**Risk assessment for Insert name of experiment or equipment, not abbreviation**

**Instructions**

This template is made to easily carry out risk assessments. What you as assessor(s) need to do is:

1. Fill in the required information in Sections 1 - 10. Remove the instruction texts highlighted in yellow. If entire sections or parts of it don’t apply, state so explicitly.
2. If the activity involves chemical hazards, carry out a risk assessment for chemical hazards in Klara as well. Print out the completed Klara risk assessment and accompany to this document.
3. Answer the control questions in Section 11 and get all signatures in Section 12. The risk assessment is approved/disapproved by signature of the head of department, Joakim Odqvist.
4. The original risk assessment is stored with the department's operations controller, Eva Werner Sundén and will also be uploaded to the Klara system. All present and future employees concerned with the activity described herein shall be informed of the content of the risk assessment.

**Date of risk assessment:** State the date the assessment was drafted!

**Version of risk assessment:** State the version of the assessment!

**Date of scheduled review:** All risk assessments at MSE are reviewed annually, in January each year.

In any case, a risk assessment should be reviewed when either the current assessment is no longer valid and/or if at any stage there has been significant changes to the specific activity or task. Significant changes can include parameters like material, concentration/temperature/current, addition of equipment, design of premises, ventilation, cooling, etc. Discuss with the laboratory responsible or safety representative in the case you are unsure whether a risk assessment needs to be reviewed.

Risk assessments should always be reviewed following an accident, incident, or ill-health event.

# Location

Room number: State the location where the activity takes place!

Address: Brinellvägen 23, 100 44 Stockholm

* 1. Laboratory responsible

Select Laboratory responsible from the drop-down list

## 1.2 Safety representative

Inform the local safety representative (skyddsombud) before this risk assessment is initiated or changed/updated! The safety representative has the legal right to be involved in conducting risk assessments and shall be given the opportunity to participate, bring forward views, and suggest measures (AFS 2001:1).

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Position | Email | Contact number |
| Stephan Schönecker | Researcher | skyddsombud@mse.kth.se | 08-790 8868 |

# Brief description of what type of experiment or equipment to be used

Write a short description of the experiment! If possible, use a picture to illustrate/explain the experiment. Specify what type of gases, chemicals, materials, etc. are involved in the experiment. If one or several parameters, such as concentration or temperature, might be altered in an experiment include it from the beginning to avoid having to revise the risk assessment. Specify if any adjustments were made to the furnace/equipment setup, for example use of water bath, hardware changes or other external instruments involved.

For example: *Reduction experiment of iron ore pellets using carbon monoxide and carbon dioxide gas mixture. The furnace used for these experiments is a high temperature vertical tube furnace from Entech equipped with a* *sealed TGA unit that sits on top of the furnace. The temperature span used for these experiments is between 700-950 deg C. In total three gases are used, argon for flushing and CO and CO2 mixed to a fixed ratio for the reduction process.*

# Brief overview of the experimental method

Explain the method of the experiment that goes through the main steps during the experiment procedure. For example: *Load the sample on weight balance, close the furnace and check for leaks, turn on water cooling, introduce inert gas, lower the sample down in the chamber and then start heating with a fixed heating rate.* It can also be described with bullet points to make it easier to follow each step in the procedure.

# Routine maintenance

Deferring maintenance can create safety or health risks in the future. If applicable, describe necessary routine maintenance for equipment or experimental setup to keep risk probability ranks at the identified levels! For example: *Make sure the gasket in the regulator for the gas bottle is intact when replacing the gas bottle, check for any leaks in the gas pipes before commencing the experiment, clean any necessary parts of the instrument/setup etc.*

# Personal protective equipment

State what personal protective equipment is required for the work, and the procedures for which the

equipment is to be worn!

# Emergency shutdown procedure

If applicable, explain how to turn off the equipment in case of an emergency! If no emergency shutdown is available, explain in detail how to proceed to turn off the equipment in case of an emergency. You may include a picture that shows where the emergency shutdown switch is located for the equipment.

# Action plan in the event of an accident or unexpected situation

Explain what may occur in the event of an accident with the present experiment or equipment and when unexpected events happen! Explain the procedures for how to act in such cases! State which damage limiting and remedial measures were taken to prepare for unexpected events!

Unexpected events are fire, evacuation, ventilation outage, power outage, water outage, chemical spill, gas leakage, equipment that is prone to failure breaking during the experiment, etc.

## Fire mitigation and evacuation route

Specify the location of the nearest fire extinguisher, fire blanket, and emergency manual push button for evacuation alarm! Describe the nearest evacuation route to the local assembly point as well as an alternative route!

Note: The evacuation alarm at Brinellvägen 23 can be started manually via push buttons located near escape routes or automatically via an automatic fire alarm (smoke detectors). When evacuating, sirens ring and lights flash (where they are installed). **The alarm system at Brinellvägen 23 is NOT connected to the fire service, 112 must be called in case of emergencies such as fire.** Also call KTH’s emergency number 08-790 7700 and report the incident.

# Risk assessment

Below final assessment systematically evaluates the potential (future) risks that are involved in the present activity. The risk assessment provides answers to the following questions: What can go wrong? Who might be harmed and how? What is the probability of that happening? What are the consequences? What have you done to control the risks? To help with the risk assessment, the following risk matrix is used. More information on the matrix can be found in: *Klara – Manualer – Manual för riskbedömning*.

|  |  |
| --- | --- |
| **Probability***For injury/illness*In all probabilities, various factors are considered* Frequency and duration.
* Accident history[[1]](#footnote-2).
* Opportunity to avoid or limit the damage; the injured person’s training on the equipment, awareness of the risk, sudden – rapid or slow event.
* Existing protection.
 | **Consequence** (Severity)*Injury/illness rank if the accident occurs and/or long-term harmful effect*  |
| 0.Harmless or trivial*No first aid needed, no injuries.* | 1.Minor*First aid treatment needed, minor injury, or shorter sick leave.* | 2.Moderate*External medical treatment needed, or longer sick leave.* | 3.Major*Extensive injuries, hospitalization needed, or loss of limbs.* | 4.Death*Single death or multiple major injuries.* | 5.Catastrophic*Several deaths.* |
| 5. Very common *Once a day.* | 2 | 3 | 4 | 4 | 4 | 4 |
| 4. Common *Monthly.* | 1 | 2 | 3 | 4 | 4 | 4 |
| 3. Quite common *Once a year.* | 1 | 2 | 3 | 3 | 4 | 4 |
| 2. Quite unusual *Once every ten years.* | 1 | 1 | 2 | 3 | 4 | 4 |
| 1. Unlikely *Once every 100 years.* | 0 | 1 | 2 | 2 | 3 | 3 |
| 0. Very unlikely *Less than once in 100 years.* | 0 | 0 | 1 | 1 | 2 | 2 |

0. Negligible risk.

1. Acceptable risk, does not need to be addressed.

2. Some risk, needs to be addressed.

3. Serious risk, needs to be addressed.

4. Very serious risk, needs to be addressed.

**Priority order for choice of measures to mitigate the identified risks to an acceptable level:**

1. Eliminate the source of the risk.
2. Take technical protective measures to minimize exposure to the risk and risk of personal injury (e.g., ventilation in connection to chemical hazards, perform work in a closed system, use remote controlled experiments).
3. Take organizational measures to minimize the risk (e.g., improve routines, limit the number of exposed persons through choice of place and time), raise awareness of risks by putting up prohibition signs, mandatory signs, and warning signs
4. Change to less dangerous work methods, processes, or equipment.
5. Use personal protective equipment when measures in accordance with the above are insufficient or impossible to implement.

**What is a chemical hazard****[[2]](#footnote-3)?**

Chemical product, chemical substance, or several chemical substances together which can cause ill- health or accidents through

* properties which make it hazardous to health,
* its properties when it depends on the way in which the substances are used or occur,
* its temperature,
* reducing the level of oxygen in the air or
* increasing the risk of fire, explosion, or other hazardous chemical reaction.

## Risk assessment – Experiment setup

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| # | Identified Risk | Consequence | Appraised Probability | Appraised Consequence | Risk Level | Action Taken | Residual Risk Level |
| List identified risks for theexperiment. Focus on risks related to the experiment, modifications done to the experiments, specificequipment used in the experiment, etc. Think of risks for both personnel and equipment/costs. | What is the consequence if the stated risk actually happens? | 0.Very unlikely 1. Unlikely2. Quite unusual3. Quite common4. Common5. Very common | 0. Harmless or trivial1. Minor2. Moderate3. Major4. Death5. Catastrophic | Value from the matrix | What have you done to mitigate or eliminate the risk?**Note:** A total risk rated to 2 or more must be addressed before running the experiment. | Total Residual Risk (after action) |
| 1 | *Example: samples are hot after heat treatment in a furnace* | *Example: the person handling the sample can be burned if they touch the sample while it is hot and any flammable materials can catch fire if they touch the hot sample* | *Example: 3* | *Example: 2* | *Example: 3* | *Example: the person handling the sample must wear heat resistant gloves, apron and shoes and handle samples with long tongs. Samples should be left to cool on a special heat resistant surface with clear warning signs about the hot surface. All flammable materials must be removed from the room before experiments are started.* | *Example: 1 [this comes from an assessment that for this particular hazard, the protective actions will reduce the frequency to level 2 and the severity to level 1]* |
| 2 |  |  |  |  |  |  |  |

## Risk assessment – Chemical hazards (see definition in Sec. 8)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| # | Identified Risk | Consequence | Appraised Probability | Appraised Consequence | Risk Level | Action Taken | Residual Risk Level |
| List identified risks for the chemical products and chemical substances used and formed by chemical reactions or parameters like temperature, etc. For example, dust from cutting in metal/ceramic, fumes from the heated sample, molten metal, epoxy, water vapor overall chemical mixtures that may present risks for personnel. | What is the consequence if the stated risk actually happens? | 0.Very unlikely 1. Unlikely2. Quite unusual3. Quite common4. Common5. Very common | 0. Harmless or trivial1. Minor2. Moderate3. Major4. Death5. Catastrophic | Value from the matrix | What have you done to mitigate or eliminate the risk?**Note:** A total risk rated to 2 or more must be addressed before running the experiment. | Total Residual Risk (after action) |
|  |  |  |  |  |  |  |  |

## Risk assessment – Other (ladders, noise, gas bottle transportation, handling of chemicals, effect on other experiments, etc.)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| # | Identified Risk | Consequence | Appraised Probability | Appraised Consequence | Risk Level | Action Taken | Residual Risk Level |
| List identified risks for the overall use of the lab or lab equipment. Objects placed on high shelves, tubes, gas pipes, noise, low light in the room, transportation of heavy objects, ladder heights etc. Consider that your experiment may affect other experiments by use of cooling water, ventilation, electricity. | What is the consequence if the stated risk actually happens? | 0.Very unlikely 1. Unlikely2. Quite unusual3. Quite common4. Common5. Very common | 0. Harmless or trivial1. Minor2. Moderate3. Major4. Death5. Catastrophic | Value from the matrix | What have you done to mitigate or eliminate the risk?**Note:** A total risk rated to 2 or more must be addressed before running the experiment. | Total Residual Risk (after action) |
|  | *Example: Gas bottle falling during transportation could crush feet* | *Falling bottle could break bones in feet* | *2* | *2* | *2* | *Wear protective shoes with crush-resistant toe caps. Only transport gas bottles in dedicated trolleys with chains or other restraining device to prevent bottles from falling. Ensure at least two people are present when transporting gas bottle to keep bottle upright. Avoid steep slopes or sharp corners.* | *0 [the probability of such an event is reduced by the protective actions and the consequences are reduced by the protective footwear]* |
|  | *Example: Damage to gas bottle during transport could lead to explosive release of gas* | *Explosive release of gas could lead to* | *2* | *4* | *4* | *Only transport gas bottles in dedicated trolleys with chains or other restraining device to prevent bottles from falling. Ensure at least two people are present when transporting gas bottle to keep bottle upright. Avoid steep slopes or sharp corners. Ensure gas bottle has protective stopper and new gasket in the gas outlet (and remove any regulator BEFORE transportation)* | *1 [the protective measures make it much less likely that the bottle will ever fall over, but do not address the consequences]* |
|  | *Example: Leak of asphyxiant gas during transportation in lift (elevator) could lead to suffocation* | *Person travelling in lift (elevator) with gas bottle could die of asphyxiation* | *1* | *4* | *3* | *Never travel with a gas bottle. Place bottle in lift (elevator) and place warning sign inside the lift (elevator) to warn people on other floors not to get into the lift. Ensure gas bottle has protective stopper and new gasket in the gas outlet (and remove any regulator BEFORE transportation)* | *0 [if the warning sign is in place, nobody should get in the lift; the consequences are unchanged]* |

# Immediate first aid to prevent serious injuries

In case the work involves chemical hazards, state the first aid treatment procedure as provided in the safety data sheet for the relevant chemical substances and products! Explain also how to deal with other injuries such as crush injuries and burn injuries, if applicable!

Take note of the *Safety regulations at MSE* for general advice on life saving treatment, first aid treatment of burn and eye injuries!

1. Other relevant routines

If applicable, list all MSE routines as well as special routines for work in specific laboratories that are relevant to the activity described in the risk assessment! This may include MSE’s routine for handling dangerous waste or MSE’s gas handling routine. All MSE routines can be found in MSE’s intranet[[3]](#footnote-4). Make sure you have read and understood these routines before commencing work!

# Control questions

### Fill in (e.g., mark with **X**) all questions together with the safety representative, laboratory responsible, and assessor(s)!

|  |  |  |
| --- | --- | --- |
|  | **Yes** | **No** |
| Have actions been taken for all identified risks with a total risk level of 2 or higher? |  |  |
| Is the laboratory responsible satisfied that any stated actions are practical and appropriate?  |  |  |
| Does the work involve any risk of personal injury/illness with residual consequence/severity rank $\geq $2? |  |  |
| Does the work involve potentially risky tasks if carried out alone or in evenings and weekends?  |  |  |
| Does the activity involve risk of severely damaging the equipment or premises? E.g. Corrosive gases/liquids, melting gas pipes, mechanical wear, water damage to premises or electrics, etc. |  |  |
| Does the activity involve chemical hazards?  |  |  |
| (If chemical hazards exist) | Have you carried out a Klara risk assessment? |  |  |
| Have you identified and registered the chemical hazards that are used/stored and can be expected to form during the experiment (AFS 2011:193)? |  |  |
| Do occupational exposure limit values exist for any of the identified and registered chemical hazards (AFS 2018:1[[4]](#footnote-5))? |  |  |
| Does the activity involve potential exposure to allergenic chemical substances? If yes, has a risk assessment as required in 37 § of AFS 2011:19 been performed? |  |  |
| Does the activity involve potential exposure to CMR substances? If yes, has a risk assessment as required in 40 § of AFS 2011:19 been performed? |  |  |
| Have you looked up information on the personal protective equipment when such is required for carrying out the work (both physical and chemical hazards)? |  |  |

# Declaration

* 1. Assessor(s)

I hereby declare that the information contained in this document is, to the best of my knowledge, correct and truthful. I declare that I have sufficient knowledge to assess the risks contained in this document and that the procedure is both necessary and is carried out in such a way that the risks are as low as reasonably practicable. Where necessary, I have sought and obtained expert advice on the risks and ways in which these risks may be minimized.

I undertake to update this document if any of the information becomes outdated or if new information is required. I understand that this document is valid until the next scheduled annual review, at the longest for a maximum of one year from the date it is countersigned by the laboratory responsible, and the risks must be reassessed, and the document must be renewed.

Duplicate the below box as needed; one box for every participating assessor (may include your supervisor and the instrument/tool responsible)!

|  |  |
| --- | --- |
| Name of assessor | Email address |
|  |  |
| Signature | Date |
|  |  |

* 1. Laboratory responsible

I hereby declare that the information contained in this risk assessment is, to the best of my knowledge, correct and truthful. I have verified that the stated actions are implemented.

|  |  |
| --- | --- |
| Name of laboratory responsible | Email address |
|  |  |
| Signature | Date |
|  |  |

* 1. Safety representative

I have been given the opportunity to participate in conducting this risk assessment and have provided views and proposed measures pertaining to the risks stated.

|  |
| --- |
| Remaining comments, if any |
| Name of safety representative | Email address |
|  |  |
| Signature | Date |
|  |  |

* 1. Head of department

[ ]  Approved until next scheduled annual review (January every year).

[ ]  Not approved.

|  |
| --- |
| Approval/non-approval comment, if any |
| Name of head of department | Email address |
| Joakim Odqvist | odqvist@kth.se  |
| Signature | Date |
|  |  |

1. For instance, Statistic on occupational accidents from the Swedish Work Environment Authority <https://www.av.se/arbetsmiljoarbete-och-inspektioner/arbetsmiljostatistik-officiell-arbetsskadestatstik/arbetsskador-2021/> [↑](#footnote-ref-2)
2. AFS2011-19 of the Swedish Work Environment Authority, <https://www.av.se/en/work-environment-work-and-inspections/publications/foreskrifter/kemiska-arbetsmiljorisker-afs-2011-19-provisions/> [↑](#footnote-ref-3)
3. <https://intra.kth.se/en/itm/verksamhetsstod/institutioner/internt-mse/sakerhet-access-till-labb-1.1182665> [↑](#footnote-ref-4)
4. Swedish Work Environment Authority <https://www.av.se/arbetsmiljoarbete-och-inspektioner/publikationer/foreskrifter/hygieniska-gransvarden-afs-20181-foreskrifter/> [↑](#footnote-ref-5)