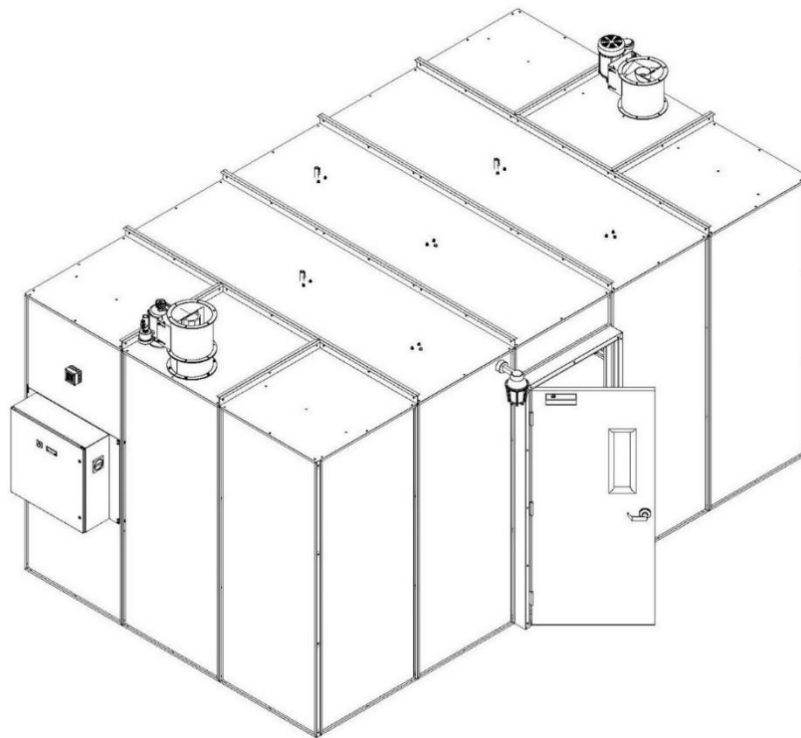


# HAL

## EXTRACTION

### SAFETY AND OPERATING MANUAL EXTRACTION BOOTH SYSTEMS

CAUTION: READ & UNDERSTAND THIS BEFORE USE



**Models 85U, 120U, 150U, 180U, 215U, 85C,  
120C, 150C, 180C, 215C, 170P, 265P, 355P**

HAL EXTRACTION TECHNOLOGY LTD.

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## I. LEGAL DISCLAIMER

In no case shall the equipment manufacturer or its officers, employees, affiliates, agents, contractors, interns, suppliers, service providers or licensors be liable for any injury, loss, claim, or any direct, indirect, incidental, punitive, special, or consequential damages of any kind, including, without limitation lost profits, lost revenue, lost savings, loss of data, replacement costs, or any similar damages, whether based in contract, tort (including negligence), strict liability or otherwise, arising from your use of any of the service or any products procured, or for any other claim related in any way to your use of a service or any product, including, but not limited to, any errors or omissions in any content, or any loss or damage of any kind incurred as a result of the use of the service or any content (or product) posted, transmitted, or otherwise made available via any service, even if advised of their possibility. Because some states or jurisdictions do not allow the exclusion or the limitation of liability for consequential or incidental damages, in such states or jurisdictions, our liability shall be limited to the maximum extent permitted by law.

Any electrical equipment added to the interior or exterior of the Extraction Booth System, and not provided by HAL Extraction as detailed in the Installation Manual, is not covered under the UL Listing.

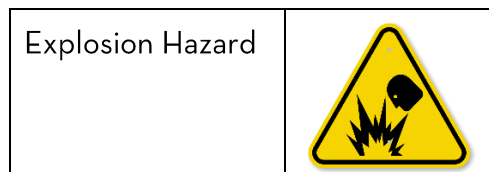
Any electrical equipment added to the interior of the Extraction Booth System, and not provided by HAL Extraction as detailed in the Installation Manual, must be listed for Class I, Division 1, Group D hazardous locations, with a marked Temperature Class not higher than T3.

Any electrical equipment added to the exterior of the Extraction Booth System, and not provided by HAL Extraction as detailed in the Installation Manual, must be listed for Class I, Division 2, Group D hazardous locations, with a marked Temperature Class not higher than T3 if within 3 feet of the any opening of the booth (openings may include the door and the utility penetration plate). The following factors have not been investigated: The physiological or other attributes or effects that can result from the use of these booths and the plant oil extraction process equipment they are intended to enclose.

## II. GENERAL SAFETY AND HEALTH PRECAUTIONS

### A. SAFETY SYMBOLS

Throughout these instructions, these symbols are used to indicate that the instructions are critically important to installer and/or operator safety.



Flammability  
Hazard



## B. WARNING: USE OF HAZARDOUS MATERIALS POSES SEVERE INHERENT DANGERS

The use of flammable, combustible or toxic liquids or gases is inherently dangerous and present real risks to workers and business owners including damaged health, injury, death, and property damage.



**NO SINGLE PIECE OF EQUIPMENT, SYSTEM,  
PERSONAL PROTECTIVE DEVICE, OR PROCEDURE CAN  
ALONE FULLY PROTECT AGAINST THESE HAZARDS.**



It is the responsibility of the owners and users of HAL Extraction Booths to know and understand the hazards of any solvents, liquids, or chemical products being used and to take all appropriate safety and operating precautions for the hazard(s) faced.

The effective prevention of fires, injuries, and accidents when working with hazardous materials requires the use of many overlapping protective systems to reduce the risks to manageable levels. The following list is not meant to be exhaustive; additional measures may be appropriate for your specific use:

- Training of personnel and operators;
- Use of, and enforcement of use of, appropriate personal protective equipment;
- Use of well-designed and properly engineered extraction equipment that has been UL Certified or reviewed by a Professional Engineer or Certified Industrial Hygienist, as appropriate;
- Documented Standard Operating Procedures for the specific facility and products generated;
- Warning signs;
- Appropriate exiting;
- Exhaust ventilation that is not recirculated;
- Toxic or Flammable Liquids and Gases;
  - Control of sources of ignition;
  - Proper equipment grounding;
  - Full-time monitoring of gases with alarm systems to warn of hazardous conditions;
  - Automatic fire protection systems in use and in working order in work areas;
  - Prohibition on use of non-rated electrical equipment in work areas;
- Job safety assessments;
- And, compliance with all applicable safety and environmental rules and regulations.

Each of these measures provides some measure of risk reduction, but none are adequate by themselves. If your pants fall down, you are at risk of embarrassment. To prevent embarrassment, you may choose to wear a belt, suspenders, or an elastic waistband. When your life is at risk, you may want all the protections in place.

**WHEN LIVES ARE AT RISK, ALL APPROPRIATE PROTECTIVE MEASURES MUST BE IN PLACE**



*Interference with the Booth's Systems (ventilation, design, operating procedures, electrical equipment or other features) may increase the risk for fire, injury, or death to occur.*



**C. WARNING: TRANSFILLING LPG CONTAINER FILLING PROHIBITED**

The HAL Booth is designed for plant oil extraction procedures. Some of those extraction procedures use butane and/or propane (liquid petroleum gas or LPG) as solvents. The System is NOT designed for LPG liquid transfilling (tank-to-tank transfer) to or from bulk storage tanks as regulated by NFPA 58. (Note: Some LPG products may require distillation to remove possible contaminants prior to use in extraction. Distillation of LPGs using UL Certified extraction equipment in accordance with UL 1389, Outline of Investigation for Plant Oil Extraction Equipment, is allowed in the HAL Booth.

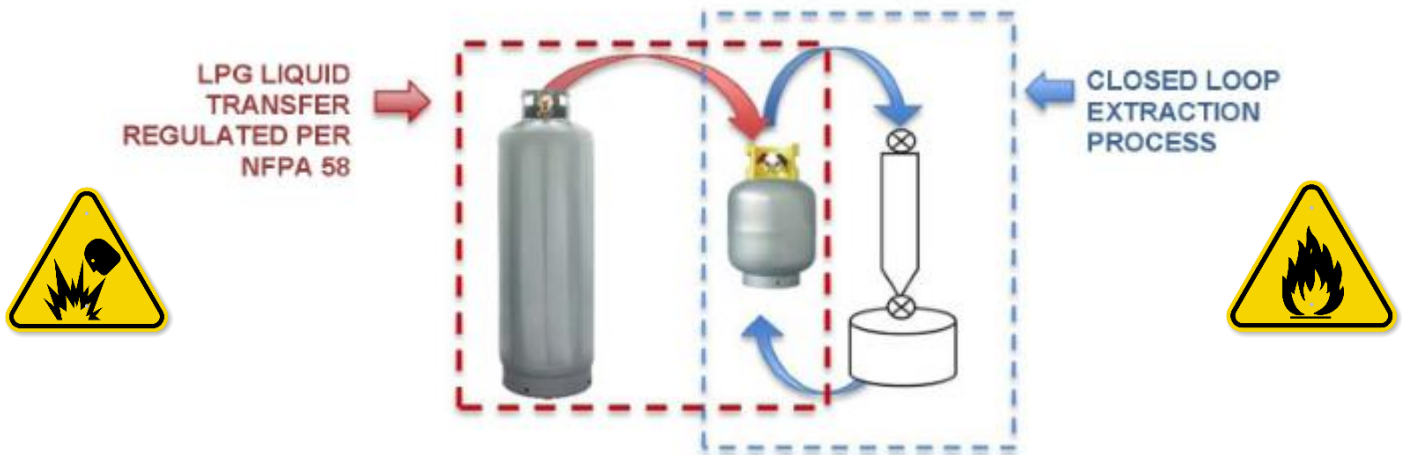


Figure 1: LPG Liquid Transfer vs. Closed Loop Extraction (image from Denver Fire Department)

**DO NOT CONDUCT LPG TANK OR BOTTLE TRANSFILLING OPERATIONS WITHIN THE EXTRACTION BOOTH**  
**DOING SO MAY RESULT IN INJURY OR DEATH**

## D. FLAMMABLE GASES AND EXPLOSION HAZARDS

### 1. FIRE TRIANGLE



Understanding the Fire Triangle is essential for anyone working with flammable liquids. Fire requires three components to occur: Oxygen, Fuel, and Heat. Each of these make up a separate leg of the triangle.

If any one component is not present in sufficient proportions, fire will not occur. The HAL Extraction Booth is designed to reduce the concentration of solvent in the air and to reduce the presence of ignition sources.

Bringing items, equipment, or materials into the Booth System that can act as an ignition source can restore the heat leg of the triangle and may result in injury or death.

The release of fuel in the form of solvent vapor into the Booth System can restore the fuel leg of the triangle and may result in injury or death.



IF AN UNCONTROLLED RELEASE OF FLAMMABLE SOLVENT OCCURS  
INSIDE  
THE BOOTH SYSTEM IMMEDIATELY EXIT AND DO NOT PROP THE  
DOOR OPEN BEHIND YOU.



### 2. LOWER FLAMMABLE LIMIT / LOWER EXPLOSIVE LIMIT

Many of the solvents used in plant oil extraction systems are flammable when the concentration of the solvent in air is within the range of flammability. If there is not enough of a solvent in the air to support combustion, the concentration of the solvent is below the “Lower Flammable Limit” or “LFL”. Comparable reference may also be to the ‘Lower Explosive Limit’ or ‘LEL’. One way to improve safety is to make sure that the concentration of a flammable solvent in air is always well below the LFL.

---

*The LOWER FLAMMABLE LIMIT is the lowest concentration of a flammable vapor in air capable of supporting combustion at a given temperature and pressure.*

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**Table 1: Lower Flammable Limit of Some Solvents\***



Solvent	(LFL) Volume %	% in Air at 10% of LFL	% in Air at 25% of LFL
n-Butane	1.9	0.19	0.475
Ethanol	3.3	0.33	0.83
Isopropyl Alcohol (2-Propanol)	2.0	0.20	0.50
Propane	2.1	0.21	0.53



\*NOTE: Data extracted from NFPA 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.

Once the concentration of a solvent in air is above its LFL (while still below the Upper Flammable Limit or UFL), any contact with an ignition source such as an open flame, spark, electrical contacts, heating coils, or lit cigarette can ignite the solvent. Fire and/or explosion will result.

We see in Table 1 that the LFL for n-butane is 1.9% in air. So, 100% of the butane LFL is 1.9% in air. If the concentration of n-butane in air is 1/2 of the LFL, or 0.95%, then the concentration is at 50% of the LFL.

When using flammable solvents, keep the concentrations below 10% of the Lower Flammable Limit during routine work, and always keep the concentrations below 25% of the LFL.


The HAL Extraction Booths are designed to increase the ventilation flow rate when the concentration exceeds 10% of the LFL and illuminate a light alarm. When the concentration reaches 25%, an audible alarm sounds. When the audible alarm sounds, turn off sources of flammable gas release and leave the area until the alarm is no longer sounding.

---


### 3. FLASH POINT AND AUTOIGNITION TEMPERATURE

The danger of flammable and combustible liquids rises along with temperature. Liquids that are cold enough to not evaporate sufficient vapor to support combustion are said to be below the “Flash Point” of the liquids. Once a liquid is warm enough to evaporate sufficient vapor to support combustion, the flammability danger increases dramatically.

Table 2: Flash Points for Common Solvents\*



Solvent	Flash Point °C	Autoignition Temperature °C
n-Butane	-60 °C	288 C
Ethanol	13 °C	363 °C
Isopropyl Alcohol (2-Propanol)	12 °C	399 °C
Propane	-104 °C	450 °C



\*NOTE: Data extracted from NFPA 497, Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas.

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### 4. IGNITION SOURCES

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*KEEP IGNITION SOURCES OUT OF THE BOOTH SYSTEM*

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- No Smoking
- No Open Flames
- No Unrated Electrical Equipment
  - No Static Spark Sources
- No Electric Heaters or Heat Guns
- No Welding or Metal Cutting
- No Ungrounded Equipment



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*Ignition sources inside or near the Booth System may result in serious injury or death.*

*Interference with the Booth System ventilation, design, operating procedures, electrical equipment or other features may reduce their effectiveness and allow fire, injury, or death to occur.*

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## E. FLAMMABLE MATERIALS - MAXIMUM ALLOWABLE QUANTITIES

Keep the total quantity of butane and/or propane in the HAL Extraction Booth (including the total capacity of all vessels) to below 300lbs, except as authorized by your local authority having jurisdiction. Applicable codes may include, but are not limited to:

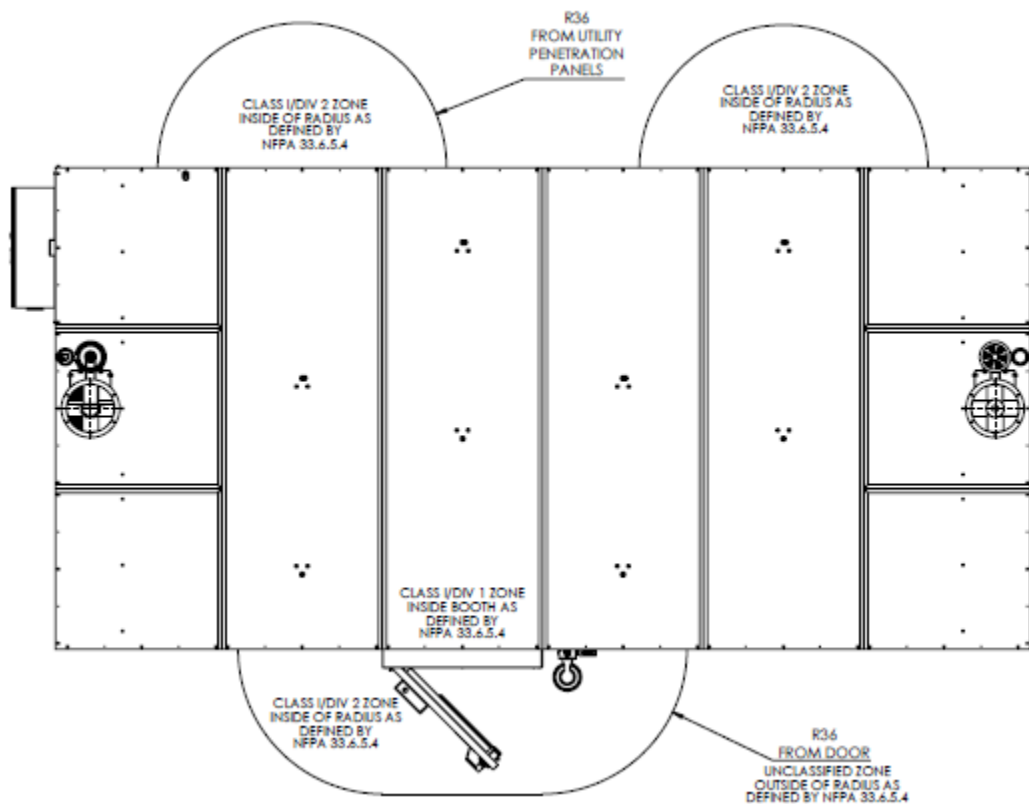
1. NFPA 30 Table 9.6.1 Maximum Allowable Quantities of Flammable and Combustible Liquids Per Control Area.
2. NFPA 58 Liquefied Petroleum Gas Code Table 8.3.1(b) Maximum Allowable Storage Quantities of LP-Gas in Industrial Storage Occupancies.
3. 2016 California Fire Code, Table 5003.1(1) Maximum Allowable Quantity of Hazardous Materials Per Control Area.

## F. CLASSIFIED LOCATIONS

The plant oil extraction process equipment intended to operate within these booths results in the release of some flammable vapors into the surrounding atmosphere as a normal part of the process. Due to the normal release of flammable vapors,

- a. the area within these booths is classified as a Class I, Division 1 hazardous location in accordance with Article 501 of the NEC, and
- b. the area outside these booths around openings is classified as a Class I, Division 2 hazardous location for a distance of 3 ft in all directions in accordance with Article 501 of the NEC.

NOTE: Openings may include the door and the utility penetration plates.



Per NFPA 33, 6.3.1.1, A Class I, Division 1 space is defined as: An ignitable concentration of flammable gas or vapor can exist under normal operating conditions.

Per NFPA 33, 6.3.1.5, A Class I, Division 2 space is defined as: An ignitable concentration of a flammable gas or vapor is not likely to exist under normal operating conditions, and if an ignitable concentration does exist, will exist only for a short period of time.

Group D denotes the flammable gas or vapor. (e.g. Butane/Propane)

### WHAT DOES "EXPLOSION-PROOF" MEAN?

*According to NFPA 70, "National Electrical Code" (NEC), "Equipment enclosed in a case that is capable of withstanding an explosion of a specified gas or vapor that may occur within it and of preventing the ignition of a specified gas or vapor surrounding the enclosure by sparks, flashes, or explosion of the gas or vapor within, and that operates at such an external temperature that a surrounding flammable atmosphere will not be ignited thereby"*

*This definition applies to individual electrical components such as switch boxes, junction boxes, motors, lights, or outlets. The overall HAL Booth is NOT designed to contain an explosion.*

### WHAT DOES "INTRINSICALLY SAFE" MEAN?

*According to NFPA 70, "National Electrical Code" (NEC), "A circuit in which any spark or thermal effect is*

*incapable of causing ignition of a mixture of flammable or combustible material in air under prescribed test conditions.*

Regarding all electrical equipment and factory-provided interconnections for electrical equipment,

- a. where located within the booths, they are marked for use in Class I, Division 1 hazardous locations in accordance with the NEC;
- b. where located within classified areas around openings into the booths, they are marked for use in Class I, Division 2 hazardous locations in accordance with the NEC; and
- c. where located outside the classified areas of the booths, but with electrical circuit extensions into the classified locations of the booths, the circuit extensions are suitable for fixed installation in the classified locations in accordance with the NEC.

The interior of the HAL Booth is a classified area and is only safe if all components and equipment within the booth are listed for use in Class I, Division 1 Group D hazardous locations.

All electrical fixtures, lines, and equipment used inside the booth shall be UL Certified and marked for Class I, Division 1 Group D hazardous locations and shall have a temperature class less than or equal to the equipment provided with the booth (T5).

All electrical fixtures, lines, and equipment located on the exterior of the booth within three feet of any opening shall be UL Certified and marked for Class I, Division 2 Group D hazardous locations.

All equipment must be UL CERTIFIED for use in Class I, Division 1 Group D hazardous locations.

## G. SAFETY FUNCTIONS OF SYSTEM



This HAL Booth is designed to be used for the solvent extraction of plant oils. The Booth System, when properly installed and operated, will reduce the risks associated with the use of flammable and/or hazardous solvents used in plant oil extraction. Use of the Booth System for other purposes has not been evaluated and may result in injury or death.



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### 1. EXPLOSION-PROOF COMPONENTS

The UL Certified Exhaust and Make-Up fans, fan motors, lights, sensor, and associated wiring system are marked for use in Class I Division 1 Group D Hazardous Locations.

The UL Certified Control Panel must be installed outside of any hazardous (classified) location, with circuit extensions permitted into Class I Division 1 Group D Hazardous Locations.

The UL Certified Light Alarm is marked for use in Class I, Division 2 Group D Hazardous Locations. It is designed to be mounted on the exterior of the booth within the 3-foot Class I, Division 2 area around the door.

The UL Certified Sound Alarm is not marked for use in hazardous locations. It must be mounted on the exterior of the booth beyond the Class I, Division 2 Group D hazardous location area around the door.

---

## 2. MAKE-UP AIR SUPPLY AND EXHAUST VENTILATION

NOTE: This topic is also addressed in detail under the “Ventilation” section of the associated Installation Manual.

The makeup air supply and exhaust ventilation on all models of the HAL Extraction Booth are functional at all times during the Booth’s operation.

The Make-Up Air System uses an air supply fan and motor to bring clean outside air, free of hazardous material and separate from the exhaust, into the Booth System and push air through the Make-Up Air Plenum.

The Exhaust Ventilation Air System is used to pull air that may contain flammable or toxic gases from the interior of the Booth System and exhaust it to the exterior of the building. Exhausted air must not be recirculated to the interior of the building. Exhaust ducts must be constructed to meet the requirements of NFPA 33.

The Ventilation System takes fresh air from the Makeup Air System and moves the incoming air through the Air Supply Plenum to be released inside of the Booth System. The base flow rate of fresh makeup air is set to capture and exhaust flammable vapors.

- During base flow rate operations, the Booth Systems are set to have a minimum exhaust air flow rate of 500 cubic feet per minute (CFM) for Classic Series Booths, and a minimum of 1000 CFM for Production and Critical Flow Series Booths.
- When the Gas Sensor detects flammable gas at or above 10% of the Lower Explosive Limit, the Control Panel increases the air flow rate to a minimum of 1500 CFM for Classic Series Booths, and a minimum of 3000 CFM for Production and Critical Flow Series Booths, for faster capture and clearance of flammable gases from the Booth System.

Note: To ensure adequate make-up air volume is supplied to the HAL Booth when it changes to its high air flow rate, it may be necessary to install a powered automatic air damper (not supplied) to the intake fan that opens upon Booth System activation of the purge flow rate (minimum of 1500 CFM for Classic Series Booths) (minimum of 3000 CFM for Production and Critical Flow Series Booths.)



Figure 2: Example of an Automatic Air Damper



THE LACK OF SUFFICIENT MAKE-UP AIR SUPPLY TO THE BOOTH SYSTEM WILL REDUCE AIR FLOW RATES AND MAY RESULT IN INJURY OR DEATH. DO NOT STARVE THE SYSTEM OF AIR



The HAL Booth exhausts air from inside the Booth System. The exhaust must be ducted to outside the building. The Booth System is designed for use with gases, solvents, or fumes that are heavier than air, so most of the exhaust vent area is located near the floor on the Exhaust Plenum.

USE OF THE SYSTEM WITH FLAMMABLE SOLVENTS WITH DENSITIES CLOSE TO OR LIGHTER THAN AIR MAY RESULT IN INJURY, DEATH, OR DESTRUCTION OF PROPERTY.

DO NOT USE OR STORE HYDROGEN, METHANE, OR ANHYDROUS AMMONIA IN THE SYSTEM.

DO NOT USE THE HAL BOOTH IF THE EXHAUST IS NOT DUCTED TO OUTSIDE THE BUILDING.

---

### 3. GAS SENSOR - EXPLOSION-PROOF

The Gas Sensors used are infrared gas analyzers constructed to analyze for a specific airborne gas and are marked for Class I Division 1 Group D Hazardous Locations.

Sensors are supplied at client request for butane, propane. Each sensor is calibrated to read the levels of the specific solvent.



MAKE SURE THAT THE SENSOR YOU ARE USING CORRESPONDS TO THE SOLVENT YOU ARE USING



Sensors for flammable solvents are set to read in percent of the lower flammable limit (%LFL).

Although the infrared gas analyzers built into the sensors are also calibrated to the specific solvent gas, a sensor calibrated to one flammable gas such as butane will also respond when exposed to another flammable gas such as propane.

WARNING – Gas Detector has not been certified regarding its performance to detect flammable gas.  
The Gas Detector is not to be relied upon for life-safety.

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#### 4. USING MIXTURES OF BUTANE AND PROPANE SOLVENTS

Some plant oil extraction system operators use mixtures of butane and propane as solvents. When mixtures of butane and propane are used, there is overlap in the sensor response to both butane and propane. In those cases, a butane sensor alone will provide a response (in terms of the %LFL) close to the mixture's actual flammability characteristics.

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#### 5. SOUND AND LIGHT ALARMS

When the gas sensor detects a gas concentration, the Booth System initiates several actions:

At the lower set-point, (10% of the LFL for flammable solvents), the Control Panel

- Increases the ventilation flow rate, and
- Illuminates the Light Alarm

At the higher set-point, (25% of the LFL), the Control Panel also

- Sounds the Sound Alarm.

Note: The Light Alarm is marked for a Class I, Division 2 Group D area. It is designed to be mounted on the exterior of the booth within the 3-foot Class I, Division 2 Group D hazardous location area around the door.

Note: The Sound Alarm is not rated for a classified space. It must be mounted on the exterior of the booth beyond the Class I, Division 2 Group D hazardous location area around the door.

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#### 6. EGRESS EXITING

Exit doors are equipped with panic bars and hardware that swing out from the interior of the Booth System towards the means of egress, ensuring ease and safety of exiting in the event of an emergency.



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## 7. FIRE SUPPRESSION SYSTEM INTEGRATION

Everyone's facility is different, so the HAL Extraction Booth does not come equipped with a pre-installed automatic fire suppression system. However, an approved fire suppression system is required by several codes and regulations for work with flammable liquids, gases, and solvents. HAL Extraction Technology Ltd. strongly urges purchasers of its Booth Systems to work with qualified local fire protection companies to select, install, and operate an approved automatic fire suppression system. Such a system is a critical part of the overall protection requirements.

These system components or equipment are designed to comply with one of the following:

- a. Certified portable fire extinguishers for installation in accordance with ANSI/NFPA 10, "Portable Fire Extinguishers."
- b. Automatic sprinkler system components for installation in accordance with ANSI/NFPA 13, "Installation of Sprinkler Systems."
- c. Alternate fire suppression system components for installation in accordance with other applicable NFPA installation standards.

An approved fire suppression system is required by the UL Listing.

## H. TRAINING

Use of these booths is intended to be by personnel trained and qualified by the booth manufacturer or their designee, or as otherwise required by the AHJ. Such persons who are to be engaged in, and have responsibility for, proper operation are intended to be experienced in such work, and to be familiar with all safety precautions.

Do not use or operate the HAL Booth without detailed and thorough training. Training in the following topics is mandatory prior to use:

- Carefully read and understand the Booth System installation and operating manual.
- Operation, control, and maintenance of the Booth System.
- Operation, control, and maintenance of the Extraction Equipment used inside of, or in conjunction with the booth.
- Required safety and health protection measures and procedures.
- Personal protective equipment required and how to use that equipment.
- Facility-specific Standard Operating Procedures for the extraction method in use.
- Use and operation of the plant oil extraction system.
- Basics in the chemistry and physics of the extraction process.
- Required personal protective equipment.
- Safety data for solvents and chemicals in use.

- Purpose and operation of all ancillary equipment.
- Pressure vessel hazards, operation, and protective measures.
- Applicable regulations, standards, and codes.

## I. PERSONAL PROTECTIVE EQUIPMENT REQUIRED

It is the responsibility of purchaser and operator of a HAL Booth or owner to evaluate the need for personal protective equipment (PPE) based on the extraction system and solvent used. It is also the responsibility of same to ensure that PPE is provided at no expense to workers, and to enforce the use of appropriate PPE. Possible PPE may include, but is not limited to:

- Eye protection (safety glasses minimum)
- Flame-resistant fabric coveralls (for use with flammable solvents)
- Nitrile gloves

Note: This is not a complete list of ???

Detailed and complete PPE requirements must be prepared by the owner and/or operator prior to the use of the HAL Booth based on the solvent used, flammability and/or toxicity concerns, the extraction system used, and regulatory compliance needs.

Air-purifying respirators are often not recommended for use with typical plant oil extraction systems and solvents. However, each employer should perform a job hazard analysis to include an evaluation of whether respirators are needed for the work performed. If needed, respirators shall be suitable for the area in which they are used.

**DO NOT USE THE HAL BOOTH WITHOUT APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT.**

### III. OPERATING THE HAL EXTRACTION BOOTH SYSTEM

The HAL Booth is designed for ease of use by the operator.

#### A. TURNING ON THE BOOTH SYSTEM

The power switch has three user-controlled positions. These include:

Off

On - Exhaust Fan

On- Exhaust Fan and Area Lighting

The master disconnect on the side of the control panel is for use by electricians and system service only. The master disconnect shuts off all power to all components of the HAL Booth including sensors, lights, alarms, fans, motors, and internal control panel components.

The LED readout on the control panel is set to read the percentage of the lower flammable limit. (100% of the LFL is the point at which the minimum concentration of gas that can support combustion is present.)

#### B. USING THE BOOTH SYSTEM

---

##### 1. ALWAYS KEEP THE DOOR TO THE BOOTH CLOSED.

Open the door only for entry and exiting of the booth. Propping the door open will seriously interfere with the air flow and may allow flammable and/or toxic vapors to escape.

---

##### 2. DO NOT BLOCK AIR MAKEUP OR EXHAUST VENTS

The free flow of air across the booth is necessary for optimal operation.

---

##### 3. PERFORM WORK THAT WILL RELEASE FLAMMABLE GASES NEAR THE EXHAUST PLENUM WALL.

The middle vents on the air plenum panels are designed to be just above the standard work table or bench height. This is to improve capture of residual solvents released during handling of fresh oil or spent feed or cleaning equipment with flammable liquids.

**ALWAYS WORK TO KEEP THE RELEASE OF FLAMMABLE VAPORS TO THE MINIMUM POSSIBLE.**

---

#### 4. CONTROL AND MINIMIZE FLAMMABLE VAPOR RELEASE

If you collect spent feed or trim in a container, use a container suitable for the application with a height that is near the bottom of the middle exhaust vents on the air plenum panel. Place the top edge of the container against the exhaust air plenum panel. That will allow vapors to be captured and exhausted from the building.

Always dry spent feed thoroughly before opening the extraction vessel for emptying.

---

#### 5. ONLY USE ELECTRICAL EQUIPMENT IN THE BOOTH LISTED FOR CLASS I DIVISION 1 GROUP D HAZARDOUS LOCATIONS

The interior of the HAL Extraction Booth is a Class I, Division 1 Group D Hazardous Location. Bringing equipment not rated for Class I, Division 1 Group D Hazardous Location into the booth may create a risk of explosion, fire or death.

Any electrical equipment added to the interior or exterior of the Extraction Booth System, and not provided by HAL Extraction as detailed in Installation Manual, is not covered under the UL Listing.

The use of electrical equipment not UL Certified for Class I, Division 1 Hazardous Location in the booth, for maintenance or any other reason, is only acceptable when no extraction is occurring, and only when the HAL Extraction Booth is free of flammable solvents.

---

#### 6. KEEP POTENTIAL IGNITION SOURCES AT LEAST 3 FEET FROM THE ANY OPENING.

The exterior of the booth within three feet of any opening is a Class I, Division 2 Group D hazardous location. Openings may include the door and the utility penetration plate.

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#### 7. DO NOT BLOCK THE SENSOR.

The sensor controls the ventilation rate based on the concentration of flammable gas in the area.

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#### 8. USE LEAK DETECTORS TO FIND RELEASES OF FLAMMABLE GAS.

Hand-held intrinsically safe flammable gas meters and leak detection fluid can help identify sources of release of flammable gases. When you identify releases, change your procedures to minimize the release of flammable gas.

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#### 9. NEVER IGNORE THE ALARM.

If the system is detecting flammable gas sufficient to increase the air flow rate or set off the audible alarm, change your procedures to reduce the release of flammable gas.

#### Actions at 10% of LFL.

When using flammable solvents, keep the concentrations below 10% of the Lower Flammable Limit during routine work, and always keep the concentrations below 25% of the LFL.

The HAL Extraction Booths are designed to increase the ventilation flow rate when the concentration exceeds 10% of the LFL and illuminate the light alarm.

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#### 10. IF THE SOUND ALARM GOES OFF, TURN OFF SOURCES OF SOLVENT VAPOR, AND LEAVE THE BOOTH

##### Actions at 25% of LFL.

The sound alarm will sound if the level of flammable gas exceeded 25% of the lower flammable limit (LFL). Turn off the valve on the solvent tank to isolate the solvent tank from the rest of the system. Close all valves on the extraction system to isolate the various vessels on the extraction system. Leave the booth and close the door to the booth behind you. Do not return to the interior of the booth until the sound alarm has ceased to sound, and the levels have returned to below 25% of the LFL.

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#### 11. KEEP THE EXHAUST FAN ON AT ALL TIMES FLAMMABLE SOLVENTS, LIQUIDS, OR GASES ARE STORED IN THE BOOTH

Stored containers can have small leaks that may result in high concentrations of flammables over time if no ventilation is occurring.

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#### 12. CALIBRATE THE SENSOR ANNUALLY.

A bottle of clean air may be used to check the zero point of the system. Calibrate the sensor annually according to the sensor manufacturer's instructions. Keep a log of all calibration activities.

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#### 13. TEST THE BOOTH QUARTERLY.

Once your alarms and sensors have been connected to the control panel, and the rest of the booth has been installed, you can test/calibrate the system.

1. Turn on the HAL Extraction Booth. Verify the digital read out on the control panel is less than 2.00
2. Attach the length of hose to the regulator barb.
3. Make sure the regulator control knob is turned all the way clockwise.
4. Slowly screw the regulator onto the calibration gas canister, taking care not to cross-thread the assembly.
5. Attach the end of the hose to the sensor calibration nipple located on the bottom of the sensor.
6. Have someone watch the digital readout on the control panel on the exterior of the booth while another individual uses the calibration gas on the interior of the booth.
7. Slowly unscrew the regulator control knob counter-clockwise. After 5-10 seconds close the regulator control knob by turning it clockwise.
8. The calibration gas is a 50% concentration of the lower flammable limit of butane.
9. As the gas is released, the digital read out on the control panel should increase.

10. When the read out displays 10.00 or above, the ventilation should increase, and the light alarm should flash.
11. When the read out displays 25.00 or above, the sound alarm should go off.
12. Remove the calibration gas assembly from the sensor calibration nipple.
13. The increased ventilation should lower the concentration of butane around the sensor and after a few moments, the siren and light alarm with stop, and the ventilation will return to normal.
14. If the booth is operating as described, no further action is required. Your booth is operating properly.
15. If the booth does not operate as described, contact HAL Extraction immediately and cease operations any extraction equipment inside of the booth.
16. Keep a log of all calibration activities

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#### 14. COMPONENT PREVENTATIVE MAINTENANCE.

Service and lubricate the motor and fan bearings according to the manufacturers' recommendations. (Typically, on a quarterly basis)

Replace the lightbulbs as needed, per the manufacturer's instructions.

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#### 15. WHAT TO DO DURING AN UNCONTROLLED RELEASE OF SOLVENT.

During an uncontrolled release of solvent, it may take a few seconds for the sensor to register the change in atmospheric concentration. Exit the booth immediately and close the door to the booth behind you. The sound alarm will sound if the level of flammable gas exceeded 25% of the lower flammable limit (LFL).

Contact your local fire department and follow their instructions.

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#### 16. WHAT TO DO IF THE BOOTH IS NOT FUNCTIONING PROPERLY.

Contact HAL Extraction and do not use the booth until it is functioning properly.

## V. CONTACT INFORMATION

Please contact HAL Extraction Technology Ltd. with any questions you have regarding the HAL Booth Systems.

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Telephone: (720) 504-4726

Email: [info@ExtractionBooth.com](mailto:info@ExtractionBooth.com)