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Photon Sciences Directorate, Brookhaven National Laboratory			
Doc No. PS-C-XFD-PRC-005	Author: B. Heneveld	Effective Date: 21Aug2014 Review Frequency: 3 yrs	Version 2
Title: Beamline Enclosures ODH Monitoring and Alarm System Certification and Inspection			Technical

**Reviewed by:**

8/20/2014	8/25/2014	8/25/2014
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<p><b>USI Screening/Resolution</b></p> <p style="text-align: right;">8/20/2014</p> <p><b>X</b> </p> <hr/> <p>Steve Moss PS Authorization Basis Manager Signed by: Moss, Steven H</p>	<p><b>Procedure Validation*</b></p> <p style="text-align: right;">8/20/2014</p> <p><b>X</b> Brian Heneveld</p> <hr/> <p>Brian Heneveld PS ESH Engineer Signed by: Heneveld, Brian</p> <p><b>*for Operations/Technical procedures only</b></p>
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**Approved by:**

8/21/2014

**X** 

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Robert Lee  
PS ESH Manager  
Signed by: Lee, Robert J

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### VERSION HISTORY LOG

VERSION	DESCRIPTION	DATE
1	First Issue	29May2014
2	Changed "hutch" to Beamline Enclosures throughout procedure; added section 6.2 and Attachment B for system inspection requirements; added Technical Authority sign-off to Attachment A. Minor edits and formatting throughout. Title changed to include Inspection.	21Aug2014

#### ACRONYMS

BNL	Brookhaven National Laboratory	ODH	Oxygen Deficiency Hazard
ESH	Environment, Safety and Health	POM	Personal Oxygen Monitor
FLOCO	Floor Coordinator	PS	Photon Sciences
LN <sub>2</sub>	Liquid Nitrogen		
NSLS-II	National Synchrotron Light Source II		
O <sub>2</sub>	Oxygen		

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## 1 PURPOSE AND SCOPE

The purpose of this procedure is to provide instructions for the certification and inspection of the PureAire Air Check O<sub>2</sub> Oxygen Deficiency Monitors and associated alarms for the NSLS-II Beamline Enclosures identified to be at risk of oxygen deficiency under specific cryogen system failure scenarios. The PureAire Air Check O<sub>2</sub> Oxygen Deficiency Monitors and associated alarms are required to be inspected and re-certified every 12 months; not to exceed 15 months.

The scope of this procedure includes:

- System Inspection:
  - Visual inspection of each system
  - Verifying the status of each system component
  - Determination and implementation of any required corrective actions/maintenance activities based upon the visual inspection
- System Certification:
  - Performance of functionality testing using a challenge gas to activate a system response
  - Verification of the activation of the sounder/strobes located within the beamline enclosures and at all exterior entrances to the beamline enclosures
  - Verification that a communication means (e.g., telephone) is readily available or automated to contact the Control Room

## 2 DEFINITIONS

- 2.1 Verification: A process of confirming that system testing results in the expected outcome.
- 2.2 Challenge Gas: The gas introduced to the monitoring sensor to ensure that the ODH monitor responds as expected under ODH conditions.

## 3 RESPONSIBILITIES

- 3.1 Testers/Inspectors
- 3.1.1 Coordinate and perform ODH Monitoring System inspection and certification.
- 3.1.2 Complete Attachment A, *Beamline Enclosures ODH Monitoring and Alarm System Inspection Data Sheet* and Attachment B, *Beamline Enclosures ODH*

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*Monitoring and Alarm System Certification*, as required and forward to the Configuration Management Specialist.

### 3.2 Assistants

3.2.1 Assist the Tester in performing the testing actions and observations when directed by the Tester.

3.2.2 Report all test observations to the Tester.

### 3.3 Configuration Management Specialist

3.3.1 Posts the completed Attachment A, *Beamline Enclosures ODH Monitoring and Alarm System Inspection Data Sheet* and/or Attachment B, *Beamline Enclosures ODH Monitoring and Alarm System Certification* on the SharePoint Document Center.

## 4 PREREQUISITES

4.1 The Tester/Inspector shall be PS ESH Staff or personnel designated by ESH Staff.

4.2 Assistants shall be designated by the Testers.

4.3 All Testers and Assistants shall be current in Oxygen Deficiency Hazard - Class 0 (TQ-ODH) training.

4.4 The following have been notified that the test will be performed:

- Beamline Staff at the testing location
- Beamline Staff at the two adjacent beamlines
- Control Room
- Appropriate FLOCO

4.5 An announcement has been made on the Building 740 public address system notifying personnel of the testing.

4.6 The appropriate functionality testing materials are available:

- Challenge gas
- Tubing
- A flow regulator
- Painter's tape (or equivalent) for diffusion ports

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4.7 The Monitor Display indicates an oxygen concentration at or between 20.4% and 21.4%.

**Note:** The Enable Lights are located adjacent to the sounder/strobe and indicate that the alarm is powered and connected to the monitoring device.

4.8 All Enable Lights are illuminated (Figure 4-1).



**Figure 4-1:** ODH Monitor with Blue Sounder/Strobe and Green Enable Light

## 5 PRECAUTIONS AND LIMITATIONS

- 5.1 Entering the beamline enclosures to perform ODH functionality testing or inspection requires coordination with beamline scientists to minimize disruption and ensure that safe entry procedures are followed.
- 5.2 No beamline enclosures shall be entered if the alarm system is activated under a potential LN<sub>2</sub> System failure condition prior to evaluation and authorization by BNL Fire/Rescue.
- 5.3 Enclosure access doors shall be placed in an open position during personnel occupancy, including implementation of functionality testing, due to a potential for oxygen deficiency.

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5.4 Any replacement of components during maintenance activities requires a Safety System Work Permit in accordance with PS-ESH-PRM-3.4.1, *Procedure for Safety System Work Permits* and re-certification of the system in accordance with PS-C-XFD-PRC-035, *NSLS-II Beamline Enclosures ODH Monitoring and Alarm System Configuration Management*.

## 6 PROCEDURE

**Note:** System inspection and certification is required every 12 months; not to exceed 15 months.

### 6.1 System Inspection

**Note:** Attachment A, *Beamline Enclosures ODH Monitoring and Alarm System Inspection Data Sheet* shall be completed for each beamline enclosure inspected.

#### 6.1.1 Visual Inspection

**Note:** Maintenance is performed in accordance with the PureAire Air Check O<sub>2</sub> Deficiency 0-25% Monitor Instruction Manual if any of the conditions below are not met.

a. Perform a visual inspection of the entire monitoring system including:

- Sensor
- Cable conduit
- Alarm units

a.1 Upon inspection, verify the following:

- The monitor display is indicating 20.4% – 21.4% oxygen
- The monitor is securely mounted
- No dust or other material has accumulated in and around the sensor diffusion port
- All green enable lights are illuminated
- All conduit containing power and alarm cables are intact and in good condition

b. Verify that the Zirconium O<sub>2</sub> sensor is within 10 years of service by inspecting the calibration sticker located on the upper left corner of the display face of the PureAire Air Check O<sub>2</sub> Oxygen Deficiency Monitor.

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**Note:** Replacement of the Zirconium O<sub>2</sub> sensor requires the use of a Safety System Work Permit in accordance with PS-ESH-PM-3.4.1, *Procedure for Safety System Work Permits*.

- c. IF the Zirconium O<sub>2</sub> sensor is not within 10 years of service, THEN replace the Zirconium O<sub>2</sub> sensor.
- d. IF any inspection results deviate from the expected configuration, THEN contact the Technical Authority.

## 6.2 System Certification

### 6.2.1 Alarm Activation

**Note:** Attachment B, *Beamline Enclosures ODH Monitoring and Alarm System Certification* shall be completed for each beamline enclosure tested.

- a. Verify that the monitor display indicates 20.4% - 21.4% oxygen.
- b. Seal diffusion ports with painter's tape (or equivalent) as indicted in Figure 6-1 below.
- c. Using the correct diameter tubing, connect the challenge gas to the monitor in a manner that will ensure that the gas will adequately impact the diffusion sensor as indicated in Figure 6-1 below.



**Figure 6-1:** Correct configuration of tape and tubing for testing

- d. Place Tester in position AND open the valve to initiate gas flow.

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- e. Verify that both visual AND audible alarms have activated at the following locations:
  - Within the beamline enclosure
  - At all exterior entrances to the beamline enclosure
- f. Verify that communication with the Control Room is readily available or an automated communication has occurred.

#### 6.2.2 Alarm Return to Normal

- a. Turn off the challenge gas.
- b. Remove tubing and diffusion port tape.
- c. WHEN the monitor indicates an oxygen concentration of greater than 19.5%, THEN verify that both visual AND audible alarms have returned to normal (non-activated) at the following locations:
  - Within the beamline enclosure
  - At all exterior entrances to the beamline enclosure
- d. IF the test was unsuccessful, THEN post the beamline enclosure indicating that "Calibrated POMs are Required for Entry" AND notify the Technical Authority.

### 6.3 Documentation

- 6.3.1 Provide the completed Attachment A, *Beamline Enclosures ODH Monitoring and Alarm System Inspection Data Sheet* and/or Attachment B, *Beamline Enclosures ODH Monitoring and Alarm System Certification* to the Configuration Management Specialist for posting on the SharePoint Document Center.

## 7 REFERENCES

- 7.1 PS-C-XFD-PRC-035, *NSLS-II Beamline Enclosures ODH Monitoring and Alarm System Configuration Management*
- 7.2 PS-C-CMD-PRC-002, *Records Management Procedure*
- 7.3 PS-ESH-PM-3.4.1, *Procedure for Safety System Work Permits*
- 7.4 PureAire Air Check O<sub>2</sub> Deficiency 0-25% Monitor Instruction Manual

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## 8 ATTACHMENTS

Attachment A, *Beamline Enclosures ODH Monitoring and Alarm System Inspection Data Sheet*

Attachment B, *Beamline Enclosures ODH Monitoring and Alarm System Certification*

## 9 DOCUMENTATION

The following documents are generated as a result of this procedure and shall be maintained in accordance with PS-C-CMD-PRC-002, *Records Management Procedure*:

- Completed Beamline Enclosures ODH Monitoring and Alarm System Inspection Data Sheets
- Completed Beamline Enclosures ODH Monitoring and Alarm System Certifications

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## Attachment A

### Beamline Enclosures ODH Monitoring and Alarm System Inspection Data Sheet

**Enclosure** \_\_\_\_\_

- |                                                                                 |                                                          |
|---------------------------------------------------------------------------------|----------------------------------------------------------|
| Monitor Display indicating 20.4% – 21.4% oxygen                                 | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Monitor is securely mounted                                                     | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Diffusion port is free of dust or other material accumulation                   | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| All enable lights are illuminated inside and outside enclosure at each entrance | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| All conduit containing power and signal cables are intact and secure            | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Zirconium O <sub>2</sub> sensor is within 10 years of service                   | Yes <input type="checkbox"/> No <input type="checkbox"/> |

Maintenance activities to be performed (if required):

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**Note:** Signatures below indicate that the inspection has been completed.

Inspection Reason:	Inspection Result: <input type="checkbox"/> Passed <input type="checkbox"/> Failed	
Inspection Date:	Start Time:	Finish Time:
Inspector:	Assistant:	
Inspector Signature:	Assistant Signature:	
Technical Authority:	Technical Authority Signature:	

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## Attachment B

### Beamline Enclosures ODH Monitoring and Alarm System Certification

**Enclosure** \_\_\_\_\_

#### *Pre-test Conditions*

The following have been notified that the test will be performed: Yes  No

- Beamline Staff at the testing location
- Beamline Staff at the adjacent beamlines
- Control Room
- Appropriate FLOCO

Monitor Display indicating 20.4% – 21.4% oxygen Yes  No

#### *Test Conditions with Challenge Gas*

Monitor display indicating less than 18% oxygen Yes  No

Audible and visual alarm activated inside enclosure Yes  No

Audible and visual alarm activated outside enclosure at each entrance Yes  No

Communication with Control Room readily available or automated Yes  No

#### *Return to Normal Operation*

Monitor Display indicating 20.4% – 21.4% oxygen Yes  No

Audible and visual alarm deactivated inside enclosure Yes  No

Audible and visual alarm deactivated outside enclosure at each entrance Yes  No

Painter's tape (or equivalent) removed from the diffusion ports Yes  No

**Note:** Signatures below indicate that the test has been completed.

Test Reason:	Test Result:	<input type="checkbox"/> Passed	<input type="checkbox"/> Failed
Test Date:	Start Time:	Finish Time:	
Tester:	Assistant:		
Tester Signature:	Assistant Signature:		
Technical Authority:	Technical Authority Signature:		

– END –