

York MRI Facility

Standard Operating Procedure #42-01

Emergency Quench Procedure

1. Introduction

- 1.1. Research involving Magnetic Resonance Imaging (MRI) at high magnetic field strengths present 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 size and strength of the static magnetic field along with the flexibility of the research system and associated peripheral hardware.
- 1.2. The static magnetic field in the 3T MRI facility is always present. It is important that all those entering the facility be aware of the presence of the field, as it cannot be detected in any way, i.e. magnetic fields cannot be felt, seen or smelled. Ferromagnetic objects brought into the magnet room could quickly become dangerous projectiles, and the magnetic field can also interfere with the operation of certain medical implants.
- 1.3. As a result of the potential for serious injury, access to the 3T MRI Facility is restricted, and requires permission. See SOP #10-01 "Restricted Access Policy".
- 1.4. Working within and around the high field MRI requires in depth training on safety and Standard Operating Procedures, and documented proof of other necessary training. See SOP #30-01 "Safety Training Procedures".
- 1.5. It is imperative that all personnel who are within and around the 3T MRI Facility always keep in mind the potential safety risks, and act in accordance with the guidelines set out in the Standard Operating Procedures.

2. Description of 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. This process generates heat, which causes the rapid evaporation, or boil-off, of the magnet's coolant (liquid helium). This evaporated coolant is extremely hazardous and requires an emergency ventilation system, consisting of a bursting disk and quench pipe through the building's roof, in order to protect facility staff and subjects. Note that once initiated, a quench cannot be stopped, and may cause complete magnet failure.
- 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:

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- 3.1.1. Immediately abort the current scan.
- 3.1.2. Turn ON the “MAGNET ROOM EXHAUST FAN”, located on the wall to the right of the operator console.
- 3.1.3. Evacuate the magnet room.
- 3.1.4. Close the door to the magnet room.
- 3.1.5. Notify the Facility Director or Safety Officer and York University Security Services Ext. 33333, immediately following the incident.

4. Depressing the Quench Button

- 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 with the non-magnetic fire extinguisher and/or the automatic fire suppression system, and requires the fire department to enter the magnet room. Refer to SOP #41-01 “Emergency Fire Procedure”.
 - 4.1.2. An individual is pinned, impaled, or in a life-threatening situation because of a large ferromagnetic object and no other method can prevent further injury or free the person.
 - 4.1.2.1. Do NOT attempt to pull large magnetic objects away from the magnet. The object may reorient itself to the magnet field lines and become a projectile, potentially causing a serious or fatal injury.
 - 4.1.2.2. If the situation is not life-threatening, it may be possible to have a Siemens Service engineer ramp the magnet down slowly.
 - 4.1.2.3. Always put a person’s immediate well being first.

5. Emergency Quench Procedure

- 5.1. Evacuate the magnet room if possible, and close the magnet room door.
- 5.2. Press one of the emergency quench buttons. They are located:
 - 5.2.1. In the Control Room, to the right of the operator console at the centre of the Siemens Alarm Panel. The button is red and is labeled STOP. It is covered by a plastic protective guard with a yellow sticker and no-magnet symbol.
 - 5.2.2. In the magnet room, immediately to the left as you enter the room. The button is red and is labeled STOP. It is covered by a plastic protective guard with a yellow sticker and no-magnet symbol.
- 5.3. Turn ON the “Magnet Room Exhaust Fan”, located on the wall to the right of the operator console.
- 5.4. The alarm will be activated at the alarm box, the MAG STOP led will be illuminated and an alarm signal will sound.
- 5.5. If the magnet was quenched because someone was pinned, and they are injured, the operator must apply first responder principles. If the victim is not responding, not breathing and has no pulse, follow the procedure outlined in SOP #40-01 “Medical Emergency Procedure”. Once the magnet room has been evacuated, close the magnet room door.
- 5.6. Notify the Facility Director or Safety Officer and York Security Ext. 33333, immediately following the incident.