**PURPOSE**

To ensure that all personnel within a work area with a fixed gas detection system know how to respond and what actions are to be taken when the fixed gas detection system alarms are activated.

\*Note: It should be noted that an alarm can be activated as a result of sensor failure. See Sensor Failure definition in Section 6.0 of the Fixed Gas Detection System Standard.

\*Note: All personnel are required to receive training on the fixed gas detection system display panel. Prior to entering the area, personnel will look at the display panel to verify it is safe to enter, and no sensor failures are indicated. Any questions or concerns should be directed to the Supervisor responsible for this area, or to Facilities at 403.220.7555.

**HAZARD IDENTIFICATION FOR TOXIC GASES**

* INSERT TOXIC GAS HAZARDS OR ATTACH SAFETY DATA SHEET (SDS)

*Examples:*

*1) Pressure Build up – Compressed gases pose a high pressure hazard as the liquid form expands to the gaseous state, thus, enclosed containers risk rupture and for this reason must be vented.*

*2) Oxygen Deficiency – Asphyxiation may result from buildup of inert gas in an enclosed space causing an oxygen deficient atmosphere.*

**RESPONSE PROCEDURES IN THE EVENT WARNING AND/OR EVACUATION ALARMS ARE ACTIVATED IN RELATION TO LABORATORY ACTIVITIES**

Alarm Set Points

* Normal (ambient) oxygen level is 20.9%
* Warning Alarm is activated when the oxygen level is less than 20.3% and at 50% of the occupational exposure limit (OEL) for the gas of concern
  + provides time to correct a procedure and evaluate
* Evacuation Alarm is activated when the oxygen level is less than 19.5% and at the ceiling or short-term occupational exposure limit (OEL) for the gas of concern
  + for oxygen sensor – evacuate and assess from outside of the laboratory space
  + for oxygen sensor – evacuation alarm for oxygen sensors are to evacuate the space ONLY, not the building
  + for toxic gas sensor – building fire alarm will be activated

ATTACH at the end of this document, the most recent version of the Fixed Gas Detection Notification, Specification, & Operational Parameters information sheet as provided by Facilities – Maintenance & Planning.

Warning Alarm Activation (has been verified not to be sensor failure)

* Notify all occupants of the space.
* Stop the flow of toxic gases, and stop any activities.
* Go to the gas detection display panel and determine which sensor location has been activated *(i.e. sensor near floor vs. sensor near ceiling)* and toxic gas concentration levels – this information will need to be communicated to Campus Security.
* Ventilation procedures *(i.e. turn on exhaust fan, etc.)*.
  + INSERT VENTILATION PROCEDURES
* Conduct portable gas monitoring (if available or appropriate).
* Notify Campus Security (403-220-5333) and Supervisor INSERT PHONE NUMBER that warning alarm has been activated.
* Go to Fire Panel located at INSERT BUILDING & ROOM NUMBER
* Inform Campus Security of the suspected cause of the alarm. (See Appendix II alarm causes and resolution flow chart)

Evacuation Alarm Activation

* All personnel to evacuate the space.
* Notify Campus Security (403-220-5333) and Supervisor INSERT PHONE NUMBER that evacuation alarm has been activated.
* One individual to meet Campus Security at Fire Panel located at INSERT BUILDING & ROOM NUMBER
* Inform Campus Security of the suspected cause of the alarm. (See Appendix II alarm causes and resolution flow chart)

**ACTIVITIES THAT MAY ACTIVATE A GAS DETECTION ALARM**

* INSERT ACTIVITIES / KNOWN PROCESSES / SOP, ETC.

\*Note: All gas detection system sensors have a life expectancy and replacement schedule. The manufacturer’s specifications must be followed for the replacement of sensors.

*Examples:*

*1) Connecting new transfer lines between a cylinder and experimental apparatus (leaking lines).*

*2) Removing a regulator from the cylinder (can release toxic gas into the space).*

**Engineering / Ventilation Controls:**

Describe any specific engineering / ventilation controls that have been implemented to prevent employee exposures to hazards. *Examples: fume hoods, equipment interlocks, supplemental ventilation, safety features on equipment, etc.*

Controls:

* INSERT CONTROLS

**SPECIAL HANDLING PROCEDURES AND STORAGE REQUIREMENTS**

Storage Requirements:

* INSERT REQUIREMENTS (i.e. ventilated cabinet)

Transportation Methods:

* INSERT METHODS (i.e. gas cylinder cart)

Transfer of Material Protocols:

* INSERT PROTOCOLS

Method for Determining When Containers are Full:

* INSERT METHODS (overfilling of equipment will cause the excess to spill or vent into the laboratory space).

**WASTE DISPOAL**

\*Note: Toxic gases are NOT to be discharged into the fume hood directly from the cylinder.

Waste Disposal Procedures and/or Packaging Requirements:

* INSERT PROCEDURES AND/OR REQUIREMENTS

**APPROVAL REQUIRED**

Indicate if, and when an approval from the Principal Investigator/Supervisor and/or Environment, Health and Safety is required.

Activities Requiring Approval:

* INSERT ACTIVITIES REQUIRING APPROVALS AND BY WHOM

*Examples:*

*1) Changing the methodology for transferring toxic gases to equipment/vessels – must be approved by the Principal Investigator/Supervisor.*

*2) Increasing the volume of toxic gases being stored in the space – must be reported to Environment, Health and Safety.*

**UNIVERSITY NOTIFICATION**

Activities where University Stakeholders Need to be Notified Prior to the Start of a Hazardous Protocol:

* INSERT ACTIVITIES AND FROM WHOM i.e Environmental Health and Safety / Facilities / Dean

*Examples:*

*1) Intentionally* quenching an NMR.

*2) Operation of an NMR with loss of gas detection system.*

*3) Operations of toxic gases outside of ventilated containment*

**AUTHORIZATION**

Authorization to work in a laboratory where fixed gas detection is installed, should be limited to occupants who have completed required operational and safety training. A training record is provided in Appendix I which outlines training requirements.

**RESPONSE PROCEDURES IN THE EVENT OF AN EMERGENCY UNRELATED TO LABORATORY ACTIVITIES (e.g. building fire alarm)**

* INSERT / ATTACH RESPONSE PROCEDURES

*Examples for consideration:*

* *Turn off / shut down…*
* *Evacuate the laboratory via…*
* *Evacuate the building via…*
* *Notify Principal Investigator / Supervisor at…*
* *Go to the assembly point located at…*
* *Any information to be communicated to Campus Security about a potential cause, report to the fire panel located at…*

**RESPONSE PROCEDURES IN THE EVENT OF AN EMERGENCY RELATED TO LABORATORY ACTIVITIES – EXCLUDING THE ACTIVATION OF WARNING AND/OR EVACUATION ALARMS (e.g. smoke from equipment)**

* INSERT / ATTACH RESPONSE PROCEDURES

*Examples for consideration:*

* *Identify areas/equipment that may trigger an emergency…*
* *Turn off / shut down…*
* *Evacuate the laboratory via…*
* *Activate the building fire alarm located at…*
* *Evacuate the building via…*
* *Notify Campus Security / Principal Investigator / Supervisor at…*
* *Go to the assembly point located at…*
* *Any information to be communicated to Campus Security about a potential cause, report to the fire panel located at…*

Signed:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Supervisor/Principal Investigator***

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| **APPENDIX I:** | **TRAINING RECORDS FOR INDIVIDUALS AUTHORIZED TO WORK IN AREA WITH FIXED GAS DETECTION SYSTEM** |

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| **Principal Investigator / Supervisor:** | INSERT NAME |

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| --- |
| The undersigned have completed the following and understand the risks of working in proximity to devices that may create a hazardous or oxygen deficient atmosphere. |
| * Received training and understand how to read the display panel prior to entering the area. * Reviewed the University of Calgary Fixed Gas Detection System Standard. * Reviewed the SOP Response to Gas Detection System Alarms – Toxic Gases. * Reviewed the Safety Data Sheet (SDS) for toxic gases (ATTACH SDS) |
| * Reviewed the manufacturer’s operating instructions for equipment. * Reviewed the laboratory instructions for operations with toxic gases. * INSERT any other REQUIRED TRAINING here |

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| **Authorized Participant Name** | **Principal Investigator / Supervisor Name** | **Date Reviewed** |
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| **APPENDIX II:** | **POTENTIAL ALARM CAUSES AND RESOLUTION CHART** | | |
| Warning Alarm is Activated –  Oxygen level is less than 20.3% or Toxic Gas Concentration is at 50% of the OEL | | | |
| Possible Cause | | Action | Resolution |
| Leaking lines / disconnecting regulator / changing cylinders, etc. | | 1) STOP PROCESS that may be causing the issue.  2) Wait 5 minutes and monitor readings on the gas detection display panel.  3) Escalate as needed. | If alarm ceases, notify Campus Security as to the cause for the alarm.  If alarm persists, follow the Response Procedures for warning alarm activation. |
| Suspected sensor failure | | 1) Monitor display panel to see if readings fluctuate or if display panel indicates a sensor failure.  2) May require no working alone or suspension of work activities until sensor has been replaced. | Contact Campus Security and inform them that the alarm may be due to sensor failure.  Campus Security to contact Life Safety to attend and verify function of sensors. |
| Ventilation system not working / no exhaust fans / no supply air, etc. | | 1) STOP PROCESS that may be causing the issue. | Contact Campus Security and inform them that the alarm may be due to ventilation failure.  Campus Security to contact Facility Manager and/or CHCP to verify ventilation operation. |
| No known or obvious cause | | 1) STOP PROCESS that may be causing the issue.  2) Wait 5 minutes and monitor readings on the gas detection display panel.  3) Escalate as needed. | If alarm ceases, return to work while monitoring display panel and alarm notifications.  If alarm persists, follow the Response Procedures for warning alarm activation and wait for Life Safety to verify detection operation. |
| INSERT OTHER AS IDENTIFIED | |  |  |

|  |  |  |
| --- | --- | --- |
| Evacuation Alarm is Activated –  Oxygen level is less than 19.5% or Toxic Gas Concentration is at ceiling or short-term limit of the OEL | | |
| Possible Cause | Action | Resolution |
|  | 1) STOP PROCESS that may be causing the issue, if safe to do so. | Follow the Response Procedures for evacuation alarm activation. |
| INSERT OTHER AS IDENTIFIED |  |  |

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| **APPENDIX III:** | **Fixed Gas Detection Notification, Specifications & Operational Procedures** |

***ATTACH DOCUMENT***