



Science and
Technology
Facilities Council

COSHH-Safe Use of Chemicals/Hazardous Substances

STFC Safety Code No 37

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STFC

COSHH-Safe Use of Chemicals/Hazardous Substances

1. Purpose

The work of the STFC involves the manufacture, storage and use of a wide variety of potentially hazardous substances. This includes substances such as cleaning chemicals; dusts; fumes; gases; paints; oils and coatings which are used in office/work environments and by contractors working for the STFC, through to those typically used in chemistry laboratories and research environments including, nano-materials and the unusual and diverse materials brought to STFC facilities by facility users.

The Control of Substances Hazardous to Health (COSHH) Regulations 2002 (as amended), aim to protect users and others from the adverse effects of a wide range of hazardous substances used at work.

This code should be considered alongside the following codes:

- SHE Code 24: Occupational Health Surveillance and Health Screening Medicals
- SHE Code 16: Biological Safety
- SHE Code 29: Management of Ionising Radiation at Work
- SHE Code 31: Disposal of Controlled and Hazardous Wastes
- SHE Code 27: Receipt and Dispatch of Hazardous Materials

2. Scope

This code applies throughout STFC sites where hazardous substances are used or generated as part of a process / activity.

This code addresses the requirement to carry out a COSHH assessment arising from the hazardous properties of a substance which may cause ill health for example through inhalation or harm to your skin.

The COSHH assessment is only part of General Risk Assessment for a process, activity or area which should also consider the other non-chemical hazards such as flammability, radioactivity etc. or the way in which that substance is used for example at non-standard temperatures or pressures. See STFC Safety Code 6 Risk Management.

This code does not address the assessment of biological agents and genetically modified organisms, see SHE Code 16 – Biological Safety. For which the specialist support and advice of the STFC Biological Safety Officer should be sought prior to commencing such work.

Certain chemicals require specific additional precautions for use on site due to having properties that can make their use very hazardous.

Chemicals with specific requirements are: - (please refer to following appendices for information)

Lead (Appendix 5)	Cadmium and its compounds (Appendix 2)
Mercury (Appendix 2)	Hydrofluoric acid (HF) (Appendix 2)
Beryllium (Appendix 2)	Nano-materials (Appendix 2)

This code does not apply to work which involves or may involve exposure to asbestos. See SHE Code 35 Management of Asbestos.

This code does not address the disposal or transport of hazardous waste. See STFC Safety Codes 27 and 31.

3. Definitions

3.1. Substance Hazardous to Health

The COSHH Regulations define a hazardous substance as the intrinsic property of that substance which has the potential to cause harm to the health of a person. The following are defined as substances hazardous to health:

- a) Substances listed in Part 1 of the approved supply list as dangerous for supply within the meaning of the Chemicals (Hazard Information and Packaging for Supply) (CHIP) Regulations and are defined as very toxic, toxic, harmful, corrosive or irritant;
- b) Substances which the Health and Safety Executive have assigned a Work Exposure Limit, see HSE, "Workplace Exposure Limits: Containing the list of workplace exposure limits for use with the Control Of Substances Hazardous to Health Regulations 2002 (as amended), EH40;
- c) A biological agent (See STFC Safety Code 16 – Biological Safety);
- d) Dust of any kind (not cited in (a) or (b) above however). [Minimum airborne dust levels are laid down for the dust to qualify]; and -
- e) any other substance which creates a comparable risk to health to any of the above.

3.2. COSHH Assessor

A suitably qualified and experienced person appointed by a Director to make or approve chemical safety assessments within a Department and to advise as required on the handling, storage, use and disposal of chemicals within a Department.

4. Responsibilities

4.1. Directors shall:

- 4.1.1. Appoint a suitable number of COSHH Assessors considered competent and experienced to carry out the duties defined in this code. For details of competencies and training see Appendix 5. Record their appointment in the SHE Directory, which will generate appointments in writing, and communicate it to staff.
- 4.1.2. Ensure that suitable procedures are in place to make sure that any hazardous substances used on STFC Facilities under their control have been subject to a suitable COSHH assessment.

4.2. Line managers (Group Leaders) shall:

- 4.2.1. Ensure that, prior to purchase of chemicals/hazardous substances, consideration is given to non-hazardous alternatives and to minimising quantities purchased or used and that suitable storage is available for all hazardous substances brought onto STFC sites.
- 4.2.2. Ensure that areas containing substances that are incompatible are suitably isolated (e.g. oxidizing and reducing substances) and stored. All chemicals/hazardous substances must also be correctly and legibly labelled.
- 4.2.3. Where proprietary chemicals are being used in accordance with manufacturers' instructions, the chemical hazard and any control measures may be included in a general risk assessment rather than a separate COSHH Assessment (see Appendix 3).
- 4.2.4. Ensure that COSHH assessments are undertaken or approved by a COSHH Assessor before new work involving hazardous substances commences.
- 4.2.5. Ensure that an inventory of hazardous substances is maintained (see Appendix 4 for a suitable template) and Safety Data Sheets from the supplier are available to those using or exposed to them.
- 4.2.6. Ensure the results of the COSHH assessment are communicated to the persons working with the hazardous substances, ensuring that those persons are trained and competent in their use and understand any controls detailed in the COSHH (and/or general) risk assessments for their work.
- 4.2.7. Ensure that the COSHH assessments are reviewed every two years, or when there is a significant change, for example an update to the safety data sheet, following the results of workplace monitoring or when there is reason to suspect that the assessment is no longer valid.
- 4.2.8. Where workplace monitoring of individuals exposed to hazardous substances is identified as being required, contact the SHE Group who will provide advice on the monitoring to be undertaken.
- 4.2.9. Ensure that, where any Local Exhaust Ventilation (LEV), fume cupboards, or any other form of atmospheric containment is indicated as a control

measure, including any new installations, they are registered with the SHE Group for statutory inspection purposes and are designed to the relevant British Standard^{1,2} prior to use.

- 4.2.10.** Ensure that all equipment used to control hazardous substances, LEV or gaseous monitoring system in their area of responsibility are regularly maintained, tested and as appropriate calibrated, and the records of such actions retained. For example glove boxes, LEV systems, extraction hoods, fume cupboards, oxygen depletion monitoring systems or toxic gas monitoring systems.
- 4.2.11.** Ensure that any requirement for health surveillance highlighted by the COSHH assessment is reported to the Occupational Health Department, see SHE Code 24: Occupational Health Screening and Health Screening Medicals and those individuals identified undertake health surveillance
- 4.2.12.** As appropriate, ensure that specialist first aid medical facilities are available to those using hazardous chemicals, and that staff are trained and competent to use them, and that they are regularly maintained. For example users of Hydrofluoric acid (HF) should only start work once they are in possession of a HF antidote gel (Calcium Gluconate) (see Appendix 2(D) for more information).
- 4.2.13.** Ensure that substances which would require a license (see Appendix 1) or are potentially explosive, at the temperatures and pressures under which they are likely to be used, are not procured or brought onto STFC sites, without first consulting the Site SHE Advisor.

4.3. COSHH Assessors shall:

- 4.3.1.** Carry out or approve COSHH assessments or approve COSHH hazards and controls in general risk assessments, see appendix 3, consulting with other persons as needed. The assessment shall include consideration of:
 - the hazardous property of the substance(s) being used (see hazard label(s));
 - information on the health effects (see safety data sheet);
 - the level, type and duration of exposure to those affected;
 - work, including the amount of substance involved;
 - the usual hierarchy of control measures (elimination, reduction, isolation, controls, PPE, discipline/supervision);
 - activities, such as maintenance where there is the potential for a high level of exposure;
 - any relevant occupational exposure limit;
 - the effect of control measures;
 - the results of health surveillance;

¹ BS EN 14175 for Fume Cupboards (or BS 7989 for re-circulating fume cupboards)

² See HSG 258 for general guidance on LEV from the HSE

- results of workplace monitoring;
- where relevant, the effects of exposure to combination of substances or the products of chemical reactions; and;
- any additional information required for the assessment such as disposal or spill procedures.

4.3.2. Ensure that, where a substance has a Work Exposure Limit³ (WEL), suitable controls and workplace monitoring are specified to ensure that any WEL cannot be exceeded.

4.3.3. Ensure that any license or registration requirements (see Appendix 1) are highlighted in the assessment.

4.3.4. Provide a copy of the assessment to the responsible line manager (group leader).

4.4. SHE Group shall:

4.4.1. Ensure that where requested, monitoring of exposure to hazardous substances is carried out by a competent person.

4.4.2. Provide advice and support, where required, for the assessment of substances hazardous to health.

4.4.3. Assess the suitability of COSHH assessments in the wider site context where unstable or energetic materials are to be introduced.

4.4.4. Ensure that an up to date register of Local Exhaust Ventilation installations is kept and that the required statutory inspections are carried out. At some STFC sites this responsibility may be undertaken by other groups.

4.5. Occupational Health Departments shall:

4.5.1. Carry out and maintain health surveillance records where they are requested by line managers as a result of a COSHH assessment, see SHE Code 24 – Occupational Health Surveillance and Health Screening Medicals.

4.6. Staff and others using hazardous substances shall:

4.6.1. Not purchase any hazardous substance without ensuring that suitable storage will be available for the material when it arrives on site both in Logistics and in the area where it is to be used.

4.6.2. Co-operate with COSHH Assessors in completing any COSHH assessment **prior to the first use** of any hazardous substance.

4.6.3. Ensure they understand the requirement for and adhere to any control measures required by COSHH assessments (or where relevant the safety data sheet) and report any equipment failures, incidents or spillages

³ See HSE document EH40/2005

promptly to their Line Manager and to SHE Group following STFC SHE Code 5, Incident Reporting and Investigation.

4.7. STFC Facility Users shall:

- 4.7.1. Follow any COSHH / risk assessment procedures established by STFC when planning to undertake an experiment on any STFC User Facility.
- 4.7.2. Provide relevant information for COSHH assessment as required by the STFC Facility procedure. Where materials require a license (see Appendix 1), it is usual for the visiting institution to extend their license to cover the STFC site they are visiting.

4.8. Contract Supervising Officers shall:

- 4.8.1. Where contractors bring chemicals/hazardous substances onto STFC sites, ensure that specific COSHH assessments have been provided by the contractors and are adhered to, as part of an overall risk assessment of their activities.
- 4.8.2. Ensure that their method statements detail how such materials will be managed, handled and disposed of and that they are adhered to.

5. References

- 5.1. L5, Control of Substances Hazardous to Health, Approved Code of Practice and guidance, HSE
- 5.2. COSHH Essentials
- 5.3. EH40/2005, Workplace Exposure Limits, HSE
- 5.4. Chemicals (Hazard Information and Packaging for Supply) Regulations 2009

Appendix 1. General Principles for Work with Hazardous Substances

Schedule 2A of the COSHH Approved Code of Practice (L5) contains relevant information on the current best practice for control of exposure to hazardous substances.

When handling any hazardous material, it is important to consider factors other than exposure to the materials as part of a general risk assessment. For example, consideration should be given to safely setting up apparatus and storage and labelling of chemicals. These should be assessed as required by SHE Code 6 – Risk Management.

Carcinogens⁴

Prevention of exposure to carcinogenic substances **must** be the first objective in view of the serious and often irreversible nature of the disease. Appendix 1 of the COSHH ACoP gives guidance on the control of carcinogenic and mutagenic substances. In addition Schedule 1 of the ACoP lists additional substances which should be treated as if they are carcinogenic.

Poisons

Special care and training will be required when dangerous poisons are to be used. Dangerous poisons are defined as those substances contained in the Poisons List Order and Schedule I of the Packaging and Labelling of Dangerous Substances Regulations (there is a specific legal requirement to keep such poisons locked up), and also those substances prohibited or controlled by the Carcinogenic Substances Regulations.

Licensed Chemicals

STFC would require a license to purchase and hold certain chemicals. Staff should contact their site Safety Group **prior to purchase** of any chemicals which fall in the following three categories.

STFC staff wishing to purchase substances in categories 2 or 3 also need to follow the Shared Services Controlled Substances procedure.

1. Duty Free Alcohol

DL and RAL have licenses to purchase limited quantities of 'industrial denatured alcohol' (IDA) and absolute ethanol free of excise duty for research purposes.

2. Drug Precursors

⁴ Carcinogen has the meaning given in COSHH Regulation 2.

STFC is required to obtain a licence before it can purchase or hold category 1 drug precursors and is required to register its holdings of category 2 substances.

3. Chemical Weapons and Precursors

STFC sites may purchase and hold up to 5g of any Chemical Weapons Convention (CWC) schedule 1 substance for research purposes but must register and keep records of quantities and location. Any requirement over 5g would necessitate an individual site license.

STFC should keep records of the purchase of CWC schedule 2 and 3 substances but is unlikely to fall under the reporting requirements.

Where any of these substances are brought onto STFC sites by facility users it is usual for the visiting institution to obtain an extension to their own license to cover the additional work on the STFC site

REACH

REACH (Registration, Evaluation, Authorisation and restriction of Chemicals) is a piece of European legislation which mainly affects producers and importers of large quantities of chemicals. However there are also important issues for 'end users'.

Safety Data Sheets

New revisions of safety data sheets should contain additional information relating to the specified use for which the chemical was purchased:

Section 1 – this should now contain a subsection which identifies the use for which the substance was purchased '**Recommended Use**' and any '**Uses advised against**'.

Section 16 – this should now contain information on recommended control measures related to the 'Recommended Use' in section 1.

Authorisation

As part of the registration process under REACH, substances may be categorised as 'Substances of Very High Concern' (SVHC) where they have intrinsic properties set out in REACH's Article 57. Authorisation to use an SHVC is required from the European Chemicals Agency (ECHA) unless used in quantities of less than 1 tonne per annum **and** it is used for pure research and development. The R&D exemption is strict, in that the substance must be central to the project. For instance, the use of trichloroethylene in a degreasing plant to clean items used in a research project would not qualify the use of trike for exemption.

There are currently 22 substances on the SVHC 'authorisation' list and 151 on a 'candidate' list of substances which could be added to the authorisation list. Both lists are updated twice a year.

Substances on the 'authorisation' list have a 'sunset date' beyond which it would be illegal to use the substance unless an exemption exists or an authorisation has been granted.

Substances harmful to the environment

Although not requiring a license, staff purchasing substances on UK Environmental Red List should have stringent control measures in place for their use to prevent escape into the wider environment. They should **never** be disposed of down a foul drain.

Disposal Arrangements

When it is necessary to dispose of surplus or contaminated chemicals or contaminated apparatus, clothing or rags etc, advice must be obtained from your Departmental Waste Disposal Officer (WDO), see STFC SHE Code 31 Disposal of Controlled and Hazardous Waste and the SHE Directory.

Appendix 2. Chemicals with specific requirements

Work on STFC sites using any of the following specified chemicals requires additional care and controls:-

- A. Working with Lead
- B. Working with Beryllium
- C. Work with Mercury
- D. Work with Hydrofluoric acid (HF)
- E. Work with Nano-materials
- F. Work with Cadmium and its compounds

A. Work with Lead

See Appendix 5 of this document.

B. Work with Beryllium

Beryllium (Be) is used routinely in the STFC, for example as a low scattering vacuum window in X-ray applications.

A concise information leaflet is available from the HSE, "Beryllium and You" (INDG 311).

NO FABRICATION PROCESS other than simple shearing of Beryllium metal foil should be attempted on STFC sites.

There is considered to be no significant risk in ordinary skin contact with Beryllium metal and its alloys provided there is no risk of breaking the skin surfaces during the handling operation, hands should be washed immediately after handling. To avoid the possibility of Beryllium contaminating a flesh wound during assembly operations (in some cases such wounds do not heal easily), gloves should be worn. Fine shards and dust caused by the breaking of a Beryllium window should be removed using a vacuum cleaner fitted with a suitable filter, after consultation with the SHE Group.

C. Work with Mercury

Introduction

Mercury (Hg) metal and its compounds have a high level of toxicity and are a hazard to health. They can enter the body by absorption through the skin as well as by ingestion or inhalation. The vapour pressure of mercury is such that small amounts exposed to the atmosphere at ambient temperature can produce significant quantities of toxic vapour.

The recommended maximum allowable concentration per cubic metre of air is as follows:-

	Long-term exposure limit (8-hour TWA) mg/m ³	Short-term exposure limit (15 minutes) mg/m ³
Alkyl compounds	0.01	0.03
All other forms	0.05	0.15

Precautions

Care must be taken to minimise the exposure of mercury metal to the atmosphere and working situations must be well ventilated. The ambient temperature must be maintained as low as possible to limit vaporisation.

Accumulation of small droplets of mercury in cracks and other inaccessible places is a continuing source of hazard. Such accumulations must be completely removed particularly where any form of heating, vibration, or agitation may occur. As removal is difficult it is important to avoid spills and provision should be made to prevent scattering of any spilt mercury. Mercury metal and its compounds or contaminated apparatus must not be handled without gloves and protective equipment: strict attention must be paid to washing the hands when work is finished. Persons with any form of broken skin must not come in contact with mercury. Smoking, drinking and eating are prohibited in any situation where mercury is present.

Apparatus containing mercury must be labelled to indicate the quantity involved and instructions in event of a spill. Individual thermometers need not be labelled but it is advisable that pockets for mercury thermometers be labelled as an accumulation could occur from breakages.

Special facilities must be provided where work involving mercury is carried out for long periods and/or where mercury or mercury contamination is exposed to the atmosphere. These special facilities may include rooms with special floors, walls and ventilation; workbenches with special catchment trays filled with water; segregated and marked tools ; clothing and footwear changing rooms ; laundering and washing instructions; permanent monitoring and medical supervision, see STFC Code 24: Occupational Health Screening and Health Surveillance Medicals. Documented operating instructions governing such requirements are strongly advised.

Mercury must be stored in a well ventilated and cool place, sheltered as far as possible from all fire hazards. Containers suitable for the purpose, taking account of the high density of mercury, must be kept closed and clearly marked to be easily recognisable. Attention is drawn to the fact that mercury will attack most metals, and this should be taken into account when selecting container materials.

Apparatus containing mercury or any process using mercury should be reviewed periodically by a responsible officer to see whether safety can be improved. In some cases consideration can be given to substitution by a safer material; for example mercury which for the foregoing reasons should not be used as a heat transfer medium in a bronze thermometer pocket, may be replaced by oil.

Disposal Arrangements

When it is necessary to dispose of surplus or contaminated mercury or mercury contaminated apparatus, clothing or rags etc, advice must be obtained from your

Departmental Waste Disposal Officer (WDO), see STFC SHE Code 31 Disposal of Controlled and Hazardous Waste and the SHE Directory.

Special arrangements exist for the disposal of mercury batteries; these must be packed so that the terminals cannot short circuit and the package labelled “Mercury batteries for disposal” with name and telephone number of the originator must be included. These should be similarly routed through your Departmental Waste Disposal Officer, see the SHE Directory.

Spills

It is the user’s responsibility to ensure that the method and facilities for the decontamination and cleaning up of spills are detailed and available.

In the case of a spillage where local facilities do not exist or is outside the scope of the arrangements, assistance and advice can be obtained from the SHE Group.

Personnel must be withdrawn from the vicinity without delay and the area cordoned off. Maximum ventilation must be given and all forms of heating and hot surfaces should, if possible, be turned off. Persons known to be contaminated or who may be so must be segregated and kept in one location until instructions are received through the SHE Group.

D. Work with Hydrofluoric acid (HF)

Hydrofluoric acid exposures are different from other acid exposures because:

- HF penetrates all tissue it comes in contact with (it does not simply stay on the surface and rapidly penetrates the protective oily barrier of the skin)
- Unlike most other acids, in HF the major toxicity is due to the F⁻ ions, which are able to freely migrate through the body, creating various compounds that can cause systemic effects
- Unlike other acids, which are easily washed off or neutralised, the effects of HF can last for several days if left untreated
- Necrosis of deeper tissues is unique to HF because the acid is highly lipophilic and readily penetrates deep into tissue. This is an often delayed reaction and causes a severe ‘pain out of proportion’ to physical examination findings.

When users at STFC want to work with Hydrofluoric acid they must first ensure they are thoroughly prepared and that they have completed all of the following:

1. Performed a full written Risk Assessment for the task to be undertaken, including a written COSHH Risk Assessment. The COSHH assessment must address the hierarchy of control and consider substituting HF for a safer alternative.
2. Attended HF Awareness course (1/2 day course), which covers:
 - Nature of Hydrofluoric acid
 - Delayed action on the body of fluoride ions
 - Hypocalcaemia and possible cardiac arrest

- Recognising HF burns
 - Treatment of HF burns via all routes of exposure:
 - a) Skin contact (including a practical demonstration of how to apply the HF antidote, Calcium Gluconate gel)
 - b) Eye exposure
 - c) Inhalation
 - d) Ingestion
 - e) Transfer to hospital
3. Have obtained tubes of Calcium Gluconate gel, with sufficient supplies to be able to take one home after experiments (and to inform others at home address how to use in case of delayed onset reaction)
 4. Be fully conversant with spill control procedures
 5. Have read and followed specific instructions contained with STFC Safety Code SC36, Management and Provision of First Aid (Appendix 9)
 6. Have PPE appropriate for the task to be performed – the PPE must be specified in the COSHH assessment
 7. Have ensured a second person can accompany users for full duration of HF usage.

In line with the above requirements it is highly recommended that individuals wanting to work with HF ensure the following elements are included in the task work procedure:

1. Review of the documented risk assessment for the task using HF
2. Consider how to minimise the quantity of HF required
3. Consider if it is possible to use a more dilute concentration of HF
4. Ensure ready access to a suitable amount of Calcium Gluconate gel (HF Antidote), with sufficient provision for home use
5. Have printed out copies of risk assessment, safety data sheet and emergency procedures (personal exposures and spills). The emergency procedures could usefully be summarised on a 'flash card' which is kept adjacent to the activity.
6. Put up signage to inform other users of the area that HF will be used
7. Make a list of required equipment, ensuring all equipment is ready before starting the activity
8. Put on appropriate PPE for the task, for both the user and accompanying user
9. Perform the task inside a fume hood where ever possible
10. Work on a tray, such that any potential spill can be contained, and ensure a spill kit is at hand
11. Minimise the amount of time during the procedure where exposure to HF can occur
12. Clean area and apparatus up as soon as possible following completion of the task

Personal Protective Equipment:

Eyes

Use chemical resistant goggles when handling concentrated HF, and use in a fume hood. At any concentration chemical splash goggles should be the minimum eye protection because of the ability of HF to cause blindness.

Skin

Laboratory coats must also be worn. If working with larger volumes of concentrated HF an acid-resistant apron e.g. natural rubber or neoprene should also be worn.

Nitrile or butyl gloves are typically worn when working with HF, but a manufacturer's glove selection guide should be consulted when selecting a glove for HF.

Gloves must be checked for leaks prior to use. Double gloving with a second pair of nitrile gloves can protect against leaks.

If gloves become contaminated with HF, they must be removed immediately, hands washed, and hands checked for any sign of contamination.

Storage of HF:

Store all solutions of HF in properly labelled, chemically compatible containers (e.g. polyethylene, polypropylene, or Teflon, and store separately from metals, concrete, glass, strong bases, sodium hydroxide, potassium hydroxide, and ceramics.

Never store in metal or glass container (or other silicon containing bottle).

Periodically check the condition of the container (plastic containers become brittle over time). Store HF containers in a secondary container, such as a tray, in a well-ventilated cabinet, separate from incompatible chemicals such as bases, metals and organic compounds.

Spills procedures:

All spills of HF solution presents a hazard so precautions must be taken to contain potential spills as far as possible. Small spills can be cleaned, with proper precautions, by the user. When using HF solutions spill kits should be readily available.

Sodium carbonate (soda, ash), sodium bicarbonate, lime, or a spill absorbent material (specified for use with HF by the manufacturer) should be used for cleaning spills.

Spill kits that contain cat litter or sand must not be used as HF reacts with silica to produce silicon tetrafluoride, a toxic gas.

E. Work with Nano-materials

Potential safety, health or environmental hazards associated with nano-scale materials is currently an area of active research, however recent results do indicate that certain forms of carbon nano-tubes do present health hazards.

HSE in collaboration with various universities have produced the document "Working Safely with Nanomaterials". The guidance in this document should be followed.

Additional information is also available from the HSE website

SHE Group should be informed of any work involving nano-materials prior to first use.

F. Work with Cadmium and its compounds

Hazards from Cadmium and its compounds are well known and the HSE document "[Cadmium and you](#)" provides a useful summary. However specific attention should be paid where cadmium or cadmium compounds are heated in vacuum, where there is a considerable risk of sublimation causing contamination throughout any vacuum system.

Appendix 3. COSHH Risk Assessment

Fundamental to the safe use of hazardous substances is to ensure that **PRIOR TO USE** the hazardous or potentially hazardous properties of all substances to be used have been considered and the risk likely to be created in using them evaluated. Appropriate control measures must then be implemented to reduce the level of risk so as to ensure that the Work Exposure Limit cannot be exceeded.

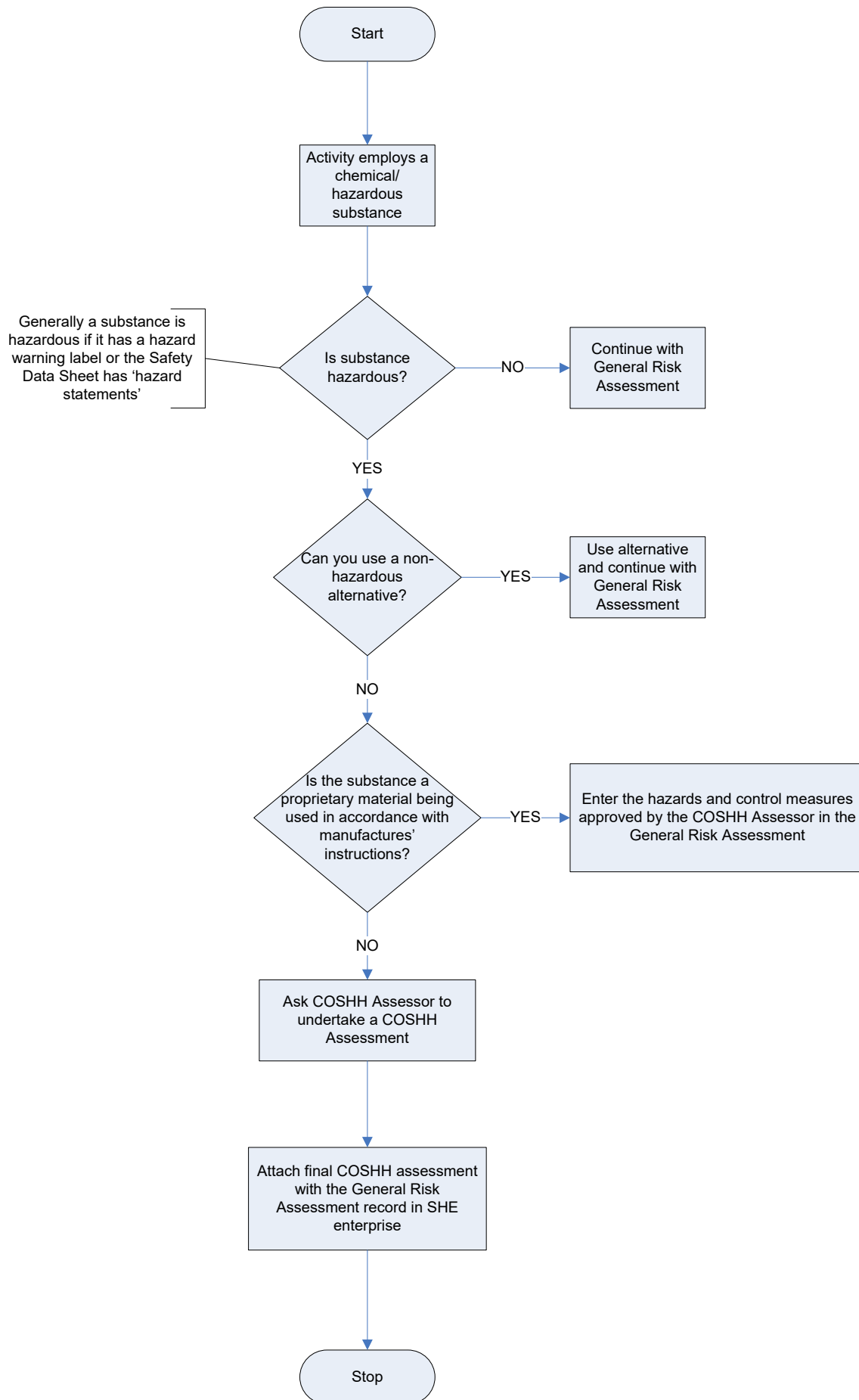
This code provides a flexible framework for undertaking COSHH risk assessments:-

- Firstly in a general work environment where a proprietary chemical is being used in accordance with manufacturer's instructions, the chemical hazard may be included as part of the general activity risk assessment after consultation with the COSHH Assessor,
- Secondly in an environment where one or more chemicals are used. For example a cooling fluid in a workshop, a cleaning solvent in a UHV cleaning area or in a Laboratory environment. In such cases a single COSHH assessment which includes all chemicals used in the process should be carried out by a COSHH Assessor.

Detailed guidance in undertaking COSHH risk assessments using STFC templates can be found in the 'COSHH Risk Assessment Procedure' document.

The flow chart below can be used to determine if a full COSHH Assessment is required or if the hazards/control measures can just be added to the General Risk Assessment.

When completed, COSHH Risk Assessments should be stored as attachments in the 'Activity Risk Assessment' module of Evotix Assure as part of the general risk assessment for the activity.



Appendix 4. Template Chemical List for Laboratories

STFC Chemical Inventory For Area _____						Maintained by _____									
Chemical name	State	CAS No	Container	Store	Date	Supplier	Main Hazards							SDS	
	S/L/G		size (ml)	Loc		& Cat No:	Flammable	Toxic	Corrosive	Irritant	Harmful	Harmful to Environment	Oxidising	Biohazard	Yes/No
Hydrofluoric acid	Liquid	7664-39-3	500	41	6/5/99	Aldrich		√	√				√		Yes
Tri-phenyl methanol	Liquid	76-84-6	500	22	7/20/01	Sigma	√								Yes

Appendix 5. Working with lead

1. INTRODUCTION

There are a number of circumstances where STFC staff may come into contact with lead (Pb) in the course of their work. These mostly relate to:

- areas where solid elemental lead is used as shielding to restrict exposure to ionising radiation, or where used as weatherproofing on buildings
- work on lead or the use of lead-based solder during fabrication
- removal or repair of lead-based paint during building refurbishments
- repairs or modifications to old lead pipework and mechanical or electrical services
- lead in lead-acid batteries
- lead in soil (usually as contamination from former processes or disposals)
- organic lead compounds such as lead alkyls or naphthenate.

Lead, including its compounds, is a substance that has long been known to have the potential to damage health. The Control of Lead at Work Regulations (CLAW) 2002 place a number of duties on employers to:

- (a) protect the health of people at work by preventing or, if not reasonably practicable, by adequately controlling their exposure to lead; and
- (b) monitor the amount of lead that employees absorb so that individuals whose work involves **significant exposure** (as defined by the Regulations) to lead at work can be redeployed before their health is affected.

2. ROUTES OF ENTRY AND SIGNIFICANT EXPOSURES

Exposure may occur where elemental lead, lead alloys or lead compounds enter the body by three principal routes, thereby causing adverse health effects:

- ingestion (e.g. lead powder, dust, paint or paste)
- skin absorption (e.g. lead alkyls or lead naphthenate)
- inhalation (e.g. lead dust, fume or vapour)

If there is a substantial risk of the employee ingesting it; **or** if there is a high risk of skin contact with lead alkyls or substances containing lead which can be absorbed through the skin, exposure may be **significant**.

Exposure to lead via the inhalation route is also considered to be **significant** if exposure exceeds half the occupational exposure limit (OEL) for lead in the atmosphere to which any employee is exposed. This means:

- (a) a concentration of 0.15 mg/m³ of lead (other than lead alkyls);
- (b) a concentration of 0.10 mg/m³ of lead contained in lead alkyls.

The OELs for lead have been established by atmospheric monitoring over an 8-hour time-weighted average (TWA) reference period, which reflects a standard 8-hour shift. (Shorter

sampling periods are possible and the results can be extrapolated, provided the sampling period is representative of a normal working exposure.)

However, there is no direct relationship between the amount of lead the body absorbs and the concentration of lead in the atmosphere and employees whose exposure is assessed as being significant, must be placed under medical surveillance. Regular biological monitoring of the level of the lead in their blood or urine (for work with lead alkyls) can detect any absorption of lead before clinical effects become evident. Biological monitoring helps employers evaluate the effectiveness of their control measures in keeping lead in blood or urine levels at acceptable concentrations.

Lead Exposure Action Values		
	Blood lead concentrations	Urinary lead concentrations
General employees	35 µg/dl or greater	40 µg Pb/g creatinine or greater
Women of reproductive capacity	20 µg/dl or greater	25 µg Pb/g creatinine or greater

3. WORK WITH LEAD AT STFC

The Approved Code of Practice (ACoP) for work with lead (L132) has a simple flow chart which can help with assessing requirements under the CLAW Regulations. It also lists the types of activity with lead which may present a risk of **significant exposure**, and where the detailed requirements of CLAW must be applied.

A copy of the ACoP can be downloaded free from:

<https://www.hse.gov.uk/pubns/books/l132.htm>

However, the general activities involving the use of lead at STFC, as described in **section 1**, above, are unlikely to result in significant exposures, providing sensible precautions and good hygiene practices are followed.

The principles of exposure control applied to hazardous substance use under the COSHH Regulations will generally also satisfy CLAW for STFC's use of lead.

All work with lead should be assessed using the STFC COSHH assessment template. If the COSHH assessment indicates that the precautions provided in the guidance are likely to be ineffective in controlling exposure to lead, by any potential exposure route, resulting in a potentially **significant exposure** then the SHE Group must be consulted.

4. CONTRACTORS WORKING AT STFC

Where external contractors are employed to work with lead, their risk assessment **must** also include consideration of the potential lead exposure of STFC employees in the vicinity of their activities.

All STFC staff coordinating or managing such contractors (for example Project Managers and Contract Supervising Officers) must review their contractors' risk assessment and method statements (RAMS) to ensure that that these risks are adequately considered, and that all lead-exposure control measures are clearly detailed.

A hierarchical approach to control measures must be applied, with avoidance of the activity being the best strategy. If the work cannot be avoided then the approach should be to restrict the activity to a specified time thereby minimising the number of persons potentially exposed, for example restricting the work with lead to weekends.

5. GUIDANCE

The following guidance is intended to minimise worker exposure to, and environmental contamination from, lead. In this context 'lead work' is any work activity where lead is handled, processed, repaired, maintained, stored or disposed of, and includes:

- Handling or stacking lead bricks
- Disposing of legacy lead
- Machining lead (cutting, shaping, or finishing lead materials using powered tools)
- Welding or torch soldering on lead material (including leaded pipes)
- Using lead-containing solder
- Grinding, sanding, wire brushing, or otherwise abrading lead-containing paint
- The use of heat guns to remove old lead paint
- Vehicle maintenance (including FLT's) and disposal of damaged lead batteries (which also contain other corrosive hazardous substances).

5 (a) Routes of Entry and their Control Measures

The relative contribution of each activity to an individual's potential lead exposure will vary according to the form in which the lead is being used, and the way in which it is being handled or machined.

The principal exposure routes for the activities undertaken at STFC are considered to be by inhalation or ingestion, and much less so via the skin, unless the skin is broken or the lead is carried through the skin's protective oily barrier in organic lead compounds. However, the following control measures for specific activities should address the potential for exposure to lead by all routes.

5 (b) Lead Brick Shielding and Lead Sheeting

Inhalation

1. Newly purchased lead bricks should be doped with Antimony (Sb) at 4% w/w, to harden the lead and lessen surface oxidisation.
2. Lead bricks should be stored in dry conditions, and not kept in the open where they are susceptible to the elements. If stored outside they should be protected from the weather.
3. Lead bricks should ideally be surface coated or painted to prevent further surface oxidisation, as this has the potential to generate dust when blocks are handled.

4. Lead bricks must be handled and placed carefully to avoid surface damage and release of lead particles, and once structures have been built, work areas must be wiped down.
5. If lead bricks remain unpainted then the external surface of the assembled shielding structure should be protected (by use of plastic sheeting or similar) to prevent accidental surface damage or abrasion during routine work, which has the potential to generate dust.
6. Respiratory Protective Equipment (RPE), with **FFP3**⁵ particulate filters, should be worn when assembling or disassembling uncoated lead shielding which is within the worker's **breathing zone**.⁶
7. Respirators must be tight fitting and fit tested.
8. Reusable respirators must be cleaned after use, and stored to prevent contamination (in a plastic zip-lock bag, for example). Reusable respirators must be checked and 'maintained' (a check of the seals, valves and straps, for example) to ensure an effective seal to the user's face and continued user protection.

Disposable respirators must be disposed of at the end of each work period (they are intended to be single use).
9. The machining of lead bricks or lead sheeting using a powered tools such as milling machines, drills, etc, should only be undertaken in designated areas, and precautions taken to wet down to prevent dust / debris generation.
10. Machine tools and bits should be cleaned with dampened disposable paper towels after use.
11. Lubricants and cutting oils used for machining lead should be changed frequently and disposed of as lead-containing waste.
12. Lead and lead-contaminated dust must be cleaned up carefully, by wet wiping only, to avoid raising dust.
13. All surfaces and bench tops must be kept as free as practicable from any accumulation of lead dust or debris.
14. Domestic vacuum cleaners may not be used.
15. Compressed air lines may not be used to clean dust laden surfaces.
16. Only the following cleaning methods are allowed:
 - a. Vacuum cleaners must be equipped with a high-efficiency particulate air (HEPA) filters, and labelled '*for lead clean up only*'. When replacing the filter it must be removed carefully without releasing dust and the filter sealed in a plastic bag for disposal as lead-containing waste.

⁵ This is a system of classifying respirators into three levels of protection: FFP1, FFP2 and FFP3. Each Filtering Facepiece (FFP) will be categorised and marked according to the level of protection it provides, FFP1 being the 'least' protective and FFP3 being the 'most'.

⁶ The **breathing zone** is generally defined as the area immediately surrounding the workers' nose and mouth where the majority of air is drawn into the lungs, and is considered to be within a 25cm radius of the nose and mouth (roughly a shoulder's breadth).

- b. Wet wiping surfaces with disposable wet paper towels. Dry sweeping of lead debris is not permitted.
- c. Lead dust on floors may be wet mopped. However, the mop head must be kept separate and labelled '*for lead clean up only*'.

NOTE: Due to the high surface area associated with lead wool and the tendency for significant surface oxidation and potential for dust generation and deposition, its use is strongly discouraged and must be justified in a COSHH assessment.

Absorption through skin

1. When handling lead bricks workers should be double gloved. A pair of disposable gloves should be worn underneath non-absorbent and non-permeable work gloves.
2. Reusable work gloves used for handling lead must be only be used for this purpose and not for any other activity. Leather gloves should be avoided as they are relatively permeable and lead dust can accumulate on them.
3. Once removed these gloves should be placed in a plastic zip-lock bag, or similar, and labelled '*for lead handling only*'. They must be separately packaged from reusable respirators which are used for lead work.
4. Disposable gloves should be changed regularly, and when damaged, and at the end of each handling period they must be disposed of promptly and not left lying around.
5. Coveralls, if worn during lengthy periods of handling, should be of the disposable type to avoid contaminating washing machines or other clothing, and disposed of at the end of each work period.

Ingestion

1. Wash hands, and face, immediately after working with lead, or disposing of lead contaminated materials.
2. In areas where there is no ready access to soap and water hand wipes should be made available for cleaning hands. However, washing with soap and water should be undertaken as soon as practicable.
3. Never eat, drink (smoke or vape) in, or around, areas where lead is handled or stored.
4. Food or drink must never be stored in an area where lead work is undertaken.

These general principles apply for ALL work with elemental lead and lead-containing materials, however additional precautions may apply in the following cases:

5 (c) Working on Leaded Paint

The age of many of STFC's buildings means that lead paint may have been used (typically on surfaces in pre-1960 buildings, and in some up to the 1980s). Painted

woodwork, particularly on or around windows and doors, must therefore be treated with caution and not dry sanded. However, in older buildings other painted surfaces may potentially contain lead and should also be treated with caution.

1. If paint is in good condition, it may be overpainted and sealed with a new coat. However, if paint is flaking and in otherwise poor condition, then removal is the best option. Consideration should be given to chemical paint removal, rather than dry sanding, providing this does not introduce additional risks.

NOTE: Such use of chemical agents is subject to further COSHH assessment.

2. Only heat guns operating below 500°C should be used to heat-strip old paint, to avoid generating lead fumes which can be inhaled.
3. If paintwork must be sanded, only **wet** sanding techniques should be used, and all dust slurry must be wet-wiped immediately.
4. Disposable gloves should be worn and changed frequently, or when damaged, and at the end of each work period they must be disposed of promptly.
5. Respiratory Protective Equipment (RPE), should be worn, which is tight fitting and fit tested, with filtration to FFP3.
6. The cleaning and maintenance requirements for RPE, as highlighted above in Section 5(b), also apply.
7. The controls highlighted above for ingestion (and skin absorption) exposure routes must also be applied, as do the arrangements for cleaning up when work is complete, and for waste disposal.

5 (d) Lead in Piped Services, on Electrical Cables or in Building Fabric

1. Avoid hot cutting lead pipes during repair and / or dismantling of old pipework, consider other work methods such as cold / mechanical cutting where practicable. Mechanical methods must take account of the potential to generate lead dust and therefore dust suppression measures applied.
2. Avoid surface abrasion of lead-containing cables or lead pipework as far as possible.
3. When working on any lead pipes disposable gloves, and ideally coveralls, should be worn and discarded at the end of the job.
4. Respiratory Protective Equipment (RPE), must be worn where there is a risk of either lead fume or lead dust generation, and this must be tight fitting and fit tested, with filtration to FFP3.
5. The cleaning and maintenance requirements for RPE, as highlighted above, also apply.
6. The hygiene controls highlighted above to prevent lead exposure by ingestion and skin absorption must also be applied, as do the arrangements for cleaning up when work is complete, and for hazardous waste disposal.

5 (e) Lead Solder and Solder Flux

During **soldering** lead **fumes** are generated, which are toxic. For this reason lead-free solders should be substituted for lead wherever possible. However, **lead-free**

alternatives are often considered to be technically inferior to **lead solder**, for both **soldering** and for certain applications e.g. electrical properties and long term reliability of circuits.

Where lead solder is **absolutely** required then suitable extraction must be provided to prevent personal exposure to lead fumes and workplace contamination.

Certain fluxes used for **soldering** also emit **fumes**, which are hazardous by inhalation. Acid flux types may contain [hydrochloric acid](#), [zinc chloride](#) or [ammonium chloride](#), which are harmful to humans. Prolonged exposure to colophony (or rosin) fumes released during soldering can cause [occupational asthma](#)⁷.

As well as inhalation hazards there are also skin hazards. While molten solder has low tendency to adhere to organic materials, molten fluxes, especially of the rosin type, adhere well to fingers, in a manner similar to hot glue, rapidly transferring heat to the skin with potential to cause serious burns. Skin protection is required.

1. Alternatives to the use of lead solder should be sought, and if they are unsuitable for a particular task the continued use of lead solder must be robustly justified in the relevant COSHH assessment.
2. Alternatives to rosin-based fluxes must also be sourced and, as above, recorded in the COSHH assessment (or justification provided where this is not possible).
3. Solder stations should be demarcated wherever possible, for example by the use of tape or signage, to prevent the potential spread of lead contamination.
4. Suitable separate storage for lead solder and fluxes must be provided (e.g. a lockable cupboard).
5. Work benches must be regularly wet-wiped to remove lead / flux dust or debris.
6. Local Exhaust Ventilation (LEV) must be used, either as on-tip extraction or by use of a mobile capture hood, as a control for the inhalation hazard.
7. LEV must be registered with SHE Group for statutory testing, and maintained in accordance with manufacturer's recommendations, **as a minimum**.
8. The controls highlighted above for ingestion and skin absorption must also be applied.

5 (f) Organic Lead Compounds

The principal route of entry for organic lead compounds is via skin absorption. Gloves must be carefully selected to take account of relevant breakthrough times during handling, and the selection must be specified in the relevant COSHH assessment. Gloves must be changed frequently and whenever damaged.

⁷ Colophony (sometimes called rosin) is a respiratory sensitiser. It is one of the top five causes of occupational asthma in the UK, and in the top 10 for contact dermatitis. It is also a cause of rhinitis and eye irritation. Colophony is derived from the resin of pine trees, either by direct tapping of the sap, by extraction from dead stumps or from oil left over from paper manufacture, and consists of a variable mixture of resin acids, some of which are unstable. Occupational asthma usually results from inhalation of the fume from heated colophony in soft soldering fluxes. Nearly all of the workers who have asthma from colophony have been exposed to solder flux fumes.

5 (g) Lead Batteries

Lead batteries obviously contain lead, which is generally contained unless the battery is damaged. Although exposure is unlikely, the principal route of entry to the body in this case is by ingestion and good hygiene practice will adequately control an individual's exposure to it. Batteries may also contain acid and during handling precautions must be taken to protect the eyes and skin (wearing safety spectacles or full face visors, and appropriate hand / arm protection) from the corrosive action of battery acid.

5 (f) Waste Management

1. Lead-contaminated waste (for example wetted paper towels, wet wipes, disposable PPE, etc) is unlikely to exceed threshold limits for disposal in the 'domestic' waste stream and may therefore be disposed of in normal black bag waste.
2. However, if a significant quantity of such lead-contaminated waste is generated on a regular basis, a designated container must be provided. Such waste may require disposal as hazardous waste, and further advice should be sought from the SHE Group.
3. Old / oxidised / unwanted lead bricks must be disposed of either as hazardous waste, or returned to the supplier where they may be reprocessed and resold. Old lead bricks must **not** be used as door stops, props or for other inappropriate purposes.
4. Lubricants, cutting oils and other wetting agents used for machining lead should be disposed of as lead-containing waste, via the hazardous waste disposal route.
5. Old lead batteries should be disposed of as hazardous waste.

5 (g) Other non-lead hazards

1. When building or relocating lead shielding bricks (or moving old lead pipework, or handling batteries) one other significant hazard relates to manual handling. For example, although lead bricks may vary in size to some degree, typically they weigh in the region of 2.2 kg each, with potential for injury due to the repetitive nature of the task.
2. Lead bricks should be handled, one brick at a time, using both hands. Good lifting technique should be applied.
3. In addition to the other PPE and RPE requirements, protective footwear should be worn, i.e. safety-toed shoes or boots.

Further information may be found in [Safety Code 12 - Safe manual handling](#).

5 (i) Health Surveillance

Implementation of the precautions listed should ensure that there is no significant occupational exposure to lead and health surveillance is not required.

However, in relation to the use of colophony, a cause of occupational asthma (if this cannot be substituted for a suitable alternative and is justified in the COSHH assessment), **may** require relevant individuals to be registered with STFC's Occupational Health provider for a health surveillance programme. A review of all relevant control measures would be required to determine whether this is necessary.

The HSE document INDG305 "Lead and You" also has basic information for those working with lead.

<https://www.hse.gov.uk/pubns/indg305.pdf>

Appendix 6. Training

Role	Initial Training	Refresher	Frequency	Comments
Staff and others using hazardous substances	To be familiar with the requirements of this code, see launch presentation and specific COSHH assessments for the activities they undertake.		As required by work activity	STFC has access to an online ' COSHH awareness ' course which can be used to familiarise new COSHH users with the basic requirements of the legislation. Managers can use this as an introduction prior to specific training for the activities being undertaken.
COSHH Assessor	Any course should include the following: <ul style="list-style-type: none"> • The legal position • Substances to which the regulations apply • Conducting assessments using STFC procedures • Control of exposure • Use of control measures • Maintenance, examination and testing, Health surveillance • Information, instruction and training • Safety Data Sheets 		5 Years	COSHH assessors should have suitable experience and training in the use of hazardous chemicals, preferably for the class of materials being assessed. NOTE: The training detailed here relates to the process of undertaking a COSHH risk assessment and will not impart any additional understanding of chemistry.
Courses Available:	Internal STFC COSHH Course (1 day)			

Appendix 7. Audit Checklist

Ref	Item	Rating	Comments
1 (Section 4.1.1) (Appendix 5)	Have COSHH Assessors been appointed and suitably trained and recorded in the SHE Directory?		
2 (Section 4.2.2)	Are hazardous chemicals suitably stored and incompatible materials segregated?		
3 (Section 4.2.3) (Section 4.2.4)	Is all work with hazardous substances carried out following a suitable COSHH or general risk assessment?		
4 (Section 4.3.1)	Are COSHH risk assessments completed or approved by trained COSHH assessor?		
5 (Section 4.2.9) (Section 4.2.10)	Are COSHH controls correctly maintained and, where required, subject to statutory inspections?		
6 (Section 4.2.11)	Where indicated on COSHH Risk Assessments, has Health Surveillance been undertaken?		
7 (Section 4.3.2)	Where indicated on COSHH Risk Assessments, has workplace monitoring been undertaken?		
8 (Section 4.2.12)	Where indicated on COSHH Risk Assessments, is specialist first aid available, maintained and in date?		
9 (Section 4.6.3) (Section 4.8.1)	Are requirements of COSHH Assessment being adhered to by users, including disposal?		
10 (Appendix 3)	Are COSHH Assessments stored in Evotix Assure?		
11 (Section 4.2.5)	Is the list of chemicals and their Safety data Sheets in any area available and up to date?		
12 (Section 4.2.9) (Section 4.2.10)	Where COSHH risk assessments require the use LEV or fume cupboards, have these systems been subject to regular maintenance and statutory inspection?		
13 (Section 4.2.2)	Are all chemicals/hazardous substances clearly labelled?		

Appendix 8. Document Retention Policy

Records established	Minimum retention period	Responsible record keeper	location of records	Comments/Justification
COSHH Assessments	Current + 5 years	Line Management	Evotix Assure	SHE Group maintain Evotix Assure facility
Gas monitoring calibration and maintenance records	Current + 3 years	Department management or Estates depending on where equipment ownership resides	Local Record System	
LEV ⁸ maintenance records	Current + 3 years	Department management or Estates depending on where equipment ownership resides	Local Record System	
LEV statutory inspection records	Current + 3 years	SHE Group RAL	Local Record System	
		Estates DL/ROE	Local Record System	
Appointments:				
COSHH Assessor	Most Recent	Director	SHE Directory	Appointment Letter

⁸ LEV - For example glove boxes, LEV systems, extraction hoods, fume cupboards