

3T/7T MRI FACILITY

SOP Number:	100.02a
Title	MRI Facility Safety Zones

Revision Chronology		
Version Number	Date	Changes
100.01	01 March 2010	Updated entry regulations
100.02a	22 January 2013	Separated SOP100 into SOPs 100a/100b, MR Zones and access restrictions defined

Facility Manager Signature: _____

Date: _____

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

Standard Operating Procedure #100.02a

MRI Facility Safety Zones

1. Introduction

- 1.1 The 3T/7T MRI Facility is used primarily for *in-vivo* studies of human and animal structure and function. These studies include assessment of metabolism and physiology, cognitive function and vascular dynamics, not only in normal and research patient populations, but also in *in-vitro* and animal models using a variety of advanced nuclear magnetic resonance imaging and spectroscopy techniques. The 3T/7T Facility represents a unique national resource for state-of-the-art evaluation of structure and functional activity using a variety of MRI and MRS techniques in a research setting. The facility resources are available to peer-reviewed grant funded scientific collaborators with appropriate Review Ethics Board (REB) protocols in place, see SOP#210: "New Protocols and Ethics".
- 1.2 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.
- 1.3 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, since we cannot otherwise detect it (i.e. magnetic fields cannot be seen or felt).
- 1.4 Dangerous and potentially lethal levels of electricity are used by both the 3T and 7T MRI systems. Therefore it is important that all individuals working around the MRI systems be aware of the dangers and understand the safety issues concerning electricity. Current-carrying cables, connections, and junction points in the vicinity of the main magnetic field are particularly susceptible to damage due to the extreme Lorentz forces created through the normal operation of the system. Periodically, the effects of prolonged mechanical fatigue will result in breakage, thereby causing electrical arcing, sparking, and high heat levels before the system can shut down. In these instances there is a high potential for personal injury as well as the possibility of a fire being ignited.

2. MRI Safety Zones

- 2.1 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 3T/7T MRI Facility is conceptually divided into four Zones of increasing level of potential risk and increasing access restriction. See Figure 1.

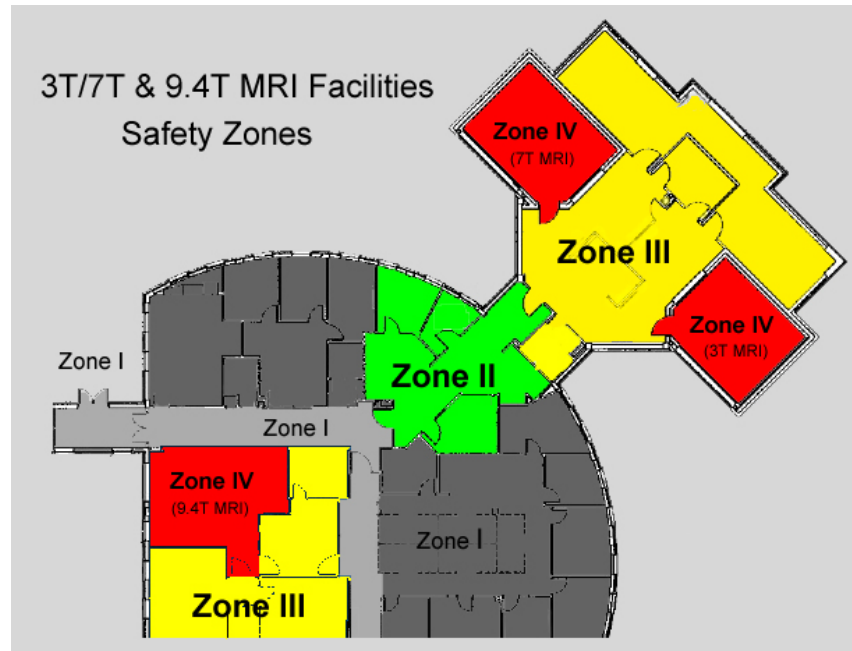


Figure 1

2.2 **Zone I**

2.2.1 Zone I encompasses all areas freely accessible to the general public and is outside the MR environment itself. This zone includes all areas of Robarts Research Institute excluding the MRI facilities, outside the building, the parking lot, and LHSC University hospital.

2.3 **Zone II**

2.3.1 Zone II is the interface between the publicly accessible uncontrolled Zone I and the strictly controlled Zones III and IV. This zone begins at the 3T/7T MRI Facility door and includes the patient waiting room, the 3T/7T Conference Room, and the hallway leading to the locked MRI control room door.

2.3.2 All non-MR personnel in Zone II are under the supervision of the 3T/7T MRI Facility staff. This includes patients, volunteers, visitors, accompanying research staff, building service personnel, and others.

2.3.3 Typically MR staff will meet the researchers and patients upon their arrival in Zone II.

2.4 **Zone III**

2.4.1 Zone III, identified by the sign depicted in Figure 2, is the region in which non-MR personnel must be accompanied at all times by certified MR staff. The existence of medical implants or ferromagnetic objects may result in serious injury, accident, or death, and therefore all access to Zone III is strictly restricted. This zone begins at the locked MRI control room door (Room 1252), and encompasses all areas beyond this door, including the 3T and 7T control rooms, equipment room, patient prep area, and animal prep room.

2.4.2 Access to Zone III is controlled by key card Security Access. Only Level 1 and

Level 2 MRI Personnel may have Security Access to Zone III (see SOP#100b: “MRI Facility Access Approval Policy”). All others may only enter under the direct supervision and permission of Level 1 or Level 2 MR Personnel after completing MR safety screening.



Figure 2

2.5 **Zone IV (Magnet Room)**

- 2.5.1 Zone IV, identified by the sign depicted in Figure 3, is synonymous with the MR magnet room, and includes the 3T scanner room and the 7T scanner room. This is the zone of greatest potential hazard due to the presence of very strong magnetic fields.
- 2.5.2 Only Level 2 MRI Personnel may have access to Zone IV. All others may enter only with the permission and supervision of Level 2 MRI Personnel after completing MR safety screening.
- 2.5.3 All others who are permitted access to Zone IV, including patients, research staff, Level 1 MRI Personnel, etc., must remain under constant observation by Level 2 MRI Personnel by visual line of sight, video monitors, and/or physiological monitors. Visitors are NOT typically allowed to enter Zone IV.



Figure 3

- 2.6 Access to Zones III and IV of the 3T/7T MRI Facility is subject to the approval of Level 2 MRI Personnel. Level 2 MRI Personnel, including the Facility Director, Facility Manager, MRI Technologists, and MRI Operators, may grant or deny anyone entry to the facility at their discretion.