OREGON OCCUPATIONAL SAFETY AND HEALTH DIVISION
DEPARTMENT OF CONSUMER AND BUSINESS SERVICES

PROGRAM DIRECTIVE

Program Directive: A-307
Issued: August 29, 2024
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SUBJECT: Local Emphasis Program (LEP) on Cannabis Processing

AFFECTED STANDARDS/ DIRECTIVES: General Industry/Agriculture

PURPOSE: This instruction contains policies and procedures for inspecting workplaces that process cannabis.

SCOPE: This instruction applies to all Oregon OSHA

REFERENCES: See Appendix E

DEFINITIONS:

- Biomass - in the cannabis and hemp industry, biomass typically refer to the plant material left over for processing after the highly prized flower of the plant has been removed.
- Butane - a flammable hydrocarbon gas used during cannabis extraction.
- CO_2 Extraction - the use of pressurized carbon dioxide to extract desirable cannabinoids from a cannabis or hemp plant.
- Decarboxylation - the heating process to convert inactive cannabinoids into their active versions.
- Distillation - the process of applying heat and pressure to a cannabis plant, forcing out impurities.
- Hydrocarbon Closed Loop System - a system where the solvent is recycled in an enclosed apparatus. As a result, operators are protected from vapors.
- Kief - the collection of loose cannabis trichomes, which are the amber and white hairs that grow on cannabis flower (buds) and leaves. It is accumulated from sifting cannabis flowers with a mesh screen or sieve. Kief is also known as “Dust,” “Chief,”

or “cannabis crystals.” It is technically only the bulbous tip of each trichome, which is the most potent part of the plant.

- Mechanical Processing - oils are squeezed out of the marijuana plants using a machine.

- Open blasting - crude method of extracting where plant material is placed in a cylinder on a baking pan. An aerosol can of butane is injected into the cylinder. Commonly done by unlicensed individuals. This is the most dangerous method resulting in frequent explosions.

- Solvent-Based Extraction Method - in a closed-loop system, the solvent passes through a vessel containing plant biomass, strips the valuable components, and is then separated from the valuable oil in a separate vessel. The solvent is recovered and can be used over and over again.

- Terpenes – aromatic compounds that give cannabis strains their unique scent.

- Trichomes – filament-like growths or appendages on the cannabis plant’s surface. They can appear all over the plant but are most concentrated on the flowers and upper leaves. They produce a sticky oil where the acidic form of cannabinoids such as THC, CBD, CBG, CBC, CBN, and over a hundred others can be found. The oil is also packed with terpenes, flavonoids, and other active compounds. Trichomes are a vital part of the plant’s defense mechanisms. THC provides the plant with UV protection, and plants exposed to high levels of UV tend to produce higher levels of THC.

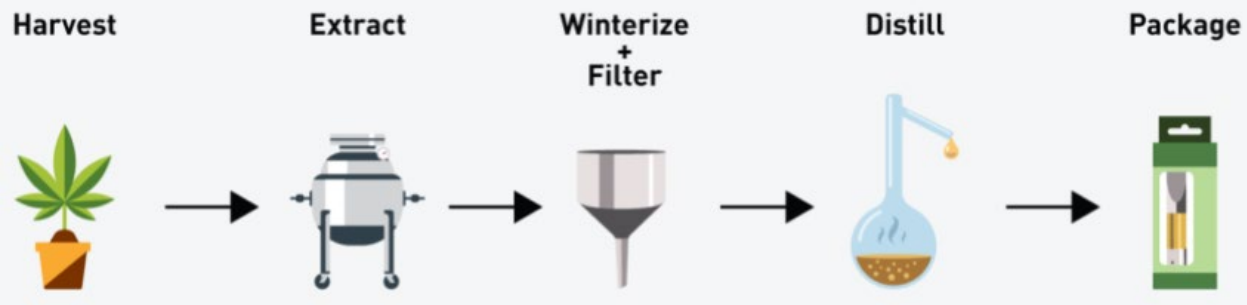
BACKGROUND:

The legalization of recreational marijuana has resulted in the creation of numerous cannabis extraction businesses in Oregon. The processes associated with this emerging industry can be dangerous. This has resulted in serious injuries and deaths throughout the United States. It is important that marijuana processors properly design safe workplaces to protect employees from these recognized occupational hazards.

Understanding what may be encountered at a cannabis processing facility is the first step in identifying and preventing hazardous conditions. Cannabis is a genus of flowering plant. Its species are used for industrial, medical, and recreational purposes. The cannabis plant is initially harvested, dried, and sorted. The buds are then separated from the stems and stalks, and all excess leaves are trimmed (usually by hand). Trimming is usually a two-part process after the plant has been bucked down (stems and fan leaves removed.) First, the bud receives a rough trim via machine. Then it is trimmed by hand. Finally, the flower is cured to allow any remaining moisture to equalize. Some of the most common and popular end-products that consumers and wholesalers seek out are found in this initial “raw” stage. These processes are generally covered by Division 4 Agriculture rules.

The raw materials are then refined through a process known as extraction in order to create cannabis oil. To create cannabis oil, a solvent (e.g., butane, ethanol, CO_2, etc.) is often used to draw active compounds like Cannabidiol (CBD) and tetrahydrocannabinol (THC) from the flowers, leaves, and stems of marijuana plants. However, the materials found at the raw stage may still be dense and irregular in size. This can make it difficult to process and/or efficiently place into an extraction machine. The cannabis is often milled or ground into smaller particles to make it ready for the first stage of extraction. The processes from receipt of raw material, through packaging, are generally covered by Division 2 General Industry rules.

Extraction can be performed using either solvent or non-solvent based processes. Solvents have been popular for many years in the modern cannabis industry. However, processors also use non-solvent processes, because some perceive them as being safer to consumers. Each extraction method has its own advantages and disadvantages when it comes to the overall yield and quality of cannabis and hemp oil. When cannabis extraction is the manufacturing process, it generally follows this order:



I. Cannabis Extraction Methods:

A. Solvent-Based Extraction Methods: The most common and widely used solvent-based extraction methods include:

1. Hydrocarbon Extraction: One of the most popular and effective solvent-based extraction methods is hydrocarbon extraction. In this method, hydrocarbon gases (E.g. Butane or Propane) are used as a solvent to extract cannabis and terpenes. This method typically offers faster extraction rates than CO_2 extraction, and hydrocarbon cannabis extraction equipment is usually less expensive to purchase. Hydrocarbons used for extraction are highly flammable and required a great deal of training and specially engineered equipment.

2. CO_2 (Carbon Dioxide) Extraction: CO_2 is used to extract concentrates under high pressure and temperatures generally not exceeding 150F. CO_2 extraction requires sophisticated equipment and a high level of training.

3. Alcohol/Ethanol Extraction: Ethanol is a volatile flammable liquid that is one of the most popular solvents for cannabis extraction. The process is still flammable but can be more easily controlled than hydrocarbon or CO_2 extraction.

B. Solventless Extraction Methods: Solventless extraction methods do not use chemical solvents to collect the plant's oils. Instead, they use a variety of agitation techniques and machines that use heat and pressure. The most common and widely used solventless extraction methods include:

1. Water and/or Ice Based separation (a.k.a. "cold water extraction"): This method works by mechanically separating out cannabinoid-rich trichomes from the biomass using water and/or ice, and an agitational force.

2. A grinder or screen to produce "Kief": It can then be pressed into hash via the use of a hash press.

3. A rosin press: this press uses heat and pressure, to squeeze cannabis oil out of biomass.

II. Winterization: The "crude oil" created during extraction goes through a process known as winterization. This typically involves taking the crude oil and dissolving it in ethanol at sub-zero temperatures. This action allows the compounds to coagulate.

III. Filtration: After the crude oil is coagulated, the unwanted parts of the product can be filtered out. The solution is forced through a series of filters with decreasing micron sizes to remove the solidified wax, lipids, fats, etc. from the oil.

IV. Decarboxylation: Decarboxylation involves using heat to change the chemical structure of the acid cannabinoids to a neutral (non-acid) form of THC, CBD, CBG, etc. This process is also used to bring out various terpenes and lipids present in the plant.

V. Distillation: a final step which involves heating the oil to get the portion of the oil that is desired.

PROGRAM PROCEDURES:

A. Inspection Scheduling: Inspections conducted under this LEP will focus on cannabis processors.

Inspection Scheduling (Cannabis Inspection Targeting):

Oregon OSHA will focus on making the most effective use of its limited resources. To do this, the Oregon Liquor Control Commission's (OLCC) marijuana business license approval database will be used to generate a cannabis scheduling list, via the interagency agreement between OLCC and Oregon OSHA. The most current OLCC database will be sorted to generate a list of all employers who are cannabis processors. OLCC employer data will be cross checked against other data sources such as OTIS/EDS, Business Registry, Corporations, etc. and corrections and additions will be made to the list as necessary. The data will then be sorted by Oregon OSHA Field Office coverage areas. The businesses on the list will be assigned a random rank order number, and inspections

will be conducted in numerical order. Businesses that have received a comprehensive health inspection within the previous three years will be removed from the list. The cannabis scheduling list can be created annually, but no less than every 3 years.

Enforcement Manager Evaluation:

Field Office managers will coordinate inspection activities covered by the LEP to assure the timely and effective use of resources. Managers should determine whether cannabis processing facilities have been addressed during recent inspections, and/or if conditions existed that would warrant another inspection. Where cannabis processing facilities are determined through complaints, accidents, or other means, that do not appear on the OLCC data, Field Office managers will inform the Health Enforcement Policy analyst for their inclusion on future lists.

B. Scheduling and Resource Allocation

1. The businesses on the cannabis emphasis list will be inspected in rank order as much as feasible. Conducting inspections out of order is acceptable for reasons such as efficiency, resource savings, batching by location in the state, etc.

2. When hazards related to cannabis processing are encountered during an inspection, the CSHO will determine, with the aid of their field office health or safety enforcement manager, the best way to address the hazard.

3. If a complaint or referral is received related to cannabis processing, the complaint or referral items should be first evaluated, then, an inspection should take place according to the criteria warranting an inspection, found in Program Directive A-219 (Complaint Policies and Procedures).

   Responses to accidents and catastrophes at facilities processing cannabis must follow the guidelines contained in Chapter 5 of the FIRM (Imminent Danger, Investigations, and Emergency Response), in addition to the guidelines contained in this instruction.

4. If cannabis production (cultivation) activities are located at a processing facility, a pesticide emphasis inspection should be initiated. The Local Emphasis Program Directive for Pesticides, A-235, should be followed.

C. Opening Conference

1. During the opening conference, the CSHO will attempt to determine if the facility is processing cannabis.

2. The CSHO will conduct a preliminary walk-around of the facility and attempt to determine if the facility is processing cannabis.

3. If the CSHO determines that the employer's operation does not involve cannabis processing, then the compliance officer may terminate the inspection.

D. Resources

1. When possible, CSHOs trained in recognizing the hazards associated with cannabis processing will be assigned to conduct inspections under this LEP. When a CSHO determines that cannabis processing hazards exist within a workplace, the CSHO should discuss cannabis processing with their manager. A determination should be made whether an inspection will take place by the on-site CSHO, a referral should be made to a more experienced CSHO, or if other expertise is needed to address the hazards.

2. Oregon OSHA's Resource Library has industry reference documents available to use as a resource to support research and enforcement activities during the inspection. See appendix E for a list of references.

3. Oregon OSHA safety and health staff must take appropriate precautionary measures to protect themselves from the hazards presented at cannabis processing facilities. This can include:

- Understanding the hazards of cannabis processing.
- Screening the area using a direct reading gas meter.
- Using only intrinsically safe devices.
- Having the appropriate respiratory protection available for usage.
- Using appropriate personal protective equipment.

E. Inspection and Citation Procedures

Citations: If a violation is discovered, cite the vertical standard that addresses the cannabis processing hazard.

***Use Division 4 if agriculture

1. **Flammable and Combustible Liquids – Division 2, Subdivision H 1910.106.** Citations under 1910.106 may be issued for violations of the flammable and combustible liquids code. Common rule violations may be found in: 1910.106(e) Industrial plants: used where flammable liquids are incidental to principal business

2. **Division 1, OAR 437-001-0760, Rules for all Workplaces, violations.** A citation under 437-001-0760(1)(b)(C) may be issued for explosion and fire hazards that exist

at cannabis processing facilities. NFPA and other standards may be used to document the failure to provide a safe workplace. Other 437-001-0760(1) rules may be more appropriate depending on the specifics of the issue of concern. These violations should be discussed with your manager and the Statewide Enforcement Manager before citing.

3. **Personal protective equipment (PPE) violations – Division 2, Subdivision I 1910.0134**. Employees may be exposed to hazards which require the use of personal protective equipment for the eyes, face, head, extremities, and/or torso. Citations under OAR 437-002-0134 may be issued due to lack of adequate assessment, selection, usage, training, and other PPE violations. Examples of hazards could include employee exposure to potential chemical burn injuries. Contact with liquid butane can cause frostbite on the skin. CSHO should document the circumstances of the violation:

    i. Would a reasonable person familiar with the circumstances recognize hazards from processing?
    ii. Are feasible types of PPE commercially available to deal with the hazards?
    iii. Appendix E and other resources should be reviewed to determine.

4. **Respiratory Protection.** Citations under 1910.134 may be issued if they are violations of any aspect of the rule.

5. **Electrical violations.** Equipment, wiring methods, and installations of equipment in hazardous (classified) locations must be done according to the current regulatory requirements. The electrical terms are defined in 1910.307(b):
    a. Class1 division 1: intrinsically safe
    b. Class1 division 2: approved for the hazardous (classified) location
    c. Class1 division 3: safe for the hazardous (classified) location.

6. **Warning sign violations.** If safety instruction signs are missing on equipment, or at the entrance to places where explosive atmospheres may occur, then citations under 1910.145(c)(3) should be issued.

7. **Hazard communication violations**. The hazard communication standard, 1910.1200, requires all employers to provide information to their employees about the hazardous chemicals to which they are exposed, by means of a hazard communication program, labels and other forms of warning, Safety Data Sheets (SDSs), and information and training.
    a. Written program- available on-site for review, updated as necessary.
    b. Safety Data Sheets- Available on-site with easy access. CSHOs must evaluate whether there is compliance with 1910.1200(g)(2)-(5) by examining a sample of SDSs. If SDSs are not updated when new information becomes available, they are deficient according to 1910.1200(g)(5).
    c. Labeling- tanks, secondary containers, etc.

d. Training- cannabis handling (allergy, etc.), solvents, etc.

8. **Egress violations**. Citations for violations of Subpart E – Means of Egress, 437-002-0040 through 0043 will be issued where violations of these provisions are found.

9. **Liquefied Petroleum Gas (LPG) violations**. Citations for violations of Subpart H – Storage and Handling of Liquefied Petroleum Gases, 1910.110 will be issued where violations of these provisions are found. Fire extinguishers are required for storage locations other than supply depots, per 1910.110 (f)(7).

10. **Noise hazards**

11. **Slips, trips, and falls**

12. **Combustible dust**

OUTREACH: Oregon OSHA will look for avenues to develop outreach programs. These efforts include:

1. Letters and news releases announcing implementation of the Cannabis Processing LEP.

2. Seminars on cannabis processing topics, tailored for specific audiences, such as: employers, employee groups, local trade unions, apprentice programs, and equipment manufacturers. Local fire department staff may be invited to participate. The state fire marshal's assistant will be encouraged to disseminate information.

3. Partnerships and alliances, such as those involving employers within the same industry to share successes and technical information concerning effective means of controlling or eliminating hazards at their facilities. Other partnerships may include other government agencies with requirements relating to cannabis processing.

OTIS CODING INSTRUCTIONS:

1. All enforcement inspections related to cannabis extraction are conducted under this LEP and must be coded with "CANNABIS" in the local emphasis tab in OTIS. (Located in the "inspection info" tab).

2. Enforcement activities related to cannabis processing under other NEPs and/or LEPs must be coded for all the NEPs and LEPs. For example, if heat hazards are also addressed during the inspection, Heat Illness Prevention should also be coded under the local emphasis tab.

3. All consultation activities (form 20, 30 and 66) conducted in response to this LEP must include “CANNABIS” in the LEP field on the forms as well.

4. All inspections where cannabis extraction activities are evaluated should be coded in OTIS in the Optional Report Information tab as S-23-Cannabis/Extract/Processor. If the extraction site is also the grow site, and both operations are evaluated during the inspection, the additional optional report information code, S-23-Cannabis Grow/Dispensary, should also be entered.

APPENDICES: The following appendices are provided as guidance for the inspection of facilities conducting cannabis processing:

Appendix A

NFPA Publications Relevant to Cannabis Processing

NFPA No.	Title	Current Edition
1	Chapter 38, Paragraph 6, Marijuana Growing, Processing, or Extraction Facilities	2018
30	Flammable and Combustible Liquids	2014
69	Standard on Explosion Prevention Systems	2014
70	National Electrical Code	2008
395	Storage of Flammable and Combustible Liquids	2008

Appendix B
Sample Inspection Questions
(CSHOs may refer to appropriate NFPA standards to develop additional questions.)

1. What extraction process is the processing facility using or are there multiple process types?

2. In CO_2 extracting facilities, is the venting sized correctly to effectively relieve the pressure; and does the relief venting exhaust to a safe location?

3. Does the company have a Lockout-Tagout (LOTO) plan for carbon dioxide tanks?

4. Are pressurized CO_2 lines protected from being broken?

5. How are flammable gases controlled when the extraction columns are removed for cleaning and maintenance?

6. Are there alarms for flammable levels and/pressure and are they set to a correct protective level?

7. Is there a fire prevention plan for liquefied petroleum and alcohol extraction processes?

8. Have the operators been trained in the safe operation of the extraction equipment?

9. Is there a maintenance plan to replace the O-rings on butane extractors because butane degrades the rubber?

10. Do the exit doors swing in the direction of escape travel?

11. Are the exhaust intakes located 1 foot from the floor for flammable storage rooms?

12. Are the exhaust stacks for flammable extraction processes configured so that gas and vapors can't concentrate on flat roofs (stacks need to be 10 feet over the surface of the roof)?

13. Are large carbon dioxide tanks ("Dewar" cryogenic vessels) located in a safe location and protected from being hit by vehicles?

14. Are electrical devices in the close proximity of flammable processing equipment intrinsically safe? (i.e., Do they have the correct electrical classification?)

Appendix C
Sample Citations

Division 1 Violations

OAR 437-001-0760(1)(b)(C): The employer did not take all reasonable means to require employees to use all means and methods that were necessary to safely accomplish all work where employees were exposed to a hazard:

(a) Butane concentrations were measured at 5% of the lower explosive limit in the area above the distillation column in the *(insert the room or building such as processing shop*) while the columns were being removed for maintenance. There were no ventilation controls installed.

Reference: National Fire Protection Association 1 – Chapter 38

Flammable Liquids Violations

29 CFR 1910.106(d)(4)(iv): Every inside storage room shall be provided with a ventilation system that provides a complete change of air within the room at least six times per hour.

a.) The flammable vapor exhaust ventilation system in the cannabis oil storage room did not provide six changes per hour on or about (*insert date)*.

Electrical Violations

1910.307(c): Electrical equipment in a hazardous (classified) location was not intrinsically safe, approved for the hazardous (classified) location, or safe for the hazardous (classified) location:

a.) The portable electric shop light located in the operator's station next to the extraction vessel was not approved for use in a Class I, Division 2 location.

NOTE: See App F for additional possible rule references.

Appendix D
Industries with Cannabis Processing Associations

Industry	NAICS
Marijuana, grown under cover	111419
Marijuana, grown in open	111998
Marijuana, merchant wholesalers	424590
Marijuana, medical or recreational	453998

Appendix E
References

- Denver Fire Department – Marijuana Extraction Guidelines for Commercial and Licensed Facilities
- International Building Code (IBC)
- National Fire Protection Association (NFPA) Number - 1, Chapter 38, Marijuana Growing, Processing, or Extraction Facilities
- International Fire Code (IFC)
- WAC 314-55-104 – State of Washington – Marijuana processor license extraction requirements.
- American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section VIII Division 1 - Rules for Construction of Pressure Vessels
- ASTM D8308-21 “Standard Practice for Cannabis/Hemp Operation Compliance Audits”

Appendix F:

Rules used in table scenarios are examples only. COs must research scope and the rule to determine the appropriate application.

Hazard Scenario	Division 2 Rule Note: Cannabis Extractors will ordinarily be Classified as Unit Physical Operations not Incidental Use.	Division 4 Rule
Flammable – Liquid (Ethanol) *1910.106 Applies to liquid flammables only. Liquified petroleum gasses (LPG) are covered in the next section*		
Regular Electrical Outlets or Electric Devices Within 5 Feet of Class1/Div1 Zone Around Flammable Extractor (Ethanol)	1910.106(e)(7)(i)(B) – ClassI/Div1 IN THE Alternative 1910.307(c)	437-004-0720(7)(b) – Ignition Source 50 Feet or 437-004-0099(2)(e)
Regular Electrical Outlets or Electric Devices Within 20 Feet of Class1/Div2 Zone Around Flammable Extractor (Ethanol)	1910.106(e)(7)(i)(C) – ClassI/Div2 IN THE Alternative 1910.307(c)	437-004-0720(7)(b) - Ignition Source 50 Feet or 437-004-0099(2)(e)
Ethanol Extractor Has No Spill Diking on Floor, Liquid Spill Could Go in All Directions	1910.106(e)(3)(iv)(A): Drainage Required (Curbs/Scuppers)	437-004-0720(7)(a) or 437-004-0099(2)(e)
Ethanol Extractor Has Portions That are Open to Air (e.g. tops of vessels only covered by cellophane wrap – but should be closed loop).	This is under Unit Physical and there is no closed container provision in Unit Physical. Incidental storage rule is 1910.106(e)(2)(iv)(B).	437-004-0720(7)(d) or 437-004-0099(2)(e)
Pressure vessel of butane has no pressure relief valve PRV.	437-001-0760(1)(c) – Employer Control Measures	437-004-0099(2)(c)(C) – Employer Means and Methods
PRV is rated too high. PRV not tagged for the specific relief pressure	437-001-0760(1)(c) – Employer Control Measures	437-004-0099(2)(c)(C) – Employer Means and Methods
Flammable storage room (inside flammable storage room) had no ventilation.	1910.106(d)(4)(iv) – 6 Air Changes Hour	No Rule

Hazard Scenario	Division 2 Rule Note: Cannabis Extractors will ordinarily be Classified as Unit Physical Operations not Incidental Use.	Division 4 Rule
		437-04-720(10)(A)(a) [Not specific to ventilation]
Inside flammable storage room not constructed with fire rated walls.	1910.106(d)(4)(i)	437-004-0720(10)(a)(B)
Flammables are transferred without grounding and bonding. Ethanol may not apply to grounding requirement, because of its low static properties.	1910.106(e)(6)(ii) Unit Physical Operation	No Rule,**437-004-0720(6)(c) but rule is not specific about grounding and bounding**
Gravity dispensing flammable liquids without an approved self-closing valve	1910.106(e)(2)(iv)(D)	
Ethanol is processed in a centrifuge with motor that is not Class I/Div 1, or any equipment within the process that is not intrinsically safe.	1910.106(e)(7)(i)(B) IN THE Alternative 1910.307(c)	437-004-0099(2)(e)– Employer Means and Methods or 437-004-0099(2)(e)
Over storage of ethanol – not in a flammable storage room.	1910.106(e)(3)(vi) - Unit physical leads you to tables H-14 and 15 in (d) that allows 2,000 gallons of Cat-2 flammable in piles. However, with the catch that the piles need to be in a cut off portion of the building with firewalls – plus other fire restrictions. The other way to comply here would be to put the flammables in a regulation "Flammable Storage Room". *Rule Chain: 106(e)(3)(vi) Storage and Handling tells you to use (h)(4) in Processing Plants, (h)(4)(i)(D) [Storage] leads to (d) of the rule and (d)(5)(v) [Storage Inside Buildings] has Tables 14-15.*	No part of the rule in AG tells you to store all flammables in a room or cabinet, nor is there a max quantity of unprotected storage. Thus, cite base rule.
Flammable storage cabinet – poor constructions such as not constructed of fire-resistant wall.	1910.106(d)(3)	437-004-0720(9)(a)
Spill control (curbs, dike or secondary containment) is not provided for flammable liquids.	1910.106(e)(3)(iv) Unit Physical Operation	437-004-0720(7)(a)
Means to promptly clean spills (spill kits) are not available for flammable liquids	1910.106(e)(2)(iv)(B)	???? or 437-004-0099(2)(e)

Hazard Scenario	Division 2 Rule Note: Cannabis Extractors will ordinarily be Classified as Unit Physical Operations not Incidental Use.	Division 4 Rule
Ventilation is not provided in areas where flammable liquids are handled. Code: 1 ft^3/square foot.	1910.106(e)(3)(v)(A) Unit Physical Operation	???? or 437-004-0099(2)(e)
Supervision and inspection not provided during hot work	1910.106(e)(8)	????? or 437-004-0099(2)(e)
Ventilation not installed within 12-inches of the floor.	NFPA Chapter 38	
Flammable - Gases (Butane and Propane) *1910.106 Applies to Liquid Flammables Only, so cite using S-Electric (1910.307c etc.)* *1910.110 Liquified Petroleum Gases*		
Regular Electrical Outlets or Electric Devices Within 5 Feet of Class1/Div1 Zone Around Flammable Extractor (Propane/Butane) GAS!	1910.307(c) – ClassI/Div1-2 Note: 307/399 has work vapor in scope.	No Rule (it is gaseous) 437-04-099(5)
Regular Electrical Outlets or Electric Devices Within 20 Feet of Class1/Div2 Zone Around Flammable Extractor (Butane/Propane) GAS!	1910.307(c) - ClassI/Div1-2	No Rule (it is gaseous) 437-04-099(5)
Ventilation not meeting NFPA requirements	437-001-0760	437-04-099(5)
Ventilation not installed within 12-inches of the floor.	NFPA rules	
Extraction equipment not grounded and bonded		
Employees not trained in safe operation of extraction equipment		
Extraction equipment not maintained in accordance with owner manuals. Sanitary clamps not maintained		
Fire Blankets not available		
Life Safety (Egress/Alarms/Fire Suppression)		
Exit Door Opens Against Exit Path	437-002-0041(4)(f)	437-004-0405(4)
The path to the exit is blocked by flammables or other	437-002-0041(1-5)	437-004-0405(3-5)
No Spill Kit	Material Handling ??	? 437-004-1610(1)(l)
No Spill Plan	Material Handling ??	? 437-004-1610(1)(l)
No Alarms for CO2 System or Butane, or alarm set to high.	437-002-0042(3)	? 437-004-0099(2)(e)
CO2 or Butane Alarm is not calibrated.	437-002-0042(3)	? 437-004-0099(2)(e)

Hazard Scenario	Division 2 Rule Note: Cannabis Extractors will ordinarily be Classified as Unit Physical Operations not Incidental Use.	Division 4 Rule
Fire Extinguishers Not Maintained	437-002-0187(1 and 2)	437-004-1450(6)
PPE		
Standard PPE Deficiencies	Standard Issues 437-002-0134	437-004-1005 General 437-004-1041 Respirator 437-004-1035 Eye 437-004-1050 Head 437-004-1060 Hand
No eyewash	437-002-0161	437-004-1305(5)
HazCom		
Standard HazCom Issues - No SDSs or Written Plan or Training	Standard 1910.1200	437-004-9800
Unlabeled containers	1910.1200(f)(6)	437-004-9800(4)(c)(5)
Equipment		
CO_2/Butane/Propane vented to back within the room – not outside.	437-002-0081(2)(a) – No exhaust shall be recirculated	No Rule
Brass nuts on high pressure clamps for the cannabis extraction chambers are not maintained properly (should be changed frequently).	437-001-0760(6) – Extraordinary Hazards.	437-004-0099(5) – Extraordinary Hazards
Room control ventilation duct is in the ceiling, but the vapors are heavier than air. Ventilation should be on the floor.	1910.106(e)(3)(v)(A): Ventilation shall be arranged to include all floor areas or pits where flammable vapors may collect.	No Rule or 437-004-0099(2)(e)
The exhaust stacks for flammable extraction processes are configured so that gas and vapors can concentrate on flat roofs (stacks need to be ten feet over the surface of the roof)?	437-002-0081(2)(a) – No exhaust shall be recirculated	No Rule or 437-004-0099(2)(e)
Refrigerator for extraction process is not "Lab Safe" – not intrinsically safe inside the cabinet.	1910.106(e)(7)(i)(B) IN THE Alternative 1910.307(c)	437-004-0720(7)(b)
Vacuum ovens are not vented outside at least 8 feet from a building opening	437-002-0081(2)(a) – No exhaust shall be recirculated	No Rule or 437-004-0099(2)(e)
Butane system vents to an unsafe location – such as by a smoking area.	437-002-0081(2)(a) – No exhaust shall be recirculated or 437-002-0081(8) Recirculating to Ignition Source	No Rule or 437-004-0099(2)(e)
No LOTO for CO2 system repairs – the program missing.	1910.147(c)….	No LOTO Rule
Latex transfer hoses on ethanol extractor – ethanol degrades latex and would leak.	437-001-0760(6) – Extraordinary Hazards.	437-004-0099(2)(c)(C) or 437-004-0099(2)(e)

Hazard Scenario	Division 2 Rule Note: Cannabis Extractors will ordinarily be Classified as Unit Physical Operations not Incidental Use.	Division 4 Rule
There is no maintenance plan to replace the O-rings on butane extractors because butane degrades the rubber?	437-001-0760(1)(c) – Employer Control Measures	437-004-0099(2)(c)(C) – Employer Means and Methods or 437-004-0099(2)(e)
Large carbon dioxide tanks ("Dewars" cryogenic vessels) are in an unsafe location and not protected from being hit by vehicles?	437-002-2101(2)	437-004-0710
Flexible electrical cords and cables used in place of fixed installations.	1910.305(g)(1)(iv)(A)	437-004-2860
Pipes for hazardous chemicals are not labeled.	437-002-0378(4)(a)	No Rule
Compressed gas cylinders are not chained (associated with welding).	437-002-2253(6)(f)(B)(ii)	437-004-0710(3)(n)
A full chemistry lab (not QA) associated with cannabis did not have a Chemical Hygiene Plan.	1910.1450(e)	No Rule
Confined Space		
No confined space assessment for extract storage tank in Hemp Extraction.	437-002-0146(4)(a)	437-004-1250(3)(e)

Appendix G
Butane chemical information

It is recommended that you contact the lab and/or review the lab's internal page to determine appropriate sampling equipment or media, dependent upon the processing agent. Some options are listed below, but due to the rapidly changing technology of sampling equipment, please consult with the Oregon Occupational Health Lab.

https://sensidyne.com/application/high-priority-safe-air-quality-in-cannabis-hemp-oil-extraction/

Chemical Identification:

CAS #	106-97-8
Formula	C_4H_{10}
Synonyms	normal-butane (n-butane); butyl hydride; diethyl; methylethylmethane

Physical Properties:

Physical description	Colorless gas with a gasoline-like or natural gas odor.		
Boiling point:	31°F	Molecular weight	58.1
Freezing point/melting point	-217°F	Vapor pressure	2.05 atm
Flash point	-76°F	Vapor density	2.11
Specific gravity	0.6 at 32°F	Ionization potential	10.63 eV
Lower explosive limit (LEL)	1.6%	Upper explosive limit (UEL)	8.4%
NFPA health rating	1	NFPA fire rating	
NFPA reactivity rating	0		

Monitoring Methods Used by OSHA:

Analyte code (IMIS no.)	0420
Sampler/Sampling media	2 tubes, ORBO™ 91 Carbosieve® S-III (130/65) in series [Supelco 20360]
Sampling time*	60 min
Sampling volume (TWA)*	3 L
Sampling flow rate (TWA)*	0.05 L/min
Analytical method instruments	GC-FID
Method reference	OSHA PV2010 (partially validated)

On-site Screening Techniques:

Device	Detector tube	Detector tube
Model/Type	Gastec 104	Matheson-Kitagawa 8014-221SA
Sampling information (see manufacturer instructions)	1 stroke, 5-1400 ppm range, uncertainty 16% for 25-400 ppm, 8% for 400-1400 ppm	1 stroke, approx. 0.02-0.6% range

Exposure Limits:

NIOSH REL Up to 10-hour TWA (ST) STEL (C) Ceiling		ACGIH TLV© 8-hour TWA (ST) STEL (C) Ceiling		CAL/OSHA PEL 8-hour TWA (ST) STEL (C) Ceiling Peak	
REL-TWA	800 ppm (1900 mg/m³)	TLV-TWA	1000 ppm [2012]	PEL-TWA	800 ppm (1900 mg/m³)
		Notes: (EX) Explosion hazard: the substance is a flammable asphyxiant or excursions above the TLV could approach 10% of the LEL.			

Sampling:
OSHA: https://www.osha.gov/chemicaldata/49

Health Hazard Information:
Acute Health Effects:
The primary risk of exposure to butane is narcosis, which occurs at high exposure levels. Exposure to 10,000 ppm butane for 10 minutes causes drowsiness, but there are no reports of systemic toxicity or irritation at this level (Gerarde 1963a, as cited in ACGIH 1986/Ex. 1-3, p. 10).

Butane Monitoring Dilemma:
Butane has a radically different flammable range compared to Methane or Pentane.
We need to understand and adjust the gas meters we use to properly measure it.
GFG Meters Use Methane Calibration Gas

Butane = 1.8 LEL (%Volume) to 8.4 UEL (%Volume)
Remember 1% by Volume = 10,000 ppm, so 1.8% = 18,000 ppm
Methane = 5 LEL (%Volume) to 15 UEL (%Volume)
Pentane = 1.5 LEL (%Volume) to 7.8 UEL (%Volume)

How far off is an inspector if they calibrate with methane instead of butane?

Question: If a methane calibrated meter says 10% of the LEL (or 10% of 1.8% by volume, or 1,800 ppm)
Answer: The corrected “true” concentration of butane would be only 1,080 ppm. We are off by 780 ppm. – (10% of LEL on Meter x 0.6 Relative Response Correction Factor = 6 % of the LEL or 1,080 ppm.)

Solutions:
a) Calibrate with butane, so the response is 1 to 1.
b) Apply the correction factor.

History: Issued 08-29-2024; Revised 12-13-2024