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C1D1 AND C1D2 HAZARDOUS AREAS FOR CANNABIS EXTRACTION FACILITIES



Sabine Downer (/biog?autnor=be3b8dd08bb848072bb8b20b) · March 2, 2020 (/biog/c1d1and-c1d2-hazardous-areas-for-cannabis-extraction-facilities) · Regulatory Compliance (/blog/category/Regulatory+Compliance), Extraction Equipment (/blog/category/Extraction+Equipment)

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When working in a cannabis extraction facility, safety is a major concern. These facilities contain hazardous areas where flammable gases, vapors, or liquids that are part of the

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C1D1 AND C1D2 HAZARDOUS AREAS FOR



extraction process present the potential for fires and explosions. These areas are referred to as Class 1 Division 1 (C1D1) and Class 1 Division 2 (C1D2) locations.

In the cannabis industry, C1D1 and C1D2 hazardous areas include areas where facilities are performing any of the following activities:

- Cannabis oil extraction using Liquefied Petroleum Gasses (Butane)
- Cannabis oil extraction using flammable solvents (Ethanol, Isopropynal, Heptane)
- Solvent distillation
- Solvent recovery
- Winterization of oils

WHAT IS A C1D1 LOCATION?

CBD extraction and cannabis extraction activities need to be housed in special areas where extraction equipment can be used safely. These areas are classified as C1D1 areas because explosive and flammable conditions exist under normal operating conditions.

The National Fire Protection Association's (NFPA) Publication 70 and Occupational Safety and Health Administration (OSHA) defines the difference between C1D1 and C1D2 locations based on how gases or vapors are contained or used. NFPA Publication 70 elaborates that C1D1 spaces are any location where one of the following conditions exists:

"(1) An ignitable concentration of flammable gas or vapor can exist under normal operating conditions.

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(2) An ignitable concentration of flammable gas or vapor can exist frequently because of repair or maintenance operations or because of leakage.

(3) Breakdown or faulty operation of equipment or processes might release an ignitable concentration of flammable gas or vapor and might also cause [the] simultaneous failure of electrical equipment in such a way as to directly cause the electrical equipment to become a source of ignition."

In hydrocarbon extraction facilities gases like propane and butane are used to extract cannabis or hemp. In facilities that perform hydrocarbon cannabis extraction C1D1 conditions exist under normal operating conditions because of the use of ignitable concentrations of flammable gases or vapors, or because of repair, maintenance, or a leak. Breakdown or operation errors may also release ignitable concentrations of flammable gases or vapors.

WHAT IS A C1D2 LOCATION?

Adjacent to C1D1 CBD extraction and cannabis extraction rooms, there may be a C1D2 area. This area may be used to house chillers and handle extraction solvents like ethanol, propane, and butane.

If one of the three following situations exist, a location is considered to meet the criteria for a C1D2 location:

"(1) Volatile flammable liquids or flammable gases are handled, processed or used, but the hazardous liquids, vapors or gases will normally be confined within closed containers or closed systems from which they can cannabis-or-the-devils-lettuce)

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LABORATORY HAZARD escape only in the event of accidental rupture or breakdown of such containers or systems, or as a result of abnormal operation of equipment.

(2) Ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation, and which might become hazardous through failure or abnormal operations of the ventilating equipment.

(3) Adjacent to a Class I, Division 1 location, and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air, and effective safeguards against ventilation failure are provided."

When volatile flammable liquids or gases are used but are usually confined in closed containers or closed systems, a location is classified as C1D2. C1D2 locations may also exist if positive mechanical ventilation is used to prevent the accumulation of ignitable concentrations of gas or vapor. Some C1D1 locations have adjacent areas that qualify as C1D2 if gases or vapors may occasionally be present in that area without the use of ventilation to prevent accumulation.

Major Compliance Requirements for C1D1 Areas

- Evacuation and dilution of atmosphere through use of C1D1 certified ventilation equipment
- All components inside a C1D1 space must be C1D1 certified explosion-proof
- C1D1 locations need to have interior and exterior monitoring of concentrations of flammable gases and vapors
- Fire suppression systems and alarms for excessive concentrations of flammable dases and vapors are needed

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• Electrical equipment in C1D1 areas must have special wiring to ensure that electronics to dot contribute to flammable and explosive hazards



Equipment approved for use in a C1D1 location may be used in a C1D2 location as long as it is approved for Class 1 and the same group. However, Class 1 equipment is made for different purposes and cannot be used in Class 2 locations. Class 2 equipment is required to seal out dust, but only Class 1 equipment must be capable of containing an internal explosion.





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OVERVIEW OF HAZARD CLASSES, DIVISIONS, GROUPS, AND ZONES

The NFPA establishes area classifications based on Classes, Divisions and Zones.

Combinations of Classes, Divisions, and Zones are used to specify what kind of hazardous conditions exist in a specified area.

Table 1: Comparison of Class/Division system and Zone system		
Hazardous Material	Class/Division	Zone
Gases or Vapors	Division1	Zone 0 and Zone 1
	Division 2	Zone 2
Table 2: Frequency of hazard occurrence determines the location's hazard level		
Continuous Hazard	Class 1, Division 1 (C1D1)	Zone 0
Intermittent/Periodic Hazard		Zone 1
Abnormal Occurrence of Hazard	Class 1, Division 2 (C1D2)	Zone 2

The Class of hazardous materials are distinguished by type:

- Class 1: Flammable gases, flammable liquid-produced vapors, and combustible liquidproduced vapors
- Class 2: Combustible dusts
- Class 3: Ignitable fibers/flyings

Divisions of hazardous areas fall under one of two categories based on what gases or vapors

can exist under normal operating conditions:

Division 1

- Ignitable concentrations of flammable gases,
- Flammable liquid-produced vapors, or
- Combustible liquid-produced vapors
 <u>are likely to exist</u>

Division 2

- Ignitable concentrations of flammable gases,
- Flammable liquid-produced vapors, or
- Combustible liquid-produced vapors
 <u>are not likely to exist</u>

C1D1 locations are therefore qualified by the following:

Class 1: Flammable gases, flammable liquid-produced vapors, and combustible liquidproduced vapors

Division 1

- Ignitable concentrations of flammable gases,
- Flammable liquid-produced vapors. or



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Combustible liquid-produced vapors are likely to exist

C1D2 locations are therefore qualified by the following:

Class 1: Flammable gases, flammable liquid-produced vapors, and combustible liquidproduced vapors

Division 2

- · Ignitable concentrations of flammable gases,
- Flammable liquid-produced vapors, or
- · Combustible liquid-produced vapors are not likely to exist

NEC article 505-506/CEC section 18 also describes hazardous zone classifications:

Zone 0: Ignitable concentrations of flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors are present continuously or for long periods of time under normal operating conditions.

Zone 1: Ignitable concentrations of flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors are likely to exist under normal operating conditions.

Zone 2: Ignitable concentrations of flammable gases, flammable liquid-produced vapors, or combustible liquid-produced vapors are not likely to exist under normal operating conditions.

C1D1 and C1D2 locations may further contain different Groups of materials depending on the specific type of hazardous material being used in the location:

Group A: Acetylene

Group B: Hydrogen

Group C: Ethylene

Group D: Propane



CANNABIS EXTRACTION EQUIPMENT AND CBD EXTRACTION EQUIPMENT SAFETY

C1D1 and C1D2 equipment is required to be labelled according to the hazard group the equipment is approved to operate in. The National Electric Code elaborates these groupings

"Group A: Acetylene

Group B: Flammable gas, flammable liquid-produced vapor or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value less than or equal to 0.45mm or minimum igniting current ratio (MIC ratio) less than or equal to 0.40. Example: Hydrogen.

Group C: Flammable gas, flammable liquid-produced vapor or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than or equal to 0.45mm or less than 0.75mm, or minimum igniting current ratio (MIC ratio) greater than 0.40 and less than or equal to 0.80. Example: Ethylene

Group D: Flammable gas, flammable liquid-produced vapor or combustible liquid-produced vapor mixed with air that may burn or explode, having either a maximum experimental safe gap (MESG) value greater than or equal to 0.75mm or minimum igniting current ratio (MIC ratio) greater than 0.80. Example: Propane."

ELECTRICAL CANNABIS EXTRACTION EQUIPMENT AND CBD EXTRACTION EQUIPMENT FOR C1D1 AND C1D2 LOCATIONS Electrical equipment in cannabis extraction labs can cause explosions in certain hazardous atmospheres. In atmospheres like cannabis extraction labs, explosive concentrations of gases and vapors are likely present. This means that special wiring and other electrical components must be used in equipment. Equipment that is certified for these types of environments is labeled according to the electrical protection type. These abbreviations are prescribed by the National Electric Code in Articles 500 to 506.

Electrical Protection Types for Gas Atmosphere Cannabis Extraction Equipment

- "d" flameproof (for EPL Gb or Mb)
- "e" increased safety (for EPL Gb or Mb)
- "ia" intrinsic safety (for EPL Ga or Ma)
- "ib" intrinsic safety (for EPL Gb or Mb)
- "ic" intrinsic safety (for EPL Gc)
- "ma" encapsulation (for EPL Ga or Ma)
- "mb" encapsulation (for EPL Gb or Mb)
- "mc" encapsulation (for EPL Gc)
- "nA" non-sparking (for EPL Gc)
- "nC" protected sparking (for EPL Gc)
- "nR" restricted breathing (for EPL Gc)



"o" – oil immersion (for EPL Gb)

"op is" – inherently safe optical radiation (for EPL Ga, Gb or Gc)

"op pr" – protected optical radiation (for EPL Gb or Gc)

"op sh" – optical system with interlock (for EPL Ga, Gb or Gc)

"pv" – pressurization (for EPL Gb or Gc)

"px" – pressurization (for EPL Gb or Mb)

"py" – pressurization (for EPL Gb)

"pz" – pressurization (for EPL Gc)

"q" – powder filling (for EPL Gb or Mb)

Each code for electrical protection corresponds to an Equipment Protection Level (EPL). This level is assigned based on the likelihood of the equipment becoming a source of ignition and distinguishing the differences between explosive gas atmospheres, explosive dust atmospheres and the explosive atmospheres in mines. For cannabis extraction equipment, it is important to know the Equipment Protection Levels for explosive gas atmospheres:

"EPL Ga – Equipment for explosive gas atmospheres, having a high level of protection, which is not a source of ignition in normal operation, during expected malfunctions or during rare malfunctions.

EPL Gb – Equipment for explosive gas atmospheres, having a high level of protection, which is not a source of ignition in normal operation or during expected malfunctions.

EPL Gc – Equipment for explosive gas atmospheres, having an enhanced

ievel of protection, which is not a source of ignition in normal operation and which may have some additional protection to ensure that it remains inactive as an ignition source in the case of regular expected occurrences, for example, failure of a lamp."



C1D1 AND C1D2 SAFETY SHOWERS

Safety shower water heaters in C1D1 and C1D2 locations need to provide protection from sparks or flames, to prevent explosions. All electrical equipment associated with the safety shower must also be certified for use in C1D1 and C1D2 locations. In addition to the individual parts being certified, the entire assembled shower must also be certified.

If a safety shower is not specially certified for use in C1D1 and C1D2 locations it can contribute to explosions. Safety showers in C1D1 and C1D2 facilities need to go beyond the minimum requirements to make sure they do not create further hazards.

VENTILATION FOR C1D1 AND C1D2 LOCATIONS IN CANNABIS AND CBD EXTRACTION LABS

Ventilation is especially important in cannabis extraction labs and CBD extraction labs. Most would not think that HVAC equipment and air conditioning could be sources of or contributors to explosions and fires, but they may. C1D1 and C1D2 rated HVAC systems are important in chemical storage areas and in extraction labs.

C1D2 air conditioning often does not require special modifications. C1D1 air conditioning can also be used in C1D2 areas, but C1D1 air conditioning must have explosion-proof modifications. A C1D2 air conditioning system cannot be used in a C1D1 area.

The added expense of C1D1 rated HVAC equipment can be avoided in some cases where HVAC electrical equipment can be placed in non-hazardous classified areas. Air conditioners consist of two sections- an indoor evaporator and an outdoor condenser. These two sections may be classified differently. Inside the C1D1 area a C1D1 rated evaporator is necessary, but if the condenser is located outside of the C1D1 area it will not need to be C1D1 rated.





HOW TO DESIGN AN EXTRACTION LAB

- 1. Assemble a hazmat design team that includes an architect, chemical process engineer, and fire protection engineer. Work with this team to create a floor plan, equipment list, process flow diagram, and fire protection technical report. Designing a facility right ensures that it will be designed for safety and ready for approval from the city.
- 2. Submit architectural and MEP engineering materials for local building approval.
- 3. Build the extraction lab!
- 4. Inspection and certification will be needed after the cannabis or CBD extraction lab is built and equipped. Here are some of the inspections and certifications that may be necessary:
 - · Certification is needed for ordinary location and safe area requirements to

evaluate it for risks of shock, fire and personal injury.

 Hazardous locations and explosion protection requirements must be certified to meet the requirements of the area classification and explosion protection requirements for the division or zone according to U.S. UL and American National Standards Institute (ANSI) and CAN Standards.

 Occupational Safety and Health Administration (OSHA) and Standards Council of Canada (SCC) regulations require that production controls must be in place.
 Production controls must have a minimum of four production inspections per year.

HAZARD JARGON

When researching C1D1 and C1D2 compliance, there may be some unfamiliar terminology. Here are definitions of some of the common terms that may be encountered:

Dielectric

Electrical charges do not flow through dielectric material when it is placed in an electric field. Because of this property, a dielectric (or dielectric material) is used as an electrical insulator.

Explosion-proof Apparatus

An explosion-proof apparatus is a space enclosed in a case that is able to withstand an explosion from gas or vapor. The apparatus is specific to the type of gas or vapor being used within it and is able to prevent it from igniting, flashing, or exploding. An explosion-proof apparatus must operate at temperatures that do not pose the risk of igniting flammable materials in its atmosphere.

Hazardous Location

Hazardous locations exist where fire hazards are present due to the presence of flammable gases or combustible vapors or dusts. Ignitable fibers or flyings may also qualify an area as a hazardous location. The likelihood of an ignitable concentration of combustible material being present in an area determines how a hazardous area is classified.

Insulated

Insulated materials offer high resistance to current conduction by separating conductive surfaces by using dielectric.

Intrinsically Safe

The term "intrinsically safe" describes apparatuses and equipment that are designed so electrical circuits are not capable of causing sparks or heat that could ignite flammable gases or vapors in the atmosphere. Intrinsically safe equipment and apparatuses withstand test conditions described in ANSI/UL 913 Ed 8.

YOUR RESOURCE FOR CANNABIS AND CBD EXTRACTION EQUIPMENT SAFETY

If you are looking for more guidance on extraction equipment, Green Machine Labs (https://www.grmlabs.com/consultation) has the answers! Maybe you are not ready to purchase quite yet or are looking for custom extraction equipment fabrication? Feel free to shoot us an email or give us a call. We are always excited to help new and experienced cannabis extractors achieve their goals.



Our mission is to provide cutting edge cannabis extraction equipment solutions while educating and building a community dedicated to cannabis quality.

REFERENCES

29 CFR 1910.307 - Hazardous (Classified) Locations

29 CFR 1910.399 – Definitions Applicable to Subpart S

National Electric Code 2014 edition - National Fire Protection Association

Fire Protection Handbook 20th edition - National Fire Protection Association

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