



**Intermountain Medical Center  
Murray, Utah  
USA**

A	08/May/2019	Final based on request DC-96435 & existing drawing "06496202.dwg"
REV	DATE	MODIFICATIONS

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



**GE Healthcare**

Wendel Larson  
801.891.9934  
Wendel.larson@ge.com

**SIGNA PREMIER UPGRADE  
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: [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.

Drawn by	Verified by	Concession	S.O. (GON)	PIM Manual	Rev
KMS	KRB	-	PR5-C109768v4	5815067	1
Format	Scale	File Name		Date	Sheet
A3	1/4"=1'-0"	MRI-M142391-FIN-00-A.DWG		08/May/2019	01/23

## 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. 6

Customer Name:	PMI Name:
GON/SO Number:	Field Service Name:
Equipment:	Country/City or City/State:
Site Visit Date for SRC:	SRC Status:
<b>Site Ready Checks at Installation</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 on the GE drawing, is at correct location and height according to the drawing specifications. Levelness and spacing has been measured. Overhead support Structure has been confirmed with contractor to meet GE 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.	
Delivery route from truck to installation space has been reviewed, all communications have occurred, arrangements made for special handling (if needed). Floors along delivery route will support weight of the equipment, 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.	
Cableways (floor, wall, ceiling, etc.) ready for GE cables and are of correct length and diameter. Cableways routed per GE Final drawings and access openings installed as determined by GEHC PM. Surface floor duct 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 is 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.	
PMI Signature:	
Customer Signature:	
FS Signatature: 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 MR 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:

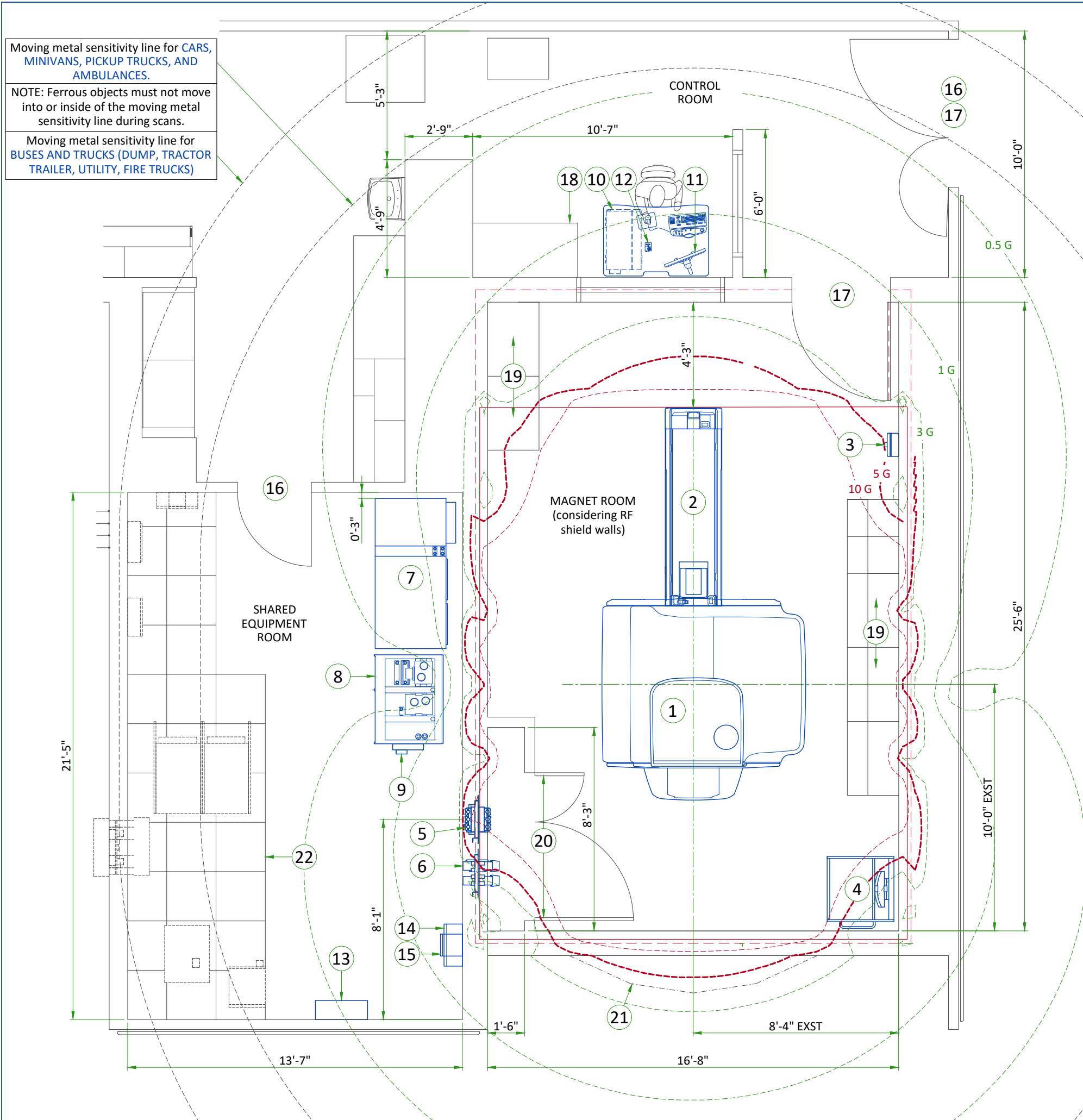
- Loose hardware/fasteners vibration or movement (electrical continuity must always be maintained)
- Flooring material including raised access flooring (panels & support hardware) and carpeting
- Electrical fixtures (i.e. Lighting fixtures, track lighting, emergency lighting, battery chargers, outlets)
- 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 RADIALLY		DISTANCE AXIALLY	
	20.0 FT	6.05 M	25.0 FT	7.65 M
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



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

BY	ITEM	DESCRIPTION	MAX HEAT OUTPUT (btu)	WEIGHT (lbs)
A	1	Existing 3T Magnet	8191	24808
A	2	Patient table - fixed	-	418
A	3	Magnet rundown unit	-	7
A	4	Phantom set storage cabinet	-	350
A	5	Integrated Systems Penetration Panel	1023	-
A	6	Integrated Cooling Penetration Panel	-	-
A	7	Integrated Systems Cabinet	39215	4699
A	8	Integrated Cooling Cabinet	3410	1353
A	9	Magnet monitor	819	10
A	10	Operator console computer	4947	122.8
A	11	Operator workspace	-	26
A	12	Pneumatic patient alert	-	0.5
B	13	Main disconnect panel	901	190
E	14	DC lighting controller	-	-
E	15	DC lighting transformer	-	-
E	16	Minimum opening for equipment delivery is 40 in. w x 82 in. h, contingent on a 72 in. corridor width		
E	17	Minimum opening for equipment delivery is 43 in. w x 82 in. h, contingent on a 96 in. corridor width		
E	18	Counter top for equipment- provide grommets openings as required to route cables		
E	19	Base cabinet for storage of: surface coils, patient positioning pads, phantoms, etc.		
E	20	Louvered doors - refer to preinstall for requirements		
E	21	5 Gauss barrier		
E	22	Portion of existing access flooring to remain		

EXISTING ACCESS FLOOR NOTE:  
DUE TO THE WEIGHT OF THE CABINETS ALL ACCESS FLOOR NEEDS TO BE REMOVED BELOW THE CABINETS AND ALONG THE DELIVERY ROUTE.

EXISTING SHIELD NOTE:  
EXISTING ISOGAUSS CONTOUR PLOTS HAVE BEEN SHOWN. THE MAGNETIC FIELD CONTAINMENT OBTAINED FROM THE EXISTING MAGNETIC SHIELD WILL REMAIN THE SAME.

The [GE HPI Technical Support Group](#) is an additional resource that can provide answers for general GE product siting questions and can be reached at (877)-305-9677 or mail to: [HPITechCOE@ge.com](mailto:HPITechCOE@ge.com)  
For [Accessory Sales](#): (866) 281-7545 Options 1, 2, 1, 2 or mail to: [gehaccessoriesales@ge.com](mailto:gehaccessoriesales@ge.com)

---	EXISTING MAGNETIC SHIELDING
- - - - -	RF SHIELD - 100 dB ATTENUATION

Exam room height	
Finished floor to slab height	-
Recommended finished ceiling height	8'-9"

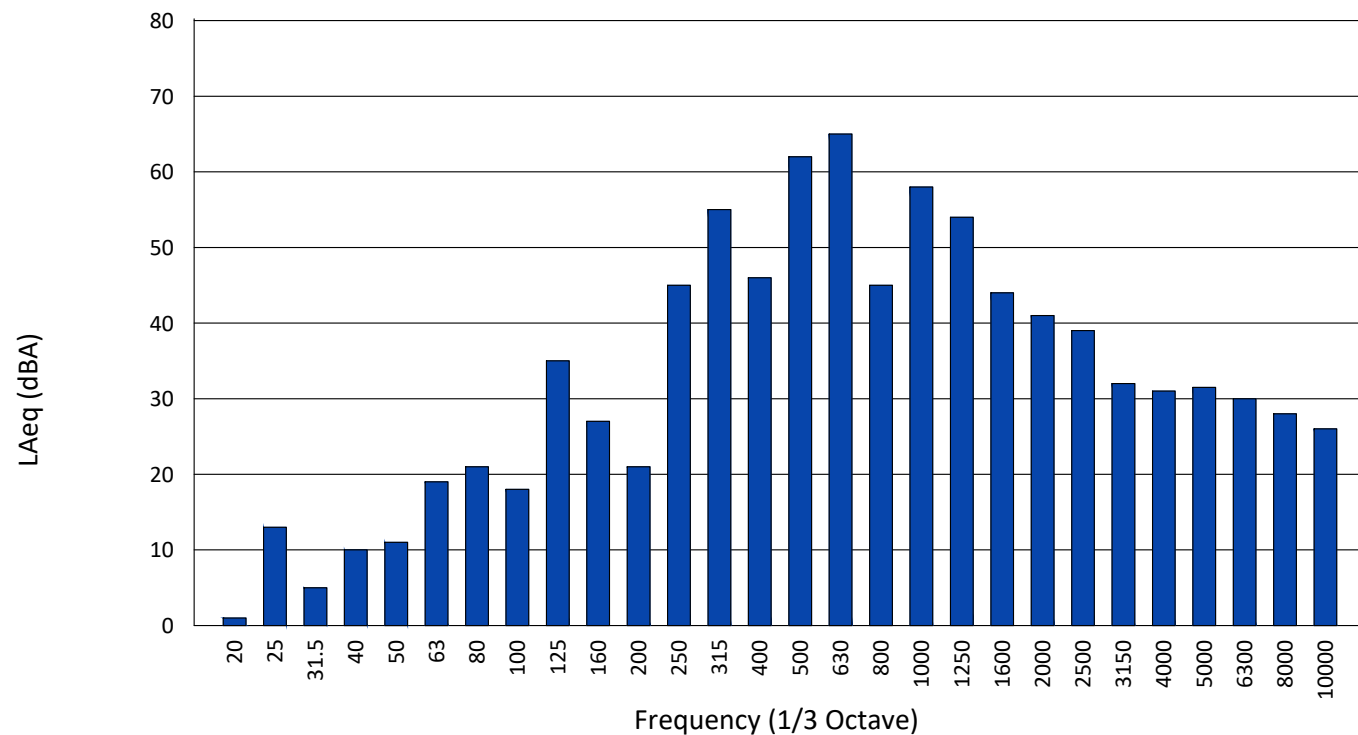


## ACOUSTIC SPECIFICATIONS

	GE Equipment Acoustic Output	Notes
Control Room	62 dBA	
Equipment Room	83.6 dBA	The 83.6 dBA level is for GE equipment only. The Equipment room acoustic level must not exceed 85 dBA
Magnet Bore Isocenter	127 dBA	See Sound Pressure Spectral Distribution Detail
Front of Magnet - 800mm from bore measurement	124 dBA	

## 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.

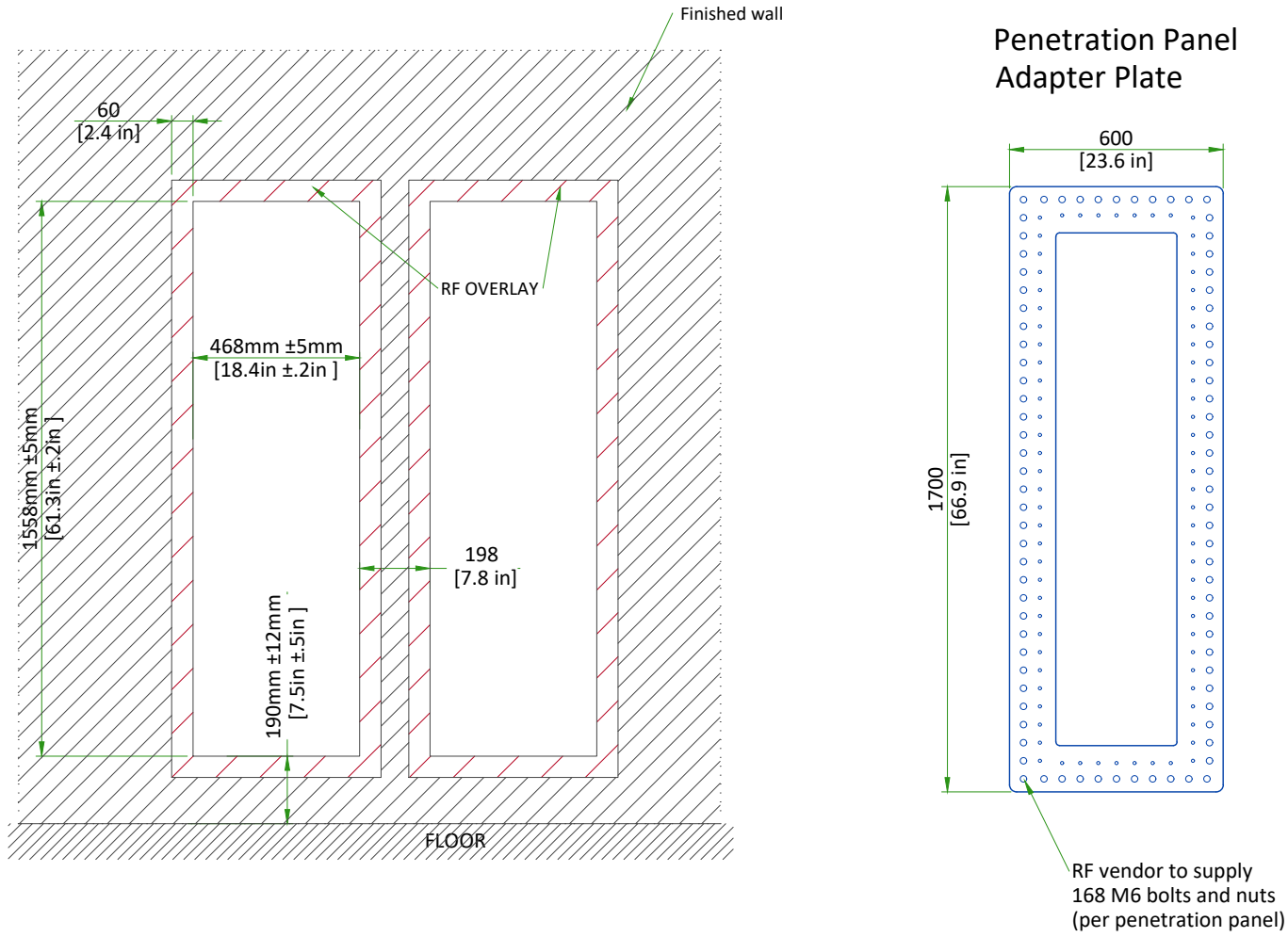
### STEEL MASS LIMITS TO MAGNET ISOCENTER (3x3 m [10x10 ft] AREA UNDER MAGNET)

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 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.

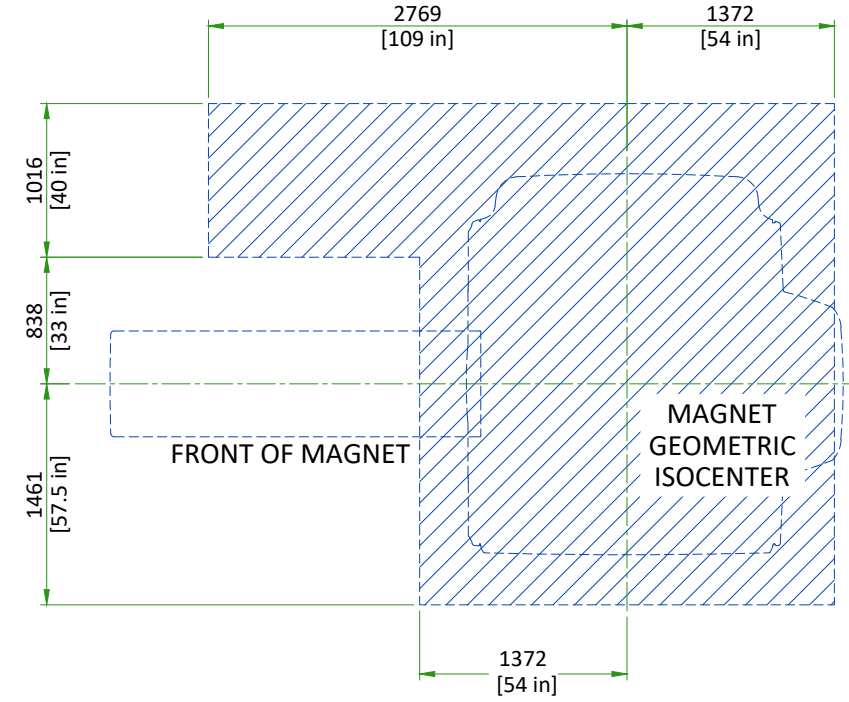
# PENETRATION PANEL WALL OPENINGS

Magnet room side

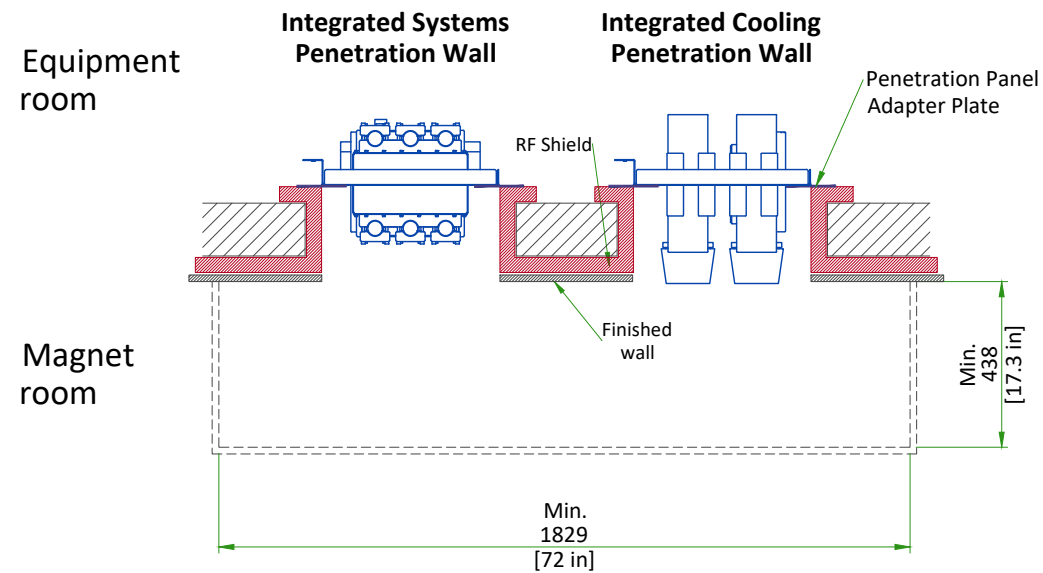


# MINIMUM MAGNET CEILING HEIGHT (TOP VIEW)

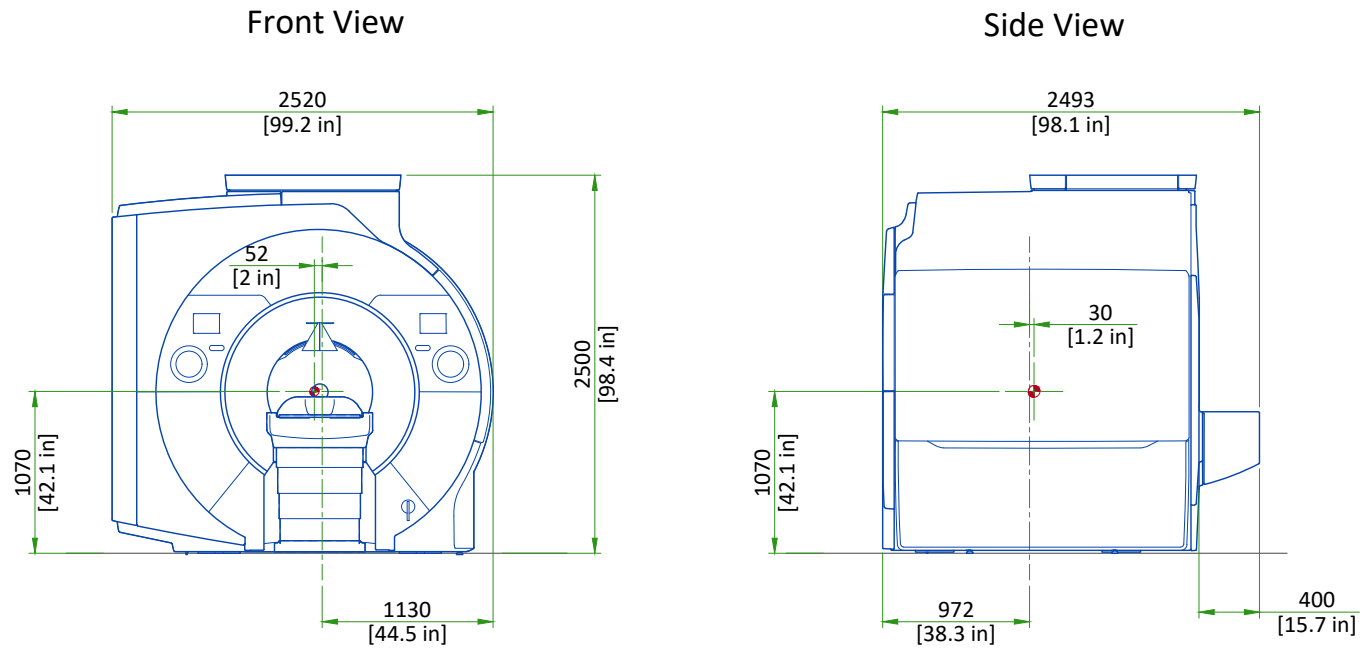
Shaded area within solid lines indicates floor to ceiling height - Ideal height of Magnet room suspended ceiling is 2667mm [105 in]. Minimum Magnet room suspended ceiling height is 2500 mm [98.5 in]. If the suspended ceiling height is between 2500mm and 2667mm [98.5 in and 105 in] a low ceiling height kit may be required.



SCALE 1:50



## MAGNET ENCLOSURE SIGNA PREMIER



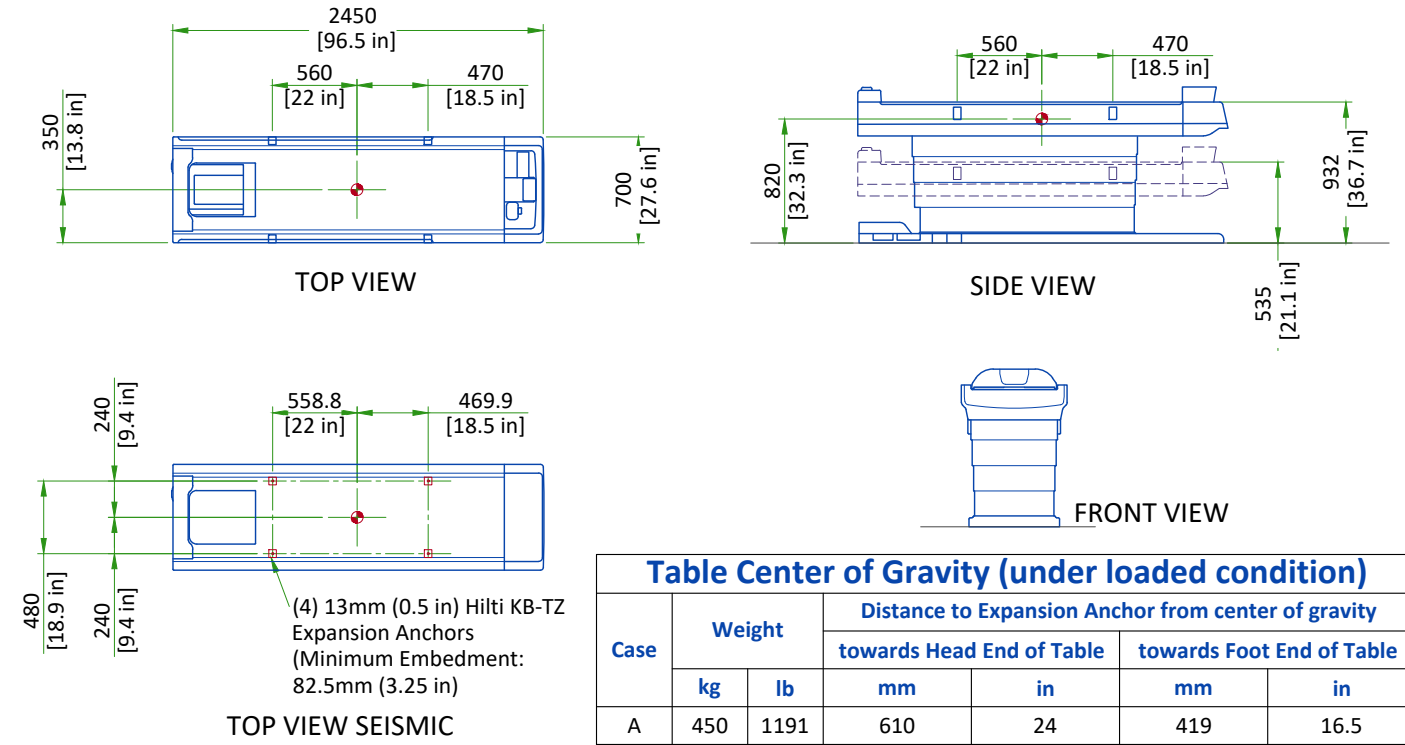
SCALE 1:50

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.

Center of gravity

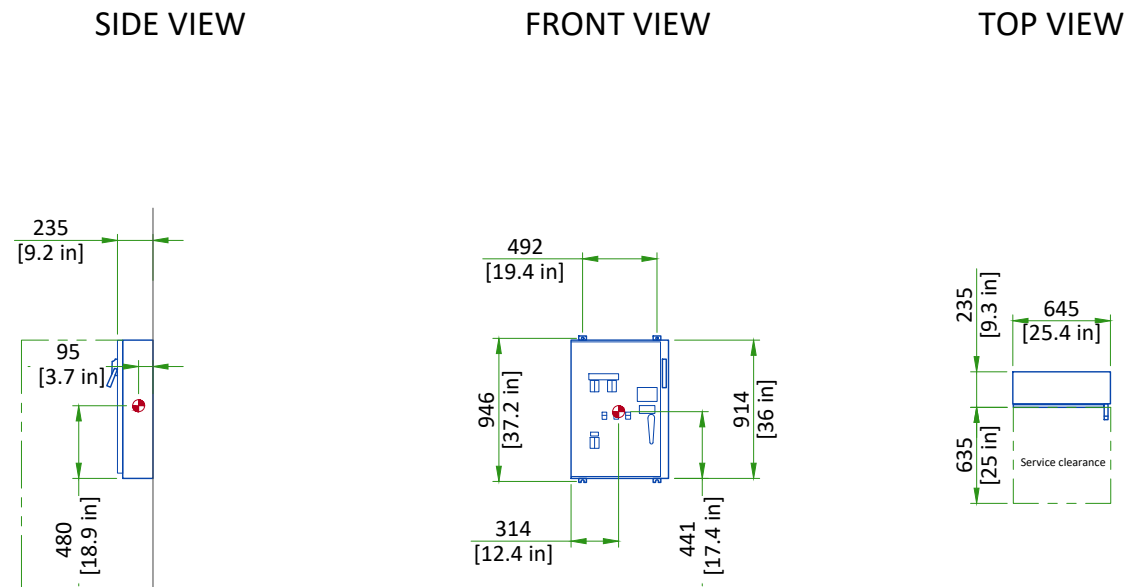
## PATIENT TABLE



Center of gravity

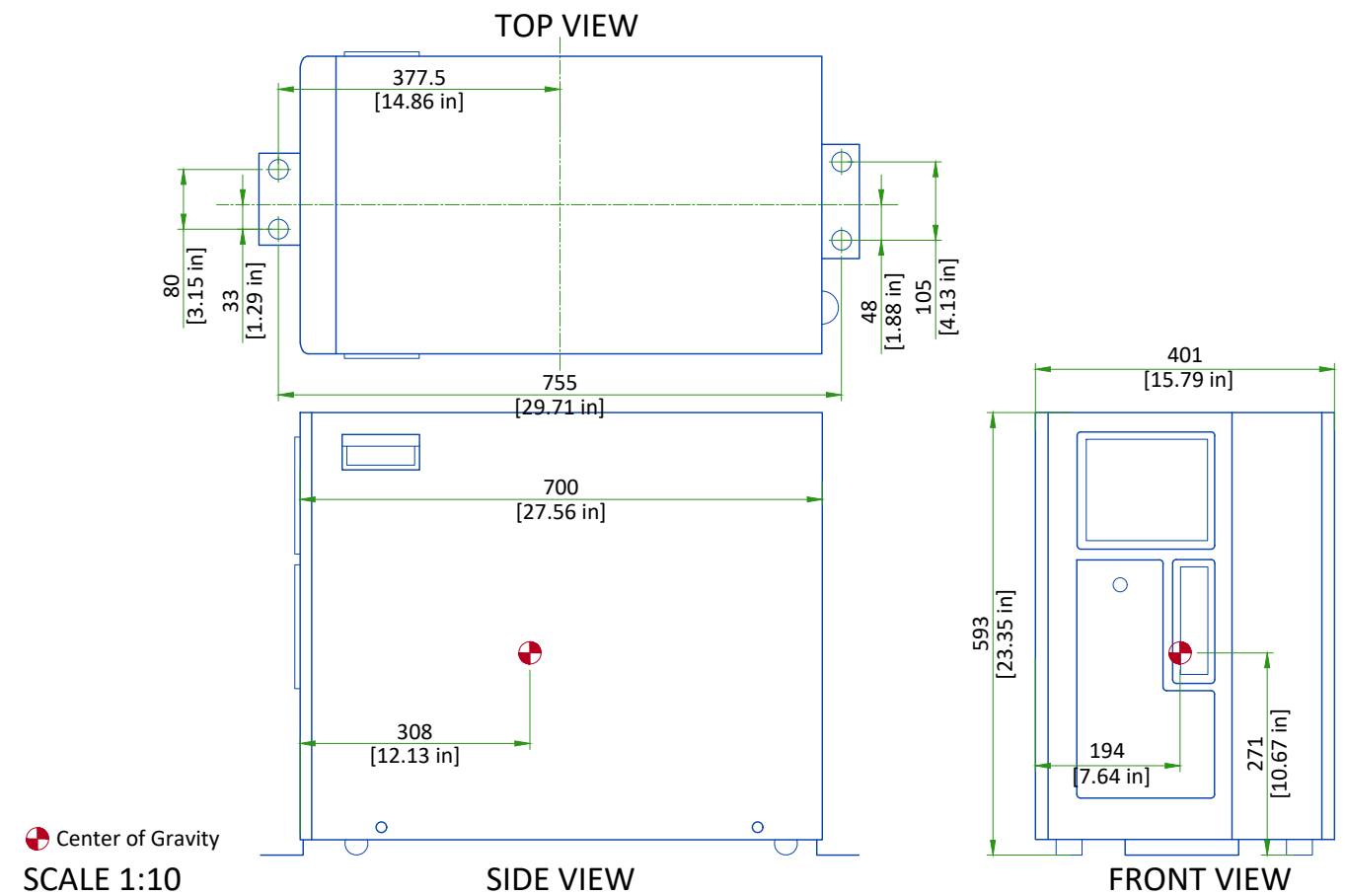
SCALE 1:50

## MAIN DISCONNECT PANEL



Center of gravity  
NOT TO SCALE

## GLOBAL OPERATOR CABINET (GOC)



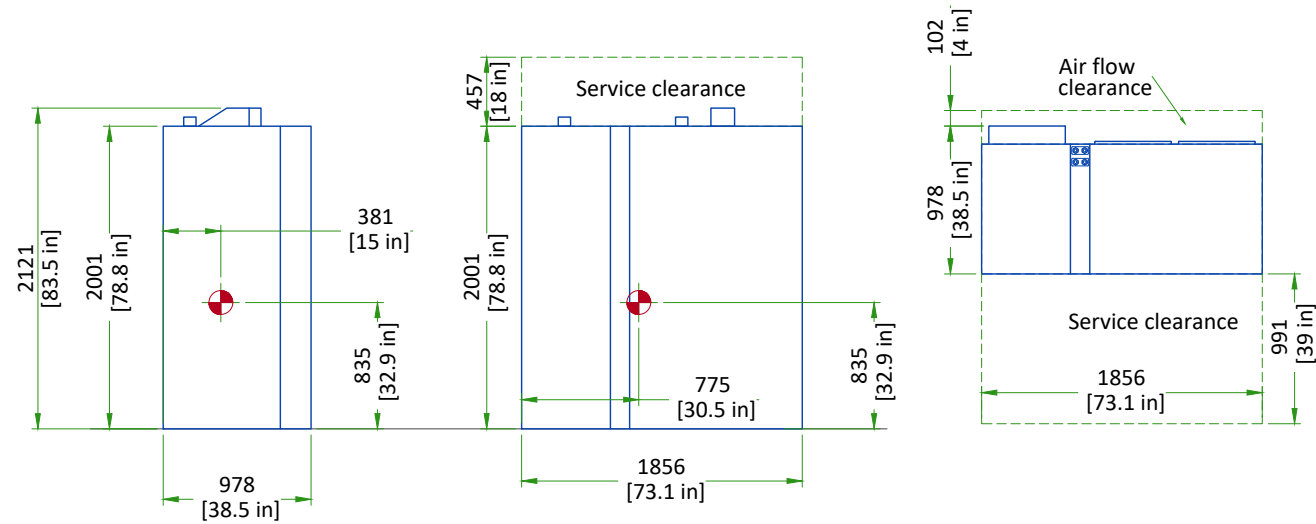
Center of Gravity  
SCALE 1:10

## INTEGRATED SYSTEMS CABINET

SIDE VIEW

FRONT VIEW

TOP VIEW



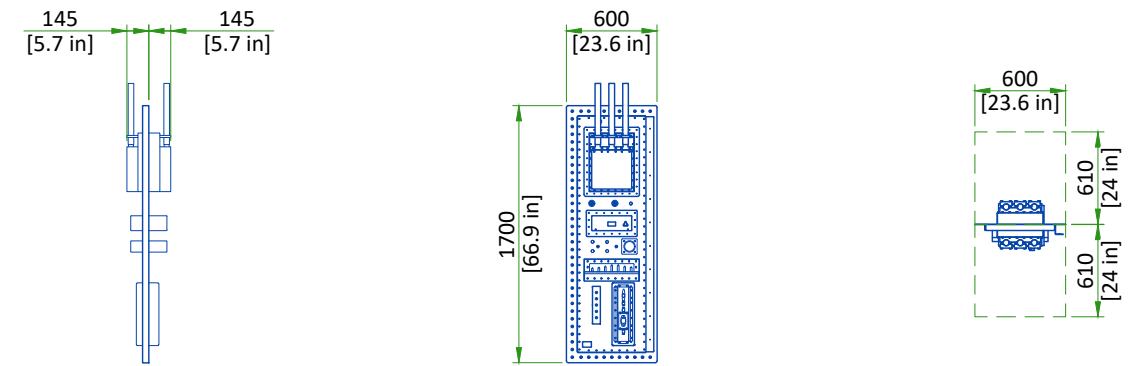
• Center of gravity  
NOT TO SCALE

## INTEGRATED SYSTEMS CABINET PENETRATION WALL

SIDE VIEW

FRONT VIEW

TOP VIEW



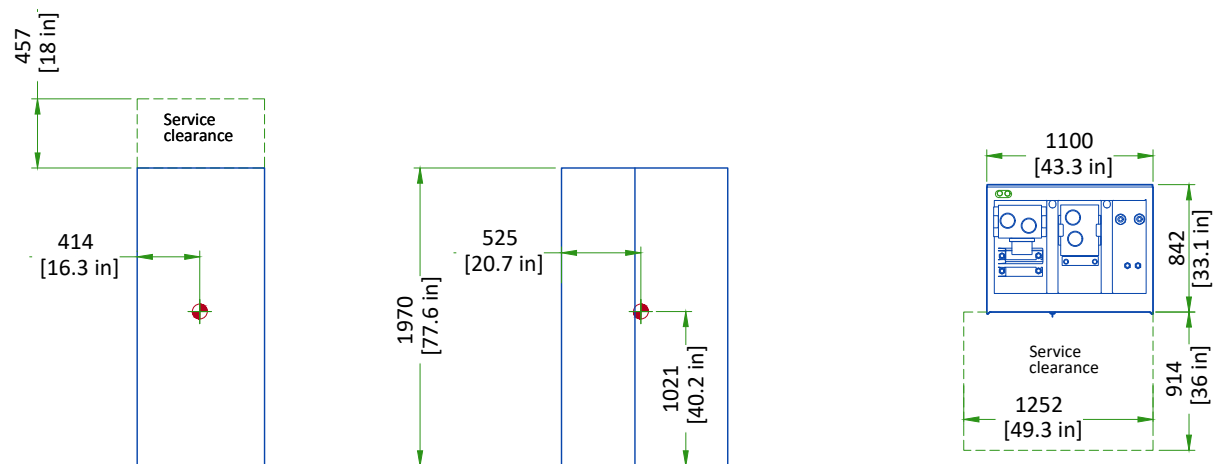
NOT TO SCALE

## INTEGRATED COOLING CABINET

SIDE VIEW

FRONT VIEW

TOP VIEW



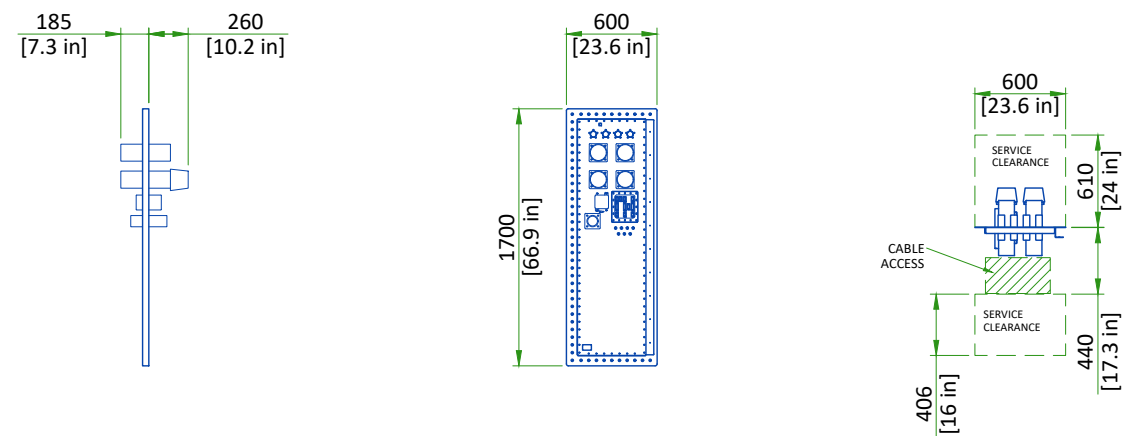
• Center of gravity  
NOT TO SCALE

## INTEGRATED COOLING CABINET SECONDARY PENETRATION WALL

SIDE VIEW

FRONT VIEW

TOP VIEW



NOT TO SCALE



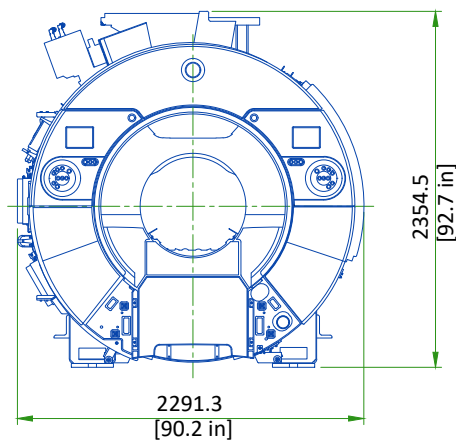
## DELIVERY

### ROUTING

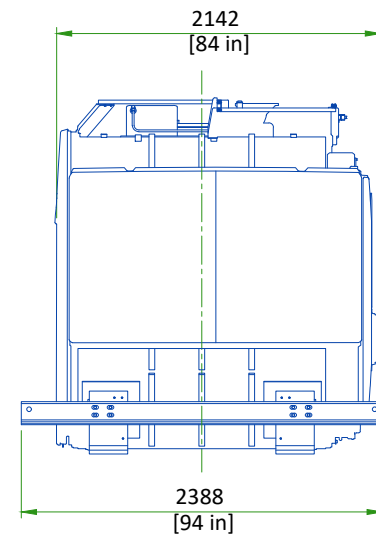
- The customer is solely liable for routing of components from dock to final site.
- GE must be able to move system components in or out with no need to uncrate or disassemble any of the components. The entire passageway must be cleared, adequately lighted and free from dust.
- The floor and its surfacing 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 7804 daN
- Height: 2.5m (8.2 ft), width: 2.4m (7.8 ft)



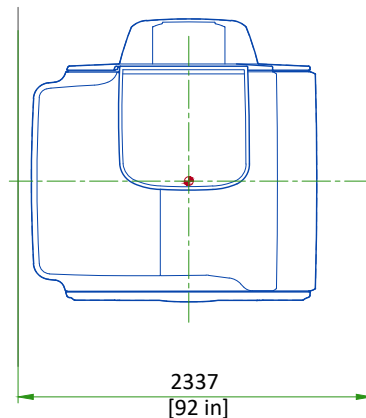
FRONT VIEW OF MAGNET



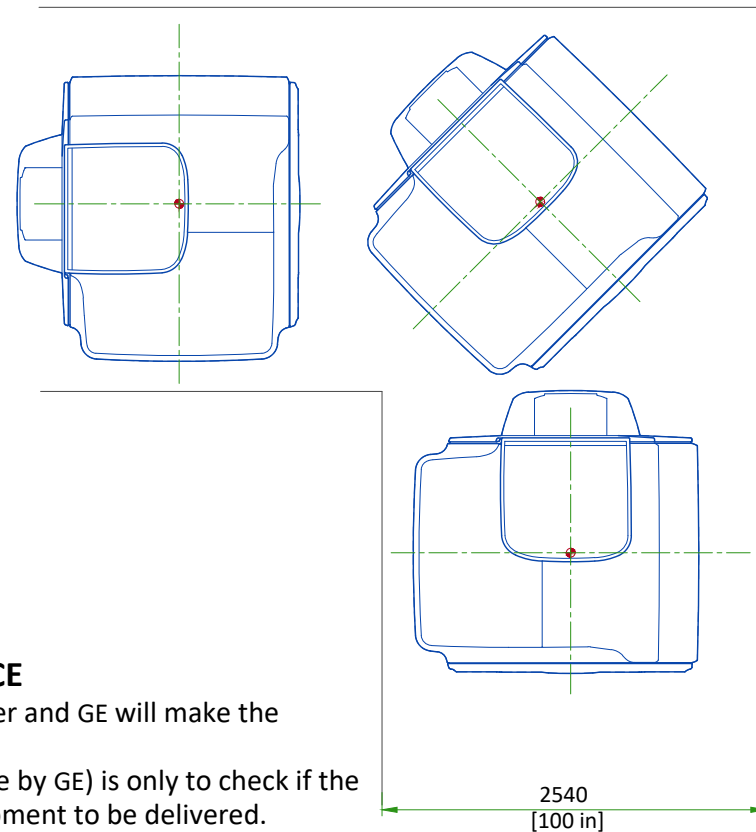
RIGHT SIDE VIEW OF MAGNET

Recommended minimum opening for side (wall) delivery : 2700 (w) x 2700 (h) [108 (w) x 108 (h)]

STRAIGHT PATH  
(Rigging wheels required)



PATH WITH 90 DEGREE TURN



### INSTALLATION AND DELIVERY ACCEPTANCE

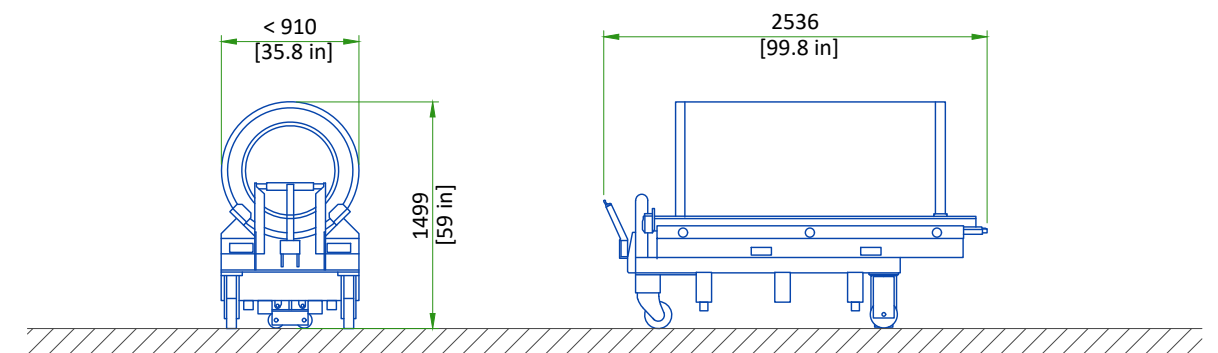
- A survey of the site established by the customer and GE will make the decision for the delivery time.
- This survey of the site (a form is made available by GE) is only to check if the apparent conditions of the site allow the equipment to be delivered.
- If the site is not ready, GE can delay the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

## DIMENSIONS OF THE MAIN REPLACEMENT PARTS



HEADER	DIMENSION LxWxH		WIEGHT		NOTE
	mm	in	kg	lbs	
Split Bridge	546x1963x178	21.5x77.3x7	18	40	
Gradient Cooling Unit	920x605x1445	36.2x23.8x56.9	144.5	318.6	
Cabinet Cooling Unit	920x705x1550	36.2x27.8x61	195.5	431	
Replacement RF Body Coil	873x896x1861	34.4x35.3x72.5	116	255	Replacement coil is shipped in a protective case. Weight & dimensions are for coil & case.
Replacement HRMw 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 re-placement coil assembly only.
Gradient Coil Replacement Tool Kit Crate	762x2184x711	30x86x28	340	750	Gradient Coil Assembly and shipping cart dimensions are with cart in lowest position. Cart can be adjusted to maximum height of 61.88 in. (1572 mm).

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"

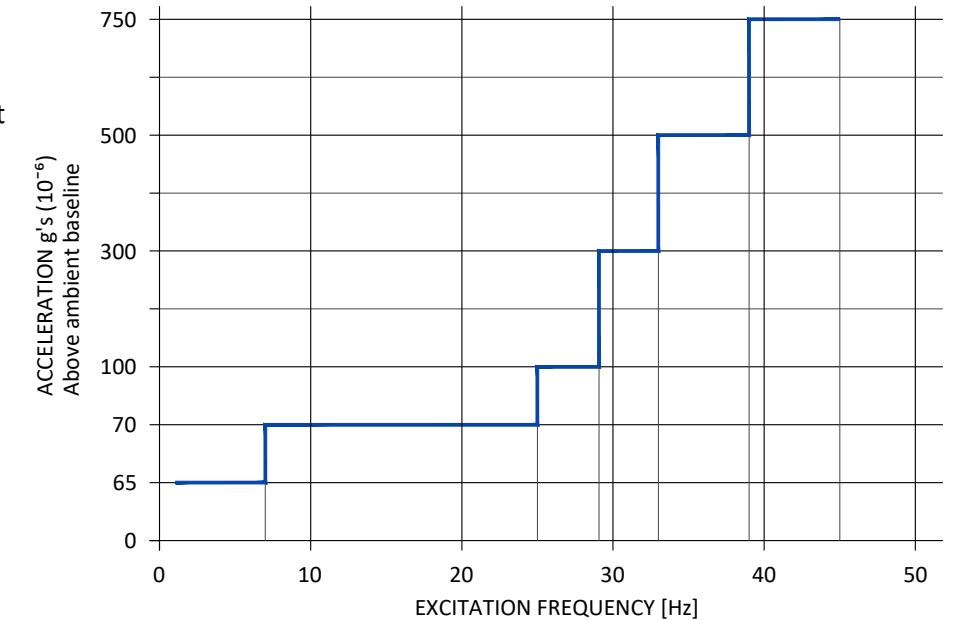
## VIBRATION SPECIFICATIONS

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.

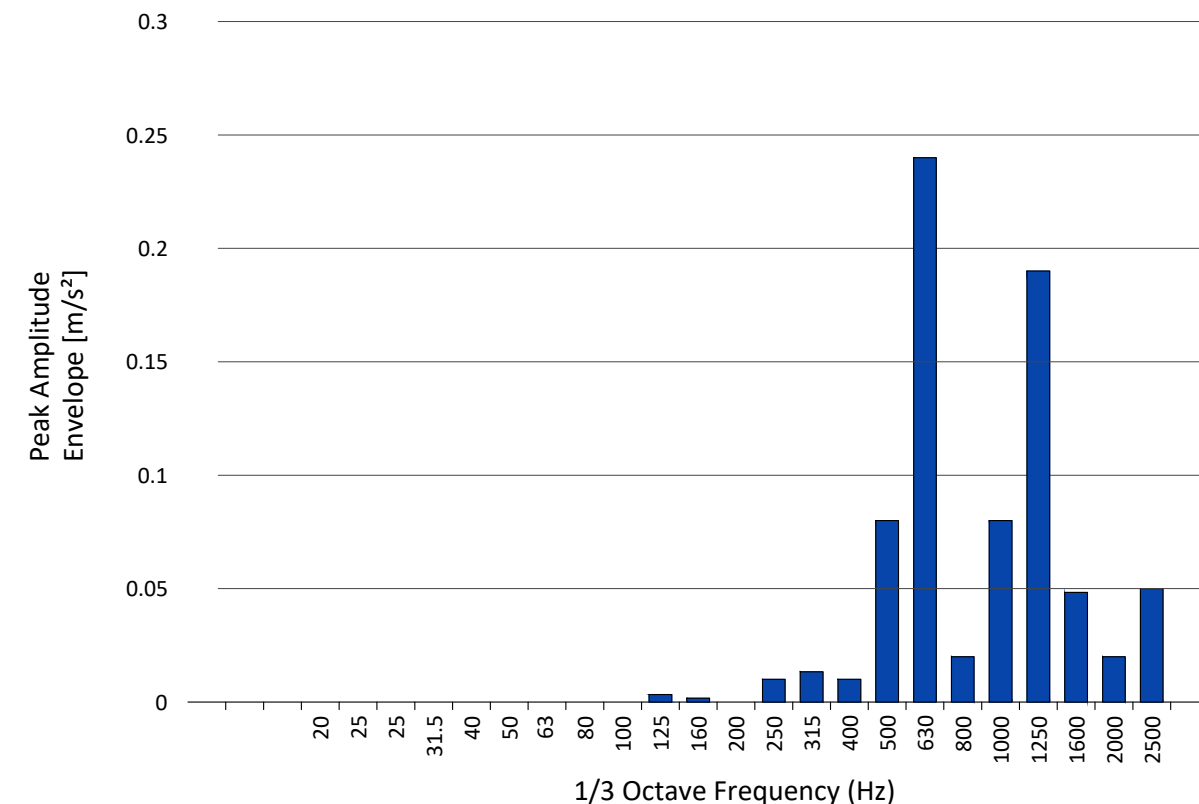
MAGNET STEADY-STATE VIBRATION SPECIFICATIONS

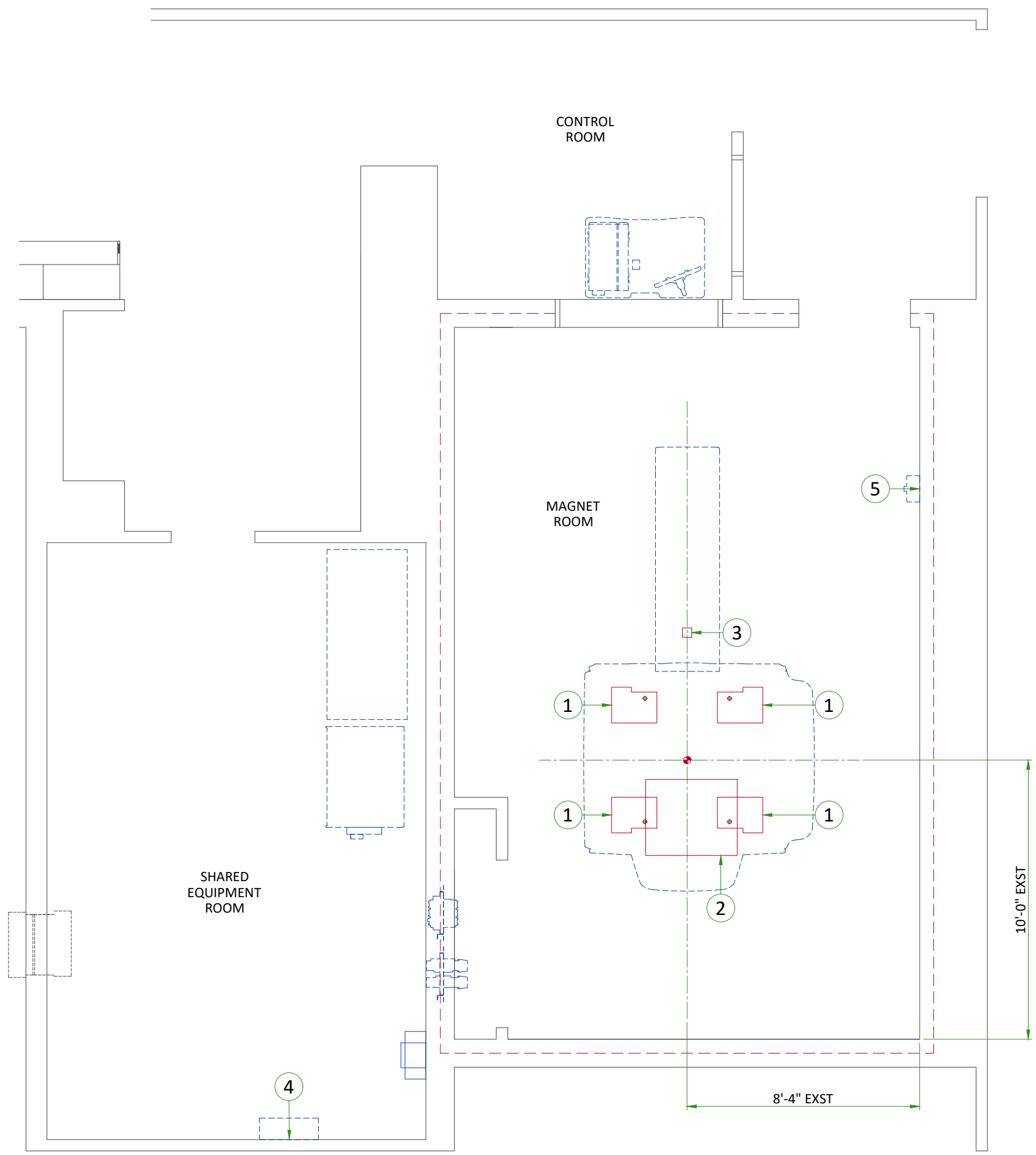


**NOTE:**

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

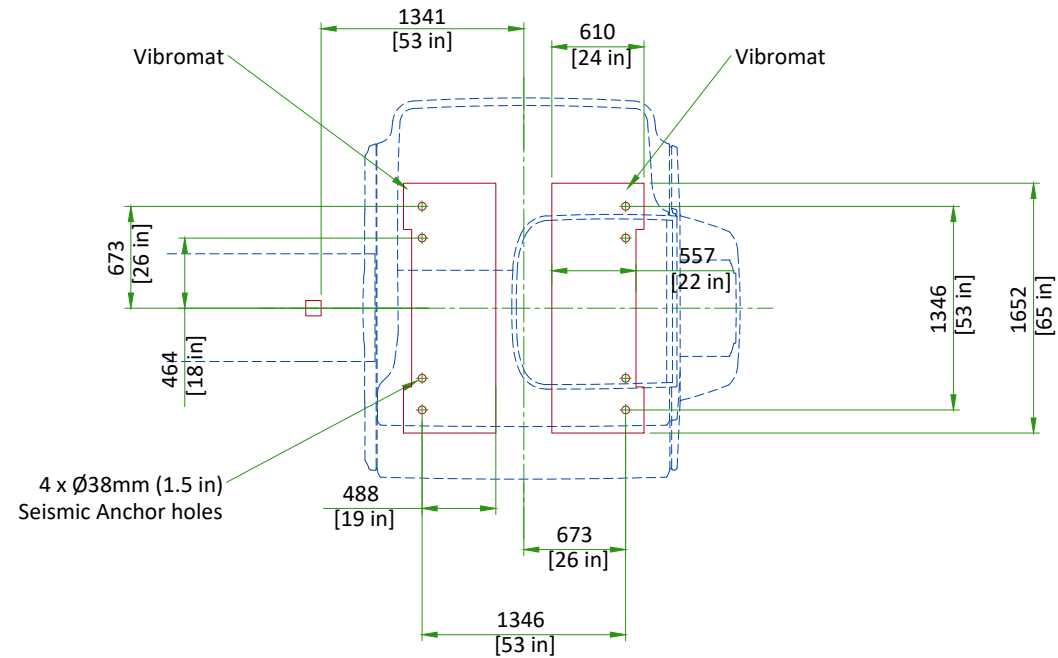
## VIBRATION TRANSMITTED THROUGH VIBROACOUSTIC MAT





ITEM	DESCRIPTION
(GE SUPPLIED / CONTRACTOR INSTALLED)	
1	Vibroacoustic dampening kit (see floor structural detail)
2	Opening in ceiling for cable connections
(CONTRACTOR SUPPLIED & INSTALLED)	
3	Patient table dock anchoring
4	Structural wall backing for Main Disconnect Panel (Upgrade: verify existing location and review structural support to be reused if adequate)
5	Structural wall backing for Magnet Rundown Unit (reuse existing)

## MAGNET ON VIBROACOUSTIC DAMPENING KIT "VIBROMAT"

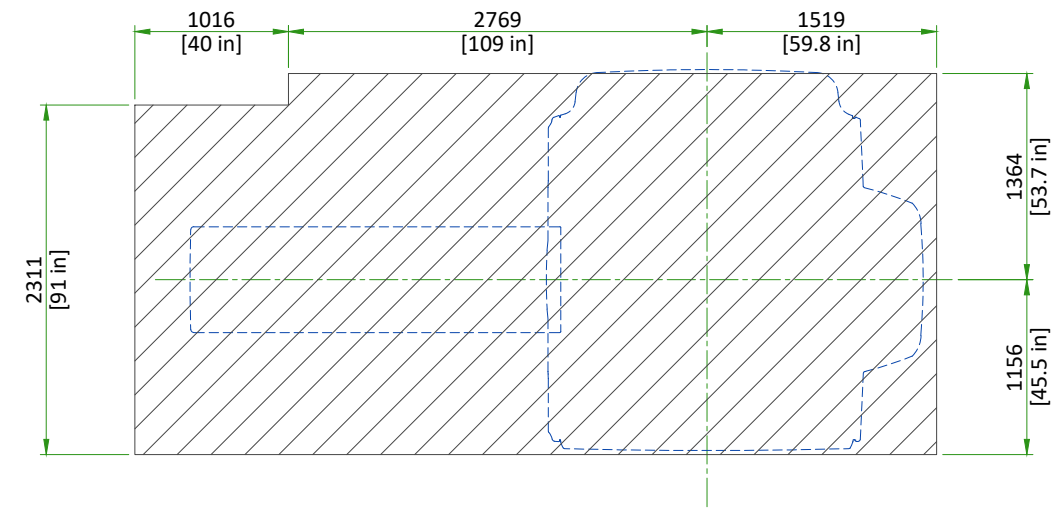


NOT TO SCALE

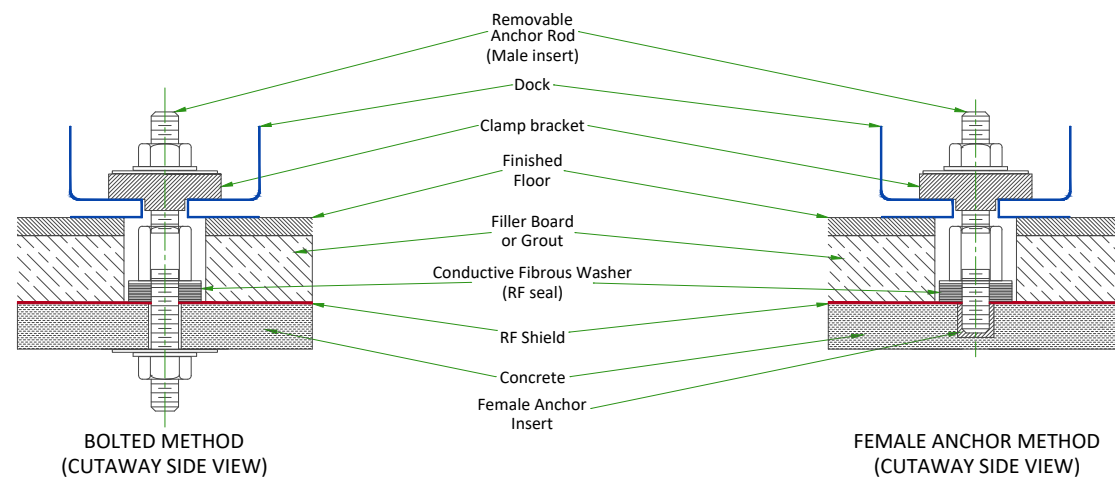
VibroAcoustic Mat weight: 116 kg[255lbs] (each)

## MAGNET ROOM FLOOR SPECIFICATIONS

Magnet, Enclosure, and Patient Table areas must be flat and level within 3 mm (0.125 in) within the shaded area shown



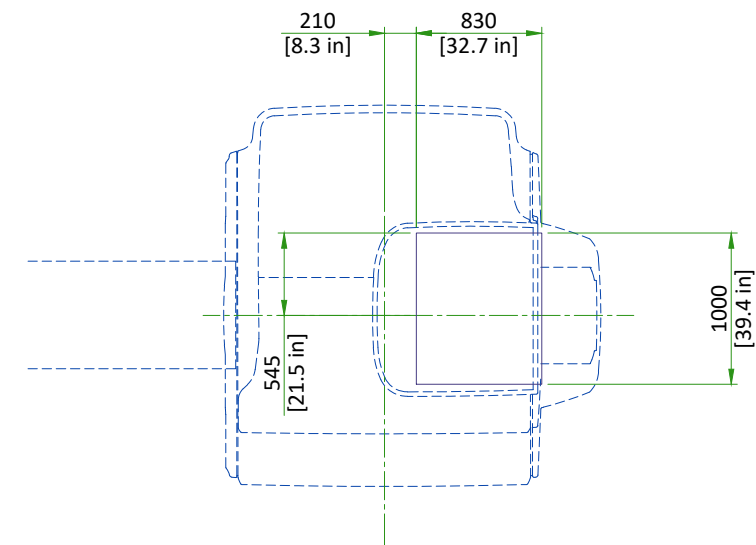
## TABLE FRAME ANCHOR MOUNTING REQUIREMENTS



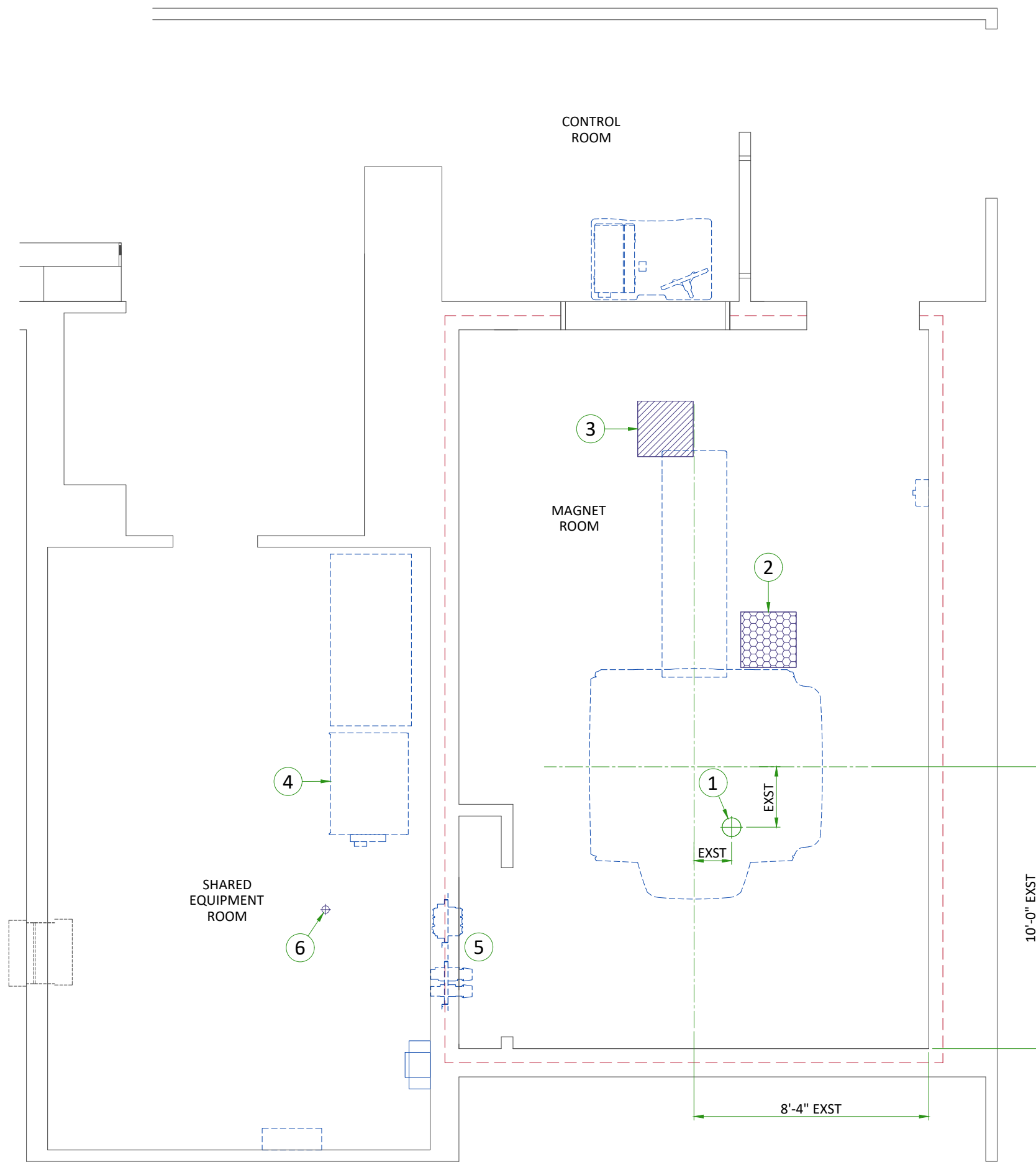
NOT TO SCALE

- The RF Shield vendor must design and install the table frame anchor bolt
- The table frame anchor hole must be drilled after the Magnet is delivered
- The table frame anchor must not contact floor rebar or other structural steel
- The table frame anchor must electrically contact the RF shield at point of entry
- The table frame anchors must have the following properties:
  - Anchors must be two-part assembly (male/female)
  - Female side must be expansion- or epoxy-type
  - 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)
  - Anchors must be electrically conductive
  - Anchors must be non-magnetic
  - Anchors must not induce galvanic corrosion with the RF shield
  - Anchors must be commercially procured
  - The anchor rod hole clearance in the table anchor base is 11 mm (0.43 in). The anchor rod diameter must be sized appropriately
  - Anchors must meet the following clamping force: 2669 N (600 lbs)
  - The anchor rod must extend 40 mm ± 13 mm (1.57 in ± 0.5 in) above the finished floor
  - The anchor rod must be less than 152 mm (152 in) in total length (length above the floor plus embedded length)
- 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).

## CEILING OPENING FOR CABLE CONCEALMENT



NOT TO SCALE



ITEM	DESCRIPTION
1	Existing cryogen vent (200mm [8"] O.D.)
2	Emergency exhaust vent - refer to magnet room vent requirements (reuse existing)
3	Pressure equalization vent - refer to magnet room vent requirements (reuse existing)
4	38mm [1.5"] NPT Male connectors, (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	Floor Drain

### 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

Room	Temperature				Humidity	
	Range		Change <sup>1</sup>		Range %RH	Change %RH/Hr <sup>2</sup>
	°C	°F	°C/Hr	°F/Hr		
Equipment room (at inlet to Equipment room)	15-32 <sup>3</sup>	59-89.6 <sup>3</sup>	3	5	30-75	5
Magnet Room	15-21	59-69.8	3	5	30-60	5
Operator Room	15-32	59-89.6	3	5	30-75	5

**NOTE**

- Operating temperature gradient limits shall be between -5° F/Hr (-3° C/Hr) and 5° F/Hr (3° C/Hr), when averaged over 1 hour
- Operating humidity gradient limits shall be between -5% RH/hour and 5% RH/hour, when averaged over 1 hour
- Maximum ambient temperature is derated by 1° C (33.8°F) per 175 m (574 ft) above 950 m (3117 ft) (not to exceed 2600 m [8530 ft])

**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.

## EQUIPMENT HEAT OUTPUT SPECIFICATIONS

Component	Room	Max kW	Max BTU/hr
Magnet (MAG) and Patient Table (PT)	Magnet	2.95	10060
Primary Pen Wal	Magnet	0	0
Secondary Pen Wall	Magnet	0.3	1023
	Equipment	0.3	1023
Integrated System Cabinet (ISC)	Equipment	11.5	39215
Integrated Cooling Cabinet (ICC)	Equipment	1.0	3410
Main Disconnect Panel (MDP)	Equipment	0.28	972
Magnet Monitor (MON)	Equipment	0.24	818
Cryocooler Compressor (CRY)	Equipment	0.5	1705
Operator Workspace equipment (OW)	Control	1.45	4945
OPTIONS			
MR Elastography (MRE)	Equipment	0.48	141

## 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.

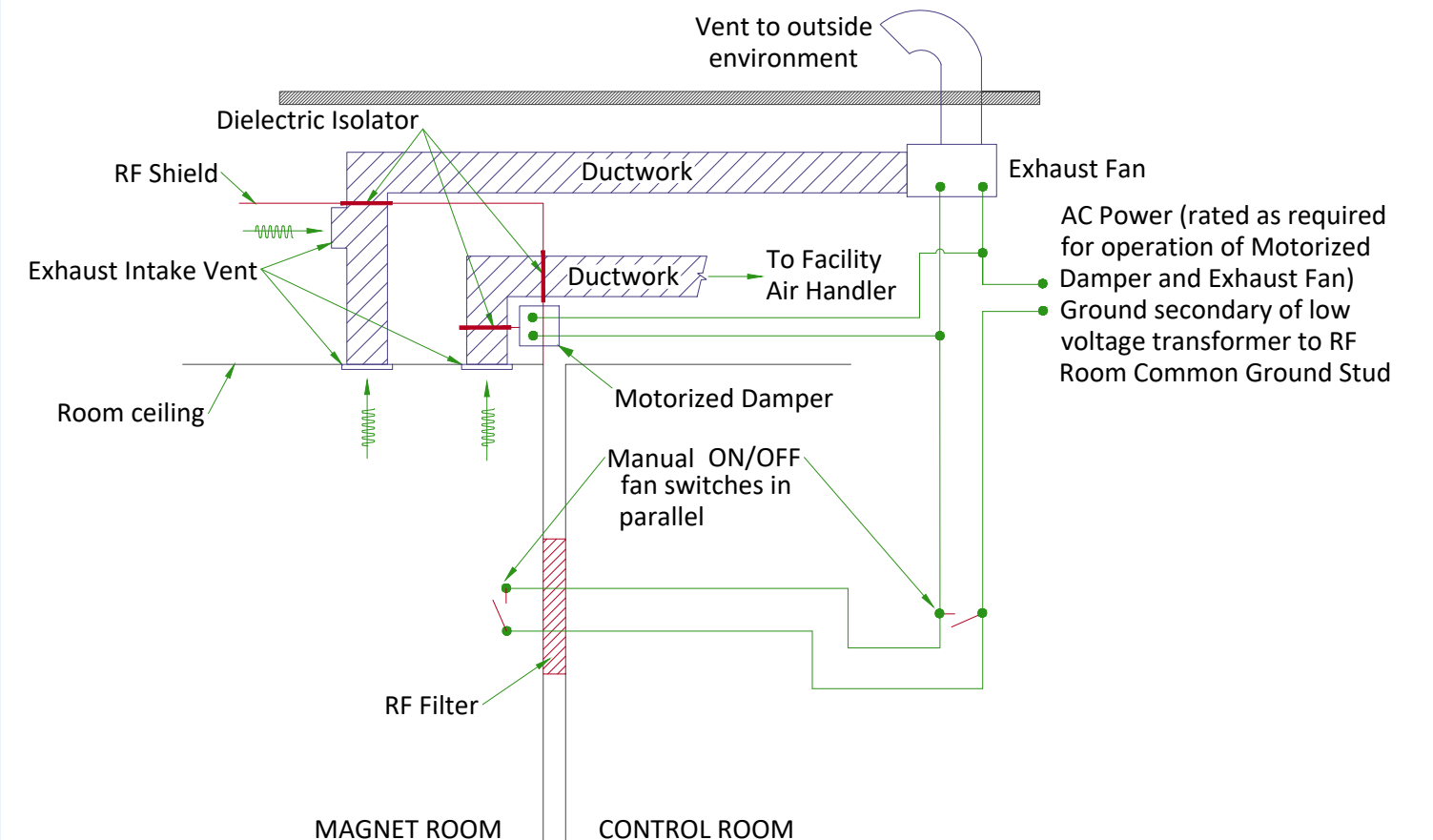
**EMERGENCY VENT REQUIREMENT**

- 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 m<sup>3</sup>/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

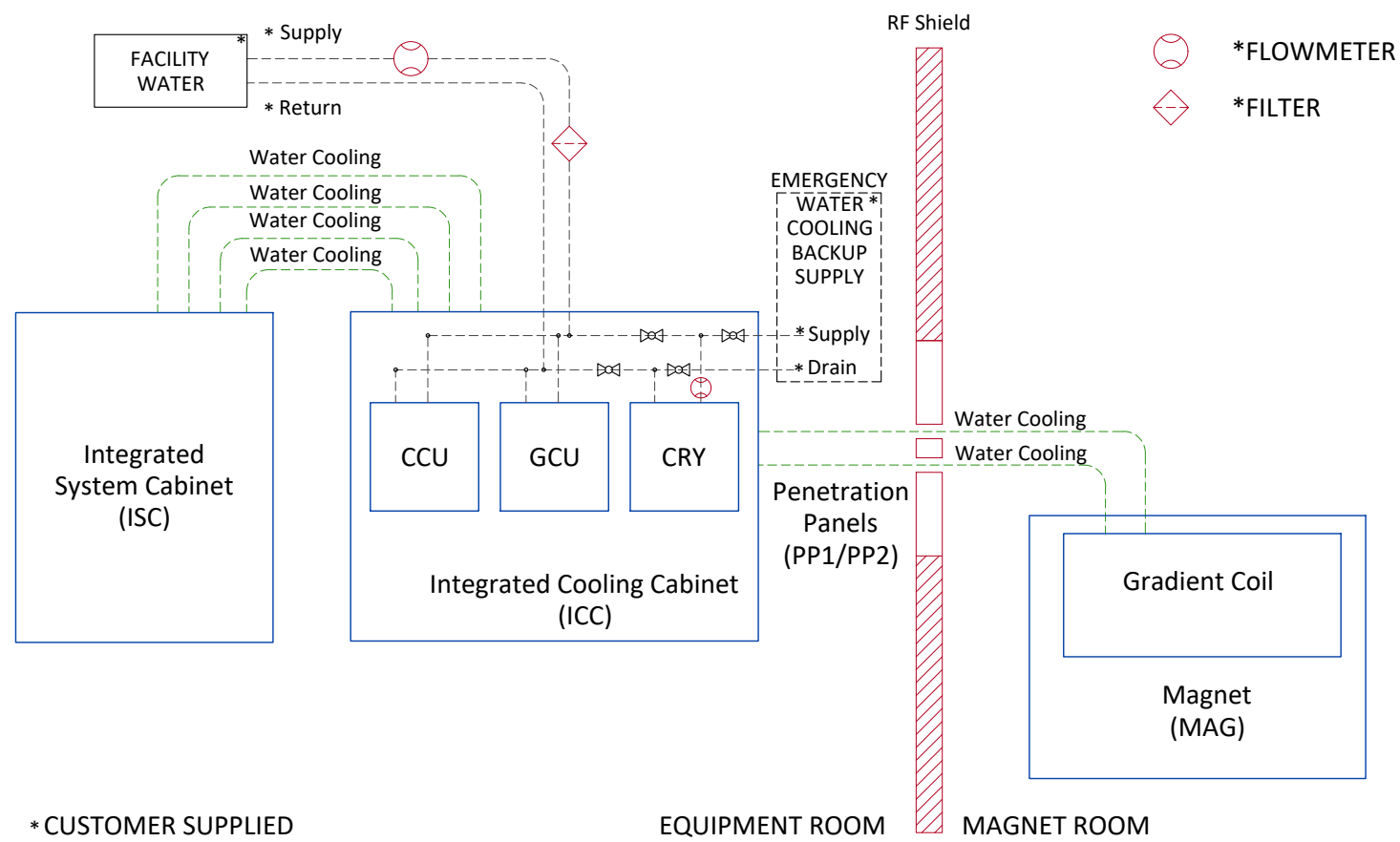
**PRESSURE VENT REQUIREMENT**

- 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.
  - 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.

## MAGNET ROOM EXHAUST FAN SCHEMATIC



## CHILLED WATER BLOCK DIAGRAM

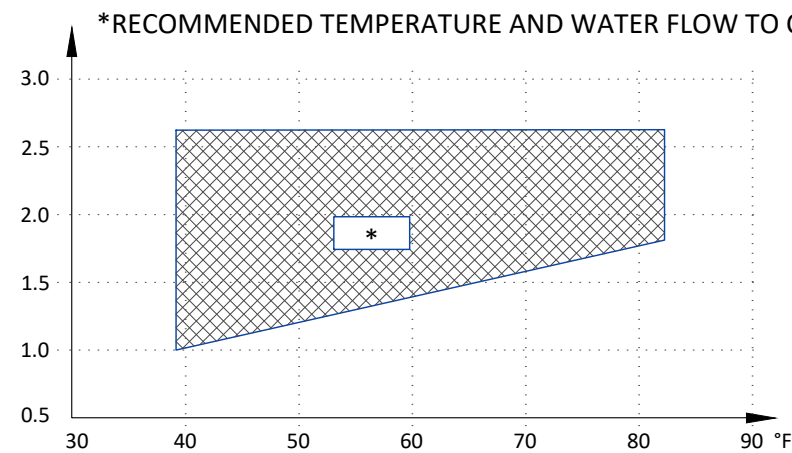


## CHILLED WATER SPECIFICATIONS

PARAMETER	REQUIREMENTS
<b>Chiller size</b>	<b>Minimum 94 kW</b>
Inlet temperature	5 to 12°C (41 to 54°F) measured at the inlet to the ICC
Minimum Flow	114L/min (30 gpm)
Maximum Flow	132 L/min (35 gpm)
Availability	Continuous
Antifreeze	no more than 50% propylene (PGW) or ethylene (EGW) glycol-water
Maximum pressure drop in ICC at minimum flow	2.2 bar (32 psi) with 50% PGW, 1060 kg/m <sup>3</sup> (66.2 lbs/ft <sup>3</sup> ) density
Maximum pressure drop in ICC at maximum flow	2.9 bar (42 psi) with 50% PGW, 1060 kg/m <sup>3</sup> (66.2 lbs/ft <sup>3</sup> ) density
Temperature rise at Minimum Flow	14°C (25°F) with 50% PGW; 3346 J/(kg K) specific heat; 1060 kg/m <sup>3</sup> density
Temperature rise at Maximum Flow	12°C (22°F) with 50% PGW; 3346 J/(kg K) specific heat; 1060 kg/m <sup>3</sup> density
Maximum inlet pressure to ICC	6 bar (87 psi)
Minimum continuous heat load	7.5 kW
Hoses to be provided by customer	38.1 mm (1.5 inch) minimum hose inside diameter
pH level	6.5 to 8.2 at 25°C (77°F)
Total hardness	Less than 200 ppm
Chloride	Less than 200 ppm
Sulfate	Less than 200 ppm
Silica	Less than 50 ppm
Iron	Less than 1 ppm
Ammonium	Less than 1 ppm
Suspended matter	Less than 10 ppm and less than 100 micron particle size
Particle size	100 micron or smaller with a field-changeable filter
Condensation protection	Facility plumbing to the ICC must be properly routed and insulated to prevent equipment damage or safety hazards

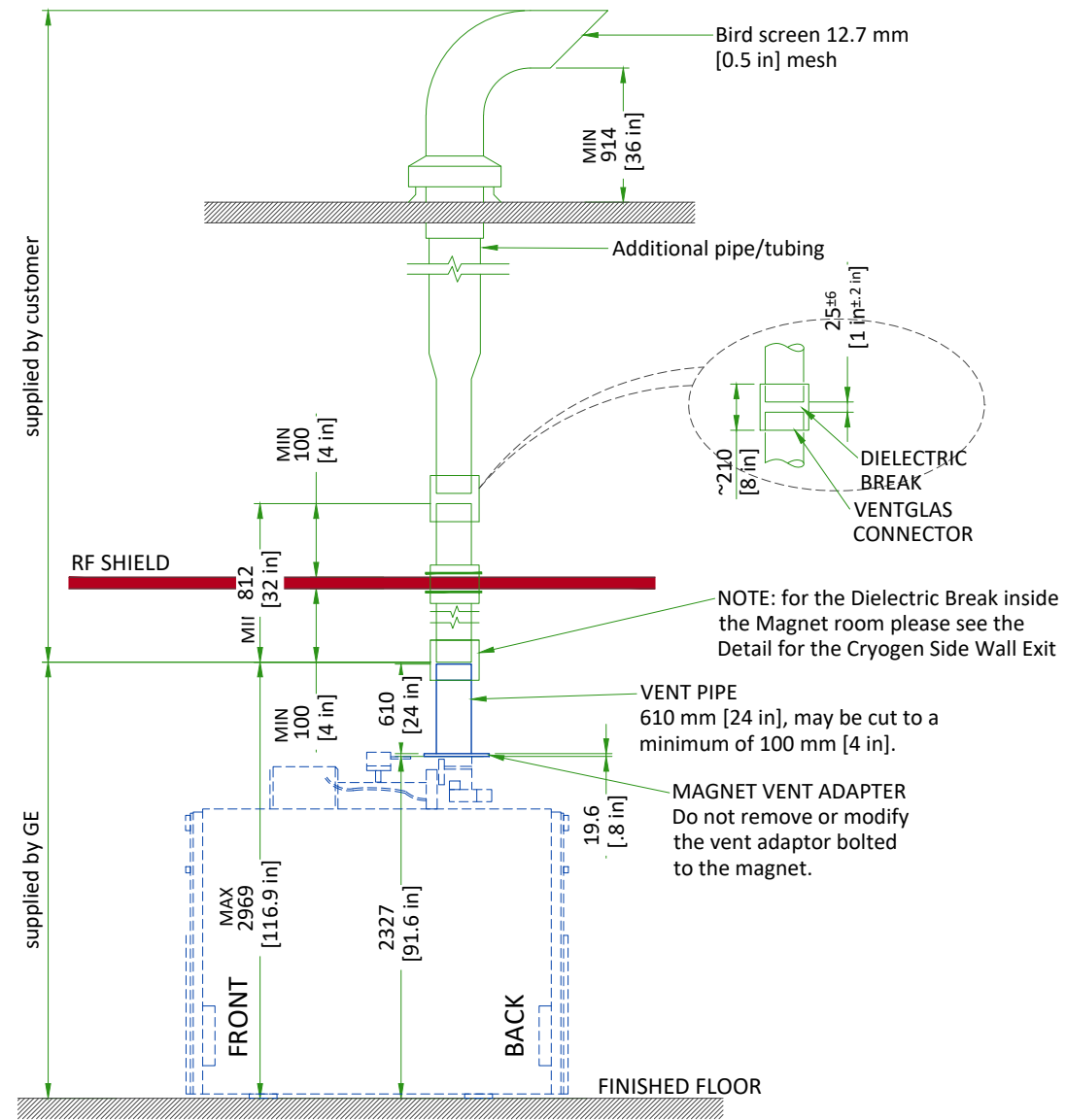
## CITY WATER BACKUP SPECIFICATIONS FOR COMPRESSOR

### 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)	

## 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.

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

### NOTE

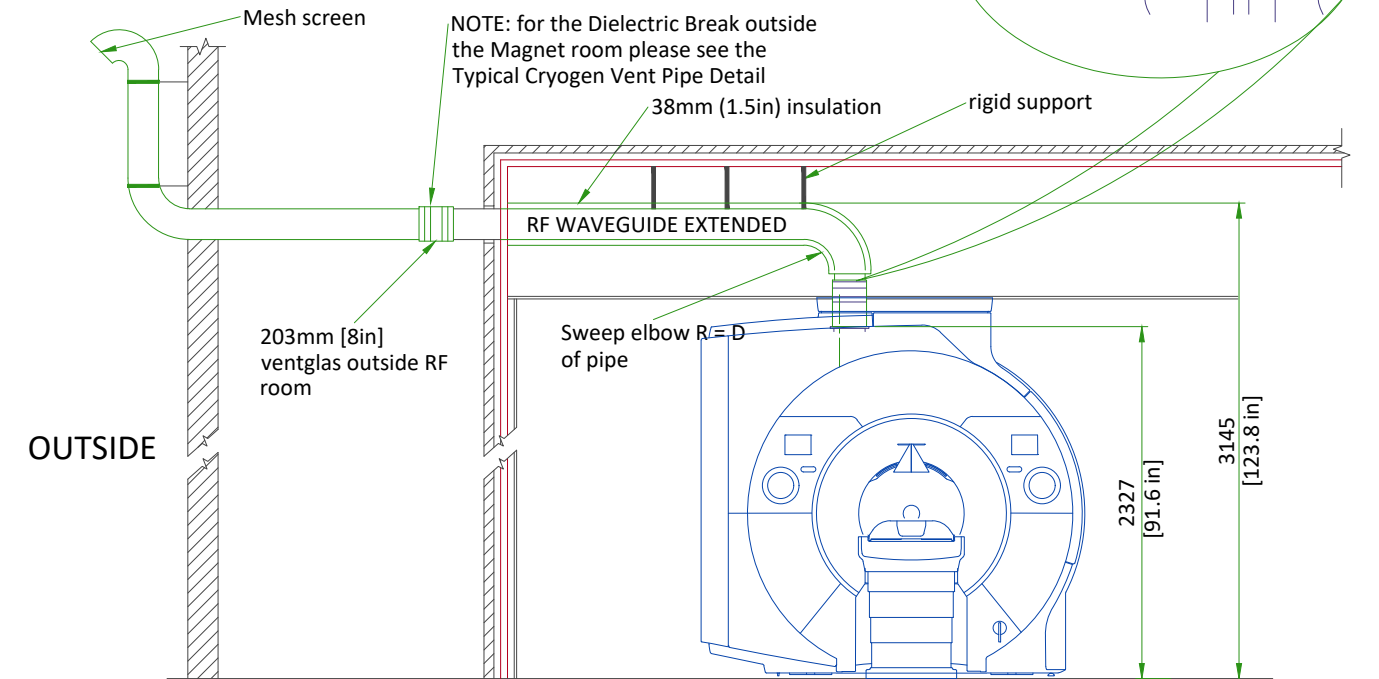
All welds on the pipe must be ground down to a smooth 203 mm [8 in] diameter so that it can be clamped to the Ventglas with enough force.

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

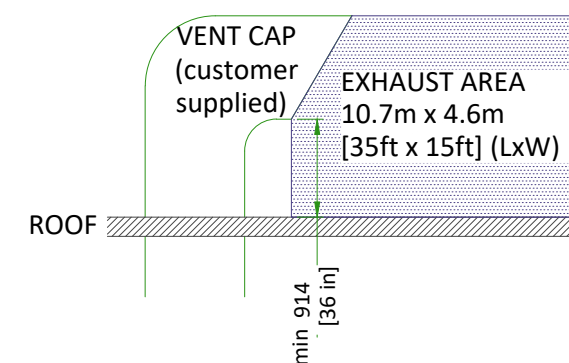
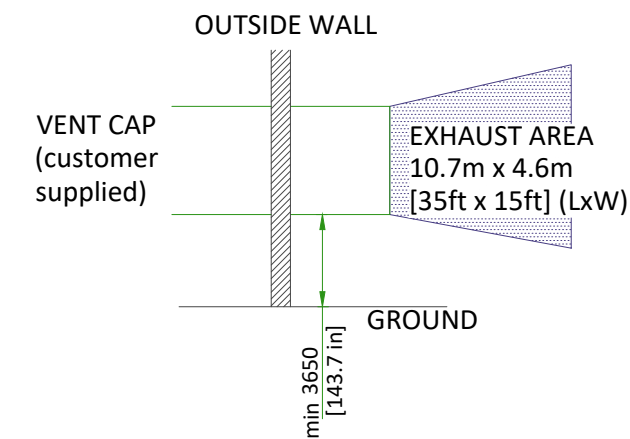
## TYPICAL CRYOGEN SIDE WALL EXIT

### KEY COMPONENTS:

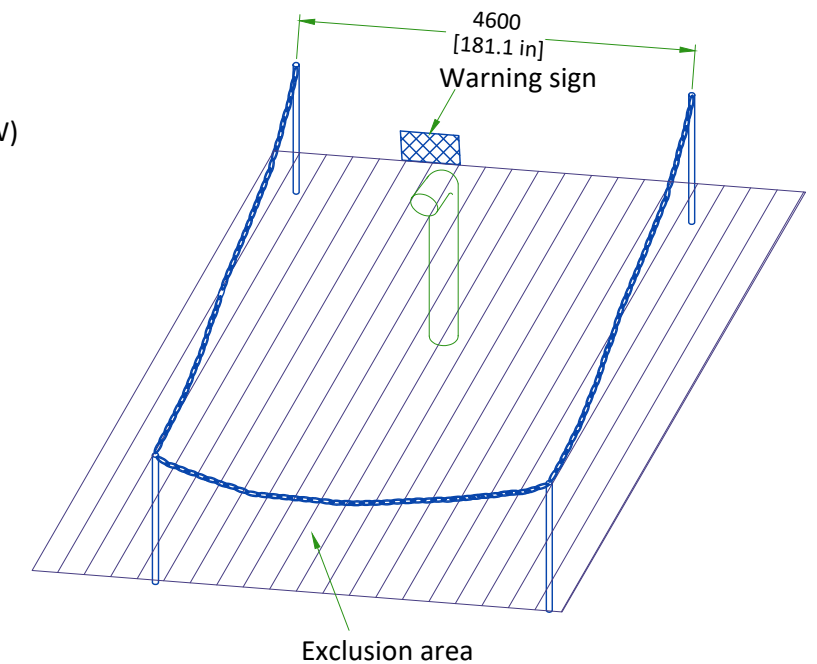
- RF waveguide extended from wall to magnet adapter
- Must be all same material and all welded or brazed
- Support system must withstand 11125 N (2500 lbs)
- GE ventglas must be installed in vertical section directly over magnet



## CRYOGENIC VENTING ( EXTERIOR )



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	
	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	0.222	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.



## 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:

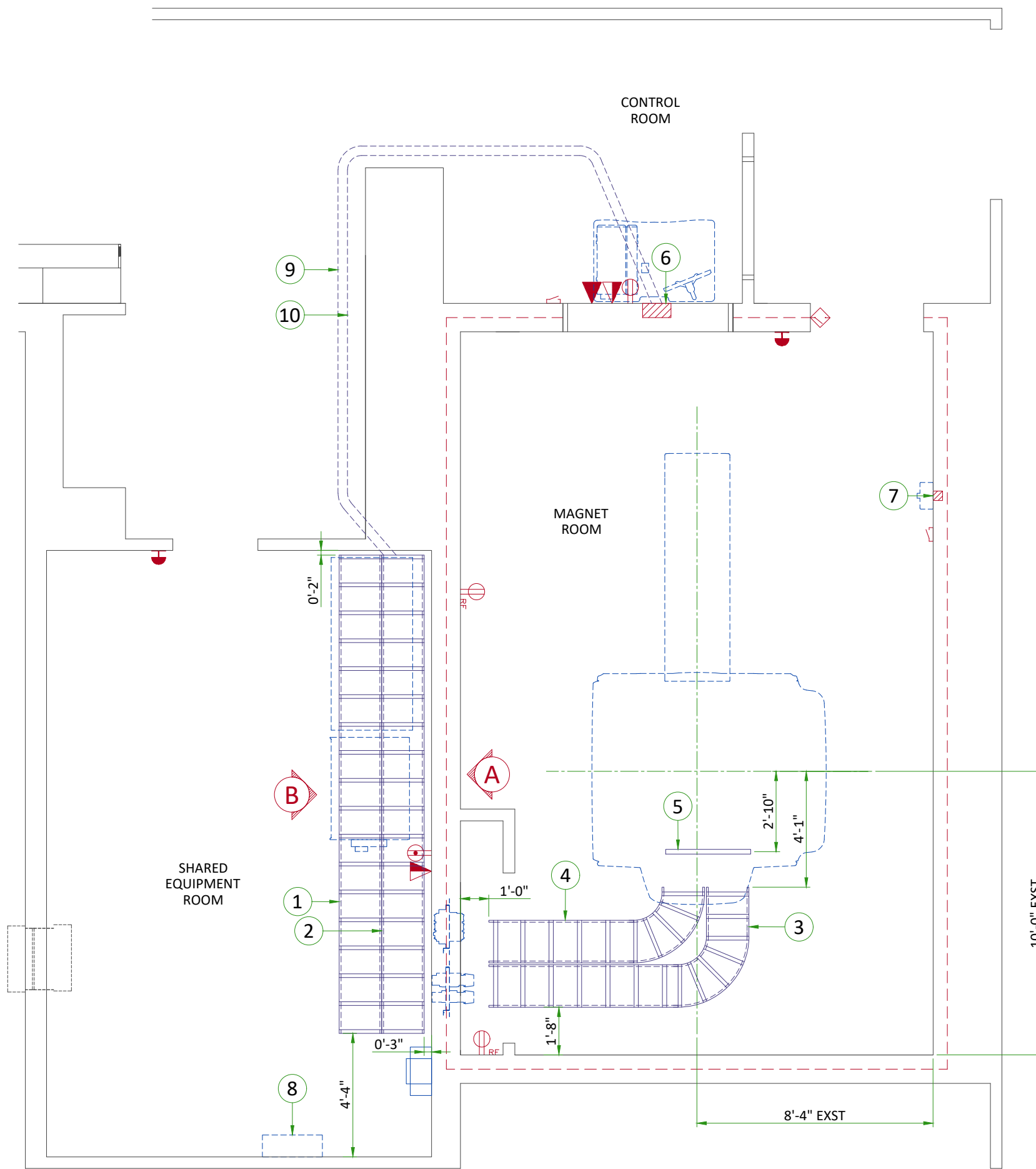
- Site-to-Site VPN/GE Solution
- Site-to-Site VPN/Customer Solution
- Connection through Dedicated Service Network
- Internet Access - connectivity for InSite 2.0

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.



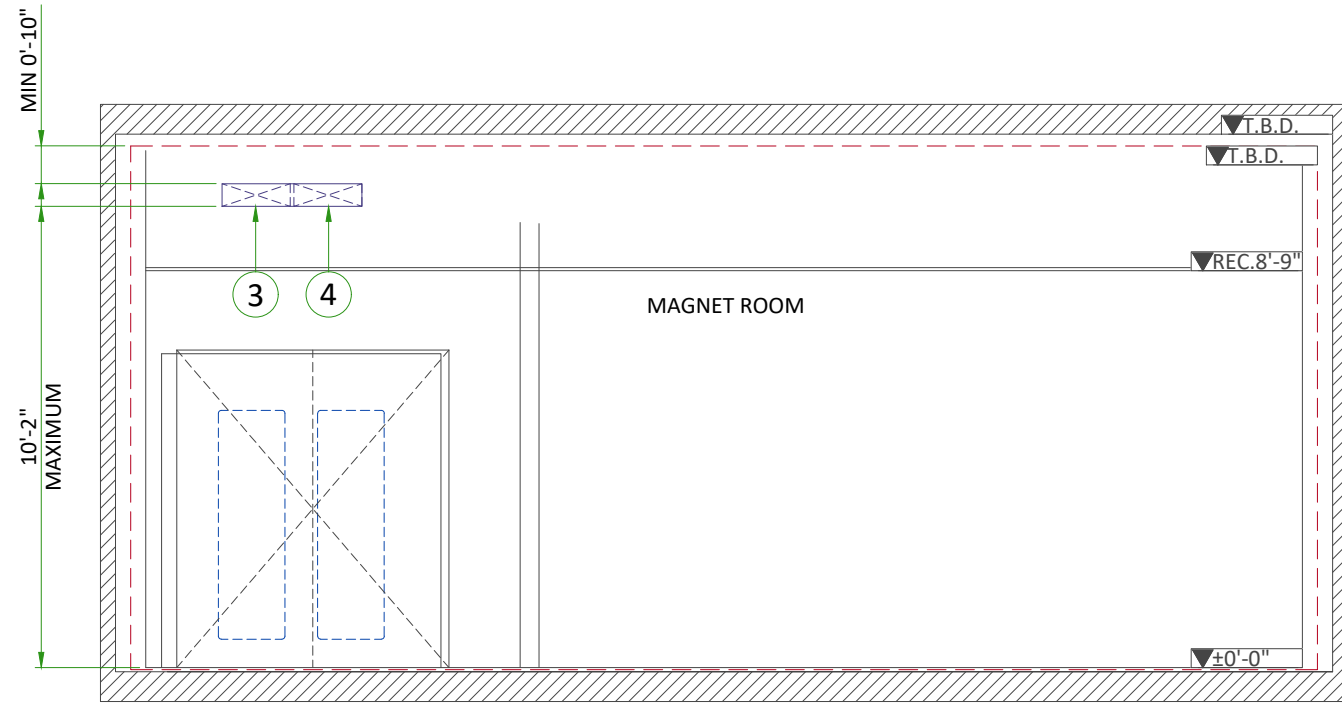


ITEM	DESCRIPTION (CONTRACTOR SUPPLIED & INSTALLED)
1	Cable ladder 18" x 6"
2	Cable ladder 18" x 6" for gradient cables
3	Non-ferrous cable ladder 18" x 6"
4	Non-ferrous cable ladder 18" x 6" for gradient cables
5	Non-ferrous unistrut cable support
6	Existing 12" x 8" x 6" Junction box
7	Existing 4" x 4" x 4" Junction box
8	Main disconnect panel (reuse existing location)
9	Existing 2" conduit above RF screen
10	Existing 3" conduit above RF screen

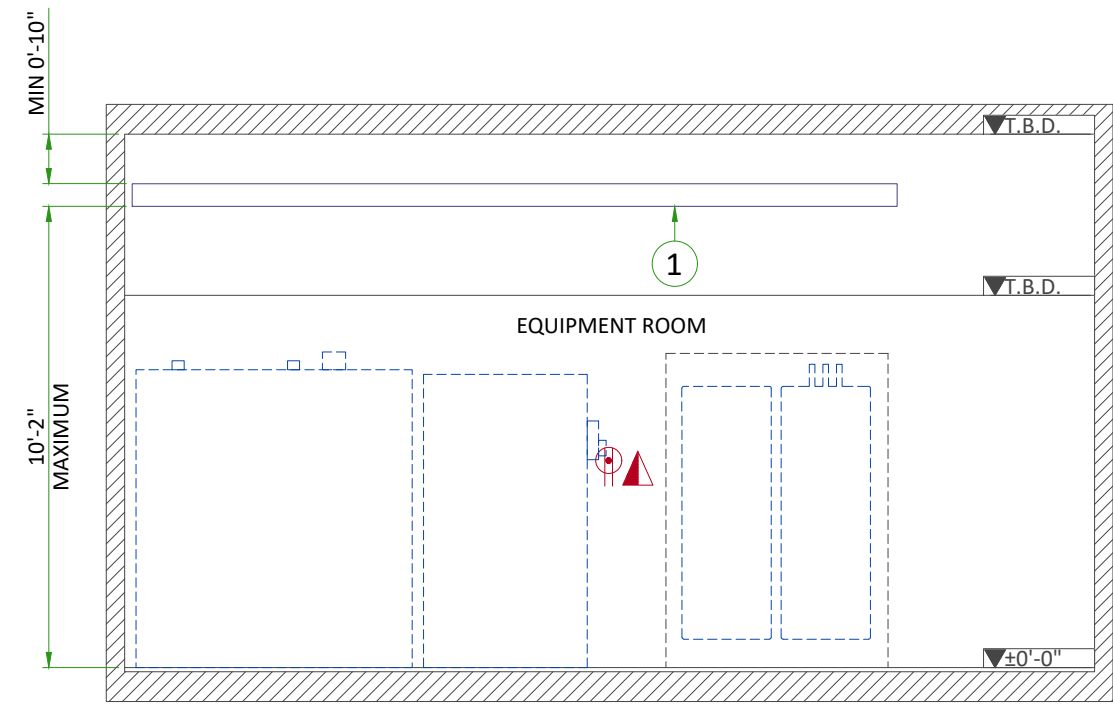
ITEM	Outlet Legend for GE Equipment
	System emergency off (SEO), (recommended height 48" above floor)
	Door interlock switch (needed only if required by state/local codes)
	Emergency exhaust fan switch, (recommended height 48" above floor)
	Duplex hospital grade, dedicated wall outlet 120-v, single phase 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

**EXISTING ELECTRICAL NOTE:**  
 USE EXISTING DUCT/CONDUITS WHERE POSSIBLE. ADDITIONAL DUCT/CONDUIT RUNS MAY BE NECESSARY IF EXISTING SYSTEM IS INADEQUATE IN SIZE AND/OR LOCATION FOR THIS INSTALLATION. VERIFY EXISTING SIZE AND LOCATION

Additional Conduit Runs (Contractor Supplied and Installed)				
From	To	Qty	Size (in)	Size (mm)
Main Disconnect Panel	Facility power	1	as Req'd	
Main Disconnect Panel	Integrated Systems Cabinet	1	as Req'd	
	Integrated Cooling Cabinet	1	as Req'd	
	System emergency off	1	1/2	16
System emergency off	Cooling Penetration Panel	1	1/2	16
Door Switch	Integrated Systems Cabinet	1	3/4	20
System emergency off	Cooling Penetration Panel	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	



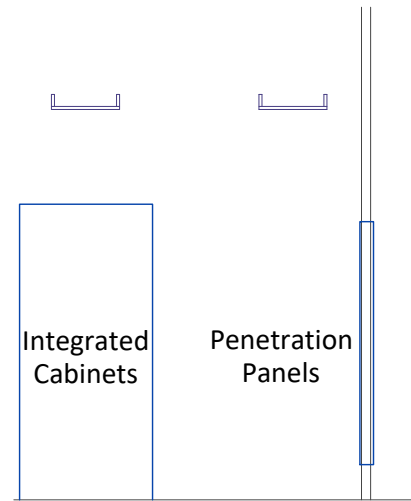
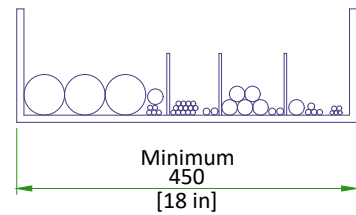
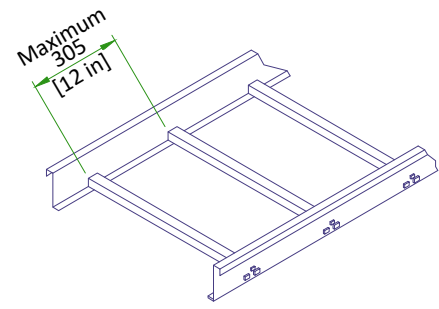
A



B

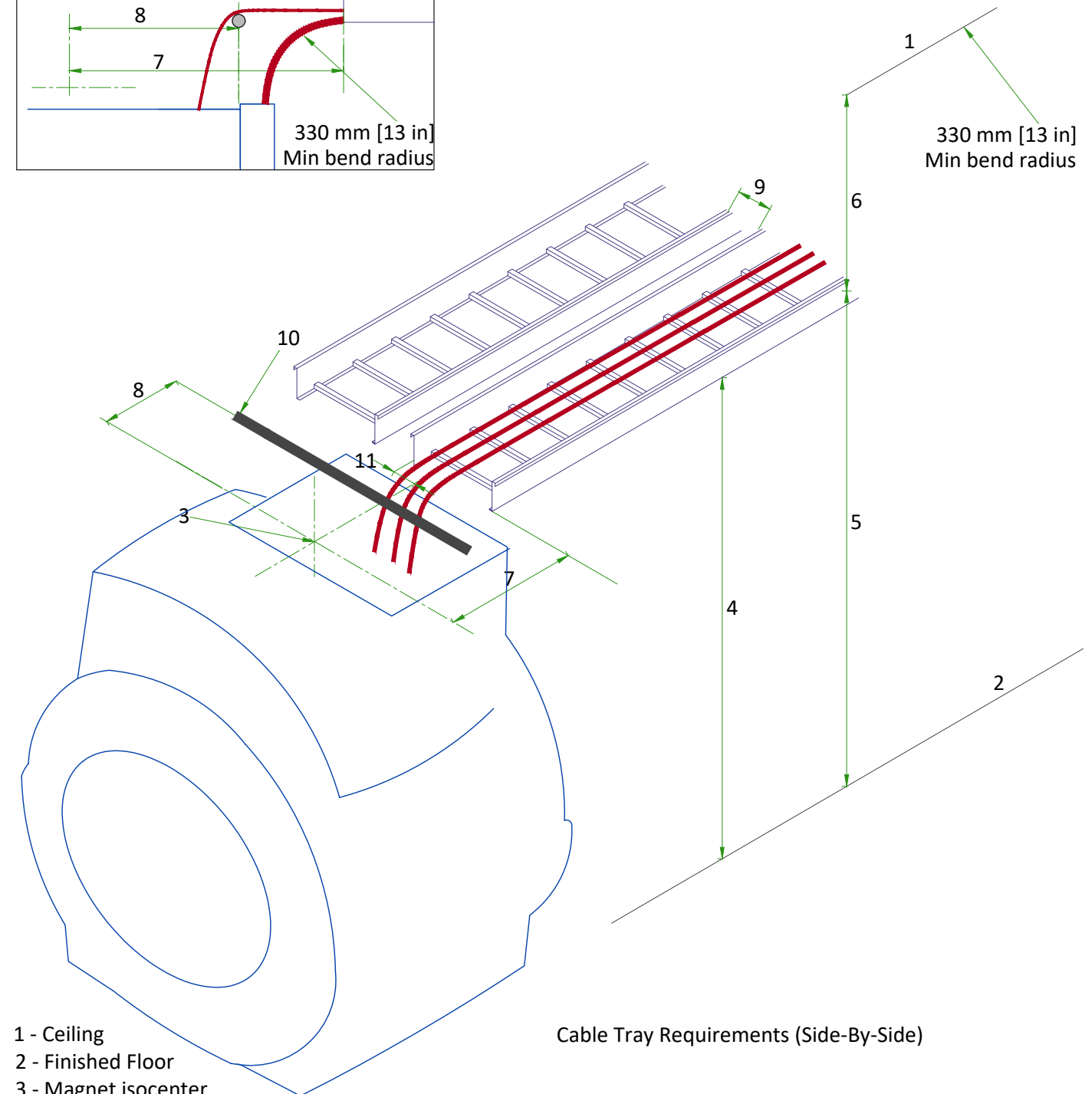
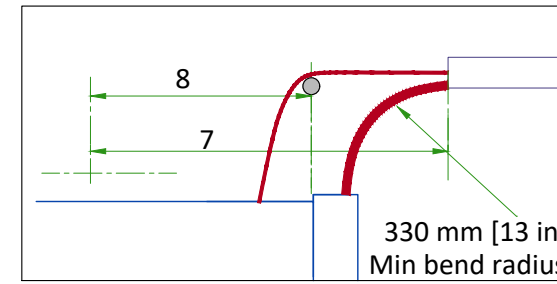
## CABLE TRAYS IN EQUIPMENT ROOM

CABLE TRAY DETAIL



NOT TO SCALE

## CABLE TRAYS REQUIREMENTS IN MAGNET ROOM



- 1 - Ceiling
- 2 - Finished Floor
- 3 - 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: 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: 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 - 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.

# POWER REQUIREMENTS

## INTRODUCTION

The system requires two independent power inputs:

- main power supply
- uninterrupted power supply

## SPECIFICATIONS OF MAIN POWER INPUT

POWER SUPPLY	380/400/415/480V +/-10%, THREE-PHASE + G
FREQUENCIES	50/60Hz ± 3Hz
MAXIMUM INPUT POWER (50 msec MAX)	349kVA
INSTALLED LOAD	181kVA
STAND-BY POWER	< 17 kVA

- 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 EMERGENCY POWER REQUIREMENT

Magnet Monitor	
POWER INPUT	EMERGENCY LIFE-SAFETY POWER, SINGLE PHASE + G
POWER DEMAND	2.0 A
VOLTAGE	110/220
FREQUENCY	50/60Hz
Shield Cryocooler Compressor	
POWER INPUT	AC 380, 400, 415, 460, 480 3Ø
POWER DEMAND	Minimum 9kVA / Recommended 12kVA
FREQUENCY	50/60Hz ± 3Hz

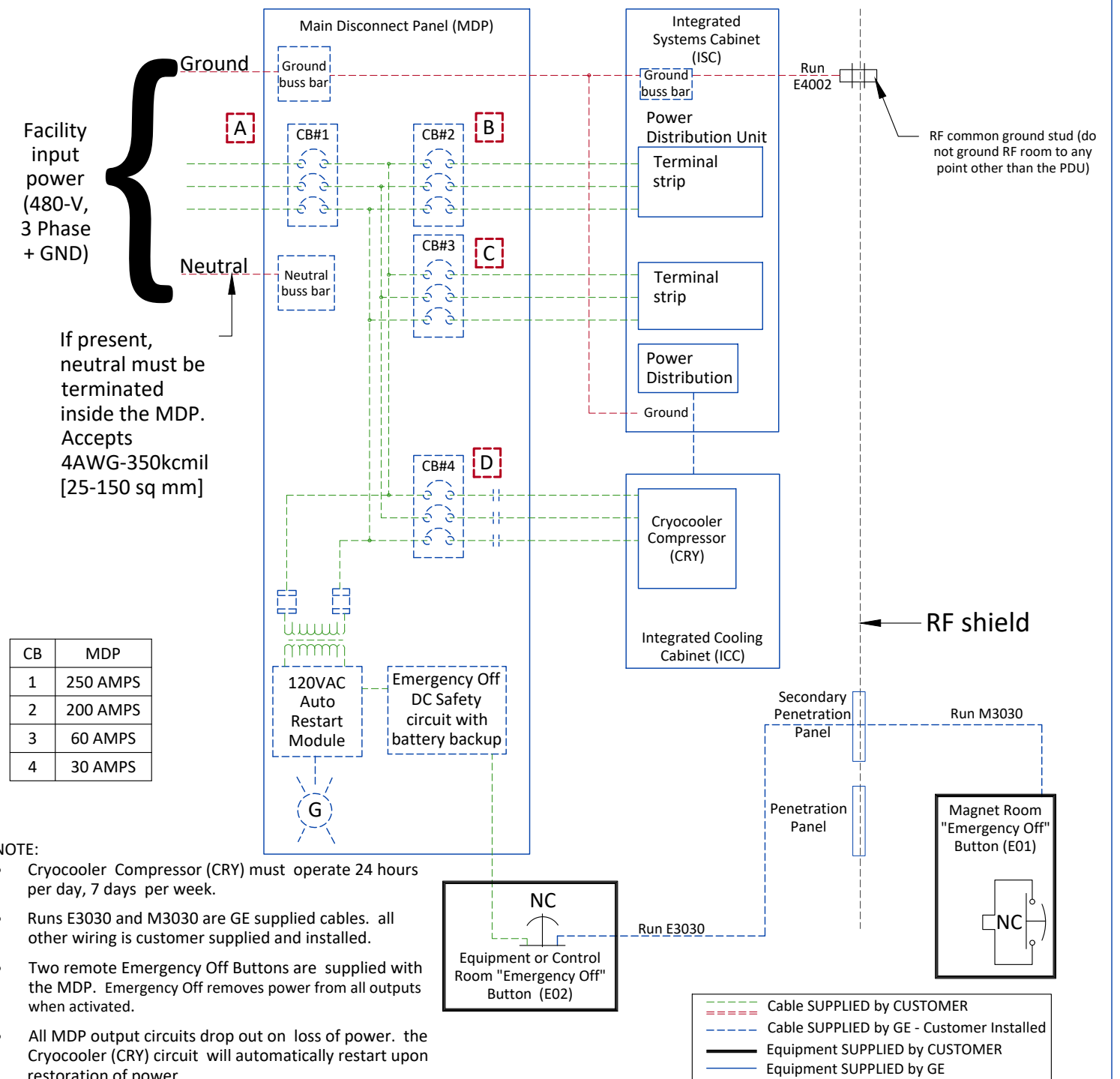
## CABLES

- Power and cable installation must comply with the distribution diagram.
- Size of the MDP 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,EO#,L...) will go to MDP with a pigtail length of 1.5m, 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.

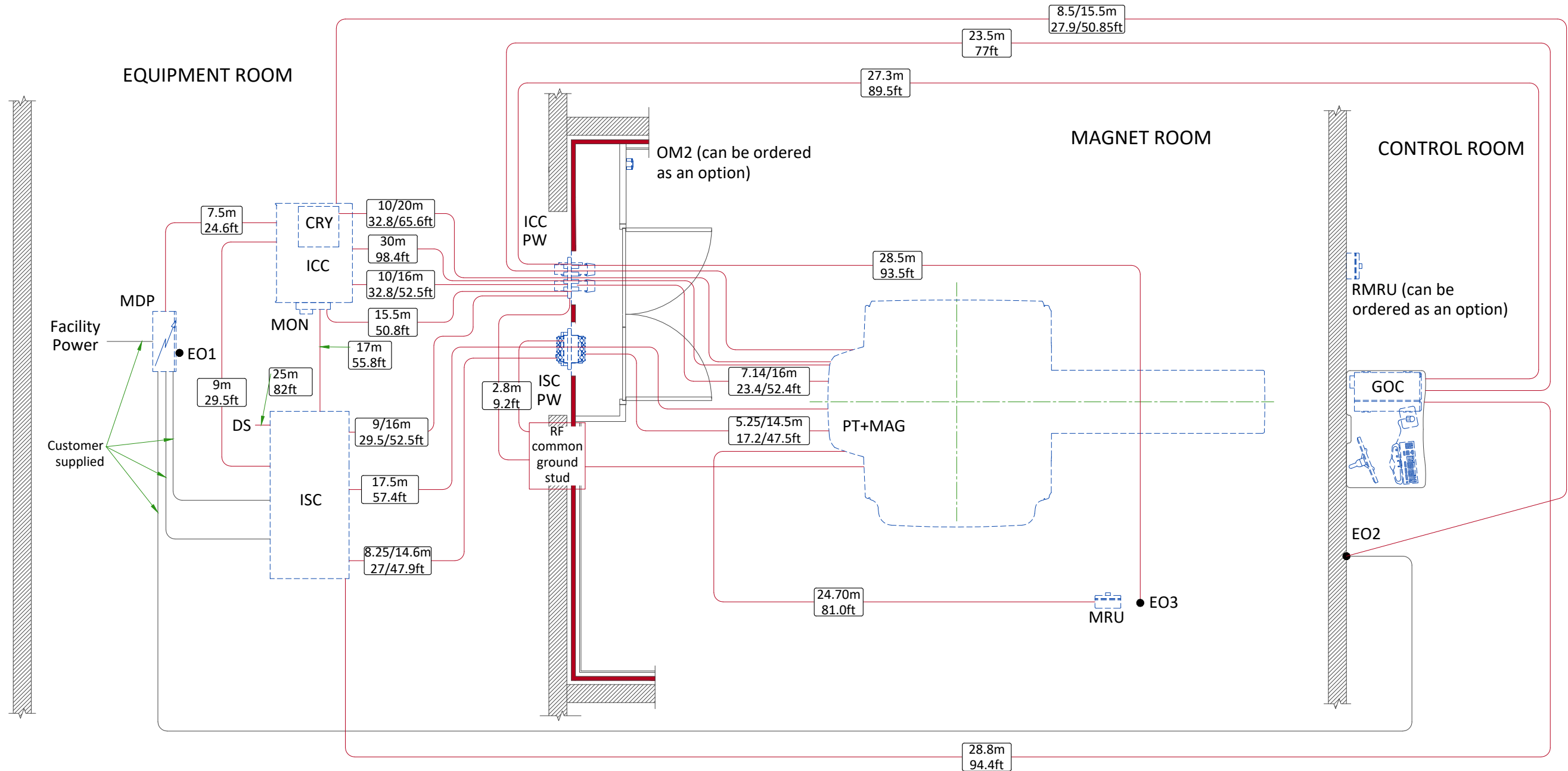
# POWER DISTRIBUTION



## MAIN FEEDER CALCULATION

Irms =	Continuous Power $V_{ph-ph} * \sqrt{3}$
FLA =	$Irms * 1.25$
Ipk =	Peak Power $V_{ph-ph} * \sqrt{3}$
Vloss =	$V_{ph-ph} * 4\%$
Rtotal =	$V_{loss}$ $I_{pk} * \sqrt{3}$
Cable Resistance =	$R_{total}$ Cable length

# 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 m (ft)
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)
	MRE	Customer Supplied Outlet	60Hz: 6.10 (20) 50Hz: 7.62 (25)