the system.
- Where fire-detection or alarm systems are provided for the building, the smoke detectors shall be supervised by such systems in an approved manner and installed in accordance with NFPA 72 and the "California Building and Fire Codes."
- **Exceptions:**
 - (1) Where the space supplied by the air-moving equipment is served by a total coverage smoke-detection system in accordance with the California Fire Code,



interconnection to such system shall be permitted to be used to accomplish the required shutoff.

(2) Automatic shutoff is not required where occupied rooms served by the air-handling equipment have direct exit to the exterior and the travel distance does not exceed 100 feet (30 480 mm).

(3) Automatic shutoff is not required for Group R, Division 3 and Group U Occupancies.

(4) Automatic shutoff is not required for approved smoke control systems or where analysis demonstrates shutoff would create a greater hazard, such as shall be permitted to be encountered in air-moving equipment supplying specialized portions of Group H Occupancies. Such equipment shall be required to have smoke detection with remote indication and manual shutoff capability at an approved location.

(5) Smoke detectors that are factory installed in listed air moving equipment shall be permitted to be used in lieu of smoke detectors installed in the main supply-air duct served by such equipment.

Dampers

General Information

- Building codes specify where fire dampers are required.
 - International Building Code
 - Some States modify the IBC for adoption within the State.
- Generally
 - Openings are windows, doors, escalators, and stairs.
 - Penetrations are electrical and plumbing pipes, tubes, conduit and vents
 - Duct and Air Transfer Openings may need fire dampers

Ducts and Air Transfer Openings at Fire Wall

Mechanical Code

- All Buildings → Smoke Damper and fire dampers
- Horizontal exits are required to resist the passage of smoke as well as fire

Fire Damper Actuators

IBC 717.3.3

- Activation device shall meet one of the following:
- Operating temperature shall be approximately 500 F above normal temperature within duct system. For static dampers, 1600 F min & 2150 F max per UL 555.
- For dynamic dampers, 1600 F min and 3500 F maximum. Operating temperature shall not be more than 3500 F where located in a smoke control system complying with IBC 909

Appendix Q – Indoor Horticulture Facilities

Q 501.0 General



- Q 501.2 Fire Suppression Systems. Fire suppression systems shall be in accordance with the building code and fire code.

Fire Protection

- Plant cultivation operations in commercial buildings are typically classified as F-1 occupancy.
- Several common triggers for plant cultivation operations require installation of a fire sprinkler system.
- Section 903.2.4 of IFC specifically addresses F-1 sprinkler requirements
- most common trigger being a fire area exceeding 12,000 square feet.

- Another common trigger is the desire for these businesses to have a sealed limited access building that leads to the creation of a story without openings (Section 903).
- An additional consideration would be a building that exceeds height and/or above grade area limitations. Per Section 903.2.5 of the IFC, Marijuana facilities that fall under a Group H occupancy classification require further consideration for a fire sprinkler system.

Hazardous Occupancy

- Building Code & Fire Code allow limited quantities of Hazardous materials (combustible, flammable, compressed gas, etc.) to be stored & used in fire-rated (but non-fire sprinklered) Control Rooms in F Occupancies. MAQ's
- Control Rooms must have independent ventilation (including fume hoods) and Class I, Division I wiring.
- Extraction equipment must be either listed or certified for intended use.

LP - Note:

- Liquefied petroleum gas (LPG) is not specifically listed in Chapter 50, Table 5003.1.1 (1) for a maximum allowable quantity (MAQ).
- However, it can be considered as a flammable gas (liquefied).
- Therefore, if MAQ for flammable gas (liquefied) is exceeded, occupancy would be considered H-2. LPG is specifically regulated in Chapter 61 of the IFC and NFPA 58

Combustible Liquids Classification

Fire Code

- [F] COMBUSTIBLE LIQUID. A liquid having a closed cup flash point at or above 100°F (38 C). Combustible liquids shall be subdivided as follows
- IA-liquids having a flash point below 73°F (23°C) and a boiling point below 100°F (38°C)
- IB-liquids having a flash point below 73°F (23°C) and a boiling point at or above 100°F (38°C)
- IC-liquids having a flash point at or above 73°F (38°C)



C0₂

- Carbon dioxide is a common solvent used in extraction process & is classified as an asphyxiant gas.
- Since C0₂ is an inert asphyxiant, Cultivation Rooms with enrichment only require detectors, alarms and purge ventilation.
- Asphyxiant gases are not regulated in the Maximum Allowable Quantities (MAQ) Per Control Area tables.

C0₂ Enrichment Systems

California Fire Code

- Carbon dioxide enrichment systems shall comply with Section 5307.4. Areas other than those covered by Section 5307.3 or 5307.4 shall comply with Section 5307.2.
- **5307.2 Permits.** Permits shall be required as set forth in Section 105.6.

C0₂ Systems

California Fire Code

- 5307.3 Equipment. Storage, use, & handling of liquid carbon dioxide shall be in accordance with Chapter 53 & applicable requirements of NFPA 55, Chapter 13. Insulated liquid carbon dioxide systems shall have pressure relief devices vented in accordance with NFPA 55.

C0₂ Enrichment Systems

California Fire Code

- **5307.3.2 Gas detection system.** A continuous gas detection system shall be provided in the room or indoor area in which the carbon dioxide enrichment process is located, in the room or indoor area in which the container systems are located, and in areas where the heavier-than-air gas can congregate. Carbon dioxide sensors shall be provided within 12 inches (305 mm) of the floor the area where the gas is most likely to accumulate or leaks are most likely to occur.
- System shall notify at a low-level alarm & high-level alarm.
- 1. Threshold for activation of low-level alarm shall not exceed a carbon dioxide concentration of 5,000 ppm (9,000 mg/m³. Time Weighted Average (TWA) over 8 hours
- 2. Threshold for activation of high-level alarm shall not exceed a carbon dioxide concentration of 30,000 ppm (54,000 mg/m³. When carbon dioxide is detected at the high-level alarm, system shall activate an audible & visible alarm in an approved location.
- **5307.4 Protection from damage.** Carbon dioxide systems shall be installed so storage tanks, cylinders, piping & fittings are protected from damage by occupants or equipment during normal facility operations.
- **5307.4.3 Gas detection system.** A gas detection system shall be provided in the room or indoor area in which the carbon dioxide enrichment process is located, in



the room or indoor area in which the container systems are located, and in other areas where carbon dioxide is expected to accumulate. Carbon dioxide sensors shall be provided within 12 inches (305 mm) of the floor in the area where the gas is expected to accumulate or leaks are most likely to occur. The system shall be designed as follows:

- **5307.4.4 Pressurization and Ventilation.** Rooms or indoor areas in which carbon dioxide enrichment is provided shall be maintained at a negative pressure in relation to the surrounding areas in the building.
- A mechanical ventilation system shall be provided in accordance with the California 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 cubic foot per minute per square foot.
 - 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 piping shall terminate outdoors in an approved location
- **5307.5 Required protection.** Where carbon dioxide storage tanks, cylinders, piping & equipment are located indoors, rooms or areas containing carbon dioxide storage tanks, cylinders, piping, fittings & other areas where a leak of carbon dioxide can collect shall be provided with ventilation in accordance with Section 5307.5.1 & an emergency alarm system in accordance with Section 5307.5.2.
- The system shall be designed as follows:
 - 1. Activate a low-level alarm upon detection of a carbon dioxide concentration of 5,000 ppm (9,000 mg/m³)
 - 2. Activate a high-level alarm upon detection of a carbon dioxide concentration of 30,000 ppm (54,000 mg/m³).
- **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
- **5307.5.1 Ventilation.** Mechanical ventilation shall be in accordance with the California Mechanical Code and shall comply with all of the following:
 - 1. Mechanical ventilation in the room or area shall be at a rate of not less than 1 cubic foot per minute per square foot [0.00508 m³/(s • m²)].
 - 2. Exhaust shall be taken from a point within 12-inches (305 mm) of the floor.
 - 3. The ventilation system shall be designed to operate at negative pressure in relation to the surrounding area
- **5307.5.2 Emergency alarm system.** An emergency alarm system shall comply with all of the following:
 - 1. Continuous gas detection shall be provided to monitor areas where carbon dioxide can accumulate.



- 2. Threshold for activation of an alarm shall not exceed 5,000 parts per million (9,000 mg/m³).
- 3. OSHA PEL = 5000
- 4. Activation of the emergency alarm system shall initiate a local alarm within the room or area in which the system is installed.

Standards for CO₂ piping?

ASME 31.1 Power Piping

- Typical materials include Type K or ACR copper (brazed) or materials that can handle pressures delivered & are rated for compressed gases. Type L may be used down stream of pressure regulators & pressure relief valves.
- Alternate materials may include pressed fittings with EPDM gaskets

Appendix Q Indoor Horticulture Facilities

- **Q 501.0 Requirements General.**
- **Q 501.3 Emergency Eyewash and Shower Equipment Stations.** Emergency shower and Eyewash stations equipment shall be required in accordance with Section 416.0.

Emergency Eyewash and Shower Equipment

416.0 UPC

- 416.1 Application. Emergency eyewash and shower equipment shall comply with ISEA Z358.1.
- 2014 edition is referenced in Chapter 17
- **416.2 Water Supply.** Emergency eyewash and shower equipment shall not be limited in the water supply flow rates. Where hot and cold water is supplied to an emergency shower or eyewash station, the temperature of the water supply shall be controlled by a temperature actuated mixing valve complying with ASSE 1071. Where water is supplied directly to an emergency shower or eyewash station from a water heater, the water heater shall comply with ASSE 1085. The flow rate, discharge pattern, and temperature of flushing fluids shall be provided in accordance with ISEA Z358.1.
- **416.3 Installation.** Emergency eyewash and shower equipment shall be installed in accordance with the manufacturer's installation instructions.
- **416.4 Location.** Emergency eyewash and shower equipment shall be located on the same level as the hazard and accessible for immediate use. The path of travel shall be free of obstructions and shall be clearly identified with signage.
- **416.5 Drain.** A drain shall not be required for emergency eyewash or shower equipment. Where a drain is provided, the discharge shall be in accordance with Section 811.0.



Eye Wash Requirements

ANSI/ISEA Z358.1

- Eyewash stations target just the eyes and therefore have a lower flow requirement. ANSI/ISEA Z358.1 recommends a flow of 0.4 gpm also at 30 psi. The nozzles should be at least six inches from any obstruction and mounted between 33 and 45 inches above the floor. An eyewash gauge should be used to verify and test the flow pattern.
- **Tepid Water:** In previous versions of the ANSI/ISEA Z358.1 standard, tepid water was mentioned in the Appendix. In the 2009 standard, tepid water requirements were moved to Definitions, which clearly define a tepid water range of 60°-100°F. It is expected regulators will step up enforcement of tepid water requirements, to ensure facilities comply.

Appendix Q – Indoor Horticulture Facilities

Q 601.0 Water Supply

- **Q 601.1 General.** Indoor horticulture water distribution systems shall be supplied with potable water in accordance with Chapter 6.
- **Q 601.2 Materials.** Pipe, tube, and fitting materials in contact with potable water, drinking water, or both shall be in accordance with Section 604.0.

Potable Water Supply

- Check building plans
- Correct meter size
- Check for renovations
- Correct pipe size at meter
- Identify types of hazards to potable water
- Backflow devices installed where required
- Correct materials used for water distribution systems

Plumbing Materials

- **604.1 Pipe, Tube, and Fittings.** Pipe, tube, fittings, solvent cement, thread sealants, solders, and flux used in potable water systems intended to supply drinking water shall comply with NSF/ANSI/CAN 61.

Per the UPC

- Type L Copper or Copper Alloy Tube
- Hard-drawn copper or copper alloy tubing... ASTM B88... colors shall be: Type K, green; Type L, blue; and Type M, red.
- Plastic materials cannot connect to metal piping used for grounding purposes

Appendix Q – Indoor Horticulture Facilities

Q 601.0 Water Supply



- Q 601.3 Protection. Potable water piping used for irrigation purposes shall be equipped with an approved backflow prevention device or assembly in accordance with Table 603.2.

Protecting the Potable Water Supply

The Following is Courtesy of the Backflow Prevention Institute (BPI)

The ABC'S of Cross-Connection Control and Backflow Protection

Terminology - *Pressure*

- The term pressure as it relates to backflow is the normal force exerted by a liquid or gas per unit of area, on the walls of a container
- Static pressure is the pressure of a fluid at rest
- Residual pressure is the pressure available at the fixture or water outlet after allowance is made for pressure drop due to friction loss, head pressure, or other system loss during maximum demand periods

What is Backflow ?

- **BACKFLOW** occurs when the normal direction of flow in a piping system is reversed.
- **BACKFLOW** is the flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any source other than its intended source

Cross-Connection

- A connection or arrangement, physical or otherwise, between a potable water supply system and a plumbing fixture or a tank, receptor, equipment, or device, through which it may be possible for nonpotable, used, unclean, polluted, and contaminated water, or other substances to enter into a part of such potable water system under any condition.
- **CROSS-CONNECTION CONTROL** is the use so assemblies, devices, methods, and procedures to prevent the contamination or pollution of a potable water supply

Cross Connection Types

- Direct Connection
 - A permanent or piped physical connection capable of allowing both backpressure and backsiphonage.
- Indirect Connection
 - A plumbing arrangement allowing backsiphonage only.

Terminology - *Backpressure*



- The downstream pressure becomes greater than the upstream or supply pressure as a result of either a reduction in the supply pressure or an increase in the system or downstream pressure.
- The pressure must be greater than atmospheric pressure because no vacuum is produced.

Terminology - *Backsiphonage*

- Backsiphonage results from the creation of a siphon being formed in the piping system.
- It occurs when the system pressure is below atmospheric pressure or a negative gauge pressure exists.

Terminology – *Degree of Hazard*

- The evaluation of the actual or potential conditions within a water system that can be classified as either a health hazard or non-health hazard.
- Contaminant: Health Hazard/ High Hazard
- Pollution: Non- Health Hazard/ Low Hazard

Barometric Loop

- A piping arrangement that extends more than 35 feet (10.7 m) at sea level is considered a barometric loop.
- Perfect vacuum at sea level could lift water a maximum of 33.9'
- A barometric loop is not like a mechanical vacuum breaker because it does not admit air into the piping system.
- However, it will stop the flow of water from the downstream piping.

ASSE 1012 Standard

- Low Hazard installation only
- Backpressure and backsiphonage protection
- Non- testable device
- Maximum pressure loss 25 psi during rated flow
- Horizontal or vertical installation
- Normal usage is on residential boilers in many areas.

Dual Check Valve ASSE 1024

- Low hazard use only
- Protects against both backpressure and backsiphonage
- Non- testable
- Maximum pressure loss 10 psi during rated flow
- Used in many areas for residential containment protection

ASSE 1011 Hose Connection Vacuum Breaker

- High and low hazard protection
- Non-testable



- Contains one check valve

ASSE 1052 Hose Connection Backflow Preventer

- High and low hazard protection
- Testable using an ASSE procedure
- Contains two check valves
- Will work under low head backpressure (maximum 10 ft. head)

Pressure Vacuum Breaker (PVB)

- A testable assembly.
- Air-inlet valve is force-loaded to an open position with a minimum of 1.0 psi loading.
- Provides high-hazard or health hazard protection.

Spill-Resistant Vacuum Breaker (SVB)

- Next-generation pressure type vacuum breaker that will not spill water.
- Components not required to be independent of each other.
- Field testable.

Double Check Valve Assembly (DCVA)

- Consists of 2 tightly closing shut-off valves.
- 2 independently acting check valves force loaded to a closed position and.
- 4 properly located test cocks.

Reduced Pressure Principle Assembly (RP)

- Senses pressure at the inlet and outlet of check valve 1
- Remains closed if supply pressure is greater than zone pressure
- Opens if the difference in pressure between the supply and zone is reduced

Become Certificated in Backflow Prevention

The screenshot shows the IAPMO BPI website. At the top, there is a search bar and a navigation menu with links for 'ABOUT US', 'TRAINING & CERTIFICATION', 'PUBLICATIONS', 'BACKFLOW PREVENTION JOURNAL MAGAZINE', and 'INDUSTRY POSITION PAPERS'. Below the navigation is a large image of various backflow prevention devices. Underneath the image, the text reads 'Backflow Prevention Training and Certification'. At the bottom of the screenshot, there is a section titled 'BACKFLOW PREVENTION INSTITUTE' with a paragraph of text: 'The motto of the Backflow Prevention Institute® is safe water through plumbing code compliance. Proper training and certification are the keys to achieving that goal. IAPMO's Backflow Prevention Institute is the industry's resource for backflow prevention and cross-connection control. It provides professional training exceeding the industry standards established by the ASSE International. Water Institute researchers from the University of North Carolina Gillings School of Global Public Health are partnering with IAPMO in an "Innovation Lab" to find ways to reduce recirculation in utility-cooled water system pipes, buildings and homes.'



<https://www.iapmo.org/bpi/>

In the UPC review Table 603.2 Backflow Prevention Devices, Assemblies & Methods



Fixtures.

601.3.4

- Where vacuum breakers or backflow preventers are installed with fixtures listed in Chapter 17, identification of the discharge side shall be permitted to be omitted.

Heat Exchangers.

603.5.4

- Heat exchangers used for heat transfer, heat recovery, or solar heating shall protect the potable water system from being contaminated by the heat-transfer medium. Single-wall heat exchangers used in indirect-fired water heaters shall meet the requirements of Section 505.4.1. Double-wall heat exchangers shall separate the potable water from the heat-transfer medium by providing a space between the two walls that are vented to the atmosphere.

Water Supply Inlets.

603.5.5

- Water supply inlets to tanks, vats, sumps, swimming pools, and other receptors shall be protected by one of the following means:
 - (1) An approved air gap.
 - (2) A listed vacuum breaker installed on the discharge side of the last valve with the critical level not less than 6 inches (152 mm) or in accordance with its listing.
 - (3) A backflow preventer suitable for the degree of hazard, installed in accordance with the requirements for that type of device or assembly as set forth in this chapter.

Appendix Q – Indoor Horticulture Facilities

Q 601.0 Water Supply

- **Q 601.4 Alternate Water Supply.** Where permitted, agricultural water may be used or alternate water sources in accordance with Appendix K.

Appendix Q – Indoor Horticulture Facilities

Q 701.0 Storage Tanks

- **Q 701.1 Construction.** Where storage tanks are used, they shall be approved by the AHJ. Potable water storage tanks shall comply with Section 607.0. Rainwater catchment storage tanks shall comply with Appendix K or in accordance with the AHJ.

Water Storage

General Information

- Control temperature about 75 degrees
- Control Humidity levels to 50% or below
- Maintain 1200-1500 ppm of CO₂ during daylight hrs.



- Cultivators typically mimic Day/Night conditions in grow rooms

Appendix Q – Indoor Horticulture Facilities

Q 801.0 Fertigation and Irrigation Equipment

- **Q 801.1 Installation.** Nutrient tanks and irrigation equipment shall be installed in accordance with the manufacturer's instructions. When connected to the potable water supply, tanks and irrigation equipment shall be located downstream of water storage tank and be protected by an approved backflow device or method in accordance with Table 603.2.
- **Q 801.2 Materials and Construction.** The piping, components, and devices shall be compatible with the additives or nutrients used. Above grade storage tanks shall be of an opaque material, approved for aboveground use in direct sunlight, or shall be shielded from direct sunlight.

Q 901.0 Sanitary Drainage and Indirect Wastes

- Q 901.1 General. Sanitary drainage shall be in accordance with Chapter 7. Indirect wastes shall be in accordance with Chapter 8. The drainage system shall be compatible with the discharge liquid waste.

Drainage

Sanitation Check

- Check that all sinks, bathrooms fixtures & grow tables drain properly
- Check sizing for waste & vent system (check plans)
- Settlement receptors of grow tables & other interceptor requirements

What About Drains?

- If equipment in room has drains for either condensate or de-humidification, YES
- Also, leachate from growing tables needs to be drained, & rooms/tables need to be cleaned after harvest
- Leachate may be reclaimed & recirculated

Drains

- Most successful drain layout comes after tables are laid out on plans.
- Trench drains running under tables are very successful because they provide clearance for other equipment.
- Will room pressure affect trap seals? Alternatives?

Drainage Piping

701.2

- Materials for drainage piping shall be in accordance with one of the referenced standards in Table 701.2 except that:



- (1) No galvanized wrought-iron or galvanized steel pipe shall be used underground and shall be kept not less than six (6) inches (152 mm) above ground.
- (2) ABS and PVC DWV piping installations shall be installed in accordance with applicable standards referenced in Table 701.2 and Chapter 14 “Firestop Protection.”
 - **Except** for individual single-family dwelling units, materials exposed within ducts or plenums shall have a flame-spread index of not more than 25 and a smoke developed index of not more than 50, where tested in accordance with ASTM E84 or UL 723.
 - Plastic piping installed in plenums shall be tested in accordance with all requirements of ASTM E84 or UL 723. Mounting methods, supports and sample sizes of materials for testing that are not specified in ASTM E84 or UL 723 shall be prohibited.
- (3) No vitrified clay pipe or fittings shall be used above ground or where pressurized by a pump or ejector.

Joints Between Various Materials

705.10

- Joints between various materials shall be installed in accordance with manufacturer’s installation instructions & Section 705.10.1 through Section 705.10.4. Mechanical couplings used to join different materials shall comply with ASTM C1173 for belowground use, ASTM C1460 for aboveground use, or ASTM C1461 for aboveground & belowground use.
 - 705.10.1 Copper or Copper Alloy Pipe to Cast- Iron Pipe.
 - 705.10.2 Copper or Copper Alloy Pipe to Threaded Pipe Joints.
 - 705.10.3 Plastic Pipe to Other Materials.
 - 705.10.4 Stainless Steel Pipe to Other Materials.

Changes in Direction of Drainage Flow.

706.0

- 706.1 Approved Fittings. Changes in direction of drainage piping shall be made by appropriate use of approved fittings & shall be of angles presented by a one-sixteenth bend, one-eighth bend, or one-sixth bend, or other approved fittings of equivalent sweep.
 - 706.2 Horizontal to Vertical.
 - 706.3 Horizontal to Horizontal.
 - 706.4 Vertical to Horizontal.

707.0 Cleanouts. UPC

- **707.1 Plug.** Each cleanout fitting for cast iron pipe shall consist of a cast iron or copper alloy body and an approved plug.
- Each cleanout for galvanized wrought iron, galvanized steel, copper, or copper alloy pipe shall consist of a plug as specified in Table 707.1, or a standard weight



copper alloy cap, or an approved ABS or PVC plastic plug, or an approved stainless-steel cleanout or plug.

- Plugs shall have raised square heads or approved countersunk rectangular slots.

Indirect Waste - Definition UPC

- A pipe that does not connect directly with the drainage system but conveys liquid wastes by discharging into a;
 - Plumbing fixture
 - Interceptor or;
 - Receptor
- Which is directly connected to the drainage system.

801.2 Air Gap or Air Break Required. UPC

- All indirect waste piping shall discharge into the building drainage system through an:
 - Airbreak or;
 - Airgap

Airbreak. UPC

- Is a physical separation which may be a low inlet into the indirect waste receptor from the fixture, appliance, or device indirectly connected.

Airgap – Drainage. UPC

- The unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe, plumbing fixture, appliance, or appurtenance conveying waste to the flood level rim of the receptor.

801.3.1 Size of Indirect Waste Pipes. UPC

- Except for refrigeration coils and ice-making machines, the size of the indirect waste pipe shall be not smaller than the drain on the unit, but shall be not smaller than 1 inch (25 mm), and the maximum developed length shall not exceed 15 feet (4572 mm). ...

803.0 Indirect Waste Piping. UPC

803.1 Materials

- Pipe, tube, and fittings conveying indirect waste shall be of such materials and design as to perform their intended function to the satisfaction of the Authority Having Jurisdiction.
- **803.2 Copper and Copper Alloys.** Joints and connections in copper and copper alloy pipe and tube shall be installed in accordance with Section 705.3.

803.3 Pipe Size and Length. UPC

Summarized

- Sized by Chapter 7 except where otherwise indicated.



- Constructed per other code sections in Chapters 7 & 9.
- Indirect waste vent shall not combine with sewer connected vents.
- Piping over 5 ft. (1524 mm), but less than 15 ft. (4572 mm) shall be trapped but not vented.
- Piping less than 15ft. (4572 mm) shall not be less than drain outlet but in no case less than ½ " (15 mm)

Pipe Size and Length

- Notice that there is no stated requirement for venting of indirect waste over 15 ft. (4572 mm)
- This is because indirect waste lines, except from refrigeration coils and ice machines, are limited to a maximum of 15 feet (4572 mm) in length.
- If an indirect waste line over 15 feet (4572 mm) were approved, it would need to be vented as described in Chapter 9.

804.0 Indirect Waste Receptors. UPC

804.1 Standpipe Receptors.

- All indirect receptors to;
 - be approved for the use proposed.
 - prevent splashing and flooding.
 - located where they are readily accessible for inspection and cleaning.
 - Shall not be located in a toilet room, closet, cupboard, storeroom or any room not in general use by occupants.

805.0 Pressure Drainage Connections. UPC

- No wastes discharging under pressure may be directly connected to drainage system but connected indirectly.
- Except approved sumps pumps or other approved fixture.

811.1 Pretreatment. UPC

Summary - Chemical Wastes

- No Chemical wastes shall be discharged into the ground, local sewer, or other means without approval of the local by the Authority Having Jurisdiction.

Summary - Requirements

- Shall be pretreated and rendered innocuous.
- Copper tube not to be used.
- Use glass, high silicon iron pipe, lead pipe ⅛" thick.
- No chemical vent may tie in with other vents.
- Detailed plans required.
- As built drawings required.
- Need AHJ approval to discharge to sanitary sewer.



811.0 Chemical Wastes. UPC

Shall also Comply with

- **811.2 Waste and Vent Pipes.**
- **811.3 Joining Materials.**
- **811.4 Access.**
- **811.5 Permanent Record.**
- **811.6 Chemical Vent.**
- **811.7 Discharge.**
- **811.8 Diluted Chemicals.**

812.0 Clear Water Wastes. UPC

- Water lifts, expansion tanks, cooling jackets, sprinkler systems, drip or overflow pans, or similar devices that discharge clear wastewater into the building drainage system shall discharge through an indirect waste.

Appendix Q – Indoor Horticulture Facilities

Q 901.0 Sanitary Drainage and Indirect Wastes

- **Q 901.2 Hazardous Materials.** Hazardous materials shall not be discharged into the sanitary sewer, storm drain, or on the ground.
- **Q 901.3 Agricultural Water Waste.** Agricultural water shall be discharged in accordance with the local, state, and federal regulations as approved by the AHJ. Where agricultural water discharges to the outdoors, & is not connected to sanitary sewer, piping shall be installed to restrict rodents or vermin from entering the building.
- **Q 901.4 Floor Drains, Floor Sinks, and Receptors.** Wastewater shall discharge into an approved receptor. Receptors shall be compatible with the wastewater and installed in accordance with this code.
 - **Q 901.4.1 Plant Storage Areas.** Where drains are provided in spaces where plants are stored, such drains shall be installed with indirect waste piping. Each indirect waste pipe from plant storage areas shall be separately piped to the indirect waste receptor and shall not combine with other indirect waste pipes.

Q 1001.0 Facilities

- **Q 1001.1 Toilet Facilities.** Toilet facilities shall be provided in accordance with the occupancy type.
- **Q 1001.2 Location.** Toilet facilities shall be located in such a manner to prevent contamination of plants during harvesting, holding, manufacturing/processing, and packing.



Seedlings humidity level

- Growth Week 1: 60%
- Growth Week 2: 60%
- Flowering Week 1: 55%
- Flowering Week 2: 50%
- Flowering Week 3: 50%
- Flowering Week 4: 50%
- Flowering Week 5: 50%
- Flowering Week 6: 45%
- Flowering Week 7: 45%
- Flowering Week 8: 40%
- Flowering Week 9: 40%

Clones Humidity Level

- Growth Week 1: 70%
- Growth Week 2: 70%
- Flowering Week 1: 65%
- Flowering Week 2: 60%
- Flowering Week 3: 55%
- Flowering Week 4: 50%
- Flowering Week 5: 50%
- Flowering Week 6: 45%
- Flowering Week 7: 45%
- Flowering Week 8: 40%
- Flowering Week 9: 40%

What are We Trying to Accomplish?

- Prevent mold and mildew
- Prevent pests (such as spider mites, aphids, white flies and mealy bugs, leaf minors and fungus gnats)
- Prevent harmful organisms (powdery mildew, botrytis and downy mildew)
- Grow Cannabis without having to destroy entire crop when subjected to required testing protocols

Lady Bugs

- Many Cultivators use Lady Bugs to consume small pests such as spider mites. When there is no food source left, the lady bugs die and fall into the table trays and floor For more information:
- www.cdpr.ca.gov/cannabis
- These are California Department of Pesticide Regulations

Vertebrate Repellants

- Geran oil
- Castor oil

Double Containment for Nutrients/Pesticides – No Drains allowed

Photocatalytic Oxidation (PCO)

- Photocatalytic Oxidation (PCO) is an advanced process by which volatile organic compounds (VOCs), bacteria, mold and fungus is destroyed by incorporating photon and ultraviolet (UV) energy activating a catalyst creating photo catalytic oxidation (PCO). PCO is produced by the air being exposed to photon light and passing through a catalyst comprised of specific nano-sized mineral compounds.



After exposure and upon entering an area, three specific free radicals are released which destroys the bioaerosols (bacteria, molds, and fungus).

Photo-hydro Ionization (PHI)

- During the process, hydrogen peroxide, hydroxyl radicals, & hydroxides attach themselves to specific organisms and kill them.
- Photo-hydro Ionization (PHI)
- When the HVAC system is in operation the HVAC-PHI Cell creates an Advanced Oxidation Process consisting of, Hydro-Peroxides, super oxide ions & hydroxide ions. All are friendly oxidizers.
- Friendly oxidizers = oxidizers revert back to oxygen & hydrogen after oxidation of the pollutant.

Storm Drains

Definitions. UPC

- **Building Drain (Storm).** A building drain which conveys storm water or other drainage but not sewage
- **Conductor.** A pipe inside the building that conveys storm water from the roof to a storm drain, combined building sewer, or other approved point of disposal.
- **Roof Drain.** A drain installed to receive water collecting on the surface of a roof and to discharge it into a leader, down-spout, or conductor.
- **Downspout.** The rain leader from the roof to the building storm drain, combined building sewer, or other means of disposal located outside of the building. See Conductor and Leader.
- **Leader.** An exterior vertical drainage pipe for conveying storm water from roof or gutter drains. See Downspout.

Bollards

- 1101.16.1 Leaders installed along alleyways, driveways or other locations where exposed to damage.
- shall be protected by metal guards, recessed into the wall or constructed of ferrous pipe.

Building Code

- Requires roof drainage water
- not be permitted to flow over
- public property, side walks and walkways
- Roof drainage is also required for all buildings to prevent roof collapse
- Where a plugged drain could allow rainwater buildup on the roof a separate overflow shall be provided



1101.0 General. UPC

1101.1 Applicability.

1101.2 Where Required.

- All roofs, paved areas, yards, courts, and courtyards shall be drained into a separate storm sewer system, or into a combined sewer system, or to some other place of disposal acceptable to the AHJ.
- In 1 & 2 family dwellings it may discharge on flat areas (such as streets or lawns) to drain away from the building, away from the adjoining property and shall not create a nuisance.

1101.3 Storm Water Drainage to Sanitary Sewer Prohibited.

- Storm water shall not be drained into sewers intended for sanitary drainage.

Contact Information

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Thank You for Coming!

