




<b>REV</b>	<b>DATE</b>	<b>MODIFICATIONS</b>
A	23/Jul/2018	First issue drawing / Final study based on MRI-

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

**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: [www.gehealthcare.com/siteplanning](http://www.gehealthcare.com/siteplanning)

GE 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 drawing. GE cannot accept responsibility for any damage due to the partial use of GE final issue drawings, however caused. All dimensions are in millimeters unless otherwise specified. Do not scale from printed pdf files. GE accepts no responsibility or liability for defective work due to scaling from these drawings.

<b>Typical</b>
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 <b>GE Healthcare</b>	----
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## SIGNA ARCHITECT / DISCOVERY MR750W FINAL STUDY

Drawn by	Verified by	Concession	S.O. (GON)	PIM Manual	Rev
PMM	PMM	-	----	5670003	8
Format	Scale	File Name		Date	Sheet
A3	1/4"=1'-0"	EN-MRI-TYP-DISCOVERY_MR750W-WEB.DWG		23/Jul/2018	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>

## GLOBAL SITE READINESS CHECKLIST (DI)

DOC1809666 Rev. 5

Customer Name:	PMI Name:	
GON/SO Number:	Field Service Name:	
Equipment:	Country/City or City/State:	
<b>Required site assessment milestones</b>	<b>Date of completion (dd/mm/yyyy)</b>	
1) Check site before Magnet Delivery		
2) Check site before installation start		
Place an "X" in either Y or N column		
<b>Site Ready Checks at Installation</b>		<b>Y</b> <b>N</b>
<b>General Site Planning</b>		
Room dimensions, including ceiling height, for all Exam, Equipment/Technical & Control rooms meets GE specifications.		
Ceiling support structure, if indicated on the GE drawing, is in the correct location and at the correct height according to the Original Equipment Manufacturer specifications. Levelness and spacing has been measured, and is ready for the installation of any GE supplied components. Overhead support Structure has been confirmed with customer/contractor to meet required GE provided criteria.		
Rooms that will contain equipment, including staging areas if applicable, are construction debris free. Precautions must be taken to prevent debris from entering rooms containing equipment.		
Finished ceiling is installed. If applicable ceiling tiles installed per PMI discretion.		
Adequate delivery route from truck to final place of installation has been reviewed with all stakeholders, all communications/notifications have occurred, arrangements have been made for special handling (rigging, elevator, fork lift, etc.). All floors along delivery route will support weight of the equipment, temporary reinforcements arranged if needed.		
System power & grounding (PDB/MDP) is available as per GE specifications, installed at point of final connection and ready to use. Lock Out Tag Out is available.		
System power and grounded audit has been scheduled to be completed during installation of equipment. (If Required) GEHC PM to confirmed if needed.		
Adequate room illumination installed and working.		
Cable ways (floor/wall/ceiling/Access Flooring) are available for installation of GE cables and are of correct length and diameter. Cable ways routes per GE Final drawings and cable access openings areas installed at a time determined by GEHC PM. Surface floor duct can be installed at time of system installation.		
HVAC systems Installed, and the site meets minimum environmental operational system requirements.		
Network outlets installed and computer network available and working.		
Hospital IT/connectivity contacts have been engaged and information has been added to Project management tool. (If Required)		
Floor levelness/flatness is measured and within tolerance, and there are no visible defects per GEHC specifications. Floor Strength and thickness have been discussed with customer/contractor and they have confirmed GE requirements are met.		
Customer supplied countertops where GE equipment will be installed are in place.		
<b>Specific for MR</b>		
RF Shield installed with possible exception of magnet entrance. RF Shield Effectivity and Ground Isolation Test needed. If GE responsible for supplying RF shield, the RF shield Effectivity and Ground Isolation Test data is a Mandatory attachment into MyProjects.		
Power and connectivity is available for magnet monitoring.		
Delivery route for He dewars & gradient coil cart to the scanning room is available.		
Chilled water supply for Water Cooled Compressor or Air Cooled Compressor is ready and meets GE specifications.		
Water drain available in the equipment room, if applicable.		
Power for MR compressor & Chiller is available.		
Ensure cryogen venting system is available for magnet connection.		
Exhaust fan system is installed and operational per GE requirements.		
Status of work		
<b>General comments</b>		
System can be delivered	PMI signature	
Site ready for installation	FS signature: optional	

## CUSTOMER SITE READINESS REQUIREMENTS

- 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;
  - Secure area for equipment,
  - Power for drills and other test equipment,
  - Capability for image analysis,
  - Restrooms.
- Provide for refuse removal and disposal (e.g. crates, cartons, packing)
- 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 preinstallation manual for the vibration specification.

## 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.

- 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.
- 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.
- For moving metal, the restriction lines typically extend outside of the MRi space. Please confirm there are no moving metal concerns within these areas. An EMI study is recommended if the restriction lines are violated.
- For vibration, analysis to be completed as required per pre-installation manual.
- 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.
- 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 1ft [.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.
- All access/computer flooring is to be removed in both the magnet room and equipment room.

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.)

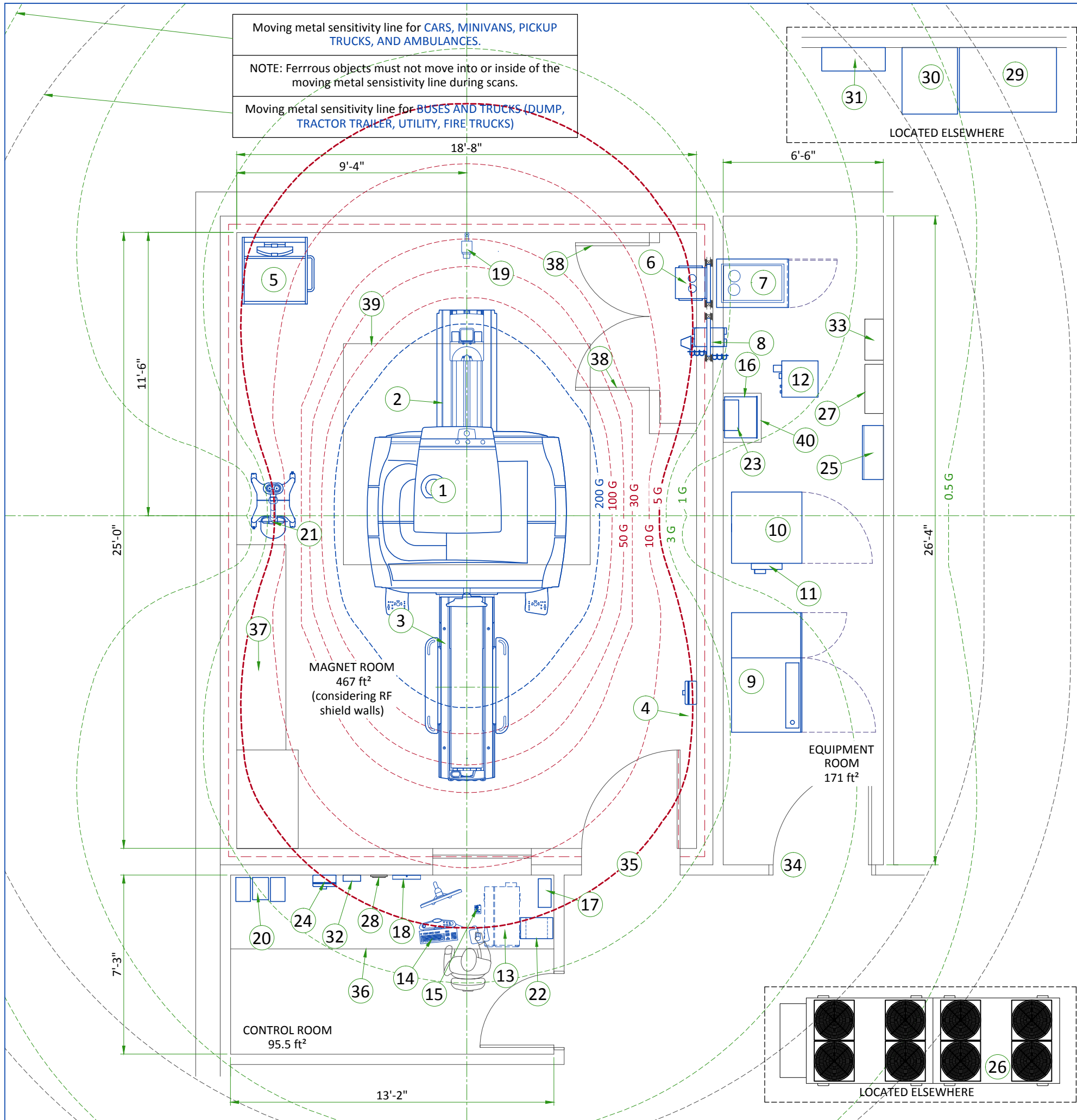
For additional information regarding image quality, refer to the pre-installation manual listed on the cover sheet.

## 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 < 17.1mG AC. EMI < 4.1mG DC.
- Potential exists under fault conditions that the 5 gauss line may expand radially to 14.8 ft. [4.5 m] and axially to 19.7 ft. [6.0 m] for 8 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 RADIALY		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])	20.0 FT	6.05 M	25.0 FT	7.65 M
Buses and trucks (dump, tractor trailer, utility, fire trucks)	23.2 FT	7.10 M	29.2 FT	8.90 M

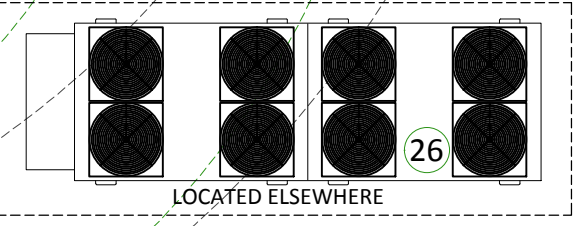
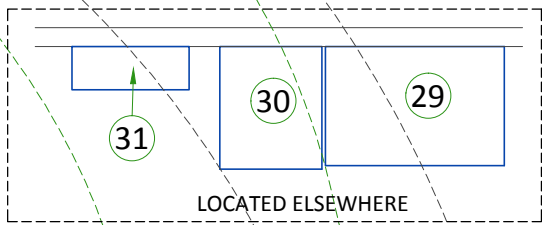




Moving metal sensitivity line for CARS, MINIVANS, PICKUP TRUCKS, AND AMBULANCES.

NOTE: Ferrrous objects must not move into or inside of the moving metal sensitivity line during scans.

Moving metal sensitivity line for BUSES AND TRUCKS (DUMP, TRACTOR TRAILER, UTILITY, FIRE TRUCKS)

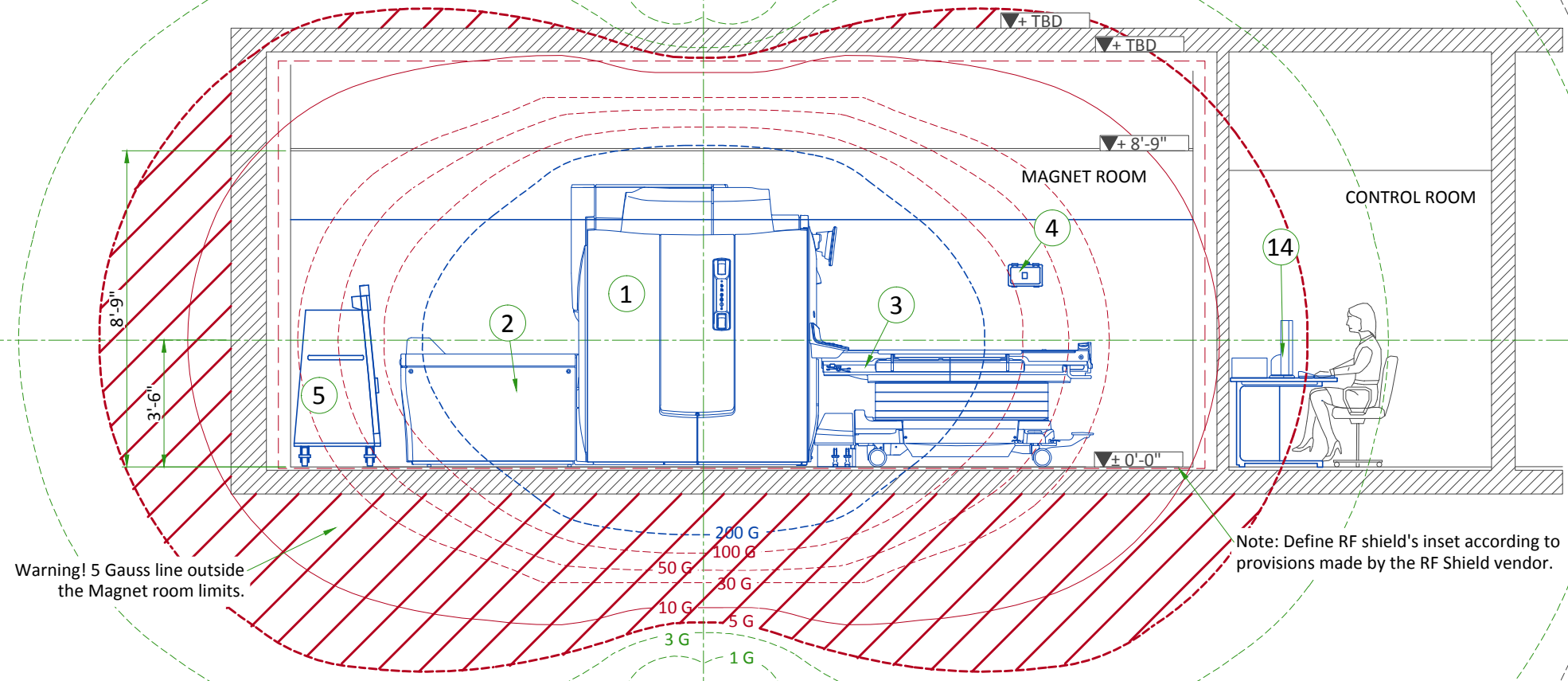


LEGEND			
A	GE Supplied	C	Customer/contractor supplied and installed
B	GE Supplied/contractor installed	D	Available from GE
- - - - - 200 Gauss		- - - - - 5 Gauss	
- - - - - 100, 50, 30, 10 Gauss		- - - - - 3, 1, 0.5 Gauss	

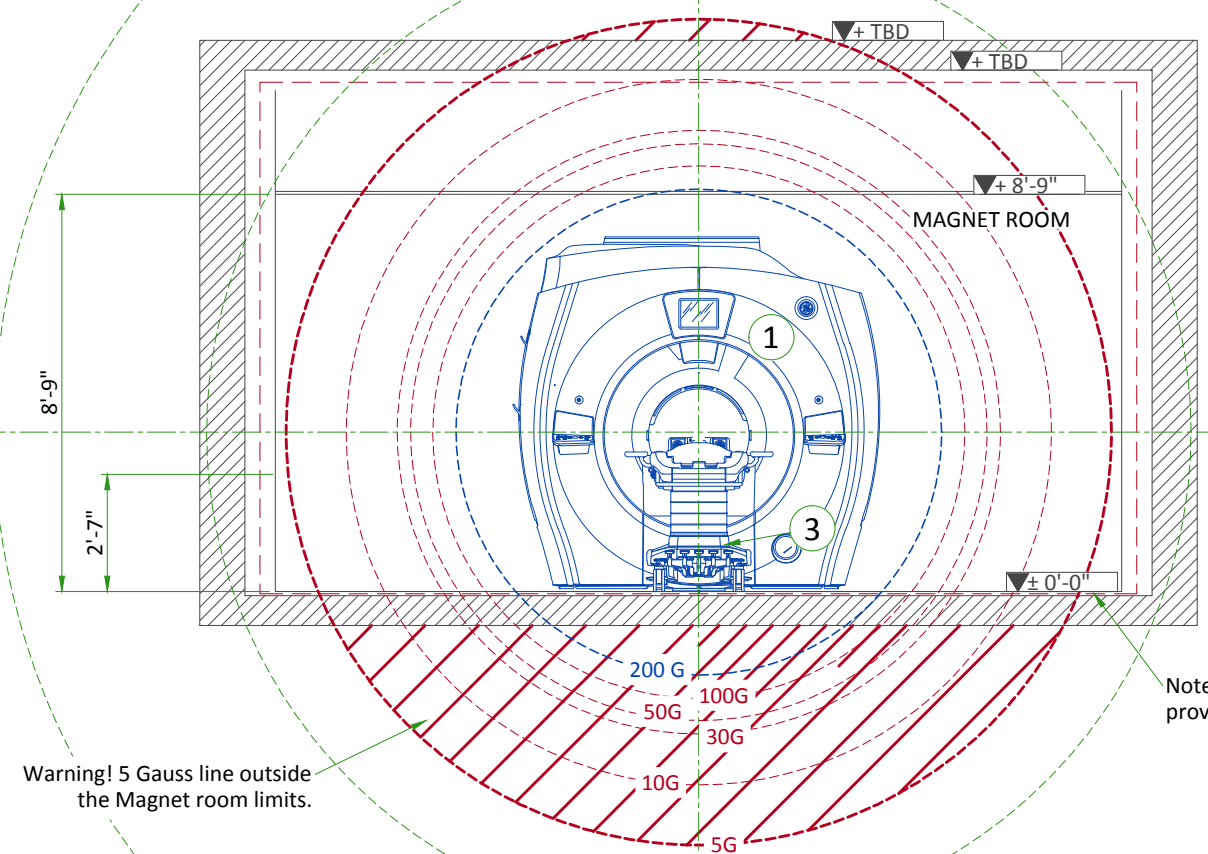
BY	ITEM	DESCRIPTION	MAX HEAT OUTPUT (btu)	WEIGHT (lbs)	MAX HEAT OUTPUT (W)	WEIGHT (kg)
A	1	3T Magnet	8189	16410	2400	7443
A	2	Rear pedestal	-	212	-	96
A	3	Patient table	-	418	-	190
A	4	Magnet rundown unit	-	7	-	3.2
A	5	Phantom set storage cabinet	-	350	-	136
A	6	Blower box	1535	-	450	-
A	7	Penetration cabinet	1024/ 10697	639	300/ 3135	290
A	8	Secondary penetration wall	-	92	-	45
A	9	Power, gradient, RF cabinet	20940	3144	6137	1426
A	10	Heat exchanger cabinet	3412	1350	1000	612
A	11	Magnet monitor	819	10	240	4.5
A	12	Cryocooler compressor	1706	264	500	120
A	13	Operator console computer	4947	141.75	1450	64.3
A	14	Operator workspace	-	26	-	11.80
A	15	Pneumatic patient alert	-	0.5	-	0.2
D	16	MR Elastography	480	53.4	0.14	24.22
D	17	700 va partial UPS	-	26	-	12
D	18	CCTV Monitor	-	8.27	-	3.75
D	19	CCTV Camera	-	0.35	-	0.16
D	20	Music system	-	-	-	-
D	21	Injector on pedestal	-	94	-	43
D	22	Injector control	675	17	198	8
D	23	Injector power supply	660	6	193	3
D	24	Remote magnet rundown unit	-	7	-	3.20
B	25	Main disconnect panel	901	130	264	59
D	26	Dimplex chiller	240002	4301	70320	1951
D	27	Water filter	-	-	-	-
D	28	Remote graphic display	-	-	-	-
D	29	150 kva UPS system	31795	2160	9318	980
D	30	UPS Battery cabinet	-	3529	-	1600
D	31	Maintenance bypass panel	-	350	-	158.80
D	32	UPS Remote status panel	-	-	-	-
D	33	Water bypass	-	-	-	-
C	34	Minimum opening for equipment delivery is 40 in. w x 82 in. h, contingent on a 72 in. corridor width				
C	35	Minimum opening for is 43 in. w x 82 in. h, contingent on a 96 in. corridor width				
C	36	Countertop with drawers for miscellaneous items.				
C	37	Base cabinet for storage of: surface coils, patient positioning pads, phantoms, etc.				
C	38	Louvered doors - refer to preinstall for requirements				
C	39	Magnet access 9'-0"x10'-0"				
C	40	Shelf				

- - - - - RF SHIELD - 100 dB ATTENUATION	
<b>Exam room height</b>	
Finished floor to slab height	TBD
Recommended finished ceiling height	8'-9"

**SIDE VIEW WITH MAGNETIC FIELD**



**FRONT VIEW WITH MAGNETIC FIELD**



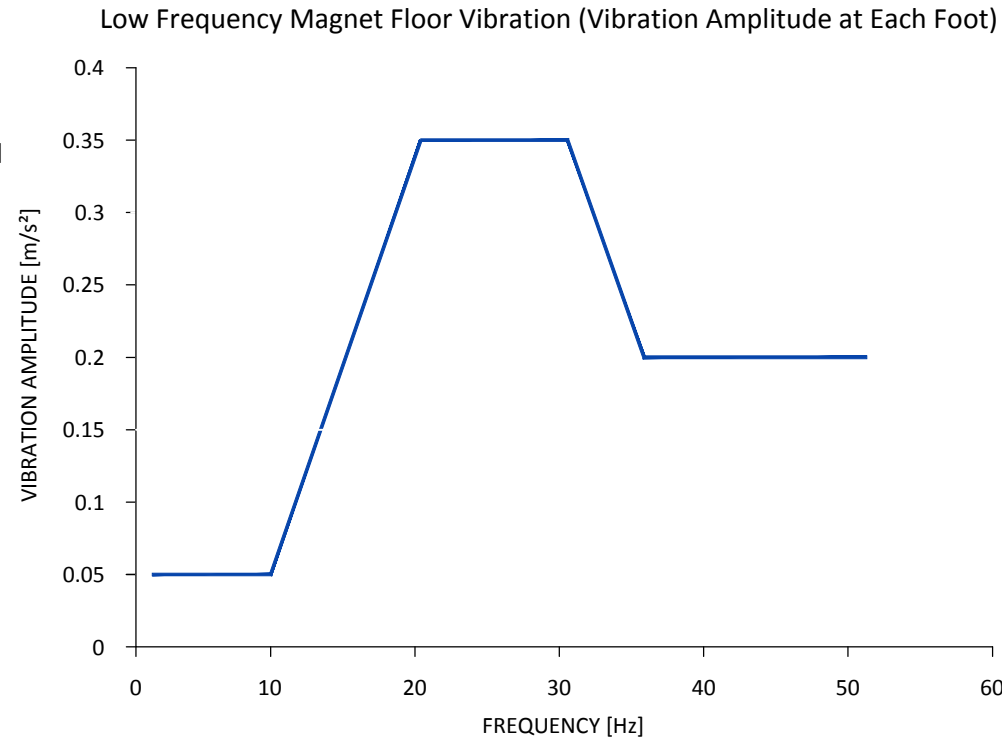
## ACOUSTICS SPECIFICATIONS

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: 62 dBA  
 Equipment Room: 80 dBA  
 Magnet Room: 127 dBA\*  
 (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

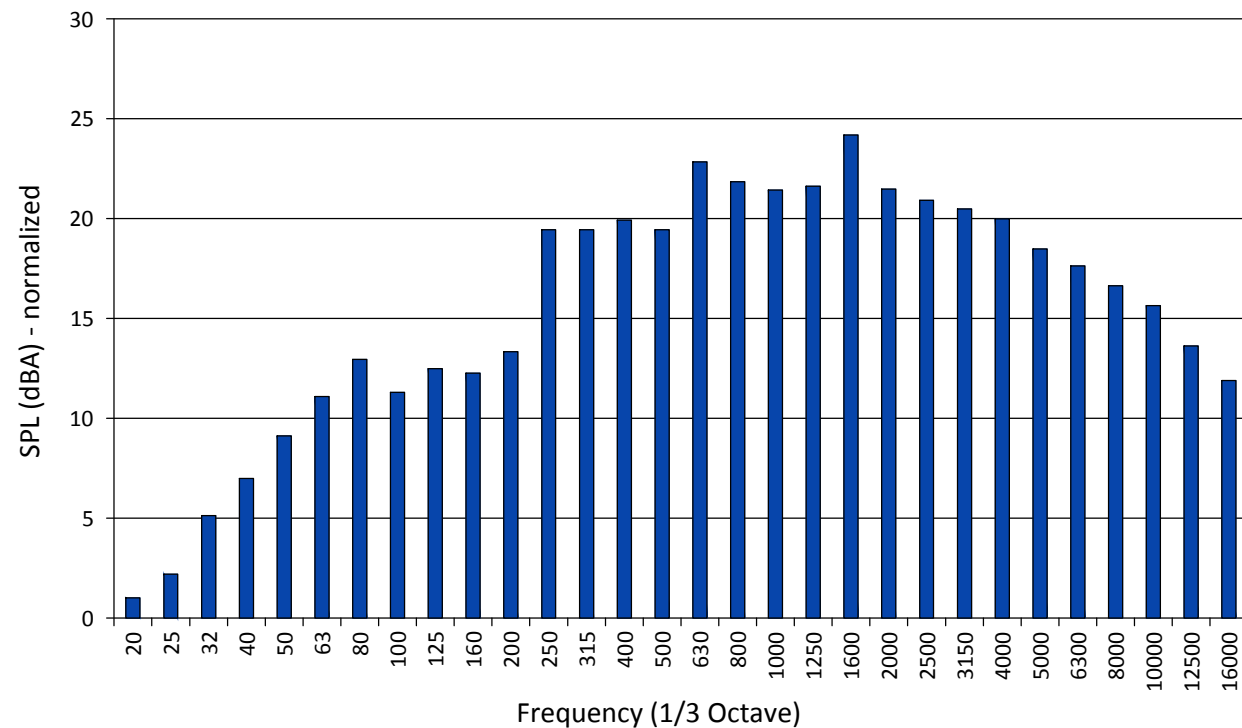


## ISOGAUSS PLOTS

\* 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

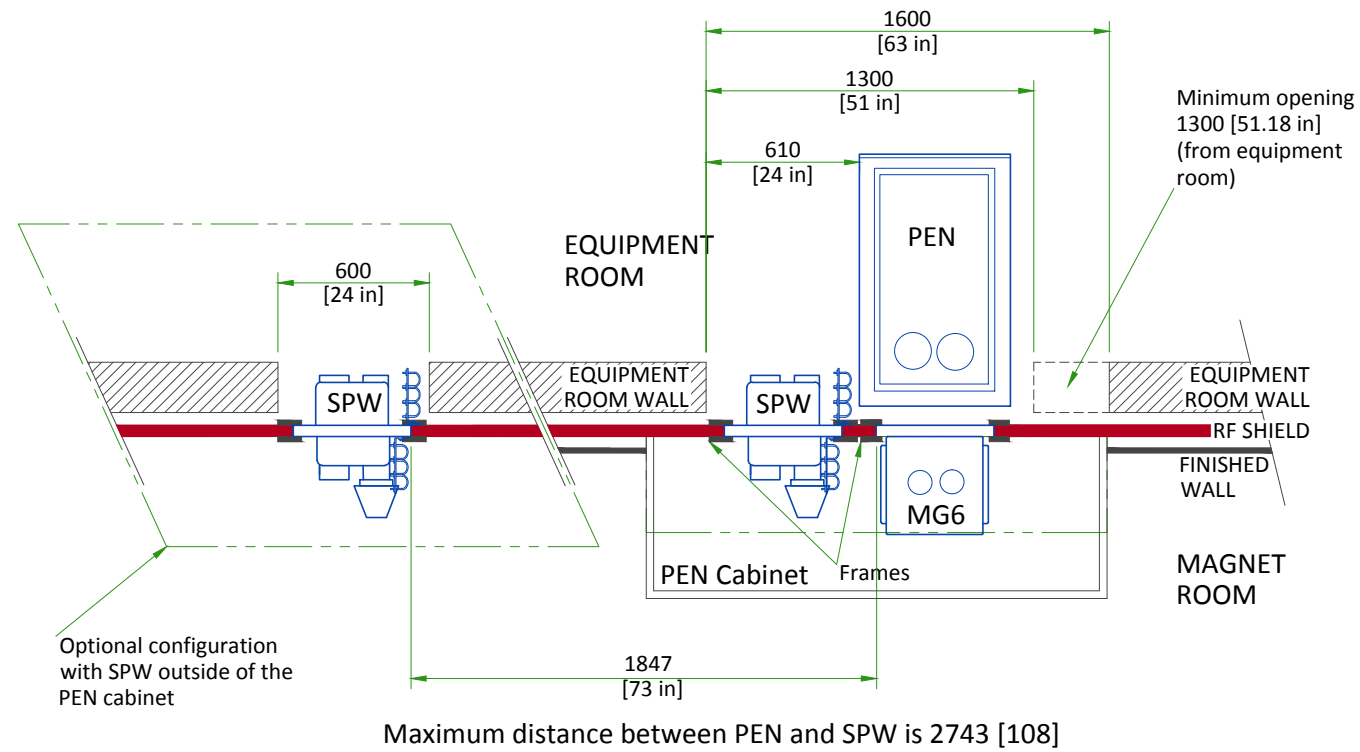
Gauss (mT) Limit	Equipment
0.5 gauss (0.05mT)	Nuclear camera
1 gauss (0.1mT)	Positron Emission Tomography scanner, Linear Accelerator, Cyclotrons, Accurate measuring scale, Image intensifiers, Bone Densitometers, Video display (tube), CT scanner, Ultrasound, Lithotripter, Electron microscope, Digital X-Ray
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, 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.

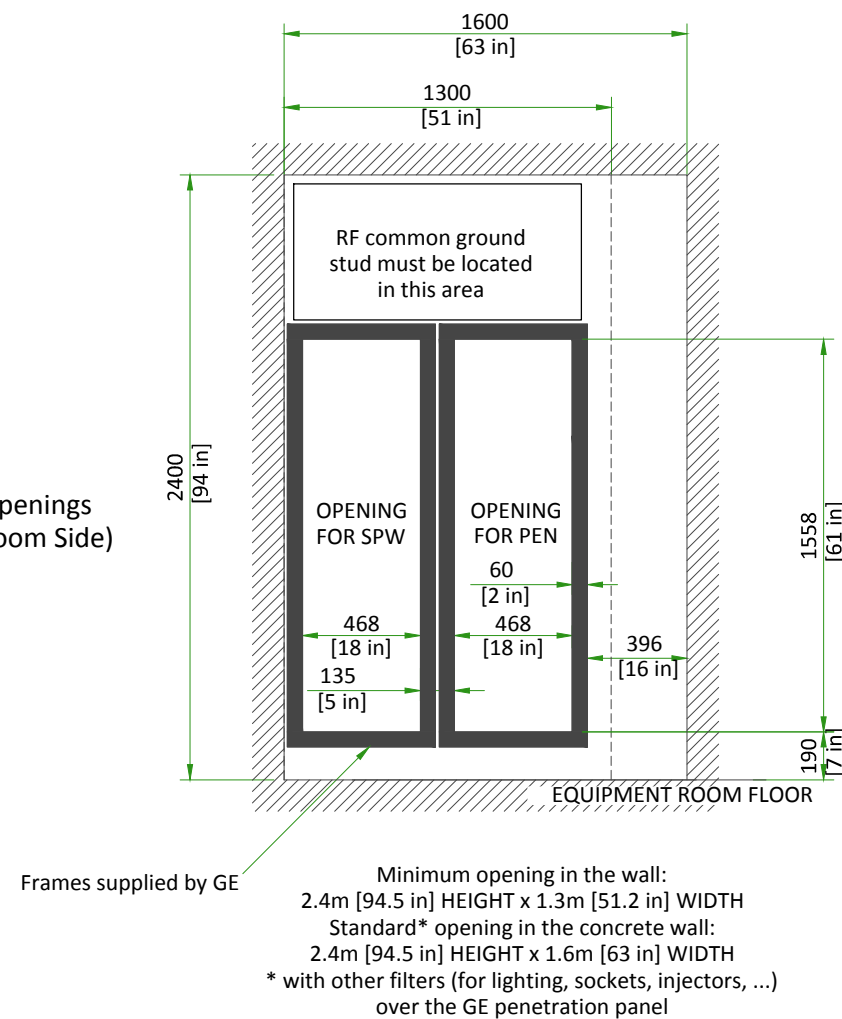
STEEL MASS LIMITS TO MAGNET ISOCENTER (3.1 m x 3.1 m [10 ft. x 10 ft.] AREA UNDER MAGNET)					
Limits Of Steel Mass		Distance From Magnet Isocenter		Distance Below Top Surface Of Floor	
kg/m <sup>2</sup>	lbs/ft <sup>2</sup>	mm	in	mm	in
0	0	0 - 1143	0-45	0 - 76	0-3
9.8	2	1143 - 1194	45-47	76 - 127	3-5
14.7	3	1194 - 1321	47-52	127 - 254	5-10
39.2	8	1321 - 1397	52-55	254 - 330	10-13
98.0	20	1397+	55+	330+	13+

The following illustrations show the idealized static magnet isogauss plot lines. 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 PANEL WITH SPW



PEN Panel Openings  
(Equipment Room Side)



SCALE 1:30

## PENETRATION PANEL CABINET

An enclosure must be provided to restrict access to the PEN panels and for storage of excess interconnections.

- The PEN cabinet must have a mechanical locking mechanism to restrict access to the PEN panels
- PEN cabinet must allow free air exchange of 1200CFM (680 m<sup>3</sup>/hour) between the Magnet room and PEN cabinet for MR system blowers. Airflow may be achieved through door louvers or other openings in the PEN cabinet that meet all other PEN cabinet requirements

A closet service hatch must be provided if the room does not allow the PEN panel blower box removal path to remain completely outside the 200 Gauss line.

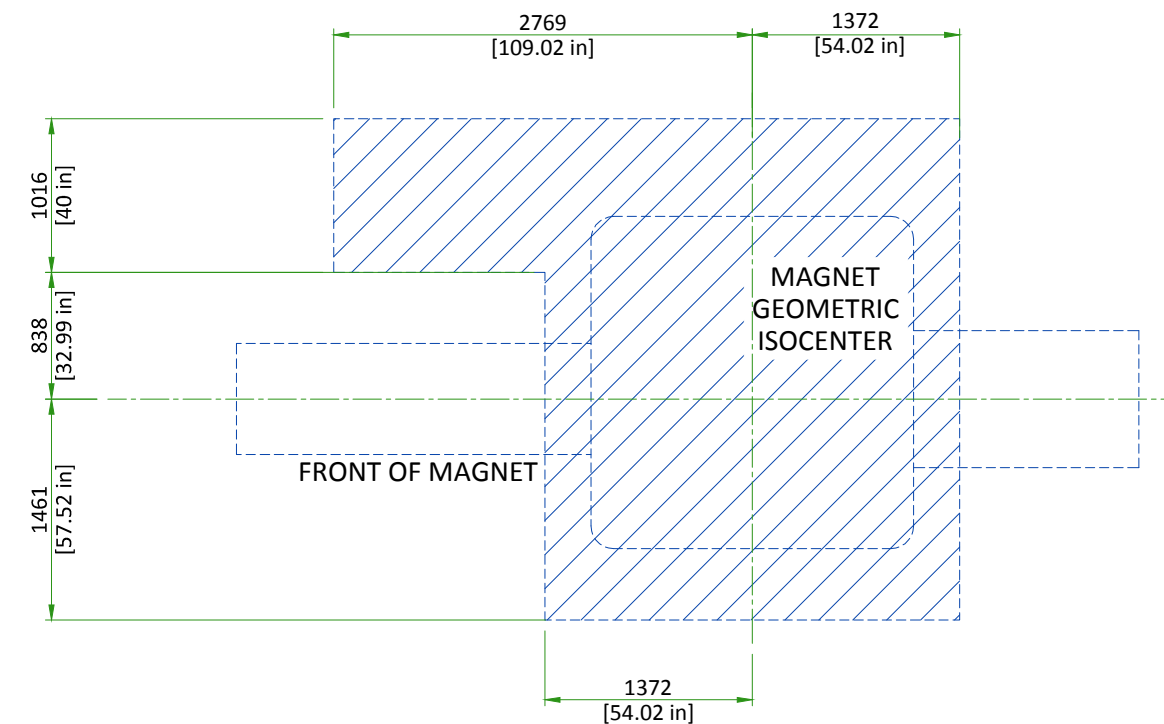
NOTE: If the room size is sufficiently large so the SPW blower box can be removed without entering the 200 Gauss line, a closet service hatch is not required.

The closet service hatch must meet the following requirements:

- Must be located within the PEN cabinet on the RF wall allowing access to the Equipment room
- May be located anywhere within the PEN cabinet (between 254 [10 in] and 1524 mm [60 in] with unobstructed pass-through)
- Must be minimum 508x508 mm [20x20 in]
- Must maintain RF shield integrity for all service access
- May use any design (quick disconnect RF panel, blanker panel, hinged door, etc.) as long as all other requirements are met
- The closet service hatch removal must take less than 15 minutes (replacement must also take less than 15 minutes)

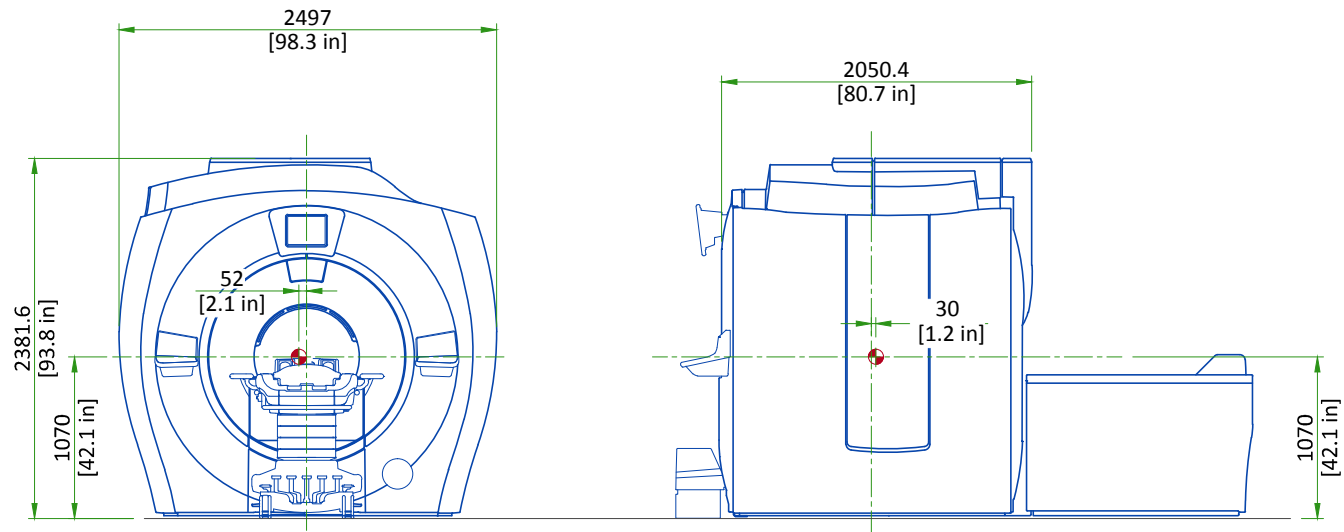
## MINIMUM MAGNET CEILING HEIGHT ( TOP VIEW )

Shaded area indicates floor to ceiling minimum height of 2500 mm (98.5 in). Special service procedures are required if ceiling height is between 2500 mm and 2667 mm (98.5 in and 105 in).



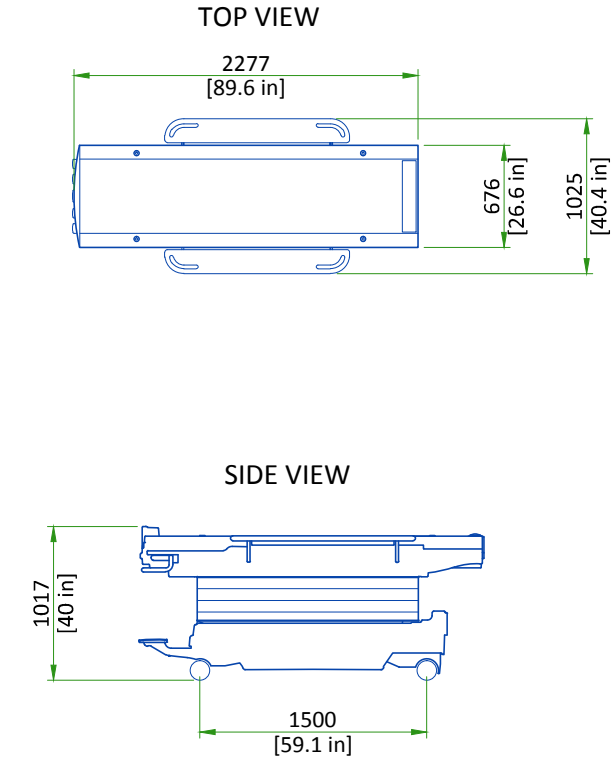


## MAGNET ENCLOSURE

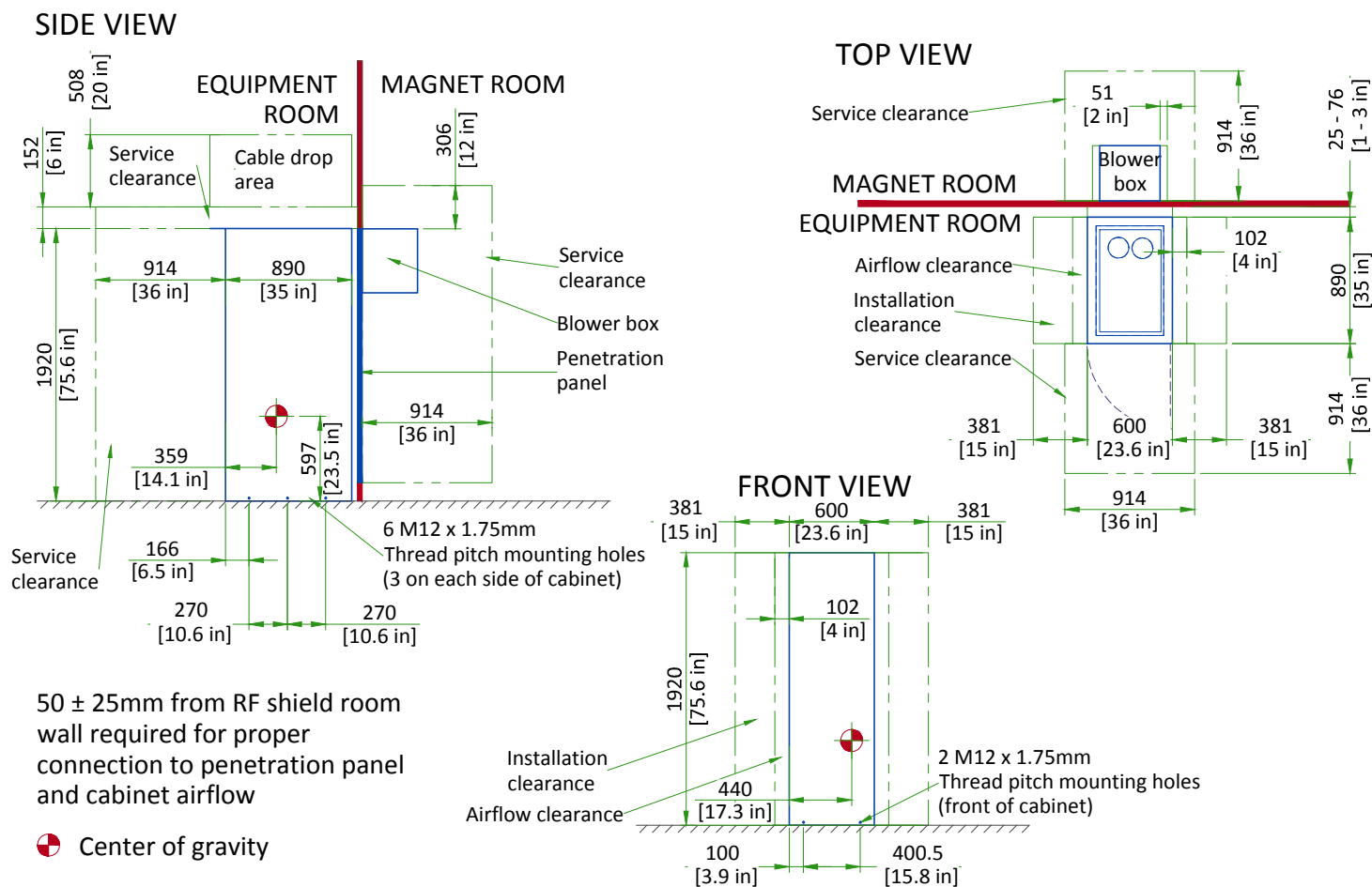


Note:  
 Center of gravity is approximate and includes the GE Healthcare supplied VibroAcoustic Dampening Kit, but does not include cryogenes, gradient assembly, side mounted electronics, or enclosures.  
 Enclosure dimensions are for reference only, NOT FOR SITE PLANNING USE.  
 ● Center of gravity

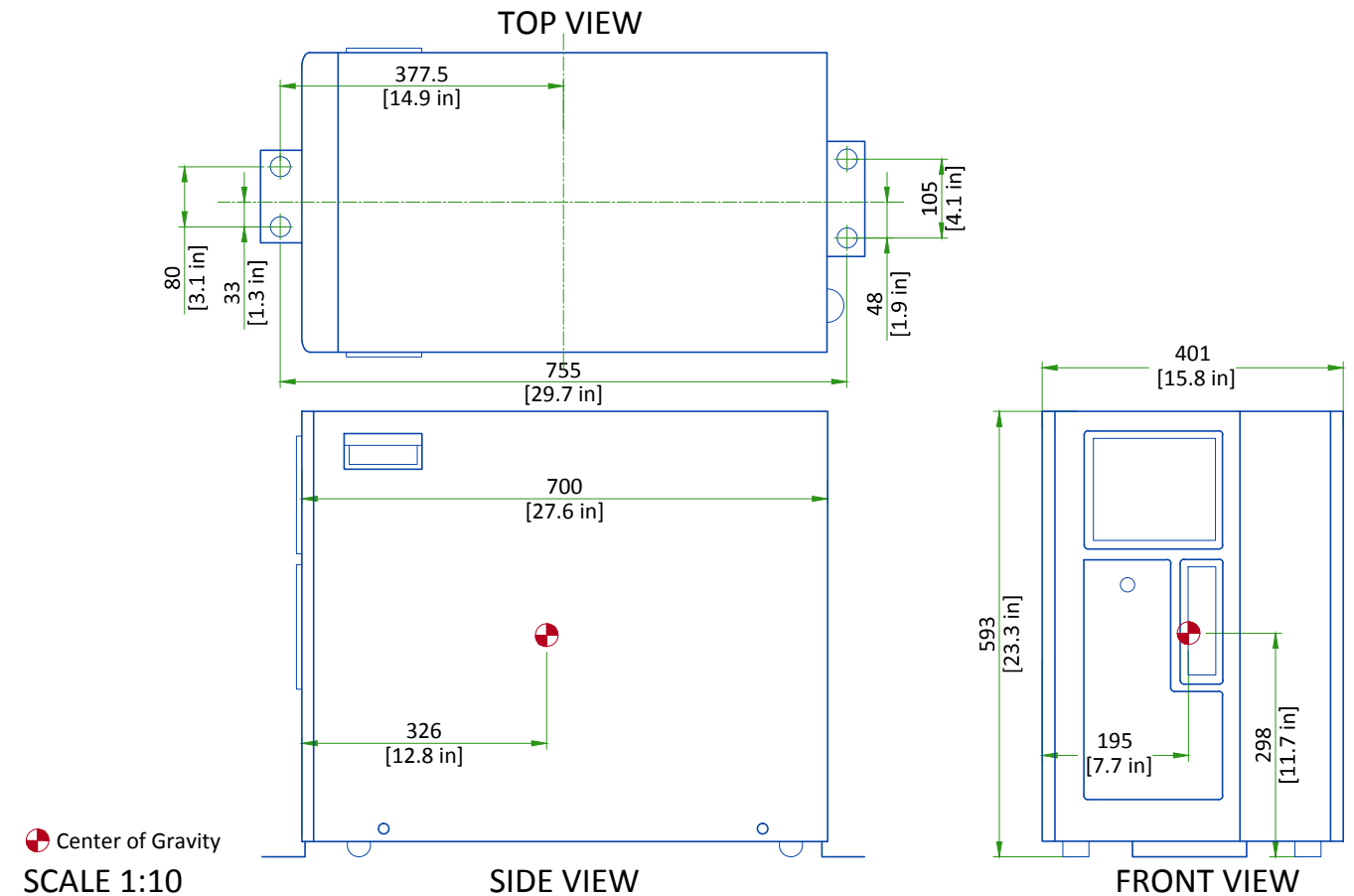
## PATIENT TRANSPORT TABLE (PT)



## PENETRATION CABINET CLEARANCE

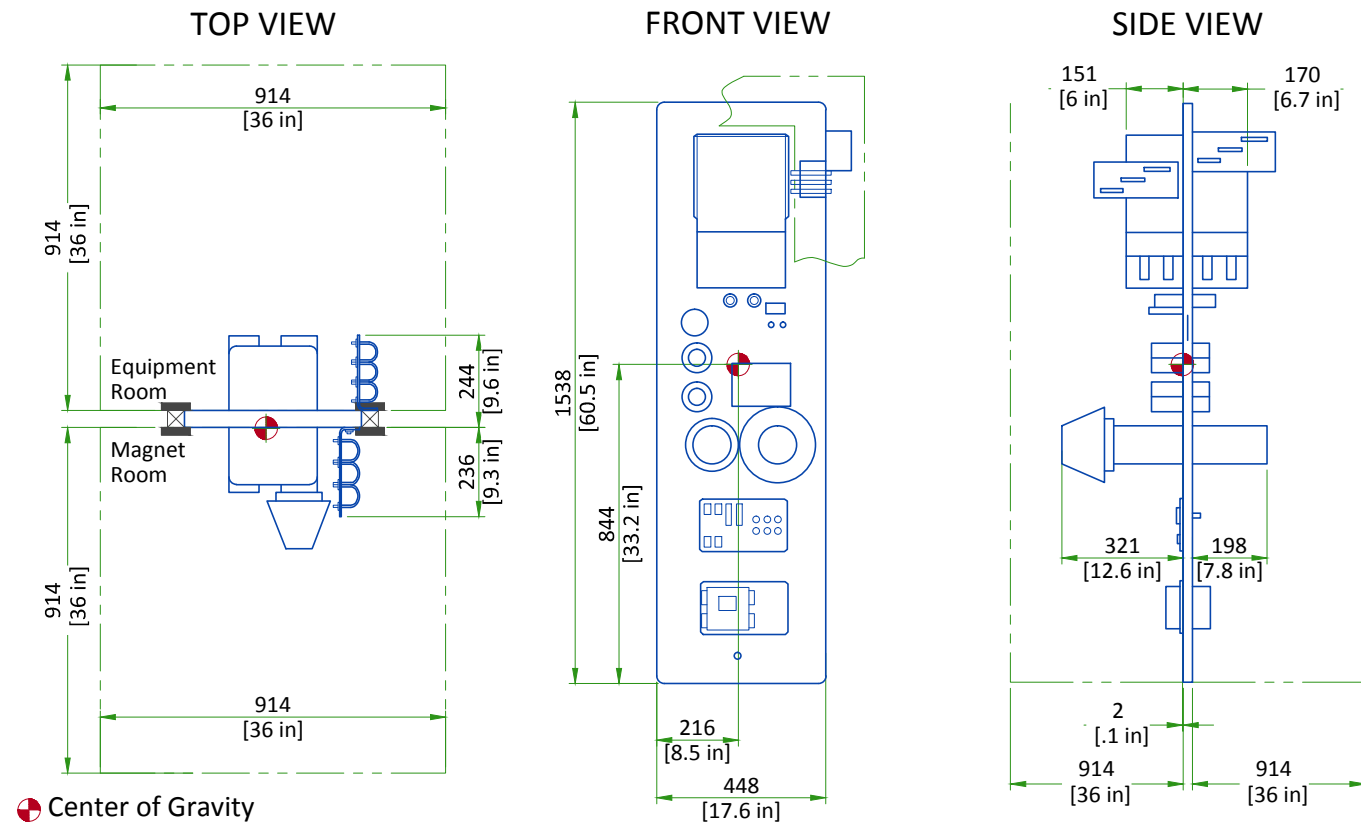


## GLOBAL OPERATORS CABINET (GOC)

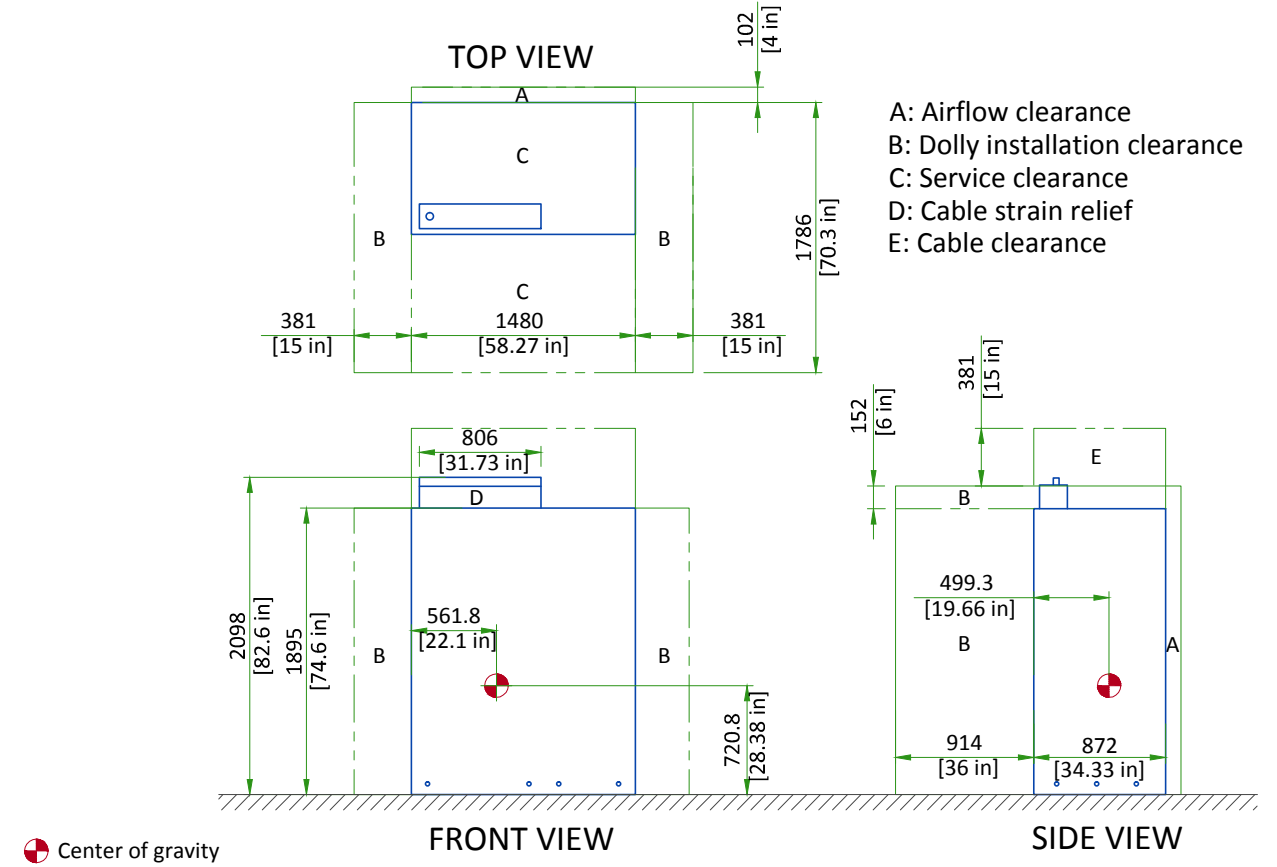




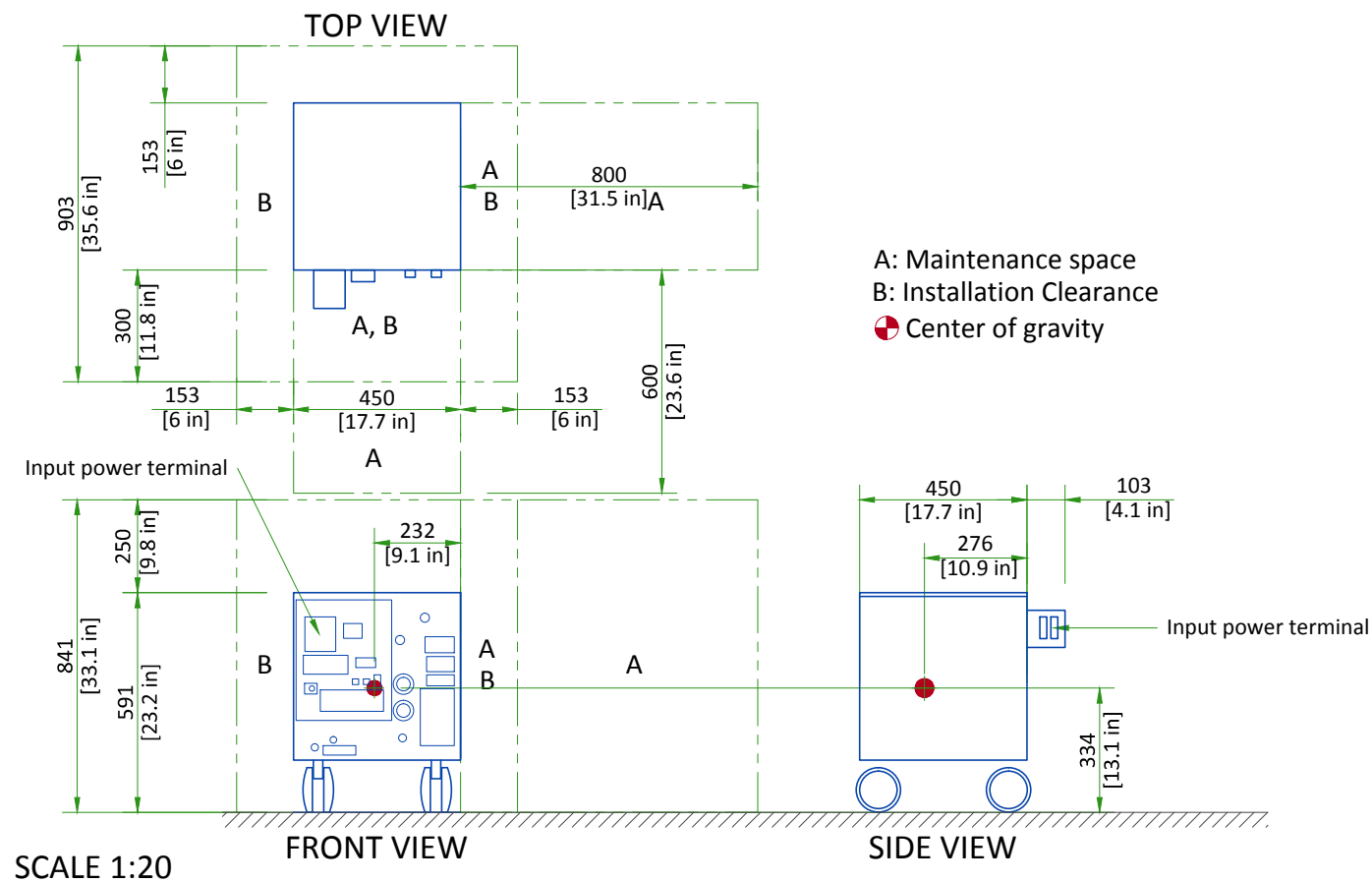
## SECONDARY PENETRATION WALL (SPW)



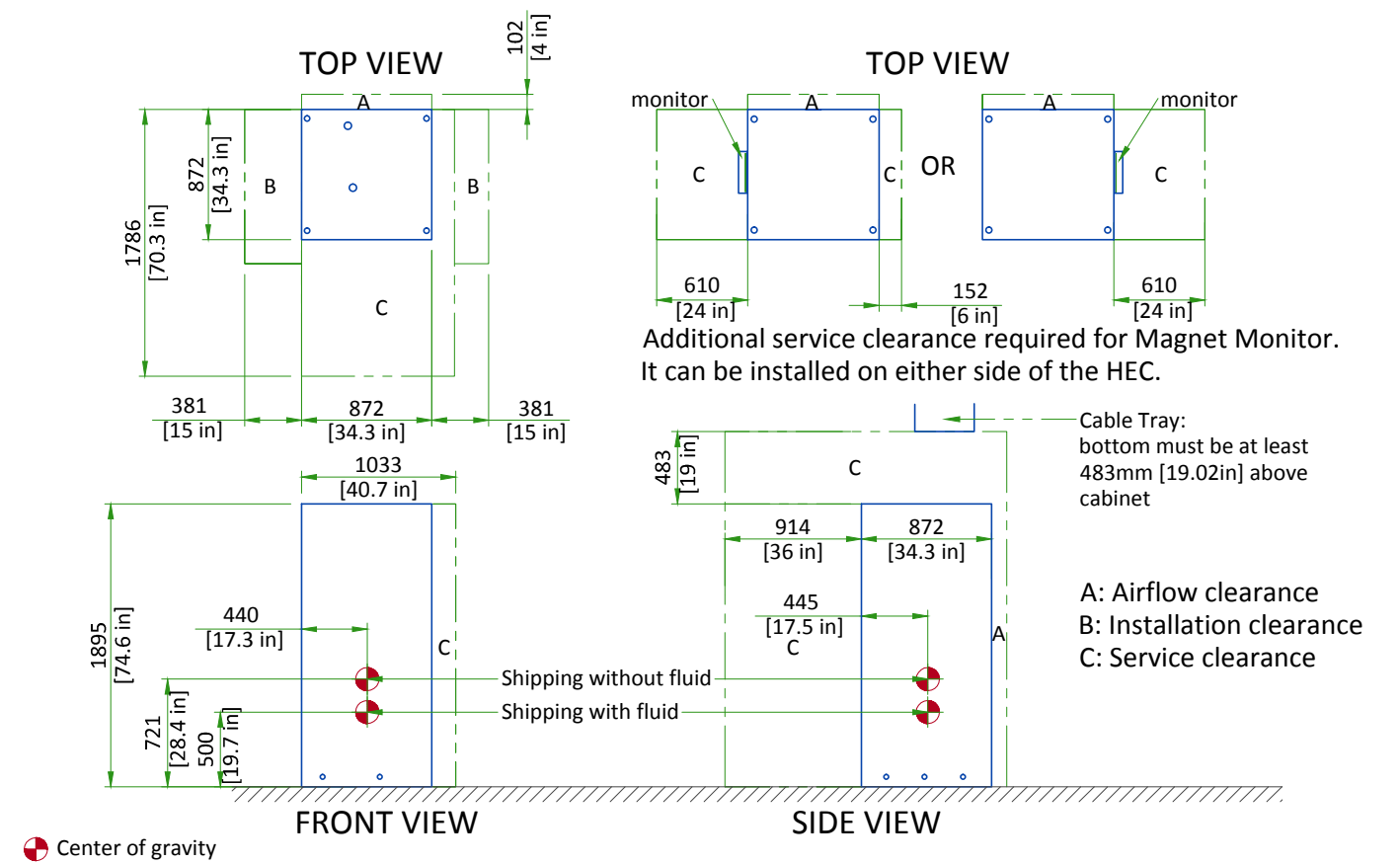
## POWER, GRADIENT, RF CABINET (PGR)



## CRYOCOOLER COMPRESSOR ( CRY )



## HEAT EXCHANGER CABINET ( HEC )



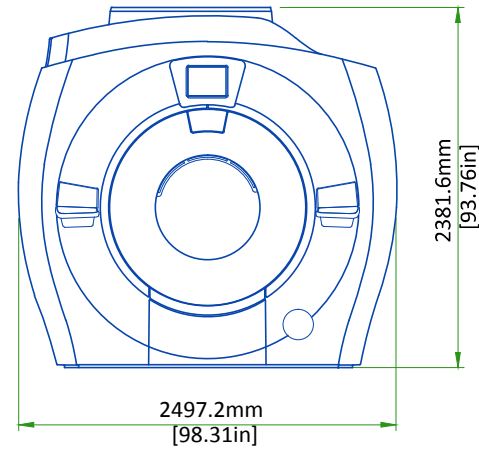
## DELIVERY

### ROUTING

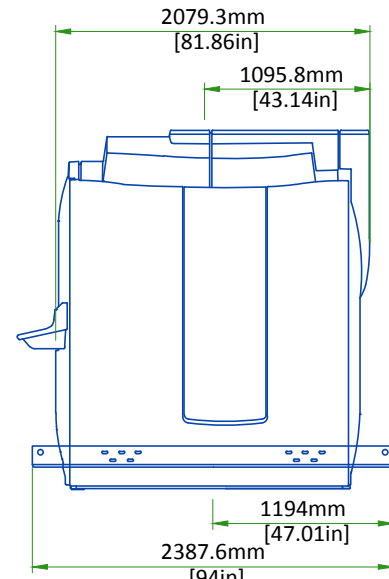
- The customer is solely liable for routing of components from dock to final site.
- GE must be able to move system components in or out with no need to uncrate or disassemble any of the components. The entire passageway must be cleared, adequately lighted and free from dust.
- The floor and its surfacing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

### MINIMUM SPECIFICATIONS FOR MAGNET ROUTING

- Floor must be able to withstand a moving load of 7691 daN
- Height: 2.5m [98.5in], width: 2.7m [106in]
- Maximum slope: 30 degree



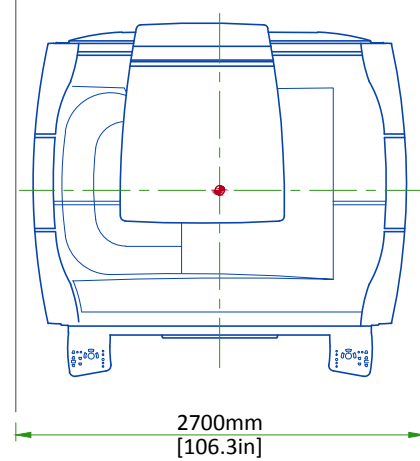
FRONT VIEW OF MAGNET



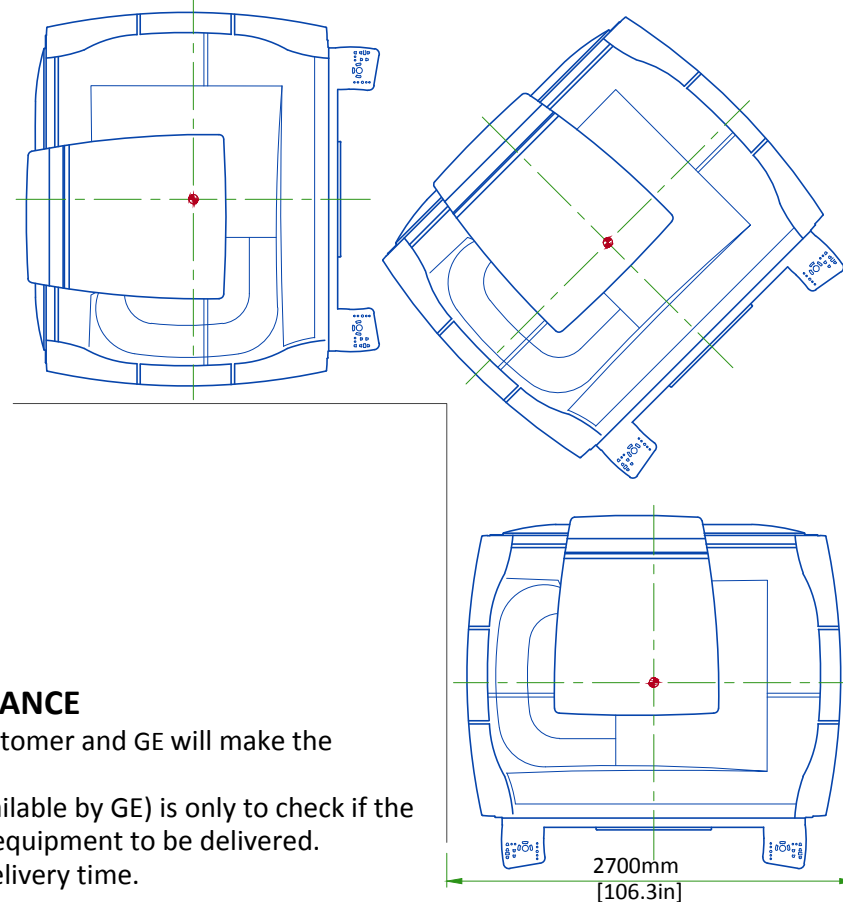
RIGHT SIDE VIEW OF MAGNET

Recommended minimum opening for side (wall) delivery : 2750 (width) x 2750 (height)

STRAIGHT PATH  
(Rigging wheels required)



PATH WITH 90 DEGREE TURN



### INSTALLATION AND DELIVERY ACCEPTANCE

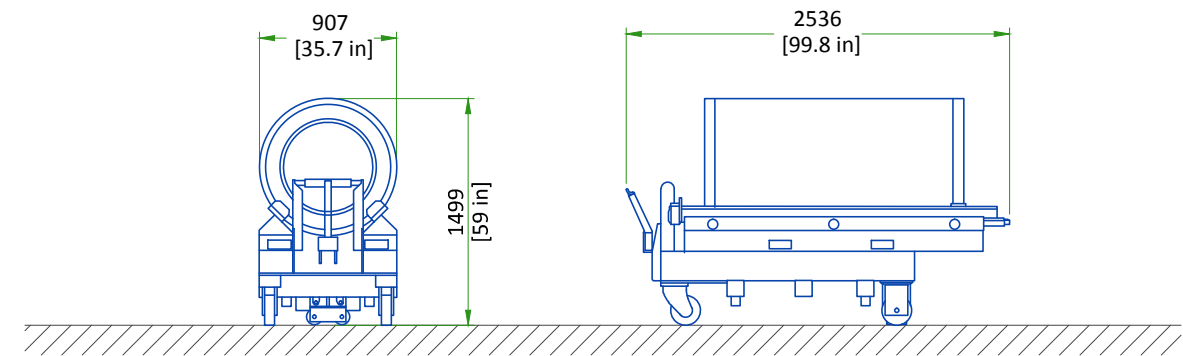
- A survey of the site established by the customer and GE will make the decision for the delivery time.
- This survey of the site (a form is made available by GE) is only to check if the apparent conditions of the site allow the equipment to be delivered.
- If the site is not ready, GE can delay the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

## CRITICAL ITEMS FOR MAGNET DELIVERY

- 24/7 chilled water and 480v power for shield/cryo cooler
- 24/7 120v power for the magnet monitor
- Phone lines for magnet monitoring and emergency use
- Magnet room exhaust fan
- Cryogen venting (if roof hatch, completed within 24 hrs)
- Magnet anchors installed and tested

This is only a partial list of items required for delivery of the magnet. For a complete checklist refer to the pre-installation manual referenced on cover sheet.

## GRADIENT COIL REPLACEMENT



EQUIPMENT	DIMENSIONS LxWxH		WEIGHT		NOTE
	mm	in	kg	lbs	
Replacement XRM gradient coil assembly on a shipping cradle/cart	991x2536x1499	39x99.84x59	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.

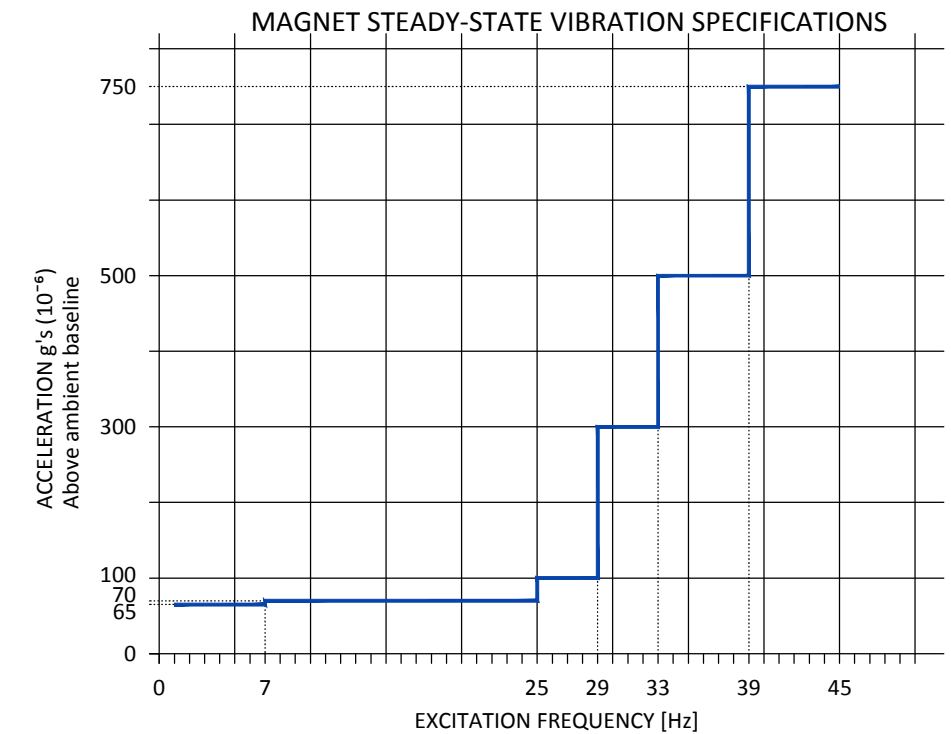
## STRUCTURAL NOTES

- 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.
- Customers contractor must provide all penetrations in post tension floors.
- Customers 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.
- Customers 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.
- Customers 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"

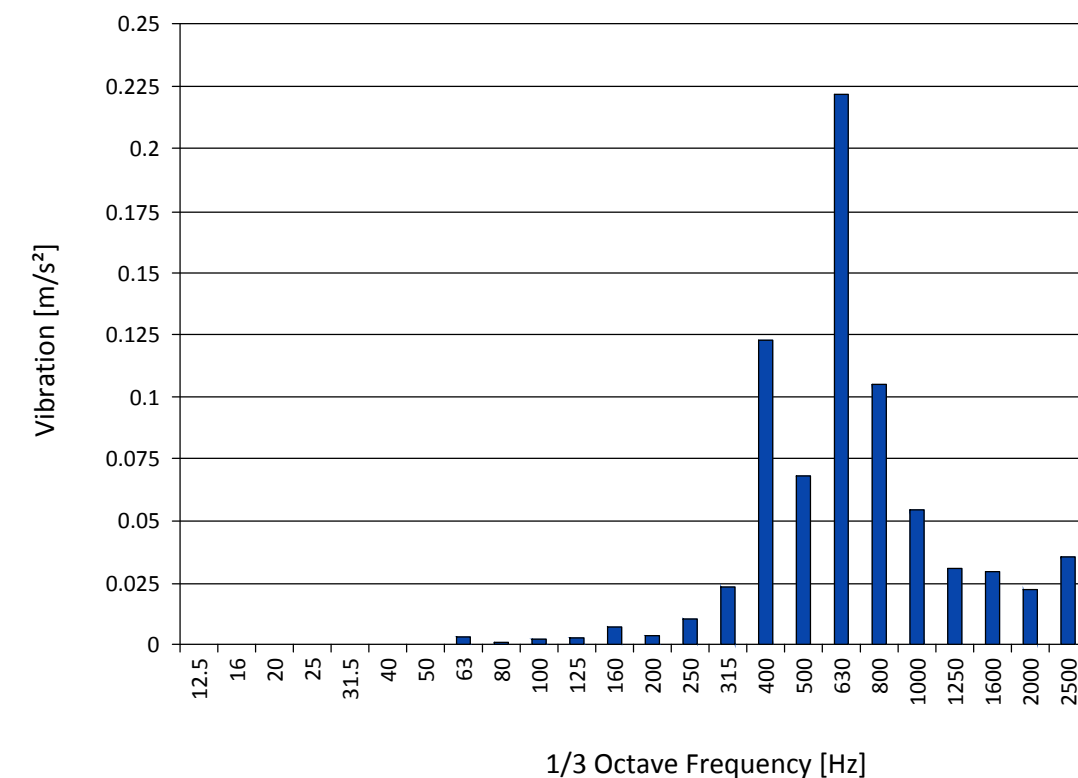
## VIBRATION SPECIFICATIONS

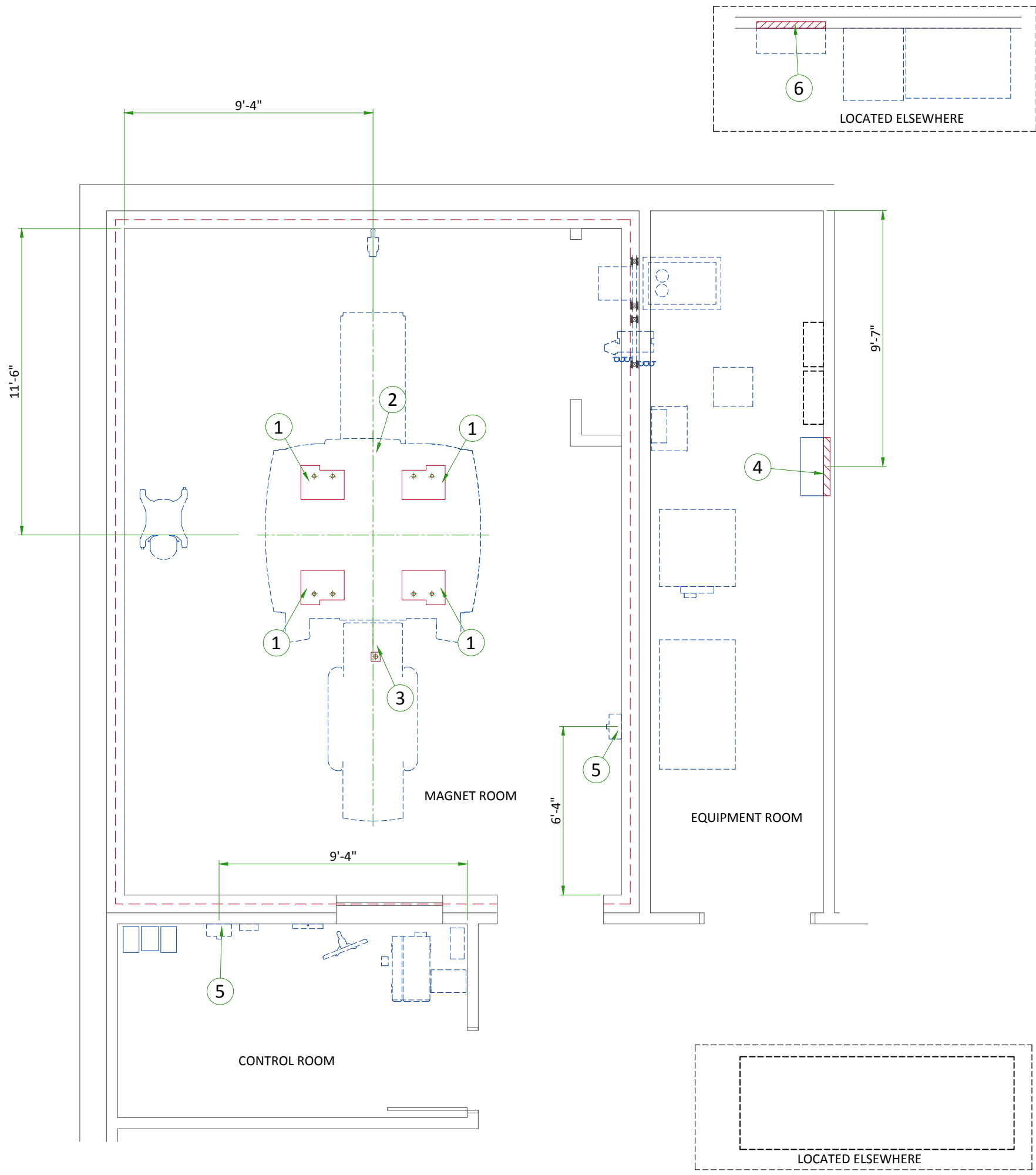
Excessive vibration can affect MR image quality. Vibration testing must be performed early in the site planning process to ensure vibration is minimized. Both steady state vibration (exhaust fans, air conditioners, pumps, etc.) and transient vibrations (traffic, pedestrians, door slamming, etc.) must 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.



## VIBRATION TRANSMITTED THROUGH VIBROACOUSTIC MAT

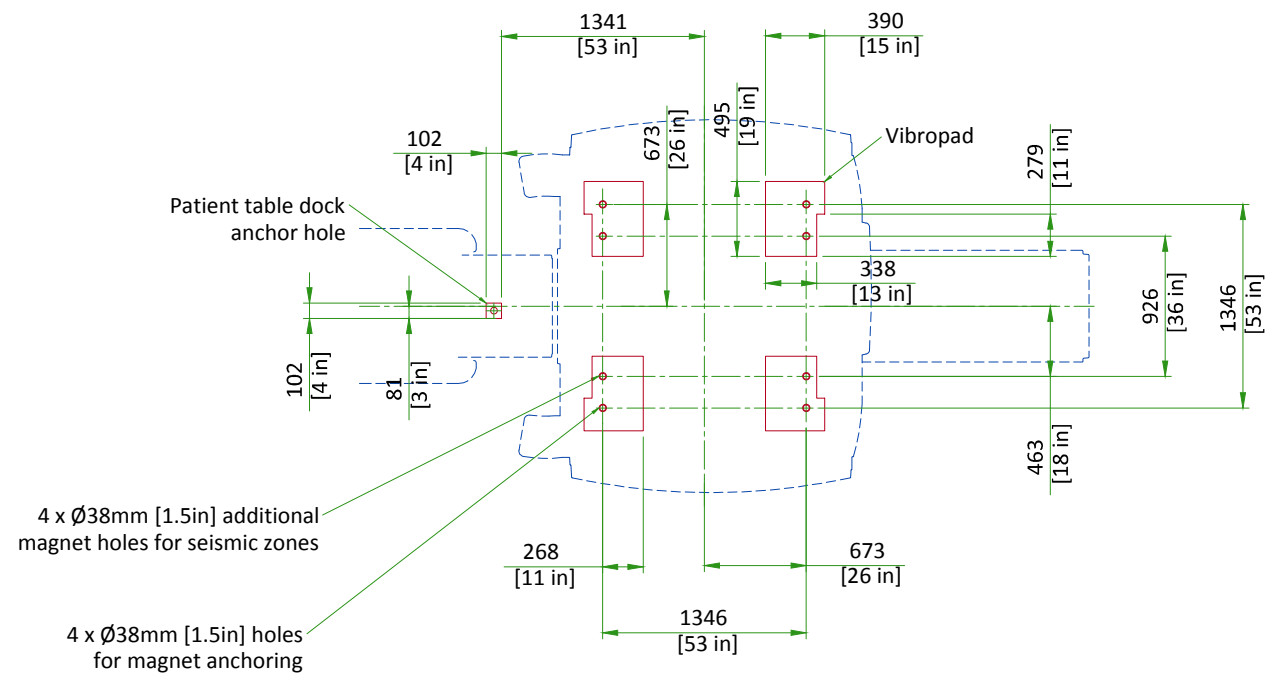




ITEM	DESCRIPTION
(GE SUPPLIED / CONTRACTOR INSTALLED)	
1	Vibroacoustic dampening kit (see floor structural detail)
2	Magnet curtain kit
(CONTRACTOR SUPPLIED & INSTALLED)	
3	Patient table dock anchoring
4	Structural wall backing for Main Disconnect Panel
5	Structural wall backing for Magnet Rundown Unit
6	Structural wall backing for Main Bypass Panel



## MAGNET ON VIBROACOUSTIC DAMPENING KIT "VIBROPAD"

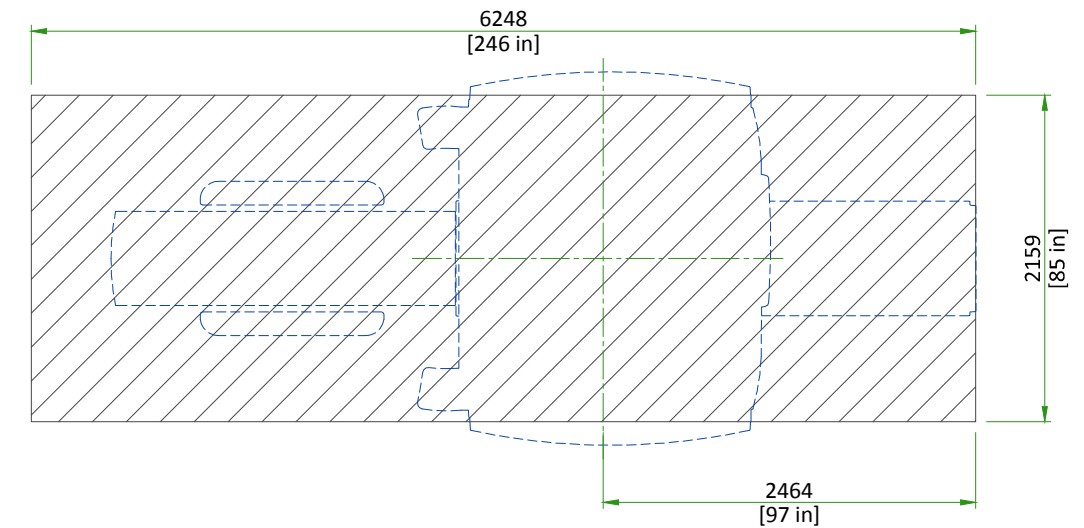


VibroAcoustic Pad weight:  
8 kg [17 lbs] (each)

NOT TO SCALE

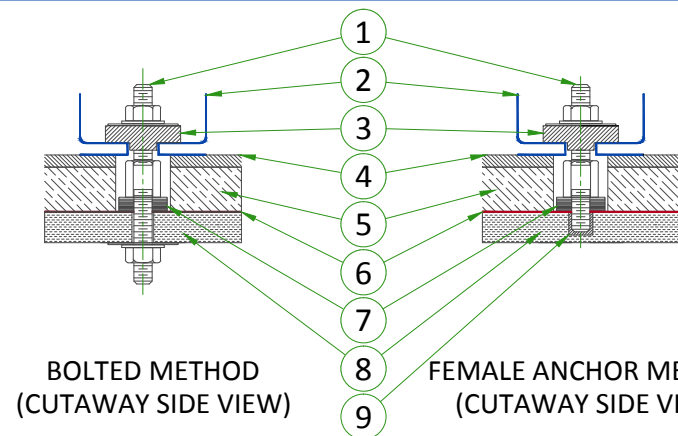
## MAGNET ROOM FLOOR SPECIFICATIONS

Magnet, Enclosure, and Patient Table areas must be flat and level within **3 mm [0.12in]** within the shaded 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.

## PATIENT TABLE DOCK ANCHOR MOUNTING REQUIREMENTS



- 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

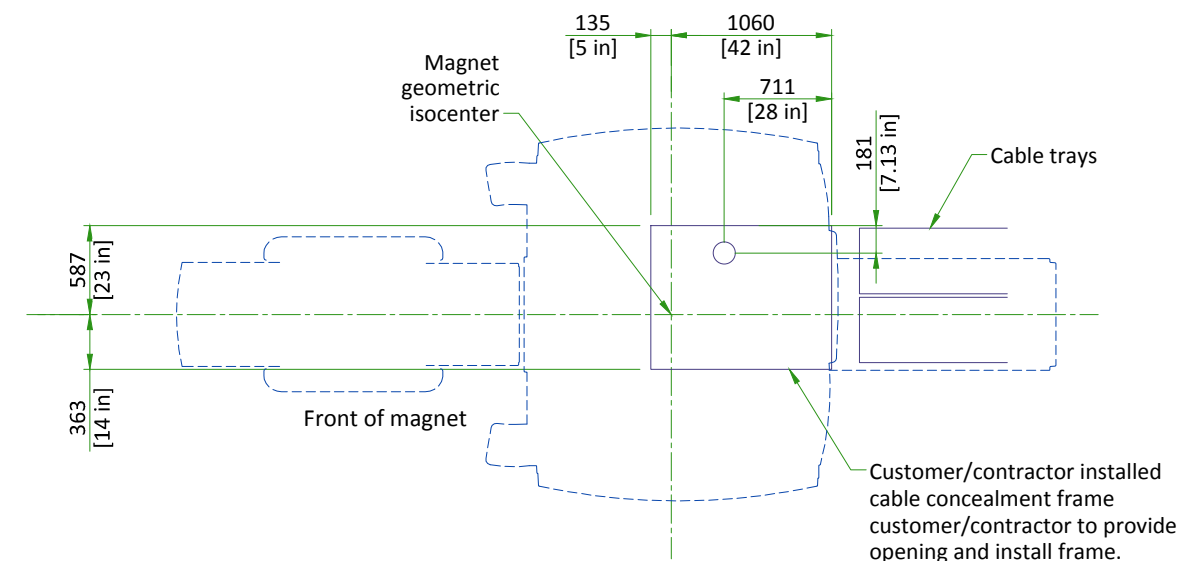
BOLTED METHOD  
(CUTAWAY SIDE VIEW)

FEMALE ANCHOR METHOD  
(CUTAWAY SIDE VIEW)

- The RF Shield vendor must design and install the dock anchor bolt
- The dock anchor hole must be drilled **after** the Magnet is installed
- The dock anchor must not contact floor rebar or other structural steel
- The dock anchor must electrically contact the RF shield at point of entry
- The dock anchor properties must comply with requirements described in the Preinstallation Manual Chapter 3 Section 5.4.4.
- The RF shield vendor must perform a pull test on the anchor (equal to the clamping force).

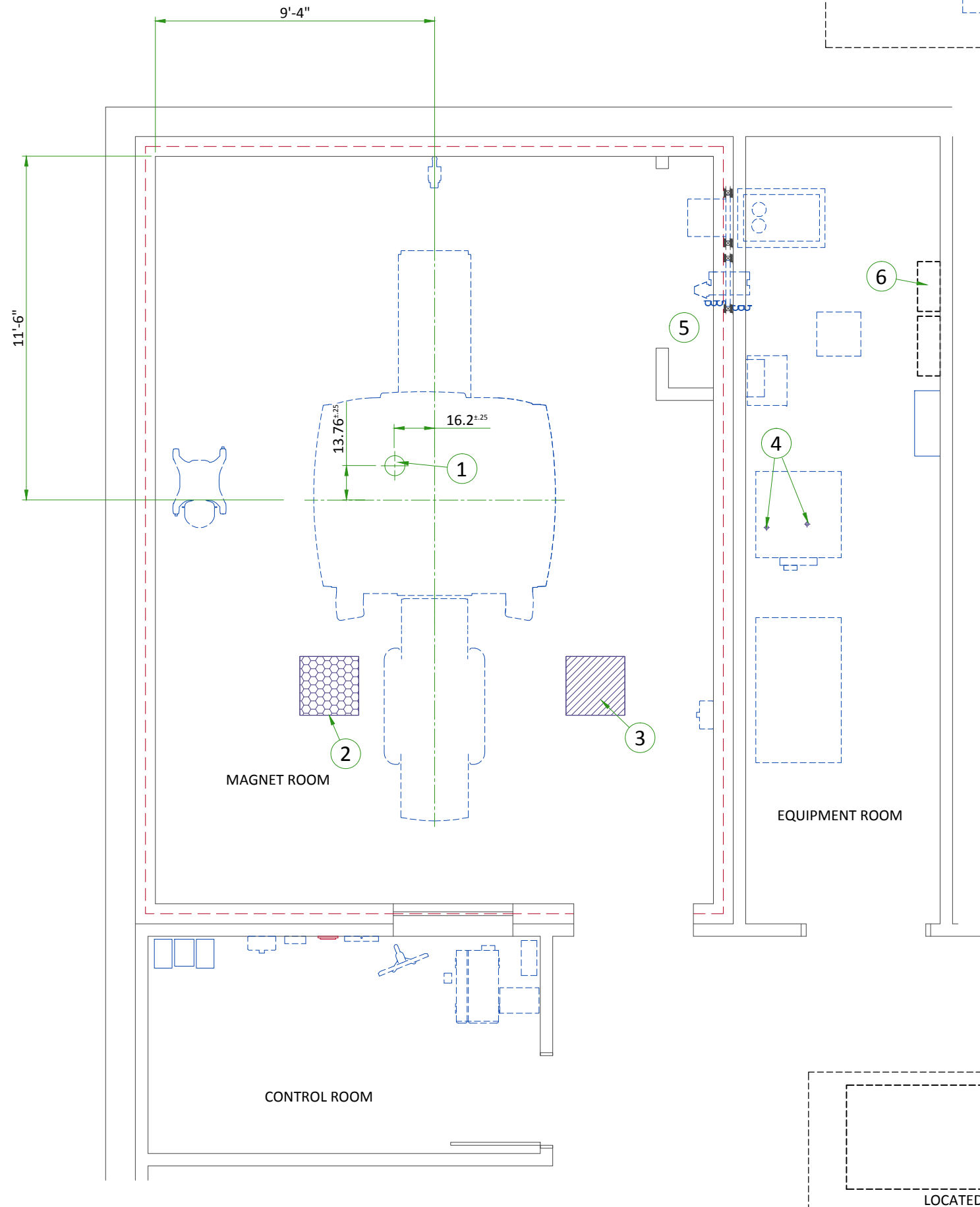
NOT TO SCALE

## CABLE CONCEALMENT



NOTE:

- This drawing is to be used only as a design intent document. refer to ge installation manual for tray install. actual tray installation may be site dependent.
- This drawing not to scale



ITEM	DESCRIPTION
1	Cryogen vent (200mm [8"] O.D.)
2	Emergency exhaust vent - refer to magnet room vent requirements (position to be defined)
3	Pressure equalization vent - refer to magnet room vent requirements (position in ceiling to be defined)
4	38mm [1.5"] NPT Male connectors, at 2.1m [82.67"] above floor, (2) 38mm [1.5"] copper lines (insulated) and (2) shut off valves. refer to chilled water block diagram
5	Closet must allow free air exchange of 400 CFM between magnet room and closet
6	Provide as needed - low pressure rubber multipurpose hose, inside dia. 1/2" working pressure range: 250 to 499 PSI - refer to the manual city water back-up system detail
7	(2) 50mm [2"] I.D. High pressure hoses and (2) 50mm [2"] to 38mm [1.5"] Reducers

**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		
	Range			Range			Range		
Temperature	15 to 21°C			15 to 32°C			15 to 32°C		
	59 to 69.8°F			59 to 89.6°F			59 to 89.6°F		
Temperature gradient	± 3°C/h			± 3°C/h			± 3°C/h		
	± 5°F/h			± 5°F/h			± 5°F/h		
Relative humidity (1)	30% to 60%			30% to 70%			30% to 70%		
Humidity gradient	≤ 5%/h			≤ 5%/h			≤ 5%/h		
System heat dissipation	Stand by	Average	Max	Stand by	Average	Max	Stand by	Average	Max
	1.01kW	1.8kW	3.15kW		1.46kW		5.79kW	6.87kW	13.05kW
	3450 btu	6142 btu	10748 btu		4947 btu		19769 btu	23225 btu	44523 btu

NOTE  
Maximum ambient temperature for the Equipment room at inlet is derated by 1°C per 300 m (984 ft) above 2000 m (6562 ft) (not to exceed 2600 m [8530 ft]).

## AIR EXCHANGE

According to local standards.

NOTE  
In case of using air conditioning systems or chilled water piping 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-ferrous.
- Waveguides must be non-ferrous 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 EXHAUST VENT REQUIREMENT

- Exhaust vent system is supplied by the customer.
- All items within the RF enclosure must be non-ferrous.
- 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 **34 m<sup>3</sup>/min (1200 CFM)** with a minimum of **12 room air exchanges per hour**.
- The exhaust fan must be placed outside the RF shielding located outside 10 gauss (1mT) and with appropriate waveguide.
- The system must have a manual exhaust fan switch near the Operator Workspace (OW) 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

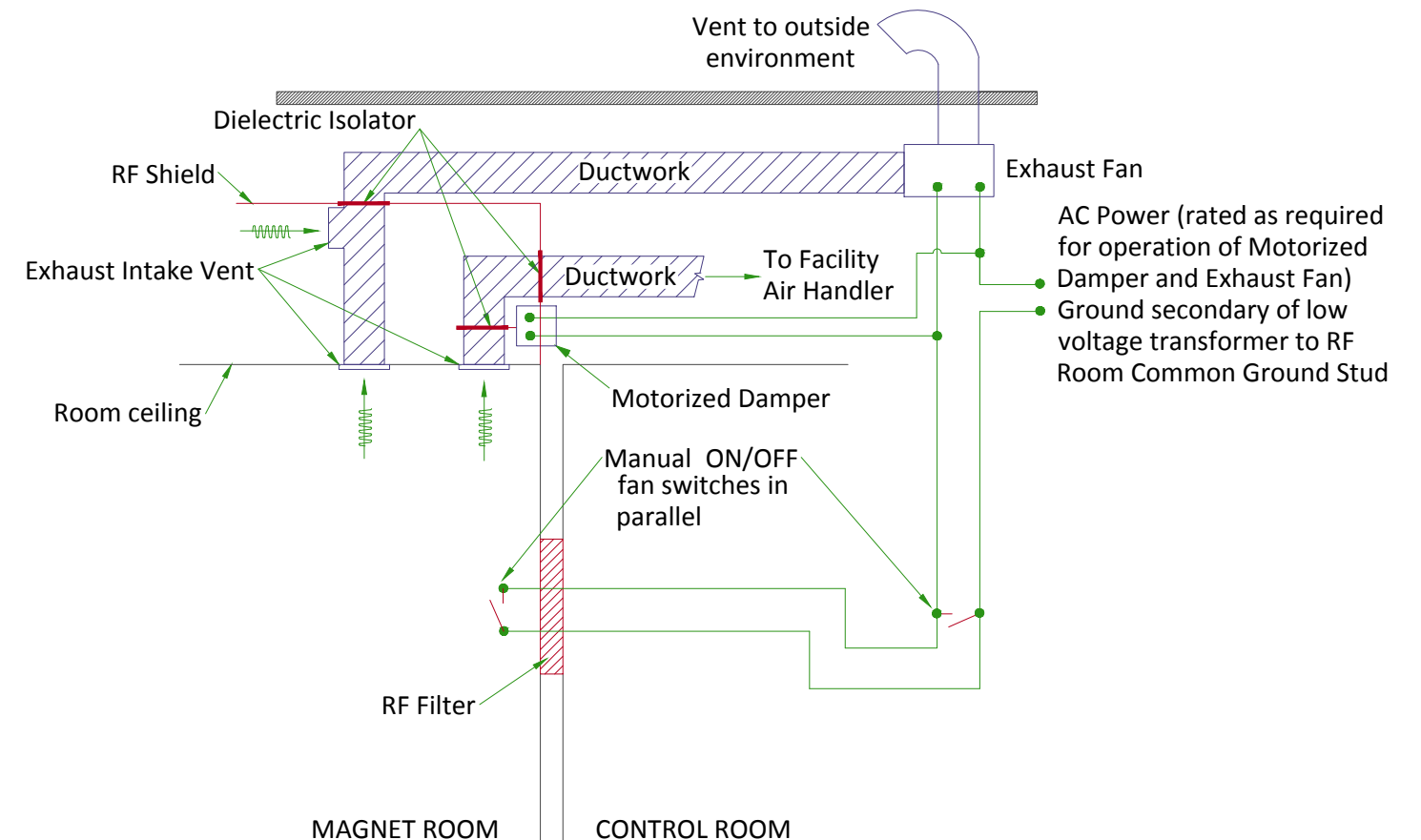
## PRESSURE EQUALIZATION VENT REQUIREMENT

- A **pressure equalizing vent is required** in the magnet room ceiling or in the wall, at the highest point possible.
- The **vent minimum size must be 610 mm x 610 mm (24 in x 24 in)** or equivalent area.
- The pressure equalization vent must be located so any Helium gas is not vented into occupied areas.  
Note: Location may affect acoustic noise transmission into occupied spaces.

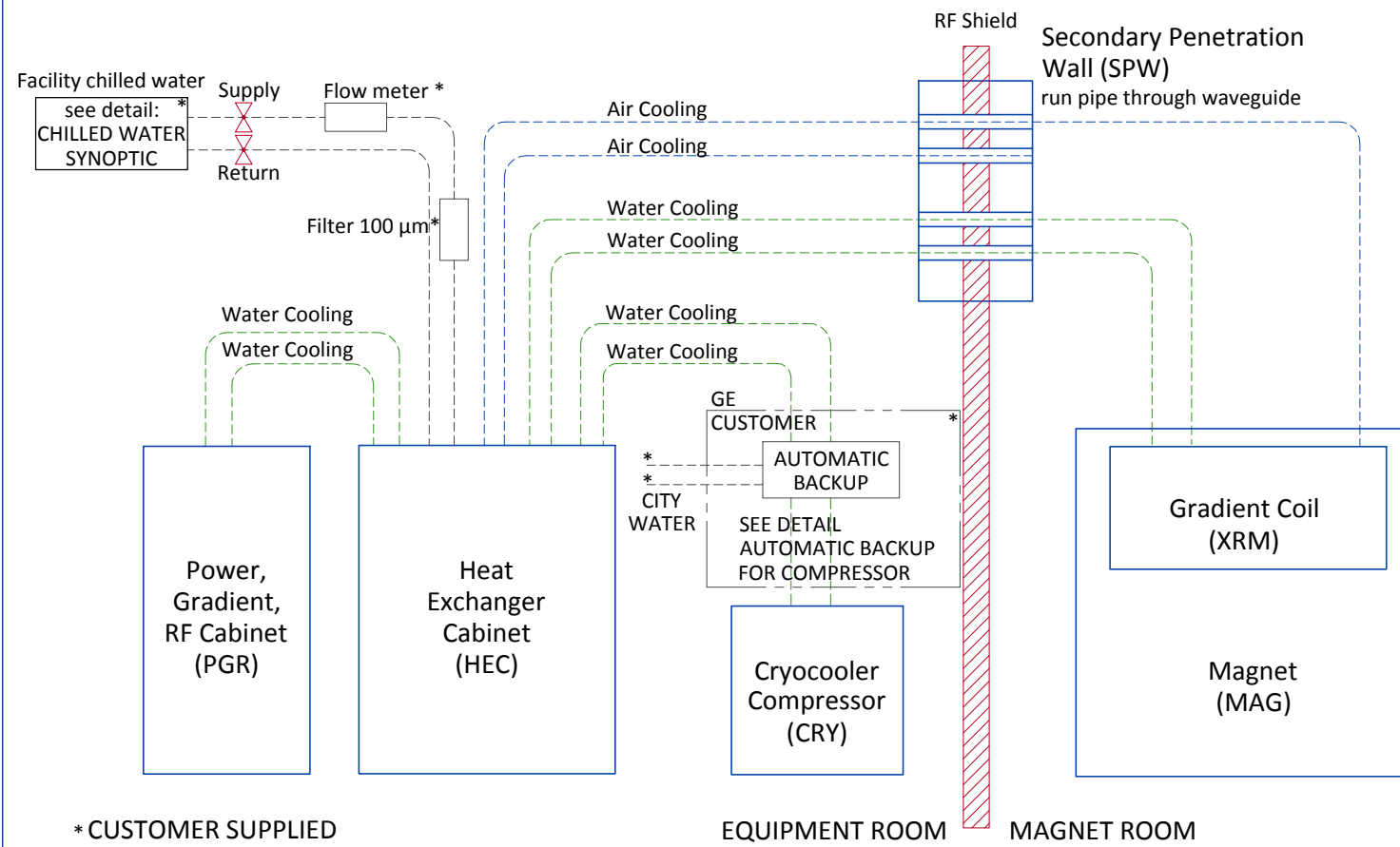
# HEAT DISSIPATION DETAILS

DESCRIPTION	ROOM	IDLE		AVERAGE		MAX	
		W	btu	W	btu	W	btu
Magnet (MAG) and Patient Table (PT)	Magnet	561	1915	1200	4095	2400	8189
Blower Box (MG6)	Magnet	450	1535	450	1535	450	1535
Penetration Panel Cabinet (PEN)	Magnet	0	0	150	512	300	1024
Penetration Panel Cabinet (PEN)	Equipment	1568	5349	1568	5349	3135	10697
Secondary Penetration Wall (SPW)	Magnet/Equipment	0	0	0	0	0	0
Main Disconnect Panel (MDP)	Equipment	132	450	132	450	264	901
Power, Gradient, RF Cabinet (PGR)	Equipment	2500	8530	3068	10470	6137	20940
Cryocooler Compressor (CRY)	Equipment	500	1706	500	1706	500	1706
Heat Exchanger Cabinet (HEC)	Equipment	500	1706	500	1706	1000	3412
Magnet Monitor (MON)	Equipment	240	819	240	819	240	819
Operator Workspace equipment (OW)	Control	1450	4947	1450	4947	1450	4947
<b>OPTIONS</b>							
Multi-Nuclear Spectroscopy Cabinet (MNS)	Equipment	7205	24584	7205	24584	7205	24584
BrainWave HW Lite Cabinet (BW)	Equipment	685	2337	685	2337	685	2337
BrainWave HW Lite Cabinet (BW) with options	Equipment	815	2781	815	2781	815	2781
CADstream	Equipment	354	1209	799	2725	1773	6049
MR Elastography (MRE)	Equipment	141	480	141	480	141	480

# MAGNET ROOM EXHAUST FAN SCHEMATIC



## CHILLED WATER BLOCK DIAGRAM

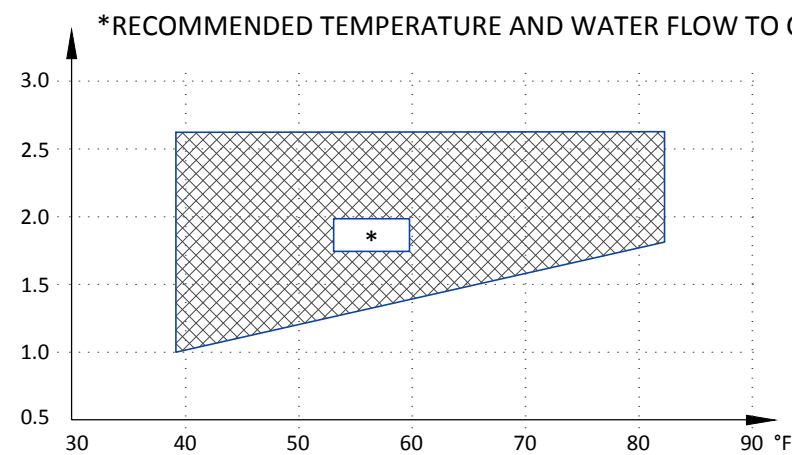


## CHILLED WATER SPECIFICATIONS

PARAMETER		REQUIREMENTS	
Chiller size		Minimum 70 kW	
Inlet temperature		42.8 to 53.6°F (6 to 12°C) measured at the inlet to the HEC	
Hose connections to the HEC (supplied by customer)		1.5 inch (38.1 mm) male NPT	
		<b>MINIMUM FLOW</b> 30 gpm (114 l/min)	<b>MAXIMUM FLOW</b> 35 gpm (132 l/min)
<b>PRESSURE DROP IN HEC CABINET</b>	40% propylene glycol, 60% water	34.8 psi (2.4 bars)	47.8 psi (3.3 bars)
	100% Water	1.5 bars	2.3 bars
Availability		Continuous	
Antifreeze		no more than 40% propylene glycol	
Temperature rise at minimum flow		17.3°F (9.6°C) with 40% propylene glycol-water 3730J/(kgK) specific heat, 1021kg/m³ density, 70kW heat	
Temperature rise at maximum flow		15.1°F (8.4°C) with 40% propylene glycol-water 3730J/(kgK) specific heat, 1021kg/m³ density, 70kW heat	
Maximum inlet pressure to HEC		87 psi (6 bar)	
Minimum continuous heat load		7.5 kW	
Hoses to be provided by customer		1.5 inch (38.1 mm) minimum hose inside diameter	
pH level		6.5 to 8.2 at 77°F (25°C)	
Total hardness		Less than 200 ppm	
Suspended matter		Less than 10 ppm	
Particle size		Less than 100 micron	
Facility filter		100 micron or smaller with a field-changeable filter	
Condensation protection		Facility plumbing to the HEC must be properly routed and insulated to prevent equipment damage or safety hazards	

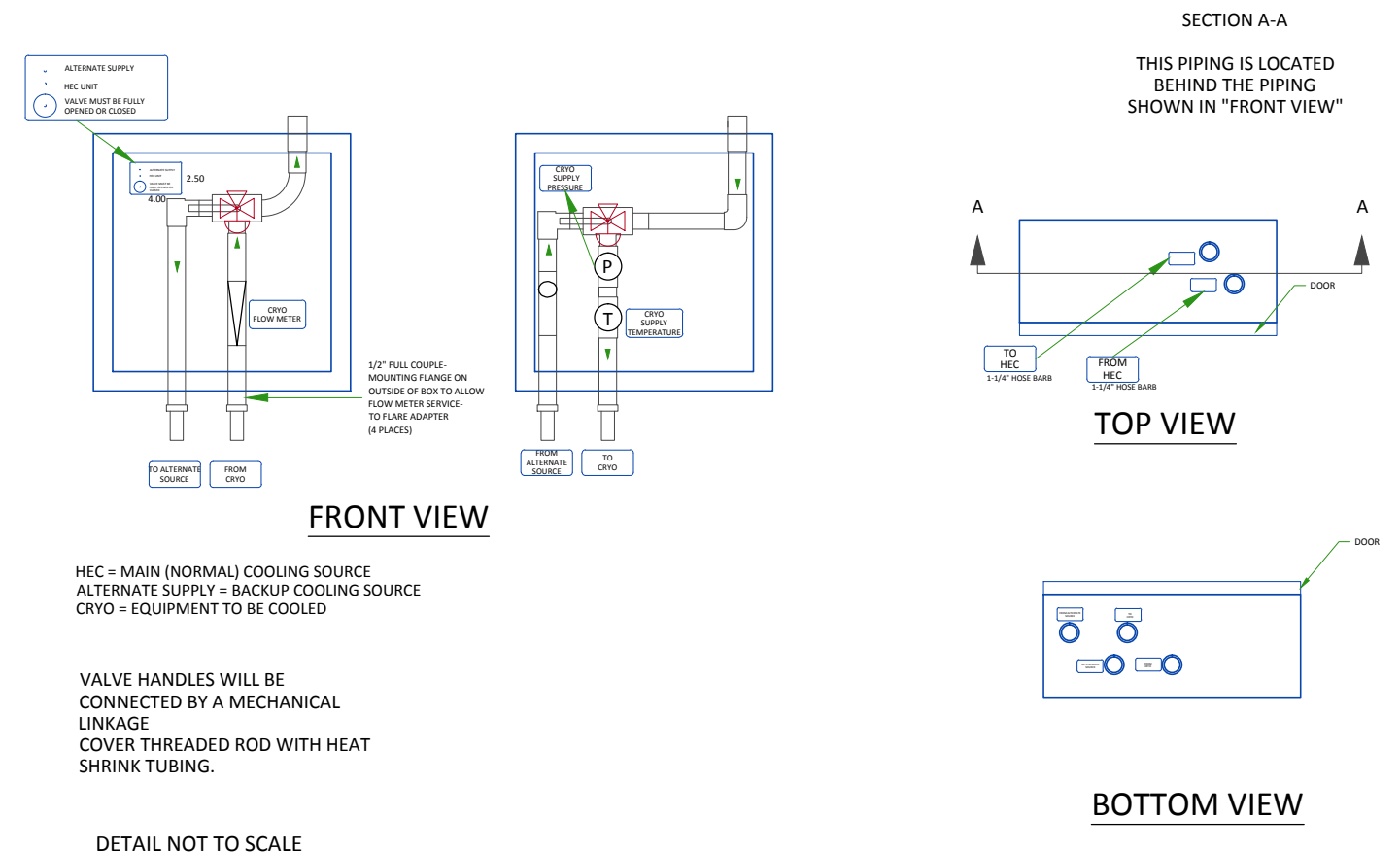
## CITY WATER BACKUP SPECIFICATIONS FOR COMPRESSOR

### 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)	

## MANUAL CITY WATER BACKUP SYSTEM (SAMPLE-DIMPLEX)





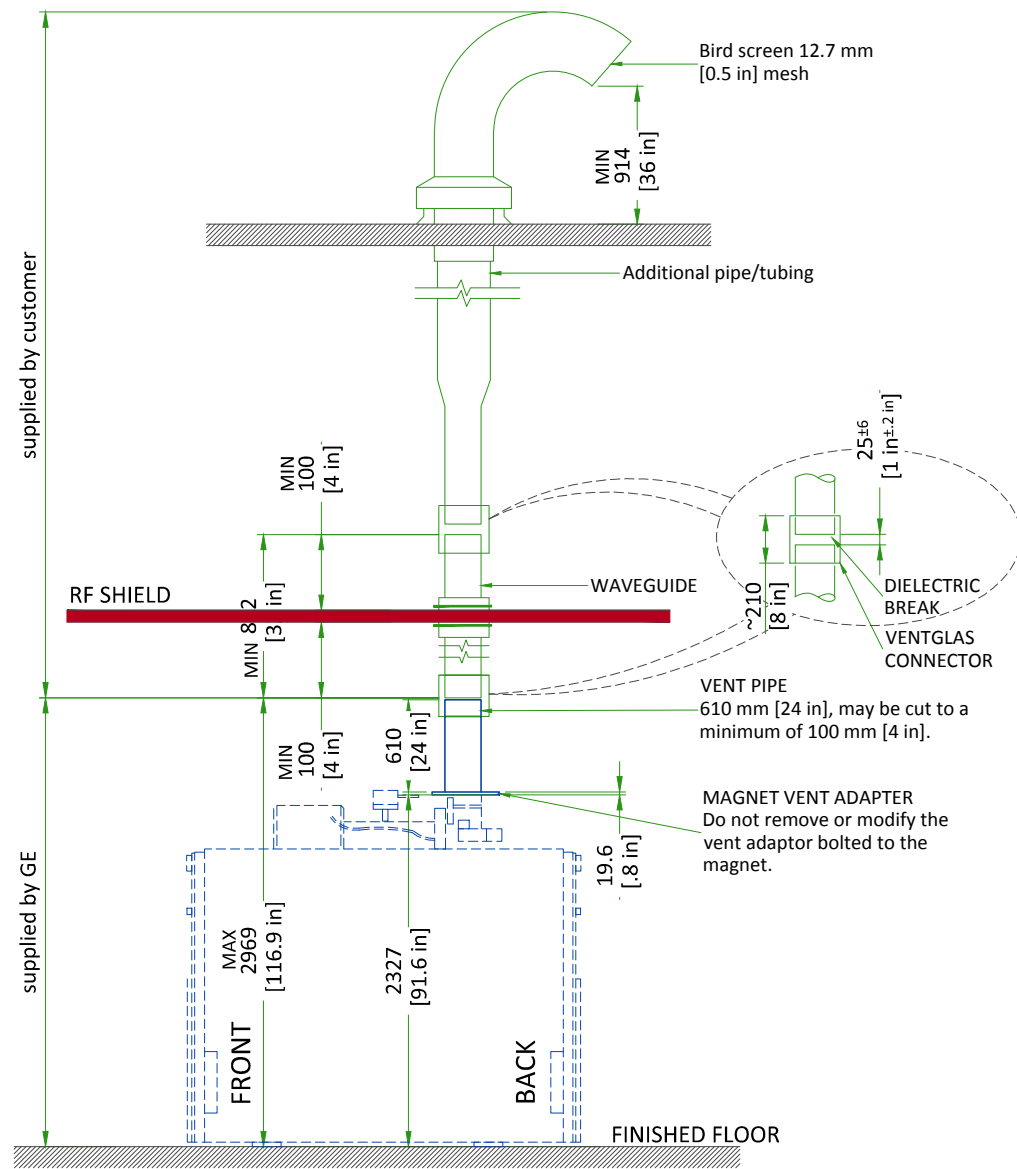
## MAGNET CRYOGENIC VENT SYSTEM PRESSURE DROP MATRIX

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	
	ft	m	psi/ft	kPa/m	psi	kPa	psi	kPa	psi	kPa	psi	kPa	psi	kPa
8 in. (200mm)	0- 10	0.00-3.05	0.14	3.22	1.12	7.70	0.74	5.13	2.09	14.43	1.40	9.62	4.19	28.86
	10-20	3.05-6.10	0.24	5.49	1.83	12.63	1.22	8.42	3.43	23.67	2.29	15.78	6.87	47.34
	20- 30	6.10-9.15	0.36	8.23	2.49	17.20	1.66	11.45	4.67	32.21	3.11	21.48	9.34	64.43
	30- 40	9.15-12.2	0.47	10.65	3.11	21.42	2.07	14.26	5.82	40.11	3.88	26.74	11.64	80.23
	40- 50	12.20-15.25	0.57	12.80	3.67	25.32	2.45	16.86	6.88	47.42	4.58	31.61	13.75	94.84
	50- 60	15.25-18.30	0.65	14.68	4.20	28.93	2.79	19.26	7.86	54.17	5.24	36.11	15.71	108.33
	60- 80	18.29-24.39	0.77	17.44	5.13	35.35	3.41	23.53	9.60	66.16	6.40	44.11	19.19	132.33
10 in. (250mm)	0-20	0.00-6.10	0.06	1.280	0.62	4.29	0.41	2.86	1.17	8.04	0.78	5.36	2.33	16.07
	20-40	6.10-12.22	0.12	2.725	1.05	7.25	0.70	4.83	1.97	13.58	1.31	9.05	3.94	27.16
	40-60	12.22-18.29	0.17	3.904	1.43	9.86	0.95	6.56	2.67	18.44	1.78	12.29	5.35	36.88
	60-80	18.29-24.39	0.21	4.859	1.76	12.14	1.17	8.07	3.29	22.70	2.19	15.13	6.58	45.40
	80-100	24.39-30.49	0.25	5.626	2.05	14.14	1.36	9.40	3.83	26.43	2.56	17.62	7.67	52.86
12 in. (300mm)	0-20	0.00-6.10	0.020	0.441	0.26	1.78	0.17	1.19	0.48	3.34	0.32	2.22	0.97	6.67
	20-40	6.10-12.22	0.041	0.937	0.43	3.00	0.29	1.99	0.81	5.61	0.54	3.74	1.63	11.22
	40-60	12.22-18.29	0.060	1.353	0.59	4.08	0.39	2.72	1.11	7.64	0.74	5.09	2.22	15.27
	60-80	18.29-24.39	0.075	1.702	0.73	5.06	0.49	3.36	1.37	9.45	0.91	6.30	2.74	18.89
	80-100	24.39-30.49	0.088	1.991	0.86	5.20	0.57	3.93	1.60	11.06	1.07	7.37	3.21	22.12
14 in. (350mm)	0-20	0.00-6.10	0.008	0.180	0.123	0.85	0.082	0.57	0.231	1.59	0.154	1.06	0.462	3.18
	20-40	6.10-12.22	0.017	0.380	0.206	1.42	0.137	0.95	0.386	2.66	0.257	1.77	0.771	5.32
	40-60	12.22-18.29	0.024	0.552	0.281	1.94	0.187	1.29	0.525	3.62	0.350	2.42	1.051	7.25
	60-80	18.29-24.39	0.031	0.699	0.349	2.41	0.232	1.60	0.652	4.50	0.435	3.00	1.304	8.99
	80-100	24.39-30.49	0.036	0.824	0.411	2.83	0.272	1.88	0.766	5.28	0.511	3.52	1.533	10.57
16 in. (400mm)	0-20	0.00-6.10	0.004	0.083	0.065	0.45	0.043	0.30	0.122	0.84	0.081	0.56	0.244	1.68
	20-40	6.10-12.22	0.008	0.174	0.108	0.75	0.072	0.50	0.202	1.39	0.135	0.93	0.404	2.79
	40-60	12.22-18.29	0.011	0.253	0.148	1.02	0.098	0.68	0.275	1.90	0.184	1.27	0.551	3.80
	60-80	18.29-24.39	0.014	0.323	0.184	1.27	0.122	0.84	0.342	2.36	0.228	1.57	0.685	4.72
	80-100	24.39-30.49	0.017	0.383	0.022	1.49	0.144	0.99	0.404	2.78	0.269	1.86	0.807	5.57

**Notes**

1. Elbows with angles greater than 90 deg must not be used
2. Data in Table 2 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
3. The total pressure drop of the entire cryogenic vent system must be less than 20 psi (138 kPa). The calculation starts at the magnet vent interface and ends at the termination point outside the building.

## 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. Magnet room end must not be more than 2969 mm [117 in] above finished floor.

- 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

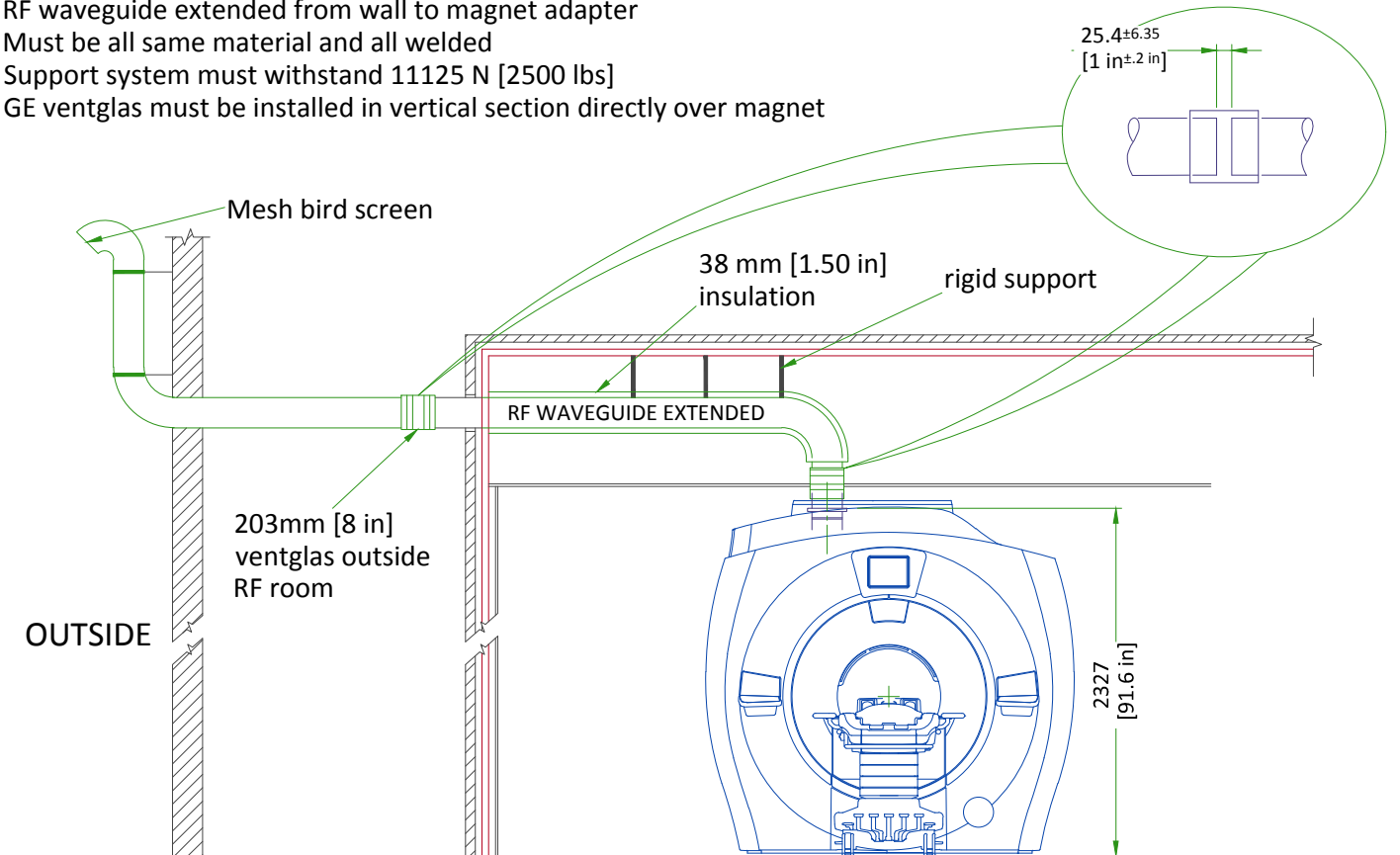
All welds on the pipe must be ground down to a smooth 203 mm [8 in] diameter so that it can be clamped to the Ventglas with enough force.

- 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

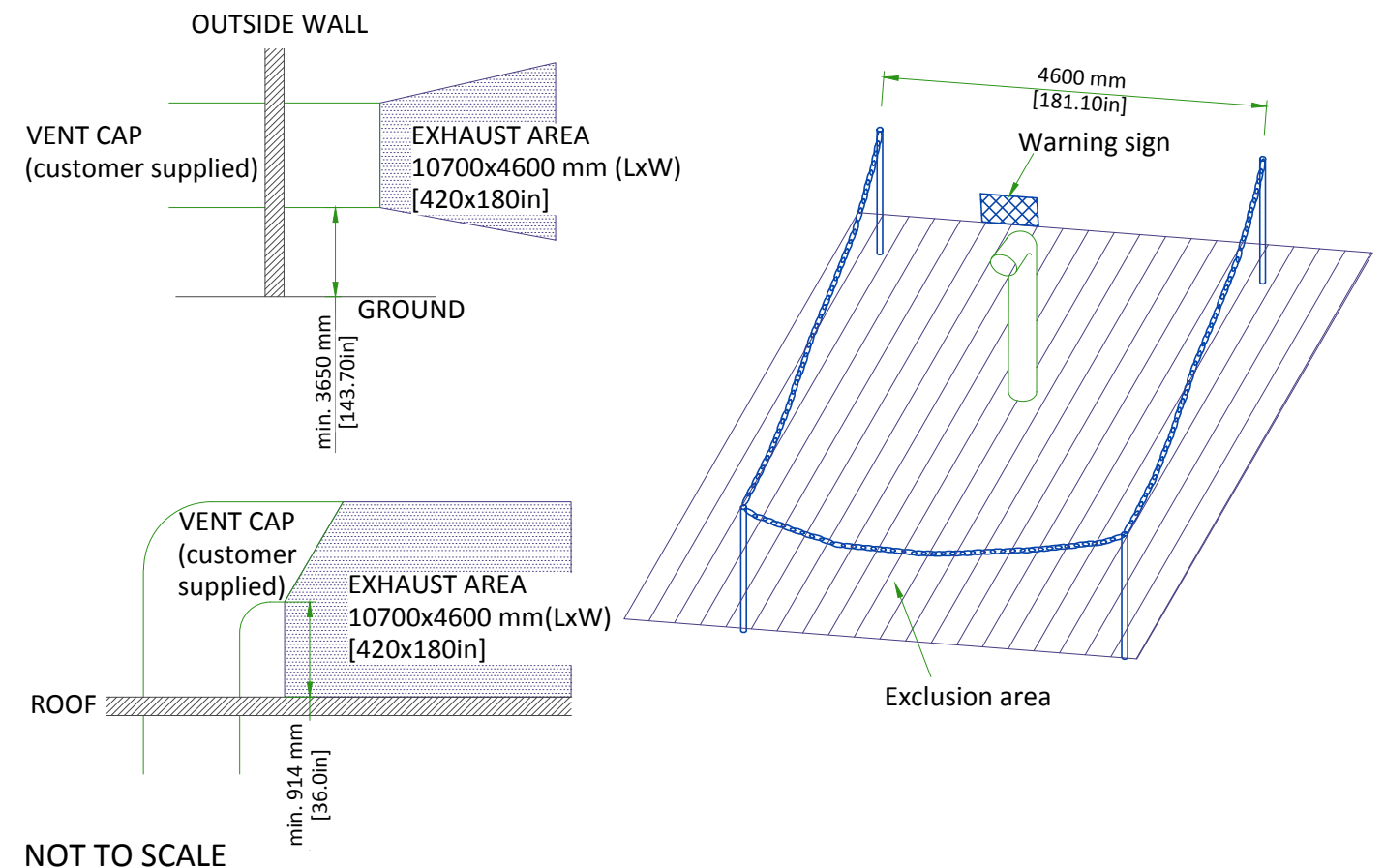
## TYPICAL CRYOGEN SIDE WALL EXIT WITH LONG SWEEP ELBOW

### KEY COMPONENTS :

- RF waveguide extended from wall to magnet adapter
- Must be all same material and all welded
- Support system must withstand 11125 N [2500 lbs]
- GE ventglas must be installed in vertical section directly over magnet



## CRYOGENIC VENTING ( EXTERIOR )



## 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 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 power source is located outside the magnet room RF.
- Battery chargers (e.g., used for emergency lighting) must be located outside the magnet RF room.
- Short filament length bulbs are recommended.
- Linear lamps are not recommended due to the high burnout rate.

## CONNECTIVITY REQUIREMENTS

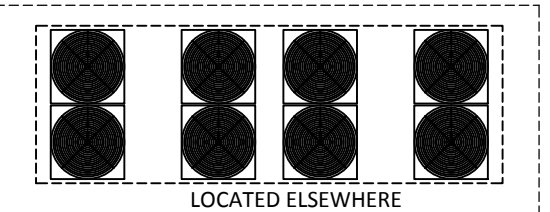
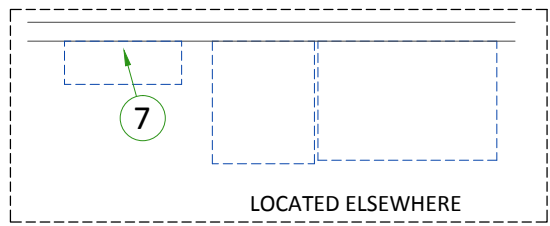
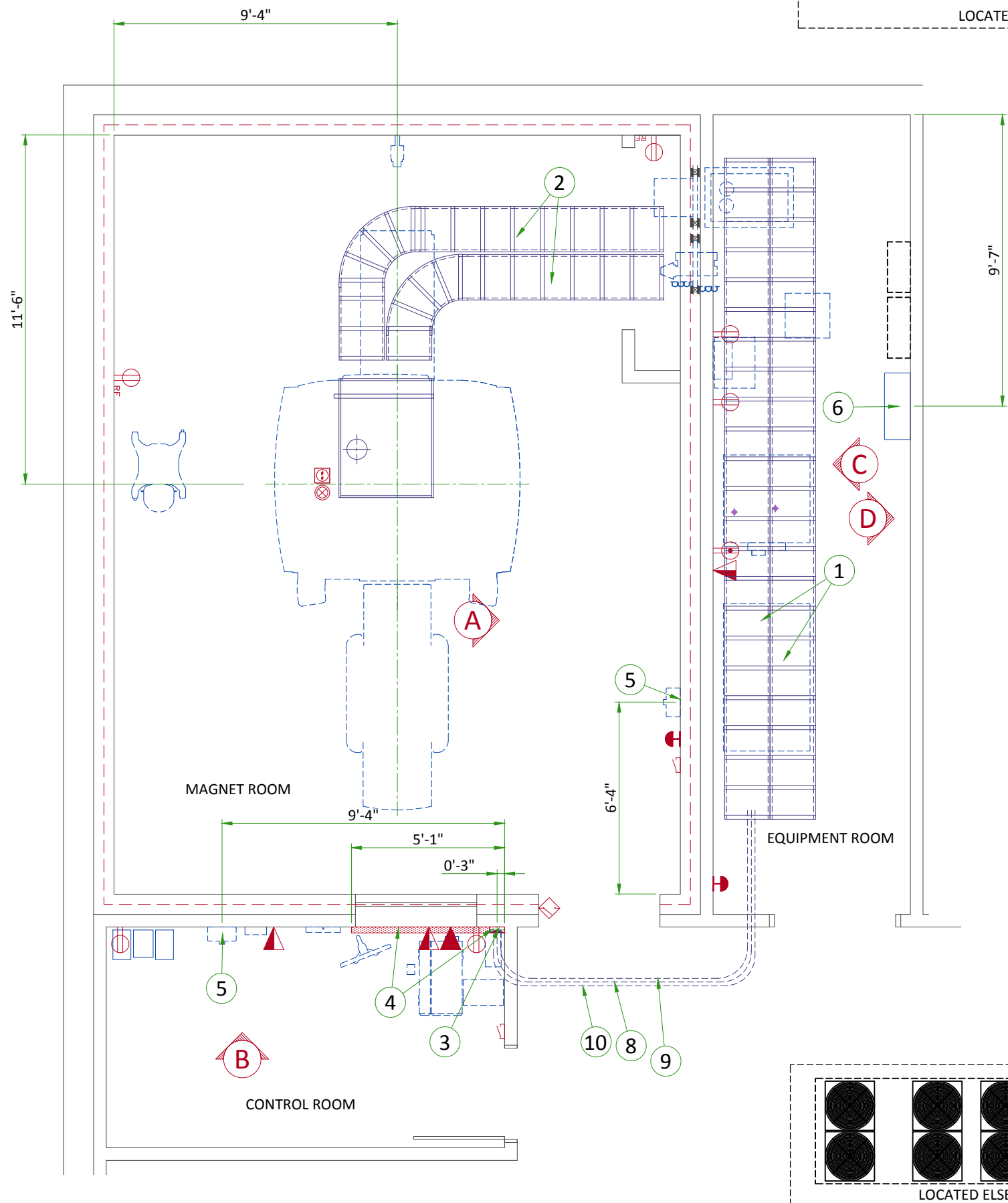
Broadband Connections are necessary during the installation process and going forward to ensure full support from the Engineering Teams for the customers system. Maximum performance and availability for the customers system is maintained and closely monitored during the lifetime of the system. Proactive and reactive maintenance is available utilising the wide range of digital tools using the connectivity solutions listed below:

- Site-to-Site VPN/GE Solution
- Site-to-Site VPN/Customer Solution
- Connection through Dedicated Service Network
- Internet Access - connectivity for InSite 2.0

The requirements for these connectivity solutions are explained in the broadband solutions catalogue (separate document).

## ELECTRICAL NOTES

1. All wires specified shall be copper stranded, flexible, thermo-plastic, color coded, cut 10 foot long at outlet boxes, duct termination points or stubbed conduit ends. All conductors, power, signal and ground, must be run in a conduit or duct system. Electrical contractor shall ring out and tag all wires at both ends. Wire runs must be continuous copper stranded and free from splices.
    - 1.1. 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. 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.
  10. The maximum point to point distances illustrated on this drawing must not be exceeded.
  11. Physical connection of primary power to GE equipment is to be made by customers electrical contractor with the supervision of a GE representative. The GE representative would be required to identify the physical connection location, and insure proper handling of GE equipment.
  12. 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.
- All junction boxes, conduit, duct, duct dividers, switches, circuit breakers, cable tray, etc., are to be supplied and installed by customers electrical contractor.
  - Conduit and duct runs shall have 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 access flooring are to be cut out and finished off with grommet material by the customers contractor.
  - General contractor to insert pull cords for all cable run conduits between the equipment room and the operators control room.
  - 10 foot pigtailed at all junction points.
  - Grounding is critical to equipment function and patient safety. Site must conform to wiring specifications shown on this plan.



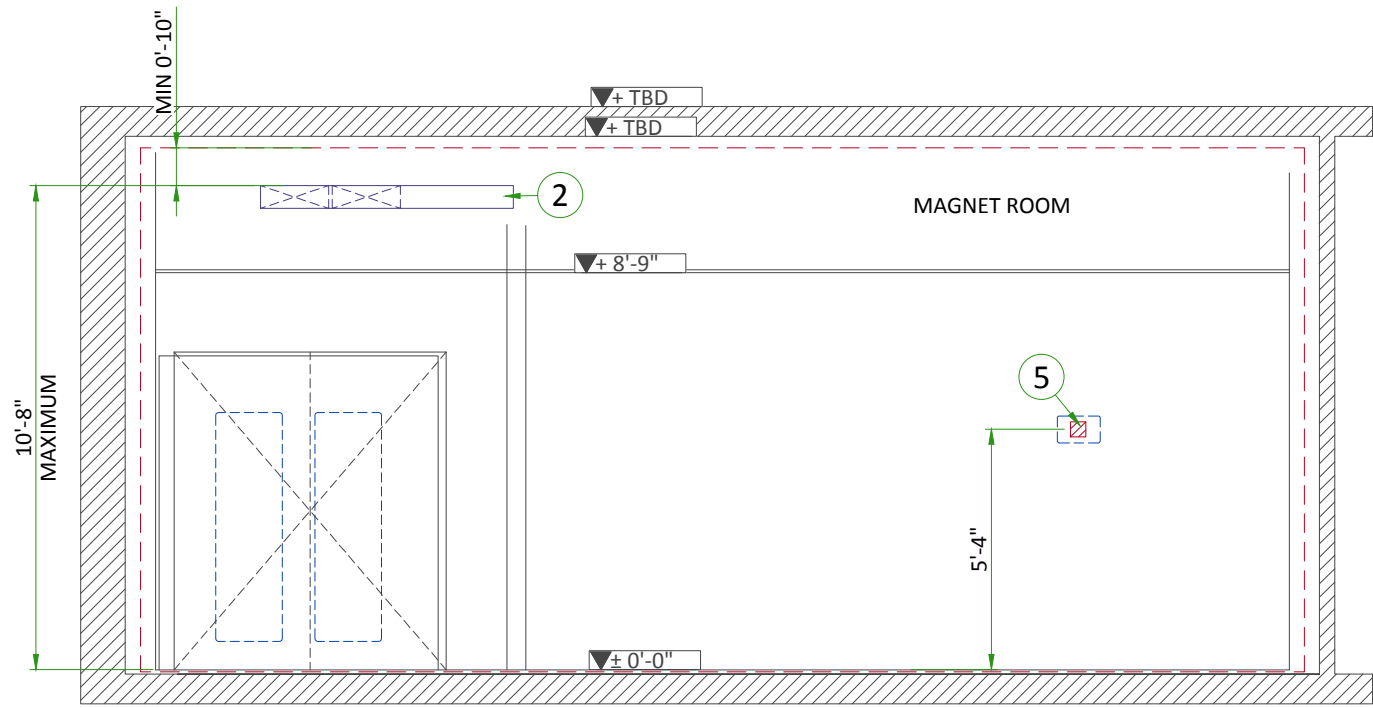
ITEM	QTY	DESCRIPTION (CONTRACTOR SUPPLIED & INSTALLED)
1		Cable ladder 450mm x 150mm [18" x 6"]
2		Non-ferrous cable ladder 450mm x 150mm [18" x 6"]
3		Box above ceiling size per local code
4		150mm x 100mm [6" x 3 1/2"] Surface wall duct
5		Magnet rundown unit/remote magnet rundown unit
6		Main disconnect panel
7		Main bypass panel
8		One 50mm [2"] cnd above ceiling
9		One 75mm [3"] cnd above ceiling
10		One 65mm [2 1/2"] cnd above ceiling

ITEM	QTY	Outlet Legend for GE Equipment
		System emergency off (SEO), (recommended height 1.2m [48"] above floor)
		Door interlock switch (needed only if required by state/local codes)
		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

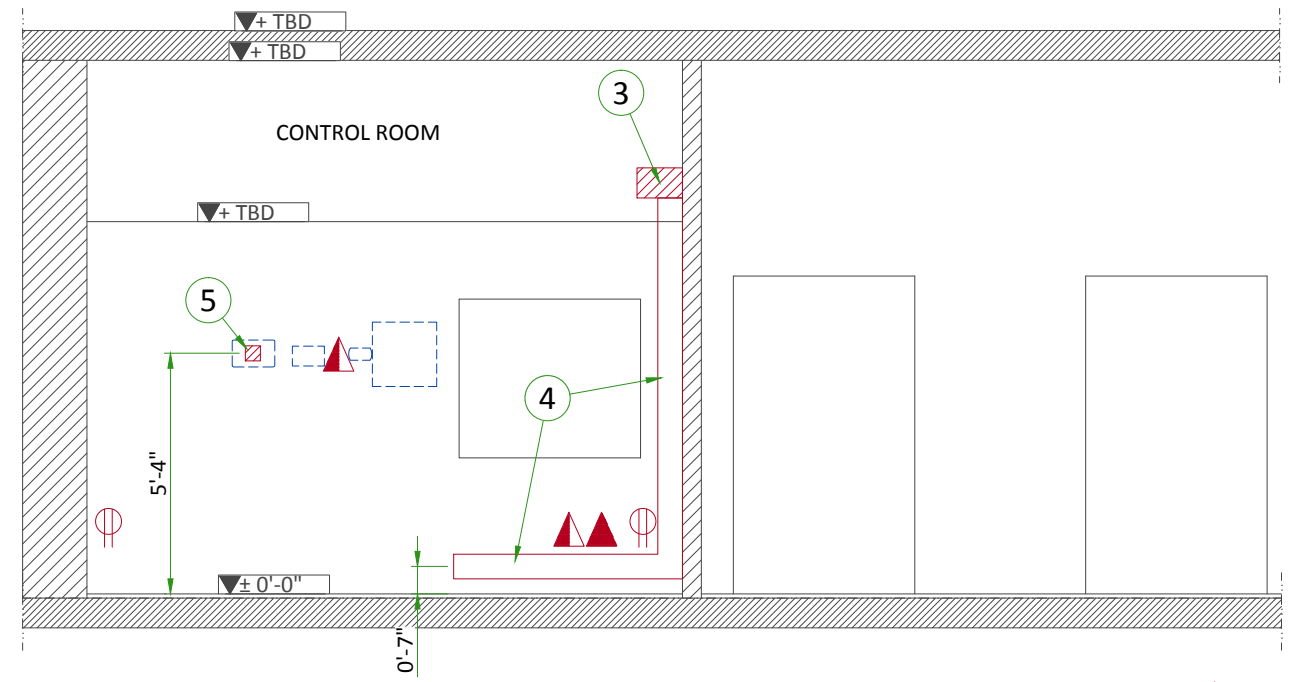
**Additional Conduit Runs  
(Contractor Supplied and Installed)**

From	To	Qty	Size (in)	Size (mm)
Main Disconnect Panel	Power, Gradient, RF cabinet	1	as Req'd	
	Heat Exchange Cabinet	1	as Req'd	
	System emergency off	1	1/2	16
System emergency off	Secondary Penetration Wall	1	1/2	16
Door Switch	Power, Gradient, RF cabinet	1	3/4	20
System emergency off	Secondary Penetration Wall	1	3/4	20
Magnet Rundown Unit	Magnet	1	1	25
	RF filter	1	as Req'd	
RF filter	120-V 1Ø Power	1	as Req'd	
Room Light	RF filter	1	as Req'd	
RF filter	Facility emergency power	1	as Req'd	
Main Bypass Panel	Main Disconnect Panel	1	as Req'd	
	UPS	2	as Req'd	
	Facility power		as Req'd	
Chiller	Remote graphic display	1	3/4	20
	Facility power	1	as Req'd	
TV Camera	Waveguide or RF filter	1	1	25
TV Monitor		1	1	25
Injector control unit	Waveguide or RF filter	1	2 1/2	70
Injector head		1	as Req'd	
Integrated Battery Charging Unit		1	as Req'd	

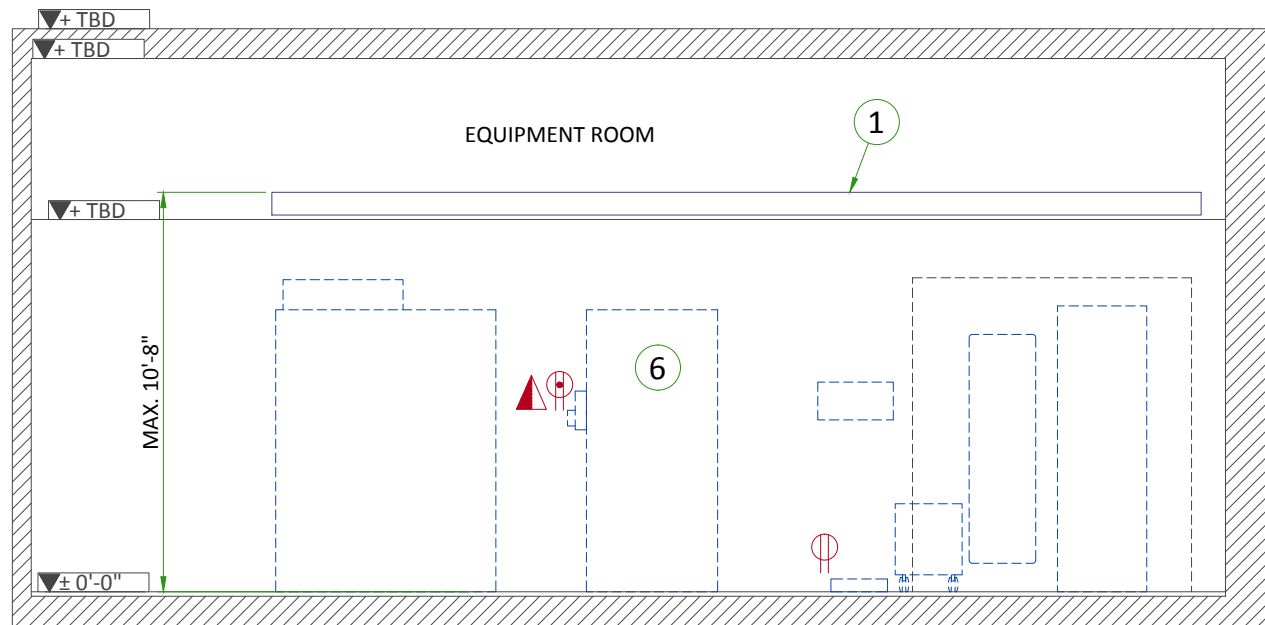




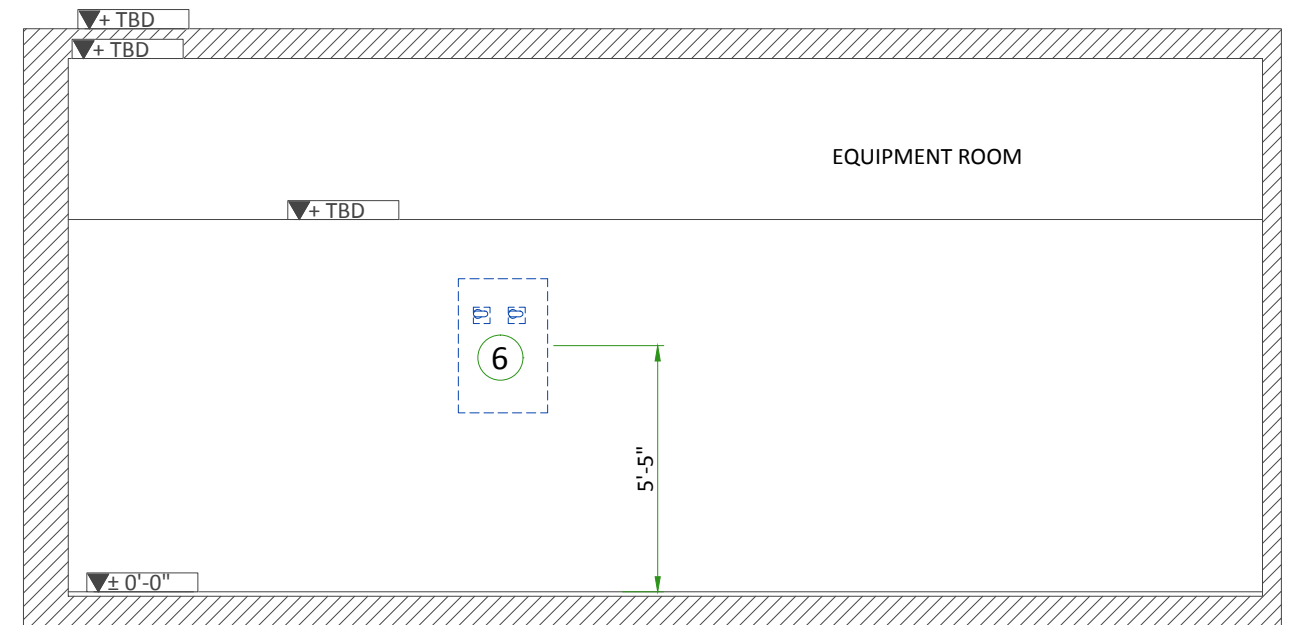
A



B

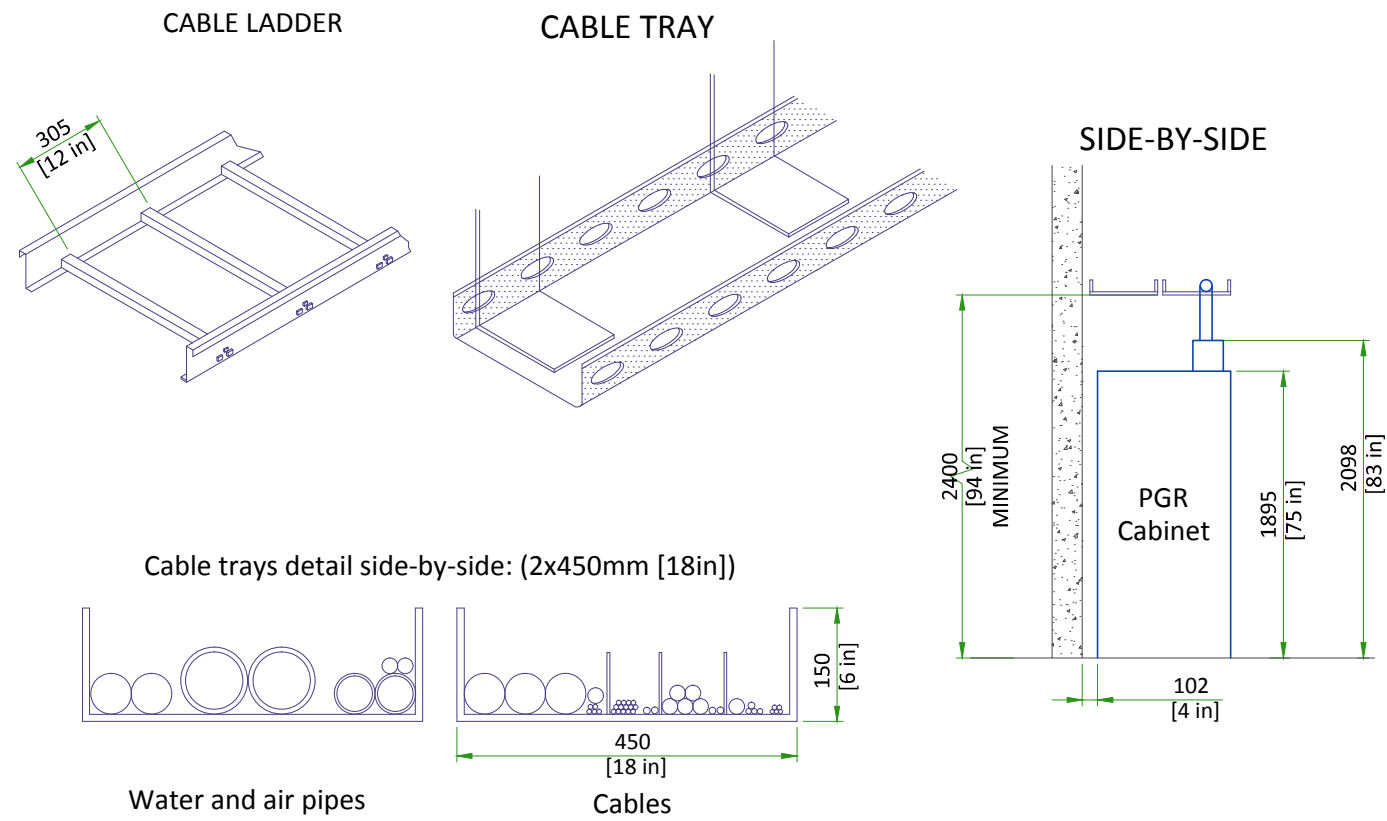


C

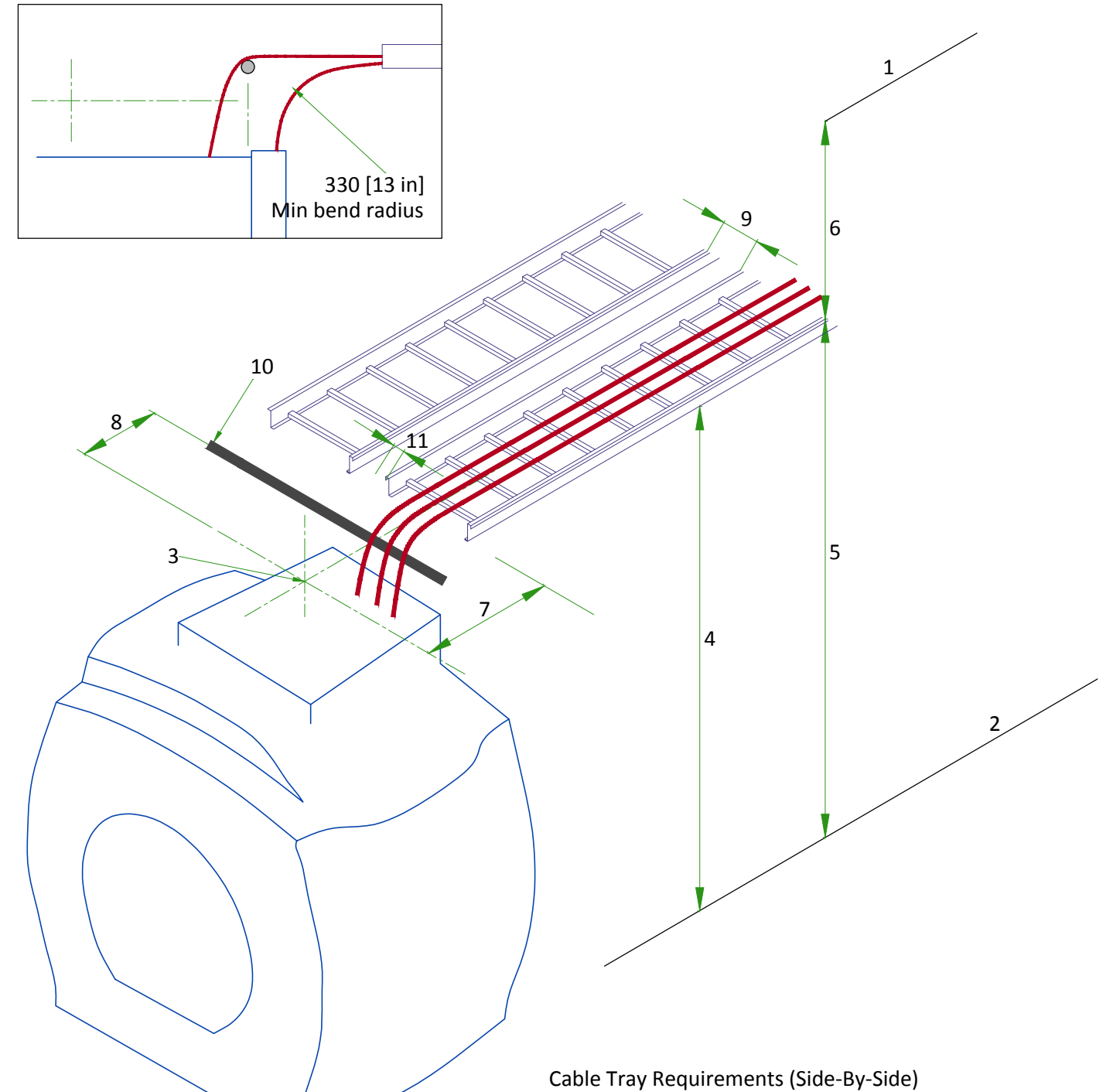


D

## CABLE WAYS IN EQUIPMENT ROOM

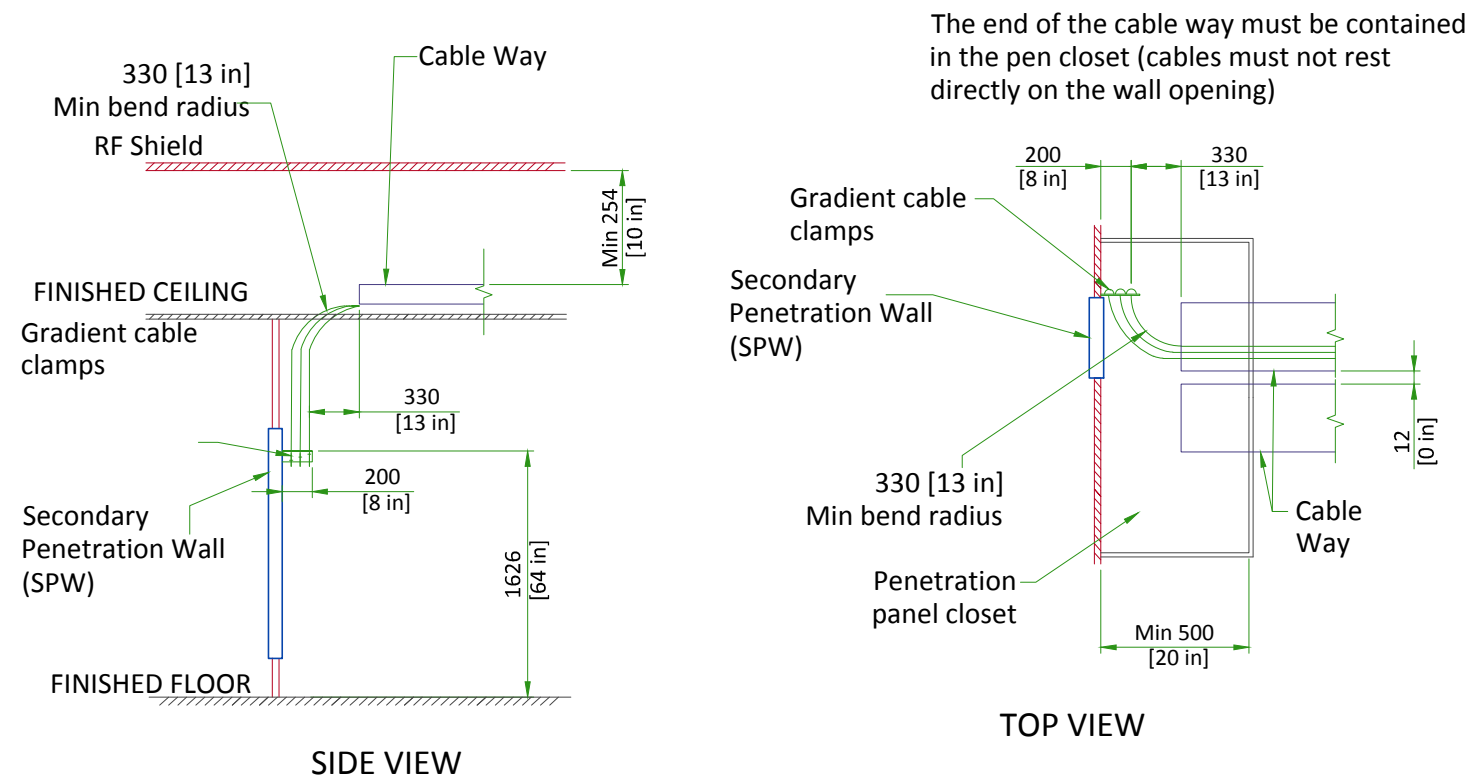


## CABLE TRAYS REQUIREMENTS IN MAGNET ROOM



## CABLE WAY TO PENETRATION PANEL

### CABLE WAY TO PENETRATION PANEL REQUIREMENTS IN THE EXAM ROOM SIDE VIEW



- 1 - Ceiling
- 2 - Finished Floor
- 3 - Magnet isocenter. Gradient cables must be centered on magnet isocenter.
- 4 - Minimum cable tray height required at back of Magnet: 2581 mm [101.5 in].  
Tray height may be lower at other points to avoid obstructions.
- 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 or other obstruction: 254 mm [10 in].
- 7 - Tray end to isocenter: 1245 ±12 mm [49 ±0.5 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 - Distance from isocenter to edge of right cable tray 60mm [2.36 in].

# POWER REQUIREMENTS

## SPECIFICATIONS OF MAIN POWER INPUT

POWER SUPPLY	<b>380/400/415/480V ±10%, THREE-PHASE + N + G</b>
FREQUENCIES	<b>50/60Hz ± 3Hz</b>
POWER FACTOR	<b>0.9</b>
MAXIMUM INPUT POWER (5 sec MAX)	<b>123kVA</b>
INSTALLED LOAD	<b>99kVA</b>
STAND-BY POWER	<b>&lt; 17kVA</b>

- 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%.

## SPECIFICATIONS OF BACK-UP POWER SUPPLY

FOR MAGNET MONITOR	
POWER INPUT	<b>EMERGENCY POWER SUPPLY, SINGLE PHASE + GROUND</b>
POWER DEMAND	<b>2kVA</b>
VOLTAGE	<b>110V / 220V</b>
FREQUENCY	<b>50/60Hz ± 3Hz</b>

FOR CRYOCOOLER COMPRESSOR	
POWER INPUT	<b>380/400/415/480V, THREE-PHASE + G</b>
POWER REQUIREMENT	<b>MIN 9kVA</b>
POWER CONSUMPTION	<b>MAX 7.2kW / STEADY STATE 6.5kW at 50Hz MAX 8.3kW / STEADY STATE 7.5kW at 60Hz</b>
FREQUENCY	<b>50/60Hz ± 3Hz</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.

FEEDER TABLE								
MIN. FEEDER WIRE SIZE, AWG OR MCM (sq. M)/VAC	MINIMUM FEEDER WIRE LENGTH - ft (m)							
	100 (30.5)	150 (46)	200 (61)	250 (76)	300 (92)	350 (107)	400 (122)	450 (137)
480 VAC	3/0 (85)	3/0 (85)	3/0 (85)	3/0 (85)	3/0 (85)	3/0 (85)	3/0 (85)	3/0 (85)
GROUND REQ'D	4	4	4	4	4	4	2	2

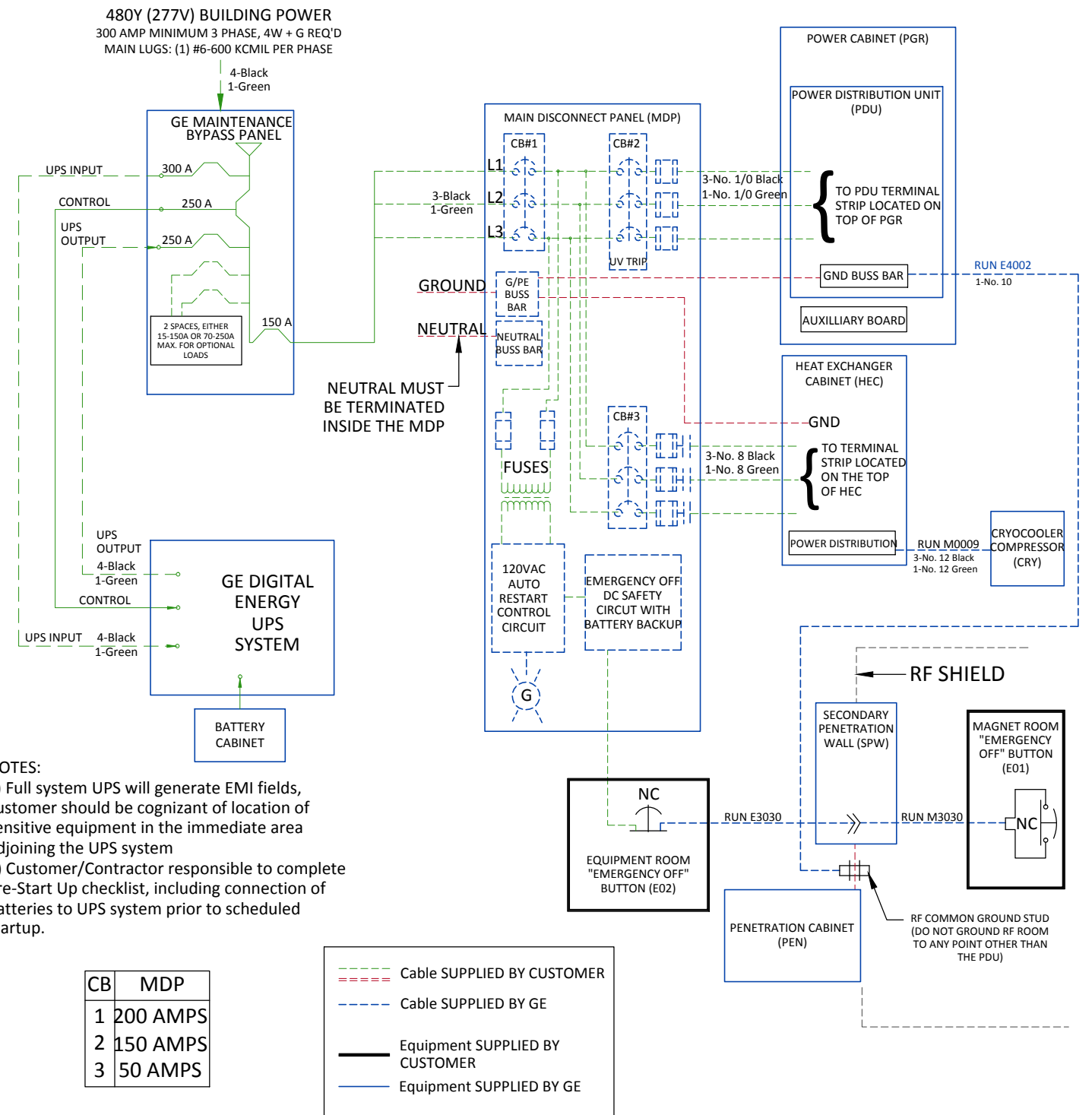
**GENERAL NOTES**

In all cases qualified personnel must verify that the feeder (at the point of take-off) and the run to the CT system meet all the requirements stated in the PIM

For a single unit installation, the minimum transformer size is 225kVa. Regulated transformer is not required unless voltage changes exceed +/- 10% over a period of 1 hour or longer

Grounding conductor will run from the equipment back to the power source/main grounding point and always travel in the same conduit with the feeders

# POWER DISTRIBUTION



### NOTES:

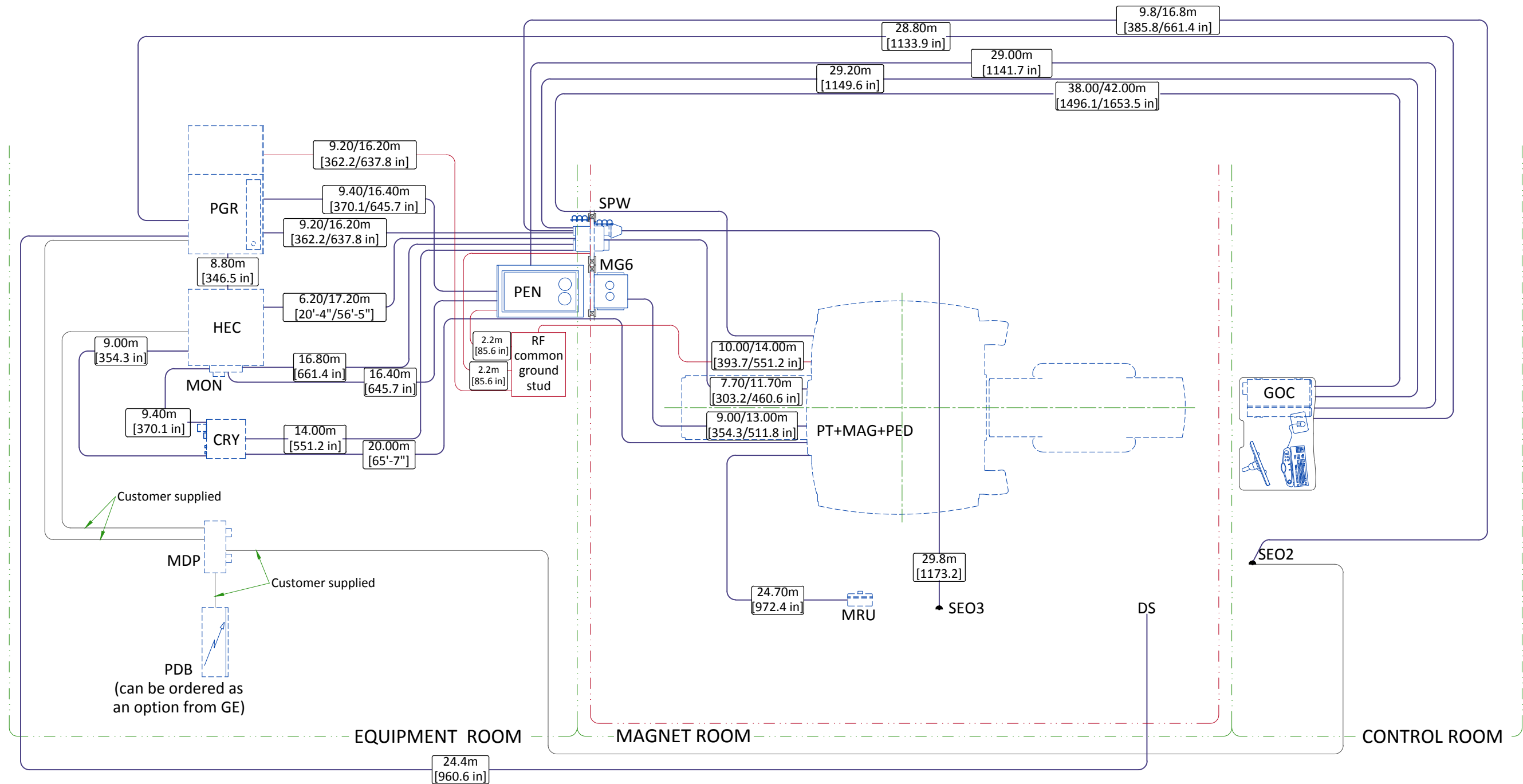
- 1) Full system UPS will generate EMI fields, customer should be cognizant of location of sensitive equipment in the immediate area adjoining the UPS system
- 2) Customer/Contractor responsible to complete Pre-Start Up checklist, including connection of batteries to UPS system prior to scheduled startup.

CB	MDP
1	200 AMPS
2	150 AMPS
3	50 AMPS

### NOTE:

- THE HEAT EXCHANGER CABINET (HEC) PROVIDES POWER TO THE CRYOCOOLER COMPRESSOR (CRY) WHICH MUST OPERATE 24 HOURS PER DAY, 7 DAYS PER WEEK TO MAXIMIZE PROPER UNINTERRUPTED MAGNET OPERATION.
- RUNS E3030, M0009, M3030 AND E4002 ARE GE SUPPLIED CABLES. ALL OTHER WIRING IS CUSTOMER SUPPLIED.
- TWO REMOTE FLUSH WALL MOUNTED EMERGENCY OFF BUTTONS ARE SUPPLIED WITH THE MDP.
- MDP PROVIDES CIRCUIT BREAKERS FOR PDU (LOCATED IN THE POWER CABINET (PGR)) AND THE HEAT EXCHANGER CABINET (HEC).
- ALL MDP OUTPUT CIRCUITS DROP OUT ON LOSS OF POWER. THE HEC CIRCUIT WILL AUTOMATICALLY RESTART UPON RESTORATION OF POWER. EMERGENCY OFF LOCKS OUT ALL CONTRACTORS.
- GE MDP SHORT CIRCUIT CURRENT RATING IS 25,000 AMPERES AT 480 VAC.
- GE MDP IS UL AND cUL LABELED.
- ALL CIRCUITS REQUIRE GROUND WIRES.
- THE WIRE SIZE FOR THE EMERGENCY-OFF CIRCUIT IS 12-22 AWG CUSTOMER SUPPLIED

# INTERCONNECTIONS



CABLES ROUTING		
Configuration	Equipment Room	Magnet Room
A	Short	Short
B	Long	Short
C	Short	Long

CABLES ROUTING FOR OPTIONS				
OPTION	FROM	TO	CABLE LENGTH	
MNS	PGR	MNS	9.75 m	383.9 in
	PEN	MNS	15.80 m	622 in
	PEN	PGR	16.60 m	653.5 in
	PEN	SPW	14.00 m	551.2 in
BW	PEN	Brainwave cabinet	18.28 m	720 in
MRE	MRE	Magnet Isocenter	Nominal: 7.31m Maximum: 10.06m	Nominal: 288 in Maximum: 396 in
	MRE	PEN cabinet	15.24m	600 in
	MRE	Ethernet Hub in PGR	15.24m	600 in
	MRE	Customer Supplied Outlet	60Hz: 6.10m 50Hz: 7.62m	60Hz: 240 in 50Hz: 300 in