



3T/7T MRI FACILITY

SOP Number:	160.03
Title	Emergency Quench

Revision Chronology		
Version Number	Date	Changes
160.01	01 March 2010	Quench procedures updated
160.02	21 January 2013	Updated procedures
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Associate Director Signature: _____

Date: _____

ROBARTS RESEARCH INSTITUTE
CENTRE FOR FUNCTIONAL AND METABOLIC MAPPING:
3T/7T MRI FACILITY

Standard Operating Procedure #160.03

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 The static magnetic field in the 3T/7T MRI Facility 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 both the 3T and 7T MRI systems.
- 1.3 Due to the inherent hazards associated with the static magnetic field, access to the 3T/7T MRI Facility is restricted to ensure the safety of all patients, subjects, visitors, and staff. The MRI Facility is conceptually divided into four Zones of increasing level of potential risk and access restriction, see SOP#100a: "MRI Facility Safety Zones", SOP#100b: "MRI Facility Access Approval Policy", and SOP#110: "MRI Facility Visitor Approval Policy".
- 1.4 Personnel working within the 3T/7T MRI Facility require extensive training, see SOP#130: "MRI Personnel Training".

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, to protect facility staff and subjects. Note that once initiated, a quench cannot be stopped, and may cause permanent damage to the magnet.
- 2.2 There are two situations in which a quench may occur:
 - 2.2.1 Spontaneously: due to some force or disruption of the magnet system.
 - 2.2.2 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 Associate 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. Refer to SOP#150: “Emergency Fire” for emergency fire procedures.
 - 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.
 - 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”. One is located in the MRI control room above the Siemens control panel, the other is located inside the penetration panel cabinet in the scanner room.



3T Quench Button



7T 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, follow the procedure outlined in SOP#140: “Emergency Code Blue”.

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