



## MR Zones and MR Personnel

The definitions for each of the zones are reproduced from the [2020 ACR Manual on MR Safety](#).

### MRI Zones

**Zone I:** This region includes all areas that are freely accessible to the general public. This area is typically outside the MR environment itself and is the area through which patients, health care personnel, and other employees of the MR facility access the MR environment (e.g., waiting room shared with other departments). There is no screening required and anyone can be in this zone.

**Zone II:** This area is the interface between the publicly accessible, uncontrolled Zone I and the strictly controlled areas of Zones III and IV. Typically, patients are greeted in Zone II and are permitted to move freely throughout Zone II, under the supervision of MR Personnel, prior to entry into Zone III. It is recommended that patient preparation for the MRI examination take place in Zone II. This preparation includes MRI screening, medical history, and appropriate patient gowning.

**Zone III:** This area is the region in which free access by unscreened Non-MR Personnel or ferromagnetic objects and equipment can result in serious injury or death due to interactions between the individuals or equipment and the MR scanner's particular environment. Access by Non-MR Personnel to and supervision over Zone III (including Zone IV; see below) is controlled by, and entirely under the supervision of, Level 2 MR Personnel. Non-MR Personnel must be accompanied by, or under the immediate supervision of and in visual contact with, an individual who is of Level 2 MR Personnel status throughout their stay in Zones III or IV, except in the changing room and/or bathroom, where verbal communication is sufficient. To avoid misunderstandings or questions of responsibility, each Non-MR Personnel individual entering Zone III must have a specifically identified Level 2 MR Personnel individual (typically—but not necessarily—an MR technologist) responsible for them throughout their stay in Zone III. This function of the Level 2 MR Personnel is directly under the authority and responsibility of the MRMD or the Level 2 MR Physician of the day for the MR facility.

Zone III regions should be physically restricted from general public access by key locks, passkey locking systems, or any other reliable, physically restricting method that can differentiate between MR Personnel and Non-MR Personnel. The use of combination locks is discouraged because combinations often become more widely distributed than initially intended, resulting in the possibility of a facility restriction violation. Only MR Personnel should be provided free access, via methods such as the access keys or passkeys, to Zone III.

There should be no exceptions to this guideline. Specifically, this includes hospital or facility administrative staff, physicians, security personnel, and other Non-MR Personnel. Zone III should be demarcated and clearly indicated as being potentially hazardous.

Among the energies that render the MR environment potentially harmful are static magnetic fields. Being 3-dimensional, Zone III controlled-access areas may project not just around but also above and below the room housing the MR scanner. This imposes a potential magnetic field hazard on individuals on floors other than that on which the scanner is found. Similarly, the typical rooftop cryogen vent location is associated with potential hazards during an active quench (loss of superconductivity/magnetic field), and access to that vent is a Zone III region. These Zone III potentially harmful access areas should be clearly identified, and their potential hazard should be clearly marked, even in typically unoccupied areas such as rooftops or storage rooms. For this reason, magnetic-field-strength spatial plots for all MRI systems should be analyzed in both horizontal and vertical orientations,



identifying areas around, above, and/or below the scanner, which may pose potential hazards, and quench vent pathways should also be considered when defining Zone III regions.

**Zone IV:** This area is synonymous with the MR scanner room itself (i.e., the physical confines of the room where the scanner is located). Zone IV, by definition, will always be located within Zone III, as it is the MR magnet and its cryostat that generate the existence of Zone III. Zone IV should also be clearly labeled as being potentially hazardous because of the presence of very strong magnetic fields. As part of the Zone IV site restriction, all MR installations should provide for visual observation by Level 2 MR Personnel to access pathways into Zone IV. By means of illustration only, the MR technologists would be able to directly observe and control, via line of sight or via video monitors, the entrances or access corridors to Zone IV from their normal positions when stationed at their desks in the scan control room. Importantly, controlled site-access restriction to Zones III and IV must be maintained during resuscitation and other emergent situations for the protection of all involved.

The entrance to Zone IV should be clearly marked with a prominently displayed red illuminated sign stating “The Magnet is Always On,” except for in the case of resistive MR systems, which should have a red illuminated sign stating “The Magnet is On” when it is energized. Ideally, signage should inform the public that the magnetic field exists even during an intentional or inadvertent power loss. This light and sign should be illuminated at all times and should be provided with a battery backup energy source to continue to remain illuminated in the event of a loss of power to the facility.

The entry door to Zone IV (i.e., the MR scanner room) should be closed except when it must remain open for patient care or room/MR system maintenance. During the times that the door to the MR system room must remain open, a “caution” barrier is recommended at the entry to Zone IV to inhibit unintended passage of personnel and/or materials from Zone III to IV. Examples of caution barriers include easily adjusted straps or plastic chains secured across the doorway to Zone IV.

### **MR Personnel**

There will be a minimum of two MR technologists or one MR technologist and one other individual with the designation MR Personnel in the immediate Zone II through Zone IV MR environment whenever patients are in the MR environment.

**Level 1 MR Personnel:** Individuals who have passed the facility’s MR safety educational requirements (as defined by the facility’s MRMD) to ensure that they would not constitute a danger to themselves or others in the MR environment will henceforth be referred to as Level 1 MR Personnel (Appendix 1).

**Level 2 MR Personnel:** Those who have been more extensively trained and educated in the broader aspects of MR safety issues, including but not limited to issues related to the potential for RF-related thermal loading or burns and direct neuromuscular excitation from rapidly changing gradients, will henceforth be referred to as Level 2 MR Personnel. Notably, it is the responsibility of the MRMD not only to identify the necessary training but also to identify those individuals who qualify as Level 1 and 2 MR Personnel (Appendix 1). Throughout this document, all references to MR Personnel that do not specify Level 1 or Level 2 will apply to both Level 1 and Level 2 MR Personnel.