

Edmond Fire Department

Plant extraction, processing, and/or testing operations



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Purpose: To provide uniform guidelines that will provide for safe operations of plant extracting, processing, and/or testing operations and in compliance with building and fire code requirements of the International Fire Code (IFC), International Building Code (IBC), the National Fire Protection Association (NFPA) and Title 17 of the City of Edmond Ordinance.

- Fire Protection Systems.

Plant Cultivation operations in commercial buildings are typically classified as F-1 occupancy. There are several common triggers for plant cultivation operations that require the installation of a fire sprinkler system.

1. Section 903.2.4 of the IFC specifically addresses F-1 sprinkler requirements with the most common trigger being a fire area exceeding 12,000 square feet.
2. 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. Group H occupancies includes operations using CO₂, LPG (Liquid Petroleum Gas), or other compressed gas systems.

An LPG extraction room, booth, or hood is required to be provided with an automatic fire suppression system in accordance with IFC Chapter 9. An automatic fire suppression system is also required in a flammable liquid extraction room, booth, or hood where vapors are released exceeding 25% of the LFL (lower flammable limit). No suppression systems are required in CO₂ extraction rooms where the building is not required to be sprinklered. Where the building is required to be sprinklered, the sprinkler system shall be extended to the room, booth, or hood in accordance with IFC 2015 requirements. Where the building is not required to be sprinklered, an alternative suppression system must be provided in accordance with IFC Section 904. These extraction room requirements are not applicable to water extractions, kief production rooms, food-based extractions, or other extraction processes not using hazardous materials.

- Extraction Process Equipment

Liquefied Petroleum Gas (LPG) and CO2 Extraction Equipment

Only closed-loop type LPG extraction equipment that has been designed to meet applicable sections of NFPA 58 is permitted. Open blasting extractions or equipment that releases butane to the atmosphere during the extraction process is strictly prohibited. Because there is no listing (such as UL, ETL, etc.) available for compressed-gas extraction systems using hazardous materials approval must be approved by an engineering report (signed and sealed by a licensed Oklahoma engineer). This approval report is required by IFC 2015 Section 104.7.2. It is the responsibility of the engineer to justify how the system meets IFC and any other national standards as any other national standards as a basis of design, including an analysis/ description of every component of the system.

Flammable liquid distillation or evaporative process equipment

There are numerous methods to perform distillation or evaporative extraction / refinement processes. In general, electrified equipment used in these processes are required to be listed by a NRTL for their intended use and are required to be operated within the manufacturer's guidelines. Equipment such as rotary evaporators are typically listed for distillation processes. Where distillation stills or heated evaporation processes are performed, the heating source shall be listed as explosion-proof (i.e. rated for the electrically classified location) unless it can be shown that the equipment has been tested as part of its listing to heat flammable liquids without the explosion-proof classification.

Vacuum Ovens

Vacuums ovens shall not be used to process volatile gases (i.e. alcohol/oil mixtures, oil containing off-gassing LPG, other flammable liquids, etc.) unless the vacuum oven is rated to process these vapors (typically an explosion-proof classification). It is the responsibility of the extraction process permit holder and operator to ensure the material being introduced into the ovens does not contain volatiles. All vacuum ovens shall be listed by a NRTL.

Refrigerators

Refrigerated storage or processing of flammable liquids including oil-laden with flammable liquids must only use refrigerators/freezer rated to store flammable liquids. At minimum, a "Lab-Safe" or "Flammable Safe" rated refrigerator/freezer must be used. Residential type refrigerators are not rated by the manufacturer for flammable liquid storage or processing. See NFPA 45 for further information regarding refrigerators used for flammable liquid storage.

- Extraction Room Construction, Gas Detection, Exhaust, & Electrical Systems.

Room Construction

Extraction rooms are required to be in a room dedicated to the extraction process. There must be no other equipment with the room (i.e. refrigerators, cooking appliances, electrical panels, computers, cell phones, etc.) that is not associated with the extraction process. Additionally, there must be no penetrations into the room that are not essential for the extraction process (i.e. gas lines, HVAC systems, plumbing, etc.) Rooms are to be continuous, noncombustible, and smooth construction, and rooms finish should also consider Department of Health requirements for cleaning purposes. Booths constructed in compliance with flammable finish requirements of IFC will be accepted as meeting these construction requirements. Acoustic-type drop ceilings that could conflict with large LPG extraction exhaust systems will not be permitted. Hand sinks and eye wash stations (if required by other Codes) can be in the room. Doors to the extraction room using hazardous materials (i.e. CO₂, LPG, or flammable liquids) must swing in the direction of egress, be self-closing/latching, and be provided with panic hardware. Post oil processing typically uses less than 5 gallons of flammable liquids and may be performed outside of the dedicated extraction. This process can typically be performed under a bench-top chemical fume hood.

LPG Extraction Process Gas Detection Systems

There are two forms of flammable gas detection required in LPG extraction areas: fixed continuous flammable gas detector serving the room, hood, or booth and a portable flammable gas detector. The intent of these type of flammable gas detection systems within LPG extraction areas is twofold: for alerting the extraction process operator(s) that the area is at or above 10% of the lower flammable limit and for the extraction process operator(s) to specifically identify potential leaks during the extraction and additionally to determine when oil and spent plant material is finished off-gassing and is safe to be removed from the extraction area.

The fixed detector must be installed in accordance with the manufacture's guidelines and depending on the size and configuration of the room, booth, or hood, additional detectors may be required. The fixed detection alarm is a local alarm only and does not require off-site monitoring and does not require full occupant notification of the building or extraction room (including ADA visual notification) as a fire alarm system may require. Fixed detection is to alarm at 10% of the lower flammable limit. The method of alerting the extraction operator (audible / visual notification) is based on the type of the gas detector chosen. Some detectors have integrated visual alarms only that can be accepted when installed within clear view of the extraction operator; i.e. at eye level with the sensor extended to the floor. Otherwise, a remote visual or audible local alarm can be accepted.

LPG Extraction Exhaust Systems

A Hazardous exhaust system is required to be installed in accordance with the Mechanical Code for extraction processes using LPG. There are many ways to design a hazardous exhaust system including fume hoods, walk-in hoods, booths, and exhausted rooms. There are manufacturers of booths and hood that meet this requirement in a complete off-the-shelf package. Exhaust systems can also be built specifically to suit the needs of a location or process; however, no one system is dictated by the Fire Code. The engineer of record must design and/or specify a system to meet the minimum requirements of a hazardous exhaust system.

The exhaust system provided is to be designed with capture and containment velocities across the work area (IMC 510.5.4) as typically seen with other industrial or laboratory processes using hazardous material. There are several different types of work areas that must be considered in this design and may be different for each extraction equipment manufacturer. The extraction process equipment location, the location of oil retrieval, and the location of LPG-laden plant material removed from the extraction equipment for degassing are all work areas that are intended to be provided with exhaust systems capture and containment velocities. The assumption that a "closed-loop" system does not release LPG into the atmosphere will not be accepted as a basis in the design of these exhaust systems, since all extraction systems must be opened at some point in the process with vapor released. It is recommended that the ACGIH Industrial Ventilation Handbook be consulted for exhaust system and capture and containment velocity design.

LPG Extraction Electrical Systems

The location of the LPG extraction process must be considered a Class I Division I location in accordance with the National Electric Code (NEC); depending on the type of exhaust system provided, this could be the entire room or the area inside of a hood or booth. This Class I Division I requirements was based on flammable gas metering of several extraction processes, all of which exceeded minimum LFLs during equipment openings for oil retrieval and removal of LPG-laden plant material in addition to other known equipment and accidental process failures releasing LPG. Flammable gasses are present during normal extraction operations; therefore, this location meets the definition of a Class I Division I location per the NEC.

The location adjacent to the Class I Division I location must be classified by the design engineer (i.e. doors to the extraction room, hoods opening into the extraction room, etc.). This is dependent on the type of exhaust system provided and the room configuration. Normally, "adjacent locations" must be from the Class I Division II; however, the NEC does not define a required distance that an "adjacent location" must be from the Class I Division II as a location in order to be classified as a Class I Division II location. The NEC defines Class I Division II as a location where flammable vapors could be present from accidental rupture or breakdown of containers. Therefore, this location classification should be established on a total extraction equipment failure. This classification has been intentionally left to the determination of the responsible engineer since many factors can influence this area, such as mechanical exhaust sizing, total LPG within the extraction equipment, etc.

Based on the Class I Division II location, all equipment in the extraction room must be rated for use in Class I Division I locations. This includes lighting, power receptacles, vacuum pumps, recovery pumps, and any other electrical equipment in the room. The need for explosion-proof rated equipment can be minimized. Lighting located behind a vapor-tight glazing panel outside of the extraction room/booth is not required to be classified as Class I Division I; this concept is like flammable finish spray booth lighting systems. Other extraction processes support systems such as air compressors to drive recovery pumps, heated/chilled water circulation pumps, vacuum air systems, etc. can all be located outside of the Class I location and piped into the process area. Where electrical equipment is needed, it must be rated for the Class I location in which it is installed in. To reduce the possibility of spark from static discharge, all metal objects including ductwork, hand sinks, water piping, etc. must be grounded/bonded in accordance with the NEC. This will also require the extraction equipment to be grounded/bonded.

The room lighting and room power receptacles (where provided) are required to be interlocked with the exhaust system such that the room power and lighting will not operate without the exhaust system running. Power serving room flammable gas detectors is not required to be part of this interlock requirement.

All electrical systems and permitting are required to be done by licensed electricians and contractors, "Electrical Contractor Registration," B.R.C.4-8-1. In addition, a single line diagram of the existing and proposed electrical system, including the main electrical service National Electric Code (NEC) 215.5, shall be provided to the city. Electrical services which are 400 amps or greater must be reviewed and approved by an Edmond Electric member.

Flexible cords (extension cords) are not to be used as a substitute for fixed wiring nor run through or concealed by holes in walls, structural ceilings, suspended ceilings, dropped ceilings or floors; run through doorways, windows or similar openings; attached to building surfaces, NEC 400.8.

Flammable Liquid Extraction & Post Oil Processing Exhaust Systems

For the purpose of this section, exhaust system requirements for extraction processes using flammable liquids are also required for post oil processing using flammable liquids. Post oil processing is an oil refining or winterization process occurring after the initial extraction is completed. There are many different methods available to perform flammable liquid extractions as well as a variety of equipment available; therefore, all processes cannot be described in detail within this guideline. Generally, these processes can be grouped into two categories; distillation extractions where most of the flammable solvent is recollected OR a heated boil-off (evaporative) process where flammable liquid is evaporated to the atmosphere without recollection. A hazardous exhaust system is required complying with IMC Section 510 for flammable liquid processes exceeding 5 gallons. These typically included boil/evaporative processes, distillation processes, and flammable liquid plant wash processes. This exhaust system is intended for larger processes where dispensing of flammable liquids also occurs in greater volumes, flammable liquid laden plant material is removed from equipment and/or vapors are present from heated extraction processes. The exhaust system must provide capture and containment velocity across the work area per IMC Section 510.5.4 and is typically provided in the form of a standard lab-type exhaust hood. It is suggested that the ACGIH Industrial Ventilation Handbook be consulted for exhaust system and capture velocity design. Distillation process using less than 5 gallons are to be performed under a chemical fume hood designed to contain fumes within the hood and exhaust them to the exterior. This system does not have the duct gauge thickness and other requirements of a full hazardous exhaust system. This exhaust system is typically for smaller bench-top type of distillations and small flammable liquid dispensing volumes. Listed solvent distillations units complying with IFC 5705.4 are not subject to these exhaust system requirements.

CO2 Extraction Process Gas Detection Systems & Storage and Handling

An approved, listed CO2 detector is required be installed when CO2 is being used, including extraction, inside any room using CO2. Auto calibrating and self-zeroing devices or detectors shall be prohibited. The CO2 detectors are required to be set to alarm at 5000 ppm of CO2. All CO2 compressed gas cylinders shall be secured to a fixed object to prevent falling. See IFC 53 for compressed gas storage requirements.

CO2 Extraction Exhaust Systems & Electrical Systems

CO2 extraction equipment is required to have releases of CO2 vented to the exterior of the building. There are no further exhaust system or electrical requirements above ordinary requirements of the International Building Code.

- **Filling LPG Extraction Equipment**

Filling LPG Extraction Equipment

Although manufacturers may use different terminology, extraction equipment includes an LPG solvent tank (i.e. a local system supply tank) which is filled with LPG and supplies the extraction equipment and this same tank is also used to reclaim LPG after the extraction. Filling the LPG solvent tank from a bulk tank (i.e. typically a 100# tank) is not included in the extrication equipment approval and is regulated per NFPA 58 as LPG liquid transfer.

Filling the solvent tank is regulated as LPG liquid transfer under NFPA 58 and must be conducted outdoors. Indoor filling and/or indoor filling from piped LPG liquid systems may be conducted indoors where the room and process has been designed in accordance with NFPA 58, notably Chapter 10. The requirements of this chapter are stringent and will not be discussed herein due to their complexity. The following is a summary of requirements from NFPA 58:

- I. Personnel conducting liquid transfer operation shall be trained in LPG filling (recertified every 3 years). Documentation of training shall be available (NFPA 58-7.2.1)
- II. Public access to the filling location must be restricted. (i.e. fenced area)
- III. The filling location must be located 15' from combustion engine use; (i.e. vehicle parking). All ignition sources shall be shut off. The location may be located against a noncombustible building wall without openings.
- IV. Electrical equipment is required to be Class I Division I within 5' and Class I Division II within 15' of filling operations.
- V. Where heating blankets are used, they must be listed for use in explosive environments. An electrical permit is required for any circuits being extended to the filling location.
- VI. Where scales are used for weighting containers, they shall be Class I Division I listed or be of the mechanical type.
- VII. Smoking, portable lighting, portable electric tools, etc. shall not be in use within 25' of the filling operation.
- VIII. Purging of tanks may be performed at the tank filling location in accordance with NFPA 58. The tank must be rapidly dispersed in the atmosphere, where environmental conditions do not allow rapid dispersal (i.e. wind conditions, site conditions such as neighboring buildings on lot lines not allowing adequate natural ventilation, etc.). LPG must be flared using a method in compliance with the NFPA 58.

- **Fire Department Access**

Buildings/facilities must have at least one all-weather road that is wide enough (minimum of 20 feet) and strong enough to support the size and weight of fire department apparatus (75,000 pounds). Roads must extend close enough to buildings (but no closer than 10 feet) to allow for firefighting operations. Roads must be marked as "Fire Lane" with signage or painted curbs to disallow parking. A means for turning fire department apparatus around will be required for roads that contain dead ends or no outlet.

Gate or barricades that obstruct roads must be approved by the Building and Fire Code Services branch of the Fire Department.

All required exterior doors must remain operable for emergency access by firefighters. Eliminating the function of any exterior doors requires prior approval that cannot be granted in every circumstance, and where allowed, the door must be marked with a sign stating, "THIS DOOR BLOCKED".

Certain equipment rooms contained within a building may require identifying signage to aid firefighters.

1. Rooms containing fire protection equipment (fire alarm panels, fire sprinkler valves, etc.)
2. Rooms containing controls for air-conditioning equipment.
3. Rooms containing utility equipment for gas or electrical service.
4. Rooms containing hazardous materials.

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