



Summary

Reference: RA044624/3

Sign-off Status: Authorised

Date Created:	04/04/2022	Confidential?	No
Assessment Title:	Department of Chemical Engineering Generic Risk Assessment for High Hazards		
Assessment Outline:	This risk assessment gives general control measures for a number of high hazards in the department. It also includes what actions need to be taken to ensure that general competency is gained. Though the hazards and controls are generic, it may be used as a reference to implement hazards and control measures into individual risk assessments. Detailed individual project risk assessments are still required for all projects and equipment. Note: Assumptions have been made based on the typical work performed in the department. Additional detail in project risk assessments will be required.		
Area Responsible (for management of risks)		Location of Risks	
Division, School, Faculty, Institute:	Faculty of Engineering Science	Building:	Roberts Building
Department:	Dept of Chemical Engineering	Area:	ALL Areas
Group/Unit:	All Groups/Units	Sub Area:	ALL Sub Areas
Further Location Information:	This risk assessment contains high hazard activities in the Department that could occur in laboratories or offices. This includes activities in the South Wing labs and Bernard Street / Tottenham Court Road offices.		
Is additional GM or HG approval required? Only relevant to specialist biological risk assessments (GMM2, GMM3, HG2, HG3, GM animals, GM plants) except GMM class 1.:	Click SELECT to change ONLY if this is a GMM Class 2, GMM Class 3, HG2, HG3, GM animals or GM plants risk assessment		
Assessment Start Date:	15/06/2022	Review or End Date:	15/06/2023
Relevant Attachments:	<p>hsg53 - Respiratory protective equipment at work.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>eh40 - Workplace exposure limits.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>hsg60 - Upper limb disorders in the workplace.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>hsg85 - Electricity at work, Safe working practices.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>hsg107 - Maintaining portable electrical equipment.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>hsg129 - Health and safety in engineering workshops.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>hsg140 - Safe use and handling of flammable liquids.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>hsg272 - Using nanomaterials at work.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>hsg281 - Electromagnetic fields at work.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>BCGA CP30 - THE SAFE USE OF LIQUID NITROGEN DEWARS.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>I121 - Work with ionising radiation.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>I150 - Explosives Regulations.pdf (Workplace Procedures) Uploaded: 04/04/2022</p> <p>Description of attachments:</p> <p>Standards, regulations, and guidance used to inform control measures.</p> <p>Location of non-electronic documents:</p> <p>N/A</p>		
Assessor(s):	Hick, Ralph G H		
Approver(s):	EVA SORENSEN		
Reason fo Review	<p>Type:</p> <p>Process Change</p> <p>Reason:</p> <p>I have included how to consider competence for all hazards (Required by T-100).</p>		
Signed Off:	EVA SORENSEN (16/06/2022 18:23)		

PEOPLE AT RISK (from the Activities covered by this Risk Assessment) *

CATEGORY
Employees
Post-Graduates



Risk Assessment

Undergraduates

Visitors

Women of Child-bearing Age

Young Persons

1. Physical / Mechanical

Description of Activity:

This section of the risk assessment concerns the physical hazards that are present in the department.

For all physical hazards consideration must be given to:

- Can the hazard be eliminated? e.g. by asking trained porters to lift / move items.
- Can the hazard be substituted for a safer option? e.g. working using mains powered equipment instead of high powered equipment.
- Can engineering controls be used to isolate the hazard? e.g. using a trolley to move items instead of carrying them.
- Can administrative controls be used to control the hazard? e.g. using safe systems of work / procedures, ensuring people are appropriately trained.
- Can workers be protected from the hazard using PPE? e.g. safety shoes, safety shield.

Hazard 1. Electrical - High Voltage

Working from an industrial supply (3 phases or voltage over 100 V) rather than normal office supply. Any work over 100 V. Note: This relates to equipment that is plugged into the mains and it enclosed.

Electrical shock, burns, fire, explosion, arcing, other secondary effects.

Existing Control Measures

All plugs and cables to be inspected frequently:

- Broken, damaged sheaths
- Broken plugs, exposed wires
- Corrosion, signs of burning

Equipment inspected prior to each use:

- Cracks, breaks
- Corrosion, signs of burning, chemical damage
- Obstructed fans, heat sources nearby
- Chemicals or water stored close to appliance

Mains sockets to be checked frequently:

- Cracks, breaks, loose
- Burning
- Accessible

Equipment or plugs found to be faulty must be withdrawn from use and reported to the Electronics Technician and relevant Lab Manager.

Equipment must be PAT tested before use. If equipment fails a PAT test it must be withdrawn from use and reported to the Electronics Technician and relevant Lab Manager.

Equipment must be rated to an electrical safety standard (e.g. CE, BSI, or UKCA marking).

High voltage equipment must not be used on extension leads.

Covers of equipment must not be removed or inside electrical components changed.

Users are deemed competent when they have:

- Been trained on how to use the equipment.

Hazard 2. Electrical - Live Work

Work that involves making, repairing or testing any electrical equipment that is live, including live batteries.

Electrical shock, burns, fire, explosion, arcing, other secondary effects.

Existing Control Measures

Including the measures from High Voltage Work:

Risk assessments must be approved by those with significant experience in live work (e.g. PI, Estates Electrician, or Electronics Technician).

No work to be done on mains supply electricity by anyone other than Electronics Technician.

No work on 'live work' over 50 V.

Specialised training and supervision required.

PPE must be worn, such as insulation gloves, insulating boots, safety glasses, and face mask / helmet depending on the job.

Users will not be deemed competent when they have:

- Been trained on how to use the equipment.
- Been supervised while using the equipment.

Hazard 3. Powered Workshop Equipment

The uses of equipment such as lathes, milling machines, power presses and drills, that have cutting, trapping, injection or other hazards.

Crushing, shearing, cutting, entanglement, trapping, impact, stabbing / puncture, friction / abrasion.

Existing Control Measures

Guards and interlocks not removed by operators. Maintenance only performed by maintenance staff with supervision.

Checks to ensure the equipment is in good condition, including locking device and mechanism.

Use restricted to competent operators only. Staff trained until determined competent.

Equipment operated according to the manufacturer's manual.

No lone working.

Avoid breathing dust / vapours. Use of appropriate respiratory equipment or LEV if required.

Suitable PPE worn, including face shields. Suitable shoes worn, long hair tied back.

Users will be deemed competent when they have:

- Been trained on how to use the equipment.
- Been supervised while using the equipment.
- Note: There must be no lone working on powered workshop equipment.

Hazard 4. Lifting Equipment

Any equipment such as cranes, hoists and fork lift trucks that is used to lift or lower loads and the accessories used to sling the load on to the equipment.

Crushing, cutting, entanglement, trapping, impact, stabbing / puncture, friction / abrasion.

Existing Control Measures

Porters to be used where reasonably possible.

Use restricted to competent operators only.

Equipment only used if it and all attachments can accommodate the load weight.

Equipment to be formally inspected by the insurer every six months. Failed items removed from use and quarantined by the DSO.

Checks before use to ensure the equipment is in good condition, including locking device and mechanism.

Equipment used according to the manufacturers instructions and using proper techniques.

Maintenance only performed by maintenance staff.

No lone working.

PPE worn, e.g. safety shoes and hard hat. No persons or body parts must ever be under loads being lifted.

Users will be deemed competent when they have:

- Been trained on how to use the equipment.
- Supervised while using the equipment.
- Attended the UCL Safety Training Course: - "Safe Use of Slings, Hoists and Mechanical Aids"

Hazard 5. Manual Handling

The requirement to move, push, pull or lift heavy loads or the regular requirement to carry out a task that is repetitive and or requiring micro- movements for a significant amount of the working week.

Injury to back, tendons, ligaments, muscles, Work-Related Upper Limb Disorder (WRULD)

Existing Control Measures

Porters to be used where reasonably possible.
Items broken up into smaller units / quantities if appropriate.

Handling aids used where appropriate e.g. trolleys and list trucks.
Repetitive work to be kept to a minimum by using different tools, job sharing, or mechanical tools to automate the process.
Limit time spent by sharing task or taking intermittent breaks.
Two persons required for manoeuvring large deliveries.

Stepping tools used to minimise stretching and fall.
Items stored appropriately.
Appropriate gloves worn if needed.
Safety shoes and hard hat worn if required.

Users will be deemed competent when they have:
- Attended the UCL Safety Training Course: "Manual Handling and Lifting".
- If moving gas cylinders: "Moving gas cylinders".

Hazard 6. Pressure Systems

Work with equipment that consists of a "pressure system" which means:

(a) a system comprising one or more pressure vessels of rigid construction, any associated pipework and protective devices;
(b) the pipework with its protective devices to which a transportable pressure receptacle is, or is intended to be, connected;
or (c) a pipeline and its protective devices, which contains or is liable to contain a relevant fluid including steam at 0.5 bar (7 psi) or above, but does not include a transportable pressure receptacle.

High-pressure fluid injection, crushing, cutting, entanglement, trapping, impact, stabbing / puncture, friction / abrasion.

Existing Control Measures

Equipment inspected before every use.
Appointed Person - Pressure Systems or PI consulted before installation.

Manufacturer's guidelines followed for commercial equipment and all parts of research rigs.
Maintenance on internal components only performed by Electronics Technician.

All research rigs to have P&IDs before use.
P&IDs displayed next to equipment and updated for changes.

Users will be deemed competent when they have:
- Been trained on how to use the equipment.

Hazard 7. Welding / Cutting / Soldering

The use of gas or plasma cutting or welding equipment, blowlamps and soldering in particular using lead solder.

Respiratory problems, burns.

Existing Control Measures

Alternatives to lead and rosin solder used wherever possible. Health surveillance for those using lead or rosin solder.

Any gas or fumes to be evacuated by either using a tip extract unit with appropriate filter (e.g. HEPA) or fume hood. Extract systems to be tested annually.

Soldering only performed by trained users.
Irons inspected before use. Irons PAT tested. Signs showing iron is hot if in use and unattended.
Irons always placed in stands and not on bench.

Appropriate fire extinguishers available nearby. Appropriate first aid (e.g. burn kits) located nearby.
Work does not take place next to ignition sources.

Appropriate PPE worn including eye protection.
Heat-resistance gloves available and used where necessary.

Users will be deemed competent when they have:
- Been trained on how to use the equipment.

Hazard 8. Compressed Gases

Any gas such as oxygen, hydrogen, methane, butane, and any gaseous mixture that is stored under pressure with a total quantity above 15kg in the building. These may be classed as a chemical hazard as well.

Crushing, explosion, trapping, impact.

Existing Control Measures

Gases must be stored appropriately, to a bench or wall with no more than three tied together. They should not be stored in passageways.
Hazardous gas cylinders must be stored in ventilated enclosures if feasible.
Gases stored and used in rooms with the correct gas alarms installed. Gas alarms calibrated yearly.
Oxygen cylinders must not be positioned within 3 metres of a flammable gas cylinder, and preferably not within 5 metres of ignition sources.

Cylinders only transported by those with suitable training (BOC are able to move cylinders).
All self-made rigs to have a P&ID displayed next to the equipment.
Smallest practical cylinder size purchased where possible, cylinders should not last longer than three months. Cylinders returned to BOC once not required.
Number of cylinders in a work place must at all times be kept to a minimum.
All cylinders must be shut off (both at the main cylinder valve and regulator valve) when not in use.
Cylinders which have a key operated main valve should always have a cylinder key nearby and clearly visible.

Frequent checks on:

- Regulators, including correct gas type and expiry date
- Gas cylinder lines, including correct gas being used, following departmental practice for colour codes
- Gas Cylinders, including no defects, secure

Users will be deemed competent when they have:

- Completed a lab induction,
- Completed the Moodle course "Chemical Engineering Compressed Gas Safety"
- Attended the UCL Safety Training Courses: "Chemical Engineering Compressed Gas Safety" and "Using Gases Safely Within Universities".
- If changing regulators "Connecting Regulators & Safe Cylinder Set-up"

Risk Level

With Existing Controls:

Risk Level **C - Medium / Moderate**

2. Biological Materials

Description of Activity:

This section of the risk assessment concerns the biological material hazards that are present in the department.

For all biological material hazards consideration must be given to:

- Can the hazard be eliminated? e.g. buying an item instead of synthesising it.
- Can the hazard be substituted for a safer option? e.g. working with deactivated biological material.
- Can engineering controls be used to isolate the hazard? e.g. using a fume cupboard / LEV.
- Can administrative controls be used to control the hazard? e.g. using safe systems of work / procedures.
- Can workers be protected from the hazard using PPE? e.g. specific types of gloves, biological lab coat with elasticated cuffs.

- Are there correct first aid and spill kits present / nearby?
- Are the waste procedures for the material identified?
- Are the materials stored correctly (away from incompatible materials)?
- Have the exposure limits been considered? (EH40)

Note: All containers of materials are clearly and unambiguously labelled in a way which is meaningful to not just those in the research group.

Hazard 1. Clinical Material

Working with substances from humans including blood and tissue as well as organs or cadavers.

General ill health, others

Existing Control Measures

Efficient protocols must be established to prevent contact with the material.
 Work with biological agents of specific hazard groups must be performed in the appropriate containment level lab.
 Work with biological agents must be performed in the appropriate LEV / fume cupboard / safety cabinet.

Avoid cross contamination. Adopt good hygiene practices.

- Increased hand-washing
- Careful removal and disposal of contaminated PPE.

Health surveillance may be required. Users must contact the UCL workplace health service, particularly those that present allergies or are at increased risk of exposure.
 Vaccinations may be appropriate if working with certain biological agents (e.g. hepatitis B).
 Disinfection / autoclaving after work must be completed to the required procedure.
 Waste must be appropriately disposed of.

Full appropriate PPE must be worn.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Attended the UCL Safety Training Course: "Principles and practice of biosafety training"

Hazard 2. Allergens / Sensitizers

Working with animals or plants regularly that may lead to sensitisation to the animal dander, dust or other substances that could cause occupational asthma, dermatitis or other health problems.

Allergic response, hypersensitivity, others

Existing Control Measures

Substitute for less hazardous alternatives where possible.

For airborne exposure, use LEV fume cupboard / safety cabinet where possible. If work cannot be contained, respiratory protective equipment may be required. Type of equipment determined by MSDS.

Health surveillance may be required. Users must contact the UCL workplace health service, particularly those that present allergies or are at increased risk of exposure.

Waste must be appropriately disposed of.

Avoid cross contamination. Adopt good hygiene practices.

- Increased hand-washing
- Careful removal and disposal of contaminated PPE.

For direct contact exposure, use appropriate PPE.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Attended the UCL Safety Training Course: "Principles and practice of biosafety training"

Hazard 3. Water Systems / Legionella

Work that uses any water system that is not connected to the mains and meets at the following criteria;

- The water is kept between 20C and 45C
- There is a source of nutrients e.g. sludge or rust and there is not a schedule to ensure the system is kept mixed with sufficient biocide
- the system can either on purpose or through a fault create an aerosol or spray
- the system allows for the storage or re-circulation of water either by design or through 'dead legs' or reservoirs

Legionnaires' disease (legionellosis)

Existing Control Measures

Avoid water temperatures of 20 - 45 °C.

If 20 - 45 °C is required, drain system each week.

Drain baths each month.

Avoid creating aerosols. Keep lids / coverings on equipment to prevent splashing or spread of water droplets.

Clean the container if it develops rust or scale. Consider replacing if there is a large amount.

Training courses for those who manage the water equipment:

- "Awareness of Legionella Bacteria in Water Systems".

Users will be deemed competent when they have:

- Been given a local lab induction.

Hazard 4. Respiratory Hazards

Carrying out work that produces, fumes, smoke, dust or gas that is removed either at source through engineering methods such as Local Exhaust Ventilation or by the provision of masks.

Occupational asthma, bronchitis, lung cancer, others

Existing Control Measures

Appropriate Local Exhaust Ventilation (LEV) must be used for all open work (e.g. HEPA filtered fume cupboards may be appropriate for particulate use).

Respiratory Protective Equipment (RPE) may be required if the substance cannot be contained and there is no other option to prevent contact with the fumes or smoke.
PPE must be selected according to MSDS of the materials and follow manufacturers instructions.

Face fit testing can be done by those have been trained by UCL to Face Fit Test users.

Face Fit Testers are deemed competent when they have:

- Completed the UCL training course: "Train the Trainer - Face fit tester".

Users will be deemed competent when they have:

- Been given a local lab induction.

Risk Level

With Existing Controls:

Risk Level **B - Low / Tolerable**

3. Chemical

Description of Activity:

This section of the risk assessment concerns the chemical hazards that are present in the department.

For all chemical hazards consideration must be given to:

- Can the hazard be eliminated? e.g. by buying a chemical instead of synthesising it.
- Can the hazard be substituted for a safer option? e.g. using a less hazardous chemical for a reaction.
- Can engineering controls be used to isolate the hazard? e.g. using a fume cupboard / LEV or a shield.
- Can administrative controls be used to control the hazard? e.g. using safe systems of work / procedures.
- Can workers be protected from the hazard using PPE? e.g. specific types of gloves, goggles, lab coats.

- Are there correct alarms (e.g. oxygen depletion) present in the room.
- Are there correct fire extinguishers (e.g. metal extinguisher) nearby?
- Are there correct first aid and spill kits present / nearby?
- Are the waste procedures for the material identified?

- Are the materials stored correctly (away from incompatible materials)?
- Have the exposure limits been considered? (EH40)

Note: All containers of materials are clearly and unambiguously labelled in a way which is meaningful to not just those in the research group.

Hazard 1. Hazardous Chemicals

Storage or use of anything labelled with a hazard symbol identifying it as dangerous to the environment, hazardous, toxic or corrosive in quantities greater than use in a domestic household
- These have been designated under REACH and will have a warning symbol on the packaging.

Poisoning, burns, damage to environment, damage to organs, death.

Existing Control Measures

Hazardous chemicals only used where no suitable alternatives can be used. Excessive quantities should not be used, only the amount necessary.

For volatile and fuming work, these must be performed in an appropriate fume cupboard or LEV; fine powder work in system with filter.

Materials must be stored according to the manufacturer's instructions. Material must not be stored with incompatible materials.

No face or body touching while wearing gloves. Hands must be washed after completion of work.

No touching communal surfaces while wearing gloves (e.g. door handles).

Minor spills must be cleaned up by the researcher. Contact a member of the technical team / DSO for major spills.

No lone or extended hours working for particularly hazardous chemicals, including those that require specific first aid measures.

The correct PPE must be worn for all hazardous chemicals as indicated in the MSDS. Gloves must be changed if there has been chemical contact.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Completed the Moodle Course "Laboratory Safety in Chemical Engineering".

Hazard 2. Explosive / Highly Reactive

Chemicals and substance that could react violently leading to an explosion or explosive atmosphere - even if there is no intention of creating an explosion and the work they are being used for would not require an explosion. This includes explosive material that has been desensitized.

Cuts, bruises, damage to body, death.

Existing Control Measures

Amount of sample used in experimental work must be kept to a minimum.
Scale-up must be avoided unless proper thought has gone into all parts of the procedure and control measures have been updated.

For more potent explosives a shield must be used, even when in a fume cupboard.
If there is a possibility an explosive atmosphere may be created, for example by the release of flammable gas or dust, the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) must be considered.

All explosive and highly reactive materials must only be used in accordance to the MSDS.
No lone working or extended hours working with explosives.
Materials must be stored according to the manufacturer's instructions. Material must not be stored with incompatible materials.
Spills must be dealt with at an appropriate level: contact DSO for larger spills.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Been trained on using the specific chemical.
- Completed the Moodle Course "Laboratory Safety in Chemical Engineering".

Hazard 3. Controlled Material

Work with materials that require either requisitions and a licence to use and store or material that is controlled and it is required that UCL provide returns of the amount on out sites at regular intervals .
These chemicals that can be used for illegal purposes either making weapons or drugs such as acetic anhydride or Ephedrine and are listed under The Misuse of Drugs Act and subsequent regulation such as the Drug Precursor Regulations and the Chemical Weapons Conventions.

Chemical misuse, licences revoked.

Existing Control Measures

All controlled materials must be reported to the responsible person for controlled materials annually.
Usage for all controlled chemicals must be monitored. Some lab stock chemicals (e.g. acetone and mercury) do not need monitoring after every usage.
Material that requires a licence must be securely stored with only appropriate persons given access.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Completed the Moodle Course "Laboratory Safety in Chemical Engineering".

Hazard 4. Nano Materials

Work that involves the use or production of material at the nanometre (nm) scale.

Respiratory issues, damage to body.

Existing Control Measures

Nano materials should be kept dispersed in a liquid medium if possible.
Powder nano material work must be performed with HEPA-filtered LEV.

Materials must be stored according to the manufacturer's instructions. Material must not be stored with incompatible materials.

No face or body touching while wearing gloves. Hands must be washed after work has been completed.

Spills must not be swept up. To avoid dispersion in air, they should be wet cleaned.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Been trained on using the materials.
- Completed the Moodle Course "Laboratory Safety in Chemical Engineering".

Hazard 5. Cryogenic Substances

Working with material such as liquid nitrogen that have cryogenic properties or work that involves samples that are stored in cryogenic processes.

Burns, temporary loss of consciousness, death.

Existing Control Measures

Cryogenics must not be used or transported with a person present in confined spaces such as small storage rooms and lifts. When transporting cryogenics in lifts, a barrier must be used so that others cannot enter the lift and the lift must be remotely sent to the correct floor. The risk assessment for work involving liquefied gases must take into account the risk of explosion and the effect of a major spill considering the size of the room, effectiveness of the ventilation, and whether oxygen depletion monitoring may be required. If work must occur regularly in small spaces with little ventilation a personal oxygen monitor will be required. Rooms must have oxygen monitors in them to alert users of low oxygen levels. In the event of a major spillage or the oxygen level dropping below 18% all persons should leave the room immediately, close the door and not re-enter until it can be confirmed that the atmosphere is safe to breathe.

Only vessels designed to hold cryogenics may be used. Cryogenic vessels must be inspected prior to use. Damaged vessels must not be used. All vessels should have a means to vent high pressure gas. Vessels should not be used with visible ice formation. Stoppers must be placed back on dewars immediately after use to reduce ice build-up.

Cryogenic approved gloves, appropriate shoes, and a face shield must be worn. Clothing to cover all body parts must be worn. Clothing should be tucked into lab coat cuffs and glove cuffs to stop the accumulation the event of a liquid nitrogen spill. Trousers should be worn over boots.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Completed the Moodle Course "Laboratory Safety in Chemical Engineering".
- Completed "Using Liquid Nitrogen Safely within Universities" (e-Learning course)
- Completed "'Safe Decanting of Liquid Nitrogen" (Practical Course)

Hazard 6. Asphyxiates

Work with nontoxic or minimally toxic gas which reduces or displaces the normal oxygen concentration in breathing air. Breathing of oxygen-depleted air can lead to death by asphyxiation (suffocation). Often associated with compressed gasses but may be produced from chemical reaction or the use of volatile liquids such as liquid nitrogen at room temperature.

Temporary loss of consciousness, death.

Existing Control Measures

Care should be taken to work with compressed gases and liquid nitrogen in rooms that are large enough to ensure that in the vent of the container being emptied and air displaced, the concentration of oxygen remaining in the room would not drop to a level which could result in unconsciousness.

Rooms must have oxygen monitors in them to alert users of low oxygen levels. Work must not be completed in confined spaces such as storage rooms.

If work must occur regularly in small spaces with little ventilation a personal oxygen depletion monitor or fixed alarm will be required.

Where possible, and if no flammable work is taking place, windows should be kept opened during experimental work.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Been supervised using the gas.
- Completed the Moodle Course "Laboratory Safety in Chemical Engineering".
- Completed "Using Liquid Nitrogen Safely within Universities" and "'Safe Decanting of Liquid Nitrogen"

Hazard 7. Toxic materials

Work with materials that cause harm if they enter the body through, absorption, ingestion, inhalation or injection and include, lead, isocyanates or carbon monoxide gas.

Temporary loss of consciousness, damage to organs, death.

Existing Control Measures

In addition to the control measures for Hazardous Chemicals:

Spills must not be swept up. To avoid dispersion in air, they should be wet cleaned. Gloves used with spills must be changed using an appropriate glove changing technique to ensure there is no contact to the body.

Highly toxic compounds should be kept in a locked cabinet, and an inventory kept of their use. No face or body touching while wearing gloves. Hands must be washed after work has been completed.

No touching of communal areas (e.g. door handles) while wearing gloves.

Research workers wishing to use known or suspected carcinogenic materials must consult the DSO.

Appropriate PPE must be worn according to manufacturer's MSDS.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Completed the Moodle Course "Laboratory Safety in Chemical Engineering".

Hazard 8. Flammable / Highly Flammable / Oxidising Agents

Working with material that ignites easily and burns rapidly with a flame, or a material with flash point below an arbitrary temperature limit of 50°C. This includes material that are marked as oxidisers as this will increase the risk from other flammable or highly flammable material.

Burns, explosions, death.

Existing Control Measures

Exchange flammable chemicals and materials with non- or less flammable ones.

No source of ignition used around flammable materials.

Work must be performed under and over the lower explosion limit (LEL).

Flashback arrestors must be installed after the regulator if there is any possibility of reverse flow of oxidising gas up the flammable gas line.

Appropriate fire extinguishers must be present nearby the work to take place.

Users should know where the correct fire extinguishers are located for their work.

All fire doors and windows must be closed prior to starting work with flammable materials.

Do not store more than 50 L in one lab. If more, a risk assessment may be required.

Store flammables in fire-rated cabinets.

Store flammables and oxidising agents separately.

Any bottles containing over 500ml of flammable liquid must be put away after use and not left out on the bench.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Completed the Moodle Course "Laboratory Safety in Chemical Engineering".
- Completed the UCL Course "UCL Fire Safety".

Risk Level

With Existing Controls:

Risk Level **C - Medium / Moderate**

4. Radiation

Description of Activity:

This section of the risk assessment concerns the radiation hazards that are present in the department.

For all radiation hazards consideration must be given to:

- Can the hazard be eliminated? e.g. does the work need to take place.
- Can the hazard be substituted for a safer option? e.g. using a lower class laser.

- Can engineering controls be used to isolate the hazard? e.g. using interlocked equipment.
- Can administrative controls be used to control the hazard? e.g. using safe systems of work / procedures.
- Can workers be protected from the hazard using PPE? e.g. dose badges for radiation monitoring.

- Are there correct warning signs (e.g. Laser / X-ray) in the room?
- Laboratories hazards must be clearly listed on the door.
- Have the local rules been signed?
- Are there correct first aid and spill kits present / nearby?
- Are the waste procedures for the material identified?
- Are the materials stored correctly (away from incompatible materials)?

Hazard 1. Ionising Radiation Unsealed Source

Work with a source material which is not encapsulated or otherwise contained, that carries enough energy to knock electrons from atoms or molecules thereby ionizing them. This includes work with nuclear material.

Burns, sickness, increased risk of cancer.

Existing Control Measures

The departmental Radiation Protection Supervisors must be consulted before any radioactive material is either brought into the department or taken out.

Work only on depleted sources.

Users to reduce work time with materials to essential only. When materials are not in use, distance kept and shielding applied if required.

Chemicals stored in at floor level in a locked chemical cabinet.

Access to lab and chemicals restricted to authorised users only. Users only allowed access when they have been proven competent by their PI.

After work, meters used to assess if material has been left behind. Meters used outside cabinet to ensure no significant leakage.

PTFE sheets and absorbent pads used to avoid contaminating surfaces.

Correct waste and spillage procedures followed.

Use of material recorded.

Written local rules outlining the work procedures required for all radiological operations should be available to workers and signed by them to indicate that they have read them.

In the event of any accident involving radioactive materials, the RPS must be informed immediately.

All sources not in use for long periods should be properly disposed of with the advice of the College Radiation Protection Officer. The RPS/deputy RPS should be notified.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Been trained on using the materials.
- Been supervised using the materials.
- Completed the Moodle course "Laboratory Safety in Chemical Engineering".
- Completed the UCL course "Principles of radiation safety training"
- Completed the UCL course "Safe handling of unsealed radioactive sources training"

Hazard 2. X-rays

Work that involves specific ionising radiation - for example any equipment that uses X-rays.

Increased risk of cancer, nausea, vomiting, internal bleeding, skin burns.

Existing Control Measures

The departmental Radiation Protection Supervisors must be consulted before any X-ray instruments are either brought into the department or taken out.

All x-ray instruments must have interlocks that shut off x-ray generation when open. The x-ray source is only active inside the sealed enclosure of the instrument and cannot escape. The x-ray instruments are serviced regularly by the manufacturers, defined per instrument. Workers are fitted with dosimetry badges that record the amount of exposure. Occupational exposure must not exceed 20 mSv per year. Young persons, pregnant persons, and new mothers are not permitted to work in the X-ray room.

Long periods of work should not take place next to the instruments. It must be completed elsewhere. If employees are exposed to radiation, they must be referred to Occupation Health for health surveillance.

Departmental contamination surveys to test leakage.

Written local rules outlining the work procedures required for all radiological operations should be available to workers and signed by them to indicate that they have read them.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Been trained on the instruments.
- Been supervised using the instruments.
- Completed the Moodle course "Laboratory Safety in Chemical Engineering".
- Completed the UCL course "Basic x-ray physics"
- Completed the UCL course "Safe use of x-rays training"
- If managing equipment, completed the UCL course "Management of X-rays training"

Hazard 3. Optical

Work involving specific non-ionising radiation in particular work involving lasers (Class 3 or Class 4) and other equipment producing ultraviolet radiation (UV-R).

Burns, injury to eye and skin.

Existing Control Measures

Lasers

Specific laser risk assessments created before starting work with any laser using the appropriate template issued by the UCL Laser Safety Officer. Lasers operated at lowest power for experiment.

Interlocks used where appropriate. Beam enclosed as much as possible for the experiment.

Alignment to take place with laser off. All items must be fixed to the bench, to avoid accidental movement. The optical bench must be clear of clutter to prevent stray reflections. Lasers must not be operated at head height. Users must remove jewellery or reflective items such as watches/bracelets.

Curtains must be used to reduce the risk of other lab users being exposed to the beam.

Users must not part of their body within the beam path. Cards may be used for tracking. Keys to laser sources will be kept separate from the lasers themselves to prevent unauthorised use. Signs are posted on each laboratory where a laser system is present. Light up signs must be used to indicate the laser is on.

Modifications or repairing equipment not be completed by user. Contact Electronics Technician if required.

Safety glasses for the laser worn (to CE or BS standard).

Users will be deemed competent when they have:

- Been given a local lab induction.
- Been trained on the instruments.
- Been supervised using the instruments.
- Completed the Moodle course "Laboratory Safety in Chemical Engineering".
- If using Class III or above laser, completed the UCL course "Laser Safety Awareness training"

UV

Light enclosed as much as possible for the experiment using screens, interlocks, etc. where appropriate.

Instrument manufacturers must be contacted to determine amount and wavelength of UV emitted. If limit of 30 J / m² is exceeded, health surveillance is required.

UV sources emitting around 185nm will produce ozone from oxygen in the atmosphere so either need to be connected to an extraction system or have the beam path flooded with an inert gas.

Access limited. Warning signs installed next to instrument.

Exposure reduced using distance and time.

Check if instrument is in good working order before use.

Modifications or repairing equipment not be completed by user. Contact Electronics Technician if required.

Safety glasses or shields rated for the UV worn (to CE, UKCA, or BS standard).

Exposed skin covered up.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Been trained on the instruments.
- Been supervised using the instruments.
- Completed the Moodle course "Laboratory Safety in Chemical Engineering".

Hazard 4. Thermal

Work that uses non-ionising radiation usually involving equipment using infra - red radiation that has a thermal effect that can cause burns to skin. Found in artificial heating devices or "hot work" such as working with molten metals.

Burns

Existing Control Measures

Substitute for safer alternatives, e.g. hot plates where possible.
Use the lowest temperatures required.

Guard the hot surface to limit contact.
Apply signs to warn others of the potential danger.
Be mindful of where the radiation is directed and control the direction of the radiation where required.

Remove flammable materials from the work area.
Leave hot surfaces / materials to cool before handling.

Use appropriate PPE at all times when handling hot equipment / material, e.g. thermal gloves.
Inspect the PPE before use for any damage / faults.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Been trained on the instruments.
- Completed the Moodle course "Laboratory Safety in Chemical Engineering".

Hazard 5. Magnetic Fields

Work involving non-ionising equipment that produces a large static magnetic field, Common examples are Magnetic Resonance Imaging (MRI) and Superconductors

Nausea and vomiting.

Existing Control Measures

Equipment interlocks must not be interfered with.
Damaged equipment removed from use and quarantined by TSO.
Manufactured instruments must not be altered or repaired in any way, unless at the explicit instruction of the manufacturer. In these cases work may only be performed by the manufacturer or the Electronics Technician.

Equipment checked regularly for damage, corrosion, or deterioration.
There must be clear signage when high fields are being used (e.g. in excess of 1 T).
To ensure the Exposure Limit Values (ELVs) are not exceeded, these must be measured with a Gauss meter, with safe distances indicated.
Access to magnetic devices restricted to those who actively work on them.

All visitors are informed of presence of magnetic devices before entering the lab.
Those with susceptible medical devices (e.g. pace-maker) must not work in rooms with significant magnetic radiation.

Magnetic jewellery must not be worn when working with magnetic fields.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Been trained on the instruments.
- Completed the Moodle course "Laboratory Safety in Chemical Engineering".

Hazard 6. Microwave

Working with equipment that use non-ionising radiation with wavelengths ranging from about one meter to one millimetre; with frequencies between 300 MHz (1 m) and 300 GHz (1 mm) that is focused or contained

Burns, headaches, nausea, vomiting, interference with medical devices.

Existing Control Measures

Equipment interlocks must not be interfered with.
 Damaged equipment removed from use and quarantined by TSO.
 Manufactured instruments must not be altered or repaired in any way, unless at the explicit instruction of the manufacturer. In these cases work may only be performed by the manufacturer or the Electronics Technician.

Equipment checked regularly for damage, corrosion, or deterioration.
 The power used must be proportional to the material volume and targeted temperature. Proposed maximum microwave power is 100W.
 Microwave applicator should not be placed close to any electrical device susceptible to electromagnetic interference (EMI).
 If EMI leakage is suspected it should be reported and EMI leakage measurements should be performed (EMI legal limit: 5 mW/cm²).

Metal containers must not be used in microwave ovens and caps or covers should be loose fitting to prevent explosions.
 Laboratory microwave ovens must not be used for warming food.

The device must not be used by anyone who is at particular risk, e.g. those with active implanted medical devices and passive implanted medical devices, pregnant people, and young persons.

Users will be deemed competent when they have:

- Been given a local lab induction.
- Been trained on the instruments.
- Completed the Moodle course "Laboratory Safety in Chemical Engineering".

Risk Level

With Existing Controls:

Risk
Level

**C -
Medium /
Moderate**

5. Organisational

Description of

This section of the risk assessment concerns the organisation hazards that are present in the department.

Activity:

For all organisation hazards consideration must be given to:

- Can the hazard be eliminated? e.g. performing the work during normal working hours.
 - Can the hazard be substituted for a safer option? e.g. having lab buddies.
 - Can engineering controls be used to isolate the hazard?
 - Can administrative controls be used to control the hazard? e.g. using safe systems of work / procedures.
 - Can workers be protected from the hazard using PPE?
-
- Are there correct fire extinguishers (e.g. metal extinguisher) nearby?
 - Are there correct first aid arrangements identified?

Hazard 1. Lone Working

When work will require a UCL employee to work either on or off UCL controlled sites, is a situation where they could not call for help or another UCL employee would not encounter them for over 15 minutes.

Not able to contact others in an accident, emergency, sudden illness, or violence.

Existing Control Measures

All high hazard activities require supervision until the person is deemed competent.

No lone working at any time on very high hazard activities such as:

- using toxic or flammable gases
- using certain dangerous chemicals e.g. toxic / flammable gases, harmful volatile and fine powder chemicals, large quantities of harmful chemicals, hydrofluoric acid (HF).
- moving heavy machinery or machine parts which could cause crushing and trapping.

Lone office working permitted outside of regular office hours.

Lone lab working permitted during extended working hours with submitted "Laboratory Working Out of Hours Permission Form" complete with designated 'lab-buddy'.

Head of Department approval for lone working outside of extended hour and normal working hours.

Periodic checks by manager or supervisor via email or other communication.

Risk assessments to be updated if used in lone working activities.

Users will be deemed competent when they have:

- Completed all mandatory training.
- Been deemed competent by their manager / supervisor.

Hazard 2. Unsocial hours

Work that regularly requires work after 21:00 before 06:00 or shift work. This may include lone working.

Likely no first aid or fire marshals available, not able to contact others in an accident, emergency, or sudden illness, increased risk of violence.

Existing Control Measures

No work outside the extended working hours without the express permission from the Head of Department.

Normal working hours: 9:00 am to 7:00 pm Monday to Friday.

Extended working hours 7:00 am to 9:00 am and 7:00 pm to 9:00 pm Monday to Friday; 9:00 am to 7:00 pm Weekends. Researchers must sign book at reception if working during these times.

No requirement for working outside of working hours imposed on researchers by supervisors.

Monitoring of CCTV and card access records to ensure working does not regularly happen.

Most Roberts building security staff have first aid training.

The control room is continuously manned.

Full completion of all mandatory training and inductions for working in unsocial hours.

Users will be deemed competent when they have:

- Completed all mandatory training.
- Been deemed competent by their manager / supervisor.

Hazard 3. Off- Site Working

Where work will involve even once working at site that is not controlled by UCL and that person would not be covered by the health and safety duties of the owner of the site (e.g. not including conferences to UK hotels or other UK universities) This may also include lone working.

Unfamiliar work places, increased risk of not knowing emergency protocols.

Existing Control Measures

High hazard work (e.g. laboratory research at UK or aboard institution) requires the researcher / staff member to have permission from manager / PI.

Risk assessments must be completed and approved by manager prior to off-site work.

Researcher / staff member must send itinerary to off-site coordinator (DSO) prior to commencing off-site work. This must include emergency contact details.

Researcher / staff member must abide by UCL and local rules.

Low hazard work (e.g. attending a conference abroad) requires the researcher / staff member to send itinerary to off-site coordinator (DSO) prior to commencing off-site work. This must include emergency contact details.

Researcher / staff member must abide by UCL and local rules.

Consideration of political and economic situation of countries prior to travel according to government website.

Insurance manager consulted before travel.

Users will be deemed competent when they have:

- Been deemed competent by their manager / supervisor.
- Completed all mandatory training.

Hazard 4. Public Engagement

Work that involves one to one interaction with non-UCL people including members of the public in both controlled circumstances (UCL sites) and non-controlled sites such as public places, private homes or organised events.

Violence, unfamiliar working arrangements.

Existing Control Measures

No solo public engagement activities to private homes. These activities must have at least two people present at all times.

Additional risk assessment for activities signed by manager / PI.

DBS checks for those that work regularly with young persons and children.

Public given detailed instructions.

Hazards isolated from the public.

Consideration of emergency procedures.

Consideration on how to move equipment.

Environment to be surveyed before use, particularly if event is outside.

Users will be deemed competent when they have:

- Completed all mandatory training.

- Been deemed competent by their manager / supervisor.

Risk Level

With Existing Controls:

Risk Level **B - Low / Tolerable**



Actions

Reference: RA044624/3

Sign-off Status: Authorised

Actions associated with this Risk Assessment

*** No Actions have been recorded***