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Foreword

The material contained in the Magnetic Resonance Imaging Design Guide is the culmination of a partnering effort by the Department of Veterans Affairs Veterans Health Administration and the Facilities Quality Office. The goal of the Design Guide is to ensure the quality of VA facilities while controlling construction and operating costs.

This document is intended to be used as a guide and as a supplement to current technical manuals and other VA criteria in the planning of MRI. **The Design Guide is not to be used as a standard design, and the use of this Design Guide does not limit the project Architect's and Engineer's responsibilities to develop a complete and accurate project design that best meets the user's needs and the applicable code requirements.**

Lloyd H. Siegel, FAIA
Director, Strategic Management Office
Office of Construction & Facilities Management
Washington, DC

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Office of Construction & Facilities Management

Lloyd H. Siegel, FAIA
Director, Strategic Management Office
Office of Construction & Facilities Management
Washington, DC

Kurt Knight
Director Facilities Quality Service
VHACO (181A)
Washington, DC

Donald L. Myers, AIA, NCARB
Senior Architect Facilities Quality Service
VHACO (181A)
Washington, DC

MRI Advisory Group

Dr. Charles M. Anderson
Director, VHA Radiology Program
VAMC, San Francisco

Dana M. Sullivan
Assistant Director, VHA Radiology Program
VACO, Washington, DC

Joseph DeRosier
Engineering Program Manager
National Center for Patient Safety

Thomas Hensch
Radiation Safety Officer
VAMC, Minneapolis

Prime Consultant

Cannon Design

Jose M. Silva, AIA, Project Principal

Ronald Villasante, Assoc. AIA, CAP

Scott Speser, NCARB, LEED

Millard Berry III, PE, LEED

Ronald Curtis, PE

Michael Dlugosz, PE

J. Joe Scott, CPD

Blake Bowen

Radiology / Imaging Specialty Sub-consultants

Junk Architects / MRI-Planning

Tobias Gilk, M Arch

Robert Junk, AIA, AHRA

Introduction

The MRI Design Guide was developed as a tool to assist Contracting Officers, Medical Center Staff, and Architects and Planners with the design and construction of MRI facilities. It is not intended to be project specific; but rather provide an overview with respect to the design and construction of MRI facilities.

Guide plates for various rooms within the MRI suite are included in this chapter to illustrate typical VA furniture, equipment, and personnel space needs. They are not project specific as it is not possible to foresee future requirements. The project specific space program is the basis of design for an individual project. It is important to note that the guide plates are intended as a generic graphic representation only.

Equipment manufacturers should be consulted for actual dimensions, utilities, shielding, and other requirements as they relate to specified equipment. Use of this design guide does not supersede the project architects' and engineers' responsibilities to develop a complete and accurate design that meets the user's needs and complies with appropriate code requirements.

Definitions

4-Zone: A safety and screening paradigm promoted by the American College of Radiology (ACR) for MRI suite layout and operation.

Active Shielding: An electromagnetic system, integrated in MRI scanners, by which the magnetic field is condensed into a smaller volume.

Bore: Open cylindrical center portion of 'doughnut' shaped MRI magnets.

Bore MRI: A type of MRI system most commonly used in current MRI procedures. The patient is fully surrounded by the bore during the scanning process.

Bloom Field: The condition, possible in some MRI scanners with active shielding, where active shielding fails and the magnetic field expands significantly in all directions.

Cryogen: Very low temperature liquid refrigerant with a boiling point of -238 Degrees Fahrenheit or lower.

Cryogen Quench Vent Pipe: A pipe which provides a pathway for gaseous cryogen escape from a superconducting MRI to an exterior discharge point.

Electromagnet: A device which generates a magnetic field through the flow of electrical current through a shaped coil.

Exclusion Zone: An area or volume to which access should be restricted and in which there are specific hazards.

Ferromagnetic: The property of a material or device which is attracted to magnetic fields.

Ferromagnetic Detection: Devices which detect ferromagnetic materials but do not alarm on non-ferromagnetic metals.

Gauss: Measure of magnetic field strength. Equal to .0001 Tesla

Gauss Line (Isogauss Line): Lines depicted on plans and sections which indicate the boundaries of the magnetic field at a given field strength.

High-Field: A description typically used to describe MRI equipment equal to or greater than 1 Tesla in magnetic field strength.

Isocenter: The center of a magnetic field. In MRI this is typically the location of maximum field strength.

Low-Field: A description typically used to describe MRI equipment less than 1 Tesla in magnetic field strength.

Open MRI: MRI systems in which the magnets are typically above and below the patient with predominantly open sides.

MR / MRI / nMR: Abbreviations for Magnetic Resonance, Magnetic Resonance Imaging and Nuclear Magnetic Resonance. All refer to the same process.

Missile / Projectile Effect: The attractive force applied to ferromagnetic objects by magnetic fields.

MR Safe: An ASTM / FDA designation which indicates that an object is safe under all MR environmental conditions.

MR Conditional: An ASTM / FDA designation which indicates that an object is safe under specifically defined MR environmental conditions.

MR Unsafe: An ASTM / FDA designation which indicates that an object is unsafe under all MR environmental conditions.

Non - Ferromagnetic: The property of a material or device which is not attracted to magnetic fields.

Passive Magnetic Shielding: Plates of magnetic material that may be provided to constrain the magnetic field from an MRI scanner.

Permanent Magnet: A material that retains magnetic properties indefinitely.

Penetration Panel: An access point through the RF shield between the MRI Scanner Room and the MRI System Component Room, provided by the MRI equipment vendor.

Quench: An event in which the liquid cryogen within a magnet rapidly boils. This may be deliberately or spontaneously triggered.

Rotational / Torque Effect: The force objects that attempts to align ferromagnetic objects with the polar orientation of magnetic fields.

Radiofrequency (RF) Shield: A special enclosure required around all clinical MRI scanner equipment, typically integrated in room construction, which keeps incidental RF energies from interfering with MRI scans.

Shim Tolerance: The limits for an MRI scanner of the mass of ferromagnetic material that can be placed in proximity to the scanner.

Stand-up MRI: A type of open MRI system where a patient is scanned while standing up.

Superconducting: A property of some electrical conductors where no current is lost to resistance during transmission.

Spatial Gradient: The rate at which magnetic field strength changes by distance from isocenter.

Tesla: Measure of magnetic field strength. Equal to 10,000 gauss

Wave Guide: A component of an RF shield which is used to prevent RF energies from entering the MRI Scanner Room through ductwork, piping or other penetrations.

Abbreviations

A	Amps
AC	Air Conditioning
ABA	Architectural Barriers Act
AC/HR	Air Changes per Hour
ADA	Americans with Disability Act
ADAAG	ADA Accessibility Guidelines
A/E	Architectural / Engineering Firm
AHJ	Authority Having Jurisdiction
AIA	American Institute of Architects
ANSI	American National Standards Institute
AR	As Required
ASRAE	American Society of Heating Refrigerating & Air-Conditioning Engineers
BGSF	Building Gross Square Feet
BTU	British Thermal Unit
CARES	Capital Asset Realignment for Enhanced Services
CFM	Cubic Feet per Minute
DOE	Department of Energy
DGSF	Departmental Gross Square Feet
DVA	Department of Veterans Affairs
FAR	Floor Area Ratio
FC	Foot Candle
OCFM	Office of Construction & Facilities Management
GSF	Gross Square Feet
GSM	Gross Square Meters
HIPAA	Healthcare Insurance Portability and Accountability Act
HP	Horsepower
HVAC	Heating, Ventilating and Air Conditioning
IAQ	Indoor Air Quality
IBC	International Building Code
JCAHO	Joint Commission (on Accreditation of Healthcare Organizations)
LB	Pound, Pounds
LUX	Lumen Per Square Meter
NEC	National Electrical Code
NFPA	National Fire Protection Association
NHCU	Nursing Home Care Unit
NSF	Net Square Feet
NSM	Net Square Meters
NTS	Not to Scale



NUSIG	National Uniform Seismic Installation Guidelines
OSHA	Occupational Safety and Health Administration
RCP	Reflected Ceiling Plan
RH	Relative Humidity
SF	Square Feet, Square Foot
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association
SqM	Square Meters
TIL	Technical Information Library
TV	Television
UBC	Uniform Building Code
UFAS	Uniform Federal Accessibility Standards
V	Volts
VA	Department of Veterans Affairs
VACO	Veterans Affairs Central Office
VAFM	Veterans Affairs Facilities Management
VAMC	Veterans Affairs Medical Center
VHA	Veterans Health Administration
VISN	Veterans Integrated Service Network































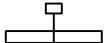




LOGISTICAL CATEGORIES (LOG CATS)




















VV: Department of Veterans Affairs furnished and installed - Medical Care Appropriations

VC: Department of Veterans Affairs furnished and Contractor installed - Medical Care Appropriations for Equipment and Construction Appropriations for Installation

CC: Contractor Furnished and Installed - Construction Appropriations

CF: Construction Appropriations - Department of Veterans Affairs furnished - Installed by the Department of Veterans Affairs or Contractor

	DUPLEX RECEPTACLE, NEMA 5-20R - 20AMP- MOUNTED 450MM (18")AFF UNLESS OTHERWISE NOTED.		WALL MOUNTED TELEPHONE OUTLET-MOUNTED 1200MM (48") AFF UNLESS OTHERWISE NOTED
	DUPLEX RECEPTACLE, NEMA 5-20R - 20AMP- MOUNTED ABOVE COUNTER TOP		COMPUTER TERMINAL OUTLET - VERIFY EXACT NEEDS-PROVIDE SIGNAL AND POWER OUTLET AS REQUIRED
	DUPLEX RECEPTACLE WITH GROUND FAULT INTERRUPTER, NEMA 5-20R - 20 AMP - MOUNTED 450MM (18")AFF UNLESS OTHERWISE NOTED		SPEAKER-CEILING MOUNTED
	DUPLEX RECEPTACLE WITH GROUND FAULT INTERRUPTER, NEMA 5-20R - 20 AMP - MOUNTED ABOVE COUNTER TOP		INTERCOM OUTLET
	WEATHERPROOF DUPLEX RECEPTACLE WITH GFI, NEMA 5-20R - 20 AMP - MOUNTED ABOVE 450MM (18") AFF UNLESS OTHERWISE NOTED		NURSE CALL DOME LIGHT-CEILING MOUNTED
	QUADRAPLEX OUTLET, NEMA 5-20R - 20 AMP - MOUNTED ABOVE 450MM (18") AFF OR QUADRAPLEX OUTLET, NEMA 5-20R - 20 AMP - PEDESTAL-MOUNTED.		NURSE CALL DOME LIGHT-WALL MOUNTED
	QUADRAPLEX OUTLET, NEMA 5-20R - 20 AMP - MOUNTED ABOVE COUNTER TOP		NURSE CALL DUTY STATION
	QUADRAPLEX OUTLET WITH GROUND FAULT INTERRUPTER, NEMA 5-20R - 20AMP - MOUNTED 450MM (18") AFF UNLESS OTHERWISE NOTED		EMERGENCY NURSE CALL
	QUADRAPLEX OUTLET WITH GROUND FAULT INTERRUPTER, NEMA 5-20R - 20AMP - MOUNTED ABOVE COUNTER TOP		NURSE CALL STAFF STATION
	DUPLEX RECEPTACLE, NEMA 5-20R - 20AMP - EMERGENCY POWER-MOUNTED 450MM (18")AFF UNLESS OTHERWISE NOTED		VOLUME CONTROL-WALL MOUNTED
	QUADRAPLEX RECEPTACLE, NEMA 5-20R - 20AMP - EMERGENCY POWER		JUNCTION BOX-PURPOSE AND LOCATION AS NOTED
	SPECIAL RECEPTACLE		SUPPLY AIR DIFFUSER
	TELEVISION OUTLET		EXHAUST OR RETURN AIR REGISTER OR GRILLE
	TELEPHONE OUTLET-MOUNTED 450MM (18") AFF UNLESS OTHERWISE NOTED		EMERGENCY EXHAUST GRILLE
			THERMOSTAT
			HUMIDISTAT
			COMBINATION FAUCET HOSE BIBB
			VACUUM
			MEDICAL AIR
			OXYGEN
			ELECTRICAL STRIP MOLD - NEMA 5-20R RECEPTACLES AT 600MM (2"-0") INTERVALS

	SINGLE POLE SWITCH		WALL-MOUNTED FLUORESCENT FIXTURE
	SINGLE POLE SWITCH – SUFFIX OF a,b OR c INDICATES SEPARATE CONTROL OR FIXTURES WITH SAME DESIGNATION		2'x2' FLUORESCENT FIXTURE-EMERGENCY POWER
	DIMMER SWITCH		2'x4' FLUORESCENT FIXTURE-EMERGENCY POWER
	THREE WAY SWITCH		WALL MOUNTED FLUORESCENT FIXTURE-EMERGENCY POWER
	DOOR SWITCH		WALL MOUNTED LIGHT FIXTURE-TYPE AS NOTED
	FUSED OR UNFUSED DISCONNECT SWITCH		LIGHT FIXTURE-TYPE AS NOTED
	EMERGENCY POWER OFF (EPO) PUSH BUTTON		LIGHT FIXTURE-TYPE AS NOTED EMERGENCY POWER
	2'x2' FLUORESCENT FIXTURE		CIRCUIT BREAKER
	1'x4' FLUORESCENT FIXTURE		BATTERY POWERED CLOCK
	2'x4' FLUORESCENT FIXTURE		