An emergency electrical shut down should be initiated by depressing the appropriate button (Figure 16) when there is a serious equipment fault, such as fire or smoke coming from the MR scanner, the equipment room, or the console. Another reason is flooding that has carried or is threatening to carry water into the electrical equipment. Circumstances that justify an emergency electrical shut down do not typically justify quenching the magnet.

- **During an emergency electrical shut down, the magnet is not quenched.** However, there may be residual power to gradients and other devices in Zone IV – electrical or fire hazards may still be present after the power shut down.
- An emergency electrical shut down should be initiated when smoke or fire is seen coming from the MR scanner, equipment room, or console or when flooding has occurred and is threatening to carry water into electrical equipment.
- Circumstances that justify an emergency electrical shut down do not typically justify quenching the magnet.

Figure 16. The emergency electrical shut down button may be a simple red button (A) and may be labeled with confusing wording such as “Emergency Stop” or “E Stop” (B).

Magnet Quench

The MR technologist may perform an emergency quench of the magnet. ***Because there is a significant expense associated with an emergency quench and because there is potential for damage to the magnet, this procedure must be undertaken with extreme caution after careful consideration and only if the magnetic field itself poses and immediate risk to life or major property.*** Two such circumstances include:

- A metal object is lodged in the scanner is such a way that it poses an immediate serious threat to a person. For example, the person is pinned to the magnet by a metal object that is causing internal injuries.
- Fire personnel determine there is no other alternative to entering the magnet room with axes or other heavy gear when fighting a fire

The magnet is quenched by depressing the appropriate button (Figure 17) and then the quench will begin within two minutes. All individuals must be cleared quickly from the Zone IV during an emergency quench because of the safety issues associated with the rapid release of the cryogen.

Figure 17. Sample quench buttons. (A) Plastic case must be opened and plastic cap removed to depress button. Quench will occur within 2 minutes. (B) Quench button labeled "STOP" under plastic lid secured by a "No Magnet" sticker. (From "Emergency shut…," 2017.)

The magnet should be quenched *only* if the magnetic field itself poses an immediate risk to life or major property. Examples for quenching include:

- A person is pinned to the magnet by a metal object that is causing internal injuries.
- Fire personnel determine there is no other alternative to entering the magnet room with axes or other heavy gear when fighting a fire.

In the absence of a *major* emergency, the MR technologist should never quench the magnet, even if he/she is convinced that a magnet quench will ultimately be necessary. For example, if a large object (such as a patient bed) has been drawn

into the magnet, but poses no immediate risk to a patient or team members, the magnet should not be quenched. Instead, the technologist should contact Engineering as service may be able to "ramp down" the magnetic field and remove the object. Although the scanner will be out of service for some time, this will spare the magnet from potential damage and spare the cost of the liquid helium replacement.

In the absence of a major emergency that threatens the life of an individual or major property damage, instead of quenching the magnet, the MR technologist should immediately secure the area (i.e., remove all individuals and prohibit re-entry) and contact Engineering.

The MR facility should assure that each MR technologist knows the:

- Appropriate response to various equipment alarms that may sound
- Difference between a routine electrical shut down and emergency electrical shutdown
- Circumstances that justify an emergency electrical shut down and an emergency magnet quench
- Locations of the emergency electrical shut down and emergency magnet quench buttons

Code

In the event of a code situation in Zone IV, the MR technologist(s) will enter the scanner room, secure the patient's airway, and remove the patient as quickly as possible from the Zone IV to Zone II. If possible, breathing resuscitation will begin in the MR scanner room but ***in no case should any other emergency personnel be allowed to bring any equipment into the scanner room*****.** **<u>The full code may begin in Zone II</u>** outside of Zone III.

Because it is MR Unsafe, the Code Cart *must always be* stored in Zone II. It must not be stored in Zone III.

The facility should conduct an MR patient resuscitation/evacuation drill at least annually.

Fire

In trying to extinguish or contain a fire in Zone III or IV, MR personnel must not jeopardize their own safety. They should complete an emergency electrical shut down and then use the MR Conditional fire extinguishers to put out the fire.

If the fire is not extinguished after emptying the available extinguisher or if any personnel are endangered, MR personnel may quench the magnet.

If a fire that cannot be extinguished by MR personnel occurs in Zone IV, the MR personnel may quench the magnet.

Should a quench be performed, Public Safety, police, and fire response personnel **must not** enter the MR scanner room with their equipment (including, but not limited to, axes, air tanks, and guns) until the MR technologist and/or service personnel confirm that the magnetic field has been successfully dissipated. (There may be a considerable static magnetic field present despite a quench or partial quench of the magnet.)

The MR facility should conduct periodic MR safety training with Public Safety and local first responders like Police and Fire Departments.