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

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.
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 regulations.
- 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 is the customer's responsibility.

THE UNDERSIGNED, HEREBY CERTIFIES THAT I HAVE READ AND APPROVED THE PLANS IN THIS DOCUMENT.

<table>
<thead>
<tr>
<th>DATE</th>
<th>NAME</th>
<th>SIGNATURE</th>
</tr>
</thead>
</table>

DISCLAIMER

GLOBAL SITE READINESS CHECKLIST (DI)

<table>
<thead>
<tr>
<th>Customer Name:</th>
<th>PMI Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>GON/SO Number:</td>
<td>Field Service Name:</td>
</tr>
<tr>
<td>Equipment:</td>
<td>Country/City or City/State:</td>
</tr>
<tr>
<td>Site Visit Date for SRC:</td>
<td>SRC Status:</td>
</tr>
</tbody>
</table>

Site Ready Checks at Installation

General Site Planning
- Room dimensions, including ceiling height, for all exam, Equipment/Technical & Control rooms meet 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 confirm 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.

Specific for MR
- 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.
- Exhaust fan system is installed and operational per GE requirements.
- PMI Signature:
- Customer Signature:
- 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:
  1. Secure area for equipment,
  2. Power for drills and other test equipment,
  3. Capability for image analysis,
  4. 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.

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.

MRI SITE PLANNING REMINDERS

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

1. The layout should be arranged so that the 5g line is contained to the magnet room. If not possible, a barrier is recommended to prevent entry to the 5g field area.
2. The spaces around, above, and below the magnet must be reviewed for effects of the 5g, 3g, 1g, and .5g fields. Refer to the proximity limit chart in the MR pre-installation manual referenced on the cover sheet.
3. For moving metal, the restriction lines typically extend outside of the MR space. Please confirm there are no moving metal concerns within these areas. An EMI study is recommended if the restriction lines are violated.
4. For vibration, analysis to be completed as required per pre-installation manual.
5. For EMI, review the site for the location of the main electrical feeders, AC devices, or distribution systems. An EMI study is recommended if large AC systems are nearby.
6. Details of the floor below the magnet must be reviewed. The structural engineer must verify that the quantity of steel in the volume 10ft (3.1m) x 10ft (3.1m) x 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.
7. 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.

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.

<table>
<thead>
<tr>
<th>Typical Moving Magnetic Mass</th>
<th>Distance Radially</th>
<th>Distance Axially</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carts, Gurneys 100-400 lbs [45-182 kg]</td>
<td>3 Gauss line</td>
<td>3 Gauss line</td>
</tr>
<tr>
<td>Forklifts, small elevator, cars, minivans, vans, pickup trucks, ambulances (objects greater than 400 lbs [182 kg])</td>
<td>20.0 FT</td>
<td>6.05 M</td>
</tr>
<tr>
<td>Buses and trucks (dump, tractor trailer, utility, fire trucks)</td>
<td>23.2 FT</td>
<td>7.10 M</td>
</tr>
</tbody>
</table>
### Reference Information

- **GE HPI Technical Support Group**
- **Accessory Sales:** (866) 281-7545 Options 1, 2, 1, 2 or mail to: gehcaccessorysales@ge.com
- **GE Supplied/Customer/contractor supplied and installed**
- **GE Supplied/contractor installed**
- **Available from GE**
- **Existing/Reinstall**

### Legend
- 200 Gauss
- 5 Gauss
- 100, 50, 30, 10 Gauss
- 3, 1, 0.5 Gauss

### BY ITEM DESCRIPTION

<table>
<thead>
<tr>
<th>A</th>
<th>1</th>
<th>1.5T Magnet</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>Patient table</td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>Magnet rundown unit</td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>Phantom set storage cabinet</td>
</tr>
<tr>
<td>A</td>
<td>5</td>
<td>Integrated Cooling Cabinet</td>
</tr>
<tr>
<td>A</td>
<td>6</td>
<td>Integrated System Cabinet</td>
</tr>
<tr>
<td>A</td>
<td>7</td>
<td>Magnet monitor</td>
</tr>
<tr>
<td>A</td>
<td>8</td>
<td>Operator console computer</td>
</tr>
<tr>
<td>A</td>
<td>9</td>
<td>Operator workspace</td>
</tr>
<tr>
<td>A</td>
<td>10</td>
<td>Pneumatic patient alert</td>
</tr>
<tr>
<td>A</td>
<td>11</td>
<td>MR Elastography</td>
</tr>
<tr>
<td>A</td>
<td>12</td>
<td>700 va partial UPS</td>
</tr>
<tr>
<td>A</td>
<td>13</td>
<td>CCTV Monitor</td>
</tr>
<tr>
<td>A</td>
<td>14</td>
<td>CCTV Camera</td>
</tr>
<tr>
<td>A</td>
<td>15</td>
<td>Music system</td>
</tr>
<tr>
<td>A</td>
<td>16</td>
<td>Injector on pedestal</td>
</tr>
<tr>
<td>A</td>
<td>17</td>
<td>Injector control</td>
</tr>
<tr>
<td>A</td>
<td>18</td>
<td>Injector power supply</td>
</tr>
<tr>
<td>A</td>
<td>19</td>
<td>Remote magnet rundown unit</td>
</tr>
<tr>
<td>A</td>
<td>20</td>
<td>Main disconnect panel</td>
</tr>
<tr>
<td>A</td>
<td>21</td>
<td>Dimplex chiller</td>
</tr>
<tr>
<td>A</td>
<td>22</td>
<td>Remote graphic display</td>
</tr>
<tr>
<td>C</td>
<td>23</td>
<td>Breaker boxes for Integrated Cooling &amp; Integrated Systems Cabinets</td>
</tr>
<tr>
<td>C</td>
<td>24</td>
<td>Minimum opening for equipment delivery is 40 in. w x 82 in. h, contingent on a 72 in. corridor width</td>
</tr>
<tr>
<td>C</td>
<td>25</td>
<td>Minimum opening for is 43 in. w x 82 in. h, contingent on a 96 in. corridor width</td>
</tr>
<tr>
<td>C</td>
<td>26</td>
<td>Counter top for equipment- provide grommeted openings as required to route cables</td>
</tr>
<tr>
<td>C</td>
<td>27</td>
<td>Base cabinet for storage of: surface coils, patient positioning pads, phantoms, etc.</td>
</tr>
<tr>
<td>C</td>
<td>28</td>
<td>Louvered doors - refer to preinstall for requirements</td>
</tr>
<tr>
<td>C</td>
<td>29</td>
<td>Magnet access 9'-0&quot;x10'-0&quot;</td>
</tr>
<tr>
<td>C</td>
<td>30</td>
<td>Shelf</td>
</tr>
<tr>
<td>C</td>
<td>31</td>
<td>Warning! 5 Gauss line outside the Magnet room limits</td>
</tr>
<tr>
<td>C</td>
<td>32</td>
<td>Define RF shield's inset according to provisions made by the RF Shield vendor</td>
</tr>
</tbody>
</table>

### Moving Metal Sensitivity Lines
- For CARS, MINIVANS, PICKUP TRUCKS, AND AMBULANCES.
- For BUSES AND TRUCKS (DUMP, TRACTOR TRAILER, UTILITY, FIRE TRUCKS)

### Moving Metal Sensitivity Line for Buses and Trucks
- Moving metal sensitivity line for BUSES AND TRUCKS (DUMP, TRACTOR TRAILER, UTILITY, FIRE TRUCKS)

### Floor Height and Attenuation
- Finished floor to slab height: TBD
- Recommended finished ceiling height: 8'-9"
SIDE VIEW WITH MAGNETIC FIELD

FRONT VIEW WITH MAGNETIC FIELD

Cable tray
Unistrut

MAGNET ROOM
CONTROL ROOM

3'-6" ± 0'-0"
8'-9" ± 0'-0"

+ TBD
ACOUSTICS SPECIFICATIONS

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

- **Control Room:** 62dBA
- **Equipment Room:** 80dBA
- **Magnet Room:** 127dBA*

*Maximum sound pressure level at magnet bore isocenter*

- Frequency: 20 Hz to 20kHz

**SOUND PRESSURE SPECTRAL DISTRIBUTION**

1/3 Band Relative SPL

- **Response (dBA):**
  - 63: 61
  - 125: 70
  - 250: 70
  - 500: 70
  - 1000: 70
  - 2000: 70
  - 4000: 70
  - 8000: 70

1/3 Octave Frequency (Hz)

**MAGNETIC PROXIMITY LIMITS**

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.

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

<table>
<thead>
<tr>
<th>Limits Of Steel Mass</th>
<th>Distance From Magnet Isocenter</th>
<th>Distance Below Top Surface of Floor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 kg/m²</td>
<td>0</td>
<td>0 - 1143</td>
</tr>
<tr>
<td>0.8 kg/m²</td>
<td>2</td>
<td>1143 - 1194</td>
</tr>
<tr>
<td>1.6 kg/m²</td>
<td>3</td>
<td>1194 - 1214</td>
</tr>
<tr>
<td>2.4 kg/m²</td>
<td>8</td>
<td>1214 - 1237</td>
</tr>
<tr>
<td>3.2 kg/m²</td>
<td>20</td>
<td>1237 - 1397</td>
</tr>
<tr>
<td>4.0 kg/m²</td>
<td>30</td>
<td>1397+</td>
</tr>
</tbody>
</table>

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.
An enclosure (i.e. closet) must be provided to restrict access to the PEN panels and for storage of excess interconnections.

- The PEN closet must have a mechanical locking mechanism to restrict access to the PEN panels.
- The PEN closet must maintain the minimum service area outside the 200 Gauss in the magnet room.
- The PEN closet must allow free air exchange of $\kappa \gg \sigma$ between the Magnet room and PEN closet for MR system blowers. Airflow may be achieved through door louvers or other openings in the PEN closet that meet all other PEN closet requirements.

A: 300 mm [11.81 in] side space for excess cable storage. Left side space and right side space can be swapped.

NOTE: All RF mesh Assy Shipping brackets should be kept on frame until after installed and RF test is completed.

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

**MINIMUM MAGNET CEILING HEIGHT (TOP VIEW)**

Shaded area within dashed lines indicates floor to ceiling minimum height of 2500 mm [98.5 in]. If suspended ceiling is between 2500 mm [98.5 in] and 2667 mm [105 in], 2.5M Low Ceiling Kit-Passive is required. Contact the PMI for preparation.
Center of gravity is approximate and includes the GE Healthcare supplied VibroAcoustic Dampening Kit, but does not include cryogens, gradient assembly, side mounted electronics, or enclosures. Enclosure dimensions are for reference only, NOT FOR SITE PLANNING USE.
GLOBAL OPERATOR CABINET (GOC)

**TOP VIEW**
- 330.5 [13.01 in]
- 700 [27.56 in]
- 308 [12.13 in]
- 194 [7.64 in]

**SIDE VIEW**
- 335.5 [13.21 in]
- 755 [29.71 in]
- 108 [4.25 in]

**FRONT VIEW**
- 401 [15.79 in]
- 50.5 [2 in]
- 593 [23.35 in]

**SCALE 1:10**

Date: 30/Jun/2019
Rev: C

SIGNA VOYAGER
Typical A7 - Equipment Details (2)
**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 5352 daN
- Height: 2.5m [98.5in], width: 2.7m [106.3in]
- Maximum slope: 30°

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

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

**CRITICAL ITEMS FOR MAGNET DELIVERY**
- 24/7 chilled water and 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)

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**

<table>
<thead>
<tr>
<th>EQUIPMENT</th>
<th>DIMENSIONS LxWxH</th>
<th>WEIGHT</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacement XRM gradient coil assembly on a shipping cradle/cart</td>
<td>991x2536x1499 [39x99.84x59]</td>
<td>1449 lbs</td>
<td>Initial gradient coil assembly is shipped installed in the magnet. Shipping/installation cart is used to install replacement coil assembly only.</td>
</tr>
</tbody>
</table>

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.
VIBRATION TRANSMITTED THROUGH VIBROACOUSTIC MAT

- 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.

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

MAGNET STEADY-STATE VIBRATION SPECIFICATIONS

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 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.

VIBRATION TRANSMITTED THROUGH VIBROACOUSTIC MAT
<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vibroacoustic dampening kit (see floor structural detail)</td>
</tr>
<tr>
<td>2</td>
<td>Magnet curtain kit</td>
</tr>
<tr>
<td>3</td>
<td>Patient table dock anchoring</td>
</tr>
<tr>
<td>4</td>
<td>Structural wall backing for Main Disconnect Panel</td>
</tr>
<tr>
<td>5</td>
<td>Structural wall backing for Magnet Rundown Unit</td>
</tr>
</tbody>
</table>
**FLOOR MOUNTING**

NOTE: The Table anchor holes can’t be pre-drill before table installation

![Diagram of floor mounting](image)

**TABLE FRAME ANCHOR MOUNTING REQUIREMENTS**

1. The RF Shield vendor must design and install the table frame anchor bolt.
2. The table frame anchor hole must be drilled after the Magnet is delivered.
3. The table frame anchor must not contact floor rebar or other structural steel.
4. The table frame anchor must electrically contact the RF shield at point of entry.
5. The table frame anchors must have the following properties:
   a. Anchors must be two-part assembly (male/female).
   b. Female side must be expansion- or epoxy-type.
   c. Male side must be a bolt or threaded rod with appropriate-sized nut (bolt or rod must be removable - not epoxied or cemented in place).
   d. Anchors must be electrically conductive.
   e. Anchors must be non-magnetic.
   f. Anchors must not induce galvanic corrosion with the RF shield.
   g. Anchors must be commercially procured.
   h. The anchor rod hole clearance in the table anchor base is 11 mm (0.43 in). The anchor rod diameter must be sized appropriately.
   i. The anchor rod must extend 40 mm ± 13 mm (1.57 in ±0.5 in) above the finished floor.
   j. The anchor rod must be less than 152 mm (6 in) in total length (length above the floor plus embedded length).
6. 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).

**CABLE CONCEALMENT**

![Diagram of cable concealment](image)

**MAGNET ROOM FLOOR SPECIFICATIONS**

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

![Diagram of magnet room floor specifications](image)

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

**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.
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. (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. (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**

<table>
<thead>
<tr>
<th>Magnet Room</th>
<th>Control Room</th>
<th>Equipment Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>15-21°C</td>
<td>15-32°C</td>
</tr>
<tr>
<td></td>
<td>59-69.8°F</td>
<td>59-89.6°F</td>
</tr>
<tr>
<td>Temperature</td>
<td>7.5°C/h</td>
<td>3°C/h</td>
</tr>
<tr>
<td>Gradient</td>
<td>30% to 80%</td>
<td>30% to 75%</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>30% to 75%</td>
<td>30% to 75%</td>
</tr>
<tr>
<td>Humidity gradient</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>System heat dissipation (2)</td>
<td>0.165kW</td>
<td>0.29kW</td>
</tr>
</tbody>
</table>

**STORAGE CONDITIONS**

| Temperature | -30°C to 50°C |
| Relative humidity | 10% to 90% |

**AIR RENEWAL**

According to local standards.

Material should not be stored for more than 90 days.

**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 drooping water.

**HEAT DISSIPATION DETAILS**

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>ROOM</th>
<th>IDLE W</th>
<th>AVERAGE</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet (MAG) and Patient Table (PT)</td>
<td>Magnet</td>
<td>561</td>
<td>1915</td>
<td>1200</td>
</tr>
<tr>
<td>Main Disconnect Panel (MDP)</td>
<td>Equipment</td>
<td>132</td>
<td>450</td>
<td>132</td>
</tr>
<tr>
<td>Integrated System Cabinet (ISC)</td>
<td>Equipment</td>
<td>280</td>
<td>955</td>
<td>2130</td>
</tr>
<tr>
<td>Integrated Cooling Cabinet (ICC)</td>
<td>Equipment</td>
<td>0</td>
<td>0</td>
<td>500</td>
</tr>
<tr>
<td>Cryocooler Compressor (CRY)</td>
<td>Equipment</td>
<td>500</td>
<td>1706</td>
<td>500</td>
</tr>
<tr>
<td>Magnet Monitor (MON)</td>
<td>Equipment</td>
<td>60</td>
<td>205</td>
<td>60</td>
</tr>
<tr>
<td>Operator Workspace equipment (OW)</td>
<td>Control</td>
<td>1450</td>
<td>4947</td>
<td>4947</td>
</tr>
<tr>
<td><strong>OPTIONS</strong></td>
<td><strong>Equipment</strong></td>
<td><strong>480</strong></td>
<td><strong>480</strong></td>
<td><strong>480</strong></td>
</tr>
</tbody>
</table>

**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.
- Ingressing 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 34 m³/min with a minimum of 12 room air exchanges per hour.
- The exhaust fan must be placed above RF shielding located outside 10 gauss (1 mT) 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.

**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.
CHILLED WATER SPECIFICATIONS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>REQUIREMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chiller size</td>
<td>Minimum 36 kW</td>
</tr>
<tr>
<td>Inlet temperature</td>
<td>5 to 15°C (41 to 59°F) measured at the inlet to the ICC</td>
</tr>
<tr>
<td>Hose connection to ICC (supplied by customer)</td>
<td>25.4mm (1 in) minimum hose inside diameter</td>
</tr>
<tr>
<td>Maximum inlet pressure to ICC</td>
<td>6.5 to 8.2 at 25°C (77°F)</td>
</tr>
<tr>
<td>Maximum continuous heat load</td>
<td>7.5 kW</td>
</tr>
<tr>
<td>pH level</td>
<td>6.5 to 8.2 at 25°C (77°F)</td>
</tr>
<tr>
<td>Total hardness</td>
<td>Less than 200 ppm</td>
</tr>
<tr>
<td>Suspended matter</td>
<td>Less than 10 ppm</td>
</tr>
<tr>
<td>Particle size</td>
<td>100 micron or smaller with a field-changeable filter</td>
</tr>
<tr>
<td>Facility filter</td>
<td>100 micron or smaller with a field-changeable filter</td>
</tr>
<tr>
<td>Condensation protection</td>
<td>Facility plumbing to the ICC must be properly routed and insulated to prevent equipment damage or safety hazards</td>
</tr>
</tbody>
</table>

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

INLET WATER FLOW/TEMPERATURE FOR CRYOCOOLER COMPRESSOR

*RECOMMENDED TEMPERATURE AND WATER FLOW TO CRY ENTRY

<table>
<thead>
<tr>
<th>INLET TEMP</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>°F</td>
<td>39.2</td>
<td>82.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INLET FLOW</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>gpm (l/min)</td>
<td>1.0</td>
<td>2.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEMP RISE</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>°F</td>
<td>89.6</td>
<td>53.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HEAT DISSIPATION (kW)</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7.2</td>
<td>7.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PRESSURE DROP</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>kPa (psi)</td>
<td>38.1</td>
<td>55.6</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>KEY COMPONENTS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>· RF waveguide extended from wall to magnet adapter</td>
</tr>
<tr>
<td>· Must be all same material and all welded or brazed</td>
</tr>
<tr>
<td>· Support system must withstand 8229 N [1850 lbs]</td>
</tr>
<tr>
<td>· GE ventglas must be installed in vertical section directly over magnet</td>
</tr>
</tbody>
</table>

NOTE: for the Dielectric Break inside the Magnet room please see the Detail for the Cryogen Side Wall Exit.
<table>
<thead>
<tr>
<th>Outer dia. of pipe (D)</th>
<th>Distance of vent system component from magnet</th>
<th>Pressure drop for straight pipe</th>
<th>Std sweep 45° elbow</th>
<th>Std sweep 90° elbow</th>
<th>Long sweep 45° elbow</th>
<th>Long sweep 90° elbow</th>
</tr>
</thead>
<tbody>
<tr>
<td>ft</td>
<td>m</td>
<td>psi/ft</td>
<td>kPa/m</td>
<td>psi</td>
<td>kPa</td>
<td>psi</td>
</tr>
<tr>
<td>8 in. (200mm)</td>
<td>0-20</td>
<td>0.61</td>
<td>0.10</td>
<td>2.26</td>
<td>1.10</td>
<td>7.58</td>
</tr>
<tr>
<td></td>
<td>40-60</td>
<td>6.1-12</td>
<td>0.21</td>
<td>4.75</td>
<td>2.10</td>
<td>14.48</td>
</tr>
<tr>
<td></td>
<td>80-100</td>
<td>18.3-24.4</td>
<td>0.38</td>
<td>8.60</td>
<td>3.70</td>
<td>25.51</td>
</tr>
<tr>
<td>10 in. (250mm)</td>
<td>0-20</td>
<td>0.61</td>
<td>0.03</td>
<td>0.68</td>
<td>0.55</td>
<td>3.79</td>
</tr>
<tr>
<td></td>
<td>40-60</td>
<td>6.1-12</td>
<td>0.07</td>
<td>1.58</td>
<td>0.82</td>
<td>5.65</td>
</tr>
<tr>
<td></td>
<td>80-100</td>
<td>18.3-24.4</td>
<td>0.12</td>
<td>2.71</td>
<td>1.51</td>
<td>10.41</td>
</tr>
<tr>
<td>12 in. (300mm)</td>
<td>0-20</td>
<td>0.61</td>
<td>0.01</td>
<td>0.29</td>
<td>0.27</td>
<td>1.86</td>
</tr>
<tr>
<td></td>
<td>40-60</td>
<td>6.1-12</td>
<td>0.027</td>
<td>0.61</td>
<td>0.41</td>
<td>2.83</td>
</tr>
<tr>
<td></td>
<td>80-100</td>
<td>18.3-24.4</td>
<td>0.054</td>
<td>1.22</td>
<td>0.69</td>
<td>4.76</td>
</tr>
<tr>
<td>14 in. (350mm)</td>
<td>0-20</td>
<td>0.61</td>
<td>0.008</td>
<td>0.055</td>
<td>0.20</td>
<td>1.3800</td>
</tr>
<tr>
<td></td>
<td>40-60</td>
<td>6.1-12</td>
<td>0.017</td>
<td>0.12</td>
<td>0.30</td>
<td>2.07</td>
</tr>
<tr>
<td></td>
<td>80-100</td>
<td>18.3-24.4</td>
<td>0.034</td>
<td>0.23</td>
<td>0.51</td>
<td>3.52</td>
</tr>
<tr>
<td>16 in. (400mm)</td>
<td>0-20</td>
<td>0.61</td>
<td>0.0053</td>
<td>0.037</td>
<td>0.153</td>
<td>1.05</td>
</tr>
<tr>
<td></td>
<td>40-60</td>
<td>6.1-12</td>
<td>0.013</td>
<td>0.09</td>
<td>0.229</td>
<td>1.58</td>
</tr>
<tr>
<td></td>
<td>80-100</td>
<td>18.3-24.4</td>
<td>0.026</td>
<td>0.18</td>
<td>0.390</td>
<td>2.69</td>
</tr>
</tbody>
</table>

Notes:
1. Elbows with angles greater than 90 deg must not be used.
2. Data in Table is based on the following facts and assumptions:
   a. Initial flow conditions at magnet interface
   b. EM energy (13MJ) is dumped to He during quench and rises He temperature to 10 Kelvin
   c. Gas temperature starting at 10 Kelvin and increase with length determined by thermal energy balance
   d. 90% He is assumed to be evacuated within 30 sec. None left after quench.
   e. Absolute roughness is assumed to be 0.25 mm.
   f. R/D = 1.0 for standard sweep elbows, R/D = 1.5 for long sweep elbows where D = outer diameter of pipe; R = radius of bend.
3. The total pressure drop of the entire cryogenic vent system must be less than 17 psi (117.2 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.

**GENERAL REQUIREMENTS**

- All opening in access flooring are to be cut off 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 pigtails at all junction points.
- Grounding is critical to equipment function and patient safety. Site must conform to wiring specifications shown on this plan.

- PVC as a substitute must be used in accordance with all local and national codes.
- 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.
- 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.
- Ceiling mounted junction boxes illustrated on this plan must be installed flush with finished ceiling.
### Outlet Legend for GE Equipment

1. System emergency off (SEO), (recommended height 1.2m [48"] above floor)
2. Door interlock switch
3. Emergency exhaust fan switch (1.2m [48"] height recommended)
4. Duplex hospital grade, dedicated wall outlet 120-v, single phase power
5. Network outlet
6. Dedicated telephone lines/network connection
7. Duplex hospital grade, dedicated outlet 120-v, single phase power, 15a
8. Duplex hospital grade, dedicated outlet 120-v, single phase outlet routed through RF filter

### Additional Conduit Runs

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Qty</th>
<th>Size (in)</th>
<th>Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Disconnect Panel</td>
<td>Facility power</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
<tr>
<td>Main Disconnect Panel</td>
<td>Integrated Systems Cabinet</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integrated Cooling Cabinet</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>System emergency off</td>
<td>1</td>
<td>1/2</td>
<td>16</td>
</tr>
<tr>
<td>Door Switch</td>
<td>Integrated Cooling Cabinet</td>
<td>1</td>
<td>1/2</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Integrated Systems Cabinet</td>
<td>1</td>
<td>3/4</td>
<td>20</td>
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<tr>
<td></td>
<td>System emergency off</td>
<td>1</td>
<td>3/4</td>
<td>20</td>
</tr>
<tr>
<td>Magnet Rundown Unit</td>
<td>Magnet</td>
<td>1</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>RF filter</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>120-V 1Ø Power</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RF filter</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Room Light</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RF filter</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Facility emergency power</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Remote graphic display</td>
<td>1</td>
<td>3/4</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Facility power</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TV Camera</td>
<td>1</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>TV Monitor</td>
<td>1</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Injector control unit</td>
<td>1</td>
<td>2 1/2</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Injector head</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integrated Battery Charging</td>
<td>1</td>
<td>as Req’d</td>
<td></td>
</tr>
</tbody>
</table>

### Additional Conduit Runs (Contractor Supplied & Installed)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>Cable ladder 450mm x 150mm [18&quot; x 6&quot;]</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Non-ferrous cable ladder 450mm x 150mm [18&quot; x 6&quot;]</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Box above ceiling size per local code</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>150mm x 100mm [6&quot; x 3 1/2&quot;] Surface wall duct</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>100mm x 100mm x 50mm [4&quot; x 4&quot; x 2&quot;] J-Box</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Main disconnect panel</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>One 50mm [2&quot;] cnd above ceiling</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>One 75mm [3&quot;] cnd above ceiling</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>Breaker Boxes</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>100mm x 100mm x 100mm [4&quot; x 4&quot; x 4&quot;] J-Box</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>Non-ferrous unistrut cable support</td>
</tr>
</tbody>
</table>
CABLE TRAYS REQUIREMENTS IN MAGNET ROOM

1. Ceiling
2. Finished Floor
3. Magnet isocenter
4.1 - Minimum cable tray height for Group E required at back of Magnet: 2395 mm [94.3 in].
4.2 - Minimum cable tray height for Groups A,B,C,D required at back of Magnet: 2436 mm [95.9 in].
4.3 - Group a - Gradient and RF common ground cables.
   Group b - Coax, RF, and AC power cables with jacket rating of 600V and above
   Group c - Data and fiber optic and 300V coax or RF clock cables
   Group d - 300V signal, 300V power, and 300V power/signal cables
   Group e - Air, water, and cryogen lines
4.4 - 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**

**SPECIFICATIONS OF MAIN POWER INPUT**

- **POWER SUPPLY**: 380/400/415/480V +7.5%/-10%, THREE-PHASE + GND
- **FREQUENCIES**: 50/60Hz ± 3Hz
- **POWER FACTOR**: 0.9
- **MAXIMUM INPUT POWER (5 sec MAX)**: 77kVA
- **CONTINUOUS (AVERAGE) POWER**: 64kVA
- **STAND-BY POWER**: < 17kVA

- 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**: EMERGENCY POWER SUPPLY, SINGLE PHASE + GROUND
- **POWER INPUT**: 2kVA
- **VOLTAGE**: 110V / 220V
- **FREQUENCY**: 50/60Hz ± 3Hz

- **FOR CRYOCOOLER COMPRESSOR**: 380/400/415/480V, THREE-PHASE + G
- **POWER INPUT**: MIN 96kVA
- **POWER CONSUMPTION**: MAX 7.2kW / STEADY STATE 6.5kW at 50Hz
  
- **MAX 8.3kW / STEADY STATE 7.5kW at 60Hz**
- **MIN 9kVA**
- **FREQUENCY**: 50/60Hz ± 3Hz

**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, 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.

**POWER DISTRIBUTION**

- **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.**
- **Grounding point of the equipotential bar will be by means of an equipotential bar.**
- **The impedance of the earth bar should be less than or equal to 2 ohms.**
- **In all cases qualified personnel must verify that the feeder (at the point of take-off) and the run to the MR 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.**

**GENERAL NOTES**

- Cryocooler Compressor (CRY) must operate 24 hours per day, 7 days per week.
- Runs E0009, E0310 and M3030 are GE supplied cables.
- All other wiring is customer supplied and installed.
- Two remote Emergency Off Maintained Buttons are supplied with the MDP. Emergency Off removes power from all outputs when activated.
- MDP provides power to customer provided circuit breakers for PDU (located in the Integrated Systems Cabinet (ISC) and the Cryocooler Compressor (CRY).)
- All MDP output circuits drop out on loss of power. the Cryocooler (CRY) circuit will automatically restart upon restoration of power.
- GE MDP Short circuit current rating is 25,000 amperes at 480 VAC.
- GE MDP is NRTL labeled.
- All feeder circuits require dedicated ground wires.
### CABLES ROUTING

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Equipment Room</th>
<th>Magnet Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Short</td>
<td>Short</td>
</tr>
<tr>
<td>B</td>
<td>Long</td>
<td>Short</td>
</tr>
<tr>
<td>C</td>
<td>Short</td>
<td>Long</td>
</tr>
<tr>
<td>D</td>
<td>Long</td>
<td>Long</td>
</tr>
<tr>
<td>E</td>
<td>Short</td>
<td>Extra Long</td>
</tr>
<tr>
<td>F</td>
<td>Long</td>
<td>Extra Long</td>
</tr>
</tbody>
</table>

Long / Short cable selection guidance

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

### CABLES ROUTING FOR OPTIONS

<table>
<thead>
<tr>
<th>OPTION</th>
<th>FROM</th>
<th>TO</th>
<th>CABLE LENGTH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MRE</td>
<td>Magnet Isocenter</td>
<td>Nominal 7.31</td>
</tr>
<tr>
<td></td>
<td>MRE</td>
<td>ISC cabinet</td>
<td>Maximum 10.06</td>
</tr>
<tr>
<td></td>
<td>MRE</td>
<td>Ethernet Hub in ISC</td>
<td>15.24</td>
</tr>
<tr>
<td></td>
<td>MRE</td>
<td>Customer Supplied Outlet</td>
<td>60 Hz 6.09</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50 Hz 7.62</td>
</tr>
</tbody>
</table>

**NOTE:** This guidance is based on the assumption that the distance between cable tray and floor is 2.6m.

**INTERCONNECTIONS**