Emergency Quench

1. Introduction

1.1 Research involving Magnetic Resonance Imaging (MRI) at high magnetic field strengths presents unique hazards to both research subjects and individuals working within and around the MRI system. Consequently, the potential for serious personal injury is present due to the sheer magnitude and strength of the static magnetic field along with the immense flexibility of the research system and associated peripheral hardware.

1.2 Due to the inherent hazards associated with the static magnetic field, access to the CFMM MRI Facility is restricted to ensure the safety of all patients, subjects, visitors, and staff. The CFMM MRI Facility is conceptually divided into four Zones of increasing level of potential risk and access restriction.

1.3 The static magnetic field in Zone 4 is always present. It is essential that everyone entering the facility is aware of the presence of the magnetic field, and that dangerous and potentially lethal levels of electricity are used by MRI systems.

2. Defining a Quench

2.1 A "quench" is an event that occurs only in superconducting magnets. It is caused by a rapid increase in the resistance of the magnet coil windings that causes a loss of superconductivity – and thus, the magnetic field. This process generates heat, which causes the rapid evaporation, or boil-off, of the magnet's coolant (liquid helium) into a large volume of gas. The expansion of the helium gas displaces oxygen causing a potentially hazardous condition for individuals in the vicinity. MRI systems require an emergency ventilation system, consisting of a bursting disk and quench pipe through the building's roof for the gas to escape. This protects both staff and subjects.

2.2 **Important**: once initiated, a quench *cannot* be stopped, and may cause permanent damage to the magnet.

2.3 There are two situations in which a quench may occur:

2.3.1 Spontaneously: due to some force or disruption of the magnet system.
2.3.2 Intentionally: when the Emergency Quench button is pressed.

3. Spontaneous Quench

3.1 In the event of a spontaneous quench:

3.1.1 Immediately abort the current scan.
3.1.2 Evacuate the magnet room.
3.1.3 Close the door to the magnet room.
3.1.4 Notify the CFMM Director and Campus Police / Emergency Dispatch (911) immediately following the incident. The facility staff must file an incident report

of the situation.

4. Emergency Quench

4.1 The emergency quench button must be pressed in the following situations:

4.1.1 There is a fire in the magnet room that CANNOT be contained using the non-magnetic fire extinguisher and requires the assistance of the fire department.

4.1.2 An individual is pinned to the magnet, trapped, or in a potentially life-threatening situation due to a NON-REMOVABLE ferromagnetic object.

4.2 Emergency Quench Procedure

4.2.1 Evacuate the magnet room, if possible, and close the magnet room door.

4.2.2 Press the emergency quench button (see pictures below).

4.2.2.1 **3T MRI**: The red emergency quench buttons are labelled "STOP" and are located behind the plastic shields on the Siemens control panel in the control room, and inside the magnet room (the highest button on wall just inside the door).

4.2.2.2 **7T MRI**: The emergency quench buttons are labelled "Magnet Emergency Discharge". There are 3 button located (i) in the MRI control room above the Siemens control panel, (ii) inside the penetration panel cabinet/closet inside the scanner room and (iii) on the magnet supervision system in the equipment room.

4.2.2.3 **9.4T MRI**: The emergency quench button is labelled "Magnet Emergency Discharge" and is located in the control room above, and to the right, of the computer desk.

3T Quench Button

7T Quench Button

9.4T Quench Button

4.2.3 If the magnet was quenched because someone was pinned or trapped, the operator must apply first responder principles. If the victim is not breathing and has no pulse.

4.2.4 Notify the CFMM Director and Campus Police / Emergency Dispatch (911) immediately following the incident. The facility staff must file an incident report of the situation.

Revision Chronology		
Version Number	Date	Changes
100.01	01 March 2010	First Version
100.02a	25 August 2011	Wording revised for clarity in section 2.2, section 2.3 added.
100.03a	31 January 2013	Sections 2 & 3 renamed, revisions throughout.
100.04a	15 June 2015	Review
100.05a	22 July 2016	Revisions throughout
230.06a	28 May 2019	Addition of Incidental findings review form
230.07a	03 April 2020	Updated to new template
130.08	12 May 2020	Edit director wording, adding 9.4T quench info, updating numbering system (MB)

CFMM Director Signature: _____

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