

STANDARD OPERATING PROCEDURE (SOP)

Procedure No.:		Revision:		Effective Date:	
Title:				Page Count:	
Work Location:					
Procedure Review Cycle:	<input type="checkbox"/> Annual <input type="checkbox"/> Other (cannot be less than annual):				
Summary:	This Standard Operating Procedure (SOP) describes the Standard operation of the located/installed in:				
Identified Hazards (X = applies):	<input type="checkbox"/> Hazardous Environment <input type="checkbox"/> Physical Hazards <input type="checkbox"/> Radiological <input type="checkbox"/> Hazardous Materials <input type="checkbox"/> Other [state hazard]: _____				
Maximum Relative Hazard Index (from Section 6):					
Role	Name	Signature		Date	
<i>Procedure Preparation and Reviewer Concurrence</i>					
Author					
Peer Reviewer					
Principal Investigator					
<i>Affected Functions/Organizations and Subject Matter Expert Concurrence</i>					
<input type="checkbox"/> Laboratory Manager					
<input type="checkbox"/> Unit Safety Committee Chair					
<input type="checkbox"/> Other: _____					
<i>Procedure Approval note: approval must be documented from one of the following sources which may be campus specific, contact your department administration and/or EH&S for additional information.</i>					
Department Chair					
Environmental Health & Safety					

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CHANGE HISTORY

Revision	Effective Date	Description of Change

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1.0 PURPOSE AND APPLICABILITY

This SOP describes the Standard operation of the _____ located in the _____ facility.

Brief description of the process (1-2 sentences):

Restrictions (Operator qualifications, training/location requirements)

This SOP has been developed to supplement the requirements of the (insert name of unit conducting process) processes. The equipment-specific requirements described in this SOP apply *in addition to* all relevant WSU requirements.

2.0 RESPONSIBILITIES

Staff with responsibilities for implementing this procedure:

Principal Investigator: _____

Project Manager: _____

Operator (of the equipment/system): _____

Laboratory Coordinator or Manager: _____

3.0 DEFINITIONS

Operator: The staff member who has been trained to perform the work described in this SOP.

Principal Investigator: The faculty member responsible for the research project and possibly also the laboratory facility where the research is being performed.

Project Manager: The student, research assistant, staff, or faculty member conducting the research work identified in Section 1.0.

Laboratory Coordinator/Manager : Individual other than the PI who is responsible for overseeing the laboratory facility where the research is being performed (where applicable).

4.0 ACRONYMS AND ABBREVIATIONS

CHP	Chemical Hygiene Plan
DOSH	Department of Occupational Safety and Health
EHS	Environmental Health and Safety
LSM	Lab Safety Manual
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
PI	Principal Investigator
R&D	research and development
RHI	Relative Hazard Index
SOP	Standard Operating Procedure

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5.0 PROCESS/EQUIPMENT OVERVIEW

5.1 Process Overview

Describe the chemistry involved and provide an overview of the operating conditions/parameters. This information allows SOP users to see a concise summary of the process and key operating conditions/parameters near the beginning of the SOP.

Describe the chemistry involved:

Identify operating conditions per the SOP:

Parameter	Experimental Operating Range	Equipment Maximum rating
Temperature		
Pressure		
Product Flow Rate		
Liquids		
Gases		
Solids		

Identify all feed streams, and their associated flow rate (attach separate page if needed):

Feed Stream description	Flow rate

List all materials and supplies required for this process:

Equipment	Materials	Chemicals

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5.2 Facility Description

is constructed/equipped with the following:

Equipment	Yes/No	Number/Capacity/Type
Laboratory Benches	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Chemical Fume Hoods	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Flammable Storage Cabinets	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Corrosive Storage Cabinets	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Other Storage Cabinets	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Gas Cylinder Storage (indicate type of storage)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Fire suppression equipment (indicate type)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Gas detection equipment	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Emergency Shower/eyewash	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Other (specify):		
Other (specify):		

5.3 Description of experimental Equipment/Systems

Describe the equipment, systems, and processes used in this procedure in sufficient detail to be meaningful in the context of the SOP and the intended use of the procedure (pictures are helpful). Attach additional page(s) as necessary.

Equipment/System	Function in this Process

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6.2 Physical Hazards & RHI

Describe the hazards and precautions associated with use of the chemicals, equipment, systems, or processes covered by the SOP. If no hazards exist, include a statement to this effect. Check all that apply.

Hazard	Check if present
Fire Hazards	<input type="checkbox"/>
Elevated Temperatures	<input type="checkbox"/>
Cryogenic/Low Temp	<input type="checkbox"/>
Compressed Gases	<input type="checkbox"/>
Pressure or Vacuum	<input type="checkbox"/>
Biological	<input type="checkbox"/>
Radiation	<input type="checkbox"/>
Laser	<input type="checkbox"/>
UV light	<input type="checkbox"/>
Electrical	<input type="checkbox"/>
Moving Parts	<input type="checkbox"/>
Tools (hand/power)	<input type="checkbox"/>
Noise/Vibration	<input type="checkbox"/>
Sharps	<input type="checkbox"/>
Other (Describe:)	<input type="checkbox"/>

Provide details regarding each physical hazard here:

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6.3 Hazard Control Summary

Indicate what control measures will be implemented to mitigate hazards identified in Sections 6.1 and 6.2 above (e.g. use of irritants will be confined to a fume hood, personnel will be wearing nitrile gloves and safety glasses).

Controls must be emplaced using engineering controls first, administrative controls second, and PPE only as a last resort. PPE selection must consider manufacturer data on chemical compatibility of materials.

Hazard Control Summary Table

Engineering Controls		
<input type="checkbox"/> Chemical Fume Hood	<input type="checkbox"/> Biological Safety Cabinet	<input type="checkbox"/> Barrier (machine guards, blast shield, etc.)
<input type="checkbox"/> Other:		
Administrative Controls		
Describe policies, procedures, training, etc. which will administratively mitigate identified hazard(s):		
PPE:		
<input type="checkbox"/> Safety Glasses	<input type="checkbox"/> Splash Goggles	<input type="checkbox"/> Face Shield
<input type="checkbox"/> Lab Coat	<input type="checkbox"/> Other skin protection (apron, gauntlets, etc. – specify):	
<input type="checkbox"/> Dust mask	<input type="checkbox"/> Air-Purifying Respirator	<input type="checkbox"/> Supplied Air
<input type="checkbox"/> Gloves (specify type):		

Describe additional control measures here:

Chemical Hazards			
(Note: controls may be chemical specific or grouped per chemical hazard class as appropriate)			
Chemical/Hazard	Engineering Controls	Administrative Controls	PPE

Physical Hazards			
Hazard	Engineering Controls	Administrative Controls	PPE

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6.4 Hazard Assessment

For each hazard, indicate the potential severity as determined with only intrinsic controls (e.g. engineering), the probability as determined with all controls (e.g. a user applies a strap to a compressed gas cylinder), and the resulting relative hazard index as looked up from the following matrix. Use the risk matrix in this section to assign a Relative Hazard Index, and enter this value on the SOP cover sheet

Probability

- Frequent*: Likely to occur repeatedly
- Probable*: Likely to occur multiple but infrequent times
- Occasional*: likely to occur at some time
- Remote*: Possible, but not likely to occur
- Improbable*: Very unlikely; can reasonably assume it will not occur

Severity

- Catastrophic*: Death, permanent disability; system or facility loss; lasting public health or environmental impact
- Severe*: Serious injury; temporary disability; subsystem loss or facility damage; temporary public health or environmental impact
- Moderate*: Medical treatment; lost work days; minor facility damage; external reporting cleanup requirements
- Minor*: First aid only; negligible or slight facility damage; routine cleanup

Risk Matrix for Determining Relative Hazard Index (RHI)		Potential Severity of Hazard			
		Catastrophic	Severe	Moderate	Minor
Likelihood of Occurrence or Exposure	Frequent	Critical RHI = 4	Critical RHI = 4	Serious RHI = 3	Medium RHI = 2
	Probable	Critical RHI = 4	Critical RHI = 4	Serious RHI = 3	Medium RHI = 2
	Occasional	Critical RHI = 4	Serious RHI = 3	Medium RHI = 2	Low RHI = 1
	Remote	Serious RHI = 3	Medium RHI = 2	Medium RHI = 2	Low RHI = 1
	Improbable	Medium RHI = 2	Low RHI = 1	Low RHI = 1	Minimal RHI = 0

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6.4.1 Hazard RHI

For each chemical and physical hazard identified in Sections 6.1 and 6.2, assign a Relative Hazard Index based on:

- Conditions under which the object or material presenting the hazard is used
- Control measures identified in Section 6.3
- The hazard matrix in Section 6.4 above

6.4.1.1 Chemical Hazard RHI

For each hazard indicated in Section 6.1, assign a Relative Hazard Index score, as described in Section 6.4.

Hazard	RHI

6.4.1.2 Physical Hazard RHI

For each hazard indicated in Section 6.1, assign a Relative Hazard Index score, as described in Section 6.4.

Hazard	RHI

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7.0 EMERGENCY RESPONSE

**In the event of any life safety emergency, call 911,
then notify the Single Point of Contact (372-7234).**

The Single Point of Contact emergency number (372-7234) is a monitored telephone line managed for the Safety needs of staff, students, and the general community in order to coordinate appropriate responses and actions for events. The Single Point of Contact will notify other required personnel.

7.1 General Emergency Procedures for [facility]

Emergency information for the _____ facility is found in the WSU Emergency Response Plan. It identifies:

- locations of fire alarm pull boxes and fire extinguishers
- locations of eyewash stations and Safety showers
- other items related to emergency responses and Safety.

7.2 Response to Process-Specific Alarms

Alarm	Response

7.3 Decontamination Procedures

Describe decontamination procedures for the chemicals used in the process. These procedures may be discussed in chemical specific SOPs attached to this document and referenced in this section

7.4 Accidental Release response

- 7.4.1 Minor Spill (as defined by Lab Safety Manual, Section II.I) Identify minor spills that will not be cleaned up per associated hazards if present.

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- 7.4.2 Major Spill (any mercury spill, any release not defined as “minor”, any release which impacts a floor/sink drain)

7.5 Accidental Exposure / First Aid Response

- 7.5.1 Eye Contact

- 7.5.2 Skin Contact

- 7.5.3 Inhalation

- 7.5.4 Ingestion/Injection

8.0 GENERAL WORK PRACTICES

8.1 Training and Qualification

Training and qualification requirements for _____ operators are based on a combination of system knowledge, procedure performance, and demonstrated practical skills.

Describe any specific requirements that an operator must meet before performing the procedure:

9.0 CONFIGURATION MANAGEMENT

During operation and maintenance of the _____ system, changes to the equipment configuration may be required (e.g., to replace a faulty component) or desired (e.g., to improve usability or performance). Likewise, changes to the documentation – corrections and refinements to the drawings, instructions, and other information in the SOP – may also be needed. As described in the following sections, certain types of hardware modifications and pen-and-ink changes to the SOP are allowed during operation and maintenance. In order to maintain configuration control of the hardware and SOP, only authorized staff are allowed to make physical changes to the equipment or pen-and-ink changes to the SOP. All changes must be approved by the appropriate parties (identified below) before implementation, and all changes must be documented.

9.1 Changes to the Equipment Configuration

A trained and qualified operator may **propose** changes to the physical configuration of the [equipment or system name]. All changes – both major and minor, as defined below – to the physical configuration must be documented and approved (in writing) by the PI. Changes that result in a discrepancy between the actual physical configuration of the equipment or system and the latest documented, approved configuration must be incorporated into updated documentation of the approved configuration (e.g., P&IDs, system description), and subjected to a complete review.

9.1.1 Minor Equipment Configuration Change

A minor equipment configuration change is a change that does not impact the operation of the equipment or degrade its Safety status. For example, replacing a faulty component with an identical one during maintenance could be considered minor equipment configuration change. As a rule, minor equipment configuration changes should not result in a physical discrepancy between the proposed equipment configuration and the latest documented, approved configuration.

Note: Replacement of an as-built equipment component with a similar – but not identical – component will constitute a major equipment configuration change unless use of the replacement component has previously been approved and documented.

A minor equipment configuration change can be implemented after review and written approval by the PI. Approved changes must be adequately documented. Additional required information includes the date and time when the changes were made and the initials of the individuals approving the change. Incorporate approved changes into an updated version of the SOP and associated documents.

9.1.2 Major Equipment Configuration Change

A major equipment configuration change is any equipment configuration change that directly impacts the operation of the equipment or degrades its Safety status. Any equipment configuration change that does not meet the above definition of “minor equipment configuration change” is considered a major equipment configuration change. Changes of this type include those that will result in an actual physical discrepancy between the unit and the latest documented, approved configuration, as well as non-identical component changes (e.g., ball valves of different capacity or material of construction) that were not previously approved.

A major equipment configuration change must be considered a new process, and must be accompanied by completion of a new SOP, to be reviewed and approved by the Principal Investigator, Unit-level Safety Committee, EH&S, and may require approval from the Authority Having Jurisdiction (e.g. Fire Marshal and Facilities Services) before the change can be implemented.

9.2 Changes to the SOP

During operation and maintenance of the _____, staff may identify errors, additions, improvements, and other proposed SOP changes. As described in the following subsections, the nature and scope of the proposed change will determine the reviews and approvals required before the change can be implemented. All SOP changes approved for implementation – including red-line markups of

drawings, additions or deletions of process steps, modifications to the checklists, etc. – must be documented. At the end of the operation or maintenance campaign, incorporate SOP changes into a revision of the SOP.

Note: Changes made to the SOP must not result in a violation the Standard operating envelope of the system, or a weakening or elimination of any hazard controls.

9.2.1 Minor SOP Changes

A minor change is a change with limited scope and effect. The change is straightforward, readily understood, and does not materially affect the technical content of the document. Minor changes are often editorial in nature. The following items are considered minor changes:

- correction of grammar or spelling;
- renumbering sections or attachments that does not affect the chronological sequence of work or usability of the document;
- adding explanatory text to improve document clarity or usability (e.g., detailed instructions for a form, clarifying documentation requirements);
- updating organizational titles (if organization responsibilities are unchanged).

Note: A change in an organizational title accompanied by a change in responsibilities is not considered a minor change.

Minor changes require review and approval of the change by the PI.

9.2.2 Major SOP Changes

A major SOP change is any document change that doesn't meet the definition of a minor change.

Major changes require review and approval of the change by the Principal Investigator, Unit-level Safety Committee, EH&S, and possibly from the Authority Having Jurisdiction (e.g. Fire Marshal), and Facilities Services.. Management may specify additional required reviews

10.0 OPERATIONAL INSTRUCTIONS

Describe, using the amount of detail necessary to ensure Standard operation, the steps required to operate the equipment or system covered by the SOP. Refer to attachments, exhibits, diagrams, pictures, checklists, etc. as needed. For stepwise activities that should be acknowledged as performed or that will be performed multiple times, it's a good practice to describe those actions in one or more checklists. Divide actions and activities into logical groupings and address in separate sections and/or checklists. This improves SOP usability and makes it easier to maintain the SOP as changes are identified.

10.1 Prerequisite Conditions (required as elements of all SOPs)

The following prerequisite conditions must be verified for all procedures, before starting work:

- Ensure that at least one working phone is available that can call the Single Point of Contact phone number (372-7163) in case of emergency.
- Identify any conditions or restrictions regarding staffing requirements for Standard operation of the equipment or system e.g. equipment is calibrated per manufacturers recommendations, equipment change-out schedule is current and up to date, etc..
- Identify tests and activities that must be performed before operating the equipment or system, e.g., leak-checks, pressure checks, inspection of tubing, etc.
- Verify that the SOP being used is current.

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10.2 Pre-Start Materials and Supplies

Identify specific materials and supplies which must be available before commencement of the process (such as compressed gases, sample containers, leak check meter, etc)

10.3 Pre-start Safety Checks

Identify specific operational conditions which must be satisfied before commencement of the process (such as leak testing, power supply deactivation, etc.). A pre-start checklist may be developed to meet this requirement, and included as an attachment to this SOP.

Check Item	Description/Parameter to verify

10.4 Operation of _____ installed in the _____ facility.

Provide detailed instructions for operating the equipment or system covered by the SOP. Describe the steps required to operate the equipment or system covered by the SOP. Refer to attachments, exhibits, checklists, etc. as needed. Use multiple subsections, numbered and bulleted lists, etc. For stepwise activities that should be acknowledged as performed or that will be performed multiple times, it's a good practice to describe those actions in one or more checklists. Divide actions and activities into logical groupings and address in separate sections and/or checklists. The operation steps should be detailed enough so an untrained user could figure out the proper operation on their own. This improves SOP usability and makes it easier to maintain the SOP as changes are identified.

Use the following page and attach additional pages as necessary to completely describe the process.

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11.0 OFF-NORMAL CONDITIONS

Identify operational parameters to be evaluated to ensure process safety. This may include verification of conditions such as temperature or pressure range, stability of materials, proper motion, sound/vibration, etc.)

Off-normal events that may occur during the execution of this SOP include:

- Power interruption
- Emergency shutdown due to an alarm
- Start-up after an emergency shutdown
- Other conditions specific to the process (specify below)
- For each off-normal condition identified below (e.g. over temperature or over pressure condition), consider the hazards identified in Sections 6.1 and 6.2 for the procedural element under review. If the controls identified in Section 6.3 are not sufficient to support the response, add additional controls to Section 6.3.

Condition	Response
Power Interruption	
Building Fire Alarm	
Gas Detection Alarm	

11.1 Conditions requiring Emergency Shutdown

Describe the procedure for conducting an emergency shutdown of the process:

11.2 Start-up After an Emergency Shutdown

Describe the procedure for re-starting after an emergency shutdown of the process:

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12.0 WASTE DISPOSAL

Describe each chemical waste stream that this procedure will generate:

Description	Contents	Quantity/Frequency

All wastes shall be collected in a sealable, airtight Glass Container.
 Plastic

Waste containers shall be located polyethylene secondary containment bin
inside a chemical storage cabinet

The container(s) shall be stored away from

When containers are full or no longer being used, generators must complete a chemical collection request, ensure the containers are properly labeled and marked with a date filled, and place them in the appropriate storage area for collection by EH&S.

13.0 MAINTENANCE

Maintenance checks include the following:

Item	Frequency

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14.0 RECORDS

Records that are generated and maintained as a result of this procedure include:

- Master Hardcopy SOP containing pen-and-ink markups
- Completed checklists for the pre-start safety checks and operational activities performed
- Operations Log

Identify where the records will be stored or maintained:

15.0 REFERENCES

List other documents referenced in this SOP or which were used in its development. Include items such as:

1. Emergency Response Plan for the _____ facility.
2. Other relevant reference(s), such as an interfacing SOP, planning documents, manufacturer's user manual, etc.

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16.0 TRAINING ACKNOWLEDGEMENT

The following table identifies individuals who have been trained to this SOP. Printed names and dated signatures of both the Trainer and the Trainee are required for each row used.

Date	Trainer		Trainee	
	Printed Name	Signature	Printed Name	Signature

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17.0EXHIBITS

Exhibit #	Title
Exhibit A	
Exhibit B	
Exhibit C	
Exhibit D	