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C-A OPERATIONS PROCEDURES MANUAL

3.15.2 Response to PASS ODH Alarms During Refrigerator Shutdown

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Hand Processed Changes

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Approved: _____ *Signature on File* _____
Collider-Accelerator Department Chairman Date

W. Anderson / R. Karol

3.15.2 Response to PASS ODH Alarms During Refrigerator Shutdown

1. Purpose

- 1.1 The purpose of this procedure is to give instructions to Collider-Accelerator Support (CAS) Watch to respond to PASS Oxygen Deficiency Hazard (ODH) alarms when the RHIC refrigerator is shutdown in order to prevent costly equipment damage to RHIC experiments, due to automatic fan starting, and to determine if the alarm is real and a potential personnel hazard. The alarm shall be assumed real until proven false.
- 1.2 Job specific work planning is required to enter an actual oxygen deficient area «19.5% oxygen) according to step 5 of the Laboratory's SBMS ODH "Re-entry" Procedure.
- 1.3 This procedure applies to shutdown conditions when the RHIC Cryogenics Watch is not stationed. Instead of operating conditions with helium conditions at ~4K and 15 atm, either helium or nitrogen gas is circulated through the ring at ~80K and up to 5 atm. Under these conditions the RHIC ring is not a posted ODH area. This is because, under the shutdown conditions, the potential leak rates and likelihood of pressure boundary failure are much lower. A given size pressure boundary failure would have a leak rate that is only about 2% as great as under operating conditions. Given the natural air exchange in the tunnel or building, this low leak rate will require on the order of days to cause an ODH alarm at the 18% trip point.
- 1.4 When an ODH alarm is received at RHIC, the ring goes into Safe Mode in the ring area(s) where the ODH alarm tripped. This requires a Controlled Access to enter these areas. This procedure allows the CAS Watch to control the access mode to the RHIC tunnel in order to allow response to the possible ODH condition.

2. Responsibilities

- 2.1 The CAS watch is responsible for the execution of this procedure.
- 2.2 The CAS watch is responsible to control access to a RHIC tunnel enclosure or building while an ODH alarm is on.
- 2.3 The MCR Group Leader, or designee, is responsible to train CAS Watch on use of the RHIC Panel View on MCR_2 so that they can obtain information on the ODH condition and location of the alarm(s), allow Controlled Access into the RHIC tunnel and to reset the access mode as conditions allow.
- 2.4 When contacted by CAS watch, the BNL Fire Group is responsible to enter the area designated by CAS watch and determine if an actual oxygen deficiency condition exists.

- 2.5 The Access Controls Group (ACG) is responsible for responding to the CAS call-in and for re-calibrating/replacing ODH sensors that have been determined to have false readings.
- 2.6 The Cryogenics Operations Group (COG) is responsible to respond to the CAS call-in and to assist as requested during the ODH alarm response.

Note:
If the Fire/Rescue Group measurements show that the ODH alarm is spurious, THEN the ESH Coordinator, or designee, is responsible for giving permission to bypass an ODH sensor (C-A OPM Att 4.92.a).

3. Prerequisites

- 3.1 One CAS Technician on watch who calls the BNL Fire/Rescue Group and other staff as needed.

4. Precautions

- 4.1 Tunnel or building entrants shall be properly trained and wear self-contained breathing apparatus when entering an enclosure during the period when a PASS ODH alarm remains un-verified.
- 4.2 ODH alarms shall be assumed to be real until proven false by Fire/Rescue Group measurements.
- 4.3 Once the area ODH alarm is verified to be real, no one shall enter the area in which an oxygen deficient atmosphere exists ($<19.5\%$) without an approved enhanced work permit which includes appropriate Personal Protective Equipment (PPE). CAS shall call-in appropriate staff that they need to deal with actual or spurious ODH alarm.

5. Procedure

Caution
Tunnel or building occupants present in an area which has an ODH alarm or whose POM indicates $< 19.5\%$ oxygen shall immediately evacuate the area to an outdoor location, call Fire/Rescue at x2222 or 911, and await the response by emergency personnel.

Note 1:

If any enclosure is in a state other than the NA state, and an ODH alarm is present in that enclosure, THEN the associated tunnel fans in the affected sector will turn on immediately and, if the alarm condition persists, the tunnel fans in the sextant will turn on ten minutes after the first fans turned on.

Note 2:

The following instructions are intended to provide guidance. Real situations may present possibilities that were unforeseen at the time this procedure was written. The CAS watch is encouraged to seek advice and call-in whoever they feel necessary to assist during any such situation.

Note 3:

The instructions assume that the alarm is in the RHIC tunnel. The same instructions apply if the alarm is in a service or support building; however, entry requirements are simpler since the access to the area is not through a PASS gate.

Note 4:

1. ODH fans will run for at least 90 seconds following an ODH alarm in the area covered by the fans even if the alarm resets during the 90-second interval.
2. If the ODH alarm clears, the fans will automatically stop at the end of the 90-second interval.

5.1 If an ODH alarm annunciates, THEN call in members of the COG, ACG and others as needed to assist with the response and:

5.1.1 Verify the validity of the alarm as follows:

- a) Using the RHIC PanelView on MCR_2, choose MainMenu/Maintenance.
- b) From the Maintenance page choose P7 (or 9, 11, 13, 15, 17, 19) ODH and "select page".
- c) IF the alarming detector indicates that EITHER division A OR division B reports an alarm, THEN PROCEED to STEP 5.1.2 to determine if the alarm condition is real.
- d) IF the alarming detector indicates BOTH division A AND division B report an alarm, THEN the ODH condition is confirmed. PROCEED to STEP 5.1.9.1.

5.1.2 Call The BNL Fire/Rescue Group on x2350 or x2222 or x911 to request a response to the area where the suspected oxygen deficiency is indicated.

5.1.2.1 Persons shall be assigned as follows:

- CAS: Wear a POM as gate/door watch and ODH fan switch operator.

Note:
See Table 1 for ODH fan start/stop controls at RHIC
External Gates.

- Fire/Rescue: Enter area designated by CAS watch wearing self-contained breathing apparatus and an instrument to measure oxygen concentration.
- 5.1.3 If the alarm is in the tunnel, the CAS watch shall attempt to alert the experiments that could be affected by operation of the ODH fans. This may not be possible since the experiments may not be manned after working hours or during RHIC shutdown.
- 5.1.4 The CAS watch shall review the entry plan with the Fire/Rescue Group and any other staff present to emphasize that speed is important and safety is paramount. The CAS shall also give the gate or building phone number to the Fire/Rescue Group entry team, from: <http://www.cadops.bnl.gov/AGS/Operations/QuickPhone/quickphone.html#olaces>
- 5.1.4.1 IF an ACG group member is available, they may elect to re..., calibrate the ODH sensor without defeating the alarm to save time. The CAS watch shall be informed of this approach.
- 5.1.5 The CAS watch shall direct the groups to assemble at the designated entry gate or building doorway with the appropriate personnel protective equipment. He sees that a CA Key is made available if the ODH alarm is in the RHIC tunnel and a Controlled Access to the area is planned.
- 5.1.6 CAS Tech (MCR) Operator gives simultaneous release from MCR Panel View at MCR_2, if the system is still in Safe Mode and Controlled Access is required. If not in Safe Mode, this step is unnecessary.
- 5.1.7 The Fire/Rescue Group team enters the enclosure or building with a self-contained breathing apparatus and oxygen measuring instrumentation. They sweep the area designated by the CAS watch and report their findings to the CAS watch as soon as possible.
- 5.1.8 If the ODH alarm is found to be false, CAS watch calls in the ACG and as needed the Cryogenics Group to assist in monitoring oxygen levels or assist with the bypass or repair the affected oxygen sensors as per the following steps:
- 5.1.8.1 The ACG will unlock and open ODH box padlock using IK056 key.
- 5.1.8.2 The ACG will operate ODH sensor bypass switch A or B in

the ODH panel to defeat alarm from appropriate sensor. If ODH Fans are on, they should go off when the switch is thrown.

5.1.8.3 When fans are off, the COG shall try to see if oxygen concentration is stable using a POM. **Note:** The oxygen concentration will decrease again once the ODH fans are off if an actual helium or nitrogen leak is present.

5.1.9 IF the alarm is caused by a real ODH condition, THEN restore ODH sensor bypass switch to its normal position (ODH fans will restart) and all entrants shall immediately leave the enclosure. Attempts to determine the ODH source shall be made only after the enclosure is ventilated and work planned using an Enhanced Work Permit

5.1.9.1 IF the ODH condition is real, THEN contact the ESSHQ Chair, or designee, and additional Cryogenics Group staff as needed to respond and isolate the cryogenic gas leak.

5.1.10 IF the alarm is caused by an erroneous signal from a sensor, THEN the alarm is false and this procedure should be followed to completion.

5.1.11 ACG member and one COG member enter the enclosure and proceed to the faulty detector.

5.1.11.1 The COG member shall monitor the area for ODH using their POM. IF they detect a hazard, THEN they shall contact the building or gate watch to turn on the ODH fans.

Note:

See Table 1 for ODH fan start/stop controls at RHIC External Gates.

5.1.11.2 The ACG member shall recalibrate or replace the sensor that caused the alarm.

5.1.11.3 ACG member restores ODH sensor bypass switch to its operating position and padlocks ODH box.

5.1.11.4 ACG member verifies proper operation of the ODH sensor.

Warning:

Verification requires that the ACG member confirms that the ODH sensor bypass switch is in the operating position.

5.1.11.5 ACG member and COG member return to the gate and report to the CAS watch the "all clear".

5.1.11.6 The CAS watch shall reset the ODH alarm on the RHIC PASS panel at MCR_2.

5.1.12 The ASSRC Chair, ESSHQ Chair, or designees, shall be notified by via e-mail that this procedure has been invoked. Pertinent details shall be provided in this notification and in the CAS log.

6. Documentation

6.1 Event description in the CAS log.

7. References

7.1 [SBMS - Re-entry into ODH Areas after Alarm.](#)

8. Attachments

8.1 ODH Fan Controls at RHIC External Gates

Attachment 8.1

Table 1

ODH Fan Controls at RHIC External Gates

Note: The fan control is usually located just below the RHIC card reader panel except as noted in this table.

External Gate Number	Notes
2GE1	No fan controls on this outdoor gate - must use the controls at the entrance to gate 2GE2 in B 1 002A
2GE2	
4GE1	No fan controls on this outdoor gate - must use the controls at the entrance to gate 4GE2 in B 1 004
4GE2	
4GE3	
5GE1	
6GE1	
6GE2	
6GE3	
7GE1	
8GEI-1	This fan control is located to the right of the Phenix IR plug door
8GE2	
10GE 1	
12GE1	