ENVIRONMENTAL HEALTH & SAFETY

FIELD RISK ASSESSMENT TOOL (Field RAT)

This tool provides a format for researchers to systematically identify, evaluate, and control hazards, for the purpose of reducing the risk of injuries, illness, and incidents while conducting field work. A risk assessment must be conducted prior to conducting field work for the first time.

The risk assessment process involves rating the risk of field work from "low" to "unacceptable". Consult with your PI/supervisor and EHS if your risk rating is "high" or "unacceptable" to redesign the work and/or implement additional controls to reduce risk.

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 your 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?

Research Question(s)

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Approach or Method

Identify the field/physical hazards: 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 the worst-case scenario.

Field and Physical Hazards

- ☐ Ladder work - severe injury, fatal fall
- ☐ Poor housekeeping – congestion; slip, trip, or fall; injuries
- ☐ Machinery – moving parts; amputation, strangulation
- ☐ 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 that could affect safety
- ☐ Thermal – cold/heat - burn, dehydration
- ☐ Other (specify):

Identify the experimental hazards: Perform background research to identify known risks of the reagents, reactions, or processes. Review SOPs, SDSs, and other available safety information for hazardous chemicals, agents, or processes. Review accident histories within your laboratory/department and at outside laboratories/departments that perform similar field work.

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
☐ Other (list):

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
☐ ATVs
☐ Slip/trip/fall
☐ Noise > 80 dBA
☐ Heat/cold illness/injury
☐ Animal handling
☐ Needles/sharps
☐ Other (list):

PHASE 2: PLAN

Outline the Procedure: List the steps or tasks of 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., perform only during daylight hours, bring fire extinguisher, wear gloves).

Steps or Tasks	Hazard / Consequence	Hazard Control Measure(s)
1		
2		
3		
4		
5		
Add more tasks/steps as needed	•	•

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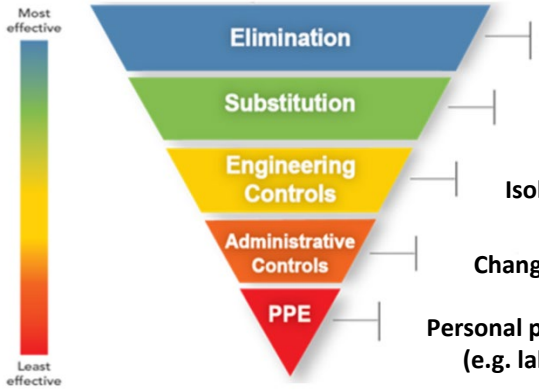
HIERARCHY OF CONTROLS



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)

Use the hierarchy of controls to determine the appropriate hazard controls and PPE/safety supplies for your field work.

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
- ☐ SDSs
- ☐ Chemical and Process Standard Operating Procedures (SOP)
- ☐ Work permits (LOTO, CSE)
- ☐ Use tool lanyards at heights
- ☐ Reduce exposure time
- ☐ Training
- ☐ Field Communication System
- ☐ Emergency Response Team
- ☐ Emergency Contact Information
- ☐ Exposure Control Plan
- ☐ Other (specify):

Field PPE/Safety Supplies: Conduct PPE Hazard Assessment

☐ Appropriate clothing
(long pants and sleeves, closed-toe shoes or boots, hats)

☐ Gloves; indicate type:
_____

☐ Safety glasses

☐ Safety goggles

☐ Face shield and googles

☐ Lab coat/Tyvek suit

☐ Respiratory protection

☐ Personal fall protection equipment

☐ Hearing protection

☐ Hardhat

☐ Impact/radiation shielding

☐ Flame-resistant lab coat

☐ Fire extinguisher

☐ Portable eyewash/safety shower

☐ First aid kit

☐ Spill kit

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

☐ Other (list):

Identify the appropriate training: Identify the general safety and procedure based/specific training appropriate for your procedure.

General Safety Training

General/Chemical Safety

☐ Laboratory Safety

☐ Hazardous Waste Mgmt

☐ Compressed Gas 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):

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):

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.

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…

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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.

Likelihood of Incident Occurrence	Severity of Consequences – Personnel Safety				
		No injuries	Minor Injury	Significant Injury	Life threatening
	Very Likely	Low	High *	Unacceptable **	Unacceptable **
	Likely	Low	Medium	High *	Unacceptable **
	Possible	Low	Medium	High *	High *
	Rare	Low	Low	Medium	High *

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.

Hazard Risk Level	Action
Unacceptable **	**STOP!** Additional controls needed to reduce risk. **Consult with PI.**
High *	Additional controls recommended to reduce risk. **Consult with PI.**
Medium	Ensure you are following best practices. Consult with peers, PI, and EH&S as needed.
Low	Perform work within controls

PI/Supervisor Approval:

_____

*Signature for **High** risk ratings. If needed, contact EHS (505-277-2753) for recommendations.

NOTE: **Unacceptable risk-rated experiments **should not proceed**. Introduce further controls to reduce risk. Contact EHS (505-277-2753) for recommendations and best practices.

PHASE 4: ASSESS

Perform a trial run: How can you 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 operate field equipment and/or manipulate the experimental apparatus? Can you run the procedure with a less hazardous material? If your procedure requires multiple people, would a table top exercise be useful?

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 questions in the section below. 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.

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:	