Typical

---

SIGNA PIONEER

FINAL STUDY

GE Healthcare

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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

Drawn by: PMM
Verified by: PMM
Concession: -
S.O. (GON): ----
PIM Manual: 5680003-1EN
Rev: 4

Format: A3
Scale: 1/4”=1’-0"
File Name: EN-MRI-TYP-SIGNA_PIONEER-WEB.DWG
Date: 24/Feb/2020
Sheet: 01/24
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.
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 the effects of the 5g, 3g, 1g, and .5g fields. Refer to the proximity limit chart in the MR pre-installation manual referenced on the cover sheet.
3. For moving metal, the restriction lines typically extend outside of the MR space. Please confirm there are no moving metal concerns within these areas.
4. For vibration, analysis to be completed as required per pre-installation manual.
5. For EMI, review the site for the location of the main electrical feeders, AC devices, or distribution systems. An EMI study is recommended if large AC systems are nearby.
6. Details of the floor below the magnet must be reviewed. The structural engineer must verify that the quantity of steel in the volume 10ft [3.1m] x 10ft [3.1m] x 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. Remove, cover, or fill-in abandoned ducts or troughs from the Equipment and Magnet rooms. Access/computer room flooring in the Equipment room can either be removed or assessed and reinforced to support heavier cabinets.

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

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.
- Potential exists under fault conditions that the 5 gauss line may expand radially to 19.68 ft. [6.0 m] and axially to 24.61 ft. [7.5 m] for 100 seconds. 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 RADIALY</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>21.0 FT</td>
<td>6.4 M</td>
</tr>
<tr>
<td></td>
<td>26.0 FT</td>
<td>7.92 M</td>
</tr>
<tr>
<td>Buses and trucks (dump, tractor trailer, utility, fire trucks)</td>
<td>24.5 FT</td>
<td>7.47 M</td>
</tr>
<tr>
<td></td>
<td>30.3 FT</td>
<td>9.25 M</td>
</tr>
</tbody>
</table>

For objects >400 lbs [182 kg], Z-axis EMI disturbances must not exceed 5.6 mG peak-to-peak.
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.

For Accessory Sales: (866) 281-7545 Options 1, 2, 1, 2 or mail to gehcaccessorysales@ge.com.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>MAX HEAT OUTPUT (W)</th>
<th>MAX HEAT OUTPUT (btu)</th>
<th>WEIGHT (lbs)</th>
<th>WEIGHT (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1</td>
<td>3T Magnet</td>
<td>8189</td>
<td>16500</td>
<td>2400</td>
<td>7500</td>
</tr>
<tr>
<td>A 2</td>
<td>Patient table</td>
<td></td>
<td></td>
<td>572</td>
<td>259.50</td>
</tr>
<tr>
<td>A 3</td>
<td>Magnet rundown unit</td>
<td></td>
<td></td>
<td>7</td>
<td>3.2</td>
</tr>
<tr>
<td>A 4</td>
<td>Phantom set storage cabinet</td>
<td></td>
<td></td>
<td>350</td>
<td>163</td>
</tr>
<tr>
<td>A 5</td>
<td>Integrated Cooling Cabinet</td>
<td>3412</td>
<td>1034</td>
<td>1000</td>
<td>469</td>
</tr>
<tr>
<td>A 6</td>
<td>Integrated System Cabinet</td>
<td>24232</td>
<td>7258</td>
<td>7100</td>
<td>1251</td>
</tr>
<tr>
<td>A 7</td>
<td>Magnet monitor</td>
<td>819</td>
<td>10</td>
<td>240</td>
<td>4.5</td>
</tr>
<tr>
<td>A 8</td>
<td>Operator console computer</td>
<td>4947</td>
<td>122.80</td>
<td>1450</td>
<td>55.70</td>
</tr>
<tr>
<td>A 9</td>
<td>Operator workspace</td>
<td></td>
<td></td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>A 10</td>
<td>Pneumatic patient alert</td>
<td></td>
<td></td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>A 11</td>
<td>MR Elastography</td>
<td>480</td>
<td>53.4</td>
<td>0.14</td>
<td>24.22</td>
</tr>
<tr>
<td>A 12</td>
<td>700 va partial UPS</td>
<td></td>
<td></td>
<td>26</td>
<td>12</td>
</tr>
<tr>
<td>A 13</td>
<td>CCTV Monitor</td>
<td>819</td>
<td>10</td>
<td>240</td>
<td>4.5</td>
</tr>
<tr>
<td>A 14</td>
<td>CCTV Camera</td>
<td></td>
<td></td>
<td>8.27</td>
<td>3.75</td>
</tr>
<tr>
<td>A 15</td>
<td>Music system</td>
<td></td>
<td></td>
<td>0.35</td>
<td>0.16</td>
</tr>
<tr>
<td>A 16</td>
<td>Injector on pedestal</td>
<td></td>
<td></td>
<td>94</td>
<td>43</td>
</tr>
<tr>
<td>A 17</td>
<td>Injector central</td>
<td></td>
<td></td>
<td>675</td>
<td>176</td>
</tr>
<tr>
<td>A 18</td>
<td>Injector power supply</td>
<td></td>
<td></td>
<td>560</td>
<td>193</td>
</tr>
<tr>
<td>A 19</td>
<td>Remote magnet rundown unit</td>
<td></td>
<td></td>
<td>7</td>
<td>3.20</td>
</tr>
<tr>
<td>B/D 20</td>
<td>Main disconnect panel</td>
<td></td>
<td></td>
<td>901</td>
<td>426</td>
</tr>
<tr>
<td>B/D 21</td>
<td>Dimplex Chiller</td>
<td>12300</td>
<td>2550</td>
<td>36000</td>
<td>1157</td>
</tr>
<tr>
<td>B/D 22</td>
<td>Remote graphic display</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>B/D 23</td>
<td>Water filter</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C 24</td>
<td>Breaker boxes for Integrated Cooling &amp; Integrated Systems Cabinets</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C 25</td>
<td>Minimum opening for equipment delivery is 40 in. w x 82 in. h, contingent on a 72 in. corridor width</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C 26</td>
<td>Minimum opening for equipment delivery is 43 in. w x 82 in. h, contingent on a 96 in. corridor width</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C 27</td>
<td>Counter top for equipment- provide grommeted openings as required to route cables</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C 28</td>
<td>Base cabinet for storage of: surface coils, patient positioning pads, phantoms, etc.</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C 29</td>
<td>Louvered doors - refer to preinstall for requirements</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C 30</td>
<td>Magnet access 9'-0&quot;x10'-0&quot;</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C 31</td>
<td>Louvered doors</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C 32</td>
<td>Warning: 5 Gauss line outside the Magnet room limits</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C 33</td>
<td>Define RF shield's inset according to provisions made by the RF Shield vendor</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**LEGEND**

- **A** GE Supplied
- **B** GE Supplied/contractor installed
- **C** Customer/contractor supplied and installed
- **D** Available from GE
- **E** Existing/Reinstall

- **5 Gauss**
- **3, 1, 0.5 Gauss**

**EQUIPMENT ROOM**

- 171 ft²

**MAGNET ROOM**

- 467 ft² (considering RF shield walls)

**CONTROL ROOM**

- 95.5 ft²

**Explain room height**

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

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MAGNETIC PROXIMITY LIMITS

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 lbs/ft²</td>
<td>0 mm</td>
</tr>
<tr>
<td>9.8 kg/m²</td>
<td>2 lbs/ft²</td>
<td>1143 - 1194</td>
</tr>
<tr>
<td>14.7 kg/m²</td>
<td>3 lbs/ft²</td>
<td>1194 - 1231</td>
</tr>
<tr>
<td>39.2 kg/m²</td>
<td>8 lbs/ft²</td>
<td>1321 - 1397</td>
</tr>
<tr>
<td>98.0 kg/m²</td>
<td>20 lbs/ft²</td>
<td>1397+</td>
</tr>
</tbody>
</table>

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.
MINIMUM MAGNET CEILING HEIGHT (TOP VIEW)

Shaded area within solid lines indicates floor to ceiling minimum height of 2500 mm [98.42in]. If ceiling is between 2500 mm [98.42in] and 2667 mm [105in], flexible main lead extension for low ceiling height is required for ramping the magnet. Contact the PMI for preparation.

INTEGRATED COOLING CABINET
- Top View
- Front View
- Magnet room
- Equipment room side
- Mesh shield frame area
- RF Shield

INTEGRATED SYSTEM CABINET
- Top View
- Front View
- Equipment room side
- Roof

INTEGRATED COOLING CABINET and Integrated Cooling Cabinet must be covered on both sides for safety.

MINIMUM MAGNET CEILING HEIGHT (TOP VIEW)

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

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

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

- The PEN closet must have a mechanical locking mechanism to restrict access to the PEN panels.
- The PEN closet must maintain the minimum service area outside the 200 Gauss in the magnet room.
- PEN closet must allow free air exchange of 400CFM (680 m³/hour) between the Magnet room and PEN closet for MR system blowers. Airflow may be achieved through door louvers or other openings in the Magnet room that meet all other PEN closet requirements.

INTEGRATED COOLING CABINET
- Front View
- Top View
- Equipment room side
- Integrated System Cabinet and Integrated Cooling Cabinet must be covered on both sides for safety.

INTEGRATED SYSTEM CABINET
- Front View
- Top View
- Equipment room side
- Roof

INTEGRATED COOLING CABINET and Integrated Cooling Cabinet must be covered on both sides for safety.
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 kg
- Height: 2.5m [98.5in], width: 2.7m [98.5in]
- 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>
</table>
| Replacement XRM gradient coil assembly on a shipping cradle/cart | 991x2536x1499 | 1449 lbs | Initial gradient coil assembly is shipped installed in the magnet. Shipping/installation cart is used to install replacement coil assembly only.

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

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

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

VIBRATION TRANSMITTED THROUGH VIBROACOUSTIC MAT
<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>(CONTRACTOR SUPPLIED &amp; INSTALLED) 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>

**Diagram**

- **MAGNET ROOM**
- **EQUIPMENT ROOM**
- **CONTROL ROOM**

Dimensions:
- 9'4" x 11'6"
- 6'4"
- LOCATED ELSEWHERE
### TABLE FRAME ANCHOR MOUNTING REQUIREMENTS

**NOT TO SCALE**

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:
   
   - 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.
   - Anchors must be two-part assembly (male/female).

### CABLE CONCEALMENT

- Customer/contractor installed cable concealment frame
- Customer/contractor to provide opening and install frame.
- Cable trays
- Geometric isocenter
- Cable trays

**NOTE:**
- This drawing is to be used only as a design intent document. Refer to GE installation manual for tray installation. Actual tray installation may be site-dependent.
- This drawing does not scale.

### MAGNET ON VIBROACOUSTIC DAMPENING KIT "VIBROMAT"

- Patient table dock frame anchor hole
- 4 x Ø38mm [1.5 in] seismic anchor holes
- 4 x magnet mounting holes

### 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.

The finished floor must support the weight of all components (e.g., patient table, gradient coil replacement cart) throughout operation and service life.
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></th>
<th>MAGNET ROOM</th>
<th>CONTROL ROOM</th>
<th>EQUIPMENT ROOM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>59-69.8°F</td>
<td>59.8-95.6°F</td>
<td>59.8-95.6°F [3]</td>
</tr>
<tr>
<td>Temperature gradient</td>
<td>≤ 3°C/h</td>
<td>≤ 3°C/h</td>
<td>≤ 3°C/h</td>
</tr>
<tr>
<td>(1)</td>
<td>≤ 5°F/h</td>
<td>≤ 5°F/h</td>
<td>≤ 5°F/h</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>30% to 60%</td>
<td>30% to 75%</td>
<td>30% to 75%</td>
</tr>
<tr>
<td>Humidity gradient</td>
<td>≤ 5% /h</td>
<td>≤ 5% /h</td>
<td>≤ 5% /h</td>
</tr>
</tbody>
</table>

**NOTE**

1. Operating temperature gradient limits shall be between -3°C/hr (-5°F/hr) and 5°C/hr (9°F/hr), when averaged over 1 hour
2. Operating humidity gradient limits shall be between -5% RH/hr and 5% RH/hr (5°F/hr), when averaged over 1 hour
3. Maximum ambient temperature is derated by 1°C per 300 m above 2000 m (not to exceed 2600 m).

### 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 them above electric equipment or to take measures to protect the equipment from dropping water.

### HEAT DISSIPATION DETAILS

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>ROOM</th>
<th>IDLE</th>
<th>AVERAGE</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnet (MAG) and Patient Table (PT)</td>
<td>Magnet</td>
<td>561 W</td>
<td>1915 BTU</td>
<td>2000 W</td>
</tr>
<tr>
<td>Main Disconnect Panel (MDP)</td>
<td>Equipment</td>
<td>132 W</td>
<td>450 BTU</td>
<td>450 W</td>
</tr>
<tr>
<td>Integrated System Cabinet (ISC)</td>
<td>Equipment</td>
<td>280 W</td>
<td>955 BTU</td>
<td>720 W</td>
</tr>
<tr>
<td>Integrated Cooling Cabinet (ICC)</td>
<td>Equipment</td>
<td>0</td>
<td>450 BTU</td>
<td>1000 W</td>
</tr>
<tr>
<td>Cryocooler Compressor (CRY)</td>
<td>Equipment</td>
<td>500 W</td>
<td>1706 BTU</td>
<td>500 W</td>
</tr>
<tr>
<td>Magnet Monitor (MMN)</td>
<td>Equipment</td>
<td>240 W</td>
<td>819 BTU</td>
<td>240 W</td>
</tr>
<tr>
<td>Operator Workspace equipment (OW)</td>
<td>Control</td>
<td>1450 W</td>
<td>4947 BTU</td>
<td>1450 W</td>
</tr>
<tr>
<td><strong>OPTIONS</strong></td>
<td><strong>Equipment</strong></td>
<td><strong>141 W</strong></td>
<td><strong>480 BTU</strong></td>
<td><strong>141 W</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.
- Incoming air must contain at least 5% air from outside the Magnet room (inside or outside the facility) to displace residual helium.

**EMERGENCY VENT REQUIREMENT**

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

**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

![Magnet Room Exhaust Fan Diagram](image-url)
### 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><strong>MINIMUM FLOW</strong></td>
<td></td>
</tr>
<tr>
<td>PRESSURE DROP IN ICC CABINET</td>
<td></td>
</tr>
<tr>
<td>40% propylene glycol, 60% water</td>
<td></td>
</tr>
<tr>
<td>MINIMUM FLOW</td>
<td></td>
</tr>
<tr>
<td>50 l/min (13.2 gpm)</td>
<td></td>
</tr>
<tr>
<td>MAXIMUM FLOW</td>
<td></td>
</tr>
<tr>
<td>80 l/min (21.1 gpm)</td>
<td></td>
</tr>
<tr>
<td>Availability</td>
<td>Continuous</td>
</tr>
<tr>
<td>Antifreeze</td>
<td>0-40% propylene glycol</td>
</tr>
<tr>
<td>Maximum inlet pressure to ICC</td>
<td>Maximum 5.52 bar (80 psi)</td>
</tr>
<tr>
<td>Minimum 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></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.

### CITY WATER BACKUP SPECIFICATIONS FOR COMPRESSOR

#### INLET WATER FLOW/TEMPERATURE FOR CRYOCOOLER COMPRESSOR

*RECOMMENDED TEMPERATURE AND WATER FLOW TO CRY ENTRY*

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>INLET TEMP</td>
<td>35.2°F</td>
<td>82.4°F</td>
</tr>
<tr>
<td>INLET FLOW</td>
<td>1.0 gpm (4 l/min)</td>
<td>2.6 gpm (10 l/min)</td>
</tr>
<tr>
<td>TEMP RISE</td>
<td>89.8°F at 1.0 gpm (32°C at 4 l/min flow)</td>
<td>55.6°F at 2.6 gpm (12°C at 10 l/min flow)</td>
</tr>
<tr>
<td>HEAT DISSIPATION (kW)</td>
<td>7.2 kW</td>
<td></td>
</tr>
<tr>
<td>PRESSURE DROP</td>
<td>8.7 psi at 2.6 gpm flow (60 KPa at 8 l/min flow)</td>
<td></td>
</tr>
</tbody>
</table>
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

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**TYPICAL CRYOGENIC VENT PIPE DETAIL**

**TYPICAL CRYOGENIC VENTING ( EXTERIOR )**

**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

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**NOTE:** for the Dielectric Break outside the Magnet room please see the Typical Cryogen Side Wall Exit

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**NOTE:** for the Dielectric Break outside the Magnet room please see the Typical Cryogen Vent Pipe Detail

---

**EXHAUST AREA**

**10.7m x 4.6m**

**[35ft x 15ft] (LxW)**
### Magnet Cryogenic Vent System Pressure Drop Matrix

<table>
<thead>
<tr>
<th>Outer Dia. of Pipe (D)</th>
<th>Distance of Vent System Component from Magnet (200mm)</th>
<th>Pressure drop for straight pipe (psi)</th>
<th>Std sweep 45° elbow (psi)</th>
<th>Long sweep 45° elbow (psi)</th>
<th>Std sweep 90° elbow (psi)</th>
<th>Long sweep 90° elbow (psi)</th>
<th>90° miter bend (psi)</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>
<td>kPa</td>
</tr>
<tr>
<td>8 in. (200mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-10</td>
<td>0.00-3.05</td>
<td>0.14</td>
<td>3.22</td>
<td>1.12</td>
<td>7.70</td>
<td>0.74</td>
<td>5.13</td>
</tr>
<tr>
<td>10-20</td>
<td>3.05-6.10</td>
<td>0.24</td>
<td>4.49</td>
<td>1.83</td>
<td>12.63</td>
<td>1.22</td>
<td>8.44</td>
</tr>
<tr>
<td>20-30</td>
<td>6.10-9.15</td>
<td>0.36</td>
<td>8.23</td>
<td>2.49</td>
<td>17.20</td>
<td>1.66</td>
<td>11.45</td>
</tr>
<tr>
<td>30-40</td>
<td>9.15-12.2</td>
<td>0.47</td>
<td>10.65</td>
<td>3.11</td>
<td>21.42</td>
<td>2.07</td>
<td>14.26</td>
</tr>
<tr>
<td>40-50</td>
<td>12.20-15.25</td>
<td>0.57</td>
<td>12.80</td>
<td>3.67</td>
<td>25.32</td>
<td>2.45</td>
<td>16.86</td>
</tr>
<tr>
<td>50-60</td>
<td>15.25-18.30</td>
<td>0.65</td>
<td>14.68</td>
<td>4.20</td>
<td>28.95</td>
<td>2.79</td>
<td>19.26</td>
</tr>
<tr>
<td>60-80</td>
<td>18.29-24.39</td>
<td>0.77</td>
<td>17.44</td>
<td>5.13</td>
<td>35.35</td>
<td>3.41</td>
<td>23.53</td>
</tr>
<tr>
<td>10 in. (250mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-20</td>
<td>0.00-6.10</td>
<td>0.06</td>
<td>1.28</td>
<td>0.62</td>
<td>4.29</td>
<td>0.41</td>
<td>2.86</td>
</tr>
<tr>
<td>20-40</td>
<td>6.10-12.2</td>
<td>0.12</td>
<td>2.72</td>
<td>1.05</td>
<td>7.25</td>
<td>0.70</td>
<td>4.83</td>
</tr>
<tr>
<td>40-60</td>
<td>12.22-18.29</td>
<td>0.17</td>
<td>3.90</td>
<td>1.43</td>
<td>9.86</td>
<td>0.95</td>
<td>6.56</td>
</tr>
<tr>
<td>60-80</td>
<td>18.29-24.39</td>
<td>0.21</td>
<td>4.85</td>
<td>1.76</td>
<td>12.14</td>
<td>1.17</td>
<td>8.07</td>
</tr>
<tr>
<td>12 in. (300mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-20</td>
<td>0.00-6.10</td>
<td>0.02</td>
<td>0.44</td>
<td>0.26</td>
<td>1.78</td>
<td>0.17</td>
<td>1.19</td>
</tr>
<tr>
<td>20-40</td>
<td>6.10-12.2</td>
<td>0.01</td>
<td>0.93</td>
<td>0.43</td>
<td>3.00</td>
<td>0.29</td>
<td>1.99</td>
</tr>
<tr>
<td>40-60</td>
<td>12.22-18.29</td>
<td>0.06</td>
<td>1.35</td>
<td>0.59</td>
<td>4.08</td>
<td>0.39</td>
<td>2.72</td>
</tr>
<tr>
<td>60-80</td>
<td>18.29-24.39</td>
<td>0.07</td>
<td>1.70</td>
<td>0.73</td>
<td>5.06</td>
<td>0.49</td>
<td>3.36</td>
</tr>
<tr>
<td>14 in. (350mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-20</td>
<td>0.00-6.10</td>
<td>0.08</td>
<td>0.18</td>
<td>0.125</td>
<td>0.85</td>
<td>0.082</td>
<td>0.57</td>
</tr>
<tr>
<td>20-40</td>
<td>6.10-12.2</td>
<td>0.17</td>
<td>0.38</td>
<td>0.206</td>
<td>1.42</td>
<td>0.137</td>
<td>0.95</td>
</tr>
<tr>
<td>40-60</td>
<td>12.22-18.29</td>
<td>0.24</td>
<td>0.52</td>
<td>0.281</td>
<td>1.94</td>
<td>0.187</td>
<td>1.29</td>
</tr>
<tr>
<td>60-80</td>
<td>18.29-24.39</td>
<td>0.31</td>
<td>0.69</td>
<td>0.345</td>
<td>2.41</td>
<td>0.232</td>
<td>1.60</td>
</tr>
<tr>
<td>16 in. (400mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-20</td>
<td>0.00-6.10</td>
<td>0.04</td>
<td>0.06</td>
<td>0.065</td>
<td>0.45</td>
<td>0.043</td>
<td>0.30</td>
</tr>
<tr>
<td>20-40</td>
<td>6.10-12.2</td>
<td>0.08</td>
<td>0.17</td>
<td>0.108</td>
<td>0.75</td>
<td>0.072</td>
<td>0.50</td>
</tr>
<tr>
<td>40-60</td>
<td>12.22-18.29</td>
<td>0.11</td>
<td>0.25</td>
<td>0.148</td>
<td>1.02</td>
<td>0.098</td>
<td>0.68</td>
</tr>
</tbody>
</table>

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

**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.
2. Aluminum or solid wires are not allowed.
3. Wire sizes given are for use of equipment. Larger sizes may be required by local codes.
4. It is recommended that all wires be color coded, as required in accordance with national and local electrical 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 pigtails at all junction points.
- Grounding is critical to equipment function and patient safety. Site must conform to wiring specifications shown on this plan.
**Additional Conduit Runs** (Contractor Supplied and Installed)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY</th>
<th>ELECTRICAL LAYOUT ITEM LIST</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;] conduit above ceiling</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>One 75mm [3&quot;] conduit 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>

**Outlet Legend for GE Equipment**

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

**Additional Conduit Runs**

<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>
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<tr>
<td>Main Disconnect Panel</td>
<td>Integrated Cooling Cabinet</td>
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<td>System emergency off</td>
<td>1</td>
<td>1/2</td>
<td>16</td>
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<tr>
<td>Main Disconnect Panel</td>
<td>Door Switch</td>
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<td>1/2</td>
<td>16</td>
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<tr>
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<td>Integrated Cooling Cabinet</td>
<td>1</td>
<td>3/4</td>
<td>20</td>
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<tr>
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<td>System emergency off</td>
<td>1</td>
<td>3/4</td>
<td>20</td>
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<tr>
<td>Magnet</td>
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<tr>
<td>Magnet</td>
<td>RF filter</td>
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<td>Room Light</td>
<td>RF filter</td>
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<td>as Req'd</td>
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<td>RF filter</td>
<td>Facility emergency power</td>
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<td>as Req'd</td>
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</tr>
<tr>
<td>Chiller</td>
<td>Remote graphic display</td>
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<td>20</td>
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<tr>
<td>Chiller</td>
<td>Facility power</td>
<td>1</td>
<td>as Req'd</td>
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<tr>
<td>TV Camera</td>
<td>Waveguide or RF filter</td>
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<td>25</td>
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<tr>
<td>TV Monitor</td>
<td>Waveguide or RF filter</td>
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<tr>
<td>Injector control unit</td>
<td>Waveguide or RF filter</td>
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<td>2 1/2</td>
<td>70</td>
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<td>Injector head</td>
<td>Waveguide or RF filter</td>
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<tr>
<td>Integrated Battery Charging Unit</td>
<td>Waveguide or RF filter</td>
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<td>as Req'd</td>
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</tbody>
</table>

**Date**

24/Feb/2020

**En-Mri-Typ-Signa_Pioneer-Web.Dwg**
**E3 - Electrical Elevations**

**SIGNA PIONEER**

**EN-MRI-TYP-SIGNA_PIONEER-WEB.DWG**

**24/Feb/2020**

---

**MAGNET ROOM**

- **± 0'-0"**
- **+ TBD**
- **+ TBD**
- **5'-5"**

---

**CONTROL ROOM**

- **± 0'-0"**
- **+ TBD**
- **+ TBD**
- **7'-0"**

---

**EQUIPMENT ROOM**

- **± 0'-0"**
- **+ TBD**
- **+ TBD**
- **10'-8"**

---

**CONTROL ROOM**

- **± 0'-0"**
- **+ TBD**
- **+ TBD**
- **5'-4"**

---

**CONTROL ROOM**

- **± 0'-0"**
- **+ TBD**
- **+ TBD**

---

**CONTROL ROOM**

- **± 0'-0"**
- **+ TBD**
- **+ TBD**

---

**CONTROL ROOM**

- **± 0'-0"**
- **+ TBD**

---
1 - Ceiling
2 - Finished Floor
3 - Magnet isocenter
4 - Minimum cable tray height required at back of Magnet: 2581 mm [95.9 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

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 must be less than 2.5%.
- Phase imbalance must not exceed 2%.
- Lock-out/Tag-out: The Main Disconnect Panel (MDP) shall provide an external single point lock-out/tag-out feature for the entire system and a means to externally lock-out/tag-out each output breaker independently.
- Each lock-out/tag-out feature shall accommodate a standard sized lock hasp.

SPECIFICATIONS OF BACK-UP POWER SUPPLY

- **MAGNET MONITOR** requires a 110/220 VAC, 50/60 Hz, 2.0 A facility supplied outlet. Power at the outlet must be continuously available.

FOR CRYOCOOLER COMPRESSOR

- **POWER INPUT**: 380/400/415/480V, THREE-PHASE + G
- **POWER REQUIREMENT**: MIN 9kVA
- **POWER CONSUMPTION**: MAX 7.2kW / STEADY STATE 6.5kW at 50Hz
- **MAX 8.3kW / STEADY STATE 7.5kW at 60Hz**
- **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 Out Buttons, L...) will go to Main Panel with a pigtail length of 1.5m [60in].

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.

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Long / Short cable selection guidance

NOTE: This guidance is based on the assumption that the distance between cable tray and floor is 2.6 m [8.53 ft].

Magnet Room:
- If the Magnet – ISC Distance is less than 5.4 m [17.7 ft], select short cable.
- If the Magnet – ISC Distance is in between 5.4 m [17.7 ft] and 9.4 m [30.8 ft], select long cable.

Equipment Room:
- If the ICC – ISC Distance is less than 0.4 m [1.3 ft], select short cable.
- If the ICC – ISC Distance is in between 0.4 m [1.3 ft] and 6.4 m [21 ft], select long cable.

<table>
<thead>
<tr>
<th>OPTION</th>
<th>FROM</th>
<th>TO</th>
<th>CABLE LENGTH</th>
</tr>
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<tbody>
<tr>
<td>MRE</td>
<td>Magnet Isocenter</td>
<td>Nominal 7.31 24</td>
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<td>ISC cabinet</td>
<td>Maximum 10.06 33</td>
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<tr>
<td>MRE</td>
<td>Ethernet Hub in ISC</td>
<td>15.24 50</td>
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<td>MRE</td>
<td>Customer Supplied Outlet</td>
<td>60 Hz 6.09 20</td>
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<td>7.62 25</td>
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<td>Remote MRU</td>
<td>Remote MRU</td>
<td>Short 1.83 6</td>
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<td>Long 30.48 100</td>
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