

**STANDARD OPERATING PROCEDURE**

**TOXIC GAS**

Research Group: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Last revision date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**Section 1: This standard operating procedure is for**

□ The generic use of a toxic gas □ A specific laboratory procedure involving a toxic gas

**Section 2: Toxic gases to be used**

*State name of toxic gas(es), physical properties, warning properties, and MIOSHA exposure limits. List the maximum quantity of gas permitted to be in use and in storage.*

**Section 3: Potential Hazards**

*List physical and health hazards associated with the toxic gas, and/or toxic chemical intermediates of the gas. Include incompatible materials and chemicals, symptoms of exposure and routes of exposure.*

*Suggested:*

*Product (M)SDS*

*NIOSH Pocket Guide to Chemical Hazards -* [*http://www.cdc.gov/niosh/npg/*](http://www.cdc.gov/niosh/npg/)

*ATSDR Toxic Substances Portal -* [*http://www.atsdr.cdc.gov/substances/toxsearch.asp*](http://www.atsdr.cdc.gov/substances/toxsearch.asp)

**Section 4: Personal Protective Equipment**

All work in laboratories must be performed under the guidelines for appropriate laboratory attire, as defined by the MSU Chemical Hygiene Plan:

* Close-toe shoes
* Long pants or long skirt covering the legs from the waist to the top of shoes
* Safety glasses or goggles, as appropriate

**In addition, flame resistant (FR) lab coats must be worn when working with flammable materials, including toxic gases that may also be flammable.**

*State where PPE for this procedure can be found in the laboratory*

**Section 5: Engineering Controls**

*Describe engineering controls that will be used to minimize potential exposure to toxic gas*

*Please note:*

* *Toxic gas cylinders must be used and stored in ventilated gas cabinets or chemical fume hoods. Describe what type of ventilation controls will be used (gas cabinet, fume hood) and date of last certification/testing*
* *The experiment should be contained within a fume hood. Describe how the experiment will be contained in a fume hood.*
* *For operations that cannot be contained in a fume hood, the use of critical orifices, automatic shutoffs and hazardous gas alarms may be necessary. Consult with MSU EHS for further information*
* *Some toxic gases require specialized regulators and supply piping, due to their toxic and/or corrosive natures. Consult with Airgas or MSU EHS for further information. Describe type of compatible tubing and regulators to be used with the gas.*

**Section 6: Special Handling and Storage Requirements**

*Describe how the toxic gas will be secured inside the fume hood or ventilated gas cabinet*

*Describe how the experimental apparatus will be tested with an inert, non-toxic gas (“dry-run”) before attaching toxic gas cylinder*

*Describe how the system will be tested for leaks, and the preventive maintenance schedule for leak testing*

*List anticipated purchase amounts, and maximum amounts of toxic gas expected to be in the laboratory at any time*

*State how the use of the toxic gas and associated apparatus is a minimum two-person procedure – no working alone with toxic gases*

**Section 7: Accidental Release Procedures**

*Describe measures to be taken should an accidental release of toxic gas occur.*

*This should include:*

* Initiation of the fume hood’s emergency purge button, if safe to do so
* Shut down of equipment, if safe to do so
* Evacuation of the laboratory
* Closing of laboratory door behind last person
* Calling 911 for assistance
* Pulling the fire alarm if release is large or has the potential to escape the confines of the laboratory
* Remaining on scene in a safe location until help arrives

**Section 8: Exposure Procedures**

Skin exposure: For large exposures, or exposures to the face or eyes, call 911 immediately for assistance. Rinse affected skin with plenty of water while removing contaminated clothing and shoes. Rinse for at least 15 minutes or until help arrives.

For small, uncomplicated skin exposures, rinse affected skin with plenty of water. Seek medical attention or proceed as directed by your PI or lab manager.

Eye exposure: Call 911 immediately. Wash eyes for at least 15 minutes or until help arrives, lifting the upper and lower eyelids.

Inhalation exposure: call 911 immediately. Move to fresh air and wait for paramedics to arrive.

**Section 9: Waste Disposal Procedures**

*Liquid or solid hazardous waste byproducts of reactions with toxic gases may have to be disposed of via MSU EHS. Describe waste disposal procedures here, if these waste products will be produced.*

*Do not attempt to “empty” or “bleed” a compressed cylinder either in the open air, or in a fume hood. Describe person responsible for ensuring full cylinders are ordered and used cylinders are returned promptly to Airgas.*

*NOTE: All compressed gas cylinders must be returned to Airgas or other supplier when empty or no longer in use. The purchase of non-returnable gas cylinders is prohibited.*

**Section 10: Material Safety Data Sheets / Safety Data Sheets**

*List location(s) of (M)SDS for toxic gases. This should include a printed copy in the laboratory in an easily accessible location*

**Section 11: Training and Awareness**

Employees working with toxic gas must complete the following training:

□ Chemical Hygiene and Hazardous Waste Initial / Refresher

□ Compressed Gas Safety

□ Site Specific Training with PI or lab manager

□ Review and signature of this completed SOP

□ Other \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*If appropriate, identify other employees in the vicinity who may be affected should an unintended reaction or release of toxic gas occur. Describe how those employees will be notified of this experiment, the location of this SOP and (M)SDS, and point contact person available for questions.*

**Section 12: Protocols**

*Attach a copy of your protocol here, including an estimate of how long the process takes and how frequently it will be conducted. Provide a general sequential description of work, including details such as amounts of toxic gases used, anticipated pressures and temperatures, special safety equipment utilized, pre-operational checks for leaks, etc.*

**Section 13: SOP Review and Prior Approval**

I, the PI/Supervisor, grant the following laboratory personnel approval to perform the above SOP

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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PI/Laboratory Supervisor signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

I have reviewed and understood this Standard Operating Procedure, and agree to abide by the protocols described herein:

Signature:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Signature:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

A completed copy of this Standard Operating Procedure has been reviewed and approved by MSU Office of Environmental Safety:

MSU EHS Staff: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_