SAFE WORK PROCEDURE (SWP)

TASK/OPERATION:	**Magnetic Resonance Safety – MR Safety (SWP01)**		
Operating Procedure Developed by:	**National Imaging Facility Fellow, with MRI Facility Committee**	**Approved:** **COO**	**Date:** **31st January 2020**
Reviewed by:	WHS & Clinical Consultant		
Version:	1.0		

Purpose:

The purpose of this document is to ensure that all users of the facility understand the unique safety risks inherent to the MRI environment.
To outline procedures that users and facility staff must follow to promote a safe working environment including the various safety levels assigned to people entering the facility.

Rationale:

Research involving Magnetic Resonance Imaging (MRI) at 3T presents unique hazards to both research participants and individuals working within the Magnetic Resonance (MR) facility. The potential for serious injury is therefore an ever-present danger.

The scanner room (Zone 4) and control room (Zone 3) within the facility are environments that many people do not routinely experience. It comes with risks inherent to working with high field magnets (See Zone Map on p 5.)

As the MR scanner is a superconducting magnet, the MRI scanner's magnetic field is ALWAYS ON and no person is allowed into the scanner room (Zone 4) without completing a screening form and obtaining the permission of a suitably accredited person.

This means that procedures need to be implemented to restrict access to various areas of the facility. These procedures encompass both the 4 zone design of the facility and the assignation of varying levels of access and restrictions assigned to people entering the facility.

All users of the facility need to undergo training to understand these risks and how to adjust their behaviour to ensure a safe working environment.

Procedures:

1) The MRI facility is divided into 4 zones to ensure the safety of volunteers, visitors, researchers and the facility staff (see Zone Map). Zones 3 and 4 are restricted areas. All zones are defined below.

    a) **Zone 1** is the unrestricted access public areas.

    b) **Zone 2** is the area between the unrestricted and restricted areas of the facility. This area includes offices, reception area, meeting rooms, interview rooms, changing areas and toilets. Visitors and volunteers do not need a safety escort in Zone 2. Safety screening usually occurs here together with interception and safe storage of all removable ferromagnetic or potentially ferromagnetic objects should take place in this area.

    c) **Zone 3** is a restricted area.
    Access is restricted to MRI-trained staff. All visitors and volunteers are required to be escorted by Level 1 – 3 personnel (see training Level below.) Large self-closing doors which can be opened from the inside are used for each non-contiguous parts of zone 3. Adjacent spaces (e.g., external gardens, roof space, MRI cabinet space etc.) lying within the 5 Gauss line must be secured against uncontrolled public access, with prominent warning signs displayed at the perimeter. The 5 Gauss line (dotted line on the Zone Map) of the Philips Ingenia CX is contained within zone 4 and the locked Equipment Room.

    This zone must be continuously supervised by senior MR staff and two MR staff should be present whenever scanning on human participants is performed. Where this is not feasible, a lone operator must be able to attend fully and continuously to the participant throughout the period for which the participant is within Zone 4. Lone operation must not be considered the norm.

    d) **Zone 4** is a highly restricted area which includes the MR scanner. All individuals entering Zone 4 are required to have first completed a screening form and have it checked by Level 3 personnel. All individuals entering Zone 4 are required to be escorted by level 2 or 3 personnel.

2) Depending on an individual's safety training, all people entering the facility will be considered to be one of 5 categories with varying restrictions on the areas of the Facility that they can access and the roles that they can perform.

    a) **MRI radiographer (Level 3):** The MR radiographer will have achieved extensive training in MR safety, volunteer screening, equipment training, emergency procedures, scanner operation and basic level cardiac support. MR Radiographers have unsupervised access to all zones within the MR unit.

    b) **Non-radiography MRI facility staff (Level 2):** Any person who has undergone more training in volunteer / participant safety screening, equipment usage (excluding operation of the scanner) and emergency procedures. With the permission of the MR system operator, non-radiography MRI facility staff will be able to accompany volunteers into Zone 4, can position the participant (including positioning the coils and other equipment), can operate the scanner table controls, and can assist in emergencies.

    c) **Researchers (Level 1):** Any person working in the MRI facility who has passed safety and equipment training to ensure safe practices during

research related activities within Zones 1 – 4. These individuals can enter zones 1 – 3 unescorted but cannot enter Zone 4 or escort volunteers or visitors into Zone 4 without the explicit direction and supervision of an MRI radiographer.

d) **Research participants:** Any person who provides informed, written consent to participate in approved research protocols. This category also includes individuals who volunteer for the purpose of testing scanner protocols or equipment. Such individuals are required to complete a Facility waiver form and are not allowed into Zone 3 without the supervision of a Level 2 or Level 3 person.

e) **Non-participants (includes accompanying persons, visitors)**: Any person who has no or minimal training in MR safety and/or is not participating in any research related activities. These individuals are not allowed into Zones 3 or 4 without the supervision of a MRI radiographer or Non-radiography MRI facility staff.

3) MRI safety training

a) All individuals partaking of the MRI safety training course must have completed an MR safety screening form and have it reviewed by a MR radiographer.

b) Researcher training will include:

i) Read the relevant MR facility SOP's.

ii) Attend the MRI Safety training session with the nominated facility staff member.

c) After completion of MRI Safety training the applicant will:

i) Know how to make themselves safe to enter zone 3.

ii) Understand the safety issues unique to MR areas with particular emphasis on safety issues with the scanner's static magnetic field and the taking of objects into Zone.

iii) Pass the MRI Safety training test.

4) No person, including staff, is to be allowed security access to the MRI unit unless they have successfully undergone MRI safety training.

5) Security access to the facility is restricted and will only be approved by either the facility director or the radiographer. All those requiring security access will be identified and granted access by the Imaging Facility Director and enabled by the Facilities Manager.

6) **All staff working in the MRI Unit** must be screened to ensure their suitability to work in this environment. It will be the responsibility of the Radiographer in MRI to ensure that all staff members who are within the MRI facility have been checked against the screening form.
Staff members must fill out this form, sign it and have it recorded. Additionally, it shall be necessary for each member of staff to update their form after any surgical procedure. Any staff member who has a device that is susceptible to electromagnetic interference must not work in the MRI unit.

The operator of the scanner shall be responsible for reviewing the checklist of the staff on a yearly basis. They will be notified via email to complete their refresher course and update their MR Safety Screening Form.

7) **All staff** are to be given thorough training with regards to MRI safety, with special reference to implants and devices, effects of magnetic field to staff and patients/participants, and history taking to ascertain if there has been any operations/accidents involving ferromagnetic metal.

   Operators are also to be trained to correctly and safely respond to a cardiac arrest or other medical emergency, fire, and power outages. Staff are to be trained in and are expected to employ, safe work practices for all work-related activities and adhere to the institutions WH&S policies.

8) Other Staff and the General Public are to be excluded from the MRI facility.

In the case of an anaesthetist or other non-MRI staff member being required to enter the Magnet Room on a regular basis then that person will be required to complete and systematically maintain their MR surveillance checklist in the manner of a member of the MRI staff. It is the responsibility of the Radiographer to assess the suitability of persons to enter the Magnet Room.

9) Participant's family or Carer

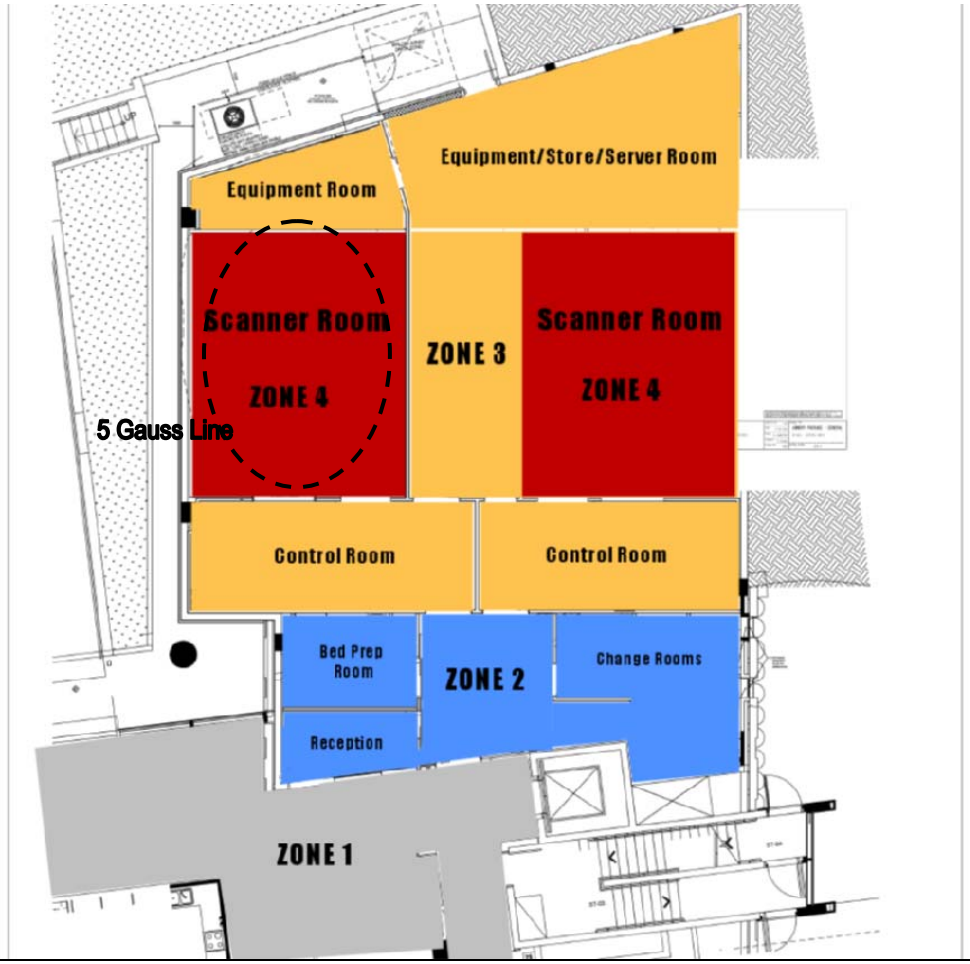
Where a member of a participant's family wishes to accompany the person being imaged into Zone 4, they must complete the Other Persons / Individual MRI Screening Form and must be assessed by the MR radiographer. The accredited person must discuss with that person the safety issues related to the MRI environment and examination.

10) MRI Safety Surveillance Questionnaire

All individuals MUST complete the safety screening form before entering Zone 4 and have it checked by the MRI radiographer.

Individuals who fail the MRI Safety Screening process must not enter Zones 3-4 of the facility.

Zone Map



Codes of Practice/Standards:

The Royal Australian and New Zealand College of Radiologists:

- https://www.ranzcr.com/search/ranzcr-mri-safety-guidelines
- https://www.ranzcr.com/our-work/quality-standards

Emergency Procedures:

- Magnetic Resonance Safety – Incidents (SWP03)
- Magnetic Resonance Safety – Emergencies (SWP04)
- NeuRA Incident Report & Investigation Procedure (WHS31) https://intranet.neura.edu.au/pages/viewpage.action?pageId=6848643&preview=%2F6848643%2F19824750%2FWHS31+Incident+Report+%26+Investigation+Procedure+v2.0.pdf
- NeuRA Online Accident & Reporting Tool https://forms.neura.edu.au/login
- NeuRA First Aid Procedure (WHS20) https://intranet.neura.edu.au/pages/viewpage.action?pageId=6848643&preview=%2F6848643%2F16450180%2FWHS20+FirstAid+Procedure.pdf
- Follow NeuRA Emergency Procedures Flipchart 2018 located near the MRI control room phone or on NeuRA Intranet https://intranet.neura.edu.au/download/attachments/6062404/Emergency%20Procedures%20Flipchart%20-%20Dec%202018.pdf?api=v2