Unit	Buildings & Estates, University of Galway, Guidance document				
Title	Local Exhaust Ventilation (LEV) Guidance			Issued by	BSUE
Category	Health and Safety	Code	BSUEOP-12	Revision	0
Approved by	Director of Buildings & Estates	Date	17/09/2024	Page	Page 1 of 30

1.0 Introduction and Scope

Local Extract Ventilation (LEV) is the name given to equipment used to protect an operator from hazardous substances including dust, chemicals or micro-organisms. LEV can take a variety of forms depending on the type of contaminant /process that it is to control exposure to.

Appendix 1, shows a variety of different types of LEV that may be in use within the University of Galway to control exposure and therefore that will fall within the scope of this policy.

Local exhaust ventilation (LEV) is an engineering system frequently used in the workplace to protect employees from hazardous substances. To have an effective system it must be well designed and installed, used correctly and properly maintained. All the participants, from designers to end-users need to work together to provide an effective system.

Contaminants which require exposure control may be in the form of gas, vapour, mist, dust/powders, and nanomaterials and can include chemical substances carcinogens, mutagens, toxins, flammable solvents and micro-organisms.

This document has been written as a guide to the Safety, Health and Welfare at Work (Carcinogens, Mutagens and Reprotoxic Substances) Regulations, 2024 (S.I. No. 122 of 2024), S.I. No.619 of 2001 and follows HSE Guidance 'Controlling Airborne Contaminants at Work –A Guide to Local Exhaust Ventilation, HSG 258. REGULATION (EC) No 1907/2006, Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH). HSA Local Exhaust Ventilation (LEV) Guidance document. I.S. EN 14175-1 FUME CUPBOARDS.

1.1 What is Local Exhaust Ventilation (LEV)

In its simplest terms, local exhaust ventilation is an engineering system to protect employees from exposure to hazardous substances by containing or capturing them locally, at the emission point.

Local exhaust ventilation (LEV) is only one of many engineering control options that may be used to remove and prevent employee exposure to vapour, mist, dust or other airborne contaminants. Typically, these substances may cause respiratory diseases: industrial asthma, cancer and chronic obstructive pulmonary disease (COPD). To be effective in protecting the employee(s), it must be of good design, fit for purpose, regularly maintained and the system's performance is monitored. Failure to do so can lead to employees being exposed because they have the impression that the system is effective when it is not.

Poor design and/or maintenance may lead, for example, to leakage in the workplace, causing concentrated local exposure rather than preventing it. A poorly designed, installed, misused and incorrectly maintained system can become an expensive waste of expenditure and may give a false impression of hazard control.

Employees must be given training in its use and maintenance to understand its correct use and effectiveness.

Examples of LEV equipment

LEV may be fixed or portable and includes items such as:

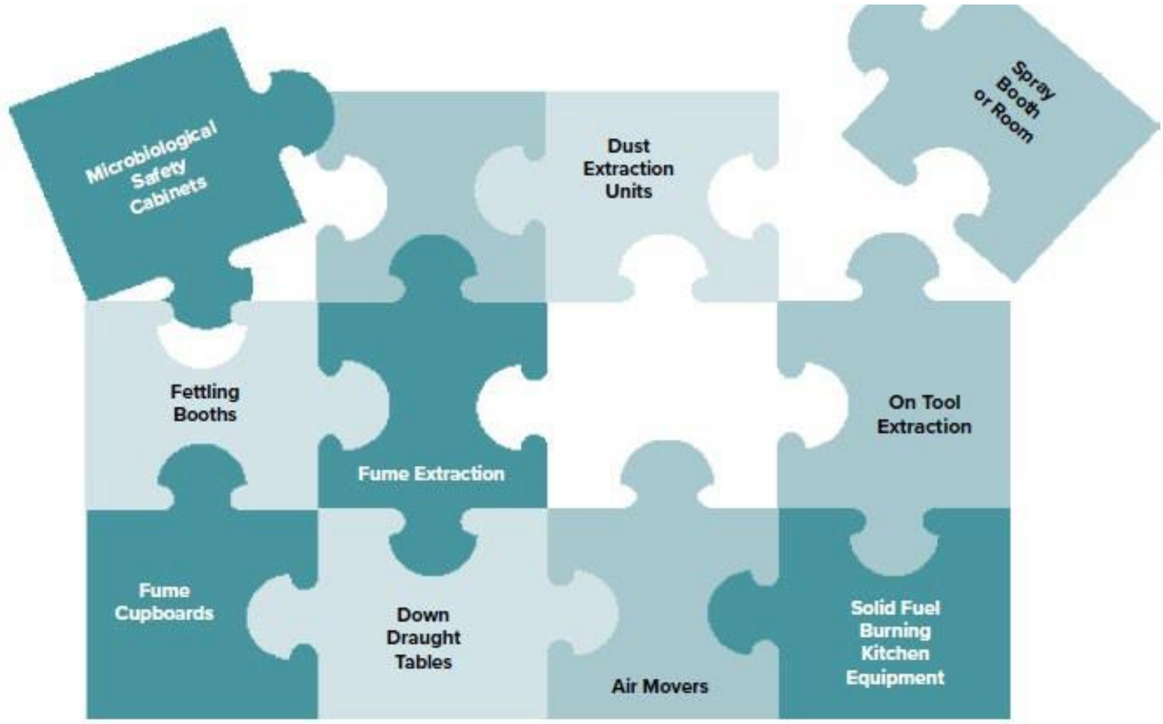


Image 1 taken from TR40 Guide to Good Practice - Local Exhaust Ventilation

The use of the equipment determines if it is LEV.

A vacuum cleaner used to connect to a source of dust to reduce the likelihood of breathing in the dust is LEV and should comply with the advice in this document and the manufacturer's recommendations.

A vacuum cleaner used only to clean floors is not LEV; however, this would need to be appropriately specified to be suitable for any hazardous waste that it is used with, so may need to comply with ATEX and have agreed safe procedures for waste emptying and disposal.

It is therefore a requirement for the user to determine the extent of the chemical usage at the design stage to ascertain the extent of the LEV system to be installed to meet the needs of the unit.

1.2 Components of an LEV system

An LEV system will include some, but not necessarily all, of these components:

- hood(s), where the air and contaminant cloud enter the LEV system
- ducting, to transport the contaminant-loaded air from the hood to the discharge point
- filter, air cleaner or arrestor, to clean the extracted air (not present in all systems); may be located before or after the air mover, and may be several types of filter in sequence
- air mover, to provide the extraction energy and direction of air movement
- discharge, to allow the release of filtered air or air loaded with contaminants to a safe place.

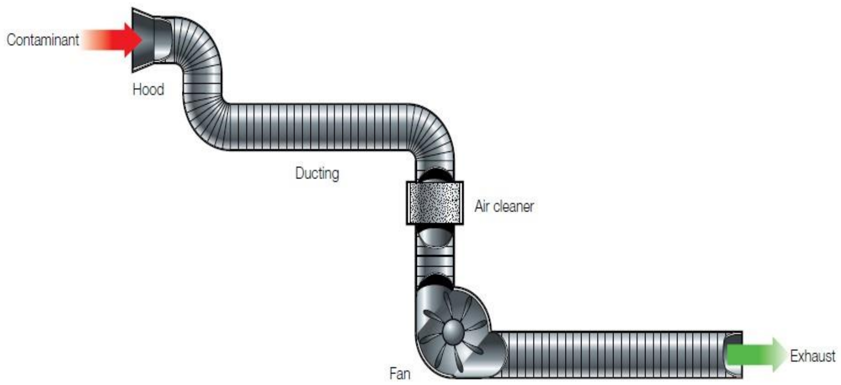


Image 2 schematic of components for LEV system taken from HAS Local Exhaust Ventilation (LEV).

Image 3: External extract fan and ducting roof mounted.

LEV systems have a wide range of designs, shapes and sizes, but fall into 3 basic design categories:

1: Enclosing
2: Receiving
3: Capturing

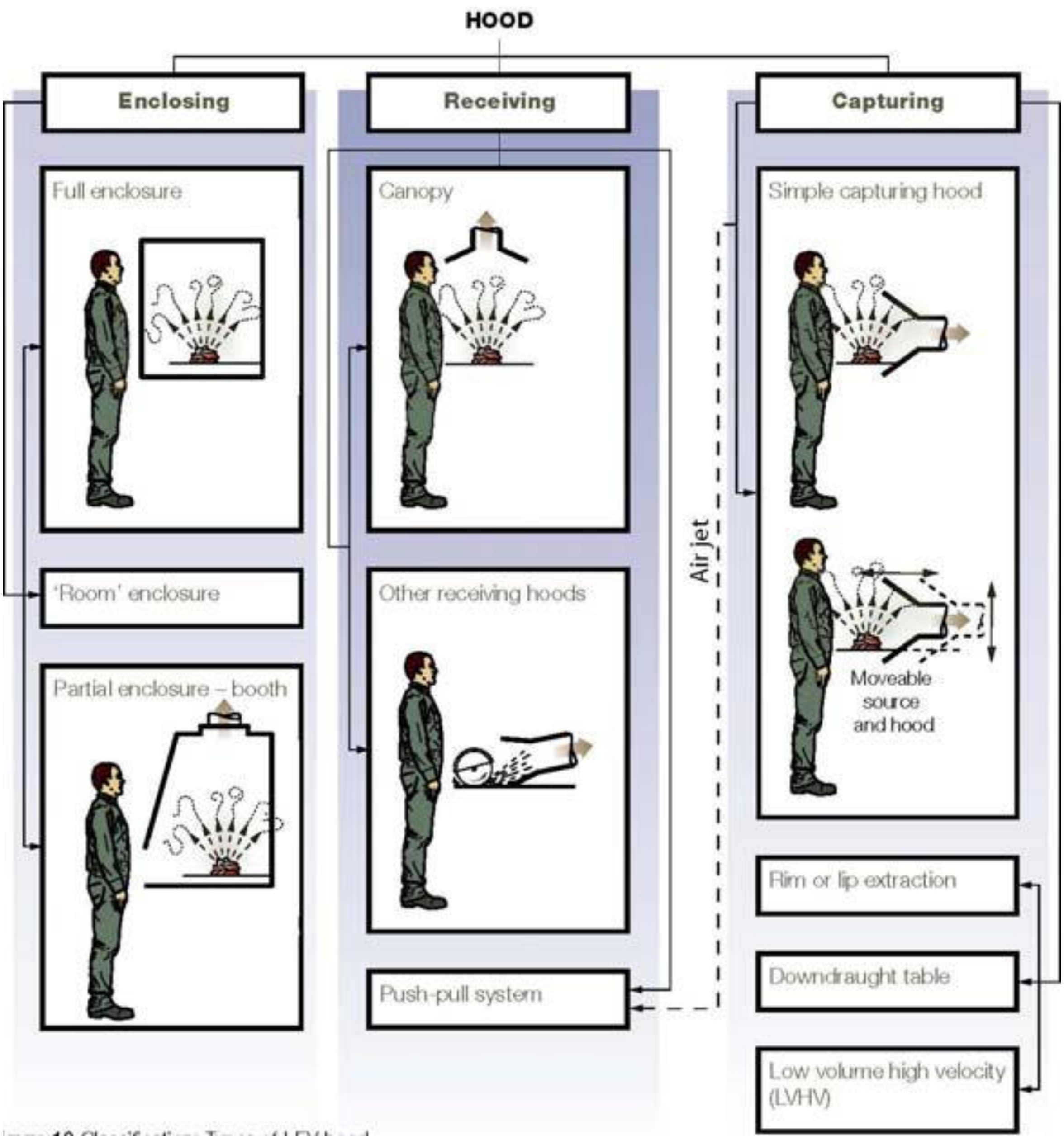


Image 4 - HSA, HSG 258 Drawings/pictures/diagrams courtesy of the HSE/HSL UK & IOSH

1.3 Legislation

Main Legal Requirements (note the latest document shall be considered at all times)

- Safety, Health and Welfare at Work Act 2005
- REGULATION (EC) No 1907/2006, Registration, Evaluation, Authorisation, and Restriction of Chemicals (REACH).
- Safety, Health and Welfare at Work (General Application) (Amendment) Regulations 2016 (S.I. No. 36 of 2016).
- The Safety, Health and Welfare at Work (Chemical Agents) (Amendment) Regulations 2021.
- Safety, Health and Welfare at Work (Carcinogens, Mutagens and Reprotoxic Substances) Regulations, 2024 (S.I. No. 122 of 2024),
- Safety, Health and Welfare at Work (Exposure to Asbestos) (Amendment) Regulations 2010 (S.I. No. 589 of 2010)
- Safety Health and Welfare at Work (Biological Agents) Regulations 2013.
- Safety, Health and Welfare at Work (Construction) Regulations 2013 (S.I. No. 291 of 2013).
- 2020 HSA Code of Practice for Biological Agents
- HSA – Chemical Agents Code of Practice 2021
- HSA – Chemicals http://www.hsa.ie/eng/topics/chemicals/

University Resources:

- University of Galway SAFETY STATEMENT
- University of Galway Health and Safety website – Chemical Agent Risk Assessment
- Emergency Action Plan – Chemical Spills
- Basic principles for the Safe Use of Chemicals

The requirement for control of exposure to dusts, chemicals and micro-organisms is detailed in the Safety, Health and Welfare at Work (Carcinogens, Mutagens and Reprotoxic Substances) Regulations, 2024 (S.I. No. 122 of 2024). The hierarchy for the means to control risks are as follows, in order of priority:

1. Eliminate the use of a harmful product or substance and use a safer one.
2. Use a safer form of the product, e.g. paste rather than powder or a substance of lower risk
3. Change the process to emit less of the substance
4. Enclose the process so that the product does not escape
5. Extract emissions of the substance near the source
6. Reduce the number of people exposed
7. Provide personal protective equipment (PPE) such as gloves, coveralls and respiratory protective equipment (RPE).

Note that PPE is the last resort and should not be considered as a substitute for the other control measures outlined above. RPE may be appropriate for emergency response situations or in addition to LEV to control residual risk.

Where it has not been possible to reduce risks using control approaches 1-3 above, LEV may therefore be used in combination with an enclosure to meet the requirements of the Chemical Agents Regulations.

The need for LEV should be identified because of the risk assessment of the entire process. This will include considering the following:

- Hazardous properties of the substances and any intermediates involved.
- Physical properties of the substances/intermediates.
- The quantities used.
- Experimental procedures that may increase risk [e.g. aerosol generation].
- Equipment required for the process and its maintenance.
- Foreseeable future changes to the process.

A new or revised risk assessment will be required in the following circumstances:

- Introducing a new process using one or more hazardous substances
- Changing an existing process to use more hazardous substances.
- Purchasing new equipment or employing new techniques
- Re-siting or re-locating an existing process/equipment that uses extraction.
- Re-using existing ventilation equipment for a different purpose than it was designed for.

1.4 Responsibilities

The Head of School or management unit has ultimate responsibility for safety within the school or facility.
The Head of the Research Group i.e. Principal Investigator (PI) is responsible for the safety of staff, or students working with the process and has responsibility for ensuring that any LEV identified as required by risk assessment is:

- fit for purpose
- ensure that their staff are fully trained in the use of the LEV
- used correctly
- subject to ongoing monitoring checks locally at a suitable frequency as determined by risk assessment.

Buildings & Estates are responsible for the following:

- The design, installation and commissioning of any necessary infrastructural requirement.
- Arranging the examination, testing and routine maintenance by competent persons for Fume Cupboards only, Units who use other forms of LEV must carry out their own testing and routine maintenance.

2.0 Design

Where LEV is identified as being required it must be designed by a professional company that is competent in designing LEV systems and be able to provide evidence of this. Suitable evidence would include membership in the following bodies:

- Chartered Institution of Building Services Engineers (CIBSE) www.cibse.org.The main professional engineering body offering qualifications and membership to ventilation engineers. *TR40: A Guide to Good Practice for Local Exhaust Ventilation*
- Building and Engineering Services Association www.b-es.org/ (formerly Heating and Ventilating Contractors Association (HVCA) www.hvca.org.uk). The main representative organisation for companies installing ventilation systems including LEV.
- British Occupational Hygiene Society (BOHS) www.bohs.org. For help with process and source assessment and LEV design and specification, as well as qualifications in designing and testing. For general advice on choosing LEV systems.
- Safety Assessment Federation (SAFED) www.safed.co.uk. Represents many insurance companies doing independent engineering inspection and certification of machinery and equipment including LEV systems.
- Independent National Inspection and Testing Association (INITA) www.inita.org.uk. Represents companies doing independent engineering inspection and certification of machinery and equipment including LEV systems.
- Solids Handling and Processing Association (SHAPA) www.shapa.co.uk. Represents the major employers in LEV manufacturing.

Design Guidance documents to be referenced during the process:

- ANSI/AIHA Z9.1-2006 Open-Surface Tanks – Ventilation and Operation
- ANSI/AIHA Z9.2-2007 – Fundamentals Governing the Design and Operation of Local Exhaust Systems
- ANSI/AIHA Z9.3-2007 Spray Finishing Operations – Safety Code for Design, Construction, and
- Ventilation
- ANSI/AIHA Z9.4-2011 Abrasive-Blasting Operations – Ventilation and Safe Practices for fixed Locations
- Enclosures
- ANSI/AIHA Z9.5-2011 Laboratory Ventilation
- ANSI/AIHA Z9.6-2008 Exhaust Systems for Grinding, Buffing and Polishing
- ANSI/AIHA Z9.7-2007 Recirculation of Air from Industrial Process Exhaust Systems
- ANSI/AIHA Z9.9-2010 Portable Ventilation System
- ANSI/AIHA Z9.10-2010 Fundamentals Governing the Design and Operation of Dilution Ventilation

- Systems in Industrial Occupancies
- ANSI/AIHA Z9.11 2008 Laboratory Decommissioning Standard
- ASHRAE (American Society of Heating, Refrigeration and Air-conditioning Engineers) Standards and Guidelines
- BSR/AIHA Z9.12 Design, Operation and Maintenance of Combustible Dust Collection Systems
- BSR/AIHA Z9.13 Design, Operation, Testing and Maintenance of Laminar Flow Fume Hoods
- BSR/AIHA Z9.14 Testing and Performance Verification Methodologies for Biological Safety Level 3
- (BSL-3) Laboratories
- EN 12469 BIOTECHNOLOGY – PERFORMANCE CRITERIA FOR MICROBIOLOGICAL SAFETY CABINETS
- I.S. EN 14175-1 FUME CUPBOARDS – PART 1: VOCABULARY
- I.S. EN 14175-2 FUME CUPBOARDS – PART 2: SAFETY AND PERFORMANCE REQUIREMENTS
- I.S. EN 14175-3 FUME CUPBOARDS – PART 3: TYPE TEST METHODS
- I.S. EN 14175-4 FUME CUPBOARDS – PART 4: ON-SITE TEST METHODS
- I.S. EN 14175-6 FUME CUPBOARDS – PART 6: VARIABLE AIR VOLUME FUME CUPBOARDS
- I.S. EN 14175 7 FUME CUPBOARDS – PART 7 FUME CUPBOARDS FOR HIGH HEAT AND ACIDIC LOAD

The designer should

- Be a specialist in the supply of LEV to laboratories and research institutions
- Have successfully applied LEV to similar processes or activities
- Be able to provide references, testimonials or examples showing successful installation of LEV Systems.
- Be able to offer independent advice

The process owner will provide the designer with details of the work to be done and information about any environmental or fire and explosion requirements including safety data sheets and hazard information, SOPs and details of all the plant and equipment to be used. The designer or process owner should produce a drawing of the area and the processes to be controlled.

The designer should visit the site to see the processes and any other extract equipment in the vicinity as these may affect the operating characteristics of the design or the equipment already installed. If the design for the new equipment is to be incorporated into part of the existing extraction systems, this must not compromise the effectiveness of the existing system nor allow contaminants to spread to other areas if the main extract system is not operational. The design must take account of the supply and make-up air systems as these can significantly affect the operation and containment capabilities of the LEV system.

2.1 Specification:

The specification produced by the designer should:

Describe the process, the contaminant, its hazards, the sources to be controlled, and how stringent the control needs to be. The important chemical and flammable properties of substances and products appear in the Safety Data Sheet; and project/process risk assessments which must be included in the specification for review.

2.2 Supply

Having specified a design the specification may be sent to several suppliers approved for the supply and installation of the equipment and to provide the information, documentation and training specified in the design. The designer may also act as a supplier.
Suppliers are to:

- Be a specialist in the supply of LEV to laboratories and research institutions.
- Have successfully applied LEV to similar processes or activities.
- Be able to provide references, testimonials or examples showing successful installation of LEV systems.
- Be members of a suitable trade association and subject to independent assessment, e.g. the Building and Engineering Services Association (formerly HVCA).

The supplier's (or designers) more detailed specifications should:

- Provide technical drawings of the system.
- State the type of hood for each source, its location or position, face velocity, and static pressure.
- Include information on any constraints, e.g. the maximum number of hoods in use at any one time.
- Describe the ducts – material, dimensions, transport velocity (if appropriate) and volume flow rate.
- Include details of how the airflows in different branches of the LEV will be balanced.
- Describe any air cleaner – specification, volume flow rate, and static pressure ranges at the inlet, outlet and across the cleaner.
- Describe the fan or other air mover – specification, volume flow rate, static pressure at the inlet, and direction of rotation of the fan.
- Describe how and where extracted air is to be discharged safely out of the building or for systems that return air to the workplace, provide information on air cleaner efficiency and sensors.
- Describe the indicators and alarms to be provided in the system.
- Provide information on the installation requirements.
- Provide adequate training in using, checking and maintaining the LEV system.
- Provide both a user manual and a logbook.

2.3 Flow Rates

The ability of a local exhaust ventilation system to reduce exposure to air contaminants is determined primarily by the effectiveness of the hood(s).

Ensure they are provided with sufficient airflow to contain and capture contaminants; also, verify the ability of the fan and ducting to extract sufficient air from each hood.

Flow rates can vary depending on the work being done.
For example, a glove box or fully enclosed system needs sufficient flow to maintain it under negative pressure with a relatively small flow rate within it. However, a relatively higher flow rate is required when the hood is capturing fugitive contaminants, especially those that may be propelled by the mechanical energy of grinding, cutting, etc.

Once the contaminant is captured, the flow rate within the ducting must be sufficient to transport the contaminant to the filtering system and onto the exhaust. There may be a header system in a system with many duct branches to individual hoods. Whether simple or complex, the ducting structure and dimensions will influence the air-flow rate. The flow rate must be sufficient to dilute flammable or combustible contaminants and not allow an accumulation within the ducting that could lead to a fire.

The design, work or process needs, or employee use can influence flow rates. Over time, wear and tear can cause a reduction in the flow rates. Regular documented monitoring by B&E and users is crucial.

2.4 Installation

The designer may also build and install the system, or this may be carried out by another suitably competent organisation.

The contractor chosen to install the equipment must provide a suitable risk assessment and method statement for the work and appropriate risk assessments. The operatives carrying out the work must be suitably trained and competent and must have undergone site-specific Health and Safety training. In addition, they must receive suitable safety LEV induction training for the building where they are working. This is arranged at handover initially by Buildings & Estates and thereafter by the School Health & Safety Co-Ordinator or other individual nominated by the Head of School or Head of the Research Group i.e. Principal Investigator (PI) responsible for the safety of staff before work commences.

On installation, the supplier should test the LEV to ensure it is working according to the specification and that any necessary balancing of the airflows has taken place. The supplier will provide commissioning records to demonstrate that the equipment is operating correctly and effectively.

2.5 Commissioning Performance Tests

Following installation, it will be necessary to carry out various commissioning and performance tests to:

- Verify that the system has been installed as per the initial design.
- Verify that the system meets the specified technical performance.
- Verify that the system provides adequate control of the contaminants.
- Provide benchmark readings for subsequent examinations and tests.

The LEV commissioning report should be undertaken by a company other than the designer/supplier of the LEV. This report together with the suppliers 'user manual' is the basis for the ongoing annual maintenance record.

A copy of the commissioning report, user manual and logbook will be made available by Buildings & Estates to the Unit Health & Safety Co-Ordinator for inclusion in the Unit's Safety File (SharePoint). Users will have access to the documentation and should store their inspection reports locally.

2.6 Documentation

Following successful commissioning and performance tests, the following documentation will be provided by Buildings & Estates to the end user.
A report that includes:

- Diagrams and a description of the LEV, including test points.
- Details of the LEV performance specifications.
- Results, such as pressures and velocities at stated points.
- Calculations on which the design was based.
- Written descriptions of the commissioning, the tests undertaken, and the outcome. Where necessary, this should also include air sampling results.
- A description informing operators should use the system so it works effectively.
- A 'user manual' with a general specification of what the LEV system is designed to control and how it achieves control. It should include:
    - Description of the system with diagrams.
    - As installed drawings.
    - Commissioning performance data.
    - Description of checks and maintenance and replacement schedules, including frequency.
    - Listing of replaceable parts (and part numbers).
    - Detailed description of the specific statutory 'thorough examination and test' requirements and exposure targets.
    - Signs of wear and control failure.
    - Description of how operators should use the system so it works effectively.
- A logbook that includes:
    - Schedules for regular checks and maintenance.
    - Records of regular checks, maintenance, replacements and repairs.

- Checks of compliance, with the correct way of working with the LEV system.
- The name of the person who made these checks.
- Relevant sections of this information provided should be incorporated into the Standard Operating Procedure (SOP) for the process.

2.7 Training

Technical staff and operators must be trained initially by the supplier in how the LEV works and how to check and maintain it. The Unit is to maintain training records of attendees, with their signatures in their Unit Safety Records (SharePoint). All training material is to be retained and maintained by the Unit.

Training should cover the basics of:

- The harmful nature of the substances used.
- How exposure may occur.
- How the LEV system works.
- Methods of working that get the best out of the LEV.
- How to check the LEV is working.
- The consequences of the LEV failing.
- What to do if something goes wrong.

2.8 Testing frequency

The University of Galway maximum time for testing is considered as 12 months for Fume Cupboards and this is generally undertaken in the summer months when the campus is quiet, all other systems shall be tested in accordance with the manufacturers recommendation but must not be more than two years. However, if the wear and tear on the system is such that it is liable that effectiveness will degrade between tests, or if the LEV is used to control exposure in very high-risk processes [e.g. processes using Hydrofluoric acid] the tests should be carried out more frequently.

2.9 Preparation for Testing

The LEV owner and specialist engineer will need to cooperate to ensure that risks are minimised for both the specialist engineer and any local workers who may be affected by the work of the specialist engineer. LEV should be cleaned by the owner, ensure risk assessment and controls are in place for this. As far as reasonably practicable and suitable documentation is provided to the specialist engineer to this effect.

Where residues that may be harmful to the specialist engineer cannot be effectively removed, then the specialist engineer must be informed accordingly about this and any PPE requirements to protect the specialist engineer must be confirmed in advance. Sufficient notice should be provided to users before work can commence in order to facilitate the relocation of activities to alternative locations.

2.10 Information

Wherever possible the specialist engineer should be provided with the following information:

- Commissioning report & figures.
- User manual.
- System logbook.
- Confirmation there have been no changes to LEV/layout or process since the last test.

On completion of the tests, the specialist engineer will attach the test label to each LEV system/ hood which shows the date the test was undertaken, the date of the next test and the name of the specialist engineer. They must also provide a written report to the Unit Safety Coordinator. Where an LEV system fails the test, the specialist engineer must verbally notify the Unit Safety Coordinator/technical manager immediately. B&E should also be notified. The Unit Safety Coordinator/technical manager should ensure that the equipment is decommissioned, and the specialist engineer must label the LEV accordingly.

2.11 University of Galway Arrangements for LEV Testing.

Buildings and Estate arrange for annual testing and maintenance for ducted fume cupboards only in all areas except for those buildings which are operated by the external contractor which include the Biomedical Science Building (BSB), Human Biology Building (HBB), CRF/TRF, Orbsen Labs and ILAS Building.
Testing of the existing 167 Fume cupboards is carried out independently by an specialist engineer contractor and all service records are noted on FLEX asset systems controlled by the Building Services team.

Daily/weekly use checks are to be carried out by users, with any defects highlighted to their Unit Liaisons/Chief Technical Officer/PIs who will log a ticket on the PEMAC system for fixing or replacement.

Testing of all other LEV (recirculating FCs, Microbiological Safety Cabinets- ducted & recirculating, capture hoods, receiving hoods, dust extraction units, self-contained single arm fume extraction, etc.) is arranged and managed locally by Schools/Units. Routine checks at suitable intervals (daily/weekly/monthly) as determined by risk assessment must be undertaken by a suitable trained worker. The nature of the routine tests will depend on the type of LEV but must be defined in the logbook / Flex System and results recorded.

The results of test measurements, such as face velocities should be compared to the data provided at the annual service and any loss of performance or other defects reported immediately to the appropriate manager and the equipment taken out of use.

2.12 Decommissioning

Where LEV is no longer required and needs to be removed consideration must be given to the decontamination of the equipment. The extent and type of decontamination required will depend on the nature of substances extracted by the system and the accessibility to the various parts of the system. Ensure risk assessment and controls are in place in accordance with the manufacturers requirements for cleaning and disposal.

Decontamination of the LEV may be undertaken by suitably competent contractors. A suitable risk assessment must be undertaken and information about the nature and quantities of substances used must be made available to those undertaking this process.

Where decontamination of any part of the system is undertaken in-house, ensure risk assessment and controls are in place this must be confirmed in writing to the contractor who is to carry out the decommissioning works.

It is the responsibility of the School/Unit to remove off-site and pay for any remedial works as part of the decommissioning.

2.13 Logbooks

All LEV systems require a logbook containing schedules, forms and records of regular checking, maintenance and repair.

Logbook contents:

The logbook should be specific to each LEV system and contain:

- Schedules for regular user checks and maintenance.
- Records of regular checks, maintenance, replacements and repairs.
- Checks on how the operator is using the LEV system.
- The name of the person who made each check, and on what date.
- The name of the employer's LEV-responsible person.
- To whom problems should be reported, and how details of problems reported.
- Space to report the results against each check item.
- A signature and date.

The logbook can include, for example, checklists identifying daily, weekly and monthly checks for each item in the system by the frequencies recommended by the manufacturer and HSG258.

References

- HSA Code of Practice for Indoor Air Quality 2023
- HSA Local Exhaust Ventilation (LEV) Guidance 2014
- HS (G) 258 - Controlling airborne contaminants at work
- A guide to local exhaust ventilation (LEV)
- INDG 408 - Clearing the air
- A simple guide to buying and using local exhaust ventilation (LEV)
- L5 - The Control of Substances Hazardous to Health Regulations 2004

Appendices

Appendix 1: Typical Examples of LEV that may be found in the University of Galway Campus

Appendix 2: University of Galway FUME CUPBOARD WEEKLY CHECKLIST – UNIT USE
https://www.universityofgalway.ie/health-safety/lab-office-field-diving/laboratorysafety/chemicalagentsandtheirriskassessment/

Appendix 3: Fume Cupboard Types and Specifications.

Appendix 4: Fume Cupboard Report Sheet

Fully/partial enclosing cabinet e.g. re-circulating/ducted Microbiological Safety Cabinet or recirculating fume cupboard		Receiving hood/canopy (low velocity)		Hand held tool extraction system	
Capturing hoods (high velocity)		Glove box		Vehicle exhaust extraction system	
Downdraught tables e.g. dissection table.		Transportable extraction system e.g. Nilfisk		Welding fume extract system	
Weigh-safe 'type' system [Note that this type of equipment is not suitable for controlling exposure to hazardous substances - use for nuisance dust only]		Fixed extraction system e.g. woodworking machinery		Ducted/extracted chemical storage cupboards	
Solder fume extract system		Spray booth		Wall/window mounted fans specifically provided to extract contaminants	

APPENDIX 1 Typical Examples of LEV that may be found in the University of Galway Campus

Appendix 2: University of Galway FUME CUPBOARD WEEKLY CHECKLIST – UNIT USE

Different nominated researchers/other lab team members to carry out **Weekly visual Inspections** of the fume cupboards using a laminated copy of this checklist provided at each Fume Cupboard. They are to record their findings on the checklist and report any major problems directly to the relevant technical staff. The **Lab Technical staff** is to carry out a complete check **every quarter** and report on SharePoint.

Where there are any significant observations or comments arising from any operational issues, the cupboard(s) are to be taken out of service until further checks are carried out and resolved.

Room Reference:	Serial Number:	Last Service/Inspection date (14mth cycle):

WEEKLY CHECKLIST	YES	NO	OBSERVATIONS/COMMENTS
Is the fume cupboard generally tidy and clean?			
Any signs of damage, internal or external			
Cracking or deterioration of sealant at edges			
The build-up of debris on the plastic mesh to the rear of the cupboard			
Sash is free to move through its full range, and remains at the position it is released at (no rising or falling)			
Sash safety point marked			
The sash alarm is operational, giving visual and audible alarms when raised above the safety point			
Record air flow rate reading. Minimum for: irritant substances 0.3 m/sec general toxic hazards 0.5 m/sec volatile toxic hazards 0 . 7 m/sec			500mm _______ m/s 15mm ________ m/s

Sash's high limit is functioning			
No internal or external obstructions to airflow into the cupboard e.g., equipment/containers/chemicals, etc.			
Lights are functional			
Flush the water supply to the cupboard for 2 minutes			
Gas tap operational – No leakage (press finger over outlet with tap shut and check for any build-up of pressure)			
Inspect external ductwork from cupboard to room exit point for any damage, cracks or breaches			

Technical Officer name (print):	Signature:	Date of Inspection:

APPENDIX 3: Fume Cupboard Types and Specifications.

The following outlines the specifications for a new Fume Cupboard on campus at the University of Galway, users must always consult with Buildings and Estates before purchasing a new Fume Cupboard.

Conventional, ducted fume cupboards.

These are fume cupboards whose exhaust is ducted to the outside atmosphere, usually via a stack/chimney whose height above the roof level is designed to ensure full and proper dispersion of the fumes away from all areas where people might be affected. The University operates two types of conventional, ducted units:

Constant Air Volume (CAV).

These are designed to maintain a constant air extraction volume no matter where the sash is positioned. Face velocities will vary depending on where the sash is set and will increase as the sash is closed. Air bypass openings situated near the sash ensure that changes in face velocity are kept within a specified range. Depending on design, fume cupboard sashes may move vertically, horizontally or in combination.

Variable Air Volume (VAV).

These units use sash positioning controls to vary the fume cupboard extract fan speeds and subsequently alter the air extract volume. The extract volume varies depending on where the sash is positioned and allows face velocities to remain constant, at a predetermined level. The systems may be linked to building monitoring systems to enable extract and room make-up air to be balanced.

Ducted, low-flow fume cupboards.

These fume cupboards are specially designed to maintain suitable containment at lower face velocities thus offering significant energy efficiency over standard systems. They typically operate with face velocities of 0.3m/s-1.

Ductless, re-circulating fume cupboards.

These are self-contained units in which the exhaust air is passed through a filtration system and discharged back into the room.

Filters must be matched to the class of chemicals to be used and have a limited absorbent capacity. Care must be taken to ensure this limit is not exceeded as it can result in the release of hazardous substances into the work environment.

These units are not suitable for work involving radioactive, highly toxic, carcinogenic or sensitising substances. It should be noted that the HSE does not recommend using these fume cupboards for exposure control of vapours or carbon nanotubes (HSE Control Guidance note 201 and HSE Risk Management of Carbon Nanotubes 2009).

The selection and fitting of recirculating systems must be carefully reviewed. Consideration should be given to whether such a unit can provide adequate, reliable control of the anticipated hazards and that the resources and a safe system of work are in place to ensure the unit is monitored and maintained to the expected specifications. These units should be only installed under exceptional circumstances, following risk assessment with guidance from the Health and Safety Office.

Specialty Fume Cupboards.

Other specialty fume extraction systems exist, which offer protection against specific hazards or classes of chemicals. These include acid digestion, water wash and scrubber systems. Further information can be provided by the Health and Safety Office.

Fume Cupboard Performance Criteria.

Fume cupboards should be maintained within the performance thresholds recommended by the manufacturer and confirmed at the time of commissioning. This includes expected face velocity and containment values, where provided by the manufacturer.

Where manufacturer performance specifications are not available e.g. older units currently installed, the following face velocity guidelines should be followed:

Conventional, ducted fume cupboards.

For standard work with hazardous substances, the face velocity should be 0.5 m/s ±10% with the sash set to 500mm height.

When face velocities fall below 0.45 m/s the unit should be removed from use until remedial work has been completed.

Ducted, low-flow fume cupboards

In standard work with hazardous substances, the face velocity should be 0.3 m/s±10%.

Where face velocity falls below 0.27 m/s the unit should be removed from use until remedial work has been completed.

Factors affecting Containment.

Many factors can influence how effectively a fume cupboard will contain vapours. Users must be aware of these factors and ensure that the fume cupboard is set up correctly to ensure it is operating efficiently. Schools and departments have a responsibility to ensure their staff and students have been fully trained in the correct use before beginning work and have signed off on the training.

Obstruction

Large, bulky items and overcrowding with equipment & reagents can cause turbulence within the fume cupboard and may block the airflow to the rear baffles and result in a reduction in fume cupboard efficiency.

Containment may be significantly reduced by operator movements at the front of the fume hood.

Disruption of laboratory air supply

Cross draughts can interfere with the laminar airflow into a fume cupboard.

Locations near doors, windows, fans, air conditioning baffles and heavy pedestrian traffic can therefore reduce fume cupboard performance.

Heat sources

Hotplates and Bunsen burners can affect the air dynamics within the cupboard.

Incorrect Velocity

Face velocity should be maintained within manufacturer-recommended thresholds.

Where face velocity differs significantly from these values, containment can be significantly reduced. Low fume cupboard air flow is more readily disrupted by general air movement within the room, whilst high face velocities can result in turbulence and eddies within the unit thus allowing substances to escape.

Users should be aware of the type of fume cupboard they are using and any specific instructions they must follow that relate to its safe operation.

Before starting work, users should complete a check of the basic functions of the system.
• Operation of control switches.
• Operation of Sash and correct positioning of sash stopper.
• The airflow indicator demonstrates an acceptable flow rate.
• Internal light functions correctly.
• Surfaces should be clean and free of contamination.

Checks should be recorded regularly (e.g. weekly/monthly) to demonstrate the unit is working correctly

Workspace and equipment arrangement.

Where possible, avoid using large items in the fume cupboard. If these are necessary, consider raising the item on lab jacks to allow airflow underneath and avoid obstructing the rear baffles.

Limit the fume cupboard contents to the minimum equipment needed for the work. Fume hoods must not be used as storage areas.

Maintain an equipment-free zone of 150mm depth inside the front of the fume cupboard. It may be useful to mark this area out for reference.

Ensure lightweight items (e.g. filter paper, disposable gloves, aluminium foil etc.) are stored securely to prevent them from being drawn into the ducting and caught around the fan mechanism. If arrestor grilles are in place to catch objects, these should be regularly cleared of obstructions.

Sinks must be kept clear of obstructions to prevent overflow.

Sash position.

Vertical sash opening cupboards should be set to the lowest comfortable working height when handling material in the fume cupboard.

The maximum working opening should not be more than 500mm.

Where fitted, horizontal sliding sash panels should not be removed during use as this will reduce face velocity below acceptable levels and disrupt containment.

When the process is operating without user intervention, the sash opening should be minimised as far as is practicable.

Fume cupboard contents.

Bottles and containers will affect the airflow within the fume cupboard. Limit the volume of reagents inside the cupboard to that needed for the day's work. Materials not in current use should be stored in an alternative location.

To ensure that other individuals who are not directly involved in the work are aware of the substances being released into the system (e.g. workers, maintenance engineers, laboratory supervisors) details of the substances currently used and the contact details of the person responsible for the work should be displayed near the fume cupboard.

If experiments need to be run outside of normal working hours, a suitable risk assessment must be completed, and authorisation given by the individual responsible for the laboratory (as defined in the School's Local Rules). Emergency procedures and 'out of hours' contact details must be displayed.

The Chemical Agents Regulations require employers to provide information on any hazardous substances to which an employee may be exposed. Safety Data sheets should be kept for 5 years and be readily available to provide maintenance staff and contractors with suitable hazard information relating to substances that have been used in the fume cupboard, before commencing any maintenance or decommissioning work. Where practicable, it may be useful to include a record of substances used as part of any fume cupboard log.

After use.

Leave the fume cupboard in a clean and safe condition. When the work is completed, ensure that redundant equipment is removed, and the fume cupboard surfaces are cleaned.

Appropriate disposal of waste, as indicated by the assessment, local rules procedures and relevant waste legislation. Consult Sustainability for further advice.

When not in use, fume cupboard sashes should be closed to minimise airflow and provide maximum containment.

Reporting problems.

Report any defects immediately to the nominated responsible person (as outlined in the School/Unit local rules), who will arrange for remedial work to be carried out and advise of any restrictions to be placed on the use of the fume cupboard.

In the event of a catastrophic failure in the system (e.g. failure of fan motor) ensure the experiment is safely shut down and, **ONLY IF SAFE TO DO SO**, transfer any hazardous substances to another working fume cupboard. Immediately report the problem to the nominated responsible person.

Recirculating fume cupboards

Additional precautions must be taken if using recirculating fume cupboards.

Risk assessment should determine whether it is acceptable to use a recirculating fume cupboard for the intended substance. Chemicals with high hazard ratings (e.g. Highly Toxic, Carcinogen and known Sensitisers) must not be handled in a recirculating fume cupboard.

Users must ensure the correct filter for the substances to be used is fitted and they should consider the compatibility of the different substances they may be working with (Appendix Two).

Users should be aware of the lifespan of the filter and ensure the expected expiry date is displayed. This will be based on expected usage patterns therefore any significant changes to use should be reassessed regularly. Routine system checks should include confirmation that the filter is 'in date' for use.

Disposal routes for all used filters should be identified either through maintenance contracts disposal routes or Sustainability to ensure all hazards, hazardous waste regulations and Duty of Care are managed.

A standard operating procedure should be established to monitor fume cupboard use; this must include details of handling, replacing and disposing of contaminated filters

Fume Cupboard System Specification

The following is a specification for a general-purpose laboratory fume cupboard. All University fume cupboards should conform to this specification. This is the minimum requirement. However, certain of these features such as the face velocity or the fabric will need to be modified for a particular installation where, for example, the level of hazard is high or where the substances used are damaging to the normal materials of construction. Amended or further requirements for a particular installation will be notified separately by the University Health and Safety Unit. The design, construction and siting and the complete installation of a fume cupboard should conform to the recommendations in BS EN 141752 and, in particular, to the following specifications.

The Fume Cupboard

Face Velocity:

Either

- No individual measurement in the plane of the sash less than 0.55 m/sec. and no measurement less than or greater than 20% of the average face velocity; or
- An average face velocity of 0.4m/s and no measurement less than or greater than 10% of the average, provided
- Containment is < 0.005ppm, Robustness of Containment is < 0.1 ppm and Air Exchange Efficiency is < 10 seconds, when the sash is set at 500 mm.

Audio Visual Indicators:

(a) Green lamp, labelled "sash safe", to indicate sash below 500 mm.
(b) Red lamp, labelled "sash high", and audible alarm to indicate sash above 500 mm; the alarm to be equipped with a mute button to automatically re-set when the sash is returned to below 500 mm.
(c) green lamp, labelled "airflow safe", to indicate the face velocity specified above is being exceeded at all points in the plane of the sash.
(d) red warning lamp, labelled "airflow failed", and audible alarm to indicate that the lowest value of face velocity is below the value specified above (for commissioning purposes, the alarm should be set to operate at not less than 90% of the specified value).

Work Surface:

This must be smooth, non-absorbent and easily decontaminated with any internal angles/corners rounded; it should have raised edges to contain spillage and be made of one-piece ceramic or cast epoxy resin. The dished area of the work surface must not extend under the airfoil referred to in paragraph 2 of "Design" below. A minimum distance of 50 mm is required between the edge of the dished area and the rear of the airfoil.

Liners and rear baffle: should be of solid epoxy resin.

NB The sealing compounds used at the joins of work surface and liners should be epoxy-based.

Sash: this should be of toughened glass, with a sash lock fitted at 500mm (NB, not a security lock, but a releasable physical stop). Fume Cupboards, BS EN 14175-Parts 1,2 3, 4 and 6::2006 and DD CEN/TS 14175-5:2006

Design:

- Surfaces must be smooth, non-absorbent and easily decontaminated with any internal angles, joints/corners, rounded, i.e. coved.
- An aerodynamically styled facia (beveled edges to opening) with a gap left between the airfoil at the bottom of the facia and the front edge of the work surface
- A rear baffle; the rear baffle should be angled near the top to form an imaginary apex with the ceiling of the fume cupboard which should be sloped from the front at a similar angle or similar aerodynamic feature proven by development; the exhaust slot formed between the bottom of the baffle and the rear of the work surface should be covered by a coarse arrestor to prevent tissues and other light items from being drawn into the exhaust system;
- A bypass arrangement, with the inlet located so as not to interfere with the aerodynamic facia and also to direct the expansion path from any explosion within the fume cupboard up and away from the operator, unless a VAV fume cupboard is installed.
- Internal fittings, including sinks, must not be closer than 150 mm to the plane of the sash.
- Sinks, if fitted, must be integral to the work surface with no overhanging lips and connections to the waste system must be via a small trap (existing waste systems may need to be refurbished).

Typical Dimensions:

Internal width 1200 mm; internal depth 650mm; internal height 1100mm; the height of work surface above floor 900mm; max. sash opening 750mm.

Services

As specified by the user on the Fume Cupboard Requirements form, BUT, in the absence of user specification, a minimum of one cold water outlet and drip cup and one double 13-amp electric socket, and subject to any specific comments on installation by the University Health and Safety Unit.

Siting of fume cupboard:

- The distance from the plane of the sash to any space used frequently or for movement of other personnel should be at least 1000 mm.
- The distance between the plane of the sash and a bench opposite to it and used by the same operator should be at least 1400 mm.
- There should be no opposing wall (or other obstruction likely to affect the airflow) within 1400 mm of the plane of the sash for a single fume cupboard but may need to be as much as 2000mm for a higher airflow fume cupboard or a bank of fume cupboards.
- No fume cupboard should be installed in a position where it is likely to be affected by another item of equipment. In particular, the distance from the plane of the sash to the sash of an opposing fume cupboard, to the face of an open-fronted safety cabinet, or the edge of an exhaust hood, should be carefully considered.
- Any room air supply diffuser should not cause an airflow exceeding 0.2m/s within 400 mm of the sash.
- No fume cupboard should be positioned with either side closer than 300 mm from a wall or similar obstruction.
- No large obstruction, e.g. an architectural column, projecting beyond the plane of the sash should be within 300 mm of the side of the fume cupboard.
- No doorway should be within 1000 mm of the plane of the sash or 300 mm of the side of a fume cupboard.
- If a fume cupboard is not designed to contain a possible fire or explosion, the fume cupboard should not be sited in a position where exit from a workspace to the only escape route will necessitate passing directly in front of the fume cupboard. The unobstructed floor area in front of a fume cupboard should be outlined on three sides by 50mm red tape applied to the floor, 300 mm from each side and 1400 mm from the plane of the sash.

Ventilated Under storage

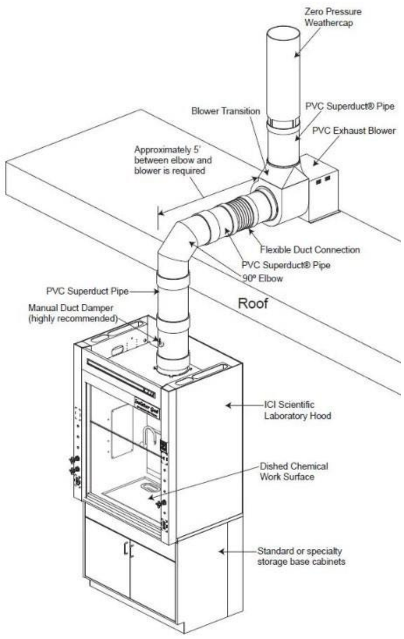
Part of the under-storage should be fitted out for the storage of toxic/corrosive substances. A 200 mm, black-on-yellow, triangular corrosive hazard warning sign conforming to The Health and Safety (Safety Signs and Signals) Regulations 1996 should be applied to the door of this compartment. The compartment and its fittings should be non-corrodible and fitted with 50 mm deep, corrosion-proof trays for spill containment near the center and at the bottom (the distance between these two trays should allow the storage of 2.5 litre Winchester bottles in the bottom of the cupboard.

The fume cupboard frame should allow for the placement of a vented cabinet (EN 14470–1(90 min)). The purchase er of the cabinet is responsible for connecting the outlet vent to the fume cupboard inlet.

The compartment should be vented at a low level via a small duct connected to the fume cupboard exhaust duct at a high level. The users shall note that the installation of venting is the responsibility of the purchasers to ensure that the system is connected and tested.

Fume Discharge System

- Negative pressure inside the building (fan positioned outside the building).
- Exhaust fan speed control to maintain steady state speed control after commissioning and to allow adjustment by variable speed controller located adjacent to the fume cupboard but inside a secure box separate from the main control panel.
- High-velocity vertical discharge, not less than 10 m/s;
- A minimum height of the top of the stack above ground level of normally 1.25 times the height of the highest point of the building or 3 m above the highest point of the building, whichever is the greater.
- The fan and motor specifications should assume highly flammable fume discharge.



Airflow Sensor: this should be of the type produced by TEL Ltd whereby the airflow through an orifice in the ceiling of the fume cupboard chamber is monitored by a calibrated diode to provide a signal for audio-visual airflow indicators.

Materials of construction

The materials for the construction of the fume cupboard system must be compatible with the substances used or generated in the system.

Air Make-Up System

Where it is necessary to install an air make-up system, the system should provide 90-95% filtered, heated, fresh air to replace the air extracted by a fume cupboard(s).

APPENDIX 4: FUME CUPBOARD REPORT SHEET

FREQUENCY	14 MONTHLY		
ROOM NO:		CUPBOARD NO	

UNIT ADDRESS:

FUME CUPBOARD SIZE:

Before checking the extract fan & ducting, notify the lab staff that the fume cupboard will be switched off for the duration of the inspection.	YES	NO
Is all glazing intact?		
Is all glazing of safety type		
Is ductwork sound and constructed of solid materials		
Is the smoke generator test satisfactory?		
Do counterbalances operate correctly?		
Is the rear baffle fitted and intact		
Are all internal surfaces and seals in good condition?		
Are low and high-level sash stops in place		
Is the maximum sash stop set at 50mm?		
Does the Bunsen burner stay lit at minimum sash position		
Is there sufficient ventilation in the room		
Is internal lighting operating		
Is the power supply intact and operable?		
Is the water supply intact and operable?		
Is the gas supply intact and operable?		
Is the drainage system operable?		
Check seals around drip cups/sinks, waste, drains and edges of worktops		
Does the extract fan operate		
Do air flow control devices work		
Is airflow indicator fitted and operating		
Is external stack in good order		
Stack discharge height above roof		
Duct work under positive pressure (%)		
Ductwork under negative pressure (%)		
Are all internal surface and seals in good condition		
Are fan belts in good condition		

Is fan housing in good condition		
Any further comments		
Tighten any loose fittings		
Carry out pencil smoke test and comment		
Remove the baffles & clean both & the rear of the chamber.		
Check complete extract system for breakages, cracks and splits especially at duct joints fabricated sections, adjacent to fans and duct brackets.		

Carry out smoke visualisation test at testing / working height. Pass ☐ Fail ☐

Face Velocities

N.B Face velocity averaged over 10 sec period shall not be less than 0.3 m/s

Average Velocity (m/s)
Date of Previous Calibration
Average Velocity of Previous calibration Serial Number of Instrument used Services Engineer Signature Date Customer Signature Has the University of Galway FLEX Asset tag been installed? Have you recorded using the FLEX Asset Tag recording system.
Next Service Date.
Comments

In the opinion of the Inspector, is this cupboard YES/NO (please delete) fit for use for the next 12 months.

Signature ……………………………………………………………………………………………….
Date: Tag Fitted:

Glossary of terms

Term	Description
Concurrency	The maximum number of hoods/enclosures in use at any one time.
COSHH regulations	Control of Substances Hazardous to Health regulations
COPD	chronic obstructive pulmonary disease
Diversity	The maximum number of hoods/enclosures to be in use at any one time.
LEV	local exhaust ventilation
OEL	occupational exposure limit(s)
OLD	occupational lung disease
RCS	respirable crystalline silica
TExT	thorough examination and testing
WEL	workplace exposure limit(s)