Chemical Management

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1. GLOSSARY

Chemical Agent: Means any chemical element or compound, on its own or admixed, as it occurs in the natural state or as produced, used or released, including release as waste, by any work activity, whether or not produced intentionally and whether or not placed on the market. Chemicals can be in a liquid, solid or gas form at the temperature and pressure being used or at standard temperature and pressure. They may or may not also meet the criteria of a Dangerous Good and / or a Hazardous Chemical Agent. 'Chemical' and 'Chemical agent' are interchangeable terms.

Competence: means a person possesses sufficient documented training, experience and knowledge appropriate to the nature of the work to be undertaken.

Dangerous Goods: Are substances that when transported are a risk to health, safety, property or the environment. Dangerous goods are subject to transport, workplace, storage, consumer and environment protection regulations, to prevent accidents to persons, property or the environment, to other goods or to the means of transport employed. Dangerous Goods are substances and or articles that are potentially hazardous to people and property. They may be corrosive, flammable, explosive, oxidising or reactive with water and are divided into 9 classes according to their dangerous properties.

Desensitised explosive: Means a solid explosive substance which has been wetted with water or alcohol or diluted with one or more other substances; or a liquid explosive substance which has been dissolved or suspended in water or one or more other substances.

Explosive precursors: Mean 'chemical substances that can be used for legitimate purposes but can also be misused to manufacture homemade explosives'. Homemade explosives have frequently been used during terrorist attacks in the European Union and elsewhere.

Gloves, Permeation: The process by which a chemical passes through a glove material on a molecular level.

Gloves, Breakthrough Time: The time it takes for a chemical to be detected on the inside of a glove after contact with the outer surface.

Gloves, Degradation: The physical changes in glove material (e.g., swelling, cracking, or weakening) caused by chemical exposure.

Hazardous Area: Means an area or space in which the atmosphere contains or may reasonably be expected to contain any material or substance (including, but not limited to, combustible dusts, combustible fibres, flammable vapours, flammable liquids, flammable gases, flammable or combustible fumes) at a concentration that is capable of being ignited by an ignition source.

Hazardous Chemical Agent: Means a chemical agent that has the potential to cause harm to human health or physical harm.

Head: The Safety, Health and Welfare at Work Act 2005 in Section 15(1), sets out the responsibilities of a 'person who has control of a place of work or part of a place of work'.
In UCC this person 'in control of the workplace or part of the workplace' is the 'Head' as defined in the Principal Statute, Clause: F.5.a. Purpose and Definitions, where "Head" means:

- Head of an academic unit by whatever name titled or the Administrative/Research Head of an administrative/research unit and shall include a person acting in the capacity of Head. OR
- Head shall also include a line manager with express authority delegated by the Head to carry out the Head's duties.

The 'head' holds responsibility for control of health and safety within the workplace or part of the workplace. Depending on the activity, the 'head' may be the Principal Investigator, Director, Head of School / Department or Line Manager. Functional areas or entities must assign head / heads in writing and detail the responsibilities of the position.

Particularly Hazardous Agents (PHA): A chemical that poses a significant risk to health due to its carcinogenicity, reproductive toxicity, or high acute toxicity. The detailed definition is provided in Appendix 6.

REACH: The EU regulation (Registration, Evaluation, Authorisation, and Restriction of Chemicals) aimed at protecting human health and the environment from chemical risks, while promoting safe use and communication of chemical substances.

Safety Data Sheet (SDS): The main tool for ensuring that suppliers communicate sufficient information along the supply chain to allow safe use of their substances and mixtures. Safety data sheets include information about the properties of the substance (or mixture), its hazards and instructions for handling, disposal and transport and also first-aid, firefighting and exposure control measures. This information is key to carrying out a risk assessment on the use of the particular substance in question and can be found in the main body of the safety data sheet or in the annexed exposure scenarios (where applicable).

Store: Means a specific location where chemicals are stored or handled, this may include but is not limited to a room, laboratory, tank, shed, freezer, fire rated or acid cabinet.

2. PURPOSE

The purpose of this procedure is to:

- Set common chemical management standards for implementation across all University College Cork Functional Areas and entities. Additionally, the procedure provides guidance, noting:
    - The UCC Health & Safety Policy specifies mandatory compliance with applicable legislation (as detailed in Section 3). To enable compliance it's required that, systems must be developed, and resources must be made available.
    - Systems of work for downstream implementation of the legislation including the Health and Safety Authority guidance note hsa.ie/chemical_and_hazardous_substances/storage. This guidance note should be implemented as far as is reasonably practicable. Any deviation from the HSA guidance note should be supported by a documented risk assessment.
    - Where the words 'must' or 'shall' are used, this denotes mandatory compliance, whereas 'may', 'could', 'should', 'recommend' or similar denotes guidance.
- Enable the attainment of United Nations Sustainable Development Goals (SDGs), including at least SDG-3 Health and SDG-12 Responsible Consumption and production.
- Provide standardized good laboratory practice across UCC laboratories and other workplaces where chemicals are used. It is intended that UCC students are trained in this good practice and are well equipped to carry these best practices over to workplaces where they attain employment. This promotes UCC's positive reputation.

3. SCOPE / LEGISLATION

This procedure covers all UCC facilities, where use of the word "Department" means College/School/Department/Centre/Unit. The Safety, Health and Welfare at Work Act 2005 and applicable regulations require a preventative approach to be taken to reduce accidents and ill health at work. Under the Act, specific regulations are applicable to chemical exposure at work, which are dealt with elsewhere in this procedure. These regulations include:

- Chemical Agents Regulations, [read in conjunction with the Code of Practice for Chemical Agents].
- Carcinogens Regulations.
- Pregnant Employee Regulations.
- ATEX Regulations
- ADR and Carriage of Dangerous Goods by Road and Transportable Pressure Equipment Regulations

4. INTRODUCTION

This Chemical Management System Procedure is an integral part of University College Cork's approach to managing health and safety risks associated with hazardous chemicals. It is directly aligned with the UCC Health and Safety Policy, which provides strategic direction and represents the highest level of safety documentation within the university.

The UCC Safety Statement defines the university's commitment to health and safety across all operations. It forms a core element of UCC's Health and Safety Management System, which offers a structured method for identifying, assessing, and controlling workplace risks. All departments, schools, and functional areas are required to align their local systems with this policy to ensure consistency and integration.

The Health and Safety Management System, aligned with ISO 45001, connects policy with practice. It includes system procedures, standard operating procedures, forms, and records, ensuring that strategic intent is translated into effective operational measures across the university.

Within this framework, the Chemical Management System Procedure outlines how UCC manages risks related to the procurement, transport, storage, and use of hazardous chemical agents. These agents are defined under the European Union's Regulations on the Classification, Labelling, and Packaging of Substances and Mixtures, and include any chemical for which a Safety Data Sheet has been provided by the manufacturer or supplier.

This procedure applies to all work areas, including those operated or maintained by the university, and to any situation where individuals may be exposed to chemical agents. It supports UCC's broader commitment to health and safety by ensuring that chemical risks are managed in accordance with both regulatory requirements and internal standards.

5. RESPONSIBLITIES

University College Cork (UCC), as a corporate body, holds ultimate responsibility for health and safety. This responsibility is carried out through individuals who oversee specific areas, processes, and activities. These individuals, referred to as managers, are accountable for ensuring that health and safety standards are upheld within their scope of control, including the safe management of chemical-related operations.

Managers are responsible for directing and controlling work activities, implementing the health and safety management system, and maintaining legal compliance. While responsibilities may be delegated to competent individuals, such delegation must be documented in writing, with managers retaining oversight.

Within UCC, research institutes and centres such as the Tyndall National Institute, the Sustainability Institute, APC Microbiome Ireland, IPIC, INSIGHT, and INFANT operate with a degree of autonomy. However, they remain subject to UCC's overarching health and safety policies and procedures, including those governing chemical safety.

This chemical system procedure outlines the responsibilities and controls necessary to ensure the safe handling, storage, use, and disposal of chemicals across all university activities. It supports UCC's commitment to maintaining a safe working environment and complying with applicable legal and institutional requirements.

5.1 MANAGER

A manager is anyone who directs and controls the work of an employee, individually or as part of a team, or who holds responsibility for an area, process, building, or facility.

Managers with direct authority over employees are responsible for ensuring their health and safety in relation to chemical use and exposure. This includes:

- Overseeing the provision of appropriate resources and information to support safe chemical management, such as access to Safety Data Sheets, chemical inventory systems, spill kits, and compliant storage facilities.
- Ensuring that staff, contractors, post docs, PhD students and others under their supervision complete required chemical safety training and receive workplace-specific instruction relevant to the hazardous chemical agents they may encounter.

Managers of processes, buildings, or facilities must ensure that the physical environment, systems, and equipment under their control support safe chemical handling, storage, and disposal, protecting all occupants and enabling compliant operations.

All managers are expected to:

- Provide daily proactive supervision to promote a positive chemical safety culture.
- Implement and maintain chemical safety systems, allocating resources appropriately.
- Manage chemical-related health and safety activities under their control, ensuring compliance with the Health and Safety Management System and applicable legal requirements. Take corrective action where needed.
- Develop, implement, and maintain chemical safety procedures, protocols, forms, and documentation in line with organizational and legal standards.
- Conduct and approve chemical risk assessments for all relevant activities, ensuring risks are identified, evaluated, and mitigated effectively.
- Collaborate with safety representatives, employees, and other managers to identify and address chemical hazards and maintain a safe working environment.
- Ensure that chemical-related incidents, near misses, or hazards are promptly reported and investigated in line with UCC requirements. Implement corrective measures and review their effectiveness.
- Delegate responsibilities where necessary to competent individuals, ensuring delegation is documented and accountability is maintained.

Certain responsibilities may fall outside the scope of a manager. For example, the Buildings and Estates Office is responsible for the management and maintenance of buildings, grounds, and property as detailed on the UCC Buildings and Estates website.

These responsibilities are part of UCC's broader commitment to health and safety and must be carried out in accordance with the UCC Safety Statement and the Health & Safety Management System.

Subsets of managers include roles such as Heads of Unit, Principal Investigators, Chief Technical Officers, and Managers of Processes, Buildings, or Facilities. However, the definition of a manager is not limited to these titles. Any individual with responsibility for directing work or overseeing an area, process, building, or facility may hold managerial responsibilities under this procedure.

5.1.1 HEAD

A Head is the manager responsible for ensuring that chemical management systems and related resources are in place, maintained, and effectively communicated within their area of responsibility. While specific tasks may be delegated in writing to competent individuals, the Head retains overall

accountability for ensuring that systems function as intended and that chemical safety standards are upheld.

Heads must ensure that:

- Chemical-related health and safety systems are established, maintained, and effectively communicated to minimize risks to staff, students, and others.
- Responsibilities for chemical safety are appropriately delegated to competent individuals, with oversight and accountability retained.
- Adequate resources, training, and information are available to support safe chemical handling, storage, use, and disposal.
- Mechanisms are in place for reporting, investigating, and responding to chemical safety incidents and near misses.
- Regulatory interactions related to chemical safety are managed appropriately, including the nomination of individuals to liaise with bodies such as the Health and Safety Authority (HSA) and the Environmental Protection Agency (EPA).
- Additional responsibilities for Heads, including those specific to functional areas, are outlined in the UCC Safety Statement.

5.1.2 PRINCIPAL INVESTIGATOR (PI)

Principal Investigators (PIs) play a central role in ensuring chemical safety within research environments at University College Cork. As managers of research teams, they are responsible for implementing the Chemical Management System Procedure in their respective areas. Their responsibilities extend beyond individual compliance to include leadership, coordination, and oversight of chemical safety practices across their research activities.

Key responsibilities include:

- Taking direct responsibility for the safe planning and execution of research involving hazardous chemicals, including work carried out by postdoctoral researchers, technical staff, and students.
- Ensuring compliance with relevant safety statements when research activities or personnel are based across multiple UCC locations.
- Identifying and assessing research-specific hazards such as chemicals, biological agents, specialist equipment, and out-of-hours work, and ensuring that appropriate control measures are in place before activities begin.
- Making risk assessments accessible to all members of the research group and to others who may be affected, particularly in shared or multi-use spaces.
- Ensuring that people employed have the necessary competence. This includes confirming appropriate qualifications, and providing suitable training and supervision to research staff, contractors, postdoctoral researchers, PhD students, demonstrators, and other applicable students to ensure the safe handling and use of hazardous chemical agents.
- Including safety-related costs in research budgets, such as those associated with equipment maintenance, chemical storage, and hazardous waste disposal.
- Representing their research area in interactions with regulatory bodies such as the Health and Safety Authority and the Environmental Protection Agency and ensuring university policies are effectively implemented to maintain high safety standards.

5.1.3 CHIEF TECHNICAL OFFICER - MANAGERIAL (CTO) / EQUIVALENT ROLE

The Chief Technical Officer (CTO) plays a pivotal role in supporting the safe and effective management of chemical activities within research, teaching, and technical facilities. This is carried out in line with the defined scope of their position, including their specific responsibilities and authority. While overall

responsibility for health and safety rests with the Head, the CTO typically serves as the primary liaison for chemical safety within the school or entity, facilitating communication with staff, students, safety representatives, and other stakeholders, including the UCC Enterprise Risk Management Office when required.
In addition to overseeing the work of Technical Officers in areas under their direct control, the CTO may supervise technical activities in teaching laboratories, where risks are managed by staff outside their direct authority. The CTO may also advise on chemical safety matters in areas where they do not manage the work or personnel involved.
The CTO may assume additional governance and compliance responsibilities formally delegated in writing by the Head. These responsibilities, as they relate to chemical safety, include:

The CTO is responsible for:

- Supporting the Head in ensuring that staff and, where appropriate, students (may include contractors, post docs, PhD students and other applicable students) receive chemical safety inductions, training, and ongoing guidance.
- Ensure all chemical-related work they direct is risk assessed, and that the relevant chemical risk assessments (e.g. GHS Health Hazards, GHS Safety & Environmental Hazards, Chemical Reactivity, Task Based Risk Assessment) are documented and made readily accessible to any person who may be affected by the work.
- Ensure that appropriate chemical risk control measures are in place before work begins, including engineering controls, PPE, ventilation, and safe storage. These measures must be routinely monitored and reviewed to ensure they remain effective in protecting staff, students, and others in laboratories, teaching spaces, and workshops.
- Ensure that equipment associated with chemical use (such as fume cupboards, chemical storage units, dosing equipment, or teaching lab setups) complies with relevant chemical safety legislation and UCC's health and safety policy and procedures. This is in conjunction with the relevant Buildings and Estates (B&E) personnel.
- Ensure that technical staff who manage or support chemical use are adequately trained and supervised to carry out their duties in a manner that safeguards their own health and safety and that of others who may be exposed to hazardous substances.
- Overseeing safe chemical storage, labelling, disposal, and equipment maintenance.
- Monitor inventory compliance trends (against requirements specified in this procedure) across laboratories and guide corrective actions where systemic issues are identified.
- Facilitate coordination between technical officers, researchers, and safety personnel to ensure inventory practices support safe chemical use and storage.

In conjunction with the Head or School / Department Health and Safety Committee

- Adapt the ERM Safety Statement and the ISO 45001-aligned Health and Safety Management System, including the risk register, to ensure they remain practical and relevant to the specific chemical risks and day-to-day operations of the school, including procurement, handling, storage, use, and disposal of hazardous substances.
- In line with UCC Buildings and Estates Fire Safety | University College Cork , which assigns responsibility for fire safety systems to the Buildings Office, the CTO supports the Fire Officer by ensuring that chemical-related fire safety measures and emergency protocols—such as appropriate storage, segregation of incompatible substances, and availability of extinguishing agents—are implemented and maintained in their designated areas.

- Oversee the effective implementation of emergency response protocols related to chemical hazards, including responses to chemical spills, chemical exposure or poisoning, and fire or explosion risks resulting from chemical reactions. This also includes ensuring that accurate information on hazardous substances is readily available to assist emergency personnel in the event of an emergency.

Further details on the CTO's broader health and safety responsibilities are outlined in the UCC Safety Statement.

5.1.4 MANAGERS OF PROCESSES, BUILDINGS, OR FACILITIES

Managers of processes, buildings, or facilities must, within their responsibility for infrastructure play a key role in ensuring that processes, buildings or facilities are suitable for chemical-related activities and that risks are appropriately managed. Their responsibilities include:

- That safety-critical building infrastructure, control systems, and emergency systems such as access control, fire suppression, and alarms are provided, maintained, and tested at appropriate intervals.
- Systems that support safe chemical management, including local exhaust ventilation systems, fume hoods, biological safety cabinets, containment infrastructure, plumbed emergency showers with eye washes, disposal systems, and chemical waste storage, must be requested through the Works Requisition Form (BEM) process.

Once installed, these systems must be maintained, tested, and monitored regularly to confirm their condition and functionality. This ensures compliance with both UCC procedures and applicable legal requirements. Additionally:

- As the owner of building infrastructure control and emergency systems, participate in local facilities management meetings and safety forums for risk management.
- When planning a new building, the intended use must be confirmed. If the building will include laboratories, workshops, or similar spaces, it must be designed and constructed to support the activities to be carried out, including appropriate infrastructure for safe chemical storage, handling, ventilation, containment, and emergency response systems. Implementation activities must adhere to this procedure and comply with applicable legislation.

5.2 GOVERNANCE AND GUIDANCE OF CHEMICAL MANAGEMENT

Effective governance and clear guidance are essential to ensuring the safe management of hazardous chemicals across UCC. This section outlines the responsibilities of key roles in setting chemical safety policy, providing oversight, and supporting compliance with relevant legislation, standards, and best practices.

5.2.1 TECHNICAL OFFICER (TO) / ALL GRADES / EQUIVALENT ROLE

The Technical Officer supports the safe operation of chemical procedures in laboratories that they are responsible for, ensuring compliance with health and safety standards and providing technical assistance to staff, researchers, and students. Key responsibilities include:

- Supervising safe chemical work in laboratories, assisting the CTO/TO team, and mentoring staff and students on chemical handling, equipment use, and emergency response.
- Maintaining laboratory equipment and chemical storage systems, ensuring they are safe and functional, while managing inventory, proper labelling, storage, and disposal of chemicals in line with regulations.

- Manage chemical inventory, including accurate recordkeeping, labelling, storage, and disposal in line with regulations.
- Ensure inventory systems are up to date, track expiry dates, and support integration with risk assessments and safety documentation.
- Preparing chemical risk assessments in consultation with staff, updating safety documentation.
- Addressing through the CTO, if necessary, any non-compliance issues and ensure corrective measures are implemented promptly.
- Delivering hands-on safety training on chemical risks, handling procedures, personal protective equipment (PPE), and will respond with emergency measures for spill response or fire, if trained for such.
- Collaborating with staff to ensure day-to-day laboratory safety, implementing emergency plans, and supporting initiatives to foster a strong safety culture.

5.2.2 EMPLOYEES

In line with Sections 13 and 14 of the Safety, Health and Welfare at Work Act 2005, all employees at UCC have legal duties related to chemical safety. These include:

- Taking reasonable care for their own health and safety and that of others who may be affected by their actions.
- Cooperating with the University to ensure compliance with chemical safety procedures and legislation.
- Participating in required chemical safety training and following all instructions related to the safe use of hazardous chemical agents, equipment, and protective measures.
- Reporting without delay any accidents, near misses, unsafe practices, or defects in equipment or systems that could pose chemical risks.
- Avoiding behaviour that could compromise chemical safety, including misuse of safety equipment or working under the influence of substances.
- Maintaining good housekeeping standards and supporting a respectful, hazard-aware working environment.
- Familiarising themselves with relevant chemical safety procedures and advocating for safe practices within their work area.

5.2.3 POSTGRADUATE RESEARCHERS

Postgraduate researchers at UCC, typically PhD students who receive studentships, have considerable autonomy in chemical laboratories and play a key role in both conducting research and supporting undergraduate teaching activities. Their responsibilities are particularly critical when working with hazardous substances, specialised equipment, and complex procedures, including:

- Safe Research Practices: Postgraduate researchers must plan and carry out chemical procedures in line with UCC's safety protocols, including proper storage, handling, and disposal of chemicals. They are expected to understand the hazards associated with reagents and reactions, and implement appropriate control measures.
- Supervision of Undergraduate Students: When acting as Laboratory Demonstrators, they guide undergraduates through chemical experiments, ensuring safe behaviour, correct technique, and strict adherence to lab protocols, especially when handling corrosive, flammable, or toxic substances.
- Collaboration with Principal Investigators (PIs): Postgraduates work closely with their PI, who holds overall responsibility for the research group's safety. They are expected to report hazards,

incidents, and near misses, and to participate in lab-specific safety reviews and refresher training.
- Risk Assessment Participation: Postgraduate researchers should actively contribute to the development and review of risk assessments for their own chemical work and provide input into risk assessments for any undergraduate experiments they supervise.
- Role Modelling: They are expected to consistently demonstrate correct use of PPE (e.g., lab coats, gloves, eye protection), safe handling of chemicals and glassware, and full compliance with emergency procedures such as spill response and eyewash station use.

5.2.4 STUDENTS

UCC has a legal duty to protect students from harm. Students also share responsibility for maintaining a safe environment, particularly when working with hazardous chemical agents. All students, including undergraduate, postgraduate, and apprentice learners, must:

- Take reasonable care for their own safety, health, and welfare, and for others who may be affected by their actions.
- Cooperate fully with UCC staff, fellow students, and others to support safe chemical practices.
- Participate in all mandatory health and safety training, both online and in-person, and attain the required level of competency before engaging in any work involving chemical agents.
- Follow all instructions and departmental standard operating procedures (SOPs) when handling chemicals or equipment, and refrain from eating, drinking, chewing gum, applying cosmetics, brushing teeth, changing contact lenses, or adjusting dental braces in laboratory areas.
- Wear appropriate personal protective equipment (PPE) and clothing, including closed-toe shoes, full-length leg coverings, minimal jewellery, and tied-back hair.
- Maintain good housekeeping standards in all work areas, including benches and shared spaces.
- Operate equipment only if properly trained and authorised and never enter laboratories or workshops without permission from supervising staff.
- Promptly report any unsafe conditions, near misses, accidents, or hazards to a Principal Investigator, Chief Technical Officer, or Technical Officer.
- Never interfere with, misuse, or damage any safety equipment or resources.
- Avoid behaviour that could compromise safety, including horseplay, bullying, or working under the influence of alcohol or drugs.
- Follow all applicable health and safety legislation, including during placements or off-campus activities.

5.2.5 VISITORS

Visitors to UCC, including invited guests and collaborators, may access areas where hazardous chemical agents are present. All visitors must:

- Follow relevant UCC policies, including those related to chemical safety, conduct, and emergency procedures.
- Comply with instructions from UCC staff and observe all safety signage and protocols.
- Remain within permitted areas and avoid interfering with chemical-related activities or equipment.
- Immediately report any incidents, hazards, or emergencies to UCC staff.
- Act responsibly and take reasonable care for their own safety and the safety of others, in accordance with Irish law.

5.2.6 MEMBERS OF THE PUBLIC

UCC maintains an open campus, but access to areas where hazardous chemical agents are used or stored is strictly prohibited. Members of the public must:

- Remain in publicly accessible areas and must not enter laboratories, workshops, chemical storage areas, or any other restricted zones.
- Comply with all posted safety signage and instructions from UCC staff or security personnel.
- Avoid any behaviour that could interfere with chemical safety or disrupt university operations.
- Take reasonable care for their own safety and the safety of others, in accordance with Irish law.
- Understand that while UCC maintains a duty of care, individuals are legally responsible for their actions while on campus and may be held accountable for any harm caused by unsafe or unlawful behaviour.

5.2.7 CONTRACTORS

Contractors working at UCC must prioritise chemical safety by:

- Complying with all relevant chemical safety legislation and UCC procedures, including those outlined in the Chemical Management System.
- Before commencing work in areas where hazardous chemical agents are present, contractors must either participate in a chemical safety induction or demonstrate that they have assessed and familiarised themselves with the specific chemical risks relevant to their tasks. This must be documented and verified by the responsible UCC contact.
- Obtaining and following permit-to-work approvals (may require input from B&E) for any tasks involving chemical agents or work in chemical-controlled areas. The permit to work must be issued by a 'competent person', who has adequate understanding of the scope of work.
- Using appropriate personal protective equipment (PPE) and handling chemicals only if trained and authorised.
- Reporting any chemical-related incidents, unsafe conditions, or near misses to UCC staff immediately.
- Cooperating with UCC staff to identify chemical hazards, follow established protocols, and maintain safe working conditions.
- Avoiding interference with chemical safety systems, equipment, or procedures.

5.2.8 FRANCHISE HOLDERS, TENANTS AND SHARED OCCUPANCY

Any external entity operating on UCC premises must ensure, as far as reasonably practicable, the safe management of chemicals in line with the Safety, Health and Welfare at Work Act 2005 and UCC policies. Key requirements:

- Maintain a current Safety Statement that includes chemical hazards, storage, handling, and disposal, and review it after any significant changes or incidents. Some aspects within the safety statement include:
    - Comply with all chemical safety legislation (e.g., REACH, which is only applicable when manufacturing quantities exceeding 10 tonnes per year, so REACH will typically not be applicable], CLP) and align with UCC emergency procedures.
    - Store chemicals securely, segregate incompatibles, and ensure all containers are correctly labelled.

    - Provide all applicable people (may include employees, contractors and others) with chemical safety training, including spill response and correct PPE use.

- Keep an up-to-date chemical inventory and ensure Safety Data Sheets (SDS) are accessible on site.
- Report chemical spills, exposures, or dangerous occurrences promptly to UCC Buildings & Estates.
- Dispose of chemical waste through approved routes and never discharge chemicals to drains.
- Submit evidence of insurance and ensure any chemical-related equipment is certified where required.

5.2.9 SHARED PLACES OF WORK – UCC AND EXTERNAL ENTITIES

When UCC staff and external entities share workspaces, both parties must manage chemical risks responsibly and comply with relevant legislation and UCC procedures. Key expectations:

- Develop and maintain risk assessments and Safety Statements that address chemical hazards in shared areas.
- Communicate openly about chemical use, storage, and disposal to prevent cross-contamination or exposure.
- Define and agree responsibilities for chemical safety in shared spaces, including emergency spill response.
- Ensure chemicals are stored securely, labelled correctly, and segregated from incompatible substances.
- Provide staff with training on chemical hazards, PPE, and emergency procedures relevant to shared environments.
- Report chemical incidents, spills, or exposures promptly and cooperate on investigations and corrective actions.
- Dispose of chemical waste through approved routes and never discharge chemicals into drains or shared systems.

5.2.10 ENTERPRISE RISK MANAGEMENT

The Health and Safety Office at the university primarily provides advisory support for chemical management, including:

- Guiding safe storage, handling, and disposal of chemicals in line with legal and institutional requirements.
- Advising on risk assessment methodology and providing tools.
- Developing and sharing best practice guidelines and procedures for chemical safety.
- Guiding on appropriate personal protective equipment (PPE).
- Supporting incident investigations where there have been chemical exposures.
- Providing generic training on chemical safety and risk awareness, through an LMS platform.
- Audits including basic chemical safety.

6. COMPETENCE

To ensure that all staff and students working with chemical agents attain the necessary competence before engaging in any work activity, it is crucial to define and assign clear responsibilities for training. The required level of competence will vary depending on the nature and complexity of the chemical work being performed. While specific roles, such as the Principal Investigator or other positions typically hold the responsibility for conducting and documenting appropriate training. The 'Head' retains overall

accountability for ensuring that the overall system for training is functioning as required. The level of competence required for chemical agents varies according to the work activity been carried out.

Some basics are:

- Determine whether all people exposed 'possess sufficient training, experience and knowledge appropriate to the nature of the work to be undertaken'.
- Review the applicable Safety Data Sheets (SDSs) and REACH compliant Exposure Scenarios where applicable.
- Review the contents of this procedure.
- Attain competence through: Online training on Chemical Awareness and Chemical Risk Assessment. Classroom-based instruction, including refresher training, seeking guidance from supervisors, hands-on practical demonstrations, and assessments to ensure understanding.
- Keep appropriate evidence of competence for review (for staff, one source would be on the UCC ERM Learning Management System - LMS, where records of training are kept). For undergraduate students receiving training, records of paid demonstration sessions, where postgraduate demonstrators are compensated to deliver instruction, can serve as evidence that the undergraduate students have participated in structured, supervised training.

7. RISK ASSESSMENT

Chemical agent risk assessment through necessity follows a different approach to other assessments, but the underlying risk scoring remains the same. The tool that is used to assess chemical health risks is: ERM.6CF.01.00.Chemical Risk Assessment 2024.12.05 (currently draft). Within this tool there are different steps:

7.1 IDENTIFY

In the workplace it is necessary to identify the health effect of chemical agents. This can be achieved by obtaining the safety data sheet (SDS) and determining which hazard categories associated with the chemical agent. In the spreadsheet ERM.6CF.01.00.Chemical Risk Assessment (still in draft), this is the IDENTIFY step.

7.2 ASSESS

The Assess step has a number of sub-steps in the spreadsheet ERM.6CF.01.00.Chemical Risk Assessment (still in draft). Existing controls in place must be determined. Various questions on exposure likelihood must be determined. Once this is completed risk is calculated within the spreadsheet.

7.3 CONTROL

Once this assessment has been completed determine whether the current available controls are adequate at preventing or minimising emissions, release and spread of contaminants. When making changes to existing processes, identify and control the highest sources of exposure first. This involves:

- Further actions needed to control the risks, aligned with the hierarchy of controls, which are:
- Elimination – eliminating the chemical hazard completely.
- Substitution – replacing a chemical hazard for another that is of lower risk.
- Engineering controls – containment/local exhaust ventilation, general dilution ventilation.
- Administrative controls – changing workplace practices to reduce exposure.
- Personal Protective Equipment – protecting workers from chemical hazards with PPE.

Determine who needs to carry out the action and when the action needs to be completed by?

7.4 TOOLS

Tools available to help with the risk assessment are:

- ERM.6CF.01.00.Chemical Risk Assessment 2024.12.05
- APPENDIX 7: SDS - REGISTRATION EVALUTION AUTHORISATION AND RESTRICTION (REACH)

8. SAFETY DATA SHEET (SDS)

The Safety Data Sheet (SDS) is a mandatory document that describes a hazardous substance and details advice on how to use it safely. Every SDS contains 16 Sections including information, classified in terms of the GHS, about:

- The chemical properties
- Hazards
- Health effects
- Mandatory labelling and signage
- Exposure control and required PPE
- Safe handling and storage
- First aid
- Emergency procedures
- Disposal

The SDS should be used to identify the type of chemical agent in use, as well as the risks and hazards associated with each chemical product. All users of chemical agents must have access to updated SDSs. It is acceptable if this is in soft copy or through a software laboratory system. A trusted open-source website for accessing SDS's is: https://echa.europa.eu/information-on-chemicals

Ensure that the review date on the SDS is less than 5 years old. Manufacturers are required to review and update SDSs at least every 5 years from the date of original preparation or the last revision. If the SDS is older than 5 years, it is no longer legally valid. Within the Functional Area / Entity, when purchasing chemicals and during the annual review of the chemical risk assessment review (it is only limited to the SDS's of chemicals included in risk assessments) the SDS check for any changes to the existing SDS.

9. LABELLING

All chemical agent containers must be labelled in line with GHS requirements (including those containing waste materials). Noting:
In certain cases, space / size may not allow for the use of full GHS compliant labels. This is where use of the full GHS 'correct' label would result in the product identifier being difficult to read and/or also impair visibility into the container, impeding safe dispensing. Correctly labelling containers is up to the school / department, noting:

- The recommended approach is to use the UCC-approved vendor software solution to generate CLP-compliant labels, ensuring both accuracy and compliance. Small departments that occasionally use low-risk chemicals may choose not to implement this software. In such cases, it is recommended to seek assistance from a department or school that can provide CLP-compliant labelling.
- All chemical agents, samples, or solutions must be clearly labelled, in line with GHS requirements and relabelled if solvent or other substance makes the original labelling illegible.

- It is acceptable, but not recommended, to use write on CLP/GHS labels by manually copying the information from the original label. For pictograms, printed commercially available hazard pictogram labels should be used.

Full 'correct' GHS Labels include:

- Product identifier
- Contact details of the manufacturer or importer
- Breakdown of the ingredients with percentages/ratios
- Hazard Pictogram
- Hazard Statement, Signal Word, Precautionary Statements
- First aid treatment and emergency procedures if not already included in the precautionary statements
- Expiry date (if applicable)

Ideally, all the required GHS label information should be contained on a single label. Where this is not practically possible, it is still acceptable for GHS information that has changed to be added as an additional label to an old container. Typically, information that is likely to have changed will be the signal word, GHS pictograms and hazard statements. Information that may have changed includes precautionary statements and first aid. Information that is unlikely to have changed is the product name or identifiers and manufacturers' information.

The 9 hazard pictograms (Irish building blocks) follow. GHS/CLP specifies the pictograms to be used but does not define the specific names associated with each pictogram. As a result, the naming conventions for the pictograms can vary depending on the source or website.

Compressed Gas: An image of a gas cylinder. Cylinders when exposed to extreme heat have the potential to explode with devastating effect. As a result, compressed gas cylinders need to be kept away from direct sunlight and sources of heat.

Environmental / Aquatic hazard: The symbol of a dead tree and fish indicates danger to the environment, which could be either immediate or delayed. It is important to ensure that substances considered to be an environmental hazard are disposed of properly.

Explosive: A sign used on explosive substances such as fireworks and various other types of ammunition. The exploding bomb signage indicates that there is a need for specialist care, and they should always be kept away from any heat source.

Flammable: With a symbol of a flame, this sign is featured on substances and products that are particularly high risk of catching fire. As a result, any product with the flammable symbol should be kept as far away as possible from any form of spark that could result in ignition.

Corrosive: Featuring a hand and a test tube with liquid splashing from it, this pictogram signals that a substance can cause severe damage to living tissue, including skin or eyes. It is used for chemicals that can cause burns or irreversible damage to skin, eyes, or metals.

Oxidiser: Featuring a flame over a circle, an oxidising substance can react exothermically. This means that it has the potential to react violently with other substances and could cause or feed a fire.

Harmful/irritant/sensitiser: This hazard label has an exclamation mark. This indicates that the container contains a hazardous substance which may be damaging to a person's health.

Acute Toxicity: Featuring skull and crossbones, the toxic sign should be easily recognised. If it includes a T in the top left-hand corner, this means that the substance is particularly potent.

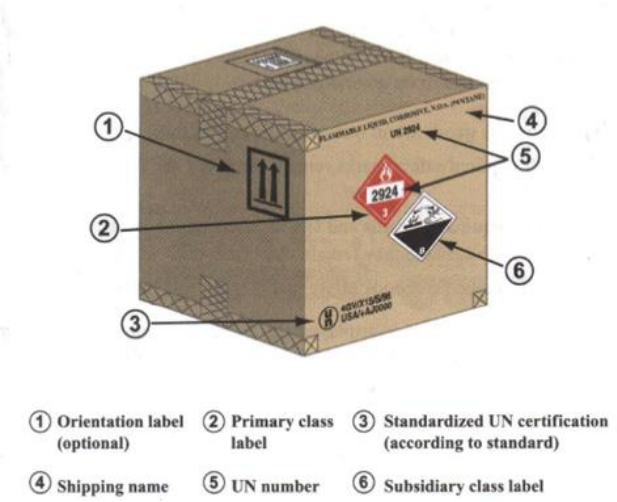
Chronic Health Hazard: Featuring a human silhouette with a white star in the centre, this sign indicates a potential risk to a person's health. This label is used for substances that can cause severe and long-term health issues, such as cancer, respiratory diseases and genetic defects, amongst others.

When using, storing or transporting chemical products, ensure that the product container is correctly labelled. In cases where the label has become damaged or illegible, a replacement label is to be installed on the container only when the contents of the container can be absolutely assured.

For transporting chemicals labels and pictograms on the packaging and transport vehicle are issued in terms of the Carriage of Dangerous Goods by Road and Use of Transportable Pressure Equipment (ADR). For packaging, labels are placed on the outside surface of packages and must conform to the specification set in ADR. The classification and labelling on the containers are issued in terms of the Globally Hazardous Substance (GHS). The labels and pictograms for the Carriage of Dangerous Goods by Road and Use of Transportable Pressure Equipment (ADR) and Globally Hazardous Substance (GHS) are different.

For GLACIAL ACETIC ACID Carriage of Dangerous Goods by Road and Use of Transportable Pressure Equipment (ADR) vs Globally Hazardous Substance (GHS) Label

ADR



① Orientation label (optional) ② Primary class label ③ Standardized UN certification (according to standard)

④ Shipping name ⑤ UN number ⑥ Subsidiary class label

GHS

Bostick & Sullivan
www.bostick-sullivan.com
877-817-4320 Toll Free

9.1 DECANTING CHEMICAL AGENTS

Where possible, please keep chemicals in their original containers that have appropriate GHS labelling. At times this is not If this is not avoidable, if you decant or transfer hazardous chemical agents out of their original container, you have a legal responsibility to ensure that the secondary or portable container features the correct chemical agent labels.

10. INVENTORY MANAGEMENT

Maintaining an up-to-date chemical inventory is a legal requirement for the use, handling, and storage of chemical agents, as outlined in the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001–2021.

The inventory also serves as a cornerstone for effectively communicating and managing chemical hazards present in the laboratory. To achieve "duty of care", with respect to chemical agents, functional

areas / entities need to monitor the purchase, distribution of and access to these substances, ensuring appropriate disposal, and limiting the storage of unnecessary hazardous materials.

A software solution is the best way of keeping an up-to-date chemical inventory but is only of use when adequately implemented and maintained. It is still acceptable to use spreadsheet-based inventory tools, but where possible these should be used in low risk, low volume working environments. There are inherent limitations with spreadsheet-based inventory tools, such as not being able to generate GHS compliant labels.

10.1 INVENTORY

- There are several causes of poor inventory management which can include:
- The continued storage of chemicals from completed projects, especially when staff or students involved have moved from the laboratory or left UCC.
- Lack of oversight, including an adequate consideration within a functional areas (inter-school / inter- department) inventory levels, operational needs, and costs of disposal.
- Poor demand planning, poor forecasting, and high forecasting error.
- Poor or non-existent inventory planning or counting inventory.
- Purchasing larger volumes than necessary for the short to medium term or the specific project. This typically occurs in order to:
    - To obtain lower unit price that are outweighed by higher carrying costs; and
    - Due to uncertainty in the supply chain, which includes chronic supplier shortages, changes in demand rate and variances in lead-time length.

Poor inventory management may be remedied for all chemical agents by:

- Using a software management tool, to allow for a view of inventory outside of the immediate lab. This creates visibility and sharing of inventory list in a controlled way with groups, departments, people or access roles.
- Giving adequate consideration to risks and controls.
- Specifying levels of stock to hold (minimum-maximum), demand planning (determining number of months' supply is needed per chemical agent).
- Classify, label and maintain. Software management tools enable carrying out each of these functions.
- Tracking and controlling inventory (determining whether to do physical inventory counts [entire inventory at one time] or cycle counting [varying times on pre-scheduled basis]). Physical inventory counts should be conducted at least once a year. Software tools utilising bar or QR codes will facilitate this process.
- Qualitatively considering before purchase:
    - Can the quantity of chemical/s be reduced, while still meeting operational requirements?
    - Can disposal of the chemical be incorporated into current waste streams, or will it require a specialised waste disposal company? (this is for consideration of cradle to grave cost).
    - Is there budgetary provision for waste disposal in the departmental or laboratory budget? (the cost of disposal can be significantly greater than cost of purchase).

10.2 PURCHASING OF CHEMICALS

Lack of purchasing oversight leads to a fragmented sourcing approach and over-ordering of chemical agents. To address this, jobs / positions who have been delegated or sub-delegated this responsibility, should require staff members, undergraduate and post graduate students to:

- Check for existing stock of chemical agents, packaging, lab supplies on Chemical Management Software (if relevant) and physically check in local laboratory storage:
    - If available in bulk storage, supply and refresh bulk storage if required.
    - Chemical Management Software shows availability across multiple teams in the School can borrow/move chemical agents in the system; and
    - Recommend an alternative.
- On ordering via Agresso or via a departmental procedure, the Technical Officer / Researcher (or other applicable position) specifies the order code, material and quantity required having reviewed their usage:
    - For new supply a sample web-link is to be provided and assess against previous orders.
    - Check Framework or request quotes if required.
- On delivery, receive and log the item into Chemical Management inventory (software or otherwise) and/or store.
- There should be evidence of the integration of purchasing oversight steps built into the system used.

11. RECEIPT OF CHEMICALS

A hazardous chemical agent carries a GHS pictogram, indicating physical, health, or environmental hazards. If the department orders a hazardous chemical agent, then "duty of care" must be practiced towards both UCC employees and students in the receipt / delivery of the chemical agents. This is facilitated through ensuring that deliveries of chemical agents which are assigned GHS pictograms are treated with due care, including:

- Unattended chemical packages in public areas pose a risk. Functional Areas must identify practical ways to manage deliveries safely;
- Be appropriately stored upon delivery within reasonable time frames; and
- Packages must be inspected to ensure their integrity. Leaking or damaged packages must be removed to a safe area and reviewed for appropriate action. The school or department is responsible for determining the appropriate action to be taken and assigning responsibility for carrying it out.

12. EXPLOSIVES AND EXPLOSIVE PRECURSORS

Explosive chemical agents must not be purchased by the Functional Area or entity before meeting specified requirements. Explosives include any UN Class 1 explosives of any of the six 'divisions', (UN numbers 0001 to UN0600).

Before embarking on the purchase of the explosive, conduct a risk assessment for the chemical agent. The purpose of the risk assessment is to determine whether the chemical agent can be eliminated or substituted.

The **CARA template** for chemicals is a structured approach to systematically evaluate and manage risks associated with chemical hazards in a workplace, which can be used. CARA stands for:

C – Chemical - Identify the chemical(s) being assessed, including its name, composition, key properties, and whether it can be eliminated or substituted with a safer alternative.
A – Activity - Describe the activity or process involving the chemical—where, when, and how it is used, stored, or disposed of. Consider if the activity could be modified to reduce or remove the need for the chemical.
R – Risk - Assess risks associated with the chemical and the activity, identifying hazards (e.g., flammability, toxicity) and evaluating exposure likelihood and severity. Include risks posed by potential substitutes.
A – Actions - Outline control measures to manage risks, such as engineering controls, PPE, training, or procedural changes. If elimination or substitution is feasible, include plans to implement this as part of risk reduction.
If it is determined that neither elimination nor substitution for the chemical agent are reasonably practicable, then:

12.1 EXPLOSIVE REQUIREMENTS

Explosives are regulated in terms of the Explosives Act, 1875, where before purchasing explosives:

- Obtain a licence for an explosives store from the local authority. See ANNEX 4: EXPLOSIVES, APPLICATION FOR GRANT OR RENEWAL OF EXPLOSIVES STORE LICENCE. Note there are specialist storage requirements **making it extremely difficult in practice, if not impossible, at UCC to purchase UN Class 1 explosives**.
- Apply for a certificate under Section 15, issued by An Garda Síochána.

When using potentially explosive chemical agents in the laboratory, ensure that risks are well understood and reduced to as low as is reasonably practicable. Researchers must get explicit authorization from the Principal Investigator. Before approval, a thorough review of Safety Data Sheets (SDS) and other chemical resources is crucial to minimize the risk of incidents.

12.2 DESENSITISED EXPLOSIVES REQUIREMENTS

Desensitised explosives are not required to have an explosives pictogram. If they are stored correctly (generally, keeping them wetted), then it should be possible to have them disposed of by UCC Waste Service Providers. Ireland currently does not specifically regulate desensitised explosives, but all the requirements for the control of risk under the SH&W Act, 2005, apply. The UK specifically regulate desensitised explosives and by following the UK HSE Legislative Explosive Regs approach, UCC may both achieve Irish legal compliance as well as follow good practice.

A summary of the UK regs are as follows:

"Certain substances do not require a certificate to acquire or store, as outlined in Schedule 2 of the regulations. University staff are primarily concerned with specified exemptions:

- Desensitized explosives for research (up to 5 grams);
- Picric acid solutions (up to 2%);
- The storage of desensitised explosives which have been assigned in accordance with the United Nations Recommendations the U.N. no. 2059, 2555, 2556 or 2557".

At UCC these explosives do not fall under the storage requirements applicable to Class 1 Explosives and other desensitised explosives. All other desensitised explosives must be treated as explosives and the controls specified in the UK HSE Legislative Explosive Regs followed.

Where possible desensitised explosives must be eliminated or substituted for lower risk chemical agents. An example is 2,4-dinitrophenol, which it may be possible to substitute with 2,4-dimethylphenol. It is up to the individual researchers to determine whether this is technically possible.

12.3 EXPLOSIVE PRECURSOR REQUIREMENTS

Explosive precursors can be used for the illicit manufacture of explosives and are regulated in the Republic of Ireland with guidance. Before purchasing specified explosive precursors, members of the public must apply for a certificate to the Gardaí who are the 'Competent Authority'. UCC staff are deemed to be 'professional users'. As professional users the only requirement is the reporting of 'suspicious transactions'. This means that there are reasonable grounds for suspecting that the substance or mixture purchased by UCC is intended or being misused for the illicit manufacture of explosives.

12.4 EXPLOSIVE DISPOSAL

Waste disposal companies will not dispose either Class 1 (explosives) and Class 7 (radioactive). Additionally consider desensitized explosives, which may have dried out and need to be disposed of as Class 1 explosives.

The steps that need to be taken when disposing of Class 1 explosives and desensitized explosives are:

- Log a request on UCC OCLA ERM Helpdesk. https://portal.ucc.ie/
- The request will be allocated to the ERM Policy Chemical Advisor, who will contact OVPRI H&S Advisor as well as General Services.
- Together with the School / Department personnel, this will be the 'Team' that will enable the disposal / controlled explosion.

Careful management of this process is required in order to ensure that both Health and Safety as well as reputational risks are well managed.

13. STORAGE DURATION TRACKING

The date received, and appropriate expiry date must be entered into the chemical inventory for all chemical agents. The date opened should be indicated by writing on the container with a permanent marker.
DATE RECEIVED, DATE OPENED and DATE EXPIRED should be entered into the chemical inventory. This would either be a software solution or an Excel Spreadsheet.
DATE OF DISPOSAL, which is the duration that a chemical agent is kept (subject to the maximum durations that follow). This date must be determined at the date of purchase of the chemical agent, based on:

- Storage, handling, and disposal considerations specified in the SDS;
- How long the chemical agent is stable / safe; and
- The suitability of use of the chemical agent for its intended purpose. If it is not fit for research / test use, then it should be discarded.

13.1 TIME CRITICAL CHEMICALS

Chemical agents in the following functional groups/chemical properties must be closely monitored and are considered "time critical":

a. Picric acid and Picrates.
b. Perchlorates.

c. Peroxides where there is evidence that the specific chemical agent requires monitoring/checking at a determined frequency.
d. Monomers that polymerize violently or become hazardous after polymerization.
e. Other materials known to deteriorate or become unstable or reactive over time.
f. Dispose of these chemical agents when the **Manufacturers Expiration** date is reached.
g. If the expiration date is not indicated, dispose of opened containers before **8 years** and unopened containers before **10 years**, even if they contain an inhibitor.

13.2 NON-TIME CRITICAL CHEMICALS

All chemical agents which are not included in the 'time critical' list are for the purposes of this procedure considered 'non-time critical'. Noting:

- Dispose of chemical agents that are not "time critical" when the **Manufacturers Expiration** date is reached.
- If the expiration date is not indicated, dispose of opened containers before **10 years** and unopened containers before **15 years**, even if they contain an inhibitor.

13.3 GENERAL PROVISIONS

This section outlines the conditions under which chemical storage timelines may be extended. Extensions must be authorized by a competent person and supported by documented, evidence-based assessments. All approvals must be time-bound, justified, and based on visual inspection and chemical suitability. These controls ensure safe retention and continued compliance with institutional and legal requirements.

13.3.1 AUTHORIZATION CONDITIONS

Storage timelines for both time-critical and non-time-critical chemical agents may be extended by a competent person, provided the following conditions are met:

- A competent person may authorize the extension only if supported by a documented, evidence-based assessment.
- The extension must be approved by:
    - The person(s) conducting the assessment.
    - The relevant research authority (e.g., Principal Investigator or Line Manager).

13.3.2 TIME-BOUND EXTENSIONS

All extensions must be clearly defined in terms of duration:

- All extensions must be clearly time-bound (e.g., 6 months, 1 year).
- Open-ended or indefinite extensions are not permitted.

13.3.3 EVIDENCE-BASED JUSTIFICATION

The extension must be supported by a written justification that includes the following:

- A documented motivation and assessment must support the extension.
- The justification must include:
    - The intended use of the chemical.
    - Supporting data or rationale for continued use beyond the original expiry.

13.3.4 VISUAL INSPECTION REQUIREMENTS

Before approval, a visual inspection must confirm the chemical and its packaging are in acceptable condition:

- The container is intact and undamaged.
- The label is legible and in good condition.
- The seal is secure.
- The contents show no visible signs of change (e.g., discoloration, precipitation, phase separation).

If any deterioration is observed in the container, label, seal, or contents, the chemical must be immediately disposed of in accordance with applicable procedures.

13.3.5 CHEMICAL SUITABILITY ASSESSMENT

An assessment must confirm the chemical remains fit for its intended use. The method depends on the chemical's stability and the level of certainty required:

Option 1: Qualitative Analysis

For stable chemicals, the following approach may be used:

- Suitable for stable chemicals not prone to significant change.
- A visual inspection and qualitative review are sufficient.
- If confirmed suitable, the expiry may be extended by up to 30% of the original shelf life.
- *Example: A 10-year shelf life may be extended by 3 years*.

Option 2: Quantitative Analysis

For unstable or uncertain chemicals, a more rigorous approach is required:

- Required when:
    - The chemical is unstable or prone to degradation.
    - There is uncertainty about its stability or performance.
- A quantitative analysis must confirm the chemical remains within acceptable purity limits.
- If confirmed, the expiry may be extended by up to 50% of the original shelf life.
- *Example: A 10-year shelf life may be extended by 5 years*.

13.3.6 ADDITIONAL REQUIREMENTS

For time-critical and non-time-based chemical agents, the risk assessment must be approved both by the person(s) completing the assessment and the director of the research (e.g., Principal Investigator or Line Manager, as appropriate).

The chemical assessment (Form provided in APPENDIX 5) must be kept as a record for as long as the chemical agent is retained. Consider whether it is possible to upload the entry for the chemical agent in the inventory application. If using a spreadsheet as the inventory tool, consider whether providing hyperlinks, file paths, or similar references could facilitate overall system effectiveness.

14. CHEMICAL COMPATABILITY

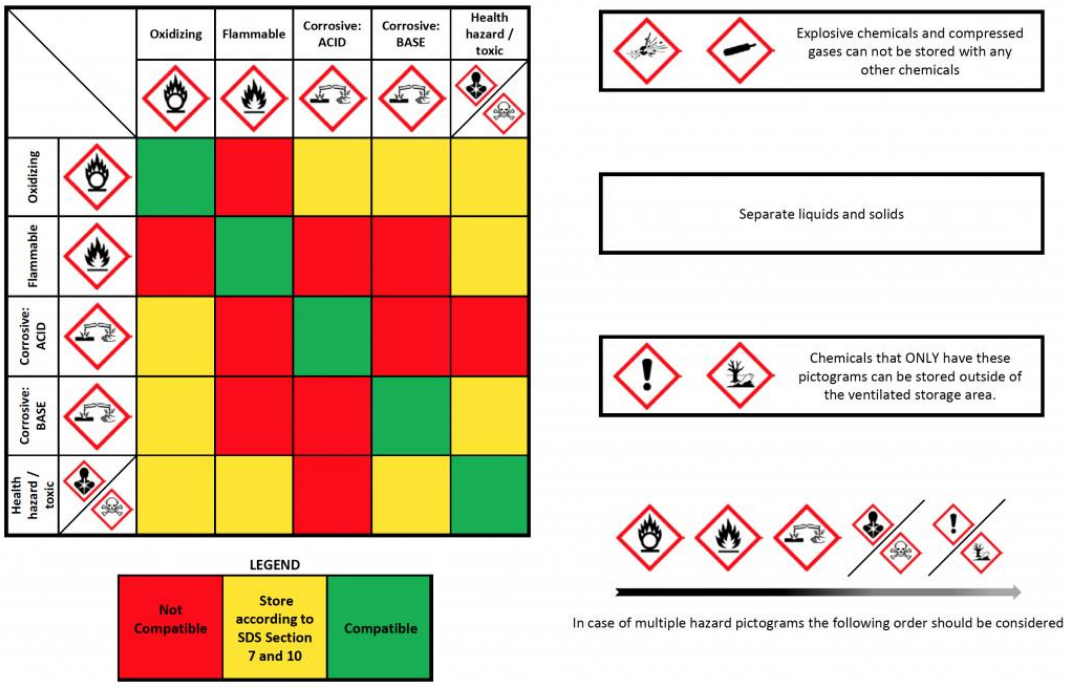
Chemical agents should be stored in the laboratory, including wastes, in such a way that minimizes the likelihood of dangerous interactions with other chemical agents and should be segregated from incompatible materials. This is typically to prevent fires, explosions, or toxic gases, vapours, mists and fumes.

Incompatible materials are defined as likely to interact with each other so as to increase any hazard or generate a new hazard when mixed or otherwise brought into contact. An individual chemical agent Safety Data Sheet must be consulted before it is stored to obtain information on its incompatibles.

Each entity (laboratories and other facilities), operating under a safety statement must document the system to be used for chemical segregation. The method must be detailed in the safety statement or local chemical agent procedure, and everyone must understand the process.

14.1.1 FIRST STEP:

As a minimum across all UCC entities, hazardous chemical agents **MUST** be separated based on GHS pictograms as outlined in the following chemical compatibility chart: https://www.epfl.ch/chemical-hazards/chemicals-storage/



All pictograms on a chemical agent must be considered. Two chemicals can have the same pictogram and still be incompatible, such as acetic acid and triethylamine. In this case, these chemicals are corrosive and carry the additional pictogram, being respectively an acid (acetic acid) and a base (triethylamine), which makes them incompatible with each other.

Staff with the necessary competence and an understanding of the associated risks may override the chemical segregation chart when justified. This decision must be based on an adequate documented assessment of risk and adherence to safety protocols.

14.1.2 SECOND STEP:

For a more detailed understanding of cross reactivity between chemicals use either the NOAA Chemical Reactivity Worksheet or an appropriate alternative be used.

- When you store highly reactive chemicals, including explosive precursors like nitric acid, or in situations where there is an elevated risk for any reason, this second step **MUST** be followed.
- For low-risk chemical storage, the second step **MAY** be followed.

14.1.3 CHEMICAL REACTIVITY WORKSHEET

The chemical-reactivity-worksheet, a freely available program developed by the National Oceanic and Atmospheric Administration (NOAA) in the USA. This assesses the type of reaction that is likely to be generated, when two or more chemical agents are mixed.

This tool can be used to:

- Create a temporary collection of chemicals, which you can also save for later reference. More info on saving My Chemicals collections...
- View predicted reactivity between the chemicals in the collection. More info on viewing reactivity predictions...
- Print reports for all the chemical agents in the collection. More info on printing reports...
- Ensure that a list of the chemicals in the cabinet and predicted reactions is kept per cabinet, and this should be available for inspection.

14.1.4 ALTERNATIVE TOOLS

Other appropriate alternative tools can be used to assist or determine chemical agent segregation. Some are (but not limited to):
https://research.columbia.edu/sites/default/files/content/EHS/Lab%20Safety/chemSegChart.pdf
https://www.dsc-ltd.co.uk/chemicalsegregationchart.html

15. CHEMICAL STORAGE - GENERAL

There are systems of work that need to be followed for all chemical agents.

15.1 INTERNAL STORAGE

- Limit volumes stored in individual containers to 5 litres (see detailed requirements in 15.2).
- Chemical liquids must be stored in bunded areas or cabinets designed to contain any leakage.
- Provide secondary containment, such as spill trays with a capacity of **110% of the largest container's volume** or **25% of the total stored volume**, whichever is greater.
- All shelves should include a front lip to prevent containers from falling.
- Shelving systems must be designed to support the maximum weight of the chemical containers.
- Store liquid chemicals no higher than **1.5 meters from floor level** (below eye level).
- Solid chemicals should ideally be stored on upper shelves, above liquid chemicals.
- Shelving must be stable, secured to walls or housed within cabinets. Avoid freestanding island shelves, as they can be unstable.
- Incompatible chemicals must not be stored together. Conduct a risk assessment to determine the required separation distance, with a general guideline of **3 meters**. Non-hazardous substances can be stored in the space between incompatible chemicals.

- Chemical agents must not be stored in direct sunlight.
- Avoid storing chemicals directly on the floor, even temporarily.
- Clearly identify chemical storage areas with appropriate signage at entry points and on storage cabinets.
- Regularly inspect chemical storage areas for unusual conditions, such as:
    - leaking or deteriorating containers
    - spilled chemicals
    - temperature extremes (too hot or cold in storage area)
    - lack of or low lighting levels
    - blocked exits or aisles
    - poor housekeeping (storage of empty containers / old equipment etc..)
    - fire equipment blocked, broken or missing
    - lack of information or warning signs ("Flammable Liquids", "Acids", "Corrosives", "Particularly Hazardous Agents", Chemical Storage")

15.2 EXTERNAL STORAGE

Quantities of chemical agents stored within a building, should be kept to a minimum. Any individual chemical agent in quantities greater than 5 litres must be stored in a designated external storage area, such as a chemical warehouse or drum store. This requirement is taken from the Health and Safety Authority guidance note hsa.ie/chemical_and_hazardous_substances/storage. This 5-litre internal storage rule applies, to any chemical agent that generates on classification a GHS pictogram. If quantities of more than 5 litres in a single container (e.g. a single 20 or 25 litre container) are required for operational reasons to be stored inside a building, a risk assessment needs to be carried out. The assessment should consider:

- Risk implications, consequence (with reference to risk elements, such as reactivity, amount of chemical agent in storage area etc.) and likelihood of realising the risk.
- Operational requirements, where limiting chemical agent containers to 5L may result in increased risk.
- Whether there is the requirement for any process to either use or generate more than 5 litres of chemical agent within one batch operation. The effect on disruption and risks such as overfilling on the process should be considered and recorded.
- Storage area considering chemical agent management, including inventory movement and management, whether the container is well controlled in terms of access and use. Do only UCC staff have access to the container, is the container kept at floor level.
- Is it possible to increase the number of controls used (barriers), so that overall risk is not increased? E.g. if appropriate the chemical agent could be stored in a 90-minute fire rated cabinet, or an acid cabinet. Is the container kept in a secondary bund?
- Cost implications of keeping the chemical agent must be provided.
- The risk assessment must be signed off by the area supervisor/section head.
- Spill/emergency response

The Risk Assessment must be stored and be available for inspection.

High risk chemicals may not be stored within buildings outside of fire rated or acid cabinets or other appropriate equipment. Note, that this also applies to waste chemicals, that when classified require a flammable or corrosive or another applicable pictogram. Any waste chemicals, awaiting disposal that are in excess of what can be stored in the appropriate cabinets or equipment, must be stored externally to the building.

16. CHEMICAL STORAGE – SPECIFIC CHEMICALS

Certain groups of chemical agents are associated with high consequence and need specific guidance.

16.1 STORAGE CABINETS / EQUIPMENT

Selecting the right cabinet for chemical storage is essential to prevent hazardous reactions, control vapours, and protect users. This section outlines safe storage practices for flammables, acids, particularly hazardous agents, and chemicals that emit noxious fumes, and emphasizes keeping fume cupboards clear to maintain airflow and safety.

- Cabinets for storage of low flash flammables are dealt with in 15.2
- Store Particularly Hazardous Agents (PHA), including in a dedicated poison cabinet, as detailed in 15.3. The detailed definition is provided in APPENDIX 6.
- Store acids in a dedicated acid cabinet.
    - Acid cabinets must be made of acid-resistant materials [typically polypropylene or HDPE] and contain a tray to catch any leakage or spillage. Wooden cabinets should not be used for storage of oxidising acids such as nitric or perchloric.
    - Nitric acid must be segregated from other acids (It can react dangerously with organic acids, such as acetic acid as well as some inorganic acids, particularly those containing sulphur or halides, such as hydrochloric acid).
- Store chemicals that give off noxious fumes and smells in cabinets fitted with forced ventilation. They may be free-standing with their own extract system or may be situated beneath a fume cupboard and attached to its duct. Noxious vapours are sucked away by the forced ventilation.
- Fume cupboards are not designed or intended to be used as storage areas, and they should be kept clear of materials and containers when these are not needed for the ongoing operational work. Materials stored in fume cupboards may disrupt the airflow making the fume cupboard less efficient and compromising the safety of the user.

16.2 LOW FLASH STORAGE (VOLATILE SOLVENTS)

A low flash point chemical is any substance that can ignite at relatively low temperatures when exposed to an ignition source. The flash point is the lowest temperature at which a liquid gives off enough vapor to form an ignitable mixture with air. These low flash chemicals have a flashpoint below 23°C – low flash (GHS Cat 1 – flammables). This includes waste flammable agents. Low flash agents are very volatile and will ‘flash back’. Examples are:

- Solvents (most common). Examples: acetone, diethyl ether, toluene, methanol, ethyl acetate. Widely used in chemical labs, cleaning, and extraction processes.
- Monomers and Reactive Liquids. Examples: styrene, methyl methacrylate. Used in polymer synthesis and can be highly flammable.
- Organic Reagents. Examples: benzene, hexane. Often used in synthesis and purification steps.
- Fuel Components. Examples: gasoline. Used in energy research or combustion studies.
- Some Pesticides and Industrial Chemicals. Certain formulations contain flammable carriers or solvents.

16.2.1 LOW FLASH - INTERNAL TO A BUILDING

- Store low-flashpoint agents in a 90-minute fire-rated cabinet with proper earthing. The total volume must not exceed 50 litres. For example, a maximum of 10 containers of 5 litres each is

acceptable (reduce this volume as far as is reasonably practicable). If volumes of low flash agent exceed 50 litres, a risk assessment must determine whether other 'controls' are needed. An example is that no oxidisers are stored in the same fire rated cabinet as low flash flammables.

- The total volume of low-flashpoint agents in the laboratory must not exceed 1 litre per square metre of the working floor area, including the main lab and any associated rooms.
- Working volumes of low flash agent, used on the laboratory bench in a suitable closed container, are recommended not to exceed 500ml. This excludes any chemical agent plumbed into instrumentation. These containers must be correctly GHS labelled. If the working volume exceeds 500ml, a risk assessment must determine whether other 'controls' are put in place. An example is that the low flash agent is not used close (<0.5m) to any potential ignition source.
- Working volumes of low flash agent must not be stored above head height or close (<0.5m) to any potential ignition source including point of electrical supply, light switches, hotplates / other heating device, Bunsen burners, compressors, pumps or stirrer motors.
- Keep containers closed when not in use.
- Decanting should be carried out in safety cabinets/fume hoods and away from any potential source of ignition.
- Keep the area where flammable liquids are stored or decanted free from combustible matter.
- Keep flammable liquids separate from incompatible classes of chemicals particularly Oxidisers (i.e. Class 5).
- Flammables, which are unstable at ambient temperature must be stored in EX-certified fridges or freezers. Do not use domestic refrigerators for storing flammable liquids, since these fridges have the potential to create a spark when the contact switch opens and closes.
- Do not store flammables in cold rooms, as they are not ventilated and usually not EX-certified.

16.2.2 LOW FLASH - EXTERNAL TO A BUILDING

Decanting and pouring low flash flammable liquids can generate a static spark of sufficient energy to ignite a flammable vapour-air mixture. A number of controls are needed to mitigate this risk when decanting 20L or more of low flash solvent:

- Well ventilated area
- Earthing (bonding)
- Use a hand pump
- Potential ignition sources, such as mobile phones, synthetic clothing, open flames, hot surfaces, electrical equipment, smoking, vaping

16.3 PARTICULARLY HAZARDOUS AGENT STORAGE (CARCINOGENS AND REPRODUCTIVE TOXINS)

Before working with any chemical classified as a carcinogen, reproductive toxin, or mutagen, a risk assessment must be completed. This assessment should evaluate the chemical's toxicity, route of exposure, and the likelihood of contact based on how and where it will be used. Based on this assessment, appropriate control measures must be implemented, including whether the chemical agent is classified as a Particularly Hazardous Agent (PHA) carcinogen or reproductive toxicant (See APPENDIX 6). Storage for PHAs:

- Store these substances separately from incompatible chemicals to prevent hazardous reactions.
- Each container must be clearly labelled with the appropriate hazard symbol and must identify the substance as a carcinogen, reproductive toxin, or mutagen.
- Opened liquid chemical containers should be stored in a manner that prevents leaks and maintains label legibility. Open secondary containment is potentially a suitable option.

- If the containers are stored in a location that is not immediately visible (e.g., inside a closed cabinet), the external surface of the storage unit must be labelled to indicate the presence of hazardous substances and to prevent accidental exposure.

17. HOUSEKEEPING

Housekeeping in a laboratory encompasses maintaining the overall condition and appearance of the space, including:

- Maintaining good housekeeping practices is a shared responsibility among all users of the space. Cleaning up after yourself demonstrates respect for others.
- Ensuring all areas of the lab are free from clutter, rubbish, unnecessary equipment, and unused chemical containers. This applies to benches, fume hoods, refrigerators, cabinets, chemical storage areas, sinks, trash cans, and more.
- Ensuring that waste chemicals are not stored in passageways, sinks or in ways that increase the risk of spills.
- Keeping all chemical containers sealed when not in use.
- Promptly cleaning up any chemical spills, whether the chemical is hazardous or not. When cleaning, inspect surrounding surfaces such as equipment, cabinets, doors, and countertops for splashes. For detailed instructions on handling spills, refer to the Chemical Spill Procedures section.
- Not obstructing emergency equipment and devices, such as eyewash stations, emergency showers, electrical panels, fire extinguishers, and spill cleanup supplies.

18. CHEMICAL AGENT SPILL

A chemical agent could be spilled or released within a building or outdoors. Minor spills can be handled by trained staff following School/Function protocols. Major incidents may necessitate building evacuation and support from external agencies or specialists. These are general guidelines; response plans vary based on chemical, quantity, and location. Prioritizing personnel safety is crucial, with clean-up following a spill. All chemical-using departments must create and practice tailored emergency procedures. Always consult the Safety Data Sheet and/or spill plan in the chemical risk assessment.

If you come across a chemical spill and cannot identify the substance, your first action should be to alert the technical officers in the area. Do not attempt to clean it up. Protect yourself and others by following all instructions, which may include:

- Isolating the area.
- Contacting Building and Estates General Services and OCLA ERM Health and Safety Advisors.
- Logged as soon as practicable on the Incident Reporting System.

19. CONTROLLED SUBSTANCES

There are many agents to which access must be restricted or manufacture regulated either as a legal requirement and/or to reduce the risk to health and safety of others. Individuals intending to work with or bring on-site any agents falling into the following categories must first notify and seek approval from the head of the functional area in which the work will take place. As with all hazardous agents, it is the individual's responsibility to ensure that the requisite facilities are available to safely store and handle regulated or controlled substances before procuring them. Agents include:

- Ethanol products (specifically dealt with in 18.2).

- Controlled drugs
- Explosives
- Radioactive materials
- Certain anesthetic agents
- Hydrofluoric acid

19.1 PARTICULARLY HAZARDOUS AGENTS (PHA)

'Heads' must impose restrictions on Particularly Hazardous Agents (PHA) or mixtures with listed or suspected extreme toxicity, irreversible health effects (e.g., carcinogens, reproductive toxins, or mutagens), or other highly dangerous properties (e.g., hydrogen gas, hydrofluoric acid). Before granting approval, the 'head 'should assess whether the laboratory where the substances will be used and stored is suitably equipped. The Functional Area must develop a Standard Operating Procedure (SOP), detailing steps for safe use and controls for the PHA. For example, for hydrofluoric acid, before purchasing try and eliminate its use or substitute for a less hazardous agent. A full documented risk assessment must be carried out and no work carried out without an SOP and all controls in place.

19.2 ETHANOL

Ethanol is included for ***purposes of governance and not specific chemical risk*** (for risk management of ethanol refer to other sections, noting that ethanol is a low flash solvent). Anyone intending to use ethanol must complete and send the 'Requisition form for denatured and un-denatured alcohol' to the office of corporate and legal affairs in UCC and must comply with the license conditions under which Revenue authorise UCC to use Ethanol for research purposes.

- In terms of the license conditions, ethanol must be carefully managed including access control, inventory volume tracking and reporting of inventory that cannot be accounted for.
- Incidents must be reported through the ERM web-reporting form:

https://www.ucc.ie/en/occupationalhealthandsafety/accidentsemergencies/incidentreportingforms/

20. EMERGENCIES AND INCIDENTS INVOLVING CHEMICALS

When an incident occurs:

- All staff and students need to understand how to quickly access Safety Data Sheets (SDS's). This is so that, they can be accessed in an emergency. There are multiple sections that are applicable in an emergency including, Section 4: First Aid Measures, Section 5: Firefighting Measures and Section 6: Accidental Release Measures. Accidental Release Measures specifically tells you what to do should the chemical agent be spilled, leaked or otherwise released. Required information includes emergency procedures, protective equipment and appropriate cleanup and containment methods.
- Every area where chemical agents are stored must have established procedures for the clean-up and safe disposal of spills, as well as easy access to appropriate spill response equipment.
- When a process / experiment is in operation and unattended, the responsible person must provide information in writing of the appropriate emergency response.
- Incidents must be reported through the ERM web-reporting form:

https://www.ucc.ie/en/occupationalhealthandsafety/accidentsemergencies/incidentreportingforms/

21. WASTE DISPOSAL

The transport of hazardous substances, including waste, samples, and materials off-campus by road, must comply with the ADR (European Agreement concerning the International Carriage of Dangerous

Goods by Road) regulations. All hazardous materials must be properly packed, labelled, and transported in UN-approved containers with the appropriate markings and hazard symbols. Before transport, all documentation must be completed accurately, detailing classification, packaging, and consignment information to ensure safety and legal compliance during handling, loading, and unloading processes.

Chemical agent waste classification and disposal at UCC is covered in a separate procedure ERM.3PR.02.00.Hazardous Waste Management.2024.12.05 (currently draft).

22. PERSONAL PROTECTIVE EQUIPMENT

In UCC laboratories where hazardous chemical agents are used:

- Laboratory coats: are mandatory at all times and must be removed upon exit.
- Open-toed or open-topped shoes are prohibited as they provide minimal protection against chemical spills.
- Eye protection (safety eyewear bearing the CE mark): is required if there is any risk of chemical splashes. This applies to everyone entering a lab where hazardous chemicals might be present, regardless of their direct involvement with the materials. When handling hazardous Chemical Agents (HCA's) that may harm the skin including corrosives, carry out an assessment to determine what eye and face protection is needed including goggles and/or a face shield. Due to discomfort, goggles and face shields are only typically worn for the duration of the hazardous task conducted. Standard prescription or sunglasses are not 'safety glasses' and do not act as a substitute for safety eyewear.
- Leg covering: clothing must completely cover the legs including ankles.
- Gloves: Review Section 8 of the SDS to determine what gloves you should be wearing to protect against the hazardous chemical agent. If the SDS does not give specific glove recommendations, then reference the Ansell guide, which can be accessed online https://cdn.mscdirect.com/global/media/pdf/search/ansell/ansell-chemical-glove-resistance-guide.pdf
- Respirator Selection: Review Section 8 of the SDS to determine what respirator you should be wearing to protect against the hazardous chemical agent. If the SDS does not give specific respirator recommendations, then reference the 3M guide, which can be accessed online https://multimedia.3m.com/mws/media/639110O/3m-respirator-selection-guide.pdf
- Respirator Service Life (to determine how long a cartridge will last): Recommend using the 3M https://sls.3m.com/selectresultstype

Additional content, particularly on respirators, is provided in APPENDIX 3: MINIMIZING AND CONTROLLING CHEMICAL EXPOSURE

23. SPECIALISED LEGAL COMPLIANCE

The chemical risk assessment carried out using the tool ERM.6CF.01.00.Chemical Risk Assessment tool is used to assess risk. Where there are 'medium' or 'high' chemical risks within a functional area or entity, then APPENDIX 1 Legal Compliance Chemical Agents Checklist must be completed at least annually. This enables compliance with the 'Specialised Legal Compliance' requirements of Section 9.1.2 of the UCC Safety Statement.

24. REVISION HISTORY

Table of changes:

Rev No.	Date	Section(s)	Description of Change

Document Authors / Reviewer

Owner:	**Name:**	**Date:**
H&S Advisor Chemical & Policy	Garth Hunter	20/11/24
Authors /Reviewers:	**Name:**	**Date:**
OVPIR	Pat Casey	20/11/24
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Tyndall	Fiona Barry	
Food & Nut Sci	David Waldron	
Anatomy & Neuro	Gerard Moloney	
ERM	Garth Hunter	

APPENDIX 1: LEGAL COMPLIANCE CHEMICAL AGENTS CHECKLIST

Regulatory requirement	Percentage Compliance	Comments
1. Risk Assessment		
1.1 Have all hazardous chemicals used or produced been identified?		
1.2 Have risk assessments been conducted for all chemical exposure?		
1.3 When necessary is air monitoring for chemicals carried out?		
1.4 Are current control measures documented in the risk assessment and adequate?		
1.5 Is the risk assessment updated at least once every 5 years **OR** when there are, changes in the work process, changes in risk, regulatory changes or controls shown to be ineffective?		
2. Safety Data Sheets (SDS) & Labelling		
2.1 Do all employees have online access to updated SDS's for chemicals in their work areas and know where to locate?		
2.2 Do all containers (including secondary containers) have GHS compliant labelling?		
3. Control Measures		
3.1 Are effective control measures, including elimination, substitution, engineering controls, and PPE, in use?		
3.2 Are these control measures regularly reviewed for effectiveness?		
4. Handling, Storage, and Disposal		
4.1 Are safe handling and storage procedures established for chemicals?		
4.2 Are unwanted or expired chemical agents disposed of in accordance with regulations?		
5. Training		
5.1 Is training provided, at the start of employment, when new chemicals are introduced, changes to work processes or equipment, if the risk assessment identifies new or different risks, when employees' knowledge is found to be insufficient or there is evidence that safety practices are not being followed correctly? Training should be provided to: • Staff		

• Contract staff when UCC staff exercise direct supervision • Postdocs • PhD students		
5.2 Is online and additional on the job training carried out, relevant to their roles?		
6. Emergency Response		
6.1 Are emergency procedures in place for chemical spills and exposures?		
6.2 Have employees been trained in emergency response procedures, and are drills conducted?		
7. Health Surveillance		
7.1 Is health surveillance specified in School/Departmental procedures, with input from an Occupational Health Physician?		
7.2 Is health surveillance for employees, carried out as guided by procedure and the risk assessment?		
7.3 Are health surveillance records maintained confidentially and reviewed for any follow-up's needed?		
8. Monitoring & Documentation		
8.1 Are records of risk assessments, exposure monitoring, and training kept?		
8.2 Are chemical safety procedures appropriately reviewed and updated?		
9. Reporting & Compliance		
9.1 Are incidents involving hazardous chemicals reported to the HSA (through OCLA)?		
9.2 Are all REACH and CLP reporting obligations being met? (See Section 7.1).		

APPENDIX 2: SPECIFIC CHEMICALS & CONTROLS

A. PEROXIDE FORMING CHEMICALS (PFCS)

These are chemical agents that can auto-oxidize with atmospheric oxygen under ambient conditions to form organic peroxides (containing a -OO- bond, including aldehydes, ethers, tetrahydrofuran, compounds containing benzylic hydrogen atoms). Once formed, organic peroxides are sensitive to thermal or mechanical shock and can be violently explosive in concentrated form or as solids.

- Make sure you know which chemical agents in your lab are PFCs and follow the recommended guidelines for storage and disposal.
- Review the Safety Data Sheet (SDS) for the safe handling of these chemical agents.
- All PFCs should be labelled with date received, date opened, discarded by date, and peroxide test date & results (if opened).
- Inspect chemical agent bottles for signs of decomposition, such as:
    - Solvent discoloration
    - Crystal or solid formation
    - Bottle, cap, or label degradation
    - Chemical agent has passed dispose by or expiration date and has not been tested for peroxide levels
- Do NOT open or handle suspect containers of peroxide-forming materials that you do not know the history of, or that you haven't carefully physically inspected.
- Order PFCs in small quantities and select materials with peroxide stabilizers or inhibitors.

B. CORROSIVES

There are a number of precautions that need to be taken when working with corrosives.

- Store liquid corrosives below eye level.
- All corrosive compounds must be stored appropriately and kept away from incompatible materials, with acids and bases stored separately. Assume that corrosive liquids are incompatible with other corrosive liquids or solids unless proven otherwise.
- Limit bench storage to one day's supply of corrosive materials.
- Design work processes to minimize vapor or dust release when using corrosive materials. Keep containers closed when not in use and use containers with minimal surface area for corrosive liquids. Never lean over containers of corrosive liquids.
- Conduct processes that may release large amounts of fumes or corrosive dust in a fume hood.
- Ensure all equipment in contact with corrosive materials is resistant to them, paying special attention to transfer lines, line joints, spill trays, reaction vessels, etc.
- Avoid using corrosive liquids under pressure when possible; if unavoidable, use a fume hood.
- Prevent corrosive materials from contacting skin by wearing appropriate gloves, as specified by the material's SDS. Neoprene and nitrile gloves are effective for most acids and bases, and PVC is also suitable for most acids. Remove and dispose of contaminated gloves immediately. Wear a lab coat and safety glasses and use a face shield or goggles if splashing is possible. Remove and/or launder or dispose of heavily contaminated lab coats.
- Use corrosive liquids in or over a resistant tray that can contain the full amount of material in the event of a spill, if practicable
- Transfer liquid corrosive compounds between containers in a fume hood over a tray.
- Clearly label all containers holding corrosive compounds and ensure the container material is resistant to the corrosive contents.
- Always add acid to water, never water to acid.

- Ensure an emergency shower is nearby when handling of corrosives, and always have a supply of clean water (from a tap or an eye wash station) nearby.
- Do not mix acid waste with organic waste to avoid fire or other undesirable reactions.
- When working with certain corrosives, such as hydrofluoric acid, have specialist spill kits containing alkali agents on hand.
- The hazard potential of hydrofluoric acid is extreme. Wherever possible eliminate or substitute for a chemical agent with a lower hazard potential. If hydrofluoric acid is used, detailed risk assessments need to be conducted, and systems of work implemented to ensure that risk is managed to As Low As is Reasonably Practicable.

C. TOXIC HAZARDOUS CHEMICAL AGENTS

The GHS categorizes acute toxicity into four levels (1-4), with Category 1 housing the most potent toxins. Chemicals fall under the highly acutely toxic category if they belong to either Category 1 or 2.

In GHS Safety Data Sheets (SDSs), hazard statements are used to convey dangers, often indicated by numbers. However, the numbers may not always be explicitly stated. Look out for specific hazard codes or statements, as they signal a chemical's acute toxicity or high acute toxicity.

DIFFERENT HAZARD CODES FOR ACUTELY TOXIC AND HIGHLY ACUTELY TOXIC CHEMICALS.

ACUTELY TOXIC	HIGHLY ACUTELY TOXIC
H302: Harmful if swallowed.	H300: Fatal if swallowed.
H303: May be harmful if swallowed.	H301: Toxic if swallowed.
H312: Harmful in contact with skin	H310: Fatal in contact with skin.
H313: May be harmful in contact with skin	H311: Toxic in contact with skin.
H332: Harmful if inhaled.	H330: Fatal if inhaled.
H333: May be harmful if inhaled.	H331: Toxic if inhaled.

- Very toxic agents, carcinogens, and mutagens that are easily dispersed (with increased exposure risk) should always be handled in a fume hood or enclosed system, unless a comprehensive risk assessment has been completed and the risk is As Low As Is Reasonably Practicable. Where possible apply Process Safety Principles of 'Keep It In The Pipes/Sealed Container/Enclosed System'.
- When working with toxic agents, always wear appropriate personal protective equipment. Understand routes of entry specific to the chemical agent and specific PPE related to the chemical agent. For example, understand whether it can be absorbed through the skin, whether ingestion is a significant route of intake, and the specific Respiratory Protective Equipment (RPE) needed. Organic / Inorganics / Acid Gases / Mercury etc... all have specific RPE. For agents toxic upon skin contact, select impermeable gloves (considering permeation and degradation). Wear a lab coat and safety glasses; use a face shield or goggles if there is a risk of splashing. Contaminated lab coats should be removed and either laundered or disposed.
- Where it is risk appropriate, (so this is not applicable to all cases) store very toxic materials in a locked cabinet when not in use.
- Perform activities that may generate airborne toxic contaminants in a fume hood or sealed system. This includes weighing operations.

- Store toxic materials in suitable areas, separated from incompatible agents. Be aware that many toxic solids can emit toxic fumes when in contact with solvents, acids, alkalis, or water, and consider this when mixing toxic wastes for disposal.
- In general, pregnant and breastfeeding women should avoid working with toxic compounds. Of particular concern are teratogens and mutagens. A detailed risk assessment must be carried out to ensure that there is NO exposure to chemical agents in either of these categories.

D. CYANIDE

Cyanide compounds are frequently used in chemical agent laboratories, and some are extremely toxic. Cyanide salts are typically solid but are often found in solution. Handling or working with cyanide salts or their solutions can lead to poisoning through inhalation of hydrogen cyanide gas or cyanide dust, absorption through the skin or eyes, or ingestion. Hydrogen cyanide gas can be released from solid cyanides through contact with acids, water, or water vapor. Although hydrogen cyanide has a bitter almond odour, this cannot be relied upon as a warning since about 20% of adults have a genetic inability to detect it. Hydrogen cyanide gas and some cyanide salts are among the fastest-acting poisons known, and even small amounts can be extremely dangerous. Any cyanide classified as such requires strict handling protocols, but cyanide compounds classified as acute toxicity category 1 or 2 (H300, H310, H330) must be handled with extreme care. Those labelled as acute toxicity category 3 (H301, H311, H331) pose a lower risk but still require caution. In addition to general chemical agent safety precautions, the following specific measures should be taken when working with cyanide compounds:

- Processes that may release cyanide gas must be conducted in a fume hood.
- Cyanide compounds must never contact a user's skin. Appropriate gloves must be worn, dictated by the material used. Typically, two pairs of gloves must be worn, a nitrile inner pair covered by a butyl rubber outer pair. Thicker gloves provide better protection but less dexterity. Additionally, a lab coat and safety glasses are also required. Contaminated lab coats must be washed independently of other laundry and not be taken home.
- After handling cyanide compounds, users should wash their hands and face before eating, drinking, or smoking.
- Only a one-day supply of cyanide materials should be kept at the bench.
- Transfer of liquid cyanide compounds between containers must always be conducted in a fume hood over a tray.
- Small cyanide spills should be treated with sodium hypochlorite to deactivate the cyanide—never use water to wash away a cyanide spill.
- All containers holding cyanide compounds must be clearly labelled.
- Work processes using cyanide materials should be designed to minimize gas release. Containers must be closed when not in use, and open containers for liquid cyanides should have the smallest possible surface area. Users should never lean over containers with cyanide compounds.
- Cyanide salts must not get wet or contact any acidic material outside of a fume hood.
- Be aware of the symptoms of cyanide exposure (e.g., headache, dizziness, shortness of breath) and stop work immediately if symptoms appear. Also, monitor coworkers for these symptoms.
- All cyanide compounds should be stored properly, away from incompatible materials. Extremely toxic cyanides should be kept in a locked cabinet or room whenever possible.
- Avoid entering confined spaces where cyanide gas may have accumulated.
- When working with highly toxic cyanide compounds, always assess the need to keep a stock of amyl nitrate and/or have an oxygen therapy kit on standby, with a trained first aider for oxygen administration.

E. MERCURY

Consider eliminating or substituting in order not to use mercury. Use an alternative chemical agent if available. For example, use alcohol thermometers instead of mercury ones, oil bubblers instead of mercury bubblers. If possible, use reducing agents other than mercury amalgams, etc.

Mercury is a silver liquid metal that can vaporize even at temperatures as low as -12º C. This vapor is both colourless and odourless. If not promptly cleaned, a mercury spill can be ground into the floor, breaking into extremely small particles with a large total surface area ($0.6m^2$ for 1 ml as 10-micron spheres). Such a large area can cause mercury to vaporize more rapidly than the room's ventilation can safely handle. The volatilization rate of mercury increases with temperature. A common issue is the breaking of thermometers in ovens, often due to bumping or exceeding the thermometer's temperature capacity. Additionally, mercury can atomize into tiny particles with a large surface area when impacted at high velocities or released into high-velocity air systems. Elemental mercury is incompatible with substances such as acetylene, aluminium, ammonia, azides, calcium, chlorates, chlorine dioxide, copper, copper alloys, ethylene oxide, halogens, iron, metal oxides, nitrates, oxygen, lithium, lead, nitromethane, rubidium, sodium carbide, sulphur, sulfuric acid, and others.

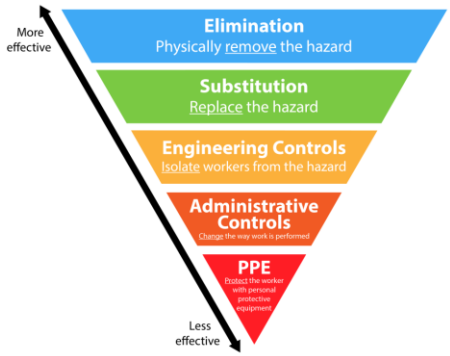
Mercury is a highly toxic metal and needs specific systems of work to control exposure. The REACH compliant SDS should be reviewed in detail including the exposure scenarios attached to the SDS, before carrying out work with mercurial based compounds.

- Store all mercury containing compounds correctly and away from incompatible agents. Containers of elemental mercury should be placed over trays or double-contained. Ensure that access to Dimethyl mercury is tightly controlled.
- Design work processes to minimize mercury vapor release. Keep containers closed when not in use and use containers with minimal surface area for liquid mercury compounds. Avoid leaning over containers holding mercury-based compounds.
- Conduct processes with a high risk of vapor release in a fume hood.
- Do not heat elemental mercury unless absolutely necessary, and only after conducting a full risk assessment.
- Prevent mercury-based materials from contacting the skin. Organo-alkyl mercury compounds are highly toxic and can be fatal on contact with skin. Elemental mercury requires nitrile, PVC, or latex gloves. Organo-alkyl mercury compounds require the use of silver shield, 4H, or other brand laminate-style gloves. Elemental mercury can remain on the skin for many hours creating the potential for ingestion.
- A lab coat and safety glasses are also required. Contaminated lab coats must be washed independently of other laundry and not be taken home.
- To control airborne exposure of elemental mercury vapor: concentrations up to 0.5 mg/m^3, use a half-face air purifying respirator with a cartridge that provides protection for mercury vapor. For concentrations between 0.5 and 2.5 mg/m^3 a full-face cartridge respirator is appropriate. For higher concentrations, a self-contained breathing apparatus is required. For organo-alkyl mercury vapor, a self-contained breathing apparatus is required if concentrations exceed the OEL.
- All people should avoid entering confined or restricted spaces where mercury vapours might be present (such as a room where there is a broken fluorescent lamp, or fluorescent tube. These lamps use a low-pressure mercury-vapor gas-discharge lamp that uses fluorescence to produce visible light.
- Be aware of mercury exposure symptoms (e.g., metallic taste, nausea, abdominal pain, vomiting, tremors, emotional instability) and stop work immediately if symptoms occur. Monitor co-workers for these symptoms.

- Wash hands and face after handling mercury-based materials and before eating, drinking, or smoking.
- Use elemental mercury in or over a tray capable of containing the full amount of mercury in case of a spill. Avoid using mercury compounds on benches with cracks where spills can accumulate.
- Transfer liquid mercury compounds between containers in a fume hood over a tray.
- Clearly label all containers holding mercury-based compounds.
- Segregate and dispose of all waste materials containing or contaminated with mercury compounds through an approved specialist contractor. Consider recycling elemental mercury when appropriate.
- Users should familiarize themselves with the properties of each mercury-based compound they use.

APPENDIX 3: MINIMIZING AND CONTROLLING CHEMICAL EXPOSURE

Occupational hygiene is the science of keeping workers safe and healthy by identifying and controlling harmful substances or conditions in the workplace. This discipline focuses on identifying and eliminating workplace threats that could jeopardize health, cause injury, or induce discomfort. These dangers include airborne contaminants that workers may inhale. Effectively managing these risks necessitates a thorough understanding of the hazards and potential worker exposure. Prioritizing the complete removal of hazardous substances, such as replacing highly toxic chemicals with safer alternatives, is the ideal strategy. When elimination is impractical, implementing specialized equipment or modifying work procedures to minimize exposure is crucial. As a last resort, personal protective equipment may be necessary to safeguard workers.



Controlling Chemical Hazards

- The most effective approach to safeguarding workers from chemical hazards is through a proactive strategy focused on prevention. This involves eliminating hazardous substances from the workplace entirely whenever feasible. If complete removal is impractical, substituting these substances with safer alternatives is the next best course of action.
- When elimination or substitution is not viable, implementing robust engineering controls becomes paramount. These controls serve as physical barriers, isolating workers from potential hazards. Ventilation systems and fume hoods are prime examples of engineering controls designed to contain and exhaust harmful fumes and vapours. By effectively capturing and removing contaminants from the work environment, these systems significantly reduce exposure risks.
- It is crucial to prioritize engineering controls as the primary defence against chemical hazards. However, when these measures alone are insufficient, additional control strategies may be necessary. These can include administrative controls, such as limiting exposure time or implementing strict work practices, and personal protective equipment (PPE), such as gloves, respirators, and protective clothing.
- It is essential to emphasize that PPE should be considered a last resort, as it relies on individual compliance and can be less reliable than engineering controls. Proper training on the correct use and maintenance of PPE is vital to ensure its effectiveness.
- By adhering to a hierarchical approach that prioritizes elimination, substitution, and engineering controls, organizations can create a safer work environment for employees exposed to chemical hazards.

Additional Containment and Control Measures

Local Exhaust Ventilation When fume hoods are unsuitable for managing chemical hazards, alternative ventilation methods may be necessary. Local exhaust extraction arms should be used to capture and remove contaminants at their source with the intent of reducing exposure. While less effective than fume hoods, these devices can be valuable tools when properly designed and installed. Ventilated hazardous gas cabinets provide another containment option for storing and handling hazardous gases.

Isolation and Containment Glove boxes offer a high level of containment for handling extremely hazardous materials. These enclosed environments prevent exposure by isolating materials from the laboratory atmosphere. Users must follow strict protocols to maintain containment, including avoiding the use of jewellery, watches, and sharp objects.

Administrative and Operational Controls Effective laboratory management includes a combination of administrative and operational controls. Clear labelling, comprehensive training, and standardized operating procedures are fundamental. Proper chemical storage, regular equipment maintenance, and adherence to established cleaning protocols contribute to a safe laboratory environment.

Equipment Evaluation and Maintenance All laboratory equipment, including safety devices such as alarms and sensors, must be installed, evaluated, and maintained according to regulations, university policies, and manufacturer guidelines. Regular inspections and maintenance are essential for ensuring equipment reliability and safety.

By implementing these additional containment and control measures in conjunction with fume hoods, laboratories can significantly reduce the risk of exposure to chemical agents.

Work Practices and Standard Operating Procedures (SOPs)
Adherence to robust work practices is essential for minimizing occupational exposure to chemical agents. Laboratory-specific SOPs, developed and reviewed by knowledgeable personnel, provide detailed guidance for safe laboratory operations. Complementing these SOPs, general safety rules and policies further protect employees from chemical agents.

Fundamental safety practices include attending required safety training, strictly following SOPs, and maintaining a clean and organized work area. Eating, drinking, and personal hygiene activities are strictly prohibited within the laboratory. Reporting unsafe conditions promptly is crucial for preventing accidents.

To minimize exposure, experiments should be scaled down to use the smallest necessary quantities of materials. Proper hand hygiene, including glove removal and handwashing before leaving the laboratory, is essential. Safe management and disposal of hazardous substances are important to protect both staff and students.

Personal Protective Equipment (PPE)
PPE serves as a final layer of protection against hazardous materials. However, it is crucial to emphasize that PPE should never replace engineering controls or sound work practices. Appropriate PPE, such as gloves, lab coats, and eye protection, must be worn in conjunction with standard laboratory attire, including long pants and closed-toe shoes. To minimize fire risks, natural fibres are preferred for clothing. By combining these essential work practices, SOPs, and PPE, laboratories can significantly reduce exposure to chemical agents and create work environment that is healthier and safer.

Gloves must be selected based on:

- Chemical Resistance: Gloves should be chosen based on the chemicals being handled. Refer to the manufacturer's permeation and degradation data to select the appropriate material.
- Permeation Time: Select gloves with a permeation breakthrough time that exceeds the duration of exposure.
- Degradation Resistance: Check glove materials for resistance to degradation, which could compromise the glove's protective properties.

Respirators are selected to ensure proper protection against the hazards present. Here's an outline that can guide you through the selection process:

1. Identify the Hazards
    - Type of Contaminants: Determine the nature of the airborne hazard—whether it's particulate (dust, fumes, smoke), gases, vapours, or a combination.
    - Concentration Levels: Know the concentration of the contaminant in the air. This helps determine the appropriate respirator.
    - Oxygen Deficiency: Ensure that the environment is not oxygen-deficient. If oxygen levels are below 19.5%, specialized respirators like supplied-air respirators (SARs) or self-contained breathing apparatus (SCBA) are necessary.

2. Evaluate the Respiratory Protection Standard
    - Check regulatory or industry standards that apply to your procedure. For example, NIOSH (National Institute for Occupational Safety and Health) in the US or EN standards in Europe.
    - Ensure the respirator selected meets the necessary standard for filtering efficiency and protection.

3. Types of Respirators

a. Air-Purifying Respirators (APRs): These remove contaminants from the air by filtering them out.
    - Particulate Respirators: For dust, mist, and fumes. Examples include N95, P100.
    - Gas and Vapor Respirators: Use cartridges to filter gases or vapours like solvents or ammonia.
    - Combination Respirators: For environments with both particulates and gases/vapours.

3M provide an excellent guide: https://multimedia.3m.com/mws/media/639110O/3m-respirator-selection-guide.pdf .

b. Supplied-Air Respirators (SARs): These provide clean air from an external source.
    - Self-Contained Breathing Apparatus (SCBA): Used for high-risk procedures like firefighting or in confined spaces.
    - Airline Respirators: Connect to a clean air source outside the contaminated area.

4. Fit Testing

c. Proper fit is essential to ensure the respirator provides adequate protection.
    - Qualitative Fit Test: Subjective, where the user identifies if they can taste or smell a test agent.
    - Quantitative Fit Test: Objective, using specialized equipment to measure leakage into the facepiece.
    - Make sure the respirator forms a tight seal on the user's face. Regular testing is required, especially if there are changes in facial structure (weight loss, facial hair, etc.).

5. Comfort and Use Considerations

- Breathing Resistance: Respirators with higher protection levels can be harder to breathe through, so comfort should be factored in if the procedure is long.
- Work Environment: Consider factors such as temperature, humidity, and the physical demands of the task, as these can affect comfort and respirator performance.

6. Maintenance and Care
    - Ensure that the respirator is cleaned, maintained, and stored properly. Reusable respirators must be regularly inspected, and worn parts (e.g., filters) must be replaced as required.
    - Disposable respirators should be discarded after use according to manufacturer recommendations.

7. Training and Education
    - Workers must be trained in the proper use, care, and limitations of the respirators. This includes donning and doffing procedures, maintenance, and recognizing when the respirator is not functioning correctly.

APPENDIX 4: EXPLOSIVES, APPLICATION FOR GRANT OR RENEWAL OF EXPLOSIVES STORE LICENCE

Application for Grant or Renewal of explosives store licence
(Note: This form should be read in conjunction with the Explosives Act 1875 and Stores for Explosives Order 2007 (S.I. 804 of 2007), and Guidance Document on Fire Safety in Stores for Explosives. See footnotes on completing each section of form).

1. Applicant

Name (if applicant is an individual) Address	
Company Name	
Name of Company Secretary	
Registered Office	
Name and evidence of competence of person directly responsible for supervising operations within store	
Phone	
Email	

2. Location of proposed store:

County	
Parish	
Place	

Location: Scaled maps should accompany the application, one of scale 1:2500, showing the entire site and all occupied buildings, roads, factories, etc. within 1000m of the site and a block plan of scale 1:500 (approx.), showing actual store (outlined in red) and remainder of the site under the control or ownership of the applicant, and a plan of the actual store of scale 1:50.

3. Checklist for construction of proposed store:

Type	Description	Yes/No
SM	Solid brick or block or reinforced concrete, mounded?	
SU	Solid brick or block or reinforced concrete, unmounded?	
MM	Metal, mounded?	
MU	Metal, without detonator annex, unmounded?	
MDU	Metal, with detonator annex, unmounded?	
UG	Underground?	
OS	Open stack ?	
Lighting	Compliant with PM 82?	
Lightning conductor	Compliant with PM 82?	
Security	Compliant with Garda Síochána CPO requirements?	
Fire safety	Compliant with Guidance Document on Fire Safety in Stores for Explosives?	

Construction requirements are specified in the Order. PM 82 is an electrical specification for explosives buildings.

4. Types of explosives proposed to be stored:

Proper shipping name	UN number	UN Hazard Code	Hazard Type

5. Separation distances from store to nearest facility:

Facility	Distance (m)
Occupied building on site	
Occupied building off site	
Place of public resort	
Major road	
Vulnerable building	
Minor road/railway line	
Bridleway/footpath/footway/lightly-used road/waterway	
Reference zone radius	

6. Number of dwellings in reference zone:

See Schedule 4 of Order for tables and explanations of separation distances.
See Article 3 of, and Schedule 4 to, Order for explanation of reference zone.
This should be determined by a physical survey, using scaled map as reference

7. Maximum quantity of explosives proposed to be stored:

Hazard type	**Maximum quantity proposed (kg)**
1	
2	
3	
4	
Controlled substances	
ANBI	
Ammonium nitrate	
Others:	

8. Written assessments referred to in Article 15 of Order
   (To be attached on first application for license.)

Signature of Applicant

_____ _____

(Block capitals)

Date: _____

This quantity is normally the net explosive mass in kg, and the maximum quantity permitted depends on available separation distances. To calculate the maximum permitted quantity, proceed as follows, in accordance with Schedule 4 of the Order, for each hazard type of explosives proposed to be stored:

a. Select correct table depending on store construction and hazard type.
b. Use appropriate line for proposed quantity of explosives.
c. Ascertain whether high-density or low-density distance is appropriate, having regard to paragraphs 3 to 6 of Schedule 4.
d. Compare required separation distance from table against actual available distance.
e. If required distance exceeds available distance, reduce proposed quantity of explosives until available distance equals or exceeds required distance.

The quantity so ascertained is the maximum permitted quantity.
Submit form with maps and fee to Secretary of local authority, with copies to: Government Inspector of Explosives, Department of Justice and Equality, Floor 2, Montague Court, Montague Street, Dublin 2, D02 FT96

APPENDIX 5: CHEMICAL STORAGE EXTENSION RISK ASSESSMENT FORM

Section 1: Chemical Identification

Field	Details
Chemical Name	
CAS Number	
Inventory ID / Barcode	
Original Expiry Date	
Manufacturer	
Storage Location	
Intended Use	

Section 2: Visual Inspection Checklist

Please confirm the following before proceeding with assessment:

Inspection Item	Pass / Fail	Comments
Container is intact and undamaged		
Label is legible and in good condition		
Seal is secure		
Contents show no visible signs of change (e.g., discoloration, precipitation)		

If any item fails, the chemical must be disposed of in accordance with disposal procedures.

Section 3: Type of Assessment Conducted

Please select one:

Qualitative Assessment

- Is sufficient when the chemical is stable and not prone to significant change.
    - Visual inspection and qualitative review confirm stability? ☐ Yes ☐ No
    - Proposed extension: _____ months (max 30% of original shelf life)

Quantitative Analysis*

Is required when the chemical agent is unstable or subject to degradation or transformation, or when there is uncertainty regarding its stability or performance.

- Is the chemical agent unstable or subject to degradation? ☐ Yes ☐ No ☐ Unknown
- Is there uncertainty about the chemical's stability or performance? ☐ Yes ☐ No
- Laboratory analysis confirms chemical remains within acceptable purity limits. ☐ Yes ☐ No
    - Analytical Technique used: _____
    - Measured Percentage Purity: _____
- Proposed extension: _____ months (max 50% of original shelf life)

*A copy of the analysis record should be kept together with this APPENDIX 5 form

Section 4: Approvals

Name	Role	Signature	Date
	Assessor		
	Principal Investigator / Line Manager		

Section 5: Record Keeping

- This form must be retained electronically for as long as the chemical is stored.

APPENDIX 6: PARTICULARLY HAZARDOUS AGENT

Category	Definition and Resources
Select Carcinogen 	• Any agent that meets one of the following criteria: - Regulated by OSHA as a carcinogen: https://www.cdc.gov/niosh/npg/nengapdxb.html - Listed under the category "Known to be carcinogens" in the 15th Report on Carcinogens published by the National Toxicology Program (NTP) - Agents Classified by the IARC Monographs, Volumes 1–137, IARC Monographs on the Identification of Carcinogenic Hazards to Humans (who.int) ➢ American Cancer Society (ACS) has compiled the above-mentioned lists into one on its website: Known and Probable Human Carcinogens ➢ Safety Data Sheet (SDS) Section 2 for specific hazards
Reproductive Toxin 	• Agents that can have adverse effects on various aspects of reproduction: fetal development (teratogens), chromosomal damage (mutagens), fertility, gestation, lactation, and sterility. • Reproductive toxins can affect both men and women ➢ Safety Data Sheet (SDS) Section 2 for specific hazards
Acute Toxin 	• Chemicals with high acute toxicity are those having oral, inhalation, or dermal LD50 and LC50 values below a specified threshold. The threshold values: - Oral LD50 (rats): < 50 mg/k - Dermal LD50 (rabbits): < 200 mg/kg - Inhalation LC50 (rats): < 200 ppm in air ➢ Safety Data Sheet (SDS) Section 11 for Toxicological Information (LD50 and LC50 values) and Section 2 for specific hazards ➢ Registry of Toxic Effects of Chemical Substances (RTECS) is also a good source of information on acute toxins

APPENDIX 7: SDS - REGISTRATION EVALUTION AUTHORISATION AND RESTRICTION (REACH)

Safety Data Sheets (SDSs), provided for substances or mixtures containing substances registered under REACH (Registration, Evaluation, Authorisation, and Restriction of Chemicals), potentially can be used in the chemical risk assessment process. The following steps outline how specific content from REACH SDSs is integrated into risk assessments to ensure safe and compliant chemical management. The limitation is that very few SDS's have Chemical Safety Assessments attached, so this mechanism has limited applicability to the risk assessment process:

1. Identify Key Information from the SDS
    - Review registration numbers where appropriate to confirm compliance with REACH requirements and trace the substance's registration status.

2. Review Chemical Safety Assessments (CSA)
    - Examine Exposure Scenarios (ES) provided in the SDS Annex for hazardous substances registered at quantities exceeding 10 tonnes per year. These scenarios describe safe conditions for the substance's use and include required risk management measures.
3. Implement Relevant Risk Management Measures
    - Ensure the risk management measures outlined in the supplier's Exposure Scenarios are implemented in the workplace to minimize risks associated with the chemical.
4. Assess Use Against Supplier's Exposure Scenarios
    - Confirm that the university's intended use of the chemical is covered by the supplier's provided Exposure Scenarios.
    - If the use is not covered, the university will need to independently evaluate 'use' risks and identify appropriate control measures.