



Midwest City Fire Marshal's Office

8201 E Reno Avenue
Midwest City, OK 73110
Office: 405-739-1340 / Fax: 405-739-1384
www.midwestcityok.org

Administrative Ruling 2019-05

Subject: Plant Extracting, Processing and Testing Operations

Effective: July 30, 2019

Code Reference: 2015 and 2018 International Fire Code (IFC)
2015 International Mechanical Code (IMC)
National Electric Code (NEC)
National Fire Protection Association (NFPA) 45: *Standard on Fire Protection for Laboratories Using Chemicals*
NFPA 58: Liquefied Petroleum Gas Code

Scope:

To provide guidelines that will provide for safe operations of plant extracting, processing and/or testing operations.

Description of Code Reference:

2015 IFC Section 102.9 reads: Requirements that are essential for the public safety of an existing or proposed activity, building or structure, or for the safety of the occupants thereof, that are not specifically provided for by this code, shall be determined by the *fire code official*.

Because of recent State of Oklahoma laws allowing for the legalization of medical marijuana and the City of Midwest City adopted 2015 IFC/IBC not addressing the potentially dangerous processes involving plant extraction, processing and testing operations, the *authority having jurisdiction* will set policy and guidelines based upon municipal codes, NFPA standards, the 2015-2018 IFC and its amendments.

Definitions (2018 IFC):

Desolvenizing – The act of removing a solvent from a material

Miscella – A mixture, in any proportion, of the extracted oil or fat and the extracting solvent

The extraction process includes the act of extraction of the oils and fats by use of a solvent, desolventizing of the raw material, production of the miscella, distillation of the solvent from the miscella and solvent recovery.

Notice:

Part 1 – Extraction Process Equipment

Extraction equipment, including equipment used for winterization or other oil refining processes, that use hazardous materials (i.e. flammable / combustible liquids, Carbon Dioxide (CO₂), liquefied petroleum gases (i.e. butane), etc.) are required to be listed or approved by the *authority having jurisdiction*. Where other processes are proposed, the Fire Code Official shall develop procedures to ensure the safety of the operations needed

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, extraction equipment approval is required from the Midwest City Fire Department for use. To

obtain equipment approval, an engineering report (signed and sealed by a licensed Oklahoma engineer), must be submitted for approval. The 2015 IFC Section 104.7.2 requires this approval report. It is the responsibility of the engineer to justify how the system meets the IFC and any other national standards as a basis of design, including an analysis / description of every component of the system.

Site Specific Engineering Report: Site-specific engineering reports shall be submitted for approval of extraction equipment to be used exclusively at a location with specific equipment. Any modification of the equipment or relocation of equipment to a new address voids the equipment approval.

Master Engineering Report – For manufacturers of extraction equipment, a *Master Engineering Report* can be submitted for approval in lieu of submitting site specific reports for every address. Once approved, the report is retained by the Midwest City Fire Marshal's office. The reported Engineer of Record then provides site specific approval letters certifying (by location address and serial number) that the equipment on-site meets the approved Master Engineering Report on file. Alteration, removal or replacement of documented equipment will result in a "Stop Work Order" being issued and the closure of the facility.

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 *National Recognized Testing Laboratory* (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. Approval of the proposed process equipment shall be submitted during construction permitting review.

Vacuum Ovens:

Vacuum 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 oven 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/freezers 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.

Part II – Extraction Room Construction, Gas Detection, Exhaust, & Electrical Systems

Room Construction:

Extraction rooms are required to be located in a room dedicated to the extraction process. There must be no other equipment within 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 of continuous, noncombustible, and smooth construction, and room 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 located 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 a dedicated extraction room. This process can typically be performed under a bench-top chemical fume hood.

Exception:

- CO2 extraction and extraction processes not utilizing hydrocarbon solvents are not required to be in a room dedicated to the extraction process.

Suppression 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 lower flammable limit (LFL). No suppression systems are required in CO2 extraction rooms when the facility 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.

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 types of flammable gas detection systems within LPG extraction areas are:

1. For alerting the extraction process operator(s) that the area is at or above 10% of the LFL
2. For the extraction process operator(s) to specifically identify potential leaks during the extraction
3. 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 manufacturers' 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 2015 IMC for extraction processes using LPG. There are many different ways to design a hazardous exhaust system including fume hoods, walk-in hoods, booths, and exhausted rooms. There are manufacturers of booths and hoods 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 materials. 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 system 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 *Association Advancing Occupational and Environmental Health* (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; 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 requirement was based on flammable gas metering of several extraction processes, all of which exceeded minimum LFLs during equipment opening 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 are Class I Division II; however, the NEC does not define a required distance that an "adjacent location" must be from the Class I Division I 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 I 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 similar to flammable finish spray booth lighting systems. Other extraction process 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. 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.

Flammable Liquid Extraction & Post Oil Processing Exhaust Systems:

For the purposes 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 ruling. Generally, these processes can be grouped into two categories:

1. Distillation extractions where most of the flammable solvent is recollected
2. 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 include 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 also small

flammable liquid dispensing volumes. Listed solvent distillation units complying with IFC 5705.4 are not subject to these exhaust system requirements.

Flammable Liquid Extraction & Post Oil Processing Electrical Systems:

For rooms, booths, or hoods containing flammable liquid extraction or post oil processes, the electrical location classification must be specified by the responsible licensed design professional. It is expected that this classification is included on building permit drawings and that supporting information is submitted justifying how the location classification was determined. Because there are numerous methods of performing flammable liquid extractions, the process must be evaluated and the classification determination must be established by the licensed design professional. *Note that the licensed design professional must consider not only the process equipment, but also the dispensing (i.e. filling and removal) of flammable liquids, soaking (i.e. plant wash) material in open containers, and the removal of plant material saturated with flammable liquids, because these operations may have an impact on the location classification.*

CO2 Extraction Process Gas Detection Systems:

Fixed continuous monitoring is required when CO2 is being used, including extraction, inside any room using CO2. Any levels outside OSHA standards shall have local audible and visible notification as follows:

- CO2 levels at or exceeding 5000 parts per million.
- CO levels at or exceeding 9 parts per million.
- O2 readings below 19.5% or above 23.5%

CO2 Extraction Exhaust Systems & Electrical Systems

CO2 extraction equipment is required to have releases of CO2 vented to the exterior. Stored cylinders shall be secured to a fixed object to prevent falling. See IFC Chapter 53 for compressed gas storage requirements. There are no further exhaust system or electrical requirements above ordinary requirements of the International Building Code.

Part III – 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. The approval for closed loop LPG extraction equipment discussed in Part I of this document approves only the closed loop system. Filling the LPG solvent tank from a bulk tank (i.e. typically a 100# tank) is not included in the extraction 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. Where performed, this process is included in the Plant Extraction Systems operational permit issued; information on LPG liquid transfer must be included on the permit application.

LPG liquid transfers using lighter refill-type containers using can taps or other puncture equipment is prohibited. The following is a summary of requirements from NFPA 58:

1. Personnel conducting liquid transfer operation shall be trained in LPG filling (recertified every 3 years).
2. Documentation of training shall be available and on-site.
3. Public access to the filling location must be restricted.
4. The filling location must be located 15 feet from combustion engine use; i.e. vehicle parking.
5. All ignition sources shall be shut off.
6. The location may be located against a noncombustible building wall without openings.
7. Electrical equipment is required to be Class I Division I within 5 feet and Class I Division II within 15 feet of filling operations.
8. Where heating blankets are used, they must be listed for use in explosive environments.
9. An electrical permit is required for any circuits being extended to the filling location.

10. Where scales are used for weighing containers, they shall be Class I Division I listed or be of the mechanical type.
11. Smoking, portable lighting, portable electric tools, etc. Shall not be in use within 25 feet of the filling operation.
12. Purging of tanks may be performed at the tank filling location in accordance with NFPA 58.
13. 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.).
14. LPG must be flared using a method in compliance with NFPA 58.

Approved:



Bert Norton
Fire Chief



Duane Helmberger
Fire Marshal