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 (if any) and MIOSHA exposure limits

Section 3: Potential Hazards

List physical and health hazards associated with the toxic gas, and/or toxic chemical intermediates of the gas.

Suggested:
Product (M)SDS
Section 4: Personal Protective Equipment

Describe types of personal protective equipment (PPE) necessary to safely handle toxic gas. Consider eye and face protection (chemical splash goggles, face shield if necessary), hand protection (chemically resistant gloves) and body protection (lab coat, apron, etc.)

State where any specialized PPE 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

Describe measures to be taken should an exposure to a person occur

This should include:

- Calling 911 immediately for assistance
- Notifying PI or department administrator
- Specific first aid procedures as described in the (M)SDS

Section 9: Waste Disposal Procedures

Hazardous waste byproducts of reactions with toxic gases are disposed of via MSU EHS. Describe waste disposal procedures here.

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 11: Protocols

Summarize the process or experiment, 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, special safety equipment utilized, pre-operational checks for leaks, etc.
Section 12: SOP Review and Prior Approval

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

Name: _______________________________________________________________________________

Name: _______________________________________________________________________________

Name: _______________________________________________________________________________

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:_______________