



Building 911B
P.O. Box 5000
Upton, NY 11973-5000
Phone 631 344-4250
Fax 631 344-5954
lessard@bnl.gov

Managed by Brookhaven Science Associates
for the U.S. Department of Energy

Date: April 26, 2004
To: W. R. Casey
From: E. Lessard, Chair, BNL Environment, Safety and Health Committee
Subject: LESHHC 04-03, LEGS Inbeam Cryostat Commissioning Requirements – Request for LS ODH Review

The BNL ES&H Committee reviewed the commissioning requirements for the Laser Electron Gamma Source (LEGS) in our meeting of April 8, 2004. LEGS is located in Light Source Target Room 1-168 and Cryolab Room 1-169. One commissioning action required the Physics Department to review the SBMS Oxygen Deficiency Hazards (ODH) Subject Area and submit the calculations and the proposed control measures to the LESHHC Cryogenic Subcommittee for review. During the course of our April 8 ODH review, there was significant Committee discussion concerning the design of the ODH mitigation system. Although we understand the LEGS ODH system design is similar to other such systems at the Light Source, it varies from ODH mitigation systems at other onsite facilities as follows:

- The emergency fans can cycle on and off, rather than being latched on by the initial ODH signal.
- The location of the manual start switch for the fan requires entry into the affected area (Room 1-168). A more preferable location would be in the hall, outside the LEGS rooms.
- The ODH sensor readout is located in the Cryolab (Room 1-169) and is viewable at a distance through the door. A more preferable readout location would be in the hallway adjacent to a set of relocated fan controls.

There was also some discussion about the requirements and procedures for entry into these rooms after an ODH alarm, particularly for personnel rescue. The meeting attendees were not conversant with the LS ODH response procedures and could not resolve these questions.

Please evaluate the current LEGS ODH mitigation system design, in conjunction with the related Alarm Response Procedure(s) to determine if system hardware and/or procedure revisions are warranted. Kindly provide a response at your earliest convenience for Committee review.

Copy to:

LESHHC Members
M. Beckman
S. Dierker

J. Ellerkamp
N. Gmür
M. Lowry

A. Sandorfi
J. Tarpinian
G. VanDerlaske

Memo

date: July 2, 2004

to: Edward Lessard, BNL Cryogen Safety Committee Chairman

from: Andrew Ackerman, NSLS

subject: Resolution of ATS Action Item 2221.1.1 - Evaluate the current LEGS ODH mitigation system design.

During a recent meeting of the BNL Cryogen Safety Committee, several issues were raised that pertain to the NSLS Oxygen Deficiency Hazard (ODH) monitoring systems and the NSLS procedures for response to alarms from those systems. Two items were entered to the ATS for tracking under item number 2221.1.1. Each is addressed below.

ATS Item #1:

This ATS item contains the following text:

“Although we understand the LEGS ODH system design is similar to other such systems at the Light Source, it varies from ODH mitigation systems at other onsite facilities as follows:

- The emergency fans can cycle on and off, rather than being latched on by the initial ODH signal.
- The location of the manual start switch for the fan requires entry into the affected area (Room 1-168). A more preferable location would be in the hall, outside the LEGS rooms.
- The ODH sensor readout is located in the Cryolab (Room 1-169) and is viewable at a distance through the door. A more preferable readout location would be in the hallway adjacent to a set of relocated fan controls.”

DISCUSSION

It is true that our ODH fan systems cycle with the Oxygen concentration detected. The trip point is 19.5%. Below that level, our fans, audible alarms, read-back to the NSLS Control Room, and illuminated beacons are activated and once the Oxygen concentration exceeds that level they cycle off, except for the alarm to the Control Room. That alarm is directed to the Alarm Microcomputer and sounds in the Control Room until the Operator silences it. That computer also generates a history file for reference. This configuration meets our needs and is adequate for control of the ODH risks presented in the areas where these systems are installed.

The manual switch referenced above is located in room 1-169 (LEGS Target Room) as indicated and that room is adjacent to room 1-168 (LEGS Cryolab). It is room 1-168 that contains sufficient cryogen to present an ODH risk and to warrant the detection system installed. When activated, a high volume fan directs air into room 1-169 and another high volume fan, located in the ceiling of room 1-169 directs air to the exterior of the building. The target room (1-169) volume, where the subject switch is located, is enormous. Should we have an ODH event, it will be in room 1-168 and that event will have no significant effect on the Oxygen concentration in room 1-169 where we have the manual switch.

The ODH sensor read out referenced above has been moved to the hallway outside of room 1-169.

ATS Item #2:

This ATS item contains the following text:

“Please evaluate the current LEGS ODH mitigation system design, in conjunction with the related Alarm Response Procedure(s) to determine if system hardware and/or procedure revisions are warranted.”

DISCUSSION

We have recently completed a rework of the NSLS ODH alarm and control systems and of the procedures for response to alarms from those systems. The configuration details and alarm response is outline in the NSLS procedure attached here.



NSLS ODH
Systems

I hope the information presented here is clear and sufficient to resolve any concerns that the Cryogen Safety Committee may have. Please contact me if more is needed. I would welcome an opportunity to present this information at a meeting of the committee and to learn what changes should be made to our systems or response should the committee determine that our program or controls require revision.

Cc: W.R. Casey
P. Mortazavi
A. Sandorfi
R. Travis

* * *

Brookhaven National Laboratory/National Synchrotron Light Source			
Subject:	Oxygen Deficiency Hazard (ODH) Alarms in Bldg. 725		
Number:	LS-OPS-0049	Revision:	B
		Effective:	06/30/2004
			Page 1 of 2
Prepared By:	Andrew Ackerman	Approved By:	Andrew Ackerman
		Approved By:	Randy Church

*Approval signatures on file with master copy.

1.0 PURPOSE

This document is to define the NSLS Oxygen Deficiency Hazard (ODH) alarm systems and the Operations Group response to alarms from these monitoring systems.

2.0 SCOPE

The requirements outlined here apply to the following NSLS ODH alarm systems:

- Liquid Nitrogen Fill Station
- MER A
- LEGS Cryolab

3.0 RESPONSIBILITY

Users/NSLS Staff are to report all alarms to the NSLS Control Room and, if appropriate, to BNL Emergency Services.

NSLS ES&H Staff are to analyze and assure adequate control of ODH risks.

NSLS Operations Staff are to monitor and respond to alarms as outlined in this document.

NSLS Mechanical Engineering Staff are to maintain the ODH detection systems in operating and calibrated order.

4.0 ODH DETECTION EQUIPMENT SUMMARY

The details of the oxygen sensing, alarms, and postings are presented in the tables contained in the attachment below. All NSLS ODH monitoring systems alarm when the ambient oxygen concentration falls below 19.5% and reset if the oxygen concentration returns to 19.5% or greater.



Equipment Matrix

Subject:	Oxygen Deficiency Hazard (ODH) Alarms in Bldg. 725		
Number:	LS-OPS-0049	Revision:	B
		Effective:	06/30/2004
			Page 2 of 2

5.0 ALARM RESPONSE

In responding to an alarm, the first priority of the Operations Coordinator is to reduce or eliminate the potential for harm to individuals. The Operations Coordinator shall take no action that places him/her or other personnel in danger.

The Operations Coordinators are NOT emergency response personnel. No non-emergency personnel may enter an ODH area once an ODH alarm has sounded without assistance from BNL Emergency Services Personnel.

If an ODH alarm is received in or reported to the NSLS Control Room, an Op Co should proceed to the area to investigate and determine if anyone needs assistance and the Machine Operator should call BNL Emergency Services for their assistance. **The Op Co is not to enter any ODH area once an alarm has sounded, even if the alarm resets.** The Op Co is to remain on the scene to assist emergency personnel in interpreting the sensor readouts, to explain the systems, and to assure no personnel entry without assistance from BNL Emergency Services

6.0 GUIDANCE

When responding to ODH alarms at the NSLS, BNL Emergency Services may not be familiar with the NSLS detection and control systems. The Op Co on the scene can provide valuable information towards determining the nature of the alarm and the operation of the control systems. Some guidance follows.

- 6.1 Liquid Nitrogen Fill Station (West Roll-Up Door).** An ODH Alarm from this area should also trigger the opening of the large West Roll-Up door. Once the door opens, the alarm is expected to reset in a few minutes time. With the door open, and the alarm reset for 10 minutes or more with the readout consistently showing greater than 19.5% Oxygen concentration, it is reasonable to expect that the hazard has cleared.
- 6.2 MER A.** An ODH alarm from this area should activate the fan system described in the attachment above. An observer standing outside this room can see the intake louvers open, but can not readily determine if the fans have activated. As we have two sensors in this room, one at the upper level and one at the lower level of the room, having both readouts indicate that the Oxygen concentration is greater than 19.5% is good indication that the hazard has cleared. There is no manual switch to activate the fan and louvers, only the Oxygen sensors can trigger those systems.
- 6.3 LEGS Cryolab.** An ODH alarm from this area should activate the fan systems described in the attachment above. An observer standing outside this room can easily determine if the fans are on by the distinctive noise they make. These are high volume fans expected to clear any ODH hazard in a few minutes time.

If the alarm resets, the fans will turn off. There is a switch in the LEGS Target Room (adjacent to the Cryolab) that can be set to have the fans stay on regardless of the Oxygen concentration. When responding to an alarm in this area, it is best to activate the fans in this manual mode to keep them activated until the trouble has been resolved.

***NSLS ODH Systems
System Description/Elements***

<i>Area/System</i>	<i>Sensors</i>	<i>Hazard</i>	<i>Read-back alarm to Control Room</i>	<i>Type of alarms</i>	<i>Interlocked devices</i>	<i>Digital readout</i>	<i>No. of Postings</i>	<i>Switches</i>	<i>Additional monitoring</i>
West Roll-up door area, 1-151A (LN2 Fill Station)	1 ODH sensor	LN2, N2	Total of 2 read-back alarms: “O 2 DEF” & “O2 POWERFAIL”	Audible: 1 horn inside the rollup door area (can be heard outside each entrance door) Visual: 4 Beacons- 3 external (outside each entrance door) and 1 inside the area,	Interlocked to the roll-up door, fill valve, and the alarm. Once alarm is received, outside roll up door opens, and LN2 fill valve closes.	1 – O2 concentration display located outside area in main aisle way to 1-151A near X14.	Total 4: 3 outside area at each entry door and 1 inside area.	N/A	1 camera in area that can be monitored from the control room.

<i>Area/System</i>	<i>Sensors</i>	<i>Hazard</i>	<i>Read-back alarm to Control Room</i>	<i>Type of alarms</i>	<i>Interlocked devices</i>	<i>Digital readout</i>	<i>No. of Postings</i>	<i>Switches</i>	<i>Additional monitoring</i>
X-5 Cryolab (1-169)	1 ODH sensor	Helium	Total of 1: “X5 CRYO ODH”	Audible: 1 horn inside area (can be heard outside each entrance door) Visual: Total 3: 2 beacons - outside each entrance door and 1 beacon inside the area	2 fans One exhausts from the Cryolab to the target area and the other exhausts from the target room to the exterior. Alarms: See Below*	1 – O2 concentration display located outside area in main aisle way to 1-169 near X4.	Total 3: 2 external (one at each entrance door) & 1 internal.	Total 2: 1 for each fan. Posting on each fan controller.	N/A

*Alarms: Once alarm is received, 2 fans, both controlled from inside the X5 Target Room (1-168) activate, The controls are labeled as follows:

- This disconnect is part of the X5 O2 deficiency alarm system-A safety system work permit must be issued prior to operating this disconnect.
- If an emergency requires operation of this disconnect: operate switch and then call the Control Room at x2550.

NOTE: Switch must remain in **AUTO** to keep O2 deficiency alarm operational.

<i>Area/System</i>	<i>Sensors</i>	<i>Hazard</i>	<i>Read-back alarm to Control Room</i>	<i>Type of alarms</i>	<i>Interlocked devices</i>	<i>Digital readout</i>	<i>No. of Postings</i>	<i>Switches</i>	<i>Additional monitoring</i>
MER-A (1-210)	2 ODH sensors: 1 upper and 1 lower	LN2 and Helium	Total 1: “ MER A ODH ”	Audible: 1 horn inside area. Visual: Total 3: 1 beacon outside area & 2 beacons inside.	1 fan and 1 louver exhausts to the exterior. Once alarm is received, roof fan is activated, louvers open	Total 2 O2 concentration displays (1 per sensor): Both within the same box just inside the MER A entry door. (Can be seen through the door glass)	Total 2: 1 inside & 1 outside.	Proposed	N/A

****POSTINGS: The postings read as follows:**

For postings outside the area:

**CAUTION
OXYGEN DEFICIENCY HAZARD
WHEN BEACON ILLUMINATED OR
ALARM SOUNDING
DO NOT ENTER**

For postings inside the area:

**CAUTION
OXYGEN DEFICIENCY HAZARD
WHEN BEACON ILLUMINATED OR
ALARM SOUNDING
LEAVE AREA IMMEDIATELY**