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Brookhaven National Laboratory
Light Sources Directorate

Subject: NSLS Operations Group Response to X21 Ventilation Alarm

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PREPARED BY ANDREW ACKERMAN

Prepared By:	Lori Stiegler	Approved By:	Andrew Ackerman	
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This document outlines the NSLS Control Room response to the ventilation alarm at X21. As per LS-ESH-0057, the Control Room will be notified any time the pre-mixed gas bottle is in the building.

Background

A ventilation system has been installed in the downstream X21 hutch to provide added control for use of gas in that hutch. An excimer laser is installed in that hutch that uses a pre-mixed gas that contains dilute (<0.1%) fluorine gas. Although the Fluorine is dilute, it has the potential for being a personnel hazard. The pre-mixed gas is contained in a typical "B" size compressed gas cylinder that is located in a ventilated gas cabinet. When the PLD experiment is running, the laser tube may require recharging from the gas cylinder, depending on laser usage. This is anticipated to be required once or twice per month. The laser tube is charged from the bottle and once charged, the bottle valve is closed and the system is static. The bottle is under high pressure (~2000 psi) and contains a potentially hazardous concentration of Fluorine. Release of the bottle contents with no ventilation control can present a dangerous situation to the local area and could require evacuation of the building. The laser tube is at 87-100 psi and holds a total Fluorine volume of approximately 70 ml. Release of the pre-mixed gas from a leak or break in the laser tube is unlikely to present significant personnel risk, but will likely be noticed as a pungent and irritating odor. The odor threshold is approximately 1000 times lower than the level that would be immediately dangerous to life and health (IDLH).

The ventilation system is in place to control any gas leaks. It has two 'legs'; one to supply air flow to a ventilated gas cabinet that holds the gas bottle and the second to supply air flow through a box that surrounds the laser tube. During normal operation, there is no release of Fluorine. The pre-mixed gas is exhausted from the laser tube through a halogen filter that removes the Fluorine, and then exhausts through the ventilation system to the roof. The ventilation system is there to prevent any gas release to the hutch and the experiment floor that might result from a leak, malfunction, or mistake.

There are no local Fluorine detectors or alarms. There is a ventilation flow alarm that sounds locally and reads out on errorPro in the Control Room. The ventilation alarm will sound if air flow is stopped. The ventilation alarm DOES NOT indicate a Fluorine gas release; it indicates loss of ventilation air flow. Loss of air flow alone is not a hazardous condition. Only loss of air flow together with a Fluorine gas leak is an immediate concern.

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Response

The Operations Staff should take the following action in response to an alarm from the X21 ventilation alarm:

Op Co is to proceed to X21 to investigate. With the alarm sounding, it is reasonable to expect that the ventilation air flow has stopped.

- Verify that the on/off pushbutton switch for the X21 ventilation system is ON. It is located on the outside of the X18B hutch wall. The switch is covered to prevent accidental shutoff.
- If the switch is in the ON position, the utilities group is to be contacted to resolve the ventilation problem, return the air flow, and reset the alarm.

If the pre-mixed gas cylinder is in the building:

- The laser operator/User should be contacted and asked to confirm that the compressed gas cylinder valve is closed. The User is to be contacted off site if needed (if running un-attended). A contact number will be posted on the hutch.
- If the laser operator/User indicates that the gas bottle is open, they should immediately close the valve. If there is any pungent smell of fluorine when the hutch is opened, immediately close the hutch door. The surrounding area should be evacuated, and Fire/Rescue summoned.
- No gas transfer is allowed.
- The User is to remain available, near the beam line, until the alarm condition is resolved.

If the gas bottle is not in the building:

- The X21 hutch should be closed, and remain closed until at least a half hour after the alarm clears. In the unlikely case of a laser tube gas leak without ventilation, the highly reactive Fluorine gas will be contained in the hutch. If entry is required while the low flow is alarming, contact the NSLS ESH Staff for guidance.