MC-1 High-Bay Hazard Awareness Training Handout

Version 1
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Overview

The upgrades to and maintenance and operation of the Muon g-2 experiment present many potential hazards. This document is intended to inform you of the potential hazards you may encounter in the MC-1 High-Bay (MC-1 HB) and the proper precautions to take to prevent unsafe situations. Please read the entire document and complete the online quiz. This hazard awareness training is mandatory for all personnel who work in the MC-1 High-Bay area. It is valid for one year.

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1. Introduction

This training document outlines the hazards specific to the MC-1 High-Bay area. For the purpose of this document, the Muon g-2 MC-1 High-Bay refers to the room with the storage ring and overhead crane, accessible only through the Controlled Access labyrinth doors or through the roll-up door.

2. Training

Unescorted access to the MC-1 High-Bay is restricted to authorized personnel that have completed this training and the appropriate radiation safety training, and are compliant with additional written Hazard Analyses (HA). Many of the hazards are similar to those found in the MC-1 Hazard Awareness Training and are not repeated here. Therefore, these two training courses are pre-requisites to this course.

- MC-1 (Muon g-2 Building) Hazard Awareness
- Job Hazard Analysis

In addition, there is always a level of radiological training required depending on the access mode. When the AD interlocks are enabled, anyone entering the High-Bay on a Controlled Access is required to have Radiological Worker (Classroom and Practical Factors) and Fermilab Controlled Access Training. When interlocks are not enabled, access is permitted with either General Employee Radiation Training (GERT) or Radiological Worker training.

With this training, you will be able to perform work in the High-Bay in the region outside of the g-2 storage ring. Working inside or on top of the ring is subject to additional restrictions and requires additional training when the magnet has the potential to be powered i.e. in the so-called MR-CLOSED state.

3. Access control to the High-Bay

In order to do work in the High-Bay, a written work request needs to first be submitted to the Electronic Control Room Logbook and approved by the Run Coordinator or an Operations Manager following the work flow diagram shown below and described in more details in the MC-1 work request procedure posted in the Muon g-2 DocDB.

To protect personnel, and the magnet itself, **access to the Experiment High-Bay is restricted to authorized personnel who have completed this training.** Authorized personnel will need to checkout one of two keys:

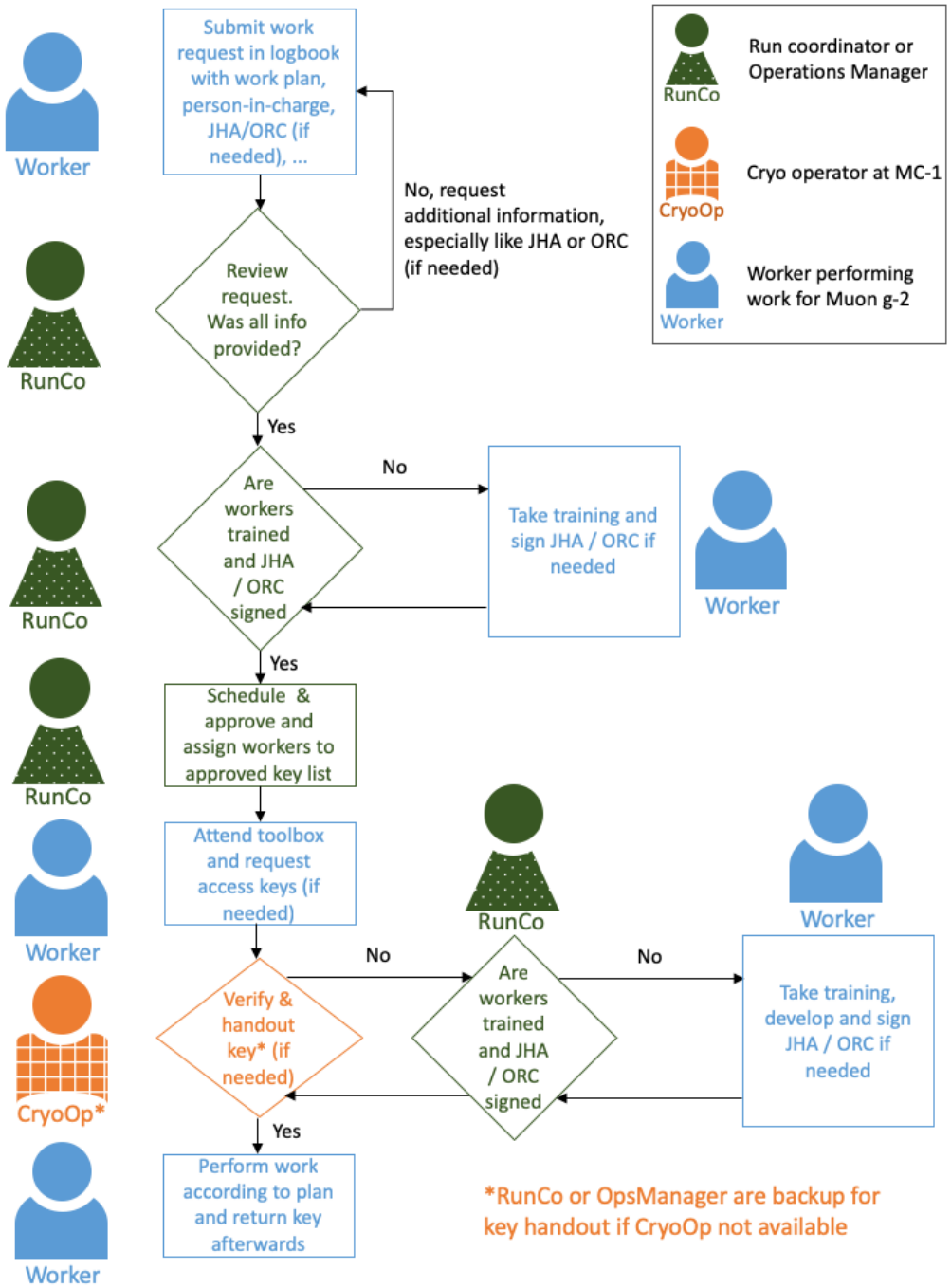
- If the High-Bay is in controlled access and the run coordinators have authorized a controlled access, the entering personnel will need to checkout keys according to the controlled access rules for MC-1.
- If the High-Bay is in supervised access and the run coordinators have authorized access, the entering personnel must checkout keys according to the Muon g-2 High-Bay key (HB-KEY) checkout procedure.

Keys can be distributed by Run Coordinators, Operation Managers, or the cryo operator after checking the key requester has the appropriate training. It is the responsibility of the Run Coordinators and Operations Managers to keep the cryo operator informed of who should be allowed access.

Access to the center and the top of the ring is further restricted during the so-called MR-CLOSED state when the magnet is or has the potential to being powered. In the MR-CLOSED state the MR key gate at the top of the stairways will be locked and requires the checkout of an MR-KEY, which will require additional training. Contact the Run Coordinator if you believe you may need additional training. When the storage ring is in the MR-OPEN state, access to the center of the storage ring is permitted with an HB-KEY but ferromagnetic materials brought into the storage ring must be logged in and out.

In the event that the experiment is transitioning from MR-OPEN to MR-CLOSED, it is the responsibility of the Run Coordinator and the cryo operator performing the sweep inside the storage ring to ensure that anyone working inside the ring with only an HB-KEY is cleared from the area.

Anyone who has checked out an HB-KEY must return the key before the end of the workday. It is permitted to take an HB-KEY outside of the MC-1 building as long as they are returned by the end of the shift. Keys should never be taken home or left somewhere at the lab outside the designated key tree.



3.1 Escorted Access

With the permission of the Run Coordinator and on a case-by-case basis, untrained personnel may be escorted into the High-Bay during supervised access periods for specific, limited duration tasks or to participate in tours. The escort must have the training required for general access and be specifically approved by the Run Coordinator to escort the personnel.

4. Specific hazards in the High-Bay area

In addition to the hazards outlined in the general MC-1 Building Hazard Awareness training, there are a number of hazards specific to the High-bay that should be considered:

- The MC-1 High-Bay contains two pulsed high voltage systems, the electrostatic quadrupoles and the magnetic kicker. Both systems' plates reside inside the storage vacuum chambers and are normally not accessible as all ports and flanges are closed. Removal of any vacuum chamber flanges that allow a person to reach the kicker or quadrupole plates or their leads requires a LOTO of the kicker or quadrupole system, respectively.
- The kicker region in the NW corner of the building had pulsed power supplies and Blumleins that are charged to high voltages. Generally, the Blumleins and the power supplies are kept behind metal screens to make them inaccessible. Work behind these screens should be done by system experts only after a JHA has been performed and the work has been approved by the Run Coordinator.
- Several beamline magnets are typically powered at the exit of the muon beam line into the hall in the south-east corner. The area around them is roped off and requires special authorization from the Run Coordinator to enter.
- Clutter should be kept to a minimum to avoid trip hazards. Tools, materials, and other items should be returned to cabinets or put in their proper storage locations at the end of the work day. A fire-resistant cabinet has been provided on the catwalk near the labyrinth entrance for storage of alcohol and other flammables.
- The magnet is covered with fiber glass insulation that has a limited fire rating. Welding in the vicinity of the fiber glass can lead to an ignition of the fiber glass and hence requires additional safety procedures and a job-specific JHA.
- Work on the top of the magnet is always a fall hazard and should be treated accordingly. However, when the magnet has the potential to be powered (MR-CLOSED), there is also a projectile hazard since the top of the magnet is just above the high-field region where dropped ferromagnetic tools and materials can become projectiles. Additional training and a written, approved JHA are needed to perform work on top of the magnet.
- Access to the scaffolding above the emergency staircase on the south wall is highly-restricted. The scaffolding must be inspected by a trained scaffolding inspector, and anyone accessing it must complete a written Job Hazard Analysis.
- Access to the ladder that leads to the overhead crane is also highly-restricted and requires a written Job Hazard Analysis.
- Compressed gas cylinders are not allowed in the center on the Muon g-2 storage ring when the magnet is on unless they are chained to a permanent fixture. Any cylinders that might enter the ring when it is in an MR-OPEN state must be removed or chained to a permanent fixture before the magnet can be powered.
- The Experimental High-Bay of MC-1 is an ODH-0 area. This means there is no special ODH training required to enter the area, but all personnel must exit the High-Bay if the audible-whooping and visual-strobe alarms go off.
- Fluorinert is used in the kicker cooling system and has the potential to generate toxic fumes as a by-product of electrical sparking. Opening up the fluorinert system should only be performed by sub-system experts as approved by the Run Coordinator following the established ventilation procedure.