Safety regulations for employees and students

Department of Materials Science and Engineering, ITM

These regulations are established by the management group and shall apply year 2022 until further notice. Any deficiencies in the regulations should be reported to head of department Joakim Odqvist, departmental operations controller Eva Werner Sundén or safety representative Stephan Schönecker.

This document is a translation of the Swedish original. In the event of any discrepancy between the original and the translation, the original takes precedence.

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Contents

1 Introduction

These safety regulations apply to the Department of Materials Science and Engineering (MSE), at the School of Industrial Engineering and Management (ITM) and as a supplement to the Work Environment Act. The safety regulations have been produced at the School of Engineering Sciences in Chemistry, Biotechnology and Health in accordance with the general provisions of the law and form an integral part of the parties' lease agreement. The purpose of the safety regulations is to minimise the risk of accident and illness associated with laboratory work. Anyone working within MSE must carefully study and apply the instructions and rules of conduct set out in these safety regulations, as well as informing themselves of the provisions of the Work Environment Act relevant to chemistry work (see links under section 5).

Any questions or requests for clarification should be addressed to the person(s) at MSE responsible for chemical handling and/or fire safety, or the manager of flammable goods. Their contact information can be found on the safety and crisis web pages at the MSE intranet (https://intra.kth.se/en/itm/verksamhetsstod/institutioner/internt-mse/sakerhet-access-till-labb-1.1182665) as well as the notice board by the entry to the lab corridors.

When working with certain instruments, e.g., laser instruments, X-ray diffractometers, etc., please refer to the rules and safety regulations of the laboratory. Gases and waste are handled according to the MSE gas and waste routines.

1.1 Routine

1. Students and employees performing work in MSE labs or workshops shall review the MSE safety regulations, sign the form on the last page and post/deliver it to the MSE operations controller for record filing. Your unit leader (for research and teaching positions) or supervisor (for doctoral students) is responsible for ensuring that this is done as soon as possible, together with other intro material for new hires.

2. Everyone working in the lab must be familiar with the risk-assessment system through a KLARA and lab safety course. After completing the introductory course, access to the KLARA inventory system is provided. The course is held by the School of Engineering Sciences in Chemistry, Biotechnology and Health several times per semester. Registration is made via Lab safety | CBH internal pages (kth.se) After completing the course, you will receive access to KLARA.

3. Apply for necessary lab access via https://www.kth.se/form/62c81064904155f6dca5ed31

   Please note that you do not have the right to use equipment, even if you enter the space, if you do not have authorisation

   Before granting lab access, the lab responsible/supervisor will conduct a physical presentation of the lab including review of rules of conduct, routine work, protective equipment and emergency exits. During this presentation, all laboratory risks shall be addressed (including all ongoing trials).

4. Everyone working in the workshop must attend a workshop course. The course is held as needed (approx. once per semester) at the Department of Production Engineering.

Apply here for the next course. After completing the course, access is given to the workshop.

5. A risk assessment must be carried out before laboratory work starts. Please note that the safety representative and lab responsible must be involved in the risk assessment.

   Use the risk assessment template developed for MSE and if chemical hazards exist, the template is supplemented with a risk assessment in KLARA. The risk assessment is done in KLARA under the org "*Materialvetenskap*". Select the status "*Klar*" when the risk assessment is completed. After that, the control questions on the printed risk assessment must be answered by the author together with the safety representative and lab responsible, possibly supervisor. The risk assessment is signed by the provider, safety representative, lab responsible, possibly supervisor, and finally by the head of department. Archived by Operations Controller.

   If an approved risk assessment is already available in KLARA, it is sufficient that you take part in and carry out the work in accordance with it. However, it should first be discussed with the lab responsible or supervisor (or instrument responsible at Hultgren) if the supervisor (or instrument responsible at Hultgren) has already signed the risk assessment, otherwise the lab responsible is sufficient before the work begins (the safety representative and head of department do not need to sign this copy). Also this version should be saved in KLARA.

6. Purchase of chemicals and other lab items. All purchases should if possible be done in WISUM and must be approved by lab responsible and supervisor before placing an order. All chemical needs shall be assessed before purchase and use. Are special handling/permits required? Is there special legislation?

7. A CMR investigation must be carried out before purchasing and working with CMR substances. This is done in dialogue with the person responsible for chemical handling. The report is sent to the head of department for approval.

   The following must be done before work with CMR can begin:

   - Complete risk assessment
   - Prepare register of employees at risk of exposure leading to risk of illness
   - Implement measures to reduce exposure

8. Implement general fire training as soon as possible (given by KTH in spring and autumn). The person responsible for fire safety assesses whether other fire safety training needs to be implemented or approved. Notify the operations controller after course completion.

9. Always report risks, incidents, accidents and workplace injuries in the IA system. https://intra.kth.se/en/anstallning/arbetsmiljo/ia-systemet-1.1046377

1.2 MSE contact details

MSE Head of Department	Joakim Odqvist	odqvist@kth.se	Room N133
Local safety representative	Stephan Schönecker	stesch@kth.se	Room N212
MSE person responsible for chemical handling	Valter Ström	valter@kth.se	Room L159
MSE person responsible for fire safety	Stephan Schönecker	stesch@kth.se	Room N212
MSE manager of flammable goods	Stephan Schönecker	stesch@kth.se	Room N212
MSE operations controller	Eva Werner Sundén	esunden@kth.se	Room K110
Laboratory responsible, Hultgren Lab	Prasath Babu Revathy Rajan	pbrrajan@kth.se	Room L160
Laboratory responsible, Properties	Valter Ström	valter@kth.se	Room L159
Laboratory responsible, Processes	Björn Glaser	bjoerng@kth.se	Room K122
Laboratory responsible, Structures	Alexander Dahlström	adahlstr@kth.se	Room N116
Laboratory responsible, Furnace hall	Chris Hulme	chrihs@kth.se	Room K121

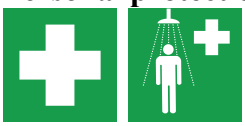
2 General working regulations

2.1 General rules

Evacuation plan

2.1 Note where evacuation plans, alarm buttons and fire-extinguishing equipment are located. Study evacuation routes carefully, especially alternative evacuation routes and the location of your reassembly point.

Personal protection



2.2 Note where eye-baths, emergency showers, dressing materials and first aid equipment are located. Appropriate protective equipment such as a cotton smock and safety glasses shall always be worn in the laboratory unless clearly unnecessary. Appropriate protective gloves shall be worn when necessary.

Smocks and gloves shall only be worn and stored in the lab. They may not be worn into offices or common areas.

2.3 Protective equipment shall be provided by the employer (Chapter 2, Section 7 of the Work Environment Act). Personal protective equipment can be smocks, gloves, safety glasses, computer glasses, hearing protection, respiratory protection, safety shoes and face shields. Prescription safety glasses can be ordered if required. Equipment that has been damaged or is otherwise suspected of being inadequately protective may not be used.

2.4 Reusable respiratory protection equipment, after cleaning, should be placed in designated storage devices to avoid air pollution. Reusable respirators must be labelled with name and date when cleaning is completed.

2.5 Remember that chemicals will eventually penetrate a protective glove. This can happen to the material without you seeing or feeling it. Gloves made of a material that provides good protection against some chemicals may provide poor protection against others. Consult the manufacturer/vendor or product/information sheet regarding which glove is appropriate for use with chemicals you work with. Do not touch with contaminated gloves any door handles, instruments etc. which others may touch bare-handed. Remove gloves safely and dispose of used gloves in the correct waste container.

2.6 Food and drink are prohibited inside the lab. Snuff may not be used and no cosmetics may be applied (this also applies to hand cream and lip balm). Tasting chemicals and oral contact with pipettes is forbidden. Avoid all skin contact with chemicals.

2.7 Work entailing risk may not be carried out alone. This is particularly important when working outside normal working hours. The lab responsible, in consultation with

the safety representative, makes an assessment of what constitutes risk.

Workplace

2.8 Coffee makers and kettles are not allowed in office spaces. These may only be found in the kitchens where there are timer sockets.

2.9 The workplace must be kept free of any chemicals and equipment not in use.

2.10 Leave bags and coats outside the laboratory.

2.11 Spills are addressed immediately by the individual who caused the spill. Spills of strong acids and bases should also be wiped off with buffer. Cleaning staff perform normal cleaning only.

2.12 Special rules have been developed for the handling of all types of waste. See The ITM School's procedure for waste management, Department of Materials Science and Engineering (MSE) | KTH Intranet Containers and packaging that have contained chemicals must be cleaned before disposal with conventional waste. Investigate in advance how to dispose of experimental residues.

2.13 Sinks in fume cupboards and other sinks shall be kept free of debris.

2.14 Cardboard boxes and other combustible materials should not be stored in the lab.

2.15 Trials that take place overnight or over a public holiday must always be labelled so that the person responsible can be reached by telephone. Diminished water flow, e.g. for cooling water, shall be regulated with a ball valve if possible and all hoses must be lashed. The risk of power or water outages must be considered.

2.16 Warning signs must be placed on equipment that may pose a particular risk.

2.17 Corridors and staircases are escape routes and must not be blocked with equipment, cabinets, boxes or other bulky materials.

Risk assessment

2.18 A written risk assessment shall always be carried out before a new experiment is performed. Consult the safety

data sheet for the chemicals to be used in the experiment. Always use the risk assessment template developed for MSE.

2.19 Safety data sheets on chemicals can be retrieved from the product register in KLARA, KTH's chemical management system, https://secure.port.se/alphaquest/app_kth/pcmain.cfm

2.20 Risk assessment of chemicals with unknown properties shall be carried out as if these substances were hazardous with respect to the properties that may be involved. Always consult the appropriate literature regarding what risks exist before starting an experiment.

2.21 If CMR substances pursuant to Section 40 of Chemical Hazards in the Working Environment (AFS 2011:19) are to be used, the following must be stated particularly clearly in the risk assessment:

- In which places and spaces CMR substances may be present.
- What protective measures are necessary to ensure that exposure is minimal.
- In which situations personal protective equipment is required.
- How the operation and functioning of equipment, processes or ventilation is to be monitored.

2.22 If allergenic substances pursuant to Section 37 of Chemical Hazards in the Working Environment (AFS 2011:19) are to be used, the following must be stated particularly clearly in the risk assessment:

- In which places and spaces the hazardous chemical products are handled and where isocyanates or formaldehyde may be released.
- What protective measures are necessary to ensure that exposure is as low as practicable.
- The situations in which personal protective equipment is required and what protective equipment is to be used.
- How the functioning of work equipment and ventilation shall be checked and maintained to prevent allergenic substances from causing illness.

If the risk assessment has shown that exposure to allergenic substances is negligible and that protective measures are therefore not necessary, this requirement does not apply. The reasons why the exposure is considered negligible must be documented in writing.

2.23 If the risk assessment shows that measures are needed to limit the risk caused by the hazard of illness or accident, the risks must be addressed by eliminating their cause; if this is not possible, preventive protection measures must be taken. The figure below shows the order of priority in which protection measures should be implemented (see Figure 1).

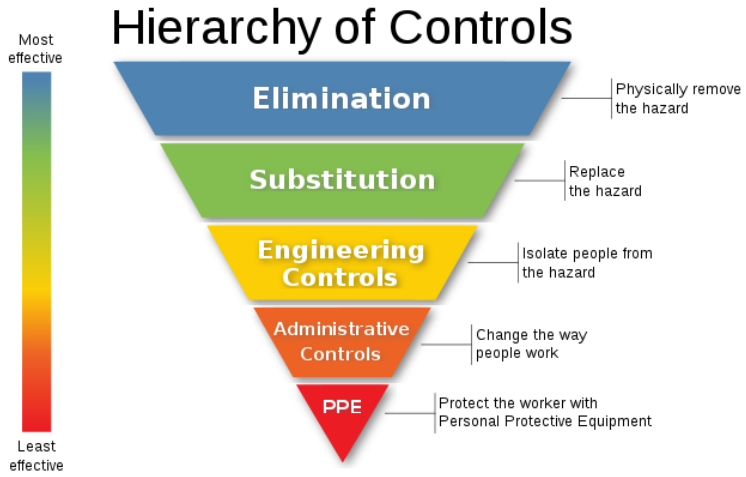


Figure 1 Order of priority in the selection of mitigation measures (risk measures ladder). The methods at the top of the graph are potentially more effective and protective than the methods at the bottom. (Wikipedia/MichaelPittman/CC0 1.0)

2.24 The risk assessment must also include possible consequences of an evacuation or a ventilation, power or water outage, and an action plan regarding how to respond.

2.25 Safety representative should be given the opportunity to comment on the risk assessment. The risk assessment must then be signed off on by the lab responsible and then by the head of department. All risk assessments must be filed in the Department and made available to the staff concerned, the head of department and the regulatory authority.

2.26 The risk assessment shall be kept up to date so long as the work is in progress. The workers concerned shall be informed of the contents.

2.27 Risk assessment with regard to chemicals can be done using a form directly in KLARA after logging in. Also use the risk assessment template developed for MSE to be uploaded in KLARA.

Hazardous activities

2.28 The manager of flammable goods, the person responsible for fire safety, the person responsible for chemical

handling, laboratory responsible, and safety representative have the right to immediately suspend hazardous activities in their area of responsibility when they deem it necessary. The risk/safety assessment must be completed and documented before work begins.

2.1.1 Protective ventilation, fume cupboards, etc.

There are a number of fume cupboards at MSE. The protective function of a fume cupboard is affected by how you act and move as well as by disturbances in your surroundings. It is easy to interfere with the operation of the fume cupboard by incorrect operation, which results in reduced safety. The instructions for fume cupboards apply to those who work at them. Please read the instructions for the fume cupboard carefully before using it. The following rules permit work in the fume cupboard to be carried out in safer conditions with reduced risk of leakage or harmful exposure to chemicals.

Fume cupboard

2.29 When working at a fume cupboard, nearby doors should be kept closed in principle to maintain a constant negative pressure in the lab regardless of the size of the hatch opening. Passers-by shall be avoided as far as possible. Smocks and sleeves shall be buttoned. The work must be done with gentle arm movements.

2.30 Work with the hatch to the fume cupboard in the safety position, normally with a maximum opening of 30-35 cm (see label). Open/close the hatch with gentle movements to maintain a laminar flow of exhaust air.

2.31 The air velocity through the hatch opening shall be approximately 0.5 m/s regardless of the size of the hatch opening. There is a control unit in the room that also maintains a constant negative pressure in the laboratory.

2.32 The hatch in the fume cupboard must be pulled down when no work is being done in the fume cupboard. It closes automatically approx. 8 minutes after you have finished working in the fume cupboard, but make a habit of always closing the hatch manually. Do not leave anything in the fume-cupboard opening that prevents the hatch from closing. Also make sure that cables and hoses are pulled into the fume cupboard via the small brush at the sides of the opening and further via the notch just within.

2.33 The light in the fume cupboard switches on automatically when you open the hatch The lighting is linked to the ventilation, i.e., it is not switched on if the ventilation is

not working. After the work is completed, the lights are switched off after approx. 30 minutes.

2.34 Work as far as possible inside the fume cupboard.

2.35 The fume cupboard is equipped with a control/alarm function that sounds in the event of low exhaust air flow. Note how it works before beginning work in the fume cupboard.

2.36 The front hatch of the fume cupboard is not intended to protect against the risk of explosion. During such work, shields made of, e.g., shatter-proof plastic must be used as protection.

2.37 If an acceleration function is available, it should only be used when necessary and then switched off.

2.38 There is no safety function in the fume cupboard in set-up mode, only a low base flow. For safety reasons, the electricity is disconnected.

2.39 There are a number of electrical outlets at the bottom of the side panel that are pre-regulated, i.e., linked to the protective ventilation. These should be used as routine. After a power outage, they are reset by pressing the black button on the front panel. Electrical outlets that are not pre-regulated (marked with a red ring) may only be used for experiments that require an uninterrupted power supply for safety reasons.

2.40 The fume cupboard is a workspace, not a storage space. Do not store chemicals or other items not required for the job at hand in the fume cupboard.

2.41 Acutely toxic substances must not be handled in fume cupboards that lack a functioning audible or visual alarm. A personal alarm that warns when the toxic limit is exceeded is recommended. Work that requires handling such substances must not be carried out alone.

2.42 In the event of a power and/or ventilation outage, all hatches to the fume cupboards must be closed manually.

2.43 Vacuum pumps used in conjunction with fume cupboards must not be placed underneath the fume cupboards unless they are Ex (explosion proof) rated. Further, a pump must

be placed on an embanked metal plate (oil leakage) and must be connected to the exhaust air (oil mist).

2.44 Please note that old fume cupboards with a vertical front hatch, which still exist, do not comply with legal requirements regarding low-exhaust air flow alarms, constant hatch-opening flow, electrical outlet location and pre-regulated electrical outlets. The hatch must always be closed manually.

Local exhaust ventilation

2.45 Place the exhaust as close as possible to the source of contamination. The maximum distance for protective effect is equal to the diameter of the exhaust duct. Remember to switch off the local exhaust ventilation when not in use for improved exhaust elsewhere in the system.

Storage

2.46 Other ventilation equipment in the laboratory includes ventilated cabinets for solvents, chemicals and gases, and ventilated containers for contaminated glass waste.

2.47 The hatch under the fume cupboard has separate exhaust ventilation.

Instruments

2.48 There are many instruments at MSE and many require you to read through manuals for their operation; a brief examination is sometimes required before you are permitted to use the instrument. Inquire regarding applicable routines. Usually, this is a matter of learning to handle delicate instruments, but for, e.g., laser instruments, your safety is also involved.

Radioactivity

2.49 The regulations for working with radioactive materials are rigorous for your own safety. Follow local instructions.

Lasers

2.50 When working with lasers, the current regulations *Artificiell optisk strålning* (Artificial optic radiation) AFS 2009:07 must be followed (see also Section 14).

2.1.2 Laboratories

Refrigerators/Freezers

2.51 Only laboratory refrigerator/freezer models may be used in the lab, which excludes the risk of spark formation inside the enclosure.

Drying cabinet

2.52 Drying cabinets must not be used for flammable goods where there is a risk that vapours from hazardous

substances may be emitted or risk of explosion.

Electric hotplates 2.53 It is not uncommon for electric hotplates, placed inappropriately or left on, to cause incidents of damage or fire. Electric hotplates must always be placed on a base of non-combustible material. There must be at least 50 cm of unobstructed space above the hotplate. If the temperature is controlled by a thermostat, the thermostat cable should be disconnected when not in use.

Water and oil baths 2.54 Water and oil baths must be made of metal and equipped with overheating protection. The temperature when using an oil bath must be at least 20 °C below the flash-point of the oil.

Vacuum apparatus 2.55 All glass to be used under vacuum shall be designed for vacuum, made of special strong glass, and shall be installed with the utmost care. When working with vacuum equipment, protective goggles suitable for the work must be worn. In front of large vacuum installations of glass, special protective shatter-proof plastic should be used.

Cooling water hoses 2.56 All hoses used for cooling water must be secured with hose clamps or tie wraps. PVC hose is used at low pressures and reinforced hose at high pressures. In experiments where fire, explosion or other incident risks arising after sudden loss of cooling water, a flow meter is required to immediately cut off the water and power supply when the water flow falls below a certain level.

2.1.3 Chemicals management

In the appendix, you will find an overview of important and common signs and hazard pictograms in your workplace.

Storage of chemicals 2.57 All chemicals and chemical products used in KTH's activities must be registered in KLARA. New chemicals not previously registered in KLARA must be registered upon delivery, before use in the organisation. At MSE, a barcode system has been introduced for chemicals, which means that all bottles and cans must be barcoded. Contact the person responsible for KLARA inventory/administration in the division.

2.58 All chemicals must be stored in ventilated chemical cabinets or chemical storage areas. Read the safety data sheet (SDS) regarding storage of the substance in question. All chemical storage areas and chemical cabinets must be

properly labelled as shown in the picture on the left.

2.59 Flammable liquids are stored in ventilated cabinets and may not be stored together with toxins.

2.60 Toxins must be stored in a locked, ventilated cabinet.

2.61 Substances that are flammable as well as toxic shall be stored together with flammable substances.

2.62 Acids must be stored in ventilated acid-proof cabinets. Acids and bases should not be stored together. Placement on different shelves may be permissible if only a few bottles are stored. Place the bottles in plastic bowls (embanked).

2.63 It is not permitted to store chemicals anywhere but ventilated cabinets and storage rooms intended for chemicals. This includes chemicals in flasks, NMR tubes, syringes, vials and the like.

Labelling of chemicals

2.64 All preparations, reagent bottles and slides must be clearly labelled. Information regarding the chemical name, hazard symbol and whether the substance is carcinogenic or allergenic must appear on the label. (See the Swedish Chemicals Agency's website https://www.kemi.se/en for detailed information regarding classification, labelling and packaging of chemical substances and mixtures). Used containers must also be labelled with the name of the user and the date. If an old bottle or can is reused for another chemical, the old text must be clearly removed, and a new label affixed to the bottle.

Transport of chemicals

2.65 All transport of chemicals must be done in a safe manner. Use Absol to protect against leakage.

Liquid nitrogen

2.66 If the ventilation is out of order, it is not permitted to pour out liquid nitrogen. 1 litre of liquid nitrogen produces about 700 litres of nitrogen gas, which entails a high risk of suffocation.

2.67 Use the lift when possible but never travel together with a container of liquid nitrogen. If the lift gets stuck and the vessel starts to leak, there is a high risk of suffocation. Make sure no one else can enter the lift during the transportation.

General information about gas cylinders

2.68 Cylinders may only be connected to a reducing valve with the same name as the one on the cylinder.

2.69 Reducing valves and gas hoses approved for that gas alone may be connected to gas cylinders.

2.70 Gaskets must be of the right quality for the type of gas chosen. Change the gasket after every one or two bottle changes. Always replace a damaged gasket.

2.71 Gas cylinders shall be handled with care and may not be subjected to bumps or blows. They must not be placed in such a way that they are exposed to heat. Gas cylinders must be placed in such a way that they cannot be pushed over. They must always be kept chained and the chain should not be placed around the valve or too far down the bottle. Alternatively, gas cylinders can be stored on wheeled gas carts. A nylon strap is not sufficient to prevent tipping as it melts in the event of fire.

2.72 Gather as much information as possible about the gas you will be working with. Study the product information and safety data sheets carefully. If questions remain, contact the gas supplier.

Storage of gases

2.73 Gas cylinders containing flammable or toxic gas must not be left in the lab. They must be stored in gas cabinets that are approved for the purpose and clearly marked with the appropriate warning signs (see picture at left).

2.74 Doors to rooms where gas cylinders are stored must be marked with a gas-cylinder warning sign. The sign is to guide and warn firefighters in the event of fire. The regulations also require the sign to be removed if the cylinder is moved from the room. Incorrect signage can lead firefighters to refrain, due to the risk of explosion, from extinguishing a fire in a room where there is in fact no gas cylinder.

Transport of gas cylinders

2.75 Hand trucks designed for gas cylinders must be used. Safety footwear (standard EN ISO 20345) must be worn throughout the handling of gas cylinders. Use the lift when possible but do not travel together with the cylinder in the lift. Make sure no one else can enter the lift during the transportation.

Toxic gas

2.76 Gases that are corrosive or pose a respiratory hazard should be purchased in the smallest possible cylinders, small enough to be placed and handled in a fume cupboard when in use, or in ventilated, fireproof cabinets. Gas cylinders containing toxic gas must be clearly marked with a skull and crossbones (see picture at left).

2.77 Toxic gas must not be stored in the same place as flammable gas.

Oxygen

2.78 Oxygen under pressure, together with oil or lubricants, can trigger an explosion. In the case of sparking or open flames, pure oxygen can significantly increase the combustion rate in porous materials such as clothing.

Acetylene gas

2.79 Gas cylinders larger than 5 litres containing acetylene gas, which are used with a supply of compressed air or oxygen, shall be fitted with flashback arrestors to prevent flashback in the pipework or to the gas cylinder during welding. The pressure on the regulator must not exceed 1.5 bar.

2.80 Self-inspection of the facility must be carried out twice a year and include leak testing, which must be documented. The flashback arrestors must be checked and documented by authorised personnel during the annual gas audit in August. The documentation of these checks shall be available to the staff concerned and to the supervisory authority.

2.81 A fireproof glove shall be provided in the immediate vicinity of the acetylene gas cylinder in the event of fire.

2.82 Leaking acetylene smells like garlic.

Liquefied petroleum gas (LPG)

2.83 LPG cylinders are filled with condensed gas and must not be stored lying down. The safety valve may be blocked by the condensed gas and there may be a risk of explosion.

Classified area (ATEX zone)

2.84 Areas where explosive atmospheres, i.e., combustible mixtures of air and flammable gas or vapor, are expected or could occur are known as classified areas. Electrical and mechanical (non-electrical) equipment used in classified areas must be certified as compliant with the ATEX Directive. Classified areas are marked with the EX-symbol (see picture at left).

2.85 Classified areas must be protected from all sources of ignition. Ignition sources may be open flames, hot surfaces, static electricity, electric sparks and arcs, mechanically generated sparks, etc. Mobile phones must not be used in classified areas (ATEX certified mobile phones may be used). A mobile phone that falls to the ground gives off an electric spark if the battery loosens. This spark can act as an ignition source.

2.1.4 Work with hazardous substances

General rules

2.86 Information on the fire and explosion hazards of different substances, toxicity and appropriate decontamination and preventive measures must be obtained before starting an experiment. Safety data sheets regarding chemicals can be downloaded from the product register in KLARA, https://secure.port.se/alphaquest/app_kth/pcmain.cfm A risk assessment must be carried out for all work with hazardous substances and any risk-reduction measures must be implemented before work begins.

2.87 Make sure to always have suitable decontaminants on hand to neutralize spills of toxins or corrosive chemicals. Until proven otherwise, all chemicals should be considered toxic.

2.88 Depending on the design of the lab and what is defined as a fire cell, the amount of flammable material that can be stored on the premises may vary in the different MSE labs. However, no more than 50 litres of flammable material in total may be stored in ventilated cabinets per lab, regardless of the size of the lab. This volume also includes gases, solvent wastes and acetone for washing. This amount must not be exceeded. Cf. MSB's information regarding flammable goods in laboratories (see links under section 5).

2.89 Please contact the MSE manager of flammable goods with any questions regarding flammable goods.

Carcinogens, mutagens, reproductive toxicants

2.90 Carcinogenic, mutagenic and reprotoxic substances are collectively known as CMR substances. These substances have the following hazard statements and/or risk phrases:

H350. May cause cancer
H340. May cause genetic defects

H360. May damage fertility or the unborn child

Suspected human carcinogens, mutagens, and reproductive toxicants have the following hazard statements:

H351. Suspected of causing cancer
H341. Suspected of causing genetic defects
H361. Suspected of damaging fertility or the unborn child

Older, currently unapproved markings may be present:
R45. Can bring about cancer
R46. Can bring about hereditary genetic damage
R49. Can bring about cancer when inhaled
R60. Can bring about impaired reproductive function
R61. Birth defects can arise.
These should be labelled as soon as possible in accordance with the requirements of the CLP legislation.

2.91 In the case of planned work with CMR substances, the practitioner and the laboratory responsible must carry out a specific investigation in which there must be a justification for the use of the substance and it cannot be replaced by another substance. Such an investigation must be carried out before the substance is purchased. More about the investigation and the form to complete can be found on KTH's website, https://intra.kth.se/en/administration/kemikaliehantering/cmr-utredning-1.541522. This form is given to the person responsible for chemical handling for review. The risk assessment must then be signed off on by the lab responsible and then by the head of department. The form is kept on file with the MSE operations controller. The investigation shall be reviewed once a year.

2.92 Employers must keep a record of workers exposed to CMR substances to such a degree that entails risk of illness. The list will be filed for 40 years. The form is sent to MSE's operations controller who forwards it to KTH central, i.e., to the secretary of KTH's Safety Committee for registration with the registrar https://intra.kth.se/administration/kemikaliehantering/exponeringsregister-1.541523
Some substances require special permission from the Swedish Work Environment Authority for purchase, use and storage. These substances are called Group B substances (see AFS 2014:43, previously AFS 2011:19).

Allergenic substances

2.93 The safety data sheets indicate which chemical substances are allergenic or sensitising. These substances have the

following hazard statements:

H317. May cause allergic skin reaction. Please note that epoxy adhesives are included in this category.
H334. May cause allergy or asthma symptoms or breathing difficulties when inhaled.

2.94 Exercise caution, use appropriate gloves and practice good hand hygiene. Allergenic substances shall always be handled in ventilated work spaces.

2.95 Anyone performing or supervising work with allergenic substances must be informed of the risks involved in handling them, how the work is to be performed and the measures to be taken in accordance with the risk assessment.

2.96 For some allergenic chemical products, there are requirements for training and medical checks (see AFS 2011:19 Section 37).

Highly corrosive chemicals

2.97 Chlorosulphonic acid, sulphuric acid, nitric acid, hydrochloric acid, hydrofluoric acid and strong alkalis, bromine, etc. should be handled with extreme caution.

2.98 Perchloric acid is explosive in contact with organic material and should be stored in the smallest possible quantity and at the lowest possible concentration. Perchloric acid should always be handled in flushable fume cupboards.

2.99 Highly corrosive chemicals must not be stored on high shelves. They must not be transported or stored permanently in beakers or flasks. Bottles containing these chemicals are best transported in a plastic bucket or similar.

2.100 Bottles containing bromine can become brittle with time, so these bottles must always be handled with care.

2.101 Protective goggles must be worn when transporting corrosive chemicals. When handling large quantities, dispensing from large bottles or diluting, full face protection must be worn.

Alkali metals

2.102 Alkali metals (mainly lithium, sodium and potassium) must be stored in paraffin or kerosene. Always wear protective gloves when working with alkali metals.

Toxins and harmful substances

2.103 Most chemicals have toxic effects on the human body. Therefore, all substances must be handled as if they were toxic. The utmost care and cleanliness shall be observed in all laboratory work.

Explosive and flammable substances

2.104 For explosive and flammable substances, the general rule applies that the smallest possible quantities may be stored in the fume cupboard during daily work. The bottles must not be left out on the tables. Ventilated cabinets must never be left open/extended, depending on the type of cabinet.

2.105 In view of the risk of ignition and explosion, all work with flammable substances shall be carried out with great care and always in ventilated work spaces.

2.106 Poisons must not be stored together with flammable goods.

2.107 Solvents in quantities greater than 2.5 litres should not be stored in glass bottles but in safety cans designed for this purpose.

2.108 Solvents dried over sodium and stored in glass bottles shall be handled with great care.

2.109 Plastic containers larger than 2 litres must be type-approved for the flammable product to be stored in the container.

2.110 Perchloric acid may only be handled in a fume cupboard.

2.111 For hydrogen peroxide in concentrations ≥ 20 %, the following storage volumes are permitted:

maximum 1 litre if concentration ≥ 80%,
maximum 5 litres if concentration is 60-80%,
maximum 50 litres if concentration is less than 60%. A permit is required for any handling of hydrogen peroxide with a concentration ≥ 60%.

2.112 Store hydrogen peroxide in a refrigerator.
(SÄIFS 1999:2, *Sprängämnesinspektionens föreskrifter om hantering av väteperoxid* - Directive of the Explosive Substances Inspectorate regarding handling of hydrogen peroxide)

Radioactive substances 	2.113	All work with radioactive substances and X-ray equipment may only be carried out after a special permit has been issued by the Swedish Radiation Safety Authority (SSM). Contact person for the permit, see website.

2.1.5 Waste management - conventional waste

See departmental waste-management routines on the intranet.
https://intra.kth.se/en/styrning/miljo-hallbar-utveckling/miljoarbete-kth-skolor/itm/styrande-dokument-fo/rutiner-2018/avfallshantering/rutin-itm-skolan-avfallshantering-mse-1.809270

2.1.6 Waste management - hazardous waste

See KTH's general routine: https://intra.kth.se/campus/lokalservice/1-avfallshantering/farligt-avfall-hantering-definitioner-1.1063787

When hazardous waste must be disposed of, contact:

Website: Sekamiljoteknik
E-mail: info@sekamiljoteknik.se
Phone: 08-235300

All waste must be properly labelled with its contents and the individual responsible. SEKA assists in the identification of substances with uncertain content. SEKA also provides suitable transport packaging.

Please note that some small amounts of chemicals can be poured down the drain pursuant to the so-called 'Exception List'.

Note also that we have a procedure for Transport Documents, which also includes the 'Obligation to make notes' mentioned in the general procedure in the link above.

Contaminated glass	2.114	Contaminated glass is stored in cardboard with a plastic bag and placed in ventilated containers in the lab.
Sharps waste	2.115	Needles, syringes, lancets (non-infectious). Such waste is placed in a suitable container, such as a sharps disposal container. When the container is full, seal the lid with tape and label the container.
Waste oil	2.116	Collected in containers. Distinguish between silicone oil and other oils.
Solvent waste	2.117	Aqueous, chlorinated and non-chlorinated solvents are collected separately in suitable containers.

Inorganic acids and bases	2.118	Neutralised and flushed down the drain, provided sufficient chemistry skills are available. Otherwise, consult the person responsible for chemicals handling.
Silica gel, etc.	2.119	Note that traditional silica gel with cobalt chloride is a CMR substance - use safer alternatives if possible.
Substances not harmful to the environment and health	2.120	In some cases, residues can be flushed down the drain. When in doubt, contact the person responsible for chemicals handling for more information.

2.2 Work during pregnancy or breastfeeding

The Swedish Work Environment Authority's regulations on pregnant and breastfeeding workers must be followed (AFS 2007:5).

The regulations apply to all operations where work is performed by employees who are pregnant, have given birth no more than 14 weeks before the work is to be performed, or are breastfeeding *and who have notified the employer of this*.

An employer who has been notified of the employee's condition referred to above must immediately investigate whether the woman is exposed in her work to any of the work environment factors or working conditions specified in the annex to the regulations or conditions comparable to them. The employer must further assess the risk of harmful effects on pregnancy or breastfeeding or other ill health. In the risk assessment, consideration must be given to the nature, degree, and duration of the exposure. The employer must then determine which measures need to be taken.

If the result of the assessment shows that there is a risk of harmful effects on pregnancy or breastfeeding, or for other ill health or accidents, the employer shall take the necessary measures to eliminate the risks. The woman may not remain at work for as long as the risk persists.

3 Action plans in the event of accident

3.1 First aid in the event of accident

Everyone working within MSE must know where the first aid kit is, what it contains, how to give first aid in the event of an accident and how to call the ambulance and fire brigade.

First aid for a seriously injured or unconscious person	3.1	1). Check the injured individual according to **L-ABS** (see description below): ***L= Life-threatening situation*** Assess your own and the injured person's safety e.g. risk of fire, explosion etc.

A= Airway

If the person is unconscious and not breathing or has abnormal breathing, start CPR (see chapter 3.2).
Ensure that the injured person has a clear airway. Check if the injured person is breathing on their own, if not, immediately start artificial respiration (mouth-to-mouth resuscitation).

B= Bleeding

Stop any bleeding by applying pressure and elevating the injured body part.

S= Shock

Prevent shock using the above measures - shock is a life-threatening condition. Protect the victim from the cold, calm the person. Elevate their legs unless a stable lateral position is required.

Once the above measures have been taken, the injured person should be placed in a stable lateral position, if possible. Keep the injured person under surveillance, as their condition can quickly worsen.

3.2 2). Alert the ambulance by calling 112, if you have not already done so. If there are other people around, ask someone to go out and guide the paramedics.

3.3 3). Someone should always accompany the injured person to the hospital to describe what has happened.

Hospital visits

3.4 Call Vårdguiden for information regarding the nearest emergency department. If there is a need for medical attention in hospital, but transport by ambulance is not deemed necessary, take a taxi or other car to the hospital. Choose St. Erik's Hospital for eye emergencies, but call their eye clinic first. Remember that someone must always accompany the injured person, even if they think they can manage on their own.

Burns

3.5 Burns are classified as follows:

First degree: superficial partial skin lesion
Second degree: deep skin injury
Third degree: full skin damage

3.6 **Actions at the scene of the accident:**

1. Rinse thoroughly and for a long time with water. Remember not to use ice-cold water - better to use something warmer and able to cool for longer.
2. Prevent shock.
3. Protect with bandages.
4. Do not remove clothing that covers the injury.

3.7 Always seek medical attention for extensive burns, deep burns or burns to the face, feet or joints.

Eye injuries

3.8 In the event of chemical splashes in the eyes:

1. Flush eyes with lukewarm water in an eye wash for at least 15 minutes. It is important that contact lenses be removed during eye rinsing, as they prevent effective eye rinsing and may aggravate any eye injury.
2. Bring portable eye-wash bottles and continue flushing your eyes during transport to hospital. Uninterrupted flushing of the eyes is important. A doctor must always be consulted if chemicals are splashed in the eyes.
3. In case of acid/base in the eyes, use eye-wash bottle, which contains a buffered saline solution.

In case of eye injury, call first for advice. The emergency room at St. Erik's Eye Hospital, Eugeniavägen 12, is open 8 a.m. - 4 p.m. At other times, call Vårdguiden.

Corrosive injuries and poisoning

3.9 Safety data sheets/product information sheets for the chemicals you use must be available in the lab, usually electronically via KLARA. When in doubt, call **112** and request toxin information in acute cases and, in less acute cases, call the Swedish Poisons Information Centre.

After incidents or accidents

3.10 All risks, incidents or accidents that occur at MSE must be reported to KTH centrally, according to the following procedure: https://intra.kth.se/en/anstallning/arbetsmiljo/anmalan-av-tillbud-risk-och-arbetsskada-1.490817 Personal injuries are also reported to the Swedish Social Insurance Agency. For more information, contact the safety representative.

3.2 Cardiopulmonary resuscitation (CPR) and defibrillator location

See instructions in the appendix regarding how to examine injured individuals. In the event of respiratory arrest: perform manual CPR until someone has retrieved the defibrillator.

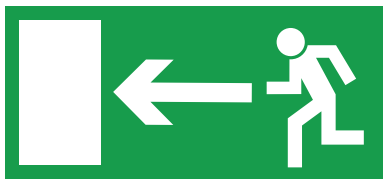
Defibrillators on MSE premises are located on level 2 (entrance level), corridor M101C, outside of room M109. Note this location.

3.3 Fire and evacuation action plan

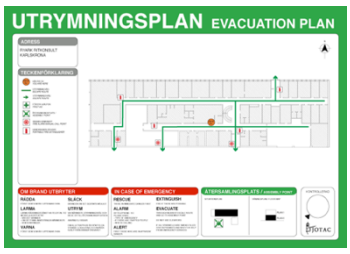
Fire is always serious and can have catastrophic consequences for individuals and organisations. You must therefore have a basic knowledge regarding fire and evacuation. Knowledge saves lives, property and organisations. Therefore, study evacuation signs carefully and apprise yourself of the location of fire extinguishers, evacuation routes (including alternative evacuation routes) and reassembly points. Alarms must always be taken very seriously.

WARN	3.11	Warn those around you that a fire has broken out. Use the alarm button to trigger fire and evacuation alarms if they are not triggered automatically.
RESCUE	3.12	Rescue and assist all persons in immediate danger and evacuate the premises. If possible, close doors and windows to reduce the spread of fire and smoke. Crawl out of a burning or smoke-filled room; in a fire, smoke rises, making it easier to see and less dangerous to breathe at floor level.
ALERT	3.13	Alert emergency services by dialling **112** and requesting the fire brigade.
EXTINGUISH	3.14	Extinguish the fire if possible without taking unnecessary risks.
EVACUATE	3.15	Evacuate the building via the evacuation routes indicated in the evacuation plan and the guidance markings.
	3.16	Go to the reassembly point, as marked on the evacuation plan.
After incidents or accidents	3.17	Evacuation counts as an incident or accident and must be reported to KTH centrally (see 3.1). Forms and information regarding routines are available at https://intra.kth.se/en/anstallning/arbetsmiljo/anmalan-av-tillbud-risk-och-arbetsskada-1.490817

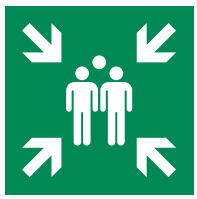
Fire extinguisher sign



Guidance for evacuation routes



Evacuation plan sign
(Wikipedia/Ryark.se/CC BY-SA 3.0)



Reassembly point sign
(Wikipedia/MaxxL)

3.3.1 More detailed description of fire measures

MSE has a fire and evacuation alarm that is **NOT** directly linked to the emergency and rescue services. The alarm can be triggered manually if necessary by means of alarm buttons located along evacuation routes. In the event of evacuation, alarm bells ring and lights flash (where installed). Doors opened with magnets close automatically in the event of fire to prevent the spread of fire.

Alert	3.18	In the event of fire and/or danger of fire, explosion or gas emission, the emergency and rescue services (SOS Alarm) must be alerted: call **112**. In addition to the SOS Alarm, you must alert KTH alarm by telephone: **08-790 7700.**
	3.19	When calling the SOS Alarm, provide clear information regarding: Name, address and what has happened: fire, gas leak, etc.
	3.20	Meet the emergency and rescue services to show them the way and provide additional information.
	3.21	In the event of a gas or chemical spill, press the fire alarm button to evacuate the building and simultaneously alert the emergency and rescue services (112).
	3.22	Calling 112 directly informs them that the alert is acute and provides them with information about what has triggered the alarm.
Extinguishing equipment	3.23	Carbon dioxide, powder and foam extinguishers, fire blankets and emergency showers are strategically placed in corridors, laboratories, etc. **In the event of electrical fire**: Use carbon dioxide extinguishers. **In case of solvent fire**: Use carbon dioxide or foam/powder extinguishers. For more information regarding the different types of fire extinguishers and their uses, see the following two pages.
Extinguishing	3.24	For simple fires - use a hand-held fire extinguisher. In the event of fire on clothing, extinguish it with a fire blanket, other cloth material (do not use synthetic clothing) or an emergency shower.
Laboratory fire	3.25	**RESCUE, ALERT, EXTINGUISH** 1. Evacuate the laboratory immediately

2. Evacuate the injured
3. Alert the emergency and rescue services
4. If the fire is limited and only if it can be extinguished without risk of injury, start extinguishing the fire.
5. Close doors to the lab if the fire proves too severe to extinguish. This reduces oxygen supply and inhibits fire development.

3.26 When the alarm sounds, it is mandatory to evacuate the **entire** building.

Evacuation

3.27 When the evacuation alarm sounds:

Stop work as quickly as possible, but in a safe and secure manner. When working in a fume cupboard, work must be completed quickly in a way that ensures safety for a longer period. Then close all the hatches to the fume cupboard. Check that no one is left behind in the room. Close doors and windows after you. The person responsible for fire safety (yellow-orange vest) and designated evacuation supervisors (orange vests) check that all rooms in the immediate vicinity have been evacuated and that staff have begun evacuating and that all internal doors have been closed. Anyone remaining, e.g., someone in the toilet, a disabled person, etc., is reported to the incident commander.

3.28 Teachers are the evacuation supervisors for student groups when teaching is taking place in the room.

3.29 Take alternative evacuation routes (emergency exits) if needed. Never walk through smoke.

3.30 All staff should proceed immediately to the building's reassembly point.

3.31 Stay at the reassembly point and await further information. It is not permitted to enter the building before permission is given by the emergency and rescue services. The silencing of the alarm bells does not mean that you can re-enter the building. An alternative reassembly point may be indicated by the emergency and rescue services.

3.3.2 Description of fire extinguishers and fire training

Fire

3.32 For a fire to start, there must be combustible material, oxygen and heat. If any of these conditions are removed,

the fire will go out. Note: This does not apply to electric batteries. Fires in these cannot be extinguished.

Fire extinguishers

3.33 Different fire extinguishers are suitable for extinguishing fires in different materials. A larger hand-held fire extinguisher is emptied in about 20-30 seconds. Spray distance varies with type: carbon dioxide extinguishers require getting close (1-2 m) and aiming the nozzle at the seat of fire, while both foam and powder extinguishers have a spray distance of 5-10 m. It is important to know how to use a fire extinguisher in order to make effective use of the extinguisher in extinguishing.

3.34 Fire extinguishers are used as follows:

1. Carry the fire extinguisher by the lower handle and release the safety pin by pulling it straight out.
2. Approach the fire standing at a safe distance.
3. Keep a firm grip on the nozzle and aim it at the seat of fire.
4. Trigger the fire extinguisher by pressing down the upper handle. Move the hose in small movements to spread the extinguishing agent.

3.35 A used fire extinguisher must always be refilled.

Carbon dioxide extinguishers

3.36 Contain carbon dioxide (a gas) which extinguishes fire quickly and "cleanly" but extinguishes embers poorly. It is important to aim the nozzle at the seat of fire, not the flames. When extinguished with carbon dioxide, the fire may flare up again if the object has not cooled down sufficiently before the carbon dioxide has dispersed. Carbon dioxide does not conduct electricity and is therefore advantageous for extinguishing fires in electrical equipment. Carbon dioxide is very cold and should not be used to extinguish fires in clothing or on people.

Foam extinguisher

3.37 Foam extinguishers effectively extinguish fires in fibrous materials (e.g., wood, paper, textiles) and burning liquids. The foam settles tightly over the seat of fire, extinguishing and cooling it. The foam then remains to protect against re-ignition. The foam is electrically conductive and unsuitable for use in extinguishing electrical fires.

Powder extinguishers

3.38 Powder extinguishers extinguish most types of fires and have a high extinguishing effectiveness. The downside is that powder is difficult to clean up and dirty - but so are fires. Therefore, avoid using powder extinguishers in rooms with delicate equipment. Powder does not conduct

electric current, which makes it suitable for extinguishing electrical fires.

3.39 At MSE, there are carbon dioxide extinguishers in all laboratories and powder extinguishers outside chemical and solvent storage areas. Foam extinguishers are found in office environments.

Fire training 3.40 KTH regularly organises fire training for KTH staff. It is compulsory that you participate in such training.

3.3.3 Reassembly points for evacuation alarms

Study the safety and crisis web pages at the ITM intranet (https://intra.kth.se/en/itm/sakerhet/krisorganisation-vid-itm-1.845850)to learn the reassembly points of various school buildings. Each entrance has an evacuation board with instructions on exits and emergency exits. Study it. This is particularly important when you are visiting a place other than your usual place of work, e.g., when teaching.

MSE's reassembly point is the car park in front of KTH Hallen (Brinellvägen 38).

3.4 Power outage action plan

Contact Akademiska Hus Emergency at 010-557 24 00 (24 hours a day).

Blackout 3.41 Evacuation of premises should be considered in the event of total blackout. If possible, someone should be left behind to check that nothing unforeseen happens to equipment left on during the power outage (hot plates, distillation equipment, etc.).

3.42 Torches are located at the exit of each lab.

Lifts 3.43 In the event of a power failure, the lifts stop, trapping both people and goods inside. All lifts at KTH have emergency alarms, which means that the signal can be heard in adjacent stairwells. The emergency phone connects to the on-call operator around the clock.

Ventilation system 3.44 In the event of a power outage, ventilation is switched off. Close all hatches to the fume cupboards to prevent solvent vapour leakage. Switch off all fragile equipment that could cause danger or damage when power is restored. Evacuate all labs and close all lab doors. Equipment connected via the pre-regulated electrical sockets on the fume cabinet remains switched off until the power is switched on manually in the fume cabinet.

3.45 The evacuation leader or safety representative should consider whether the premises must be evacuated.

3.46 If "life-threatening experiments" are in progress and cannot be stopped in the event of a power outage, the risk assessment must include a description of the response and the measures to be taken in the event of a power outage.

3.5 Action plan for water outages

For any planned disruption in water supply, information will be shared with those affected by the disruption. In the event of unplanned water outages, please contact Akademiska Hus Emergency at 010-557 24 00 (24 hours a day).

Laboratory work

3.47 Do not plan any laboratory work that requires continuous access to tap water during a planned water outage.

3.48 The supervisor together with the safety representative decides whether normal laboratory work without risk elements shall be permitted during a planned water outage, given that emergency showers will not work. If laboratory work is carried out, eye wash bottles should be available in the laboratory.

3.49 The risk assessment of a planned experiment must always include what might happen and how to react in the event of a sudden and unplanned water outage. This is particularly important for all activities that require cooling water. In experiments with risk of fire, explosion or other accident in the event of a sudden loss of cooling water, safety equipment is required in the form of a flow meter which immediately cuts off the power supply when the water flow falls below a certain level.

4 Important contact details

SOS Alarm	112
KTH alert	08-790 77 00
Health care advice, Vårdguiden	1177
St Erik's Eye Hospital, emergency eye care	08-123 231 00
Swedish Poisons Information Centre	Emergency: 112, less urgent: 010-456 67 00

Akademiska Hus - acute issues	010-557 24 00
Telephone number of Stockholm's three largest taxi companies:	Taxi Stockholm 08-15 00 00 Sverige Taxi 020-20 20 20 Taxi Kurir 0771-86 00 00

5 Links and literature

This regulation is based on the Swedish Work Environment Authority's statute book (AFS): (https://www.av.se/en/work-environment-work-and-inspections/publications/foreskrifter/)

- *Arbetsplatsens utformning* (Workplace Design) AFS 2020:1
- Chemical Hazards in the Working Environment AFS 2011:19 (amended regulations available)
- *Hygieniska gränsvärden* (Occupational exposure limits) AFS 2018:1 (amended regulations available)
- *Gaser* (Gases) AFS 1997:7 (amended regulations available)
- Use of Personal Protective Equipment, AFS 2001:3
- *Gravida och ammande arbetstagare* (Pregnant and breastfeeding workers) AFS 2007:5

MSB's informational material regarding flammable and explosive goods: https://www.msb.se/sv/amnesomraden/skydd-mot-olyckor-och-farliga-amnen/brandfarligt-och-explosivt/informationsmaterial-om-brandfarliga-och-explosiva-varor/

MSE’s intranet pages on safety and crisis: https://intra.kth.se/en/itm/verksamhetsstod/institutioner/internt-mse

ITM’s intranet pages on safety and crisis: https://intra.kth.se/en/itm/sakerhet/krisorganisation-vid-itm-1.845850

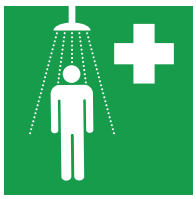
6 Appendix

A.1 Important signs/hazard pictograms

Below you will find an overview of the important and common signs/hazard pictograms in your workplace. Please note that older orange or yellow signs with the hazard symbols may still be present. A complete list is available on the Swedish Work Environment Authority's website:
https://www.av.se/arbetsmiljoarbete-och-inspektioner/publikationer/skyltar/

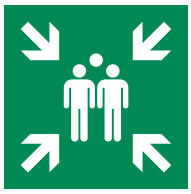
Emergency signs


First Aid


Emergency shower


Eye wash


Evacuation route


Reassembly point
(Wikipedia/MaxxL)
.

Warning signs

Flammable substances/goods. Keep away from heat, sparks and open flames.

Explosive substances. Handle with care and keep away from heat, sparks and open flames.

Acute toxicity. Can be fatal upon swallowing, skin contact or inhalation.

Corrosive substances. Dangerous upon skin contact or in eyes or mouth.

Serious health hazard. May be carcinogenic and may affect fertility. May cause allergies.

Gas under pressure. Do not heat due to risk of explosion.

Environmentally hazardous substances. Dangerous for the environment.

Oxidising substances/goods May cause or feed fire.

Health hazard. Can bring about itching and irritation of the skin or eyes, can bring about skin allergies or make you drowsy or dizzy.

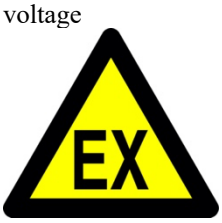
Danger high voltage

Danger

Laser radiation

Radioactive substances

Strong magnetic field



Explosion hazard area when handling flammable gases and liquids

Fire safety signs

Fire extinguishers

Other fire protection, possibly with additional sign, e.g., fire door, fire ventilation, smoke hatch or fire blanket

Prohibition signs

No smoking

Smoking/open flames prohibited

Prohibited to use water when extinguishing fire

Authorised access only

Do not touch

Mandatory signs

Respiratory protection

Face protection

Hearing protection

Safety glasses

Protective gloves

A.2 CPR action plans

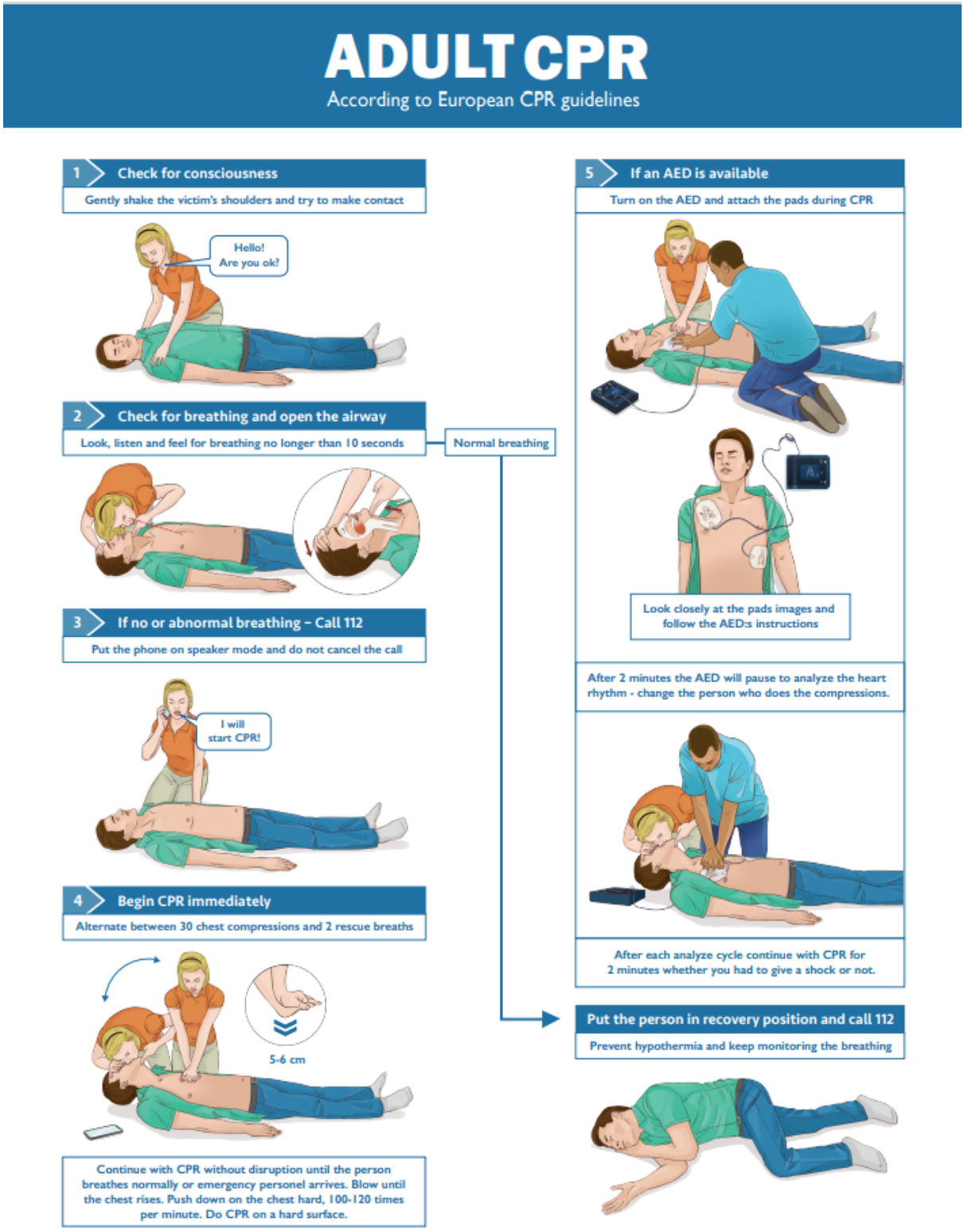


Figure 2: https://www.hlr-experten.se/hlr-affischer/

7 Acknowledgement of safety regulations

The undersigned has read and understands and will comply with the contents of the safety regulations for employees and students at the Department of Materials Science and Engineering.

Date: _____

Signature: _____

Name clarification: _____

After being signed, this page is submitted to the operations controller at Materials Science and Engineering for record filing.

8 Notification of changes

The following changes were made for version 1.1 (March 24, 2023) in addition to minor language changes:

- Paragraphs amended: 2.65, 2.66, 2.67, 2.75, 2.90, 3.34
- Paragraphs added: 2.84, 2.85
- Sections added: Section 2.2 Work during pregnancy or breastfeeding