



Typical

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REV	DATE	MODIFICATIONS
01 - C1 - Cover Sheet		16 - M3 - Chilled Water
02 - C2 - Disclaimer - Site Readiness		17 - M4 - Cryogenics (1)
03 - A1 - General Notes		18 - M5 - Cryogenics (2)
04 - A2 - Equipment Layout		19 - E1 - Electrical Notes
05 - A3 - Section Views		20 - E2 - Electrical Layout
06 - A4 - Acoustic - Proximity Limits		21 - E3 - Electrical Elevations
07 - A5 - RF shielding		22 - E4 - Electrical Details
08 - A6 - Equipment Details (1)		23 - E5 - Power Requirements
09 - A7 - Equipment Details (2)		24 - E6 - Interconnections
10 - A8 - Delivery		
11 - S1 - Structural Notes		
12 - S2 - Structural Layout		
13 - S3 - Structural Details		
14 - M1 - Mechanical Layout		
15 - M2 - HVAC-Venting		



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## SIGNA VOYAGER FINAL STUDY

A mandatory component of this drawing set is the GE HealthCare Pre Installation manual. Failure to reference the Pre Installation manual will result in incomplete documentation required for site design and preparation.  
Pre Installation documents for GE HealthCare products can be accessed on the web at: <https://www.gehealthcare.com/support/manuals>

GE HealthCare does not take responsibility for any damages resulting from changes on drawings made by others. Errors may occur by not referring to the complete set of final issue drawings. GE HealthCare cannot accept responsibility for any damage due to the partial use of GE HealthCare final issue drawings, however caused. All dimensions are in millimeters unless otherwise specified. Do not scale from printed pdf files. GE HealthCare accepts no responsibility or liability for defective work due to scaling from these drawings.

Drawn by	Verified by	Concession	GON/Quote	PIM Manual	Rev
PMM	PMM	-	----	5680008-1EN	14
Format	Scale	File Name		Date	Sheet
A3	1/4"=1'-0"	EN-MRI-TYP-SIGNA_VOYAGER_LCC-NF.DWG		18/Feb/2025	01/24

## DISCLAIMER

### GENERAL SPECIFICATIONS

- GE is not responsible for the installation of developers and associated equipment, lighting, cassette trays and protective screens or derivatives not mentioned in the order.
- The final study contains recommendations for the location of GE equipment and associated devices, electrical wiring and room arrangements. When preparing the study, every effort has been made to consider every aspect of the actual equipment expected to be installed.
- The layout of the equipment offered by GE, the dimensions given for the premises, the details provided for the pre-installation work and electrical power supply are given according to the information noted during on-site study and the wishes expressed by the customer.
- The room dimensions used to create the equipment layout may originate from a previous layout and may not be accurate as they may not have been verified on site. GE cannot take any responsibility for errors due to lack of information.
- Dimensions apply to finished surfaces of the room.
- Actual configuration may differ from options presented in some typical views or tables.
- If this set of final drawings has been approved by the customer, any subsequent modification of the site must be subject to further investigation by GE about the feasibility of installing the equipment. Any reservations must be noted.
- The equipment layout indicates the placement and interconnection of the indicated equipment components. There may be local requirements that could impact the placement of these components. It remains the customer's responsibility to ensure that the site and final equipment placement complies with all applicable local requirements.
- All work required to install GE equipment must be carried out in compliance with the building regulations and the safety standards of legal force in the country concerned.
- These drawings are not to be used for actual construction purposes. The company cannot take responsibility for any damage resulting therefrom.

### CUSTOMER RESPONSIBILITIES

- It is the responsibility of the customer to prepare the site in accordance with the specifications stated in the final study. A detailed site readiness checklist is provided by GE. It is the responsibility of the customer to ensure all requirements are fulfilled and that the site conforms to all specifications defined in the checklist and final study. The GE Project Manager of Installation (PMI) will work in cooperation with the customer to follow up and ensure that actions in the checklist are complete, and if necessary, will aid in the rescheduling of the delivery and installation date.
- Prior to installation, a structural engineer of record must ensure that the floor and ceiling is designed in such a way that the loads of the installed system can be securely borne and transferred. The layout of additional structural elements, dimensioning and the selection of appropriate installation methods are the sole responsibility of the structural engineer. Execution of load bearing structures supporting equipment on the ceiling, floor or walls are the customer's responsibility.

<b>THE UNDERSIGNED, HEREBY CERTIFIES THAT I HAVE READ AND APPROVED THE PLANS IN THIS DOCUMENT.</b>		
<b>DATE</b>	<b>NAME</b>	<b>SIGNATURE</b>

## CUSTOMER SITE READINESS REQUIREMENTS

### REQUIRED MANUALS FOR SYSTEM PRE-INSTALLATION

Description	Document Number*
Product specific Pre-installation Manual	Refer to cover page
Magnet Room Venting	5850263
RF Shielded Room Pre-installation Requirements for MR systems	5850260
IEC Electromagnetic Compatibility	5850261
Acoustic Room Details	5850262
Magnet Venting Conformance Assessment Form	2705036
*documents can be accessed in multiple languages at <a href="https://www.gehealthcare.com/support/manuals">https://www.gehealthcare.com/support/manuals</a>	

- A mandatory component of this drawing set is the GE HealthCare Pre-installation manual. Failure to reference the Pre-installation manual will result in incomplete documentation required for site design and preparation.
- The items on the GE HealthCare Site Readiness Checklist **DOC2949060** and Worksheet **DOC2949068** are **REQUIRED** to facilitate equipment delivery to the site. Equipment will not be delivered if these requirements are not satisfied.
  - Any deviation from these drawings must be communicated in writing to and reviewed by your local GE HealthCare installation project manager prior to making changes.
  - Make arrangements for any rigging, special handling, or facility modifications that must be made to deliver the equipment to the installation site. If desired, your local GE HealthCare installation project manager can supply a reference list of rigging contractors.
  - New construction requires the following;
    1. Secure area for equipment,
    2. Power for drills and other test equipment,
    3. Restrooms.
  - Provide for refuse removal and disposal (e.g. crates, cartons, packing)
  - It is required to minimize vibrations within the scan room. It is the customer's responsibility to contract a vibration consultant/engineer to implement site design modifications to meet the GE vibration specification. Refer to the system Pre-installation manual for vibration specifications.

## MRI SITE PLANNING REMINDERS

Please refer to pre-installation checklist in pre-installation manual listed on the cover sheet for items critical to image quality.

1. The layout should be arranged so that the 5g line is contained to the magnet room. If not possible, a barrier is recommended to prevent entry to the 5g field area.
2. The spaces around, above, and below the magnet must be reviewed for effects of the 5g, 3g, 1g, and .5g fields. Refer to the proximity limit chart in the MR pre-installation manual referenced on the cover sheet.
3. For moving metal, the restriction lines typically extend outside of the MR space. Please confirm there are no moving metal concerns within these areas.
4. For vibration, analysis to be completed as required per pre-installation manual.
5. For EMI, review the site for the location of the main electrical feeders, AC devices, or distribution systems. An EMI study is recommended if large AC systems are nearby.
6. Details of the floor below the magnet must be reviewed. The structural engineer must verify that the quantity of steel in the volume 10ft [3.1m] x 10ft [3.1m] x 13in [.3m] deep (below the magnet) does not exceed the allowable steel content as given in the MR pre-installation manual referenced on the cover sheet.
7. Remove, cover, or fill-in abandoned ducts or troughs from the Equipment and Magnet rooms. Access/computer room flooring in the Equipment room can either be removed or assessed and reinforced to support heavier cabinets.

Responsibility for the coordination, design, engineering, and site preparation resides with the customer and their project architects and contractors. GE does not, by providing reviews and furnishing comments and assistance, accept any responsibility beyond its obligations as defined in the MR system, sale/purchase agreement.

## IMAGE QUALITY CONSIDERATIONS

Broadband RF noise is a single transient or continuous series of transient disturbances caused by an electrical discharge. Low humidity environmental conditions will have higher probability of electrical discharge. The electrical discharge can occur due to electrical arcing (micro arcing) or merely static discharge. Some potential sources capable of producing electrical discharge include:

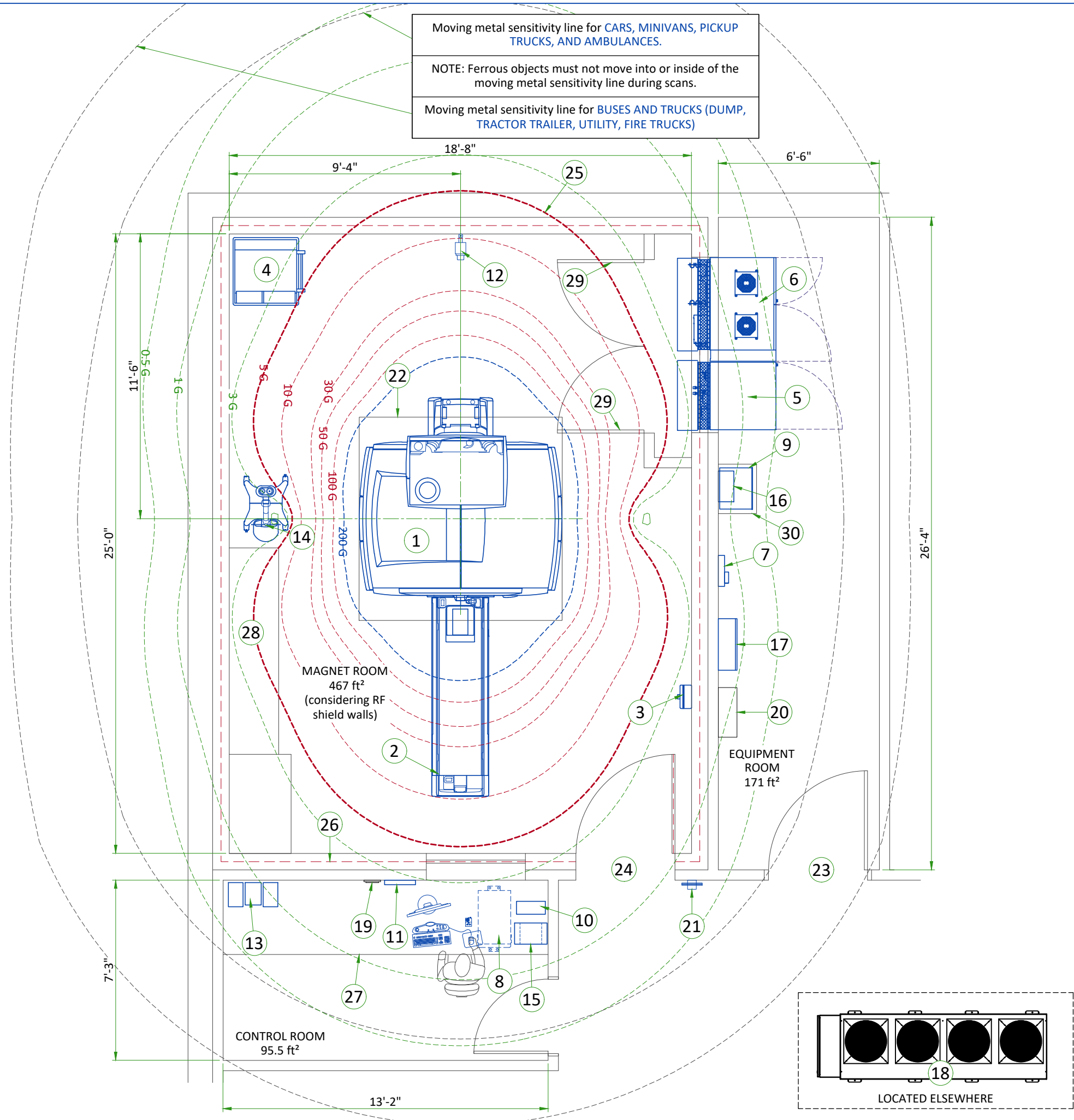
- Loose hardware/fasteners vibration or movement (electrical continuity must always be maintained)
- Flooring material including raised access flooring (panels & support hardware) and carpeting
- Electrical fixtures (i.e. Lighting fixtures, track lighting, emergency lighting, battery chargers, outlets)
- Ducting for HVAC and cable routing
- RF shield seals (walls, doors, windows etc.)

For additional information regarding image quality, refer to the pre-installation manual listed on the cover sheet.

## MAGNETIC INTERFERENCE SPECIFICATIONS

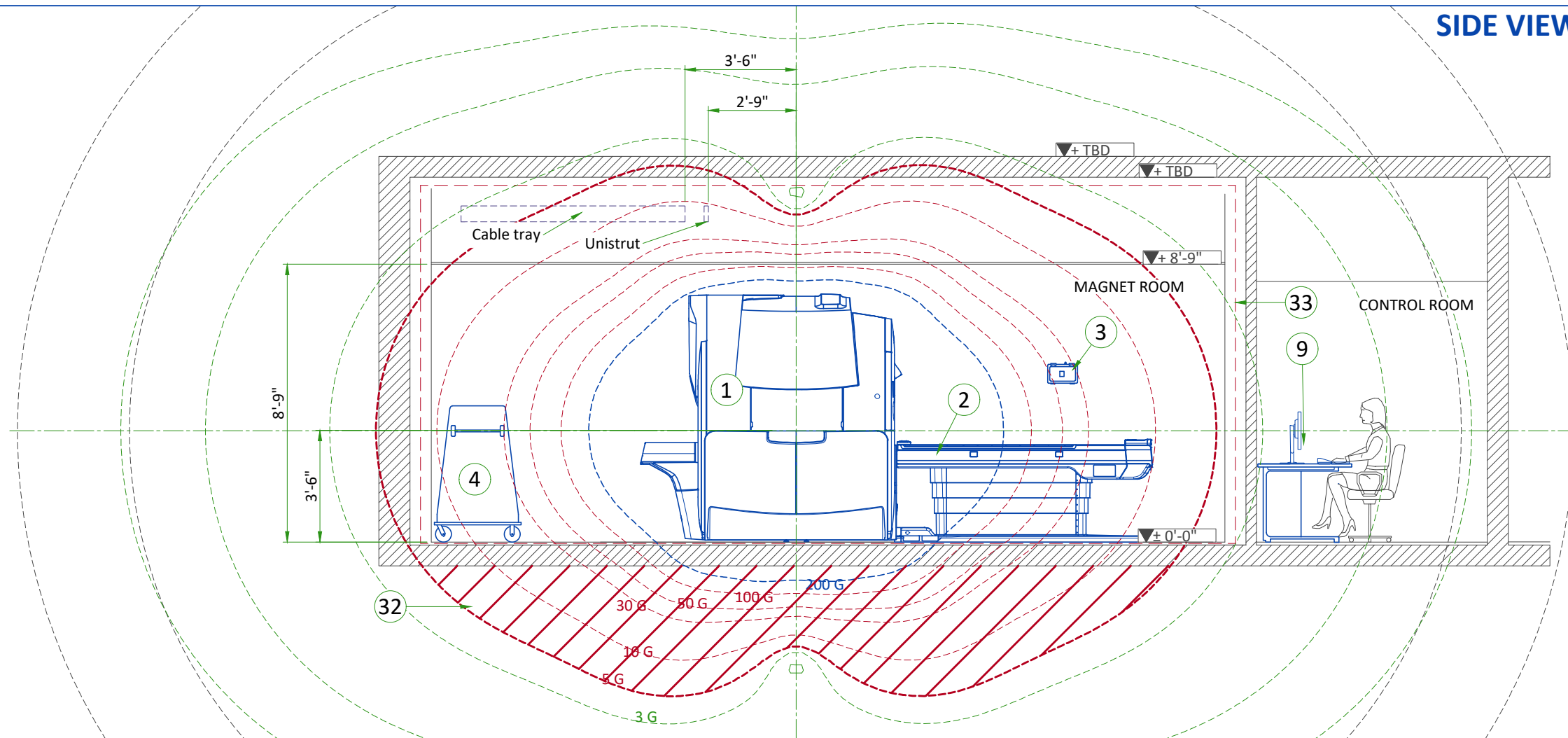
- The customer must establish protocols to prevent persons with cardiac pacemakers, neurostimulators, and biostimulation devices from entering magnetic fields of greater than 5 gauss (exclusion zone).
- Main power transformers must remain outside the 3 gauss field. EMI < 40mG RMS AC at the magnet location. EMI 4.43mGp-p DC, refer to Preinstallation Manual for additional information.
- Potential exists under fault conditions that the 5 gauss line may expand radially to 19.68 ft. [6.0 m] and axially to 24.61 ft. [7.5 m] for 2 seconds or less. It should be noted that normal rampdowns or magnet rundown unit initiated quenches will not cause the magnetic field to expand.
- It is recommended every site consider the event of a quench and plan accordingly (such as placing 5 gauss warning signs at expanded locations).
- The ferrous metal objects listed below must not move into or inside of the moving metal sensitivity line during scans.

TYPICAL MOVING MAGNETIC MASS	DISTANCE RADIALLY		DISTANCE AXIALLY	
Carts, Gurneys 100-400 lbs [45-182 kg]	3 Gauss line		3 Gauss line	
Forklifts, small elevator, cars, minivans vans, pickup trucks, ambulances (objects greater than 400 lbs [182 kg])	15.5 FT	4.72 M	21.0 FT	6.4 M
Buses and trucks (dump, tractor trailer, utility, fire trucks)	18.1 FT	5.52 M	24.5 FT	7.47 M

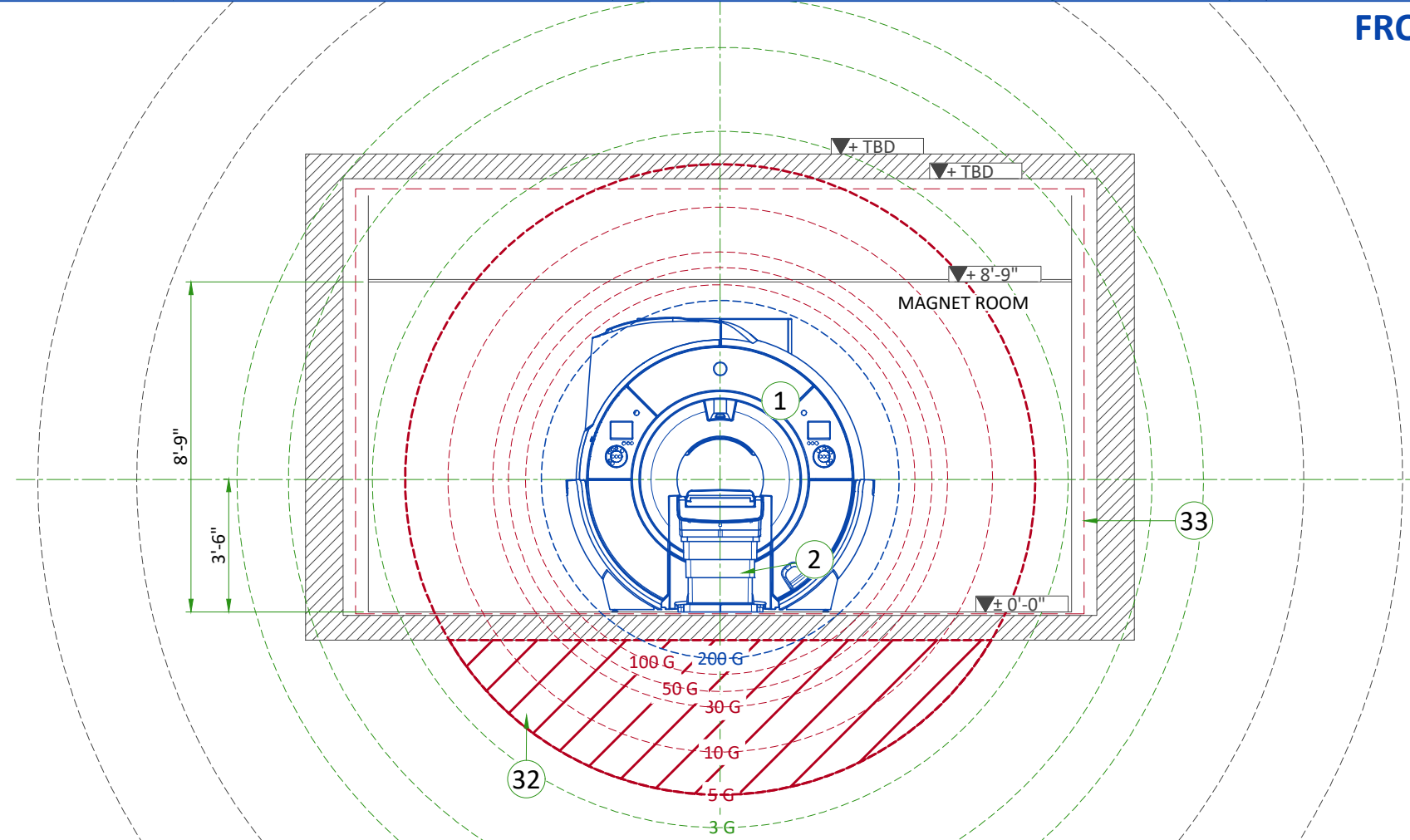


LEGEND						
A	GE SUPPLIED	D	AVAILABLE FROM GE			
B	GE SUPPLIED/CONTRACTOR INSTALLED	E	EQUIPMENT EXISTING IN ROOM			
C	CUSTOMER/CONTRACTOR SUPPLIED AND INSTALLED	*	ITEM TO BE REINSTALLED FROM ANOTHER SITE			
---		---	200 GAUSS			
---		---	5 GAUSS			
---		---	100, 50, 30, 10 GAUSS			
---		---	3, 1, 0.5 GAUSS			
BY	ITEM	DESCRIPTION	MAX HEAT OUTPUT (BTU/h)	WEIGHT (lbs)	MAX HEAT OUTPUT (W)	WEIGHT (kg)
A	1	MAGNET (MAG) (LCC RD)	-	10981	-	4980
A	2	PATIENT TABLE (PT)	-	572	-	259.5
A	3	MAGNET RUNDOWN UNIT (MRU)	-	7	-	3.2
A	4	PHANTOM SET STORAGE CABINET (SPT)	-	300	-	136
A	5	INTEGRATED COOLING CABINET (ICC)	5118	1045	1500	474
A	6	INTEGRATED SYSTEM CABINET (ISC)	24225	2692	7100	1221
A	7	MAGNET MONITOR (MON)	819	10	240	4.5
A	8	OPERATOR CONSOLE (GOC)	4947	143	1450	64.7
A	9	MAGNETIC RESONANCE ELASTOGRAPHY (MRE)	481	53	141	24.22
A	10	700VA UPS	-	26	-	12
A	11	CCTV MONITOR	-	8	-	3.5
A	12	CCTV CAMERA	-	-	-	-
A	13	MUSIC SYSTEM	-	-	-	-
A	14	INJECTOR HEAD ON PEDESTAL	-	95	-	43
A	15	INJECTOR CONTROL	676	18	198	8
A	16	INJECTOR POWER SUPPLY	601	7	176	3
B	17	MAIN DISCONNECT PANEL (MDP)	901	141	264	64
D	18	DIMPLEX CHILLER	122832	2551	36000	1157
D	19	REMOTE GRAPHIC DISPLAY (RGD)	-	-	-	-
D	20	WATER FILTER	-	-	-	-
A	21	METAL DETECTOR (HAND HELD)	-	-	-	-
C	22	MAGNET ACCESS 2.5m x 2.5m [98.5in x 98.5in]	-	-	-	-
C	23	MINIMUM OPENING FOR EQUIPMENT DELIVERY IS 1016 mm x 2083 mm [40 in x 82 in], CONTINGENT ON A 1829 mm [72 in] CORRIDOR WIDTH				
C	24	MINIMUM OPENING FOR EQUIPMENT DELIVERY IS 1092 mm x 2083 mm [43 in x 82 in], CONTINGENT ON A 2438 mm [96 in] CORRIDOR WIDTH				
C	25	WARNING! 5 GAUSS LINE OUTSIDE THE MAGNET ROOM LIMITS				
C	26	DEFINE RF SHIELD'S INSET ACCORDING TO PROVISIONS MADE BY THE RF SHIELD VENDOR				
C	27	COUNTER TOP FOR EQUIPMENT- PROVIDE GROMMETED OPENINGS AS REQUIRED TO ROUTE CABLES				
C	28	BASE CABINET FOR STORAGE OF: SURFACE COILS, PATIENT POSITIONING PADS, PHANTOMS, ETC.				
C	29	LOUVERED DOORS - REFER TO PREINSTALL MANUAL FOR REQUIREMENTS				
C	30	SHELF				
---			RF SHIELD - 100 dB ATTENUATION			
EXAM ROOM HEIGHT						
FINISHED FLOOR TO SLAB HEIGHT					TBD	
FALSE CEILING HEIGHT					8'-9"	
For Accessory Sales: (866) 281-7545 Options 1, 2, 1, 2 or mail to: gehcaccessorysales@ge.com						

**SIDE VIEW WITH MAGNETIC FIELD**



**FRONT VIEW WITH MAGNETIC FIELD**



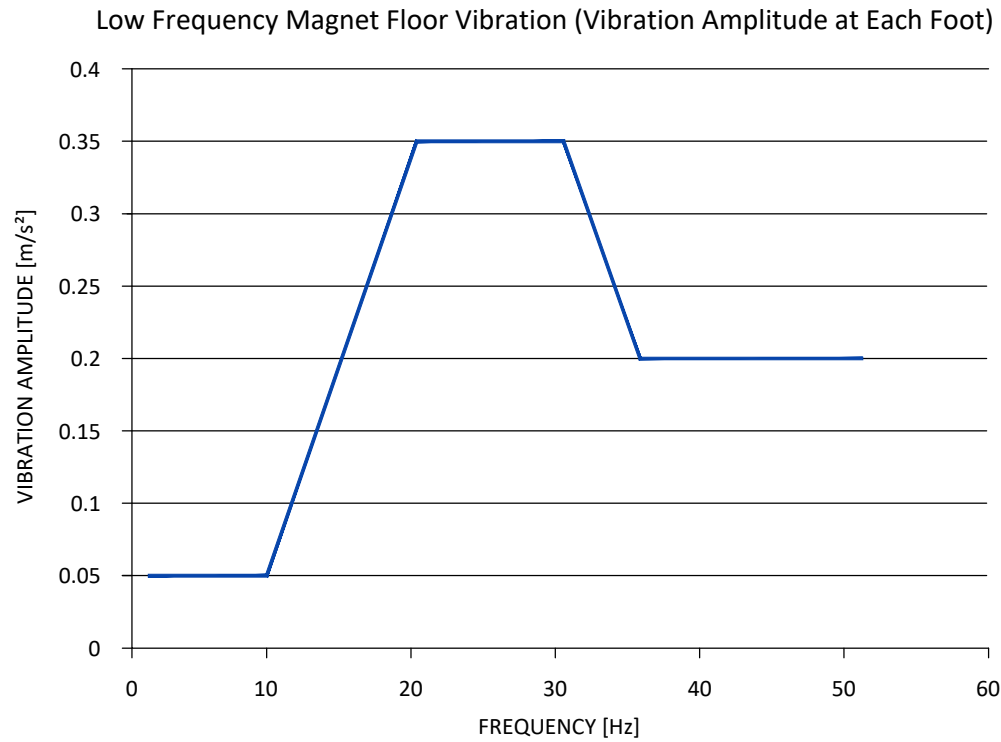
## ACOUSTICS SPECIFICATIONS

Acoustic and vibroacoustic information is provided for site planning and architectural design activities. It is the customer's responsibility to hire a qualified acoustic engineer for solutions to further attenuate this transmitted noise and vibration, if required. The actual room noise level may vary based on room design, optional equipment, and usage:

Control Room: 62dBA  
 Equipment Room: 80dBA  
 Magnet Room: 122dBA\*  
 (maximum sound pressure level at magnet bore isocenter)

\* Frequency: 20 Hz to 20kHz

FREQUENCY (Hz)	AMPLITUDE (m/s <sup>2</sup> )
2	0.05
10	0.05
20	0.35
30	0.35
35	0.2
50	0.2

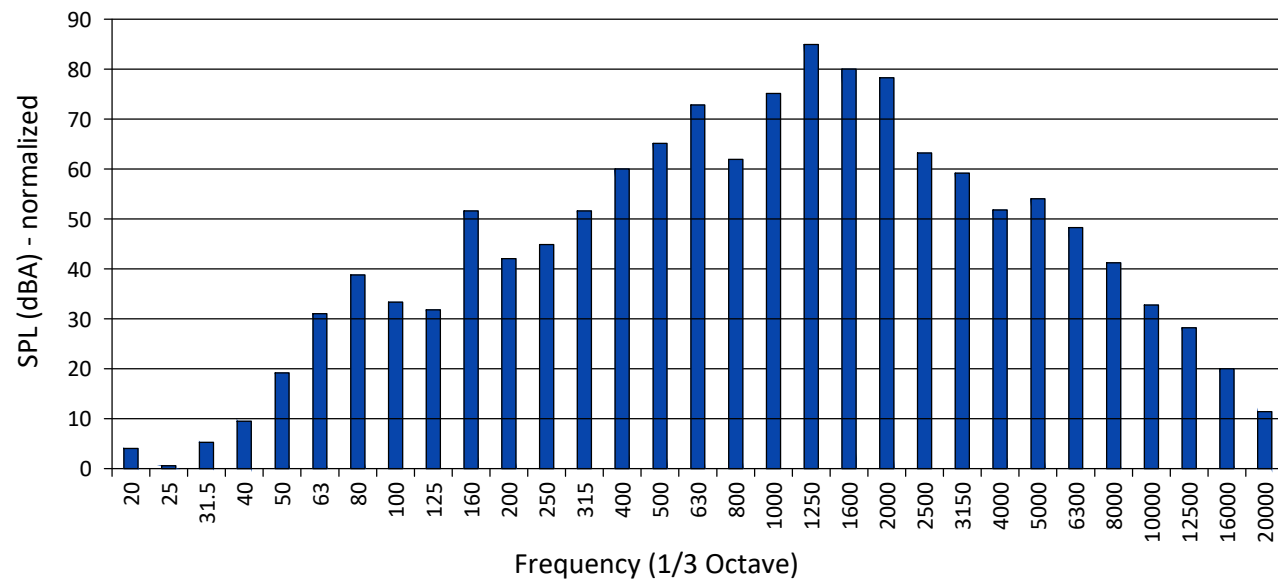


## ISOGAUSS PLOTS

\* The isogauss contour plots depicted on this drawing represent magnetic fringe fields resulting from the normal operation of the magnet provided with the MR system. The actual magnetic field intensity at any point in the vicinity of the magnet when installed may vary from the contour plots due to factors such as the concentrating effects of nearby ferrous objects ambient magnetic fields, including the earth's magnetic field. Therefore, the contours shown are only approximations of actual field intensities found at a corresponding distance from the magnet's isocenter.

## SOUND PRESSURE SPECTRAL DISTRIBUTION

1/3 Band Relative SPL



## MAGNETIC PROXIMITY LIMITS

Gauss (mT) Limit	Equipment
0.5 gauss (0.05mT)	Nuclear camera
1 gauss (0.1mT)	Positron Emission Tomography scanner, Linear Accelerator, Cyclotrons, Accurate measuring scale, Analog image intensifiers, Bone Densitometers, Video display (tube), CT scanner, Ultrasound, Lithotripter, Electron microscope
3 gauss (0.3mT)	Power transformers, Main electrical distribution transformers
5 gauss (0.5mT)	Cardiac pacemakers, Neurostimulators, Biostimulation devices
10 gauss (1mT)	Magnetic computer media, Line printers, VCRs, Film processor, X-ray tubes, Emergency generators, Commercial laundry equipment, Food preparation area, Water cooling equipment, HVAC equipment, Major mechanical equipment room, Credit cards, watches, and clocks, Air conditioning equipment, Fuel storage tanks, Motors greater than 5 horsepower
50 gauss (5mT)	Metal detector for screening, LCD panels, Telephones
No Limit	Digital Detectors

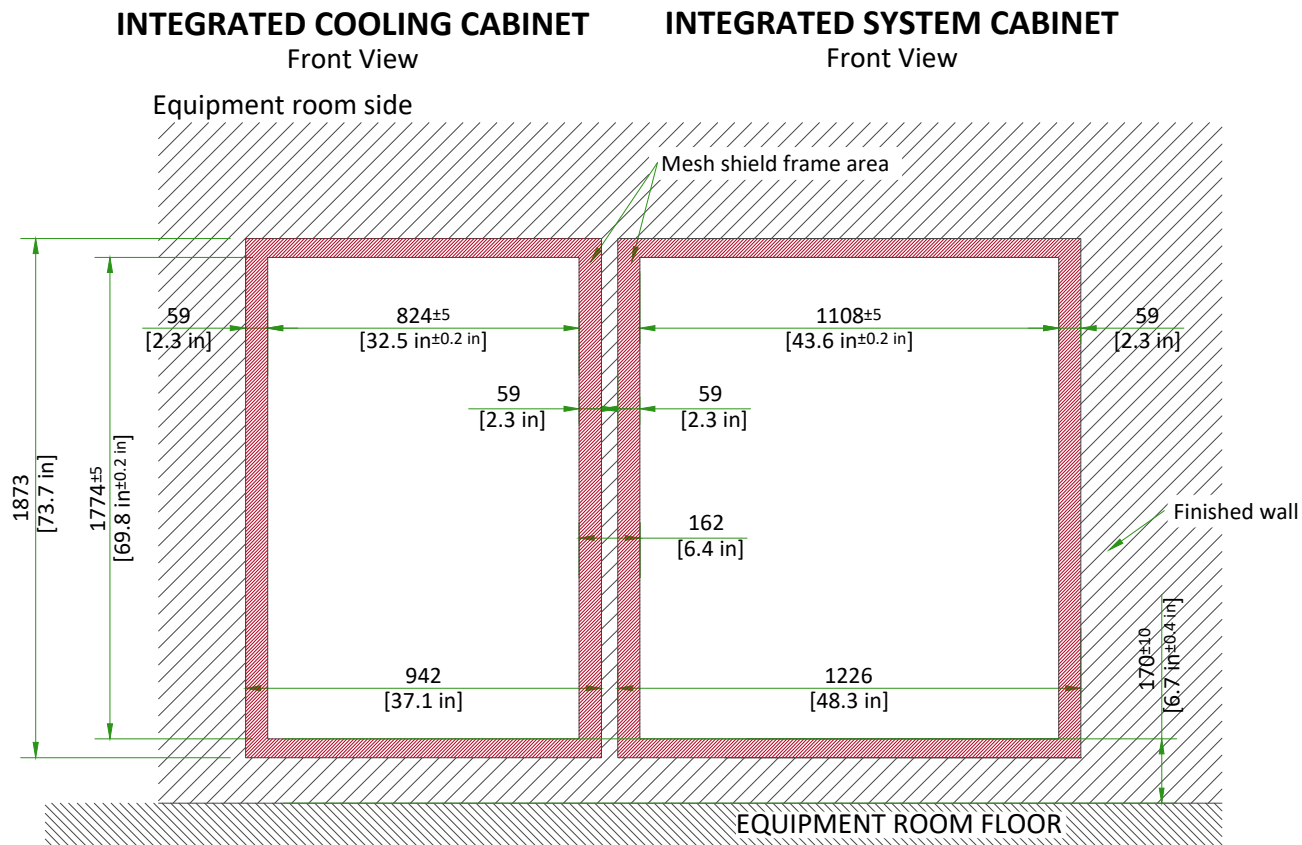
The customer must provide detail defining ferrous material below the magnet to the Project Manager so the GE Healthcare MR Siting and Shielding team can review for compliance.

### STEEL MASS LIMITS TO MAGNET ISOCENTER (3x3 m [10x10 ft] AREA UNDER MAGNET)

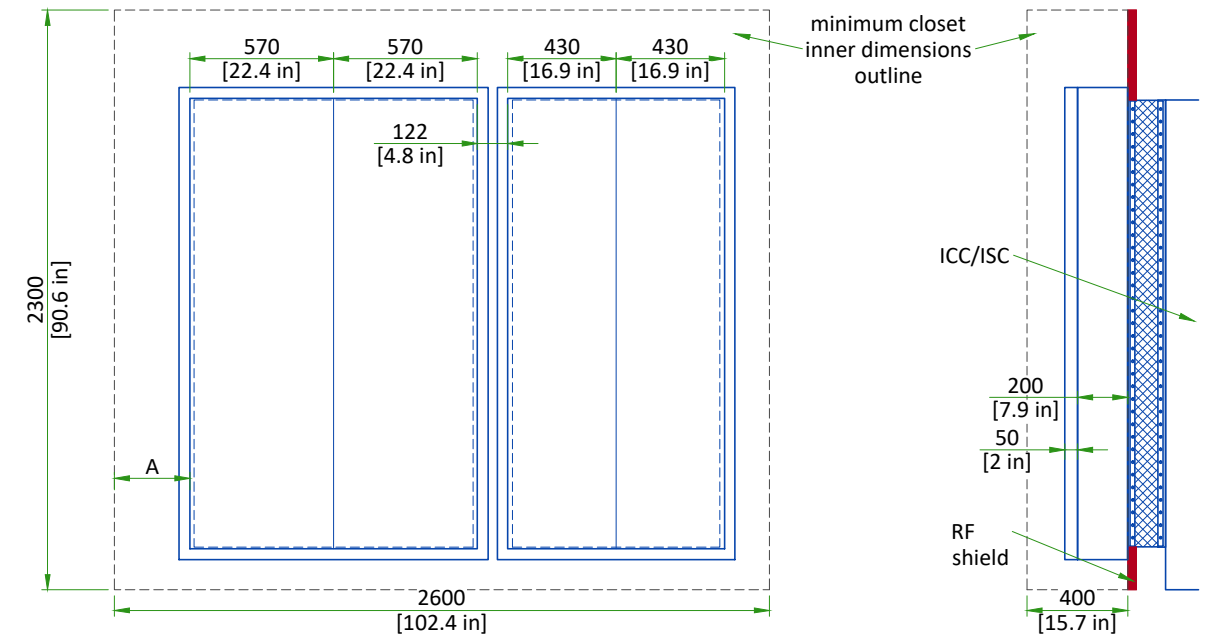
Limits Of Steel Mass		Distance Below Top Surface Of Floor	
kg/m <sup>2</sup>	lbs/ft <sup>2</sup>	mm	in
0	0	0 - 76	0-3
9.8	2	76 - 127	3-5
14.7	3	127 - 254	5-10
39.2	8	254 - 330	10-13
98.0	20	330+	13+

The actual field strength can be affected by Magnetic shielding, Earth's magnetic field, other magnetic fields and stationary or moving metal. This information must be used to evaluate potential site interaction of GE Healthcare equipment with other non-GE Healthcare equipment. Magnetic shielding can be installed to prevent interaction between the magnet and nearby sensitive devices. The GE Healthcare Project Manager of Installation (PMI) can work with the customer to coordinate the magnetic shielding site evaluation. The customer is responsible for installation of all magnetic shielding.

## PENETRATION PANELS WALL OPENINGS

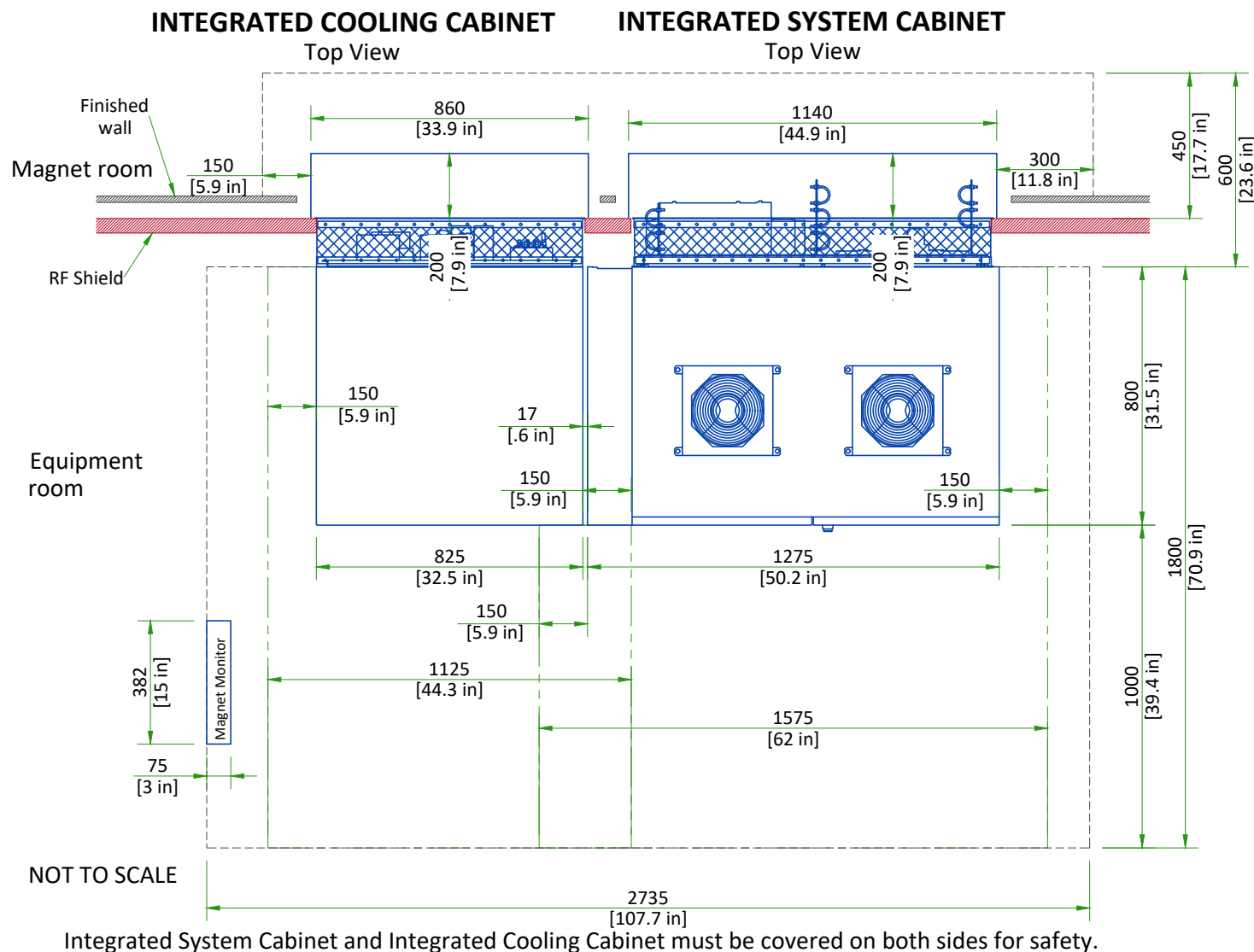


## PENETRATION PANEL CLOSET



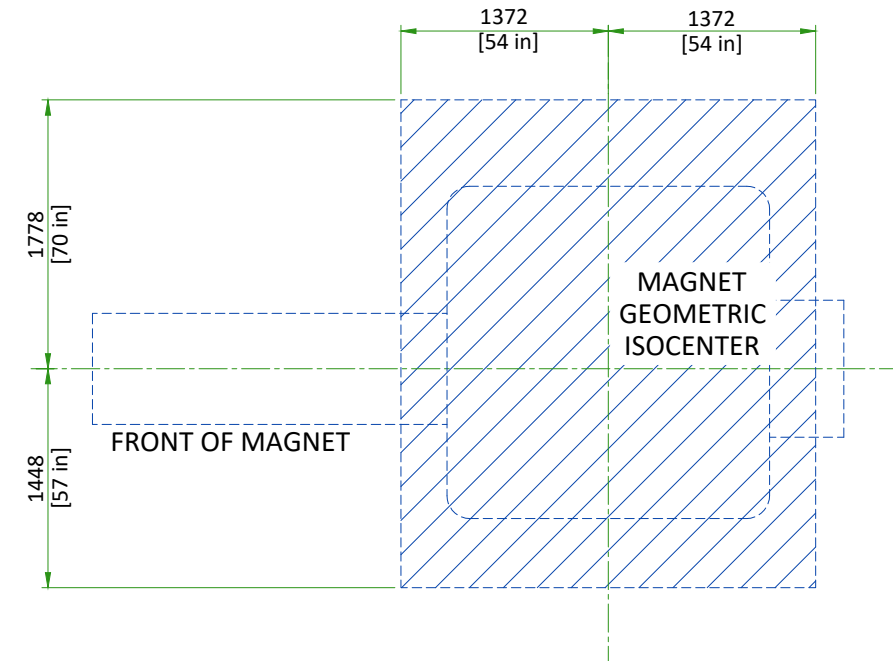
A: 300 mm [11.81in] side space for excess cable storage. Left side space and right side space can be swapped.  
 NOTE: All RF mesh Assy Shipping brackets should be kept on frame until after installed and RF test is completed.  
 An enclosure (i.e. closet) must be provided to restrict access to the PEN panels and for storage of excess interconnections.

- The PEN closet must have a mechanical locking mechanism to restrict access to the PEN panels
- The PEN closet must maintain the minimum service area outside the 200 Gauss in the magnet room.
- PEN closet must allow free air exchange of **400CFM (680 m<sup>3</sup>/hour)** between the Magnet room and PEN closet for MR system blowers. Airflow may be achieved through door louvers or other openings in the PEN closet that meet all other PEN closet requirements



## MINIMUM MAGNET CEILING HEIGHT (TOP VIEW)

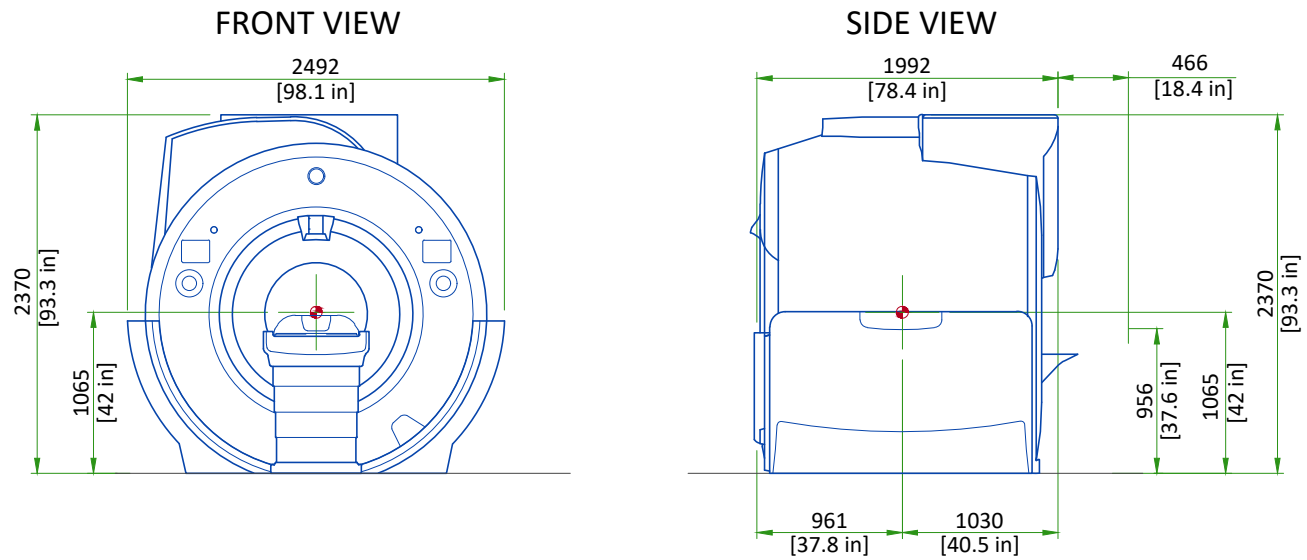
If the ceiling height is between 2500 mm [98.5 in] and 2667 mm [105 in], the flexible main lead extension for low ceiling height (2.5M Low Ceiling Kit-Passive, M7000GM) is required for ramping the magnet. Contact the GEHC PMI and GEHC Service Field Engineer for further evaluation.



SCALE 1:50

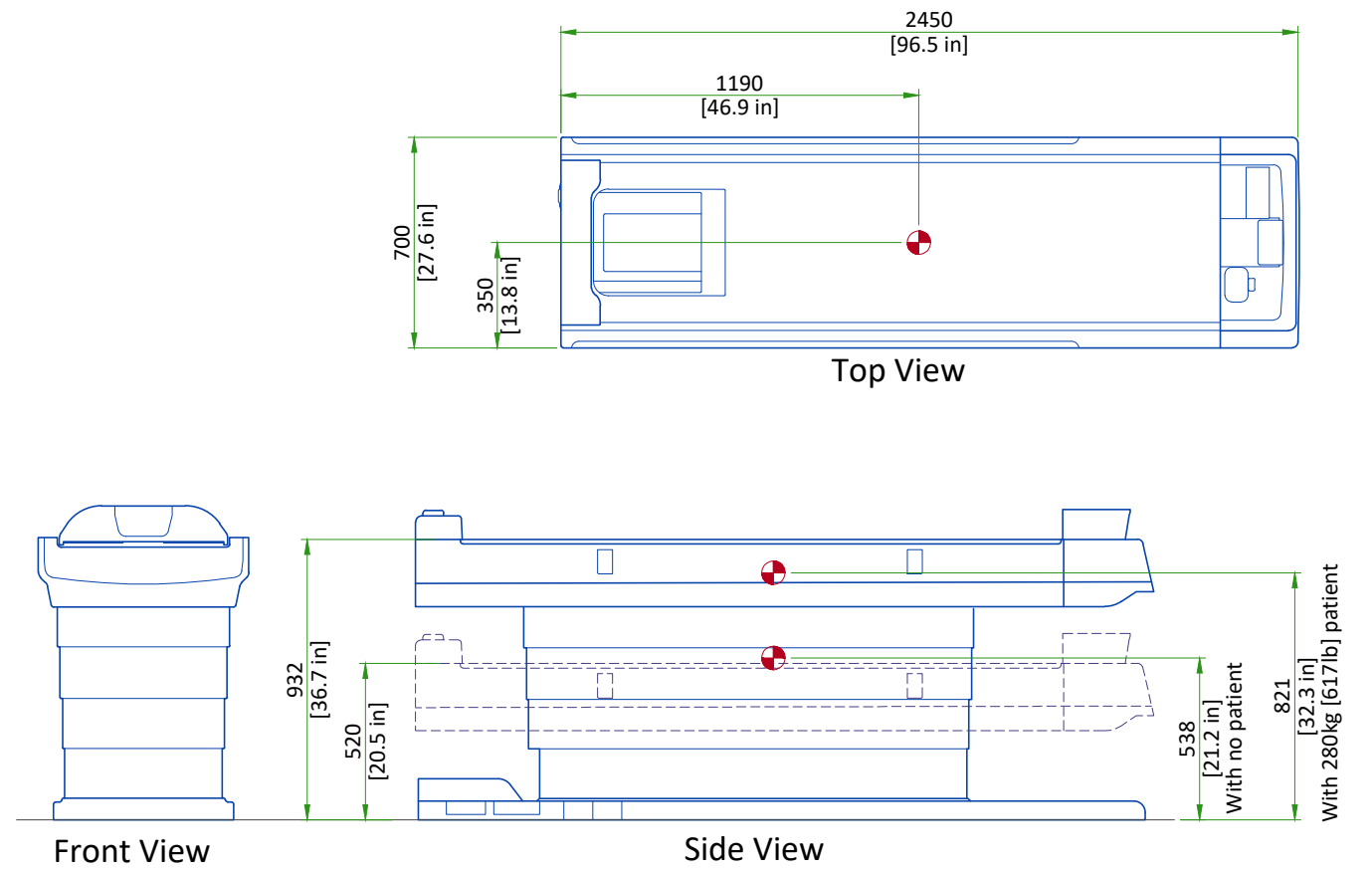
Integrated System Cabinet and Integrated Cooling Cabinet must be covered on both sides for safety.

## MAGNET ENCLOSURE



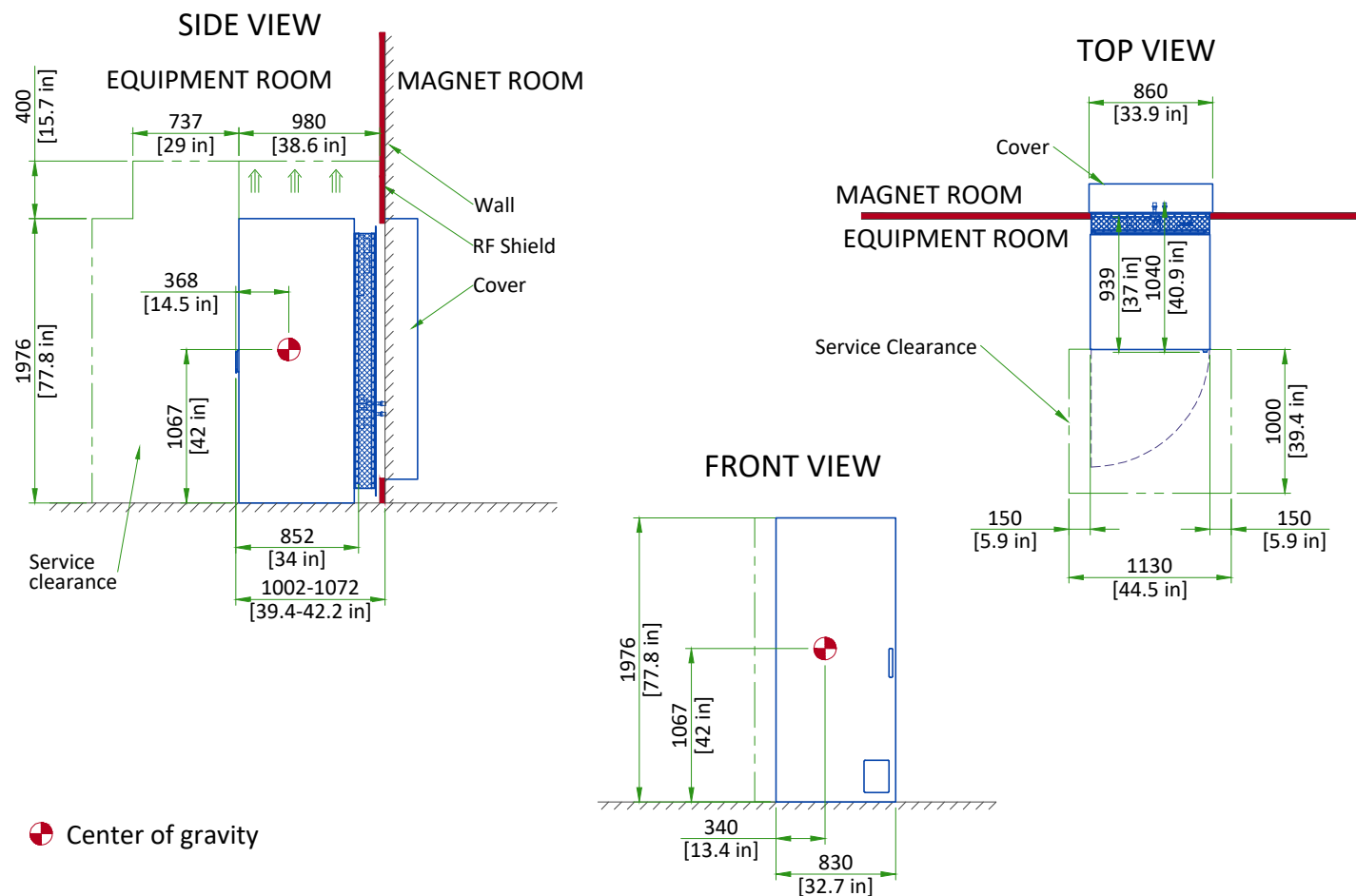
Note:  
 Center of gravity is approximate and includes the GE Healthcare supplied VibroAcoustic Dampening Kit, but does not include cryogenics, gradient assembly, side mounted electronics, or enclosures.  
 Enclosure dimensions are for reference only, NOT FOR SITE PLANNING USE.  
 ● Center of gravity

## PATIENT TABLE (PT)



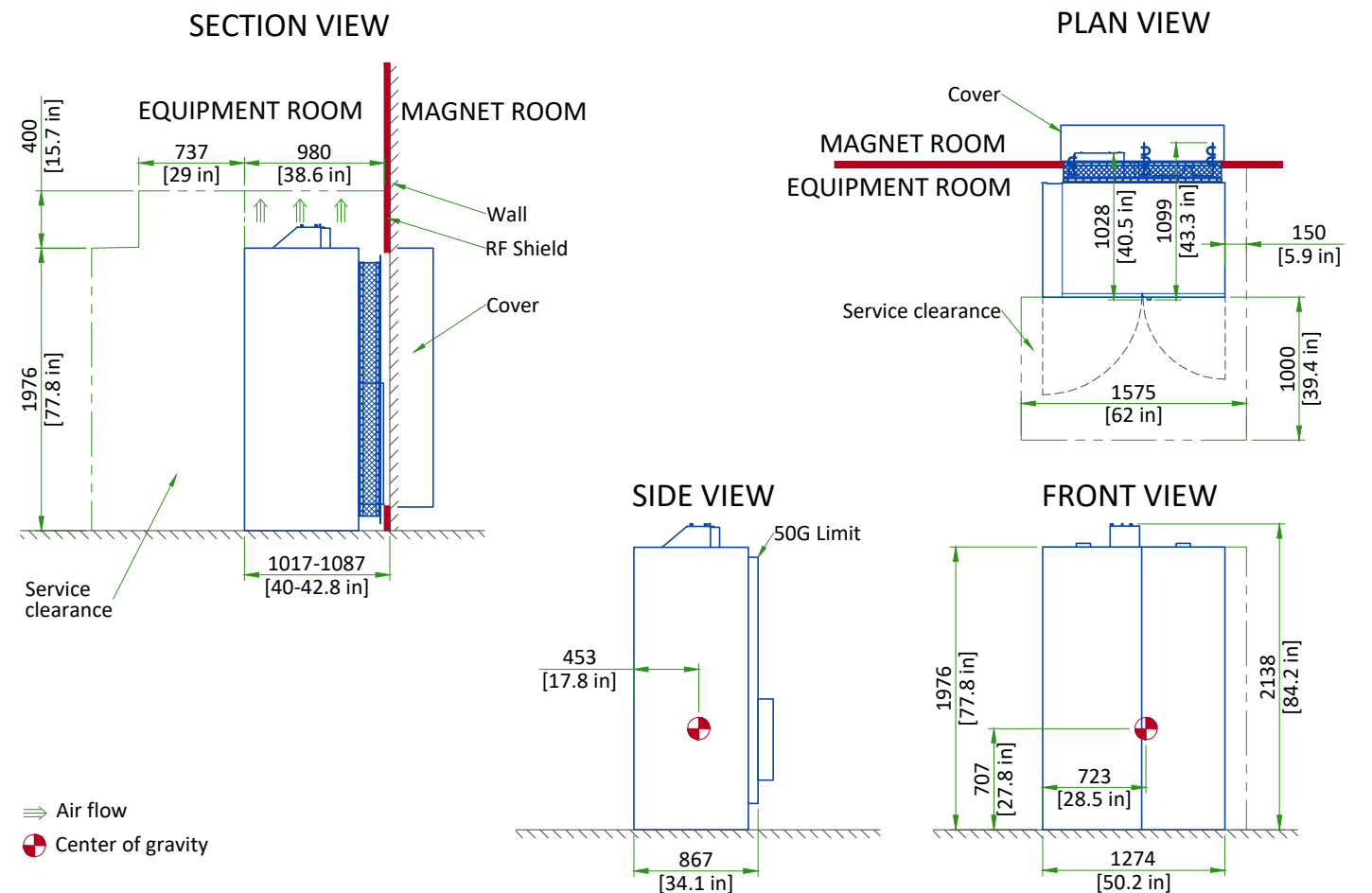
Scale 1:25

## INTEGRATED COOLING CABINET



● Center of gravity

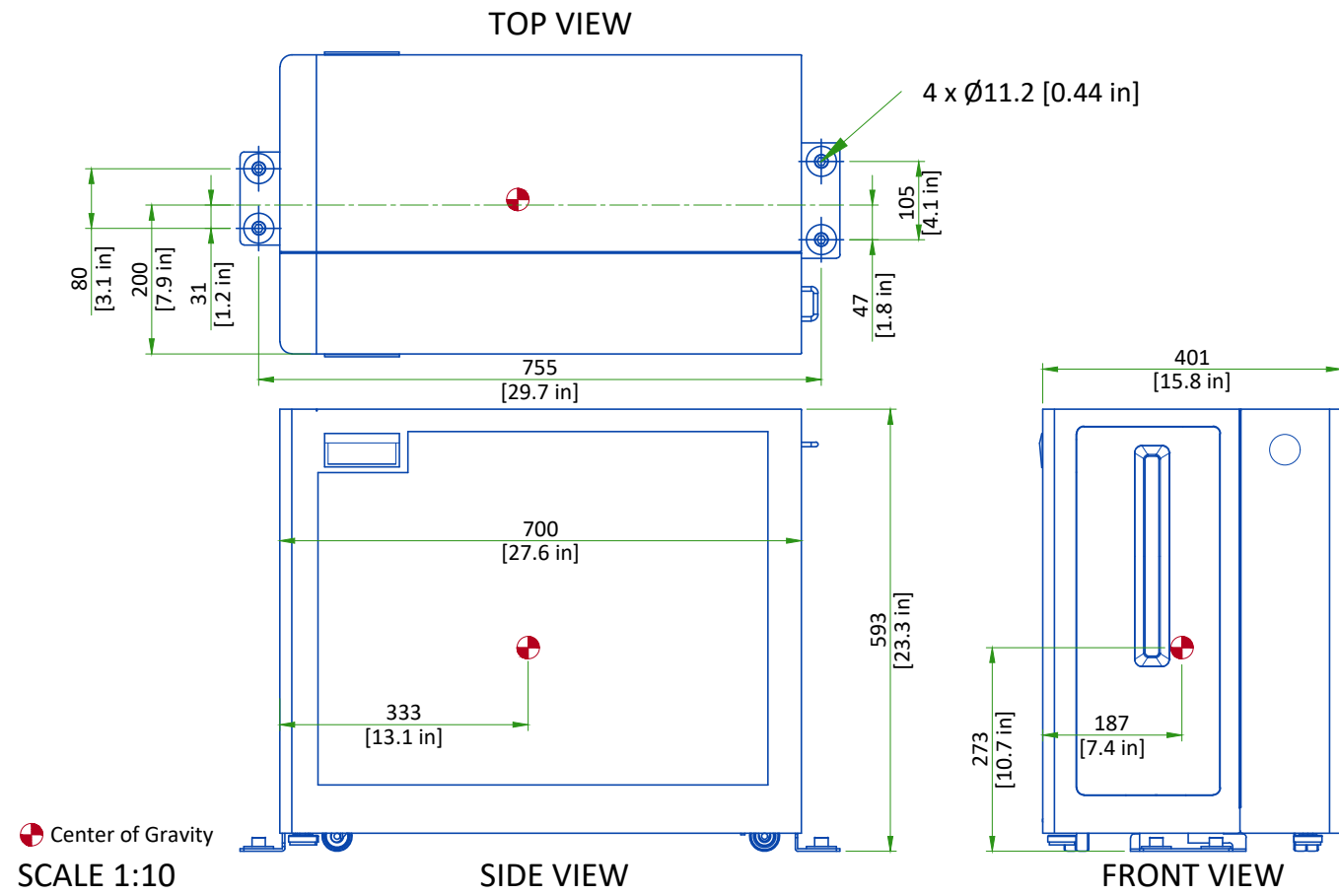
## INTEGRATED SYSTEM CABINET



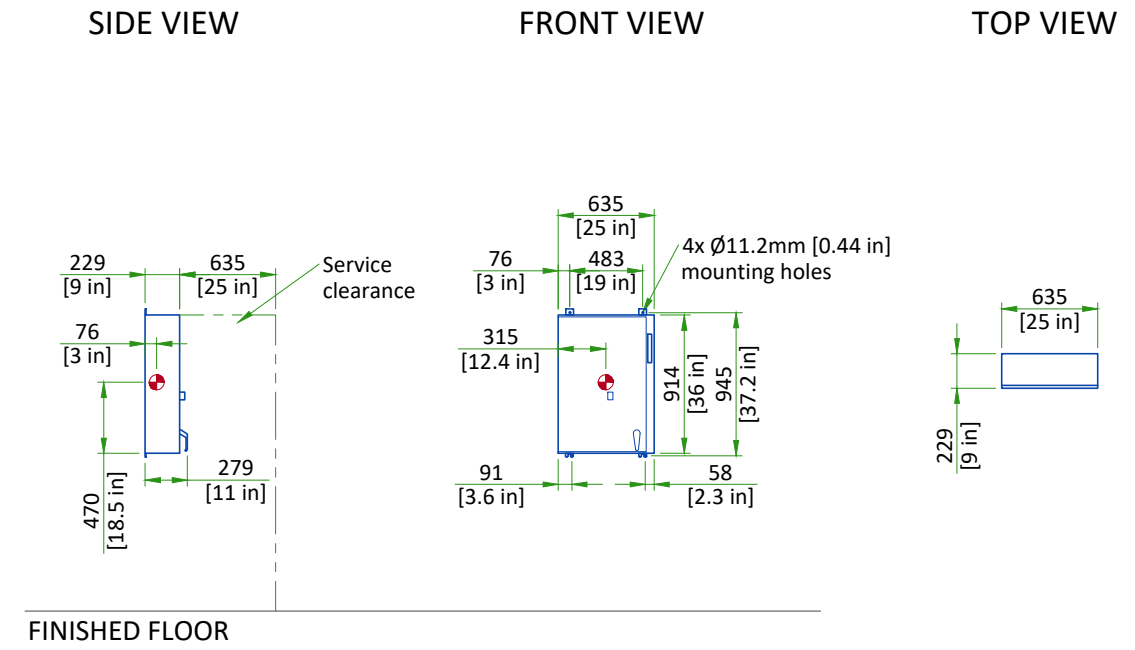
⇒ Air flow  
 ● Center of gravity



## GLOBAL OPERATOR CABINET (GOC)

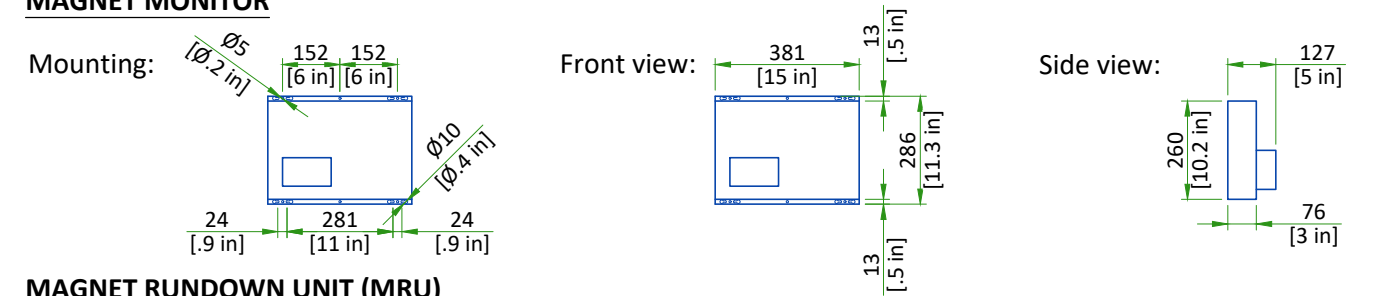


## MAIN DISCONNECT PANEL

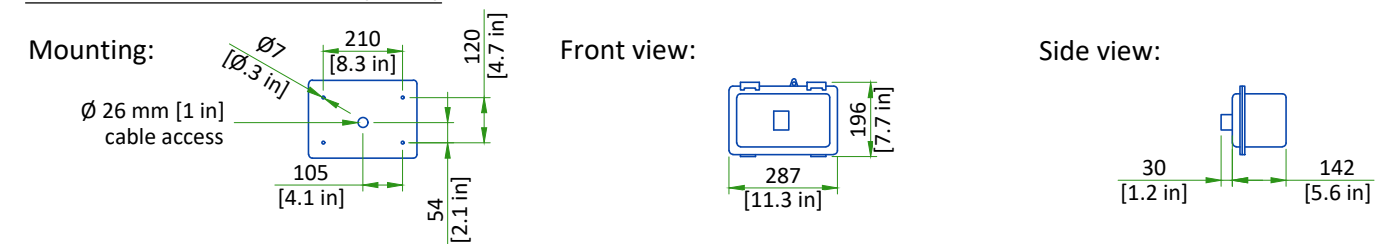


## MAGNET MONITOR AND MAGNET RUNDOWN UNIT (MRU)

### MAGNET MONITOR



### MAGNET RUNDOWN UNIT (MRU)



The bottom edge of the MRU must be mounted 1524 ±25 mm [60 ± 1 in] above the magnet room floor.

SCALE 1:20

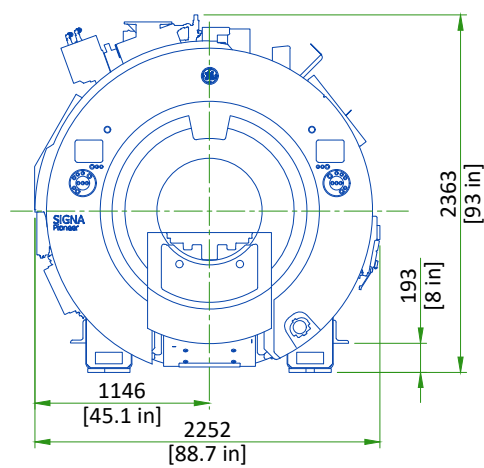
## DELIVERY

### ROUTING

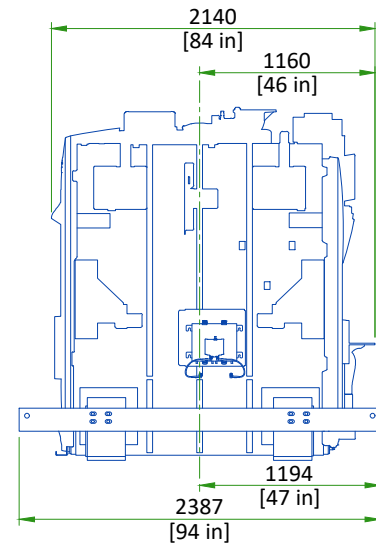
- The customer is solely liable for routing of components from dock to final site.
- GE must be able to move system components in or out with no need to uncrate or disassemble any of the components. The entire passageway must be cleared, adequately lighted and free from dust.
- The floor and its surfacing must be able to withstand the live load of components and handling equipment.
- Floor surfacing must be continuous.
- The customer must protect any fragile flooring surfaces.

### SPECIFICATIONS FOR MAGNET ROUTING

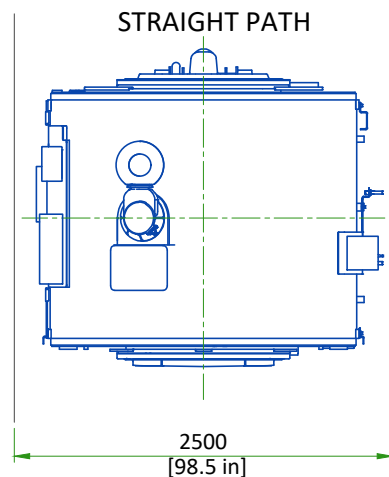
- Floor must be able to withstand a moving load of 5320 kg [11800 lb]
- Recommended opening height: 2.5m [98.5in], width: 2.5m [98.5in]. If recommended dimensions cannot be met refer to pre-installation manual for detailed specifications.
- Maximum slope: 30°



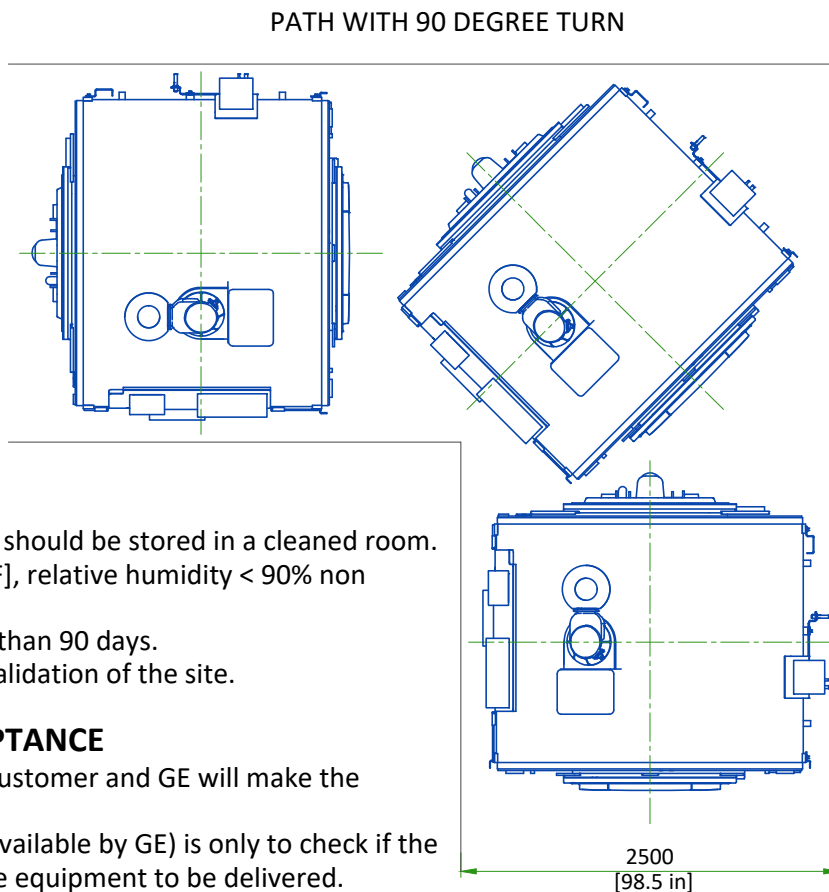
FRONT VIEW OF MAGNET



RIGHT SIDE VIEW OF MAGNET



STRAIGHT PATH



PATH WITH 90 DEGREE TURN

### STORAGE CONDITIONS

- System components except the magnet should be stored in a cleaned room.
- Temperature = -30 to 60°C [-22 to 140°F], relative humidity < 90% non condensing.
- Material should not be stored for more than 90 days.
- The magnet will be delivered after GE validation of the site.

### INSTALLATION AND DELIVERY ACCEPTANCE

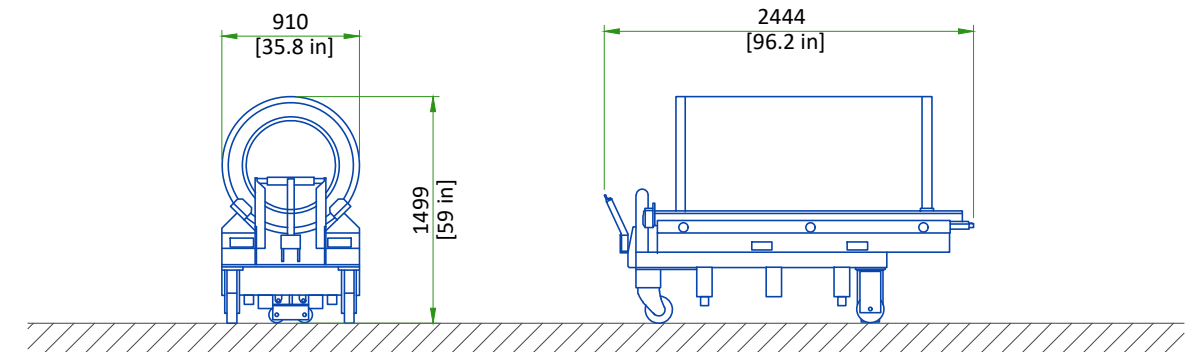
- A survey of the site established by the customer and GE will make the decision for the delivery time.
- This survey of the site (a form is made available by GE) is only to check if the apparent conditions of the site allow the equipment to be delivered.
- If the site is not ready, GE can delay the delivery time.

## CRITICAL ITEMS FOR MAGNET DELIVERY

- 24/7 chilled water and three phase power for Cryocooler Compressor. Refer to Power Requirements detail for detailed specifications.
- 24/7 single phase power for the Magnet Monitor. Refer to Power Requirements detail for detailed specifications.
- Ethernet connections for magnet monitoring and phone lines for emergency use. Refer to Connectivity Requirements detail for additional information.
- Operational magnet room exhaust fan. Refer to Magnet Room Venting Requirements detail for detailed specifications.
- The Cryogen Vent system is installed, complete to outside the building and ready for connection to magnet or will be completed by RF cage closure. Connection delay not to exceed 24 Hours.

This is only a partial list of items required for delivery of the magnet. For a complete checklist refer to the Pre-Installation Manual (PIM) referenced on the cover sheet.

## GRADIENT COIL REPLACEMENT



EQUIPMENT	DIMENSIONS LxWxH		WEIGHT		NOTE
	mm	in	kg	lbs	
Replacement VRMw gradient coil assembly on a shipping cradle/cart	910x2444x1499	35.8x96.2x59	1449	3194	Initial gradient coil assembly is shipped installed in the magnet. Shipping/installation cart is used to install replacement coil assembly only.

The weight bearing structure of the site should support any additional weight of the main replacement parts occurring during maintenance of the magnet, throughout the whole lifecycle of the MR.

## STRUCTURAL NOTES

- All units that are wall mounted or wall supported are to be provided with supports where necessary. Wall supports are to be supplied and installed by the customer or his contractors.
- Dimensions are to finished surfaces of room.
- Certain MR procedures require an extremely stable environment to achieve high resolution image quality. Vibration is known to introduce field instabilities into the imaging system. The vibration effects on image quality can be minimized during the initial site planning of the mr suite by minimizing the vibration environment. See [PROXIMITY LIMITS](#), [PATIENT TABLE DOCK ANCHOR MOUNTING REQUIREMENTS AND VIBROACOUSTIC DAMPENING KIT](#) details for additional information.
- Standard steel studs, nails, screws, conduit, piping, drains and other hardware are acceptable if properly secured. Any loose steel objects can be violently accelerated into the bore of the magnet. Careful thought should be given to the selection of light fixtures, cabinets, wall decorations, etc. To minimize this potential hazard. For safety, all removable items within the magnet room such as faucet handles, drain covers, switch box cover plates, light fixture components, mounting screws, etc. must be non-magnetic. If you have a specific question about material, bring it to the attention of your GE project manager of installations.
- Floor levelness refer to [MAGNET ROOM FLOOR SPECIFICATIONS DETAIL](#), this floor levelness requirement is important for accurate patient table docking.
- Non-movable steel such as wall studs or hvac components will produce negligible effect on the active shield magnet.
- Customer's contractor must provide all penetrations in post tension floors.
- Customer's contractor must provide and install any non-standard anchoring. Documents for standard anchoring methods are included with GE equipment drawings for geographic areas that require such documentation.
- Customer's contractor must provide and install hardware for "through the floor" anchoring and/or any bracing under access floors. This contractor must also provide floor drilling that cannot be completed because of an obstruction encountered while drilling by the GE installer such as rebar etc.
- Customer's contractor to provide and install appropriate supports for the storage of excess cables.
- It is the customer's responsibility to perform any floor or wall penetrations that may be required. The customer is also responsible for ensuring that no subsurface utilities (e.g., electrical or any other form of wiring, conduits, piping, duct work or structural supports (i.e. post tension cables or rebar)) will interfere or come in contact with subsurface penetration operations (e.g. drilling and installation of anchors/screws) performed during the installation process. To ensure worker safety, GE installers will perform surface penetration operations only after the customer's validation and completion of the "GE surface penetration permit"

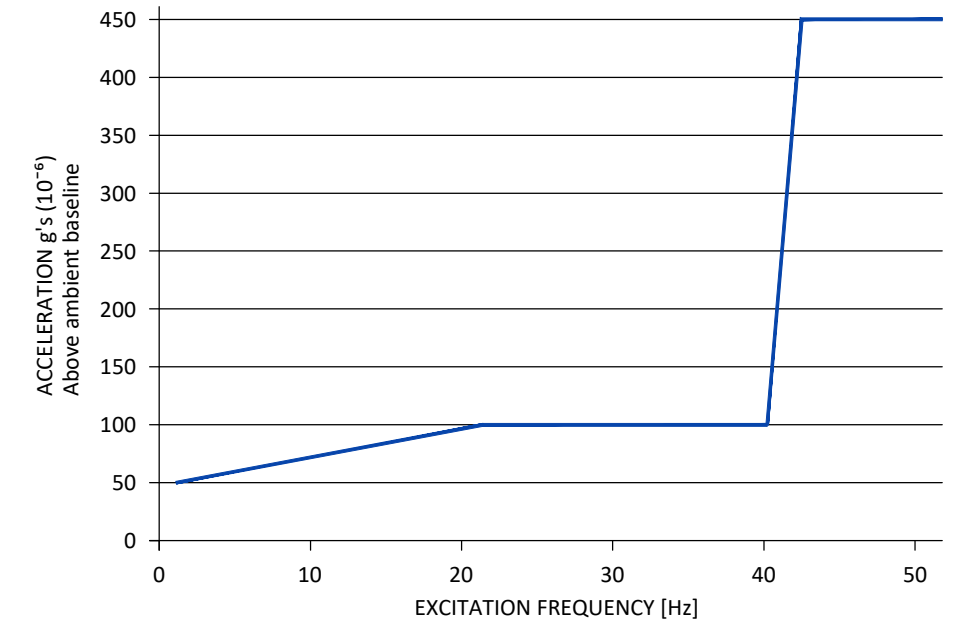
## VIBRATION SPECIFICATIONS

Excessive vibration can affect MR image quality. Vibration testing must be performed early in the site planning process to ensure vibration is minimized. Both steady state vibration (exhaust fans, air conditioners, pumps, etc.) and transient vibrations (traffic, pedestrians, door slamming, etc.) must be assessed. The Magnet cannot be directly isolated from vibration. Any vibration issue must be resolved at the source.

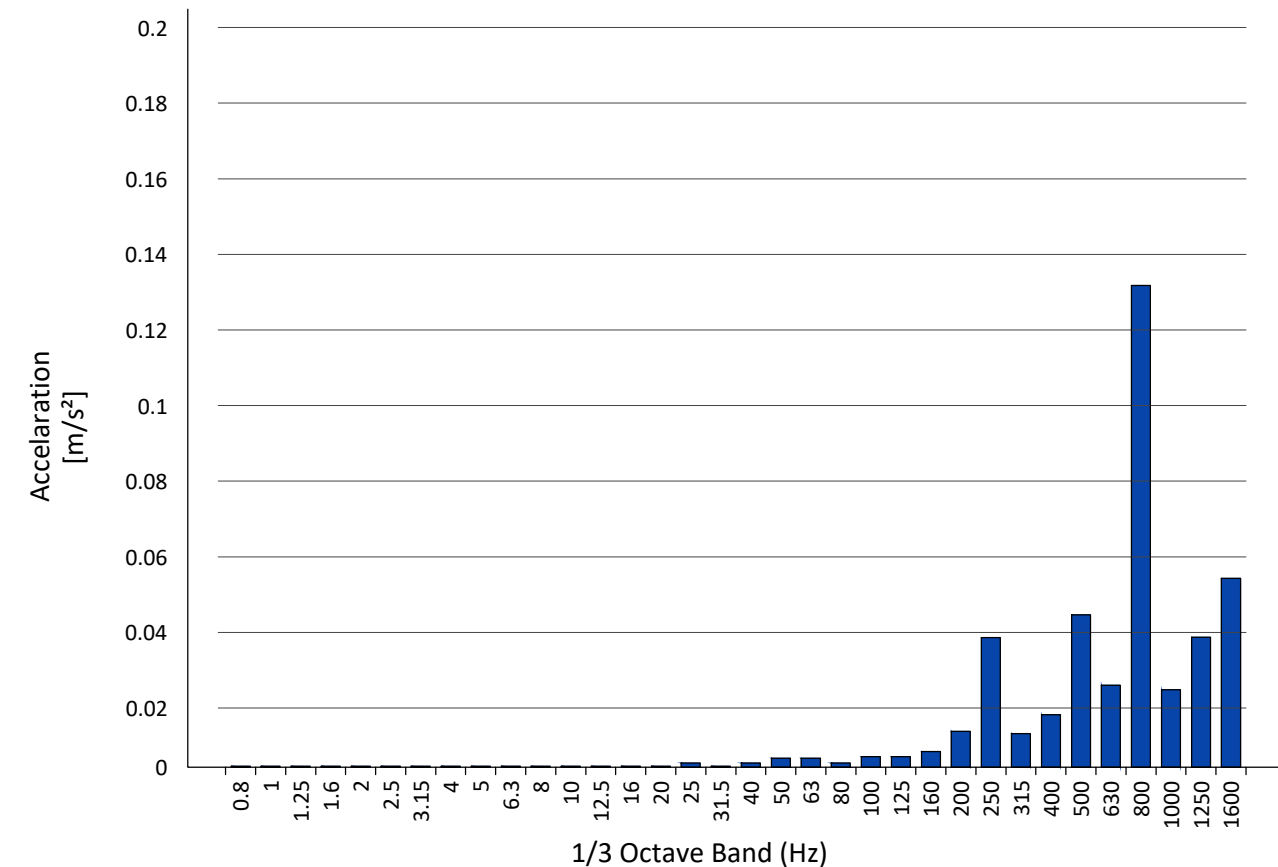
Transient vibration levels above the specified limits in the MR Site Vibration Test Guidelines must be analyzed. Any transient vibration that causes vibration to exceed the steady-state level must be mitigated.

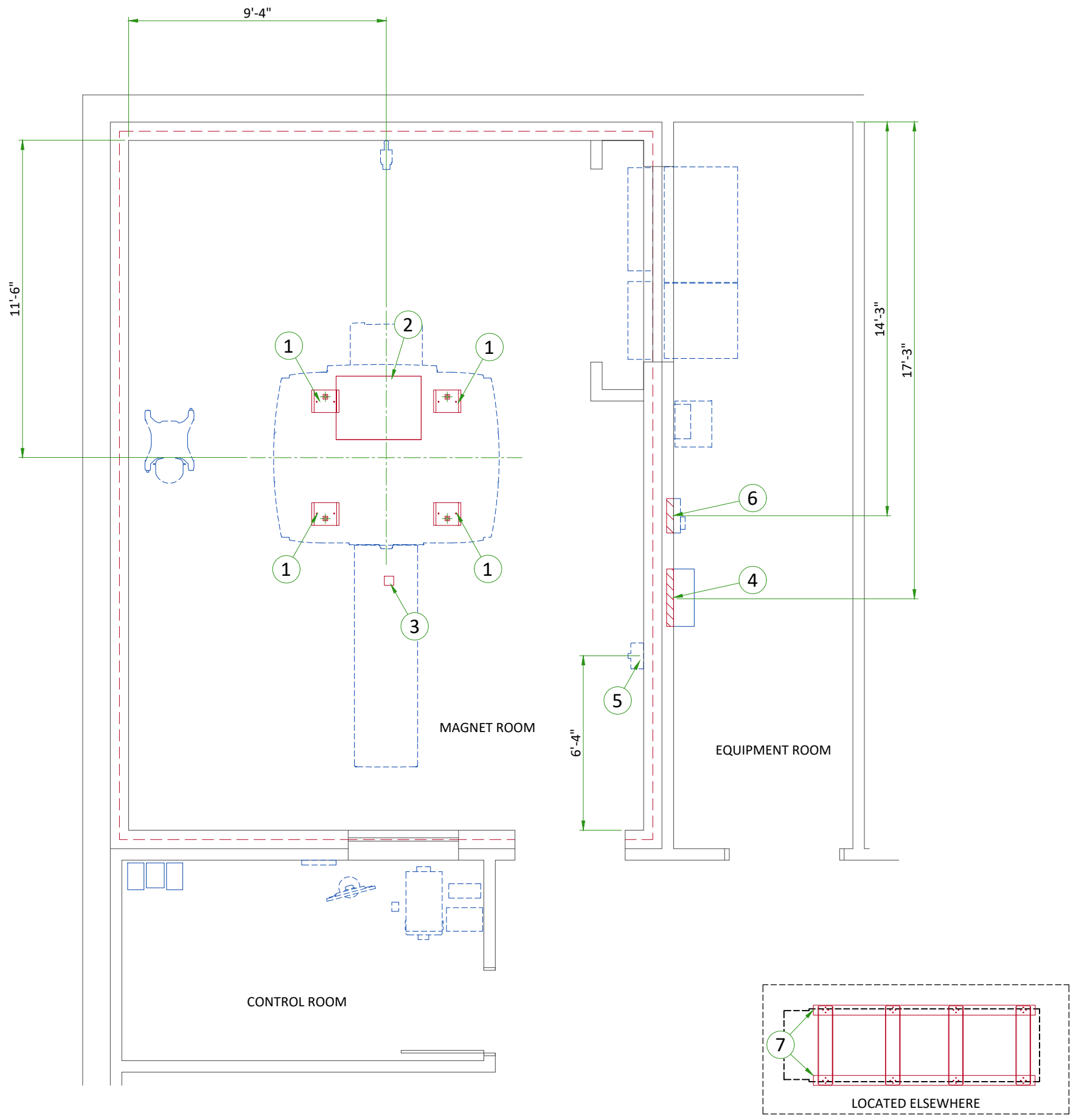
NOTE:  
The customer may have to hire a vibration consultant based on the results of the analysis.

MAGNET STEADY-STATE VIBRATION SPECIFICATIONS



## VIBRATION TRANSMITTED THROUGH VIBROACOUSTIC MAT

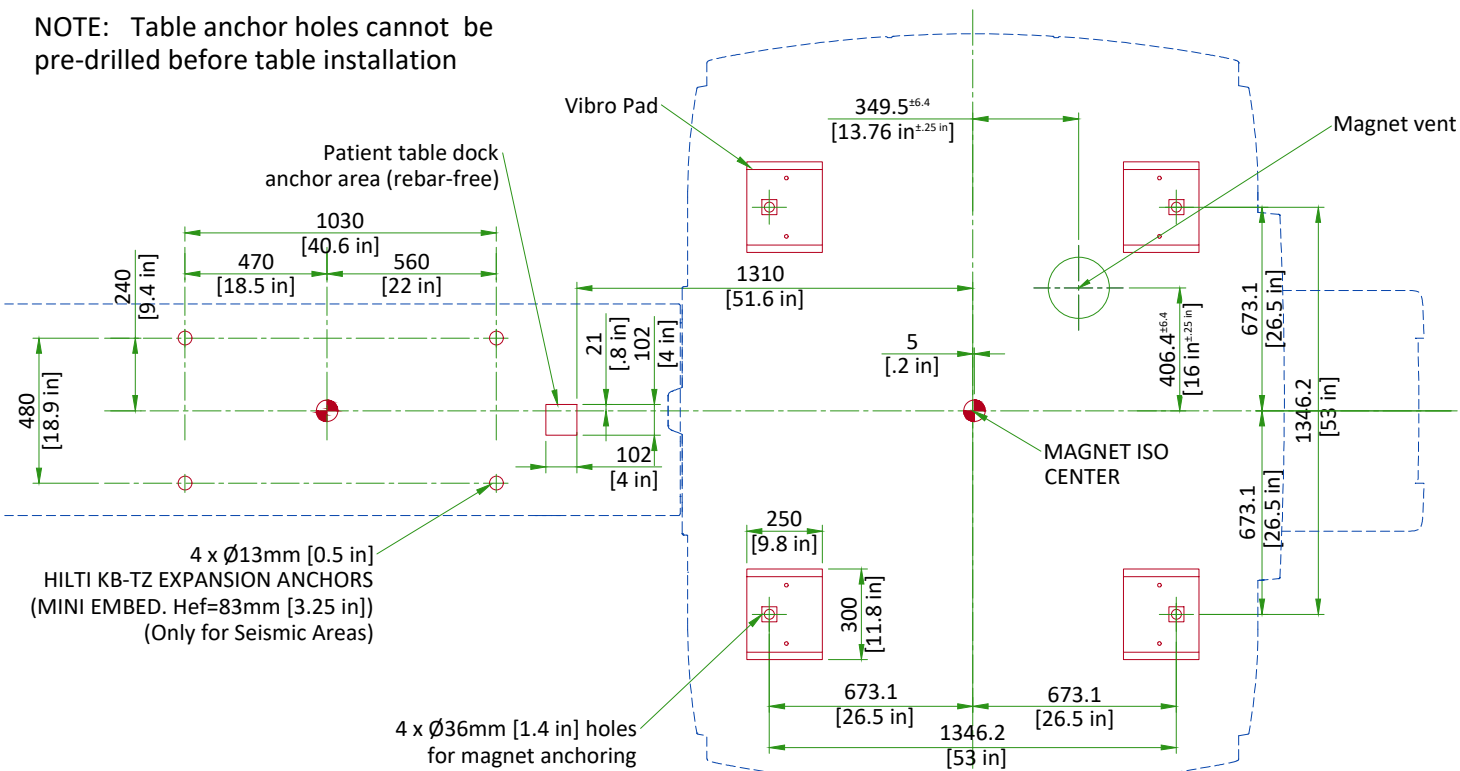




ITEM	DESCRIPTION
(GE SUPPLIED / CONTRACTOR INSTALLED)	
1	Vibroacoustic dampening kit (see floor structural detail)
2	Magnet curtain kit
(CONTRACTOR SUPPLIED & INSTALLED)	
3	Patient table dock anchoring
4	Structural wall backing for Main Disconnect Panel
5	Structural wall backing for Magnet Rundown Unit
6	Structural wall backing for Magnet Monitor
7	Two I-beam runners are to support chiller feet at both ends. Refer to Dimplex manual.

## FLOOR MOUNTING

NOTE: Table anchor holes cannot be pre-drilled before table installation



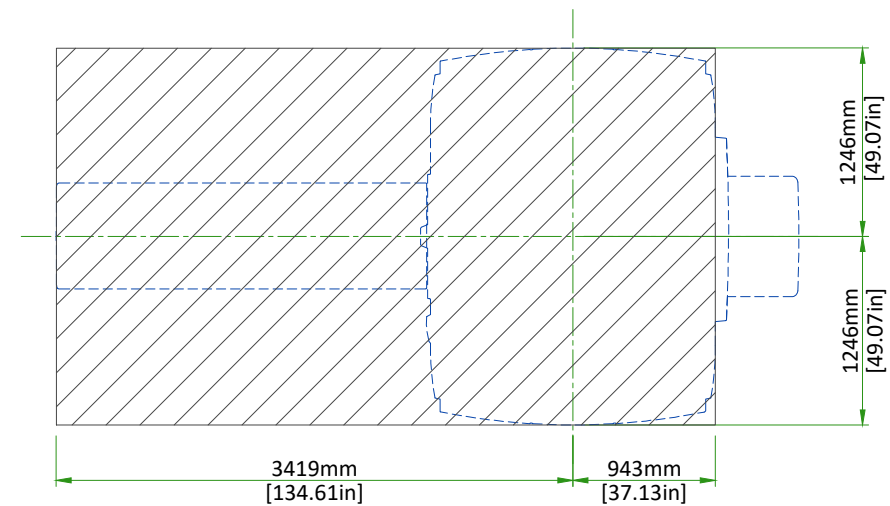
Center of Gravity

SCALE 1:25

VibroAcoustic Kit (M50002LP)

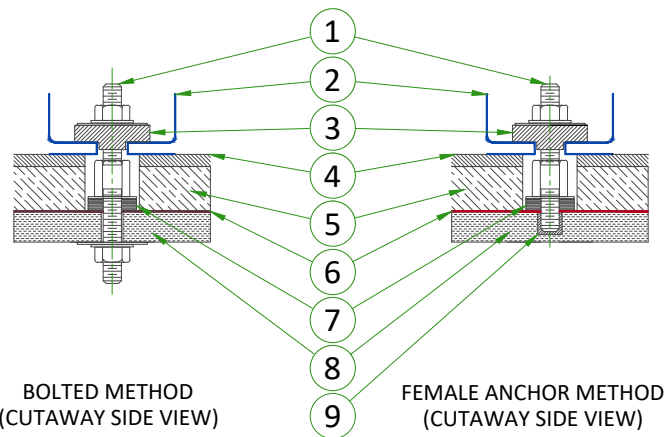
## MAGNET ROOM FLOOR SPECIFICATIONS

Floor must be flat and level to 3 mm [0.12in] between high and low spots over the area shown.



The finished floor must support the weight of all components (e.g., patient table, gradient coil replacement cart) throughout operation and service life.

## DOCK/TABLE FRAME ANCHOR MOUNTING REQUIREMENTS



BOLTED METHOD  
(CUTAWAY SIDE VIEW)

FEMALE ANCHOR METHOD  
(CUTAWAY SIDE VIEW)

- 1 Removable Anchor Rod (Male insert)
- 2 Dock
- 3 Clamp bracket
- 4 Finished floor
- 5 Filler Board or Grout
- 6 RF Shield
- 7 Conductive Fibrous Washer (RF seal)
- 8 Concrete
- 9 Female Anchor Insert

NOT TO SCALE

- The RF Shield vendor must design and install the dock/table frame anchor bolt
- The anchor bolt must be installed **after** the Magnet is installed
- The dock/table frame anchor must not contact floor rebar or other structural steel
- The dock/table frame anchor must electrically contact the RF shield at point of entry
- The RF shield vendor must perform a pull test on the anchor (equal to the clamping force). Results must be provided to the GE HealthCare Project Manager of Installation (PMI).

THE DOCK ANCHOR PROPERTIES MUST COMPLY WITH THE FOLLOWING REQUIREMENTS:

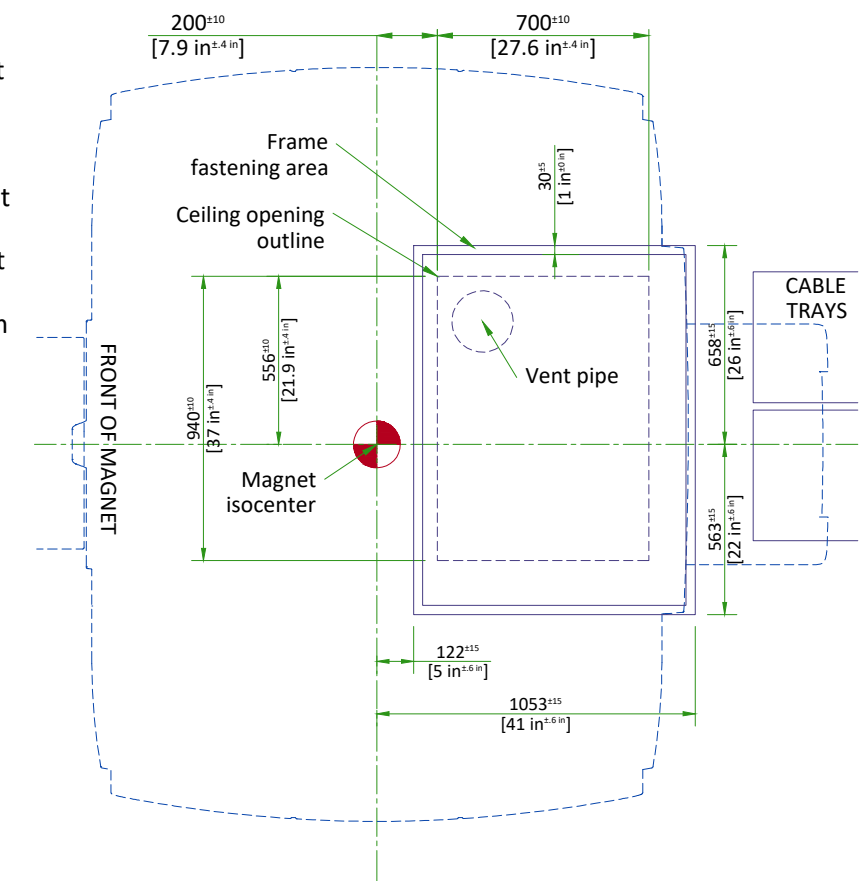
- a. Anchors must be two-part assembly (male/female)
- b. Female side must be expansion- or epoxy-type
- c. Male side must be a bolt or threaded rod with appropriate-sized nut (bolt or rod must be removable - not epoxied or cemented in place)
- d. Anchors must be electrically conductive
- e. Anchors must be non-ferrous
- f. Anchors must not induce galvanic corrosion with the RF shield
- g. Anchors must be commercially procured
- h. If anchoring a table, the anchor rod hole clearance in the table frame anchor base is 11 mm [0.43 in]. The anchor rod diameter must be sized appropriately.
- i. Anchors must meet the following clamping force: 2,669 N [600 lb]
- j. The anchor rod must extend at least 35 mm [1.38 in] but not more than 60 mm [2.36 in] above the finished floor.
- k. The anchor rod must be less than 152 mm [6 in] in total length (length above the floor plus embedded length)
- l. If underside of deck is metallic, then insulating bushing must be added to through bolt hardware to prevent grounding of shield at this point.

## CABLE CONCEALMENT

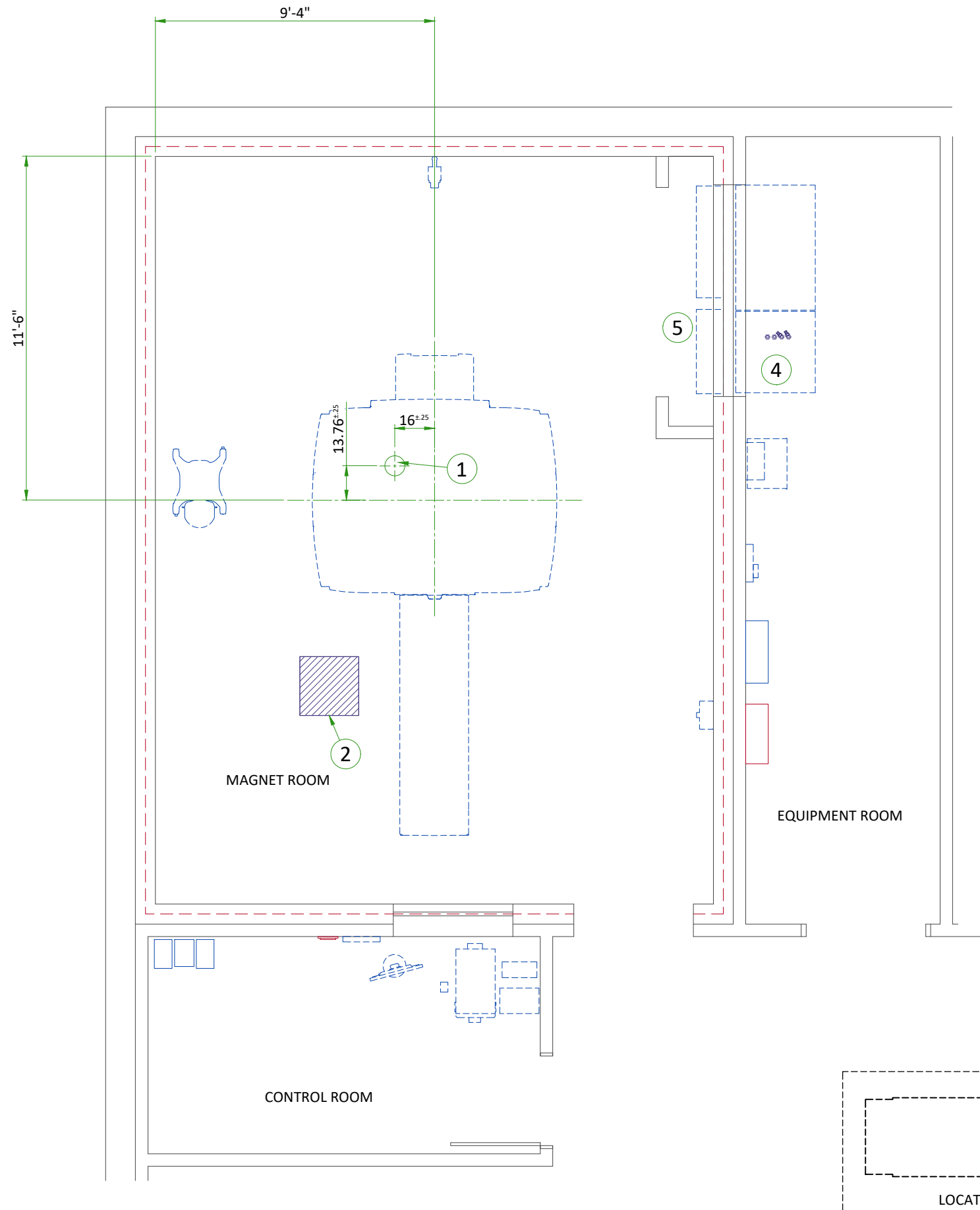
NOTES:

- 1) Ceiling Opening and Cable Concealment Kit Frame Fasten Area are measured from isocenter.
- 2) Cable Concealment Kit Frame Fasten Area must be enforced to sustain the Kit (Frame + Covers) weight 30 kg [66 lb].
- 3) The space above the cable concealment opening must be clear of any obstructions, up to a height of 2794 mm [110 in] from the finished floor, for cables to be routed to the magnet.

For LCC magnet refer to Pre-Magnet Delivery manual 5728068-1EN for additional information.



SCALE 1:25



ITEM	DESCRIPTION
1	Cryogen vent (200mm [8"] O.D.)
2	Emergency exhaust vent - refer to magnet room vent requirements (position to be defined)
3	(2) 50mm [2"] I.D. High pressure hoses and (2) 50mm [2"] to 38mm [1.5"] Reducers
4	25.4 mm [1 in] minimum hose inside diameter. If the hose is longer than 10 m [32.8 ft] and shorter than 30 m [98.4 ft], a hose with a 31.75 mm [1.25 in] minimum ID is recommended. If using 31.75 mm [1.25 in] hose, an adaptor is required to reduce the inner diameter to 25.4 mm [1 in] for the ICC connection. Refer to chilled water block diagram.
5	Closet must allow free air exchange of 400 CFM between magnet room and closet

### MECHANICAL/PLUMBING NOTES

- All piping, fittings, supports, hoses, clamps, ventilation systems, etc. are to be supplied and installed by the customer or his contractors.
- For complete design and requirements, specifications and guidelines refer to the pre-installation manual: system cooling, cryogen venting, waveguides and exhaust venting.
- An emergency water cooling back-up supply is recommended for continuous cryogen compressor operation. if using an open loop back-up design, ensure a drain is provided. please refer to the pre-install manual for optional back-up coolant supply requirements

# TEMPERATURE AND HUMIDITY SPECIFICATIONS

## IN-USE CONDITIONS

	MAGNET ROOM			CONTROL ROOM			EQUIPMENT ROOM		
Temperature	15-21°C			15-32°C			15-32°C [3]		
	59-69.8°F			59-89.6°F			59-89.6°F [3]		
Temperature gradient [1]	≤ 3°C/h			≤ 3°C/h			≤ 3°C/h		
	≤ 5°F/h			≤ 5°F/h			≤ 5°F/h		
Relative humidity	30% to 60%			30% to 75%			30% to 75%		
Humidity gradient [2]	≤ 5%/h			≤ 5%/h			≤ 5%/h		
System heat dissipation (2)	Stand by	Max	Average	Stand by	Max	Average	Stand by	Max	Average
	0.56kW	2.40kW	<b>1.20kW</b>		1.45kW		0.97kW	8.92kW	<b>3.32kW</b>
	1915 btu	8189 btu	4095 btu		4947 btu		3316 btu	30456 btu	11337 btu

**NOTE**

Maximum ambient temperature is derated by 1°C [1.8°F] per 300 m [984 ft] above 2000 m [6561 ft] (not to exceed 2600 m 8530 ft).

(1) non-condensing

(2) Actual heat output is site specific and dependent on the specific MR system configuration and customer usage of the MR system and options

## STORAGE CONDITIONS

Temperature	-30°C to 50°C
Relative humidity (1)	10% to 90%

Material should not be stored for more than 90 days.

## AIR RENEWAL

According to local standards.

**NOTE**

In case of using air conditioning systems that have a risk of water leakage it is recommended not to install it above electric equipment or to take measures to protect the equipment from dropping water.

# MAGNET ROOM VENTING REQUIREMENTS

## HVAC VENT REQUIREMENTS

- HVAC vendor must comply with Magnet room temperature and humidity specifications and RF shielding specifications.
- RF Shield vendor must install open pipe or honeycomb HVAC waveguides.
- All serviceable parts in the Magnet room (e.g.: diffusers) must be non-magnetic.
- Waveguides must be nonmagnetic and electrically isolated.
- Incoming air must contain at least **5% air** from outside the Magnet room (inside or outside the facility) to displace residual helium.

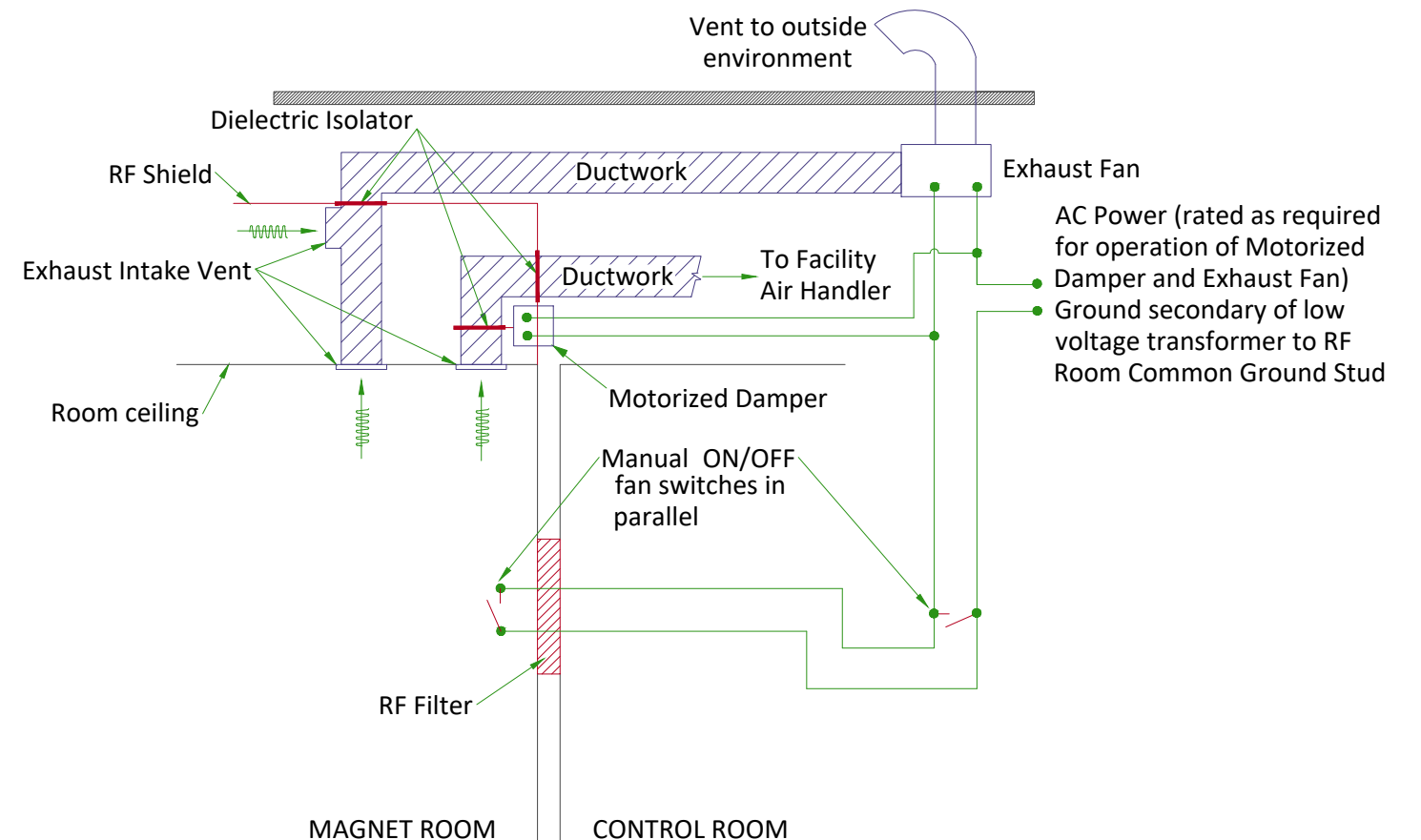
## EMERGENCY VENT REQUIREMENT

- Exhaust vent system is supplied by the customer.
- All items within the RF enclosure must be non-magnetic.
- The exhaust vent system must be tested and operational before the magnet is installed.
- The exhaust intake vent must be located near the magnet cryogenic vent at the highest point on the finished or drop ceiling.
- The Magnet room exhaust fan and exhaust intake vent must have a capacity of at least **1200 CFM (34 m³/min)** with a minimum of **12 room air exchanges per hour**.
- The exhaust fan must be placed above RF shielding located outside 10 gauss (1mT) and with appropriate waveguide.
- The system must have a manual exhaust fan switch near the Operator Workspace and in the Magnet room near the door (the switches must be connected in parallel).
- All system components must be accessible for customer inspection, cleaning and maintenance

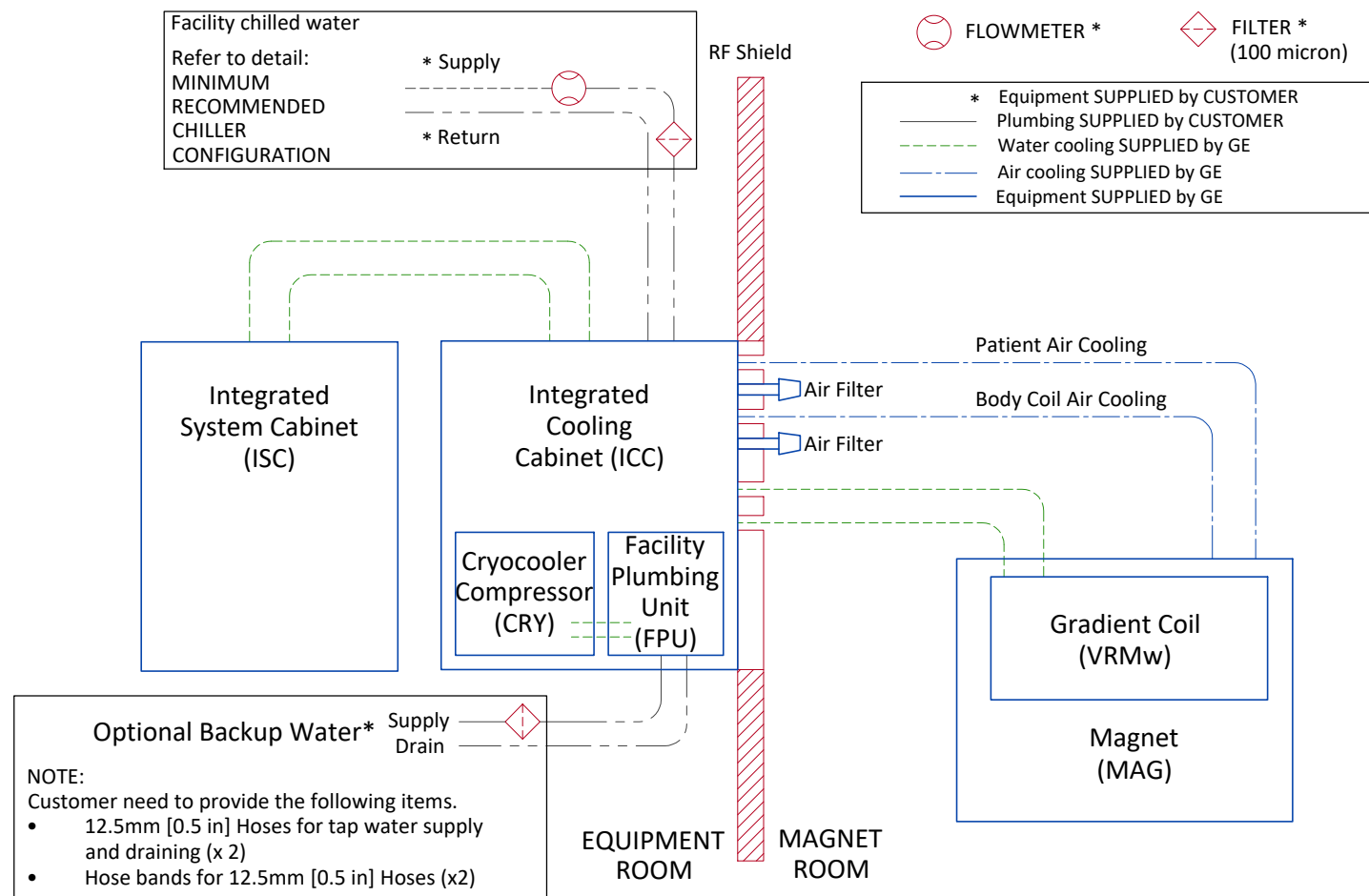
# HEAT DISSIPATION DETAILS

DESCRIPTION	ROOM	IDLE W		AVERAGE		MAX	
		W	BTU/hr	W	BTU/hr	W	BTU/hr
Magnet (MAG) and Patient Table (PT)	Magnet	561	1915	1200	4095	2400	8189
Main Disconnect Panel (MDP)	Equipment	132	450	132	450	264	901
Integrated System Cabinet (ISC)	Equipment	280	955	2130	7270	7100	24232
Integrated Cooling Cabinet (ICC)	Equipment	0	0	500	1706	1000	3412
Cryocooler Compressor (CRY)	Equipment	500	1706	500	1706	500	1706
Magnet Monitor (MON)	Equipment	60	205	60	205	60	205
Operator Workspace equipment (OW)	Control	1450	4947	1450	4947	1450	4947
MR Elastography (MRE)	Equipment	141	480	141	480	141	480

# MAGNET ROOM EXHAUST FAN SCHEMATIC



## CHILLED WATER BLOCK DIAGRAM



## CHILLED WATER SPECIFICATIONS

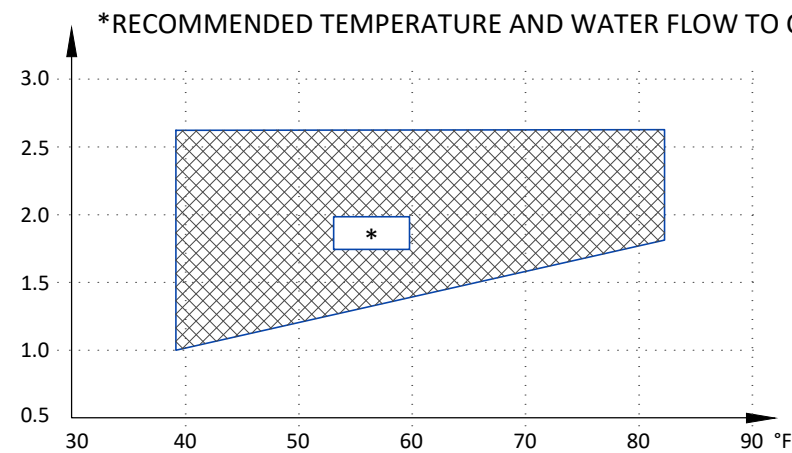
PARAMETER		REQUIREMENTS	
Chiller size		Minimum 36kW	
Inlet temperature		5 to 15°C [41 to 59°F] measured at the inlet to the ICC	
Hose connection to ICC (supplied by customer)		25.4mm (1 in) minimum hose inside diameter	
		<b>MINIMUM FLOW</b> 50 l/min (13.2 gpm)	<b>MAXIMUM FLOW</b> 80 l/min (21.1 gpm)
<b>PRESSURE DROP IN ICC CABINET</b>	<b>40% propylene glycol or ethylene glycol, 60% water</b>	1.8 bars (26.1 psi)	3.4 bars (49.3 psi)
Availability		Continuous	
Antifreeze		0-40% propylene glycol	
Maximum inlet pressure to ICC		Maximum 5.52 bar (80 psi)	
Minimum continuous heat load		7.5 kW	
Condensation protection		Facility plumbing to the ICC must be properly routed and insulated to prevent equipment damage or safety hazards	
Water quality		Refer to pre-installation manual for detailed specifications	

### NOTE

- The customer must balance the cost of cryogenes and local controls with the cost of emergency backup facility coolant.
- For the site without insite connection, the customer must provide and install an in-line thermometer on the supply facility coolant hose. The thermometer must be capable of visually displaying thermometer covering 41 to 59°F (5 to 15°C) and configured for the properties of the cooling fluid in use.

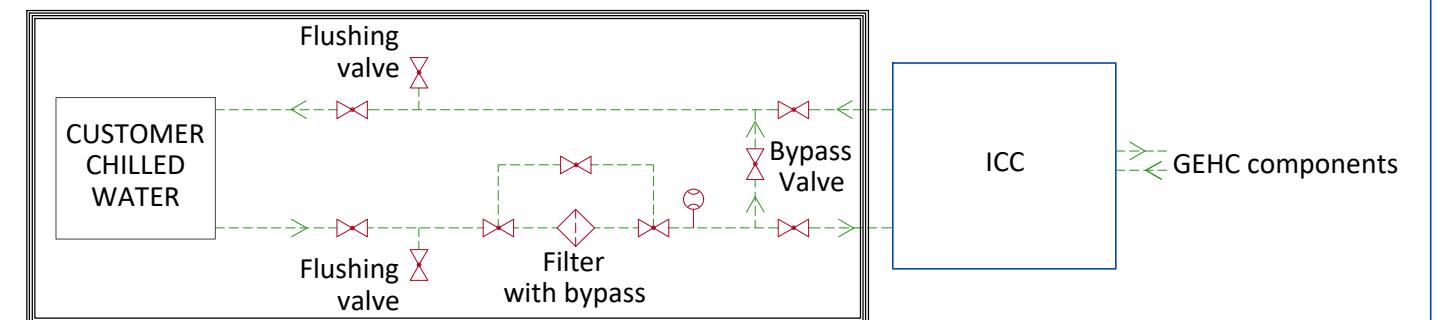
## CITY WATER BACKUP SPECIFICATIONS FOR COMPRESSOR

### INLET WATER FLOW/TEMPERATURE FOR CRYOCOOLER COMPRESSOR



	MIN	MAX
<b>INLET TEMP</b>	39.2°F (4°C)	82.4°F (28°C)
<b>INLET FLOW</b>	1.0 gpm (4 l/min)	2.6 gpm (10 l/min)
<b>TEMP RISE</b>	89.6°F at 1.0 gpm (32°C at 4 l/min flow)	53.6°F at 2.6 gpm (12°C at 10 l/min flow)
<b>HEAT DISSIPATION (kW)</b>	7.2 kW	
<b>PRESSURE DROP</b>	8.7 psi at 2.1 gpm flow (60 kPa at 8 l/min flow)	

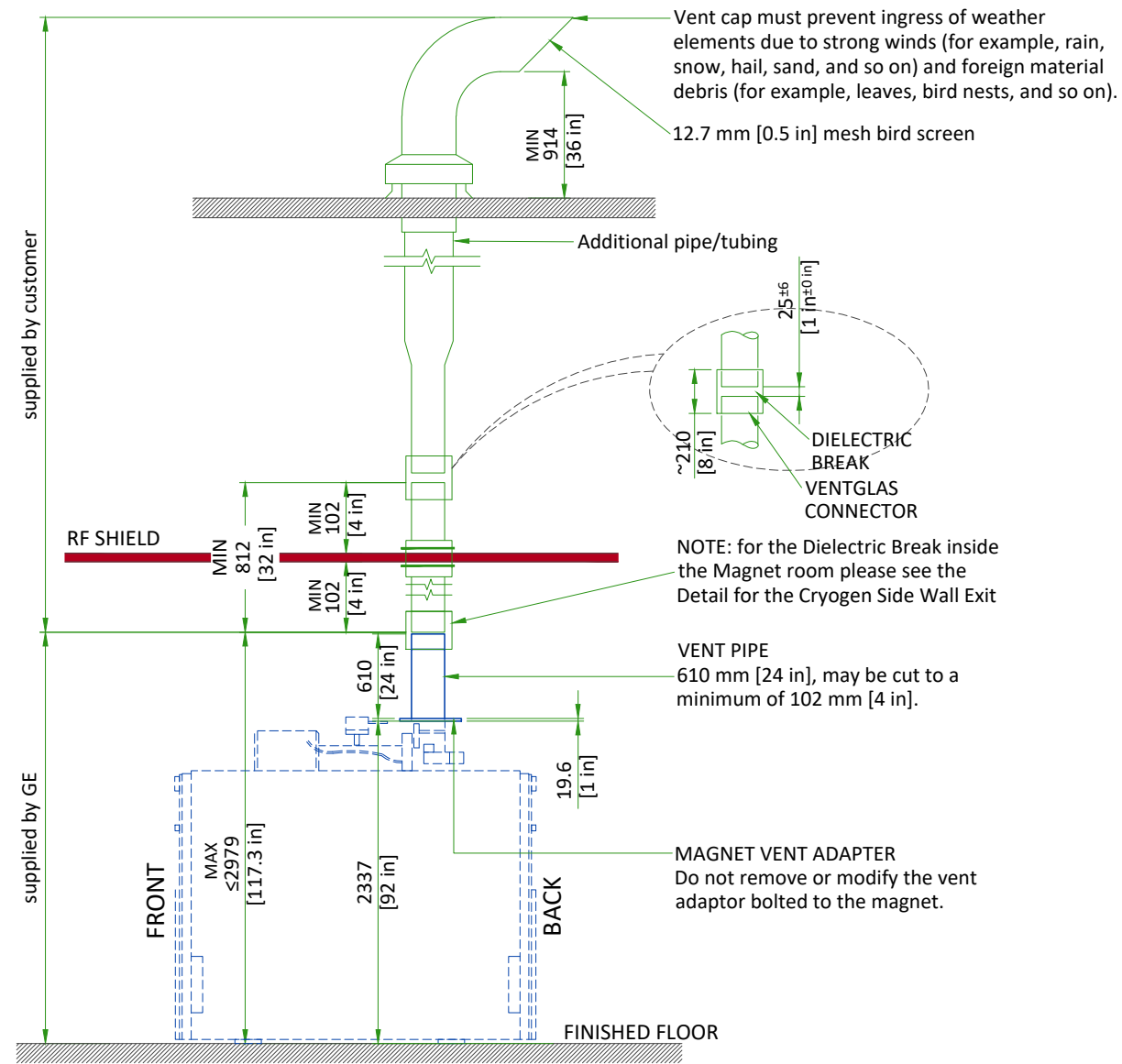
## MINIMUM RECOMMENDED CHILLER CONFIGURATION



- FLOW METER
- VALVE
- FILTER
- Equipment supplied by GEHC
- Customer/contractor supplied and installed



## TYPICAL CRYOGENIC VENT PIPE DETAIL



Waveguide is contractor supplied. Minimum 812 mm [32 in]. Must extend at least 100 mm [4 in] on magnet room side of the wall/ceiling and 25±6 mm [1±0.25 in] from the GE supplied pipe below isolation joint.

- The 203 mm [8 in] OD vent material must be one of the following materials with the wall thickness indicated:
  - SS 304: Minimum 0.89 mm [0.035 in]; Maximum 3.18 mm [0.125 in]
  - AL 6061-T6: Minimum 2.11 mm [0.083 in]; Maximum 3.18 mm [0.125 in]
  - CU DWV, M or L: Minimum 2.11 mm [0.083 in]; Maximum 3.56 mm [0.140 in]
- Either tubes or pipes may be used and must be seamless or have welded seams

### NOTE

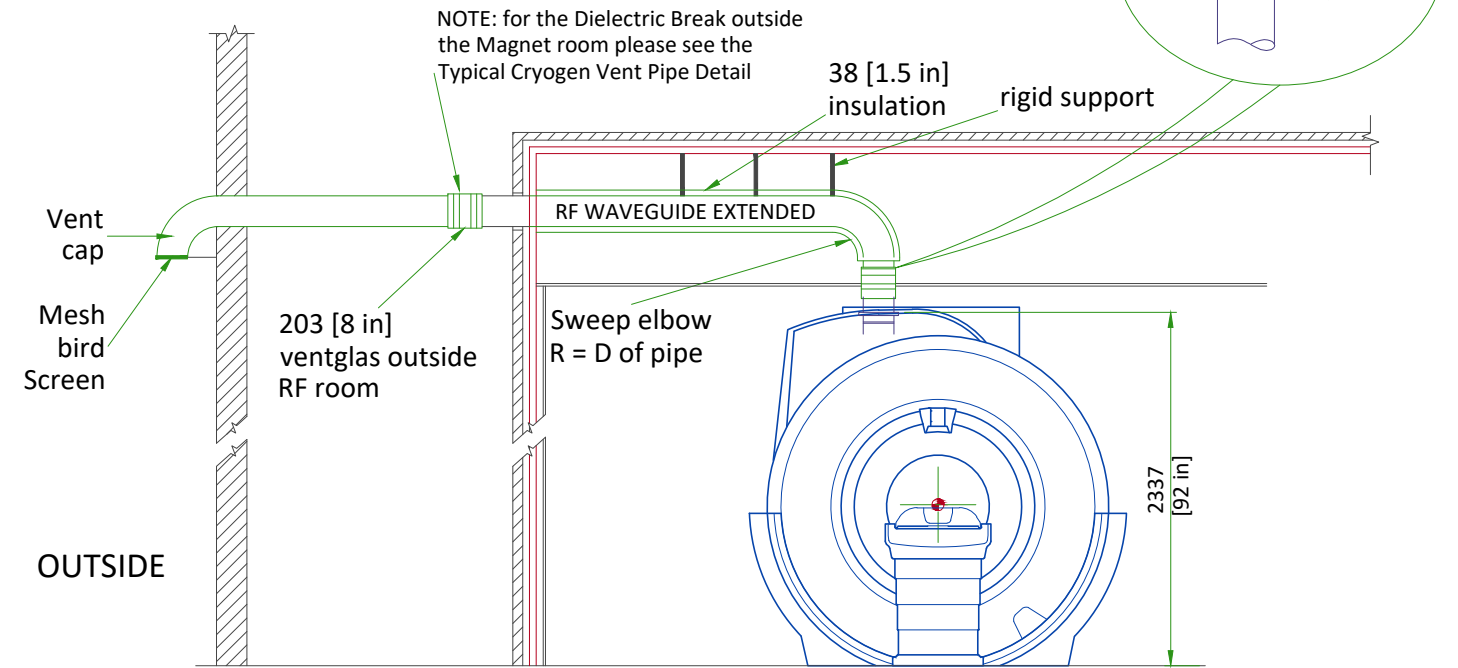
All welds on the pipe must be ground down to a smooth 203 mm [8 in] diameter so that it can be clamped to the Ventglas with enough force.

- Corrugated pipe or spiral duct must not be used
- If required, bellows pipe less than 300 mm [12 in] in length may be used as a thermal expansion joint
- The vent pipe must withstand the maximum pressure listed in the Pre-Installation Manual
- Waveguide vent material must match the outside diameter of the magnet flanged vent adapter

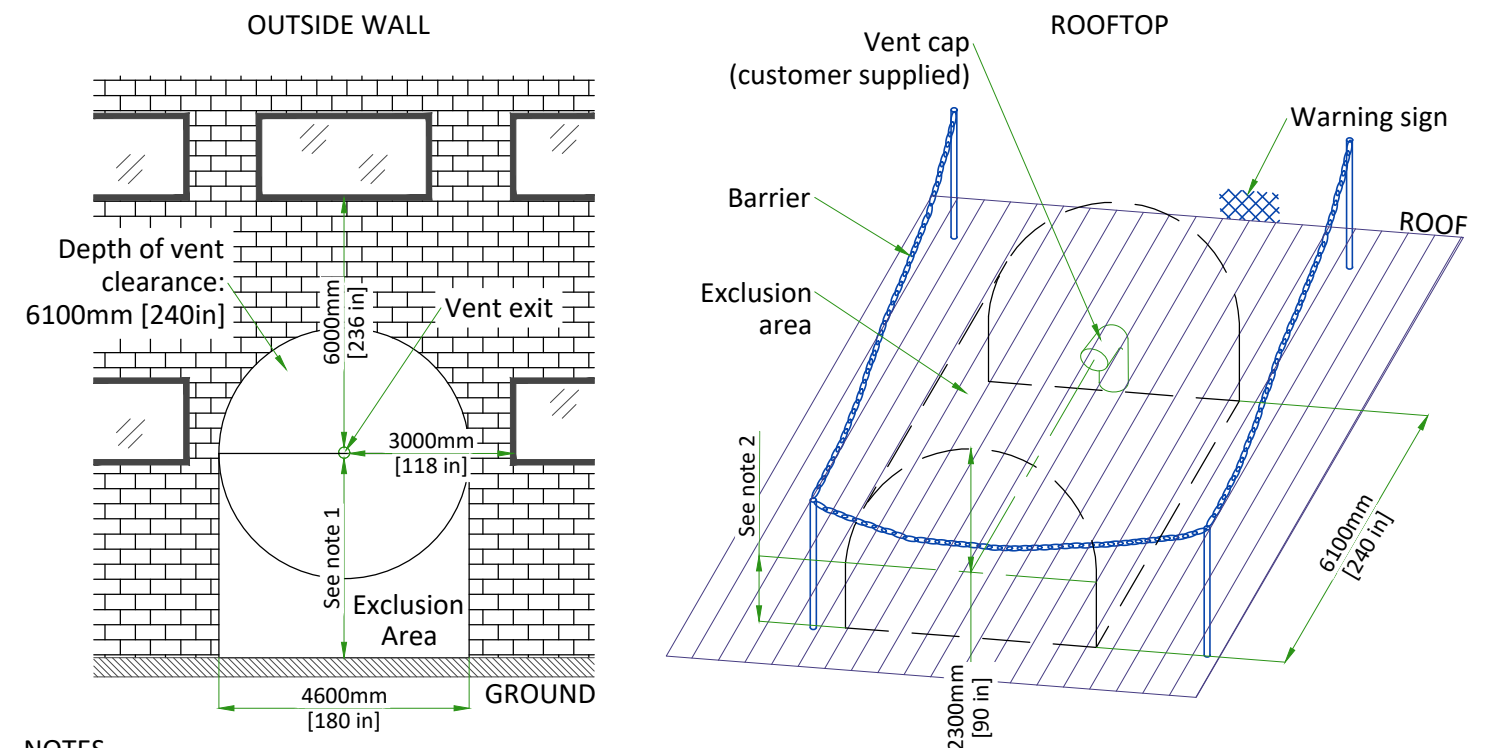
## TYPICAL CRYOGEN SIDE WALL EXIT

### KEY COMPONENTS:

- RF waveguide extended from wall to magnet adapter
- Must be all same material and all welded or brazed
- Support system must withstand 8229 N [1850 lbs]
- GE ventglas must be installed in vertical section directly over magnet
- Vent cap must prevent ingress of weather elements due to strong wind (for example, rain, snow, hail, sand, and so on) and foreign material debris (for example, leaves, bird nests, and so on).



## CRYOGENIC VENTING ( EXTERIOR )



### NOTES

- Restricted area: minimum distance between vent pipe and ground is 3660mm [144 in]. Barriers are required. Public area: barriers are not required if height is > 5000mm [197 in].
- The bottom of the 90° elbow must be at least 914mm [36 in] above the roof deck (or higher if at risk of being blocked by drifting snow, sand, or other potential obstructions.)

NOT TO SCALE

## MAGNET CRYOGENIC VENT SYSTEM PRESSURE DROP MATRIX

Outer dia. of pipe (D)	Distance of vent system component from magnet		Pressure drop for straight pipe		Std sweep 45° elbow		Long sweep 45° elbow		Std sweep 90° elbow		Long sweep 90° elbow		90° miter bend	
	m	ft	kPa/m	psi/ft	kPa	psi	kPa	psi	kPa	psi	kPa	psi	kPa	psi
8 in. (200mm)	0.00-3.05	0-10	1.629	0.072	3.877	0.562	2.585	0.375	7.269	1.054	4.846	0.703	14.539	2.108
	3.05-6.10	10-20	2.784	0.123	6.393	0.927	4.262	0.618	11.987	1.738	7.992	1.159	23.975	3.476
	6.10-9.15	20-30	4.172	0.184	8.712	1.263	5.808	0.842	16.535	2.369	10.890	1.579	32.670	4.737
	9.15-12.2	30-40	5.391	0.238	10.847	1.573	7.231	1.049	20.338	2.949	13.559	1.966	40.677	5.898
	12.20-15.25	40-50	6.460	0.286	12.812	1.858	8.541	1.239	24.023	3.483	16.015	2.322	48.046	6.967
	15.25-18.30	50-60	7.394	0.327	14.620	2.120	9.747	1.413	27.413	3.975	18.275	2.650	54.826	7.950
	18.29-24.39	60-80	8.913	0.394	17.813	2.583	11.875	1.722	33.400	4.843	22.266	3.229	66.799	9.686
24.39-30.49	80-100	10.049	0.444	20.514	2.974	13.676	1.983	38.463	5.577	25.642	3.718	76.926	11.154	
10 in. (250mm)	0.00-6.10	0-20	0.824	0.036	2.382	0.345	1.588	0.230	4.467	0.648	2.978	0.432	8.934	1.295
	6.10-12.22	20-40	1.607	0.071	4.035	0.585	2.690	0.390	7.565	1.097	5.043	0.731	15.130	2.194
	12.22-18.29	40-60	2.239	0.099	5.477	0.794	3.651	0.529	10.269	1.489	6.846	0.993	20.537	2.978
	18.29-24.39	60-80	2.745	0.121	6.733	0.976	4.489	0.651	12.625	1.831	8.416	1.220	25.249	3.661
	24.39-30.49	80-100	3.145	0.139	7.827	1.135	5.218	0.757	14.676	2.128	9.784	1.419	29.353	4.256
12 in. (300mm)	0.00-6.10	0-20	0.424	0.019	1.486	0.215	0.991	0.144	2.786	0.404	1.858	0.269	5.573	0.808
	6.10-12.22	20-40	0.829	0.037	2.501	0.363	1.667	0.242	4.689	0.680	3.126	0.453	9.377	1.360
	12.22-18.29	40-60	1.169	0.052	3.408	0.494	2.272	0.329	6.389	0.926	4.260	0.618	12.779	1.853
	18.29-24.39	60-80	1.453	0.064	4.218	0.612	2.812	0.408	7.908	1.147	5.272	0.764	15.816	2.293
	24.39-30.49	80-100	1.688	0.075	4.941	0.716	3.294	0.478	9.263	1.343	6.176	0.895	18.527	2.686
14 in. (350mm)	0.00-6.10	0-20	0.235	0.010	0.970	0.141	0.647	0.094	1.819	0.264	1.213	0.179	3.639	0.528
	6.10-12.22	20-40	0.459	0.020	1.619	0.235	1.079	0.157	3.036	0.440	2.024	0.293	6.072	0.880
	12.22-18.29	40-60	0.652	0.029	2.209	0.320	1.473	0.214	4.142	0.601	2.761	0.400	8.284	1.201
	18.29-24.39	60-80	0.817	0.036	2.745	0.398	1.830	0.265	5.147	0.746	3.431	0.498	10.293	1.493
	24.39-30.49	80-100	0.958	0.042	3.231	0.469	2.154	0.312	6.059	0.879	4.039	0.586	12.117	1.757
16 in. (400mm)	0.00-6.10	0-20	0.184	0.008	0.875	0.127	0.584	0.085	1.641	0.238	1.094	0.159	3.283	0.476
	6.10-12.22	20-40	0.356	0.016	1.444	0.209	0.962	0.140	2.707	0.392	1.804	0.262	5.413	0.785
	12.22-18.29	40-60	0.508	0.022	1.968	0.285	1.312	0.190	3.689	0.535	2.460	0.357	7.379	1.070
	18.29-24.39	60-80	0.642	0.028	2.451	0.355	1.634	0.237	4.596	0.666	3.064	0.444	9.191	1.333
	24.39-30.49	80-100	0.759	0.034	2.896	0.420	1.931	0.280	5.430	0.787	3.620	0.525	10.861	1.575

**Notes**

1. Refer to Magnet Room Venting manual 5850263-1EN for specifications of distances >100 ft (30.49 m).
2. Elbows with angles greater than 90° must not be used
3. Data in Table is based on the following facts and assumptions:
  - a. Initial flow conditions at magnet interface
  - b. EM energy (13MJ) is dumped to He during quench and rises He temperature to 10 Kelvin
  - c. Gas temperature starting at 10 Kelvin and increase with length determined by thermal energy balance
  - d. 90% He is assumed to be evacuated within 30 sec. None left after quench.
  - e. Absolute roughness is assumed to be 0.25 mm.
  - f. R/D = 1.0 for standard sweep elbows, R/D = 1.5 for long sweep elbows where D = outer diameter of pipe; R = radius of bend
4. The total pressure drop of the entire cryogenic vent system varies with the type of adapter selected, refer to Magnet Room Venting manual. The calculation starts at the magnet vent interface and ends at the termination point outside the building.

## LIGHTING REQUIREMENTS

- All lighting fixtures and associated components must meet all RF shielded room and RF grounding requirements (e.g., track lighting is not recommended due to possible RF noise).
- All removable lighting fixtures and associated components must be non-magnetic.
- All lighting must use direct current (the DC must have less than 5% ripple).
- 300 lux must be provided at the front of the magnet for patient access and above the magnet for servicing.
- Fluorescent lighting must not be used in the magnet room.
- Lighting must be adjusted using a discrete switch or a variable DC lighting controller.
- SCR dimmers or rheostats must not be used.
- DC LED lighting may be used if the DC power converter and RF sources are all located outside the magnet room RF shield.

NOTE: LED lighting could cause image quality issues due to RF interference. Make sure a MR-compatible LED lighting solution is chosen.

- Battery chargers (e.g., used for emergency lighting) must be located outside the magnet room.
- LED Lighting or short filament length incandescent bulbs are recommended.
- Linear lamps are not recommended due to the high burnout rate.

## CONNECTIVITY REQUIREMENTS

Your new GE Healthcare imaging modality will require local and remote connectivity to enable our full range of digital support:

- Local connectivity - This allows your system to connect to local devices such as PACS and modality worklist. We will require network information to configure the system(s), and a live ethernet port(s) prior to the delivery of the system(s).
- Remote connectivity - Your GE Healthcare service warranty includes InSite™ (applicable to InSite capable products), a powerful broadband-based service which enables digital tools that can help guard your hospital against equipment downtime and revenue loss by quickly connecting you to a GE Healthcare expert.

Depending on product family and software version, imaging systems can be connected in one of the following methods:

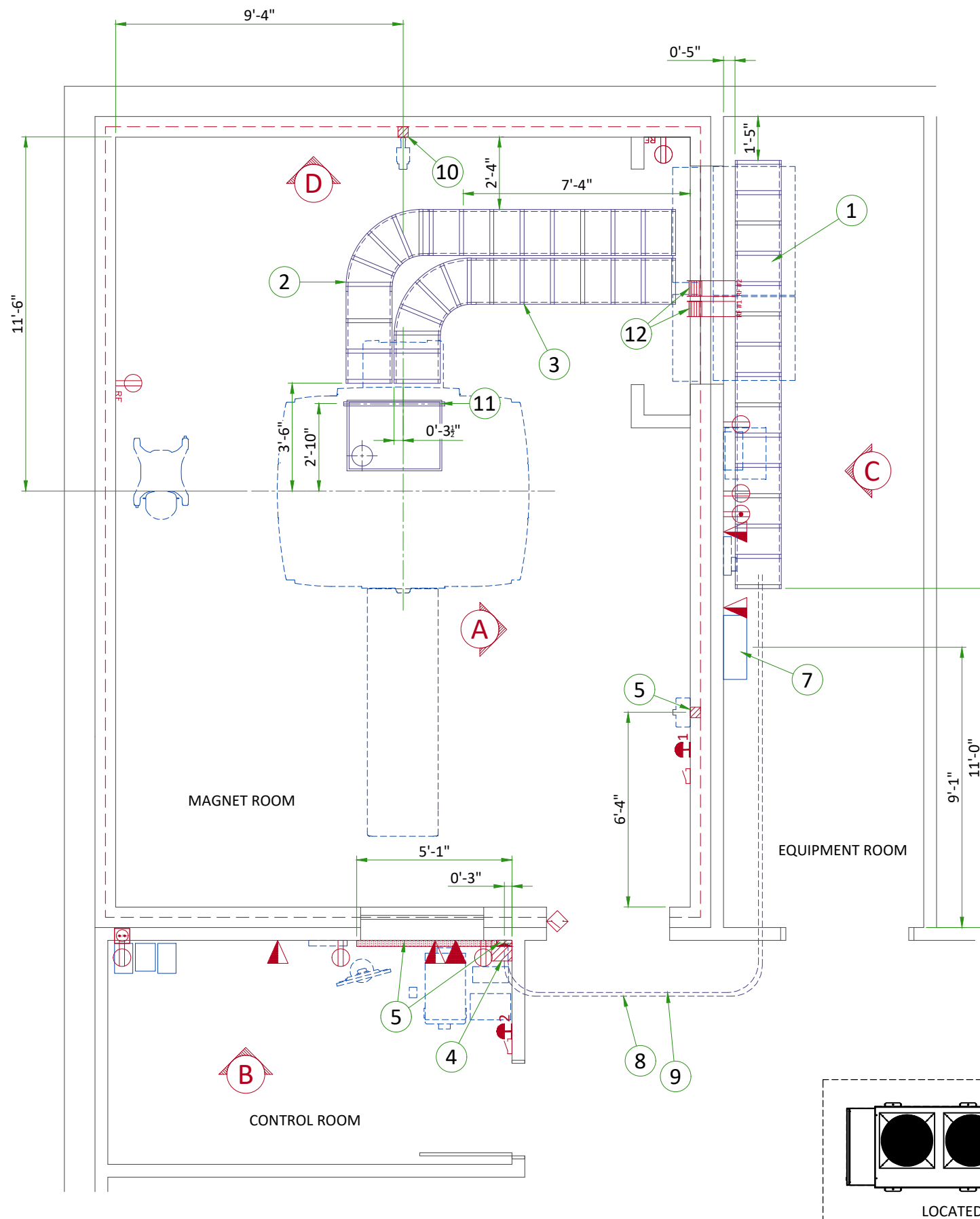
1. TLS over TCP Port 443 (Preferred method for new products) via:
  - a. DNS resolution
  - b. Customer-provided Proxy or
  - c. GE Proxy (Available in some regions)
2. Site-to-Site IPsec VPN tunnel

Please provide the GE project manager with the contact information for the resource that can provide information required to set up these connections. GEHC will send out communication to these contacts, which will include the project's Connectivity requirements, and a Connectivity form. This form will need to be completed and returned to GEHC prior to delivery of the system to ensure the system is tested and connectivity is enabled prior to the completion of the installation.

## ELECTRICAL NOTES

1. Aluminum or solid wires are not allowed.
2. Wire sizes given are for use of equipment. Larger sizes may be required by local codes.
3. It is recommended that all wires be color coded, as required in accordance with national and local electrical codes.
4. Conduit sizes shall be verified by the architect, electrical engineer or contractor, in accordance with local or national codes.
5. Convenience outlets are not illustrated. Their number and location are to be specified by others. Locate at least one convenience outlet close to the system control, the power distribution unit and one on each wall of the procedure room. Use hospital approved outlet or equivalent.
6. General room illumination is not illustrated. Caution should be taken to avoid excessive heat from overhead spotlights. Damage can occur to ceiling mounting components and wiring if high wattage bulbs are used. Recommend low wattage bulbs no higher than 75 watts and use dimmer controls (except MR). Do not mount lights directly above areas where ceiling mounted accessories will be parked.
7. Routing of cable ductwork, conduits, etc., must run direct as possible otherwise may result in the need for greater than standard cable lengths (refer to the interconnection diagram for maximum usable lengths point to point).
8. Conduit turns to have large, sweeping bends with minimum radius in accordance with national and local electrical codes.
9. In some cases GEHC will specify ground wires to be sized larger than code. In these situations, the GEHC specification must be followed.
10. A special grounding system is required in all procedure rooms by some national and local codes. It is recommended in areas where patients might be examined or treated under present, future, or emergency conditions. Consult the governing electrical code and confer with appropriate customer administrative personnel to determine the areas requiring this type of grounding system.
11. The maximum point to point distances illustrated on this drawing must not be exceeded.
12. Physical connection of primary power to GEHC equipment is to be made by customers electrical contractor with the supervision of a GEHC representative. The GEHC representative would be required to identify the physical connection location, and insure proper handling of GEHC equipment.
13. GEHC conducts power audits to verify quality of power being delivered to the system. The customer's electrical contractor is required to be available to support this activity.
14. Every installation is unique. The electrical contractor will be required to support the installation of the GEHC equipment by providing knockouts, grommeted openings, bushings, etc. as required. All power connections to be performed by the electrician.

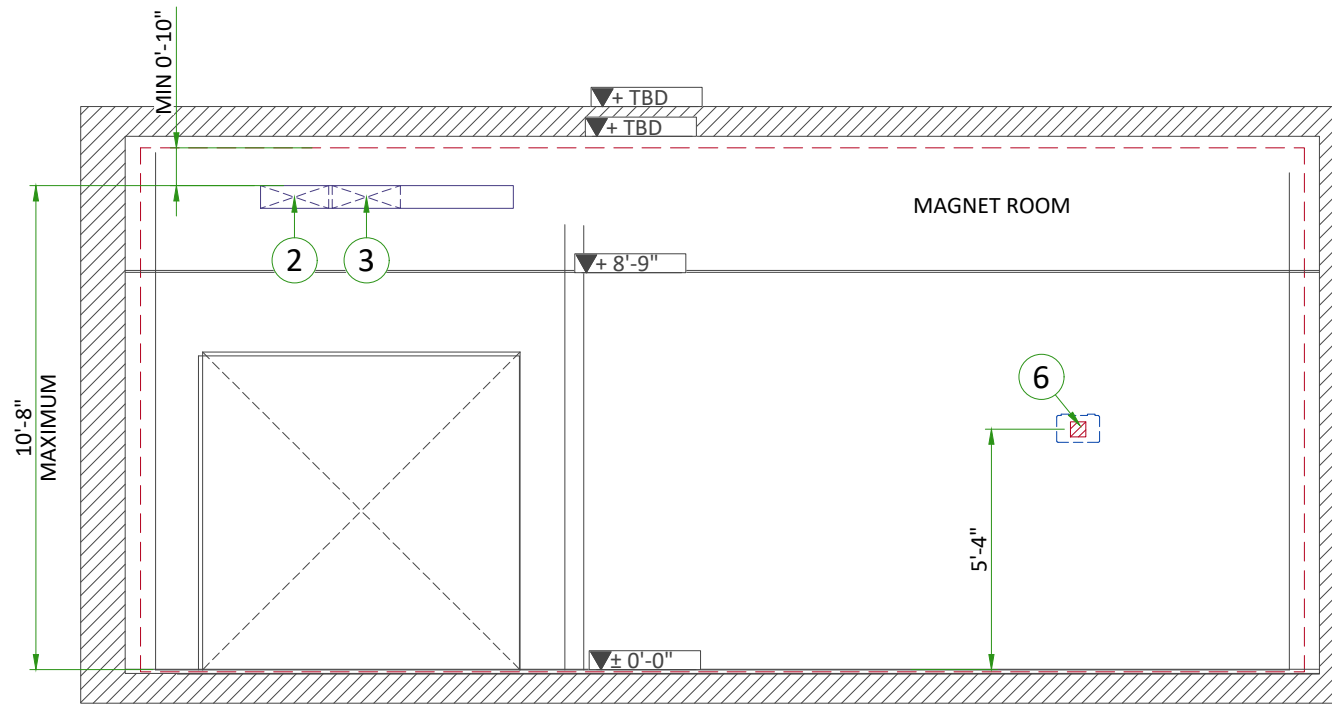
- All junction boxes, conduit, duct, duct dividers, switches, circuit breakers, cable tray, etc., are to be supplied and installed by customers electrical contractor. All junction boxes shall be provided with covers.
- Conduit and duct runs shall have gradual sweep radius bends.
- Conduits and duct above ceiling or below finished floor must be installed as near to ceiling or floor as possible to reduce run length.
- Ceiling mounted junction boxes illustrated on this plan must be installed flush with finished ceiling.
- All ductwork must meet the following requirements:
  1. Ductwork shall be metal with dividers and have removable, accessible covers.
  2. Ductwork shall be certified/rated for electrical power purposes.
  3. Ductwork shall be electrically and mechanically bonded together in an approved manner.
  4. PVC as a substitute must be used in accordance with all local and national codes.
- All openings in raceway and access flooring are to be cut out and finished off with grommet material by the customers contractor.
- Electrical contractor to provide measured pull strings in all conduit and raceway runs.
- Provide 10 foot pigtails at all junction points.
- Grounding is critical to equipment function and patient safety. Site must conform to wiring specifications shown on this plan.



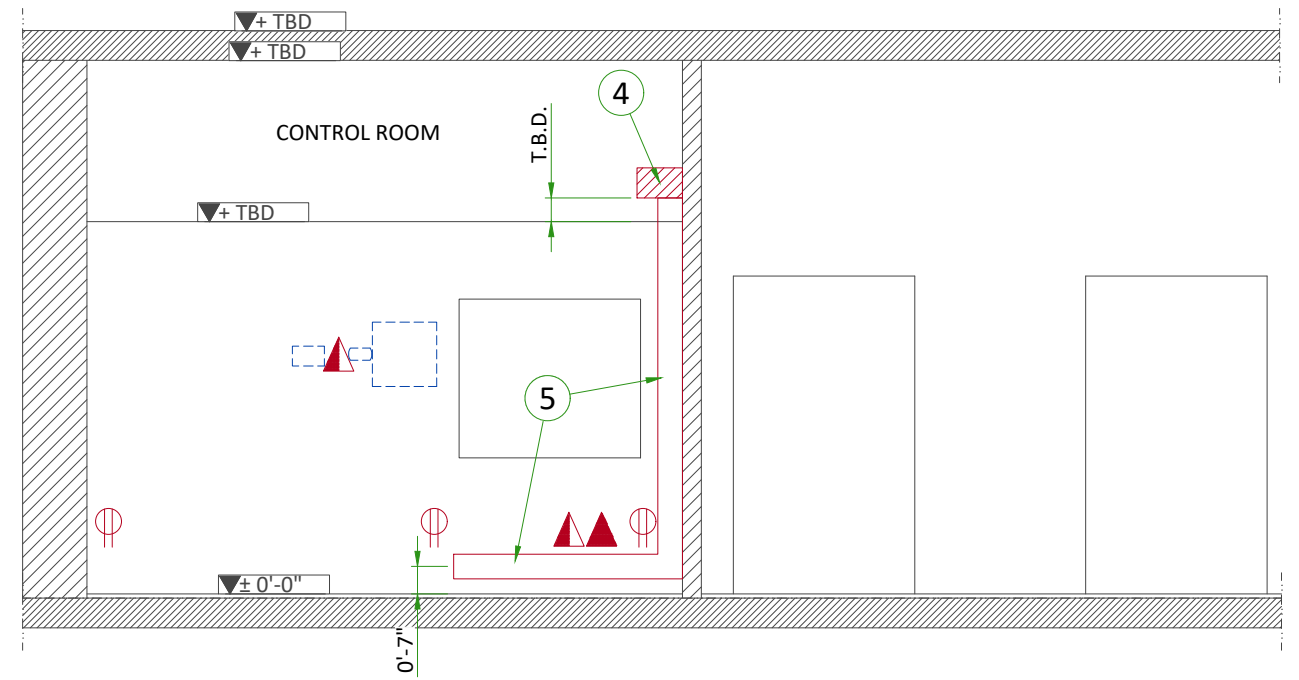
ITEM	Electrical Layout Item List
1	Cable ladder 18" x 6" [450 x 150]
2	Non-ferrous cable ladder 18" x 6" [450 x 150]
3	Non-ferrous cable ladder for gradient cables 18" x 6" [450 x 150]
4	Box above ceiling size per local code
5	Surface wall duct with minimum 2 dividers 6" x 3 1/2" [150 x 100]
6	Box in wall 4" x 4" x 2" [100 x 100 x 50]
7	Main disconnect panel (MDP)
8	Conduit above RF screen 2" [50]
9	Conduit above RF screen 3" [75]
10	Box in wall 4" x 4" x 4" [100 x 100 x 100]
11	Non-ferrous unistrut cable support
12	RF Filters - grounded to RF shield at Common Ground Stud

ITEM	QTY	Electrical Outlet Legend
Customer/contractor supplied and installed items unless otherwise specified. Height above floor determined by local codes unless otherwise specified.		
		System emergency off (EO1, 2), (recommended height 1.2m [48"] above floor)
		Door interlock switch
		Emergency exhaust fan switch 1.2m [48"] height recommended)
		Duplex hospital grade, dedicated wall outlet 120-v, single phase power
		Network outlet
		Dedicated telephone lines/network connection
		Duplex hospital grade, dedicated outlet 120-v emergency, single phase power, 15a
		Duplex hospital grade, dedicated outlet 120-v, single phase outlet routed through RF filter

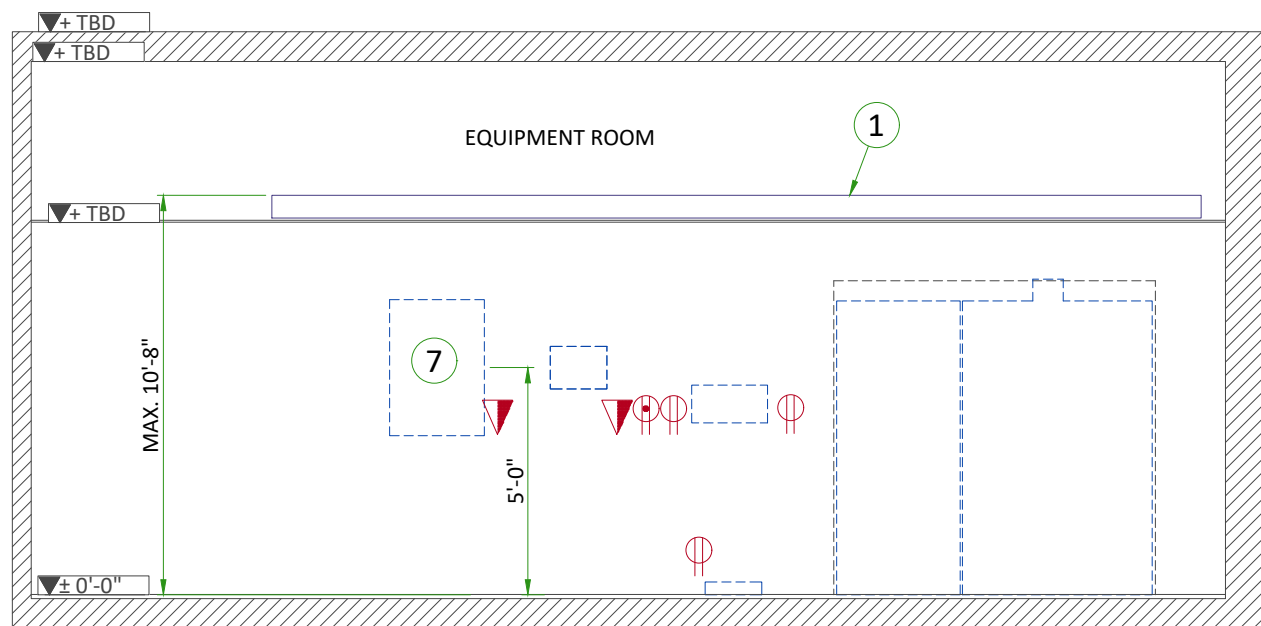
Additional Conduit Runs (Contractor Supplied and Installed)					
From (Bubble # / Item)	To (Bubble # / Item)	Qty	Size		
			In.	mm	
7	Main Disconnect Panel	Facility Power	1	As req'd	As req'd
7	Main Disconnect Panel	Integrated Systems Cabinet	1	As req'd	As req'd
		Integrated Cooling Cabinet	1	As req'd	As req'd
		System emergency off 2	1	1/2	16
	System emergency off 2	Integrated Cooling Cabinet	1	1/2	16
	Door switch	Integrated Systems Cabinet	1	3/4	20
	System emergency off 1	Integrated Cooling Cabinet	1	3/4	20
6	Magnet Rundown Unit	Magnet	1	1	25
		RF filter #1	1	As req'd	As req'd
	RF filter #1	120-V 1Ø Power	1	As req'd	As req'd
	Room Light	RF filter #2	1	As req'd	As req'd
	RF filter #2	Facility emergency power	1	As req'd	As req'd
10	TV Camera	Waveguide or RF filter	1	1	25
4	TV Monitor		1	1	25
	Injector control unit	Waveguide or RF filter	1	2 1/2	70
	Injector head		1	As req'd	As req'd
	Integrated battery charging unit		1	As req'd	As req'd
	Dimplex Chiller	Remote Graphic Display	1	3/4	20
		Facility Power	1	as Req'd	



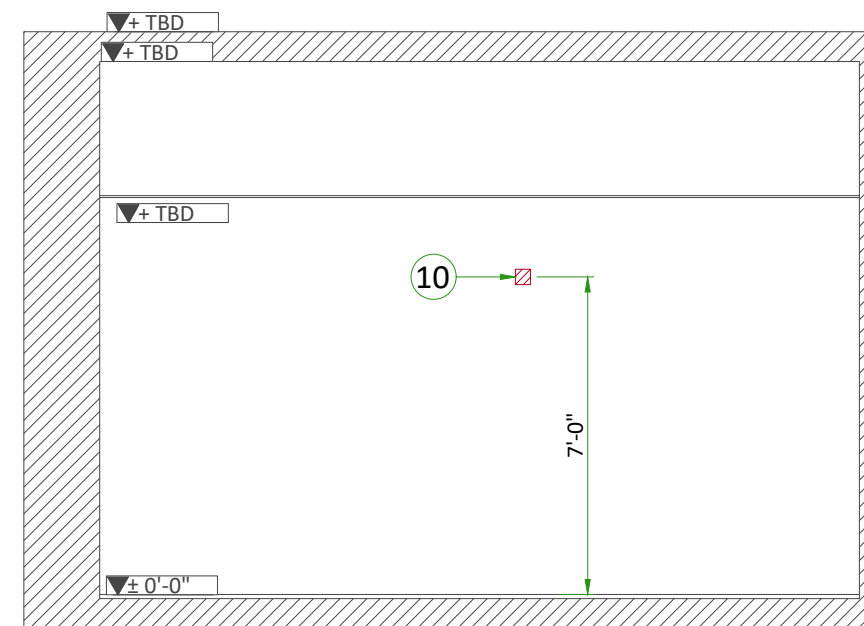
A



B



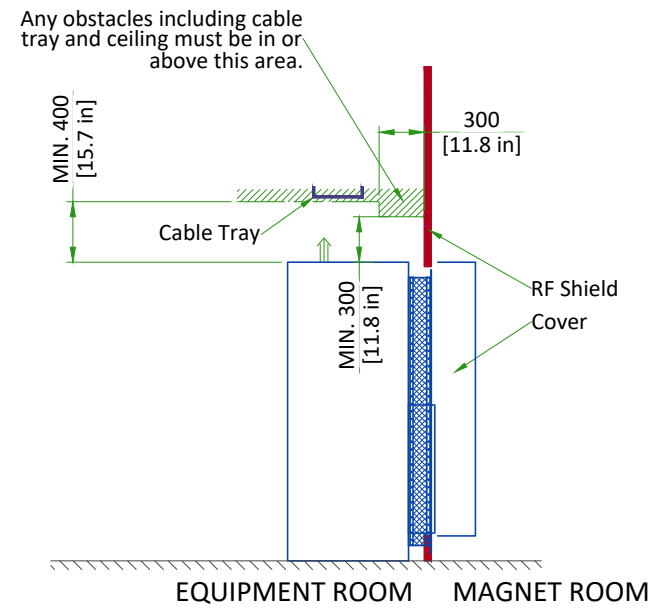
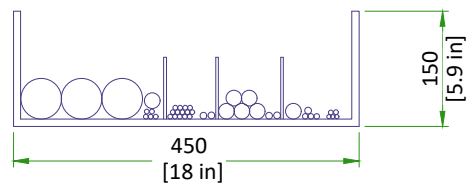
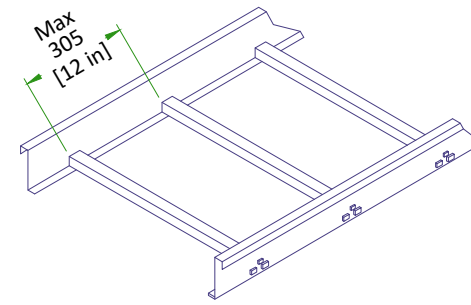
C



D

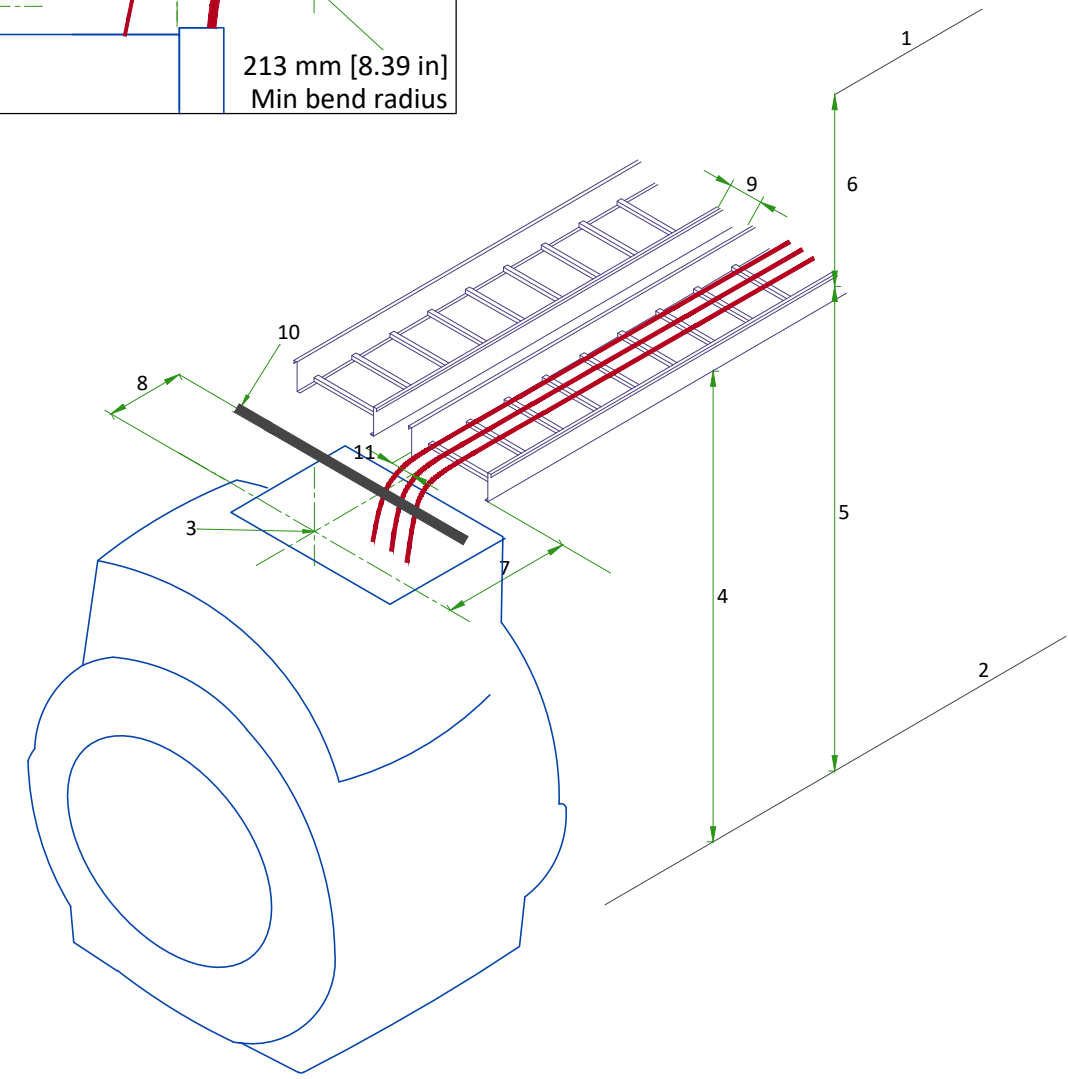
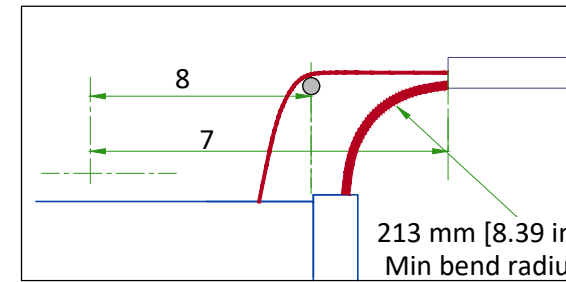
## CABLE TRAYS IN EQUIPMENT ROOM

### CABLE TRAY DETAIL



NOT TO SCALE

## CABLE TRAYS REQUIREMENTS IN MAGNET ROOM



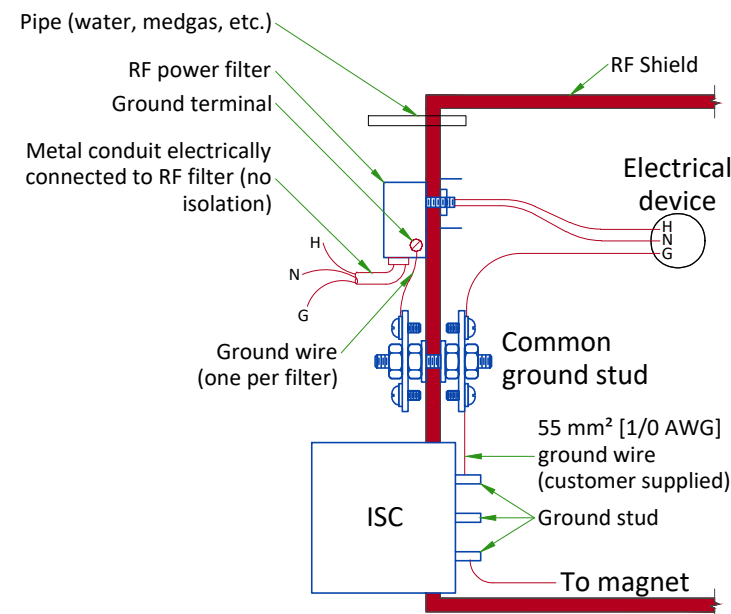
Cable Tray Requirements (Side-By-Side)

- 1 - Ceiling
- 2 - Finished Floor
- 3 - Magnet isocenter
- 4 - Minimum cable tray height for Groups A,B,C,D required at back of Magnet: 2449 mm [96.4 in].
- 5 - Maximum height from floor to top of tray (anywhere in Magnet room): 3251 mm [128 in].
- 6 - Minimum distance from top of cable tray to ceiling: 254 mm [10 in].  
Minimum distance on either side of an obstruction: 254 mm [10 in], minimum distance from top of cable tray to Obstruction: 178 mm [7 in].
- 7 - Tray end to isocenter: 1067 mm [42 in].
- 8 - Other cable termination to isocenter: 864 ±12 mm [34 ±0.5 in].
- 9 - Minimum distance between trays: 12 mm [0.5 in].
- 10 - Non-ferrous cable support
- 11 - The center of the gradient cable group is 89 mm [3.5 in] from the inside edge of the tray, in line with the magnet center.

## TYPICAL MAGNET ROOM GROUNDING

### GROUNDING REQUIREMENTS

- All power lines into the RF shielded room require an RF filter.
- All electrical devices (for example, outlets, light fixtures, and so on) must have a ground wire from device power source and be grounded to the RF Shield at the RF Common Ground Stud.
- Resistance between any two grounded devices must not exceed 0.1 ohm to ensure equal potential ground system within the Magnet Room.
- Do not ground non-MR equipment to the MR ground system.
- The common ground stud must be installed near the penetration point(s) of the GE equipment, into the RF shield between the Equipment Room and Magnet Room.
- For additional information refer to RF Shielded Room manual 5850260-1EN



# POWER REQUIREMENTS

## SPECIFICATIONS OF MAIN POWER INPUT

POWER SUPPLY	380/400/415/480V +7.5%/-10%, 3 PHASE + GND
FREQUENCIES	50/60Hz ± 3Hz
POWER FACTOR	0.9
TOTAL SYSTEM 50 MILLISECOND POWER	89kVA
TOTAL SYSTEM CONTINUOUS POWER	64kVA

- Governing electrical codes may require a neutral wire. If present, neutral must be terminated in MDP.
- Power input must be separated from any others which may generate transients (elevators, air conditioning, radiology rooms equipped with high speed film changers...).
- Total harmonic distortion less than 2.5%. Phase imbalance must not exceed 2%.
- Lock-out/Tag-out: The Main Disconnect Panel (MDP) shall provide an external single point lock-out/tag-out feature for the entire system and a means to externally lock-out/tag-out each output breaker independently. Each lock-out/tag-out feature shall accommodate a standard sized lock hasp.

## SPECIFICATIONS OF OPTIONAL BACK-UP POWER SUPPLY

**MAGNET MONITOR REQUIRES A 110/220 VAC, 50/60 HZ, 3.0 A FACILITY SUPPLIED OUTLET. POWER AT THE OUTLET MUST BE CONTINUOUSLY AVAILABLE.**

### FOR CRYOCOOLER COMPRESSOR

POWER INPUT	380/400/415/480V, THREE-PHASE + G
POWER REQUIREMENT	MIN 9kVA
POWER CONSUMPTION	MAX 7.2kW / STEADY STATE 6.5kW at 50Hz MAX 8.3kW / STEADY STATE 7.5kW at 60Hz
FREQUENCY	50/60Hz ± 3Hz
<b>Power to Cryocooler Compressor must be removed when emergency off circuit is actuated.</b>	

## CABLES

- Power and cable installation must comply with the distribution diagram.
- Size of the Main power input cable is determined by the customer, taking its length and admissible voltage drops into consideration.
- All cables must be isolated and flexible, cable color codes must comply with standards for electrical installation.
- The cables from signaling and remote control (Y, Emergency Off Buttons, L...) will go to Main Panel with a pigtail length of 1.5m [60in], and will be connected during installation.
- Each conductor will be identified and isolated (screw connector).

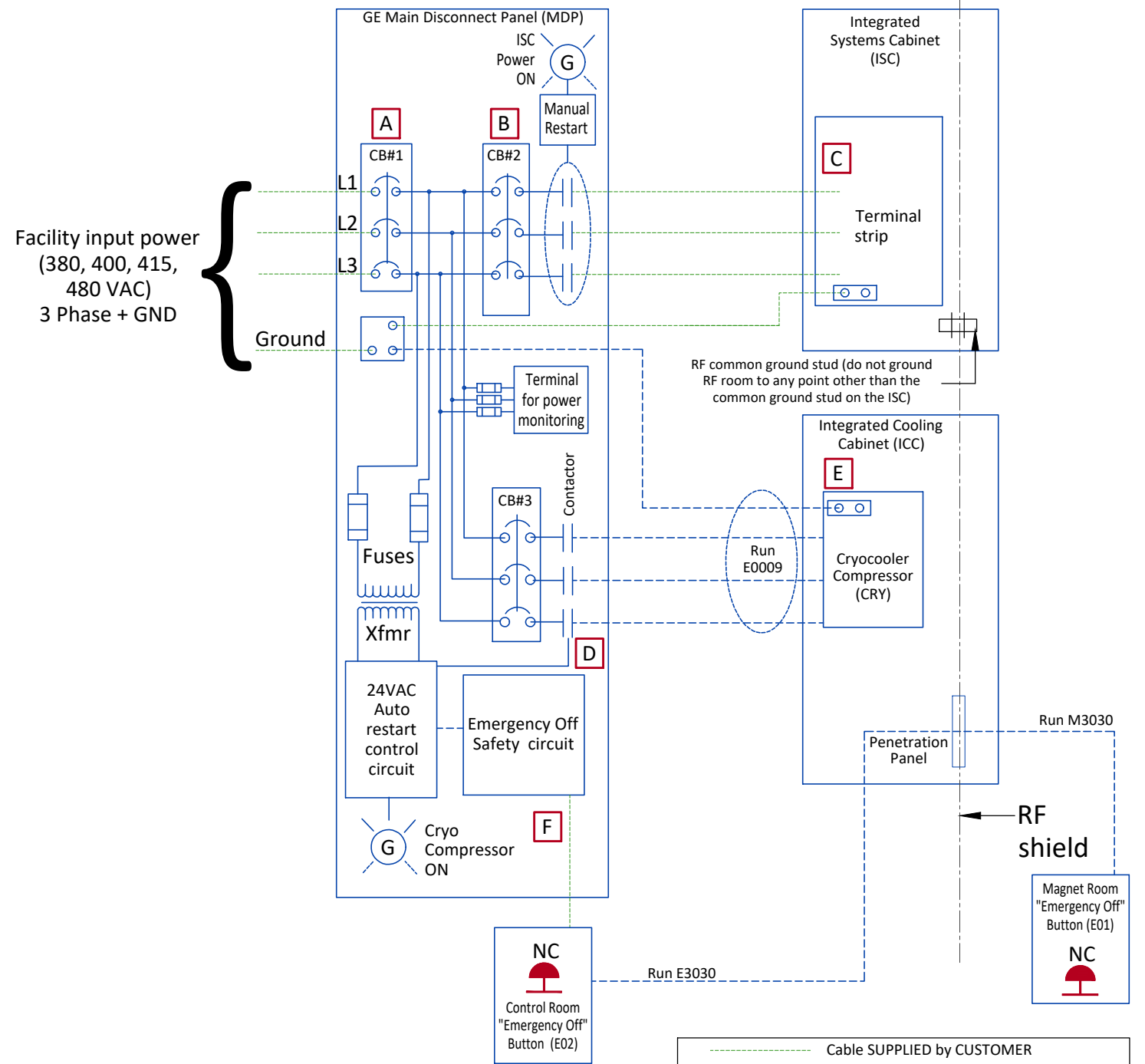
## GROUND SYSTEM

- The equipotential link will be by means of an equipotential bar.
- The grounding point of MDP is directly connected to the building's ground by an isolated copper cable.
- The impedance of the earth bar should be less than or equal to 2 ohms.

### GUIDANCE ON SLECTION OF FEEDER AND TRANSFORMER FOR MR SYSTEM

	Direct feed from facility to MR system	MR system fed by dedicated facility distribution transformer
<b>Prerequisite Conditions</b>		
MR System Incoming Voltage	480V 3-phase	
Minimum Source short-circuit kVA	2,225 kVA (at source of feeder to MDP)	1,950 kVA (at input to distribution transformer)
Minimum No-Load Voltage	460V	475V (transformer secondary tapped accordingly)
<b>Feeder and Transformer Recommendations</b>		
Dedicated Distribution Transformer Recommendations	N/A	Size: 112.5 kVA Impedance (Z): ≤5% K-Factor: ≥ K=20 125A overcurrent protection on secondary*
Maximum Feeder Length*	530 ft	530 ft
Feeder Size - 3-phase power conductors*	1 AWG Cu	1 AWG Cu
Feeder Size - Ground (USA)*	6 AWG Cu (equipment grounding conductor)	6 AWG Cu (supply side bonding jumper) 6 AWG Cu (equipment grounding conductor)
Feeder Size - Ground (Canada)*	6 AWG Cu (bonding conductor)	6 AWG Cu (equipment bonding conductor)
* NOTE: Recommendations shown apply only to cases defined exactly as shown in this table and when not in conflict with local electrical codes. For all other cases, refer to the local codes and the System Voltage Regulation Calculator located on the GE Healthcare Site Planning Website		

# POWER DISTRIBUTION



## NOTES:

- Cryocooler Compressor (CRY) must operate 24 hours per day, 7 days per week.
- Runs E0009, E3030 and M3030 are GE supplied cables. All other wiring is customer supplied and installed.
- Two remote Emergency Off Maintained Buttons are supplied with the MDP. Emergency Off removes power from all outputs when activated.
- All MDP output circuits drop out on loss of power. the Cryocooler (CRY) circuit will automatically restart upon restoration of power.
- MDP Short circuit current rating is 25,000 amperes at 480 VAC.
- MDP is NRTL labeled.
- All feeder circuits require dedicated ground wires.

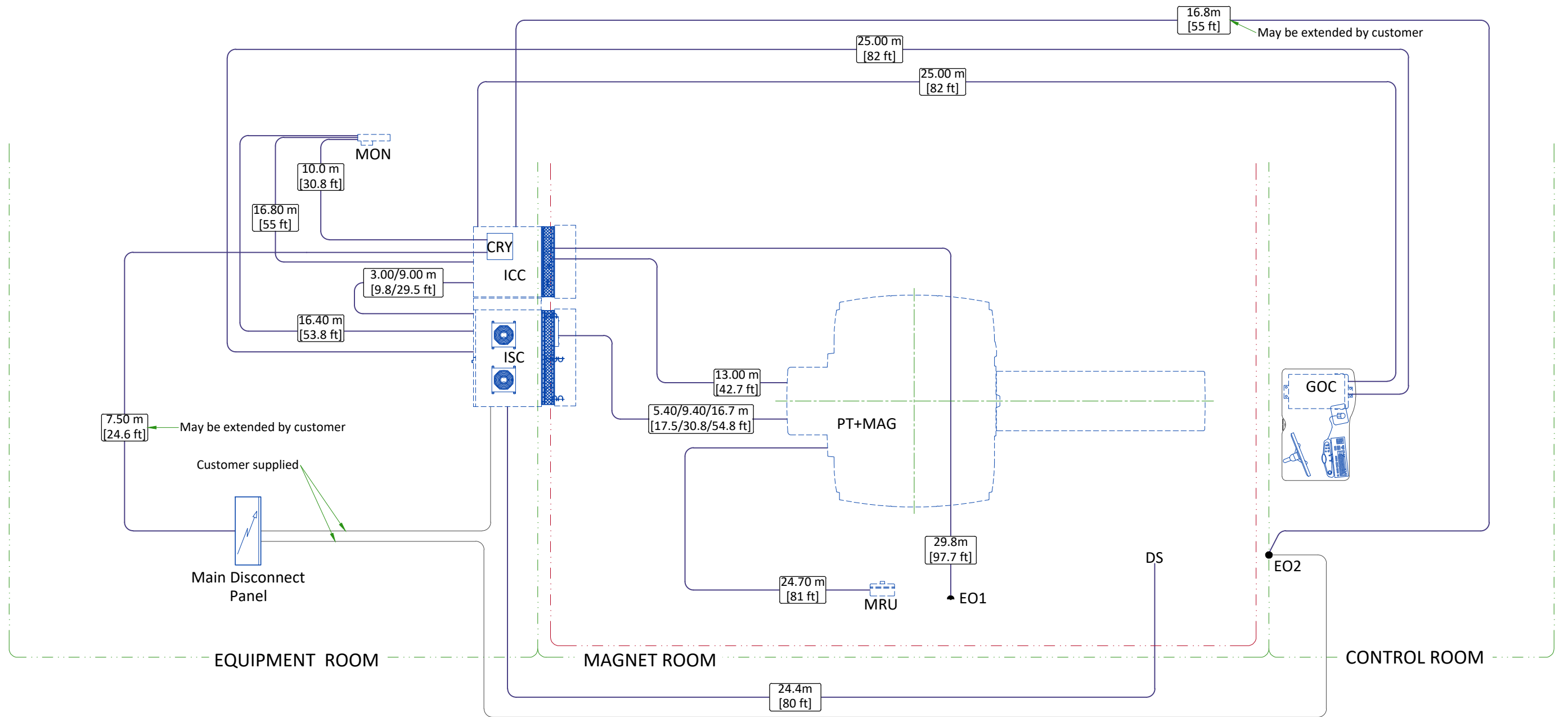
CB	MDP
1	125A
2	110A
3	25A

--- (dashed green)	Cable SUPPLIED by CUSTOMER
--- (dashed blue)	Cable SUPPLIED by GE - Customer Installed
— (solid black)	Equipment SUPPLIED by CUSTOMER
— (solid blue)	Equipment SUPPLIED by GE

Accepts following range of standard stranded conductors. All wire types, color and sizing to be selected in accordance with governing electrical code(s).

GE MDP M70022MA (380V-480V)				
Item	Phase		Ground	
	AWG/kcmil	sq mm	AWG/kcmil	sq mm
A	12 - 3/0	4 - 95	6 - 250	16 - 120
B	12 - 1/0	6 - 50	6 - 250	16 - 120
C	10 - 1	6 - 35	10 - 1	6 - 35
D	14 - 8	2.5 - 10	14 - 4	2.5 - 25
E	14 - 10	2.5 - 6	14 - 10	2.5 - 6
F	22 - 12	0.5 - 2.5		

# INTERCONNECTIONS



## Long / Short cable selection guidance

NOTE: This guidance is based on the assumption that the distance between cable tray and floor is 2.6m (8.5 ft).

- If the Magnet – ISC Distance is less than 5.4 m (17.7 ft), select short cable.
- If the Magnet – ISC Distance is in between 5.4 m (17.7 ft) and 9.4 m (30.8 ft), select long cable.
- If the Magnet – ISC Distance is in between 9.4 m (30.8 ft) and 16.7 m (54.8 ft), select extra long cable.

## CABLES ROUTING FOR OPTIONS

Option	From	To	Cable Length		
				m	ft
Magnetic Resonance Elastography (MRE)	MRE	Magnet Isocenter	Nominal	7.31	24
			Maximum	10.06	33
	MRE	ISC cabinet		15.24	50
	MRE	Ethernet Hub in ISC		15.24	50
Brainwave (BW)	ICC, top edge	Top of GOC		32.54	106.8
		Top of GOC		26.53	87
		Magnet		13.05	42.8
	MRE	Customer Supplied Outlet	60 Hz	6.09	20
			50 Hz	7.62	25