Hazard Review & Safety Protocol

Guide to practice

CEBC Safety Meeting, 2015.03.11

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What is a hazard review?

An analysis of all the ways in which an experiment or procedure may cause harm to you, your co-workers, or lab.

Adapted from: http://www.stonybrook.edu/ehs/lab/general-lab-safety/hazard-reviews.shtml

Why conduct a hazard review?

- To determine appropriate protective measures (i.e., *the safety protocol*) that you will implement to avoid accidents and injury.
- Required at CEBC for all laboratory activities

Adapted from: http://www.stonybrook.edu/ehs/lab/general-lab-safety/hazard-reviews.shtml

When to conduct a hazard review?

Whenever:

- There is a new procedure, process or test, even if it is similar to older practices.
- There is a change, substitution, or deletion of any of the ingredients.
- There is a significant change in the quantity of chemicals used.
- There is a change in apparatus or equipment.
- There is an accident, near-miss, or unexpected behavior.

Adapted from: http://www.stonybrook.edu/ehs/lab/general-lab-safety/hazard-reviews.shtml

Hazard Review Approval Process

- ***The researcher prepares the review***
  - Obtain hazard review form: cebc.ku.edu/lab-safety
  - Consult advanced researchers for help, if needed
  - Line up reviewers for comment, discuss as needed
  - Prepare ahead of time to allow for corrections & amendments
- ***The reviewers: peers, faculty mentor***
  - Include reviewers from outside your area (e.g., engineering, chemistry, industry partner, KU's EHS, etc.). If needed, seek additional reviewers for multidisciplinary expertise, etc.
- **Give approved form to lab manager, Fenghui Niu, before proceeding with experiment**

“The Form”

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The University of Kansas

Process Hazard Review

Complete this form whenever there is a new experimental procedure or whenever there is a change, substitution or deletion of any aspect of an existing procedure.

The goal is to ensure that the researcher, faculty mentor, and lab manager have reviewed the hazards posed by the experiment and have taken the proper steps to minimize risk of harm or damage. The safety precautions outlined here must be implemented before the procedure is conducted to prevent accidents or injury.

		LAB MGR USE
Name of procedure, process, or experiment, project ID:		Procedure ID #:
Location: (building & room #)		Replaces ID # (if appl.):
Prepared by (name):		
Date:		

Attach the following to this coversheet:

1. Provide an overview of the experiment, process or procedure
2. Describe potential hazards
3. Describe preventive measures
4. Describe how chemicals and samples will be stored
5. Describe how waste will be collected and disposed
6. Provide a detailed operating procedure

Your signature below confirms that you have reviewed the hazards for this process and concur that the precautions outlined here will make the risk of harm as low as reasonably achievable, “ALARA”.

Researcher, name & signature:	Date:
Faculty mentor/PI, name & signature:	Date:
Independent peer(s), name(s) & signature(s):	Date:
Lab manager, name & signature:	Date:

Page 2+: "the meat"

- Not a check-out list!
- Independent thought a must
- Elaboration required
- Make it as broad as justifiable
- Subject to thorough, critical review
- Include facts and supporting calculations, references, etc.

Process Hazard Review

1) Provide an overview of the experiment, procedure, or instrument (see detailed operating conditions below in item 6 for more information)

2) Describe potential hazards, including:
   a) Flammable Chemicals
   b) Toxic/Carcinogenic Chemicals
   c) Strong Acids or Bases
   d) Explosive/Pyrophoric Chemicals
   e) High/Low Temperature/Pressure
   f) Moving Parts/Mechanical Hazards
   g) Electrical Hazards
   h) Other (specify)

3) Describe preventive measure(s) to be taken to avoid harm or injury, including:
   a) Engineering controls
   b) Personal protective equipment
   c) Training requirements
   d) Other

4) Describe how chemicals and samples will be stored

5) Describe how waste will be collected and disposed

6) Provide a detailed operating procedure

Example 1, "easy"

Fatty acids separation by LC, changing operating conditions

Comment in writing, expand as needed, and make sure to address all.

1) Description of Experiment/Procedure/Instrument
   Substituting THF (or better a generic class of solvents say flammable organics of similar low, toxicity) for ethyl acetate, which is spelled out in existing SOP as solvent, for LC of fatty acids separation
2) Operating conditions
   Closed system: 40C, ambient pressure, 300 ml/hr; unattended operation
3) Identification of potential hazards
   a) *Flammable Chemicals*: yes THF, flashpoint = -14C
   b) *Toxic/Carcinogenic Chemicals no*
   c) *Strong Acids or Bases no*
   d) *Explosive/Pyrophoric Chemicals no*
   e) *High/Low Temperature/Pressure no*
   f) *Moving Parts/Mechanical Hazards no*
   g) *Electrical Hazards no*
   h) *Other* (specify) flooding with water should the water jacket hose got dis-attached from the equipment

Example 1, “easy”, cntd:

Fatty acids separation by LC, changing operating conditions

1) Description of preventive measure(s)
   - *a)* Engineering controls sealed system, operated in the hood with lowered sash; water hoses secured in place with clamps
   - *b)* Personal Protective Equipment Required safety glasses, THF compatible gloves (nitrile (8 mil), double glove), lab coat
   - *c)* Training Requirements no additional/special training needed
   - *d)* Other periodic checks by the operator ca. 1x/hr
2) Waste generation and disposal same as for ethyl acetate: used solvent waste tb placed in flammable waste container in a satellite location

3) SOP (attach) in place

Example 2, "involved"

Fatty Acids Ozonolysis

1) Description of Experiment/Procedure/Instrument
   New reactor set-up and its operation in ozonolysis of fatty acid esters in liquid CO2; storage of the ozonides for subsequent decomposition to acids.
2) Operating conditions
   Detailed system diagram with all the streams and conditions identified plus description of the procedure attached
3) Identification of potential hazards
   a) *Flammable Chemicals*: yes fatty acids flashpoint 130-180C; in the presence of O2, O3 (? Find or comment from experience); ozonides,
4) Description of preventive measure(s)
   a) Engineering controls operated in the hood with lowered sash, sound barrier if noise (specify) above xyDb (by OSHA or HSE or equivalent, define); allowable accumulation of ozonides less than 100g (Based on calculation of explosive power), stored at 4C in an explosion proof fridge
   b) Personal Protective Equipment Required safety glasses, gloves, lab coat, closed-up shoes, face shield when working on or transferring ozonides
   c) Training Requirements special training by an experienced operator required, confirmed by independent but supervised operation of the unit for first three runs minimum
   d) Other attended operation (how many people in the lab or in the vicinity, how alarmed? alarm response?), notification of experiment in progress

Example 2, “involved”, cntd

1) Description of preventive measure(s)
   a) Engineering controls operated in the hood with lowered sash, sound barrier if noise (specify) above xyDb (by OSHA or HSE or equivalent, define); allowable accumulation of ozonides less than 100g (Based on calculation of explosive power), stored at 4C in an explosion proof fridge
   b) Personal Protective Equipment Required safety glasses, gloves, lab coat, closed-up shoes, face shield when working on or transferring ozonides
   c) Training Requirements special training by an experienced operator required, confirmed by independent but supervised operation of the unit for first three runs minimum
   d) Other attended operation (how many people in the lab or in the vicinity, how alarmed? alarm response?), notification of experiment in progress

2) Waste generation and disposal gas phase: CO2, O2 and ozone. Ozone destruction by …; no liquid phase waste: material in process, feed to the acid generator
3) SOP (attach)

Need help?

If you have questions about the process, contact:

- Fenghui Niu, Lab Manager, niu@ku.edu
- Andrzej Rokicki, Industry Liaison, rokicka@ku.edu
- Andrew Danby, Research Associate, amdanby@ku.edu
- Derek Butler, Postdoctoral Fellow with ADM, d125b067@ku.edu

Rolling Out New Hazard Review Process

To get this started:

- **For all ongoing research activities**, submit **Hazard Review** by **June 1**
- **For any new research activities** (including changes to existing processes, experiments), **submit Hazard Review before proceeding**