Job Safety Assessment

- **Used to determine hazards associated with a particular experiment / procedure and to control the hazards.**
- **Side benefit: excellent method to organize experiment and procedure prior to operation.**
- **Can be used as an appendix in thesis.**

Need:

1. **Complete diagram of lab, showing location of safety equipment, chemical storage and experiment.**
2. **Complete flow diagram of apparatus, including numbered valves.**
3. **MSDS sheets for all chemicals attached.**

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Job Safety Assessment Form
Department of Chemical Engineering
Michigan Technological University

Equipment Name:	JSA Author:
Room Number/Building:	Faculty Supervisor:
Revision #:	Revision Date:

Used to identify location of experiment.

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Purpose of Experiment / Equipment: Briefly describe what this experiment is designed to achieve and the types of data collected.

Provide a brief verbal description of what this experiment is supposed to do.

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Personal Protective Equipment (PPE) – Check all PPE worn during the entire experiment. Do not list these in the procedure section.

☐ Long Pants	☐ Safety Glasses	☐ Hard Hat	☐ Apron
☐ Long Sleeves	☐ Splash Goggles	☐ Insulated Gloves	☐ Ear Protection
☐ Non-porous Shoes	☐ Face Shield	☐ Chemical Gloves	☐ Other:

This should summarize all the personal protective equipment required normally in the laboratory and PPE required for this particular experiment. Equipment that is required all the time (such as safety glasses) does not need to be listed on each step of the JSA.

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Hazard Summary – Check all general hazards that are likely to be encountered during this experiment and list the major source of the hazard.

Hazard	Major Source of Hazard
☐ Toxicity	
☐ Fire/Flammability	
☐ Reactivity	
☐ Pressure Hazard	
☐ Electrical Shock	
☐ Mechanical Hazard	
☐ Hot Surfaces/ High Temp > 150 F	
☐ Biohazard	
☐ Laser Radiation	
☐ Ionizing radiation	
☐ Other: ____	
☐ Other: ____	

Check all hazards that result due to this experiment. Identify the one major source of the hazard.

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Expected Operating Conditions –

Temperature	Pressure
Normal:	Normal:
Minimum:	Minimum:
Maximum:	Maximum:

List the expected normal, minimum and maximum values for the temperature and pressure.

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Special Operating Conditions - Check all that apply and consult department Safety Manual.

Unattended Operation: ☐	Drying Oven: ☐
Regulated Chemicals: ☐	Class 3b or 4 Lasers: ☐
Pressures Exceeding 35 atm (515 psia) or Equipment Specifications: ☐	
Temperatures Exceeding 1000°C or Equipment Specifications: ☐	

Check all special operating conditions. If any of these are checked, need to consult with Dave Caspary, Manager of Laboratory Facilities.

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Available Safety Equipment – Provide the location of each item shown below. Show the location of this equipment on the attached floor plan. If not available, type "NA" in the field.

Item	Location
Fire Extinguisher:	
Eyewash:	
Safety Shower:	
Telephone:	
First Aid Kit:	
Other:	
Other:	

List all equipment available within the laboratory and their location. Show the locations on the attached floor plan.

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Spill Response Supplies - Provide the location of each item shown below. Show the location of this equipment on the attached floor plan. If not available, type "NA" in the field.

Item	Location
Spill Kit:	
Floor-Dri:	
Spill Dikes:	
Sodium Bicarbonate:	
Drain Plugs:	
Spill Pillows:	
Mercury Spill Kit:	
Other:	
Other:	

List the location of the spill response equipment. Show location on an attached laboratory diagram.

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Required Attachments:

☐ Diagram of process or equipment
Label all valves and identify all equipment for reference in procedure.

☐ Laboratory Floor Plan
Identify the location of your experiment and all safety and spill response equipment.

☐ Equipment Specifications
Include materials of construction, maximum temperature and pressure, standard operating values, and any other specifications important to the safe operation.

☐ Material Safety Data Sheets (MSDS)
Include for all reactants, products and any intermediate or other chemicals which may occur.

Additional Attachments: As necessary.

☐	☐
☐	☐

Provide all the attachments shown, and list any additional attachments provided.

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Chemical Information Page
Fill in as much data below as available. If data are not available, leave the field blank.
List all chemicals, including reactants, products, intermediates, solvents, and any others used.

Chemical Properties and Hazards

Chemical Name	Physical State S, L, G	NFPA Ratings* H	F	S	Sp.	Incompatible Chemicals List chemicals present within the laboratory, and any others that may come in contact.	Flash Point Temp.	Flammability Limits LFL	UFL

*NFPA Ratings: H – Health, F – Flammability, S – Stability, Sp. – Special

List all chemicals (including reactants and products) used for this experiment / procedure, and additional information requested.

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Chemical Toxicology, Regulation and Disposal: List the same chemicals that appear above, in the same order.

Chemical Name	Toxicology TWA	PEL	Other	Hazardous Waste Number*	Regulated? See Safety Manual	Personal Protective Equipment Specific to this Chemical
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

*See Chemical Engineering Hazardous Waste Manual.

Provide information on the chemical toxicology, regulation and disposal. List personal protective equipment specific to this chemical.

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Chemical Reactions: Provide details below on any chemical reaction(s) that occur in your process. Please show the species involved, the stoichiometry and the heat of reaction, if available. Also list side reactions and any other reactions that may impact safety. You cannot type subscripts in the form field provided – use the names for the species and the stoichiometric coefficients.

Provide information on the chemical reactions. Include the stoichiometric equation, heat of reaction, and any other information.

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Job Safety Assessment Form
Safe Operating Procedures Page

Sequence of Steps	Potential Hazards	Procedure to Control Hazard	PPE or Equipment Required
Emergency Shutdown			
Start-up Procedure			
Run Time Procedure			
Shutdown Procedure			
Cleanup / Waste Disposal			

Need to be as detailed as possible. Refer to flow diagram of equipment and floor layout. Safety procedure should be as detailed as possible, not just "be safe" or "be careful".

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Emergency Shutdown:

List a few things you can do prior to evacuating the laboratory.

Start-Up Procedure:

List the steps to get ready to operate the experiment.

Run Time Procedure:

Steps required to operate the experiment.

Shut-down Procedure:

Steps required to normally terminate the experiment.

Clean-up / Waste Disposal:

Steps required to clean the equipment and dispose of all chemical wastes.

JSA – Example

Need to charge 10 ml of acetic anhydride into a test cell. Acetic anhydride is stored in the flammable storage cabinet in a 1-liter container.

First step → get MSDS sheet!

Acetic Anhydride MSDS

OSHA PEL: 5 PPM **OSHA PEL Code:** M
OSHA STEL: OSHA STEL Code:
ACGIH TLV: 5 PPM **ACGIH TLV Code:** M
ACGIH STEL: N/P **ACGIH STEL Code:**
EPA Reporting Quantity: 5000 LBS
DOT Reporting Quantity: 5000 LBS
Ozone Depleting Chemical: N

Acetic Anhydride MSDS

Health Hazards Acute & Chronic: ACUTE:INHAL:IRRITATION OF NOSE & THROAT, SEVERE IRRITATION OF RESPIRATORY SYSTEM, COUGHING, DIFFICULT BREATHING, CHEST PAINS, PULMONARY EDEMA. SKIN/EYE CONTACT:BURNS. SKIN ABSORPTION:NONE IDENTIFIED. INGEST:SEVERE BURNS TO MOUTH, THROAT & STOMACH, NAUSEA, VOMITING, SHOCK. CHRONIC:NONE IDENTIFIED. (EFTS OF OVEREXP)

Signs & Symptoms of Overexposure:
HLTH HAZ:TARGET ORGANS:RESPIRATORY SYSTEM, LUNGS, EYES, SKIN.

Medical Conditions Aggravated by Exposure:
NONE IDENTIFIED.

Acetic Anhydride MSDS

Route of Entry Indicators:
Inhalation: YES
Skin: YES
Ingestion: YES

Repiratory Protection:
RESP PROT REQUIRED IF AIRBORNE CONC EXCEEDS TLV. AT CONCS UP TO 250 PPM, A NIOSH/MSHA APPRVD CHEM CARTRIDGE RESP W/ACID/ORGANIC CARTRIDGE IS REC. ABOVE THIS LEVEL, A NIOSH/MSHA APPRVD SCBA IS ADVISED.
Ventilation:
USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS. VENT HOOD.

Acetic Anhydride MSDS

Protective Gloves:
NEOPRENE GLOVES.
Eye Protection: SAFETY GOGGLES & FACE SHIELD.
Other Protective Equipment: UNIFORM & PROTECTIVE SUIT ARE RECOMMENDED. LAB COAT & APRON.
Work Hygenic Practices: WASH THOROUGHLY AFTER HANDLING.

Flash Point: Flash Point Text: 118F,48C

Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): 2.7%
Upper Limit(s): 10.3%

Conclusions from MSDS

1. **Perform all open bottle transfer operations in hood.**
2. **Wear Neoprene gloves for all operations.**
3. **Wear face shield and safety goggles.**
4. **Use lab coat.**
5. **Wash hands thoroughly after all transfers.**

JSA Steps

Step	Hazard	Safety Proc.	PPE
1. Remove acetic anhydride from storage cabinet and place in tub on cart.			
	Spill	Tub to contain	Face Shield
		Spill kit in lab	Neoprene Gloves
			Lab Coat
		Safety Shower in lab	
	Fire and Explosion	Fire Extinguisher on wall near door.	
		Safety Shower in NE corner of lab.	
2. Move cart to hood	"	"	"
3. Move acetic anhydride from cart to tub in hood.			
	"	"	"

JSA Steps

Step	Hazard	Safety Proc.	PPE
4. Remove cap from bottle and pour 10 ml into measuring flask.			
	"	"	"
5. Pour into test cell.	"	"	"
6. Place cap on bottle, return to cart, transport to storage cabinet.