Field Work Risk Assessment Tool (Field R.A.T.)

The Field Work Risk Assessment Tool (Field RAT) provides a framework for risk assessment complimenting the process researchers already use to answer scientific questions in the field.

This tool provides a format for researchers to systematically identify, evaluate, and control hazards to reduce risk of injuries and incidents. Conduct a risk assessment prior to conducting field work and associated experiments for the first time and review the [Field Work R.A.T. Guidelines](https://www.ehs.washington.edu/system/files/resources/field-work-risk-assessment-tool-guidelines.pdf) document for further details.

The risk assessment process involves rating the risk of the field experiment from “low” to “unacceptable” risk. Consult with your PI/supervisor and EH&S if your risk rating is “high” or “unacceptable” to redesign the experiment and/or implement additional controls to reduce risk.

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| --- | --- |
| **Field Project / Activity:** | |
| **Site / Location:** | |
| **PI / Lab Group:** | |
| **Supervisor:** | |
| **Department:** | **Start Date:** |
| **Form Completed By:** | **On (Date):** |

# Phase 1: Explore

**Identify your research question and approach.** What question are you trying to answer? Where will you conduct your research? What are you trying to measure or learn? What is your hypothesis? What approach or method will you use to answer your question? Are there alternative approaches?

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| **Research Question(s)** |
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| **Approach(s) or Method** |
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**Identify the field / physical hazards (check all that apply):** For each task, identify all of the hazards and consequences that could occur. Think about the inherent hazards of the field environment, material, equipment or activity; what could go wrong (failures and/or modes of failure); what is worst-case credible consequence.

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| **Field and Physical Hazards** | |
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| * Ladder work - severe injury, fatal fall * Poor housekeeping – congestion; slip, trip, or fall; injuries * Machinery – moving parts; amputation * Flammable Liquids – vapors; fire/explosion * Hazardous materials - uncontrolled spill/release * Hazardous materials transportation * Noise - hearing loss * Electricity - shock and/or arc flash * Dusts, fumes, mists, or vapors in air - inhalation * Oxygen displacement - asphyxiation * Confined space - hazardous atmosphere; engulfment; fatality * Portable tools – projectiles; eye injury * Contact with hot, toxic, or caustic chemical/product - burn, injury * Biological exposure - infection | * Repetitive tasks - Musculoskeletal Disorder (MSD) injury * Strain from lifting, pushing, or pulling - MSD injury * Working in awkward position - MSD injury * Lighting problem - seizures, headache * Falling object – struck by; injury * Radiation - exposure * Weather conditions affect safety * Thermal – cold/heat - burn, dehydration * Other (specify): |

**Identify the experimental hazards (check all that apply).** Perform background research to identify known risks of the reagents, reactions, or processes. Review protocols, Safety Data Sheets (SDSs), and safety information for hazardous chemicals, agents, or processes. Review accident histories within your laboratory/department.

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| **Hazardous Agents** |

**Physical Hazards of Chemicals**

☐ Compressed gases

☐ Corrosives

☐ Cryogens

☐ Explosives

☐ Flammables

☐ Organic peroxides

☐ Oxidizers

☐ Peroxide formers

☐ Pyrophorics

☐ Self-heating substances

☐ Self-reactive substances

☐ Substances which, in contact with water, emit flammable or toxic gases

**Health Hazards of Chemicals**

☐ Acute toxicity

☐ Carcinogens

☐ Eye damage/ irritation

☐ Germ cell mutagens

☐ Nanomaterials

☐ Reproductive toxins

☐ Respiratory or skin sensitization

☐ Simple asphyxiant

☐ Skin corrosion/ irritation

☐ Specific target organ toxicity

☐ Hazards not otherwise classified

**Ionizing Radiation**

☐ Irradiator

☐ Radionuclide

☐ Radionuclide sealed source

☐ X-ray machine

**Non-Ionizing Radiation**

☐ Lasers, Class 3 or 4

☐ Lasers, Class 2

☐ Magnetic fields (e.g., NMR, MRI)

☐ RF/microwaves

☐ UV lamps

**Biohazards**

☐ BSL-2 Biological agents

☐ BSL-3 Biological agents

☐ Human cells/blood/ BBP

☐ NHPs/cells/blood

☐ Non-exempt rDNA

☐ Animal work

☐ High risk animals (RC1)

☐ Other (list):

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| **Hazardous Conditions or Processes** |

**Reaction Hazards**

☐ Explosive

☐ Exothermic, with potential for fire, excessive heat, or runaway reaction

☐ Endothermic, with potential for freezing solvents decreased solubility or heterogeneous mixtures

☐ Gases produced

☐ Hazardous reaction intermediates/products

☐ Hazardous side reactions

**Hazardous Processes**

☐ Generation of air contaminants (gases, aerosols, or particulates)

☐ Heating chemicals

☐ Large mass or volume

☐ Pressure > atmospheric

☐ Pressure < atmospheric

☐ Scale-up of reaction

**Physical /** **Other Hazards**

☐ Hand/power tools

☐ Moving equipment/parts

☐ Electrical

☐ Noise > 80 dBA

☐ Heat/hot surfaces

☐ Ergonomic hazards

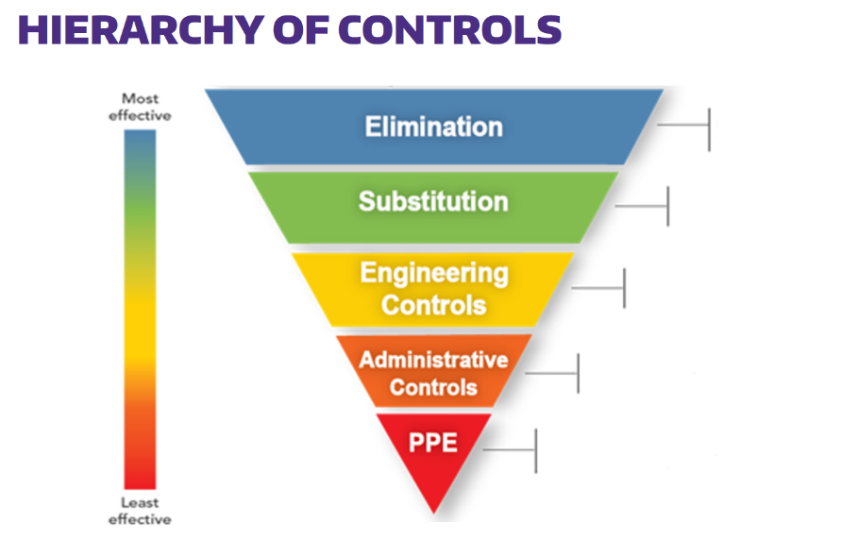
☐ Needles/sharps

☐ Other (list):

# Phase 2: Plan

**Outline the Procedure.** List the steps or tasks for your field procedures and the hazard/potential consequences of each. Include set-up and clean-up steps or tasks. Define the hazard controls to minimize the risk of each step using the hierarchy of controls starting with the most effective (i.e., elimination, substitution, engineering controls, administrative controls, and personal protective equipment). List the hazard control measure you would use for each step or task (e.g., run at a micro scale, wear face shield and goggles).

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| **Steps or Tasks** | **Hazard / Consequence** | **Hazard Control Measure(s)** |
| 1 Click to add first task/step. | * Click to add a hazard and consequence. * Click to add a hazard and consequence. * Click to add a hazard and consequence. | * Click to add a control. * Click to add a control. * Click to add a control. |
| 2 Click to add second task/step. | * Click to add a hazard and consequence. * Click to add a hazard and consequence. * Click to add a hazard and consequence. | * Click to add a control. * Click to add a control. * Click to add a control. |
| 3 Click to add third task/step. | * Click to add a hazard and consequence. * Click to add a hazard and consequence. * Click to add a hazard and consequence. | * Click to add a control. * Click to add a control. * Click to add a control. |
| 4 Click to add fourth task/step. | * Click to add a hazard and consequence. * Click to add a hazard and consequence. * Click to add a hazard and consequence. | * Click to add a control. * Click to add a control. * Click to add a control. |
| 5 Click to add fifth task/step. | * Click to add a hazard and consequence. * Click to add a hazard and consequence. * Click to add a hazard and consequence. | * Click to add a control. * Click to add a control. * Click to add a control. |
| **Add more tasks/steps as needed** |  |  |



**Eliminate use of chemical or hazard**

**Use a less hazardous chemical, concentration, or process**

**Isolate people from hazard (e.g. ventilation, barriers)**

**Change the way people work (e.g. training, work policies, SOPs)**

**Personal protective equipment**

**(e.g. lab coat, appropriate gloves, goggles)**

A hierarchy of controls should be applied starting with the most effective controls (i.e., elimination and substitution) at the top of the graphic and moving down. While personal protective equipment (PPE) should always be used, it should be considered the last line of defense from potential hazards.

**Environmental Controls:** Identify existing controls to eliminate or mitigate the potential hazard/consequence scenario. If the consequence is sever, try to use inherently safe controls and multiple controls to mitigate the risk. Some controls can help prevent the likelihood of the accident scenario by preventing the occurrence or reducing the severity of the consequence.

**Determine and select the appropriate controls and PPE / safety supplies for the field procedure (check all that apply).**

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| **Field Controls / Safeguards** |

**Engineering**

* Secondary containment (berms, vaults)
* Install guards on machine moving parts
* Use scaffold or lift instead of ladder
* Ventilate the area
* Detection and alarm systems (interlocks and notification)
* Use platform ladder instead of regular step ladder
* Guardrails (permanent or temporary)
* Pressure relief
* Isolate the area (barriers)
* Insulate noisy equipment
* Waste/Hazardous materials disposal method(s)
* Fire protection - sprinklers and alarm, field procedures
* Fire extinguisher
* Other (specify):

**Safe Work Practices and Administrative**

* Field RATs
* Field Safety Plan
* Safe work practices
* Chemical Transportation (D.O.T. regulations and UW policies)
* SDSs
* Chemical and Process Standard Operating Procedures (SOP)
* Work permits (LOTO, CSE)
* Use tool lanyards at heights
* Reduce exposure time
* Training (see Section below)
* Field Communication System
* Emergency response team
* Emergency Contact Information
* Exposure control plan
* Other (specify):

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| **Field PPE/Safety Supplies: Conduct PPE Hazard Assessment** |

☒ Appropriate street clothing

(long pants, closed shoes)

☐ Gloves; indicate type: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

☐ Safety glasses

☐ Safety goggles

☐ Face shield and googles

☐ Lab coat / Tyvek suit

☐ Respiratory protection

☐ Personal fall protection equipment

☐ Hearing protection

☐ Hard Hat

☐ Impact / Radiation shielding

☐ Flame-resistant lab coat

☐ Fire extinguisher

☐ Portable eyewash/safety shower

☐ First aid kit

☐ Spill kits

☐ Specialized medical supplies (e.g. calcium gluconate for hydrofluoric acid and amyl nitrite for cyanides

☐ Other (list):

**Identify the appropriate training (check all that apply).** Identify the general safety and procedure based/specific training appropriate for your procedure.

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| **General Safety Training** |

**General/Chemical Safety**

☐ Lab Safety Compliance & Practices

☒ Managing Lab Chemicals

☐ Compressed Gas Safety

☐ Transportation Safety

☐ Hydrofluoric Acid Safety

☐ Formaldehyde Safety

**Biosafety**

☐ Biosafety Training

☐ Bloodborne Pathogens

**Radiation Safety**

☐ Radiation Safety

☐ Laser Safety

**Field Safety**

☐ Equipment Safety

☐ First Aid & CPR

☐ SCUBA certification/diving safety

☐ Driving safety

☐ Boating safety

☐ Other (list):

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| **Job Specific Training** |

☒ Lab/job-specific training

☒ Review of Field Safety Plan

☐ Chemical and process SOP(s) to review (list):

☐ Emergency plans or field evacuation plans

☐ Equipment SOP(s) to review (list):

☐ Other (list):

*1 For guidance on selection of Personal Protective Equipment (PPE), use EH&S PPE Hazard Assessment Tool.*

*2 For guidance on selection of chemical-resistant gloves, see EH&S Website.*

**Specify Required PPE and Training based on checklists above:**

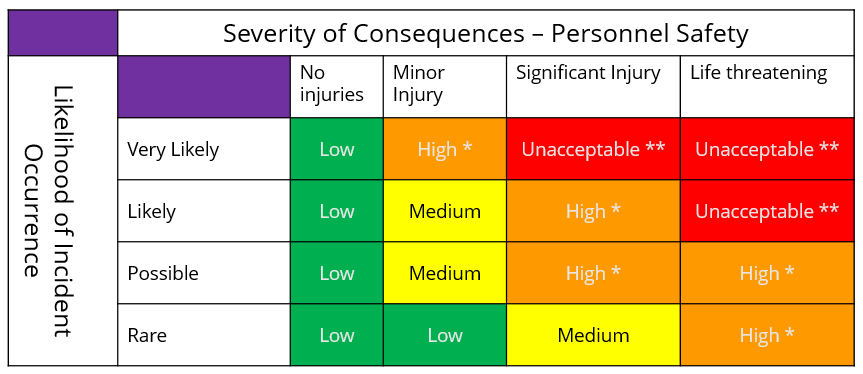
|  |  |
| --- | --- |
| **Required PPE** | **Required Training** |
| Click to add eye and face protection.  Click to add head protection.  Click to add body (foot, leg, hand, or arm) protection.  Click to add hearing protection.  Click to add respiratory protection. | Click to add required training.  Click to add required training.  Click to add required training.  Click to add required training.  Click to add required training.  Click to add required training. |

# Phase 3: Challenge

**Question your methods.** What have you missed and who can advise you? Challenge your hazard control measures by asking “What if…?” questions. “What if” questions should challenge you to find the gaps in your knowledge or logic. Include possible accident and field-specific scenarios. Factors to consider are human error, weather considerations, equipment failures, and deviations from the planned/expected parameters (e.g., temperature, pressure, time, flow rate, and scale/concentration). Update your plan to include any new controls required to address these possibilities.

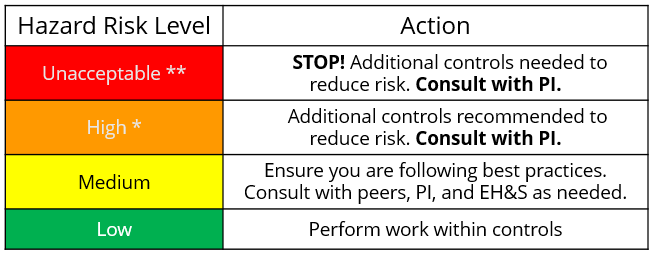
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| **What If Analysis** |
| **What if…?** Examples: there is a loss of cooling? …valves/stopcocks are left open/closed? …there is unexpected over-pressurization? …a spill occurs? …the laser is misaligned? …weather conditions change? |
| **Then…** there may be a runaway reaction. …there may be an unexpected splash potential. …the reaction vessel may fail. …there may be a dermal exposure. …there may be an eye injury. …routes may be inaccessible. |
| **What if…?** |
| **Then…** |
| **What if…?** |
| **Then…** |
| **What if…?** |
| **Then…** |
| **What if…?** |
| **Then…** |
| **What if…?** |
| **Then…** |
| **What if…?** |
| **Then…** |
| **What if…?** |
| **Then…** |

**Assign a risk rating to the experiment.** Based on your procedure outline and the what if analysis, determine the risk rating for the experiment or procedure.



**Risk Rating:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*1The Risk Rating is subjective. The primary goal is for researchers to think about risk, and differentiate unacceptable and high-level risk steps from those with a lower level risk. This will help drive additional consultation and control measures where needed.*

**Revise plan if the risk rating is too high.** Are these risks acceptable? Use this table to determine the action to take based on the risk rating. What are the highest risk steps? What more can you do to control the risks? Return to planning and use the hierarchy of controls to design a safer experiment.

**PI/Supervisor Approval:**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**\***Signature for **High** risk ratings.If needed, contact EH&S (206.221.2339) for recommendations.

**NOTE:** **\*\*Unacceptable** risk-rated experiments **should not proceed**. Introduce further controls to reduce risk. Contact EH&S (206.221.2339) for recommendations and best practices.

# Phase 4: Assess

**Perform a trial run.** How you can test your experimental design? Can you simulate the field environment? Can you conduct a dry run of the procedure without hazardous chemicals/reagents/gases to familiarize yourself with equipment and demonstrate your ability to manipulate the experimental apparatus? Can you run the procedure with a less hazardous material? Can you test your experimental design at a smaller scale? If your procedure requires multiple people, would a table top exercise be useful?

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| **Trial Run** |
| **Trial Run Procedure / Date:** |
| **Did the trial go as expected? Yes ☐ No ☐** |
| **Experimental design changes needed (if any):** |

**Perform and evaluate.** Run your procedure using the appropriate controls you’ve identified. Evaluate controls and hazards as you work. Critique the controls and process you used by answering the following questions. If changes to controls are needed, update your risk assessment tool and re-evaluate any time you revise your process (e.g. changes in scale, reagent, equipment, or field conditions that might increase the hazard/risk). Share your assessment with your PI/colleagues for the next iteration of the experiment.

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| **Evaluate Your Procedure** |
| **What went well?** |
| **Did the controls perform as expected?** |
| **Did anything unexpected occur?** |
| **Did a hazard manifest itself that was not previously identified?** |
| **Were there any close-calls or near misses that indicate areas of needed improvement?** |
| **Did something go exceptionally well that others could learn from?** |
| **I plan to evolve my procedure by...** |

|  |  |
| --- | --- |
| **Procedure Risk Assessment is Complete** | |
| **Form Completed By:** | |
| **Signature:** | **Date:** |
| **PI / Supervisor Signature:** | |