If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.

The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A

C-A OPERATIONS PROCEDURES MANUAL

2.5.2 Accelerator Safety Envelope Credited Controls, Supports and Administrative Controls for RHIC

Text Pages 2 through 15

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: _____***Signature / Date on File***_____

Collider-Accelerator Department Chairman Date

E. Lessard, R. Karol

2.5.2 Accelerator Safety Envelope Credited Controls and Supports for RHIC

1. Purpose

1.1. This procedure assigns responsibility for maintaining the Accelerator Credited Controls and Supports for the RHIC Collider, STAR experiment, PHENIX experiment and CeC PoP experiment. These are based on the Accelerator Safety Envelope and any relevant USIs documented using C-A OPM 1.10.1, Unreviewed Safety Issues.

1.1.1 Additionally, the RHIC Collider and experiments are limited by ESH requirements established by the C-A Radiation Safety Committee (RSC), the C-A Accelerator Systems Safety Review Committee (ASSRC), and the C-A Experimental Safety Review Committee (ESRC). C-A safety-committee requirements are documented in RSC, ASSRC, and ESRC Checkoff Lists in the Main Control Room (MCR). These Checkoff Lists must be completed before allowing reviewed systems to become operational, or allowing beam in RHIC, or allowing beam collisions for experiments.

1.2. Implicit in the notion of Accelerator Safety Envelope Credited Controls and Supports is that variations in operating conditions are permitted if and only if they do not exceed the defined boundaries. A variation beyond the boundaries described in this procedure shall be evaluated as a Reportable Occurrence. Notifications of occurrences shall be made according to C-A OPM 10.1.

1.2.1 If a Credited Control or its Supports are not satisfied and it has a specific Authorized Alternative associated with it, then take immediate action to implement the Authorized Alternative or safely stop the activity that uses the affected equipment as soon as practicable.

1.2.2 If a Credited Control or its Supports have no specific Authorized Alternative, and is not satisfied, then stop the activity that uses the affected Credited Control or Support as soon as practicable .

1.2.3 If an Authorized Alternative is implemented, then this is not a Reportable Occurrence.

1.3 Emergency actions may be taken that depart from these Credited Controls or Supports when no actions consistent with the control or support are immediately apparent and when these actions are needed to protect the public, worker or environment:

1.3.1 These emergency actions shall be approved by the person in charge of facility safety, as defined in the operating procedures, when the emergency occurs and must be reported to C-AD management within 2-hours.

2. Responsibilities

2.1. The C-A Department Chairman must approve all changes to the Accelerator Safety Envelope.

2.2 The following individuals have responsibilities for each of the Credited Controls and Supports as specified in this procedure:

2.2.1 Associate Chair for ESSHQ

2.2.2 ESSHQ Division Head

2.2.3 Chair of ASSRC

2.2.4 Chair of ESRC

2.2.5 Chair of RSC

2.2.6 Head of MCR

2.2.7 Head of Facilities and Experimental Support

2.2.8 MCR Operations Coordinator and Operator

2.2.9 Liaison Physicists

2.2.10 Liaison Engineers

2.2.11 Cryogenic Systems Operations Group Leader

2.2.12 Head of Cryogenic Systems

2.2.13 Facility Support Representative (RCD)

2.2.14 Access Controls Group Leader

2.2.15 Accelerator Components & Instrumentation Group Leader

2.2.16 Maintenance Coordinator

2.2.17 CAS Supervisor

2.2.18 Collider Electrical Power Supplies Group Leader

2.2.19 ESH Coordinator

2.2.20 CeC PoP Experiment Shift Leader

2.3 The person in charge that approves Emergency Actions that depart from the requirements of this procedure must inform the Department Chair within 2-hours of this decision.

3. Prerequisites

None

4. Precautions

None

5. Procedure

Caution:

1. In all cases, if RHIC has an Unreviewed Safety Issue, startup or restart of the activity requires DOE approval.
2. If RHIC is shut down by C-AD management for safety reasons, contact the C-AD ESSHQ Associate Chair or C-AD ESSHQ Division Head for assistance with requirements for restart of the activity.

5.1 RHIC Beam Limits

Notes:

1. These limits are not yet at the DOE approved ASE values because physical modifications in some cases must be in place before the approved ASE limits are permitted.
2. The current, approved RHIC ASE authorizes the following limits provided the Radiation Safety Committee approves on a case-by-case basis. Each case approval must be signed by the RSC chair in the RSC check-off list.

    - For ions with mass numbers from 2 to 238, the maximum number of heavy ions in each ring must not exceed the equivalent of $5x10^{11}$ Au ions at 120 GeV/u. (Reference ASE Section 2.1).
    - The maximum number of protons in each ring must not exceed the equivalent of $5x10^{13}$ at 300 GeV. (Reference ASE Section 2.2).

5.1.1 The on-duty Operations Coordinator must ensure that the maximum number of heavy ions (mass numbers from 2 to 238) in each ring does not exceed the equivalent of 2.4×10^{11} Au ions at 100 GeV/u (Reference ASE Section 2.1).

5.1.1.1 Deuterium – $1.2x10^{13}$ ions per ring at 125 GeV/u

5.1.1.2 Oxygen – $2x10^{12}$ ions per ring at 125 GeV/u

5.1.1.3 Silicon – $1.34x10^{12}$ ions per ring at 125 GeV/u

5.1.1.4 Copper – $6.48x10^{11}$ ions per ring at 115 GeV/u

5.1.1.5 Iodine – $3.6x10^{11}$ ions per ring at 104 GeV/u

5.1.2 Prior to injection in RHIC, the C-AD Radiation Safety Committee shall consider each new species.

5.1.3 The on-duty Operations Coordinator shall maintain the maximum number of protons in each ring to be equal to or less than the equivalent of $3x10^{13}$ at 255 GeV.

5.1.4 The on-duty CeC PoP Experiment Shift Leader shall ensure CeC electron kinetic energy is limited to 25 MeV.

5.1.4.1 The on-duty CeC PoP Experiment Shift Leader shall ensure electron beam power to the low-power dump does not exceed 1 W averaged over 1 hour.

5.1.4.2 The on-duty CeC PoP Experiment Shift Leader shall ensure electron beam power to the high-power dump shall not exceed 8500 W averaged over 1 hour.

5.1.4.3 The on-duty CeC PoP Experiment Shift Leader or his designee shall ensure shield blocks in or around penetrations and local beam line shielding will be properly in place and configuration controlled.

5.1.4.4 With CeC in operation, commissioning mode, the ACS Group Leader shall ensure relevant portions of the ACS are functional if they are preventing exposure to CeC beam radiation or CeC RF-generated x-rays inside enclosures, and the ACS must remove beam, or turn off RF, when excessive beam loss or x-ray dose occurs.

5.1.4.5 With CeC in commissioning mode and CeC injection in between RHIC ion bunches, the on-duty Operations Coordinator shall ensure RHIC operates with zero beam in Blue Ring and Yellow ring with no more than 12 ion bunches with nominal intensity not exceeding 10^9 ions per bunch and total intensity of $12x10^9$ ions.

5.1.4.6 With CeC in commissioning mode and CeC injection only into the abort gap, the on-duty Operations Coordinator shall allow simultaneous RHIC operation.

5.2 Radiation Shielding

5.2.1 Before beam or other radiation producing operations (e.g. RF testing), the RHIC

Liaison Physicist must verify that all shielding (e.g. berms, shield blocks, CeC penetration shielding, etc.), are properly in place and configuration controlled.

5.3 Access Controls during Operations with Beam or RF Cavity Testing

5.3.1 The Access Controls Group Leader must ensure that the Access Controls System (ACS) configuration control and maintenance is in accordance with C-A OPM 4.91. This means that portions of the ACS that prevent exposure to beam radiation or RF-generated x-rays inside enclosures, and that remove beam, or turn off RF, when excessive beam loss or x-ray dose occurs are functional.

5.3.2 During RF only operations for RHIC or CeC respectively, the 4 o'clock portion of the RHIC ACS (ACS Group Leader assurance required) and/or the 2 o'clock portion or the RHIC ACS must be functional. CeC PoP Experimental Shift Leader and ACS Group Leader assurance required.

5.3.3 The Access Controls Group Leader, and Accelerator Components & Instrumentation Group Leader, must ensure that the area radiation monitors that are interfaced with the Access Controls System to remove beam when excessive beam loss is sensed, or turn off RF when excessive x-rays are produced, are within their calibration date.

5.3.4 The Access Controls Group Leader, and Accelerator Components & Instrumentation Group Leader, must ensure that the locations of area radiation monitors are maintained and configuration controlled as defined by the C-A Radiation Safety Committee.

5.3.5 The Access Controls Group leader must ensure that the high intensity proton source at Linac is prevented from being transported to the W-line, either by the ACS or by RS LOTO of appropriate critical devices.

5.4 Groundwater Protection

5.4.1 The appropriate Liaison Engineer must ensure that installed impermeable caps are functional.

Authorized Alternatives: If an installed cap is discovered to be breached, alternative equivalent protection approved by C-AD management must be in place within 10 days of discovery. Permanent repair of the cap must be initiated as soon as possible.

5.5 ODH Protection

Note 1:

Personnel may be escorted into ODH areas without completion of training (ODH 0 or 1 areas) or medical exam (ODH 1 areas). Untrained personnel

Note 2:

The following apply when the MCR is staffed and/or the Cryo Shift is staffed

Note 3:

Tunnel sextant 1 is from 12 o'clock to 2 o'clock; tunnel sextant 3 is from 2 o'clock to 4 o'clock, etc. Sextants 5 and 7 do not include the STAR IR and sextants 7 and 9 do not include the PHENIX IR. STAR and PHENIX IRs are not ODH areas because they are isolated from the sextant by gas barriers.

5.5.1 For RHIC Compressor Building (1005H), when the superconducting magnet cryogenic system cool-down below room temperature begins, the Access Controls Group Leader, and the Cryogenic Systems Operations Group Leader, must ensure that:

5.5.1.1 At least three ODH exhaust fans in 1005H are operational and

5.5.1.2 The ODH portion of the RHIC Access Controls System is operable; that is, when the oxygen concentration falls below 18% (nominal), the ODH fans in 1005H must turn on.

Authorized Alternative: If less than three ODH fans are operable in 1005H or the ODH portion of the Access Controls System is out of service, then entry is allowed if each entrant has their own 5-minute escape pack (or wears a self-contained breathing apparatus) and a portable oxygen monitor.

5.5.2 For RHIC Refrigerator Building (1005R) when liquid helium is in the liquid helium pots, the Access Controls group Leader, and the Cryogenic Systems Operations Group Leader, must ensure that:

5.5.2.1 At least one ODH exhaust fan in 1005R is operational and:

5.5.2.2 The ODH portion of the RHIC ACS is operable; that is, when the oxygen concentration falls below 18% (nominal), the ODH fans in 1005R must turn on , and

5.5.2.3 Each entrant is responsible to have their own 5-minute escape pack, (or wears a self-contained breathing apparatus), and a portable oxygen monitor.

Authorized Alternative: If no ODH fan is operable in the Refrigerator Building, or the ODH portion of the RHIC ACS is out of service, then entry is allowed if

each entrant wears a self-contained breathing apparatus and a portable oxygen monitor.

5.5.3 For RHIC tunnel sextants when the superconducting magnet cryogenic system is cooled below a temperature of 80 K but above 40 K , the Access Controls Group Leader, and the Cryogenics Systems Operations Group Leader, must ensure that:

5.5.3.1 At least three ODH exhaust fans in each RHIC tunnel sextant is operational, and

5.5.3.2 The ODH portion of the RHIC ACS is operable, that is, when the oxygen concentration falls below 18% (nominal), the ODH fans in that sextant must turn on.

Authorized Alternative: If less than three ODH fans are operable in a sextant, or the ODH portion of the RHIC ACS is out of service, entry to that sextant is allowed if each entrant has their own 5-minute escape pack (or wears a self-contained breathing apparatus), and a portable oxygen monitor.

5.5.4 For RHIC tunnel sextants when the superconducting magnet cryogenic system is cooled below a temperature of 40 K, and tunnel entry is allowed by the ACS, the Access Controls Group Leader, the Collider Electrical Power Supplies Group Leader, and the Cryogenics Systems Operations Group Leader, must ensure that:

5.5.4.1 At least three ODH exhaust fans in each RHIC tunnel sextant are operational, and

5.5.4.2 The ODH portion of the RHIC ACS is operable, that is, when the oxygen concentration falls below 18% (nominal), the ODH fans in that sextant must turn on.

5.5.4.3 The Vacuum Oxygen Deficiency Hazard (VODH) System is operable; that is, at least one of the two vacuum space pressure switch strings for each magnet string (yellow and blue) is operable.

5.5.4.4 When any of the installed power switches that monitor the magnet cryostats and vacuum jacketed piping sense a pressure of 0.5 atm (nominal) in these vacuum spaces, the ODH fans and the ODH alarms in the entire ring must turn on, and the cryogenic isolation valve in the affected ring (yellow or blue) must close.

Authorized Alternatives:

1) If less than three ODH fans are operable in a sextant or the ODH portion of the RHIC ACS is out of service, the affected portion of the tunnel must be reposted from ODH-0 to ODH-1. Each entrant to that sextant is responsible to

have their own self-contained breathing apparatus and a portable oxygen monitor.

2) If both strings of the VODH system are out of service, the affected portion of the tunnel must be reposted from ODH-0 to ODH-1, and entry into the tunnel is allowed with work planning. Each entrant is responsible to have their own 5-minute escape pack (or a self-contained breathing apparatus) and a portable oxygen monitor.

5.5.5 For RHIC tunnel sextants when the 80 K Cooler is operating, the Access Controls Group Leader, and the Cryogenics Systems Operations Group Leader, must ensure that:

5.5.5.1 At least three ODH exhaust fans in each RHIC tunnel sextant are operational, and

5.5.5.2 The ODH portion of the RHIC ACS is operable; that is, when the oxygen concentration falls below 18% (nominal), the ODH fans in that sextant must turn on.

Authorized Alternative: If less than three ODH fans are operable in a sextant, or the ODH portion of the RHIC ACS is out of service, entry to that sextant is allowed if each entrant has their own 5-minute escape pack (or wears a self-contained breathing apparatus), and a portable oxygen monitor.

5.5.6 For RHIC IP2 and Building 1002A when the CeC is operating with LHe the Access Controls Group Leader, and the Cryogenics Systems Operations Group Leader, must ensure that:

5.5.6.1 If the total liquid helium inventory in the CeC PoP Experiment cryogenic system is increased, then the ODH calculations in Building 1002A need to be re-evaluated.

5.5.6.2 Building 1002A ODH exhaust fan must be operational.

Authorized Alternative: If Building 1002A ODH fan is not operable, entry to 1002A is allowed if each entrant has their own 5-minute escape pack (or a self-contained breathing apparatus) and a portable oxygen monitor.

5.5.6.3 At least three ODH exhaust fans serving RHIC IP2 must be operational, and

5.5.6.4 The ODH portion of the RHIC ACS must be operable; that is, when the oxygen concentration falls below 18% (nominal), the ODH fans serving RHIC IP2 must turn on.

Authorized Alternative: If less than three ODH fans are operable or the ODH portion of the RHIC ACS is out of service, entry to IP2 is allowed if each entrant has their own 5-minute escape pack (or a self-contained breathing apparatus) and

a portable oxygen monitor.

5.5.7 The on-duty Operations Coordinator must ensure that before individuals enter the RHIC tunnel, when the helium temperature in magnets is below 40K, the RHIC magnet main power supplies are limited to supply a current of ≤530 amperes (see C-A-OPM 2.42). This restriction may be accomplished by enabling the over-current trip circuitry, or by locking the power supplies out.

Authorized Alternative: The C-AD Department Chair, Chief Electrical Engineer and the ESH Coordinator, must approve in writing if the Main Magnet power supply currents are to be increased to >530 amperes while allowing personnel in the RHIC tunnel. Work planning must document controls to minimize the hazard of this situation.

5.6 Smoke Inhalation Protection in RHIC Tunnel

5.6.1 The on-duty Operations Coordinator, or the Maintenance Coordinator or designee, must ensure that personnel occupy the RHIC tunnel enclosure only if the exhaust fans in the occupied area, required for personnel protection during an emergency, can be manually activated.

Authorized Alternative: If exhaust fans in an occupied area are inoperable, the on-duty Operations Coordinator, or the Maintenance Coordinator, must take immediate actions to empty the affected area of all personnel within four hours, and prevent occupancy until operability is restored. However, workers may enter the affected area using PPE as required by work planning to restore fan operability.

5.7 Protection against Flammable Gas Hazards at STAR

5.7.1 The following are required whenever flammable gas is in the integrated detector positioned in the intersecting region (IR).

5.7.1.1 The Head of Facilities and Experimental Support, and the STAR Liaison Physicist, must ensure that both STAR and the RHIC ACS flammable gas detection systems are operational.

Authorized Alternative: Within 2 hours of discovery, and if requested by the STAR Experimental Shift Leader, the C-AD Chair, or designee, may allow partial or full inoperability of either one of the two flammable gas detection systems for up to 80 hours with flammable gas present if the benefit of continuing STAR detector operations is judged to outweigh the potential risk of STAR experiment damage. As specified in C-A-OPM 3.24.1, the on-duty Operations Coordinator must implement the compensatory actions to be taken during inoperability.

5.7.1.2 The Star Liaison Physicist must ensure that if Silicon Detectors are operational, then the Inner Field Cage, IFC, detector ventilation system is delivering air flow.

5.7.1.3 The Star Liaison Physicist must ensure that at least one of the two IR emergency exhaust fans that are connected to the RHIC Access Controls System is operable.

5.7.1.4 The Star Liaison Physicist must ensure that a minimum of 1775 ft^3 (50,000 L) of inert purge gas is available to dilute the detector flammable gas volumes below 25% of the Lower Explosive Limit.

5.7.1.5 The Star Liaison Physicist must ensure that the Time Projection Chamber (TPC) gas used in the detector is P-10 or equivalent. The Collider-Accelerator Department must approve equivalent hazardous gases prior to use.

5.7.1.6 The Star Liaison Physicist must ensure that when electronics are powered in the integrated detector in the IR, either the detector Highly Sensitive Smoke Detection (HSSD) system, or the ceiling-level HSSD system are operational.

5.8 Protection against Flammable Gas Hazards at PHENIX

5.8.1 The following are required whenever flammable gas is in the integrated detector positioned in the IR:

5.8.1.1 The Head of Facilities and Experimental Support, and the PHENIX Liaison Physicist, must ensure that both PHENIX and the RHIC ACS flammable gas detection systems are operational.

Authorized Alternative: Within 2 hours of discovery, and if requested by the PHENIX Experiment Shift Leader, the Department Chair, or designee, may allow partial or full inoperability of either one of the two flammable gas detection systems for up to 80 hours with flammable gas present, if the benefit of continuing PHENIX detector operations is judged to outweigh the potential risk of PHENIX experiment damage. As specified in C-A-OPM 3.24.1, the on-duty Operations Coordinator must implement the compensatory actions to be taken during inoperability.

5.8.1.2 The PHENIX Liaison Physicist must ensure that both emergency fan systems, SF1/EF1 and SF2/EF2, that are connected to the RHIC Access Controls System, are operable.

5.8.1.3 The PHENIX Liaison Physicist must ensure that a minimum of 2200 ft^3 (62,500 L) of inert purge gas is available to dilute the detector flammable gas volumes below 25% of the Lower Explosive Limit.

5.8.1.4 The PHENIX Liaison Physicist must ensure that either the detector HSSD or the ceiling level HSSD system is operational.

5.8.1.5 If the Ring Imaging Cerenkov Counter (RICH) detector is run with flammable gas, the PHENIX Liaison Physicist must ensure that both the PHENIX High Capacity Ventilation System are operational, AND the interstitial space

between the RICH and the Pad Chamber Front End Electronics is inerted.

5.8.2 The PHENIX Liaison Physicist must ensure that whenever the integrated detector electronics are powered in the IR, one of the following three systems is operational:

5.8.2.1 The electronics racks interlocks, or

5.8.2.2 The detector HSSD system, or

5.8.2.3 The ceiling level HSSD system.

5.8.3 The PHENIX Liaison Physicist must ensure that if the IR is occupied by personnel after flammable gas is present, then both the personnel plug door and the emergency escape labyrinth are available for egress.

5.9 Staffing

5.9.1 MCR: The Head of the MCR must ensure that one qualified Operations Coordinator and one qualified Operator are on duty when beam is in operation at RHIC. During normal operations, one of the two must remain in the MCR at all times.

5.9.2 An MCR Operator qualified in CeC operations procedures shall be required to be present in MCR during any period of operation with CeC beam.

Authorized Alternative: If one operator is incapacitated, the remaining operator may continue RHIC operations as long as manning requirements are restored within two hours.

5.10 The CAS Supervisor must ensure that the minimum experimental area staffing is a qualified Collider-Accelerator Support (CAS) watch for any RHIC operations with beam.

5.11 Cryogenic Control Room: The Head of Cryogenic Systems, or designee, must ensure that one qualified Cryogenic Shift Supervisor, or designee, and one qualified Cryogenic Operator are on watch when the refrigerator is in operation. One of the two must remain in the Cryogenic Control Room at all times unless controls in the Cryogenic Control Room are relocated to the MCR in B911, or unless emergency conditions require actions to be taken by all cryogenic watch standers.

Authorized Alternative: If one operator is incapacitated, the remaining operator may continue Collider operations as long as manning requirements are restored within two hours.

5.12 STAR and PHENIX staffing

5.12.1 Watch: The PHENIX Liaison Physicist must ensure that a qualified local watch is stationed when flammable gas is in the PHENIX detector in the IR.

5.12.2 Watch: The STAR Liaison Physicist must ensure that a qualified local watch is stationed when flammable gas is in the STAR detector in the IR.

5.12.3 PHENIX Experimental Area: The PHENIX Liaison Physicist must ensure that one Experiment Shift Leader is stationed for experimental operations with beam.

5.12.4 STAR Experimental Area: The STAR Liaison Physicist must ensure that one Experiment Shift Leader is stationed for experimental operations with beam.

5.13 RHIC and Experiment Modification and Controls

5.13.1 The Associate Chair for ESSHQ must ensure that there are approved Configuration Control procedures to ensure review of modifications against Credited Controls and Supports in the ASE.

5.13.2 The appropriate Liaison Physicist must ensure that each experiment, if any, at RHIC is reviewed by C-AD for Configuration Control and safety before running with beam. It is noted that an experiment may lie dormant for a period greater than one year between runs and not require a review during the dormancy period. For experiments that may run more than once within a 12-month period, a review must occur before each singular scheduled run.

5.13.3 During shutdown periods, when C-AD does not operate MCR, C-AD must review specific safety requests for experiments on a case basis. The ESRC must perform the review and the C-AD Chair must approve the experiment.

5.13.4 The appropriate Liaison Physicist or Liaison Engineer, must ensure that any modifications to the RHIC machine or experiments, that may increase the frequency or consequences of known hazards, or which introduce new hazards, are documented using the Unreviewed Safety Issue Determination (USID) process. If a positive USID exists, the modification may not be implemented without DOE approval.

5.14 Beam Loss

5.14.1 The FS Representative, and ESSHQ Division Head, must ensure that beam loss induced radiation within uncontrolled areas for credible repeated losses is less than 100 mrem in a year. C-AD uses BNL's environmental TLD monitor to check the effectiveness of the C-AD radiation control program

5.15 Completion of RSC, ASSRC and ESRC Checkoff Lists

5.15.1 The Head of the Main Control Room, or designee, must ensure all relevant RSC, ASSRC and ESRC Checkoff Lists are completed and signed by the appropriate personnel before allowing beam into the area addressed by the checkoff list.

5.15.1.1 Each experiment in the RHIC, AGS, booster, Linac, EBIS, AGS Experimental Halls, U-Line and V-Line must be reviewed by the ESRC or C-AD

Safety Engineering before running with beam.

5.16 Calibration, Testing, Maintenance and Inspection that Supports Credited Controls

5.16.1 The Access Controls Group Leader must ensure that the RHIC ACS is functionally tested in accordance with requirements in the BNL Radiation Control Manual, Chapter 3, Appendix 3A.

5.16.2 The Access Controls Group Leader must ensure that ODH ventilation fans, and air outlet louvers that are signaled by the RHIC ACS, must be functionally tested annually, or before the running period.

5.16.3 Before the running period, or each year, the Access Controls Group Leader, Collider Power Supply Group Leader, and the Cryogenic Section Group Leader, must ensure that the VODH System has been functionally tested.

5.16.4 The STAR Liaison Engineer must ensure that STAR Highly Sensitive Smoke Detection (HSSD) systems undergo annual testing (not to exceed 15 months).

5.16.5 The STAR Liaison Engineer must ensure that STAR Flammable Gas Detection System undergo annual testing not to exceed 15 months).

5.16.6 The STAR Liaison Engineer must ensure that STAR emergency exhaust fans undergo annual testing (not to exceed 15 months).

5.16.7 The PHENIX Liaison Engineer must ensure that PHENIX Highly Sensitive Smoke Detection (HSSD) systems undergo annual testing (not to exceed 15 months).

5.16.8 The PHENIX Liaison Engineer must ensure that PHENIX Flammable Gas Detection System undergo annual testing (not to exceed 15 months).

5.16.9 The PHENIX Liaison Engineer must ensure that PHENIX emergency exhaust fans undergo annual testing (not to exceed 15 months).

5.16.10 The PHENIX Liaison Engineer must ensure that PHENIX High Capacity Ventilation System undergo annual testing if it is required to be operable (not to exceed 15 months).

5.16.11 The PHENIX Liaison Physicist must ensure that all PHENIX electronics rack interlocks in the IR undergo annual testing (not to exceed 15 months).

5.16.12 The Access Controls Group Leader, and the Accelerator Components & Instrumentation Group Leader, must ensure that area radiation monitors undergo annual calibration (not to exceed 15 months).

5.16.13 The RHIC Liaison Physicist must ensure that radiological shielding and barriers (berms, shield blocks, fencing, etc.) undergo visual inspection prior to operations to ensure that they are in place and functional.

5.16.14 The RHIC Liaison Engineers must ensure that RHIC and ATR rainwater barriers for activated soil undergo annual visual inspections to ensure that they are in place and functional.

5.16.15 The ESH Coordinator must ensure that accessible ODH fans and air inlet louvers are manually tested semiannually (not to exceed 8 months)

5.16.16 The Collider Electrical Power Supplies Group Leader must verify that the hardware current limits on the RHIC Main Power Supplies function properly by testing them prior to operations each running period, as per C-A-OPM 2.41.

6. Documentation

None

7. References

7.1 C-AD SAD and associated USIs.

7.2 Accelerator Safety Envelope for RHIC.

7.3 BNL RadCon Manual, Chapter 3, Appendix 3A.

7.4 C-A-OPM 10.1, "Occurrence Reporting and Processing of Operations Information".

7.5 C-A-OPM 1.10.1, "Procedure for Identifying Unreviewed Safety Issues".

7.6 C-A-OPM 4.91, "Configuration Management Plan for the C-A Access Controls System".

7.7 C-A-OPM 3.24.1, "Response to Partial or Full Inoperability of a STAR or PHENIX Flammable Gas Detection System".

7.8 C-A-OPM 2.42, "Procedure for Entering the RHIC Tunnel When Helium is Below 40K and the RHIC Main Power Supplies Current Must be Limited".

7.9 Letter from F. Crescenzo (DOE-BHSO) to G. Goode dated March 6, 2013, Approval of the Relativistic Heavy Ion Collider (RHIC) Accelerator Safety Envelope (ASE) Modification for ODH-0.

8. Attachments

None