PHILIPS

Healthcare

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Revision History

Note for Architects and/or Contractors: If revisions are listed, these drawings must be thoroughly reviewed so that all changes can be incorporated into your project.

Rev.	Date	Revision Descriptions.	By

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Project
Ingenia 1.5T Omega HP
Standard Reference Drawing
Not Site Specific
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C1

11.16.12

General Specifications

1. Responsibility
The customer shall be solely responsible, at their expense for preparation of site, including any required structural alterations. The site preparation shall be in accordance with plans and specifications provided by Philips. Compliance with all safety, electrical, and building codes relevant to the equipment and its installation is the sole responsibility of the customer. The customer shall advise Philips of conditions at or near the site which could adversely affect the carrying out of the installation work and shall ensure that such conditions are corrected and that the site is fully prepared and available to Philips before the installation work is due to begin. The customer shall provide all necessary plumbing, carpentry work, or conduit wiring required to attach and install products ready for use.

2. Permits
Customer shall obtain all permits and licenses required by federal, state / provincial or local authorities in connection with the construction, installation and operation of the products and shall bear any expense in obtaining or in complying with any related rules, regulations, ordinances and statutes

3. Asbestos and Other Toxic Substances
Philips assumes no hazardous waste (i.e., pcb's in existing transformers) exists at the site. If any hazardous materials are found, it shall be the sole responsibility of the customer to properly remove and dispose of this material at their expense. Any delays caused in the project for this special handling shall result in Philips time period for completion being extended by like period of time. Philips assumes that no asbestos material is involved in this project in any ceilings, walls or floors. If any asbestos material is found anywhere on the site, it shall be the customer's sole responsibility to properly remove and/or make safe this condition at the customer's expense.

4. Labor
In the event local labor conditions make it impossible or undesirable to use Philips' regular employees for such installation and connection, such work shall be performed by laborers supplied by the customer, or by an independent contractor chosen by the customer at the customer's expense, and in such case, Philips agrees to furnish adequate engineering supervision for proper completion of the installation.

5. Schedule
The general contractor should provide Philips with a schedule of work to assist in the coordination of delivery of Philips supplied products, which are to be installed by the contractor, and the delivery of the primary equipment.

6. Extended Installation or Turnkey Work by Philips
All room preparation requirements for Philips equipment indicated on these drawings is the responsibility of the customer. If an extended installation or turnkey contract exists between Philips and the customer for room preparation work required by the equipment represented on these drawings, then some of the responsibilities of the customer as depicted in these drawings may be assumed by Philips. In the event of a conflict between the work described in the turnkey contract workscope and these drawings, the turnkey contract workscope shall govern.

Minimum Site Preparation Requirements

A smooth, efficient installation is vital to Philips and their customers. Understanding what the minimum site preparation requirements are will help achieve this goal. The following list defines the basic requirements which must be fulfilled before the installation can begin.

1. Walls to be painted or covered, baseboards installed, floors to be level and tiled and/or covered, ceiling shall have grid tiles and lighting fixtures installed.
2. Doors and windows, especially radio frequency shielding, installed and finished with locksets operational.
3. All electrical convenience, conduit, raceway and junction boxes installed.
4. Incoming mains power operational and connected to room MR mains breaker.
5. 115V convenience outlets operational.
6. All contractor supplied cables pulled and terminated.
7. All support structures correctly installed. All channels, pipes, beams and/or other supporting devices should be level, parallel, and free of lateral or longitudinal movements.
8. A dust-free environment in and around the procedure room.
9. All HVAC (heating, ventilating and air conditioning) installed and operational as per specifications.
10. All plumbing installed and finished.
11. Architectural features such as computer floor, wood floor, casework, bulkheads, installed and finished.
12. Clear door openings and pathway leading up to and into the exam room are recommended to be 48" (1220mm) W x 84" (2133mm) H. Minimum 40" (1000mm) W x 81" (2050mm) H, contingent on an 8' - 0" (2440mm) corridor width.
13. The magnet is the only system part that in most cases cannot be transferred through the door of the RF enclosure. A special opening to allow its installation in the enclosure must therefore be made available. The minimum transfer opening dimensions are 7' - 10 ½" (2400 mm) H x 8' - 3" (2500mm) W. If possible, an extra 8" (200mm) in opening width is strongly recommended. **Refer to sheet AD2 for transport dimension details.**
14. Internet access is required to be available in the control area prior to system delivery for Web FSE access. Refer to sheet EL of the final drawing package for details.
15. Remote Service Diagnostics - Imaging systems installed by Philips Healthcare is equipped with a service diagnostic feature which requires an RJ45 type ethernet 10/100/1000 Mbit network connector to be installed as shown on plans. Access to customer network is needed for Remote Service Network (RSN) connectivity. All costs for network setup and installation are the responsibility of the customer. Refer to sheet N1 of the final drawing package for details.

Note
Once Philips has started the installation, the contractor shall schedule their work around the Philips installation team on site.

Electrical Requirements

Supply Configuration: 3 phase, 4 wire power and ground.

Nominal Line Voltage: 208, 240, 480 VAC, 60 Hz

Branch Power Requirement: 80 kVA

Circuit Breaker: 3 pole, 100 Amps (480 VAC)

Note: For Voltages other than 480 VAC: **PDU-MRPT2 must be ordered**
Alternate Circuit Breaker for PDU-MRPT2: 3 pole, 225 Amps (208 VAC), 200 Amps (240 VAC)

Dimplex Chiller Requirements

Supply Configuration: 3 ø, 3 wire power and ground.

Nominal Line Voltage: 208, 480 VAC, 60 Hz.

Circuit Breaker: 60 Amps (For 480 VAC)
125 Amps (208V Chiller must be special ordered from Dimplex)

HVAC Requirement for General Equipment Locations

Heating, ventilation, air conditioning requirements concern all rooms (equipment room, magnet room, and control room) and must be maintained 24 hours a day, 7 days a week.

Examination Room:
Temperature: 68° to 75° fahrenheit (20° to 24° celsius)
Maximum Temperature Rate of Change: 9° fahrenheit (5° celsius) per 10 minutes
Humidity: 40% to 70%, non-condensing
Air Conditioning Capacity: **6800 Btu / hr (2 kW)**
- Energy dissipated in the examination room will be removed from the room by an additional air exhaust system.
- Gradient coil heat dissipation (3400 to 51200 Btu / hr [1 to 15 kW]) will be removed via liquid cooling of the gradient coil.
- Exam room temperature and humidity specifications are critical for the MR and must be met at all times. No exceptions are allowed.

Equipment Room:
Temperature: 59° to 75° fahrenheit (15° to 24° celsius)
Maximum Temperature Rate of Change: 9° fahrenheit (5° celsius) per 10 minutes
Humidity: 30% to 70%, non-condensing
Air Conditioning Capacity:
- At Standby: 6800 Btu / hr (2 kW)
- Peak Dissipation Scanning: **27300 Btu / hr (8 kW)**

Control Room:
Temperature: 64° to 75° fahrenheit (18° to 24° celsius)
Maximum Temperature Rate of Change: 9° fahrenheit (5° celsius) per 10 minutes
Humidity: 30% to 70%, non-condensing
Air Conditioning Capacity: **1700 Btu / hr (0.5 kW)**

Refer to sheet MP4 of final drawing package for complete HVAC requirements. (13.0)

MRI Chiller Requirements

Chilled water is required for Magnet cooling. For chillers purchased from Philips, Dimplex Thermal Solutions shall provide chiller commissioning and in-warranty chiller service. Philips can provide contractors who will perform turn-key installation of mechanical, electrical and plumbing requirements for the chiller installation at an additional cost. Consult with Philips Sales to arrange for turn-key services.

Refer to sheet MP5 of final drawing package for complete chiller requirements.

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AN

Equipment Legend

- A Furnished and installed by Philips
- B Furnished by customer/contractor and installed by customer/contractor
- C Installed by customer/contractor
- D Furnished by Philips and installed by contractor
- E Existing
- F Future
- G Optional item furnishd by Philips
- H Furnished by RF Enclosure Supplier and installed by RF Enclosure Supplier
- J Furnished by Philips and Installed by Rigging Company

	Equipment Designation	Description	Max. Gauss	Weight (lbs)	Heat Load (btu/hr) *	Detail Sheet
A	OC	Operator's Console	30	145	1700	AD3
A	OT	Operator's Table	---	220	0	AD3
D	ERB	Emergency Run-Down Button (Qty. = 2)	---	3	0	AD3
J	MAG	Magnet Assembly	---	9921	6800	AD3
A	PS	Patient Support (MT)	---	573	1025	AD3
A	HEP	Helium Gas Exhaust Pipe (exam room only)	---	4/ft	0	
C	HWG	Helium Gas Exhaust Wave Guide	---	10	0	
A	GAC	Gradient Amplifier 787 Double Cabinet	150	2015	27900	AD4
A	DACC	Data Acquisition and Control Cabinet	50	585	23900	AD4
D	LCC	Liquid Cooling Cabinet	150	660	3400	AD4
D	MDU	Mains Distribution Unit	150	605	1700	AD4
A	SFB	System Filter Box with Covers	70	175	3400	AD4
B	CB1	Circuit Breaker (for system)	50	t.b.d.	t.b.d.	
B	CB2	Circuit Breaker (for Chiller)	50	t.b.d.	t.b.d.	
D	CH	Dimplex MEDKOOL 15000 AC Chiller	10	2600	188000	AD5
D	REM	Chiller Remote Controller	10	1	0	
A	SACU	System Air Cooling Unit	50	55	340	AD5
A	SIL	SACU Silencer	---	9	---	AD5
D	PV	Patient Ventilation	50	56	---	AD5
G	VFW	Viewforum Workstation	10	125	1000	
G	RFSC	RF Coil Storage Cabinet	---	t.b.d.	0	AD4
G	FC	Flex Caddy coil cart	---	t.b.d.	0	AD5

*** Heat load indicated is peak dissipation for each cabinet measured individually. Peak room heat dissipation as indicated on Sheet AN and MP4 will be less than the sum of each individual cabinet in a given room due to the fact that not all cabinets will run peak heat loads at the same time.**

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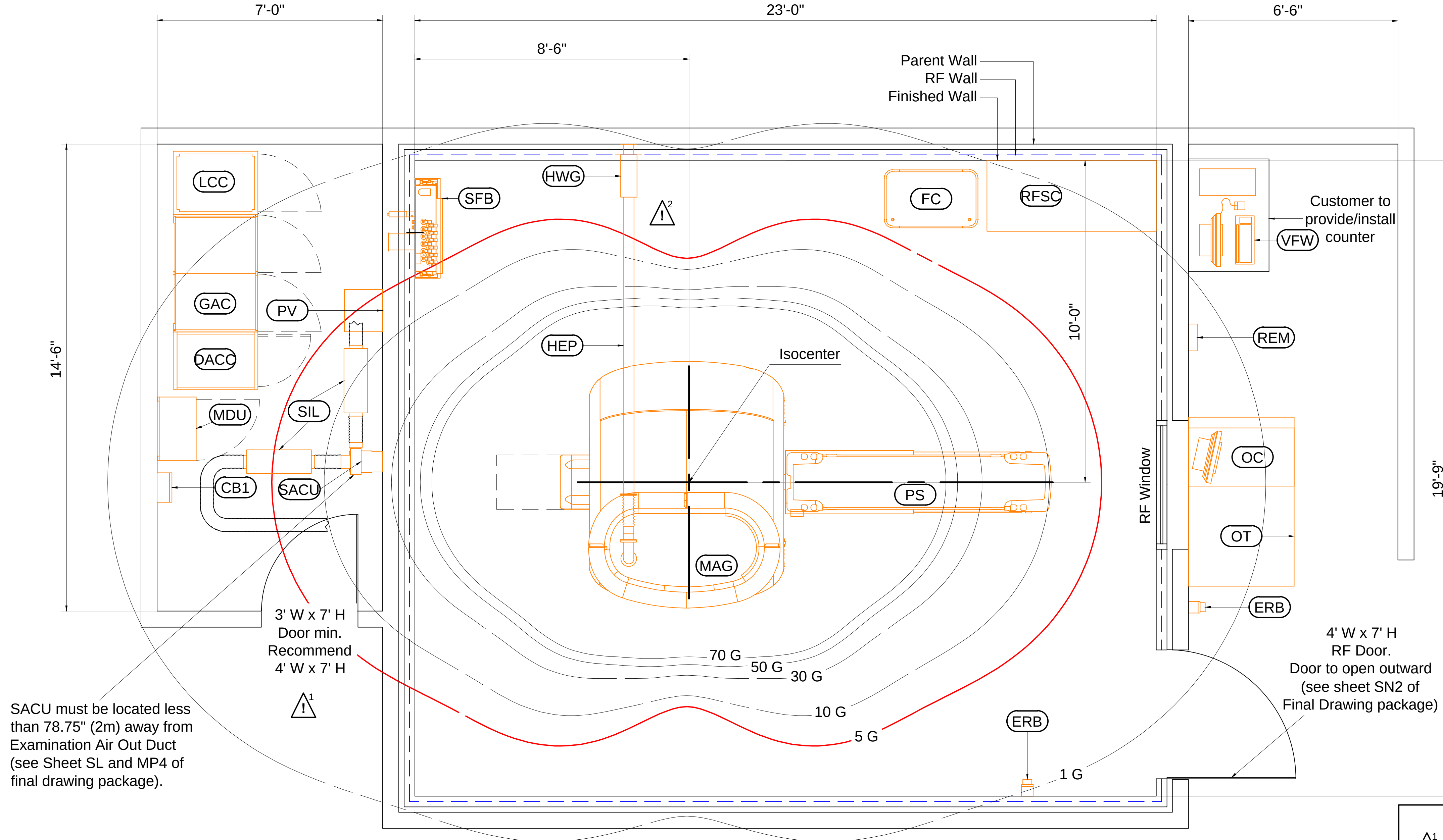
11.16.12



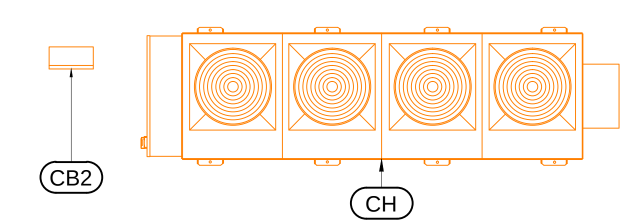
Controlled Zone
Exclusion zone for persons with cardiac pacemakers or other electrical implants - Magnetic field exceeds 5 Gauss (0.5 mT).

Helium Exhaust Pipe Verification
Customer's architect/contractor to provide plan and elevation details of helium exhaust pipe design for verification that specifications are being met, prior to installation.
(Refer to sheet MP3 of Final Drawing Package for details)

Planning Issues and Considerations

1. Passive magnetic shielding needed to contain the 5 Gauss line.
2. Helium Exhaust Pipe and Helium Waveguide are shown in their default location. Once final RF ceiling is determined, plans must be revised to reflect the site specific ceiling heights and Helium Pipe and Helium Waveguide locations.

* All floor support below the magnet including floor reinforcement and beams must be verified to meet the requirements shown on the SN1 page of the final drawing package.
* Exact equipment configuration to be determined by local Philips sales/service.



Verify location with Customer and local Philips Service

Equipment Layout

Ceiling Height Guide

Equipment Room:	10' - 6"	(3200mm) Recommended
	9' - 2"	(2795mm) ***Minimum****
Exam Room Suspended Ceiling:	8' - 3 1/4"	(2520mm) ***Required***
Exam Room RF Ceiling:		
Helium Waveguide Through RF Wall:	9' - 9"	(2970mm) ***Minimum****
Helium Waveguide Through RF Ceiling:	10' - 0 1/2"	(3060mm) ***Minimum****
Control Room:	9' - 10"	(3000mm) Recommended
	7' - 3"	(2200mm) ***Minimum***

*Ceiling Heights outside the minimum dimensions may be possible.
These Ceiling Heights must be reviewed and approved.

0 1' 2' 4' 8'
0 .5m 1m 2m

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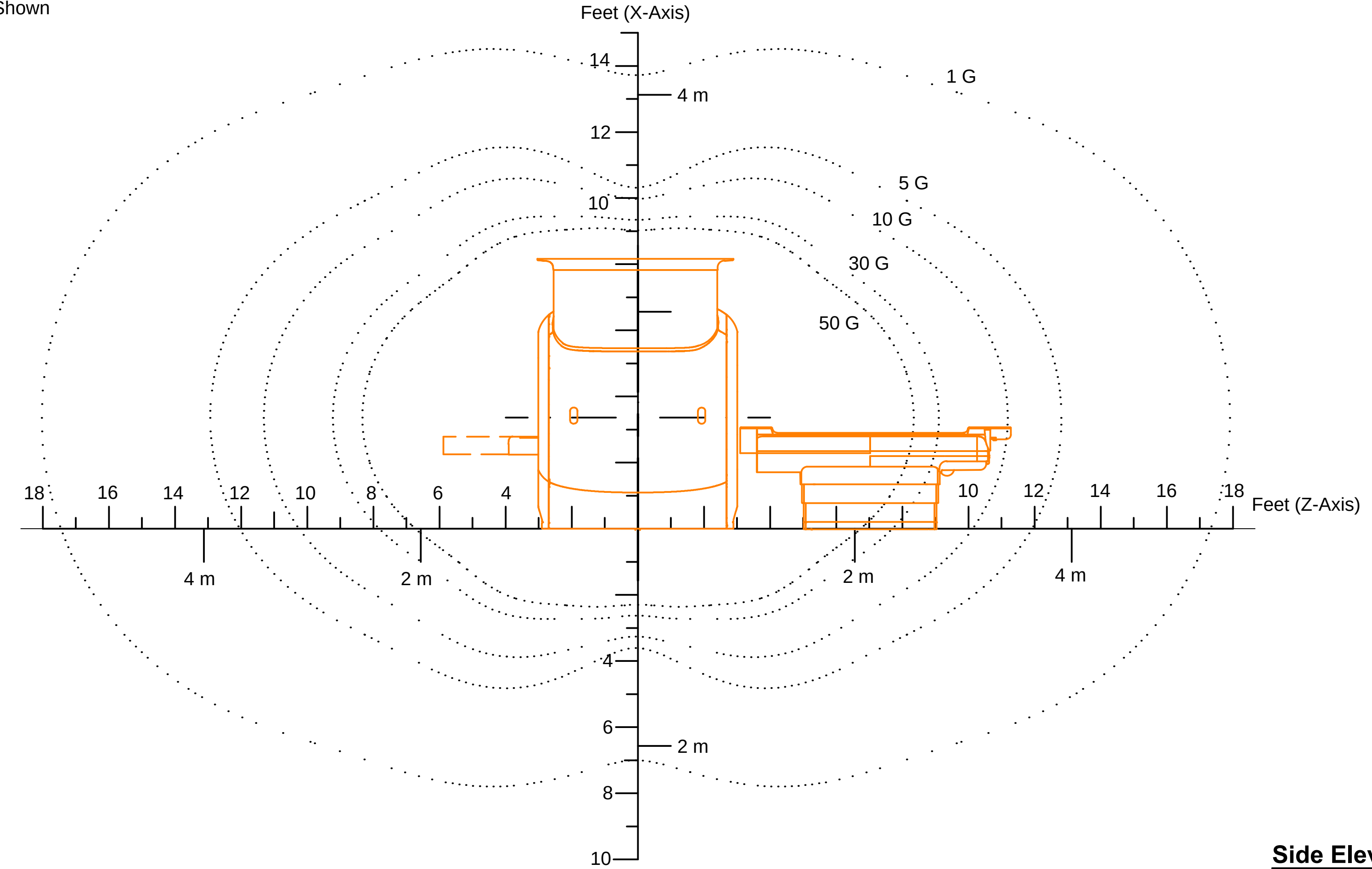
A1

Magnetic Field Plot - (without magnetic shielding)

Static Fringe Field Shown

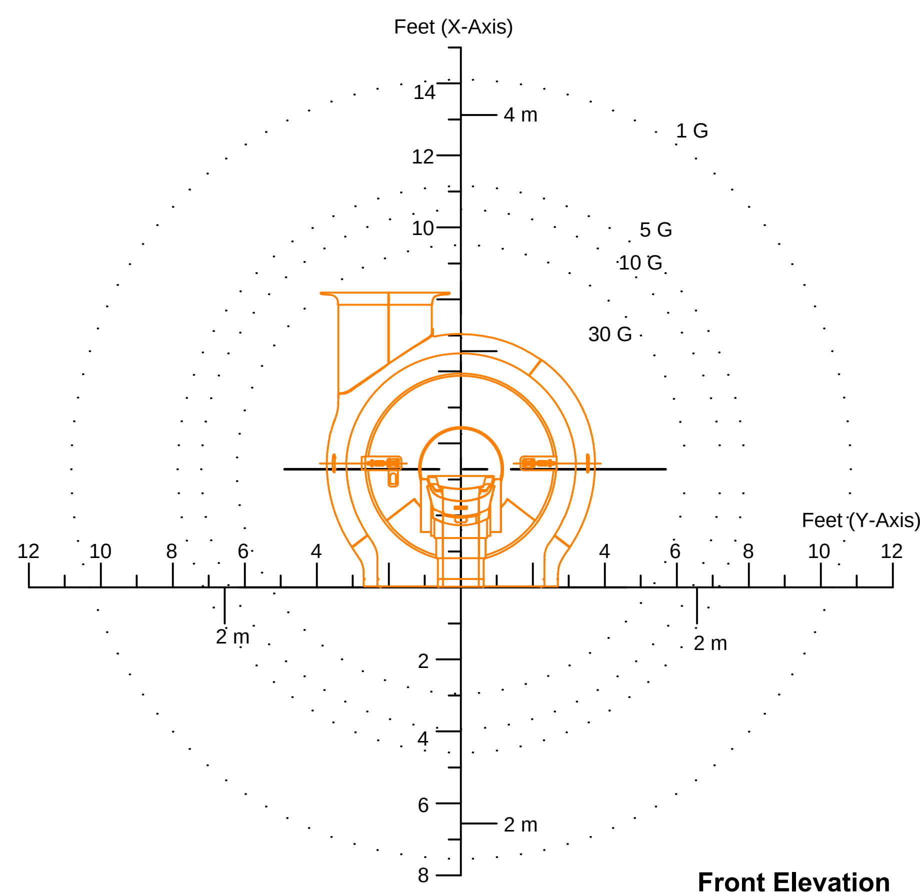


Side Elevation

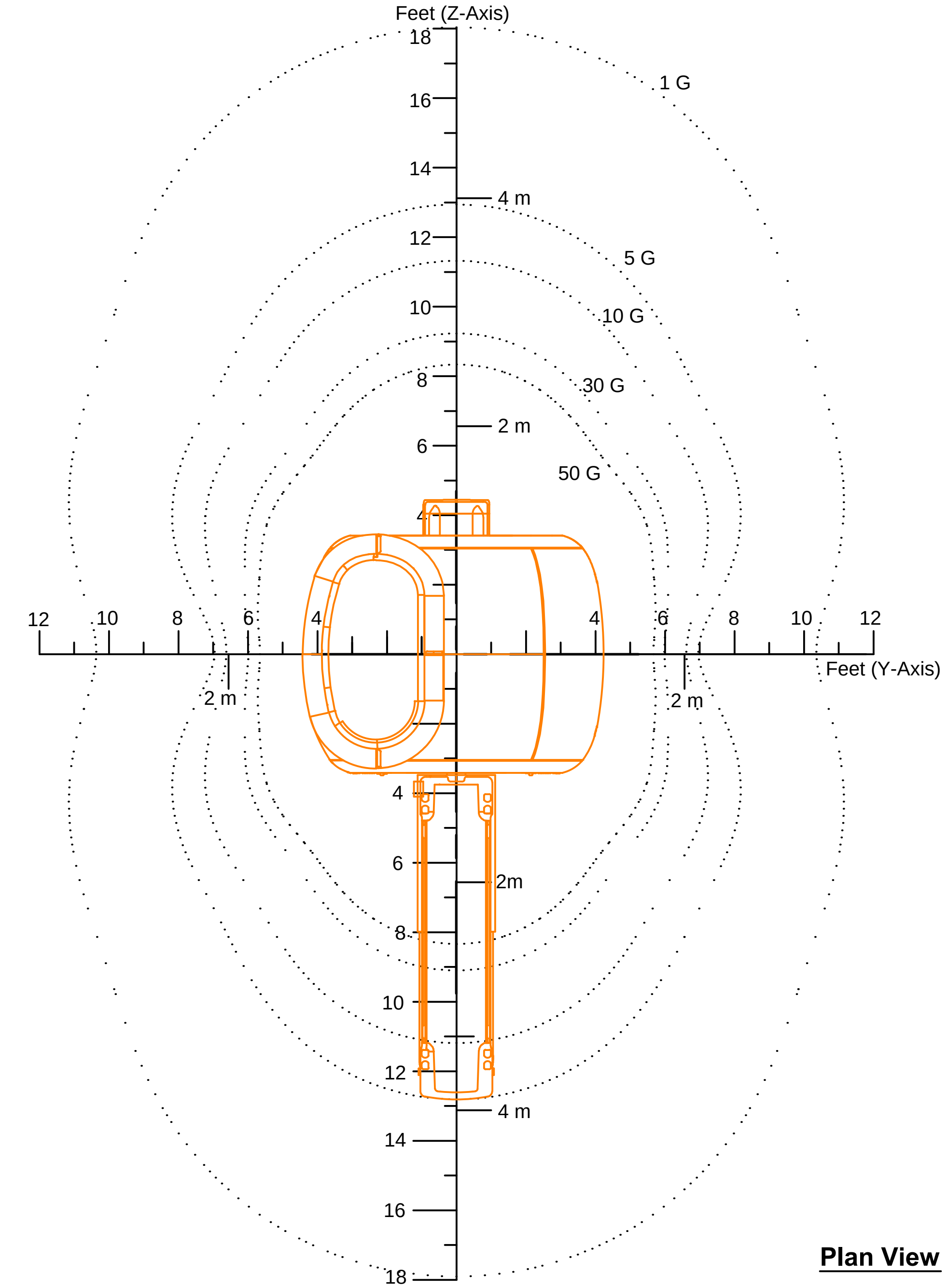
Equipment	
≤ 1.0 G (0.1 mT)	Nuclear Cameras, PET Scanners, Linear Accelerators, Electron Microscopes, **Image Intensifiers**, Blood Chemistry Analyzers, Cyclotrons, and **CRT Monitors**
2.0 G (0.2 mT)	CT Scanners manufactured after 2003
2.5 G (0.25 mT)	CT Scanners manufactured prior to 2003, Power and Main Distribution Transformers, and Ultrasound Machines
5.0 G (0.5 mT)	Neurostimulators, Biostimulation Devices, Power Conditioners, Computers, Tape Storage, Disc Drives, and **Pacemakers**
10.0 G (1.0 mT)	HVAC Equipment, X-Ray Tubes, Emergency Generators, Food Prep Areas, Chillers, Telephone Switching, Credit Cards, Analog Watches and Clocks, Fuel Storage Tanks, ECG equipment with LCD display and Motors/Pumps > 5 HP
15.0 G (1.5 mT)	Film Processors and Cardiac Recorders
25.0 G (2.5 mT)	Flat Panel (LCD) Monitors
50.0 G (5.0 mT)	Laser Imagers, Telephones, X-Ray Electronics, Metal Detectors
100.0 G (10.0 mT)	Oxygen Monitor Sensor

Note:
The fringe field limits above are provided for preliminary planning purposes and represent the approximate exposure to magnet field acceptable for the type of instrument. It is the responsibility of the customer to have the vendor of the equipment in question set acceptable magnetic field limits for proper operation of their equipment.

Typical Maximum Fringe Field



Front Elevation



Plan View

Notes:

1. The fringe field diagrams indicated have been empirically confirmed under unobstructed, greenfield conditions. Actual environmental parameters at this site may influence the true extent of the fringe field and affect the accuracy of the field shown.
2. Isocenter in the X-Axis is 39.53" (1004 mm) above finished floor.
3. Magnetic shielding requirements are to be determined on a site by site basis. If additional shielding is required, consult with Philips Service. The customer accepts full responsibility for all cost associated with additional magnetic shielding.
4. Due to variability in the orientation of the site with respect to the earth's magnetic field and construction of the site, the tolerances in Table 1 should be taken into account.

Table 1 - Fringe Field Tolerances

Fringe Field	Tolerance
1 Gauss	+/- 2' - 8" (+/- 800 mm)
5 Gauss	+/- 8" (+/- 200 mm)
10 Gauss	+/- 4" (+/- 100 mm)

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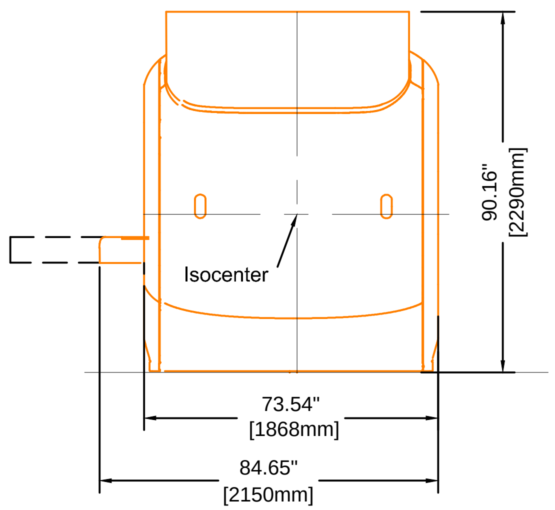
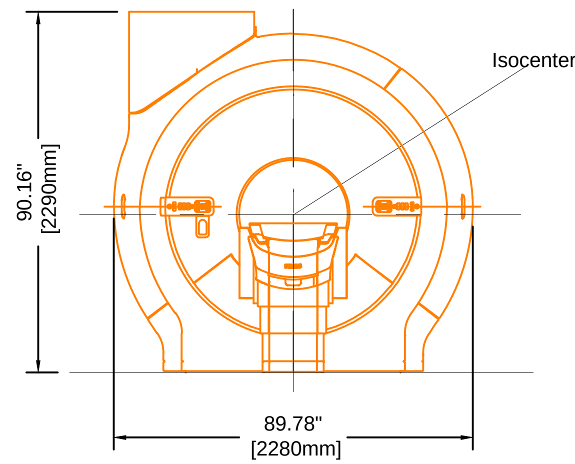
Magnet Rigging Details - Pre-assembled Magnet

Magnet assembly dimensions including transport frame and wheels	Length	Width	Height
Pre-assembled magnet assembly including covers	6' - 1 ½" (1870mm)	7' - 6" (2280mm)	
If transport width is > 7' - 6" (2280mm)			7' - 6 ¼" (2290mm)
*If transport width is < 7' - 6" (2280mm)			7' - 7 ¼" (2320mm)

*If transport width is < 7' - 6" (2280mm). The magnet needs to be transported sideways. Now the height increases due to a different location of the wheels under the magnet.
Note: Part of patient support that is sticking out at the rear of the assembly has to be removed on site. This is a 15 minute job.



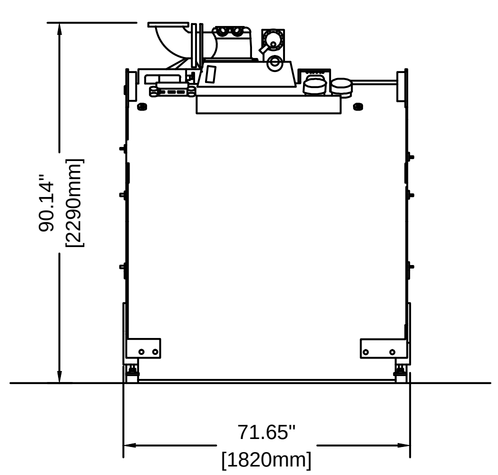


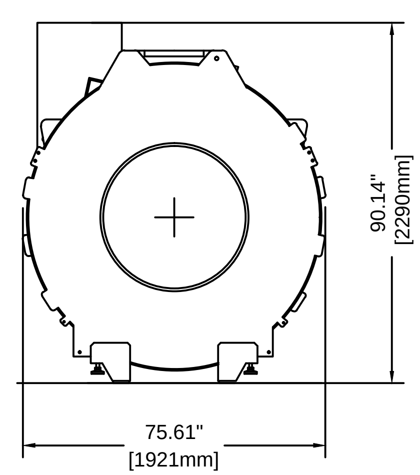
(11.0)

Magnet Rigging Details - With Covers Locally Removed

Magnet assembly dimensions including transport frame and wheels	Length	Width	Height
Pre-assembled magnet assembly with covers removed	6' - 0" (1820mm)	6' - 3 ½" (1920mm)	
If transport width is > 6' - 3 ½" (1920mm)			7' - 6 ¼" (2290mm)
*If transport width is < 6' - 3 ½" (1920mm)			7' - 7 ¼" (2320mm)

*If transport width is < 6' - 3 ½" (1920mm). The magnet needs to be transported sideways. Now the height increases due to a different location of the wheels under the magnet.





(11.0)

General Delivery and Rigging Notes

1. Additional height for protective floor covering, and/or other site-specific restrictions must be added to the transport height.
2. All magnets are delivered pre-assembled.
3. The transport beams, wheels and hydraulic lifting tool will be delivered by the Transport and Installation team. An additional order is not needed.
4. It is the rigger's responsibility to provide a spreader bar if a crane will be used.

a. Rigging is customer/contractor's responsibility unless specific arrangements have been made with Philips Sales/Service.
b. Assembled magnet weight is 9,921 lbs (4,500kg).
c. Transport via wall: A height of 7' - 10 ½" (2400mm) and width of 8' - 3" (2500mm) is recommended.
Transport via roof: A length of 8' - 3" (2500mm) and width of 8' - 3" (2500mm) is recommended.

Note: Transport height can be reduced further, however, this is a costly excercise and needs to be planned in advance. Due to extra costs and potential mechanical risks related to the magnet, we strongly suggest avoiding this solution. Please investigate the costs associated with modifying the building.

- Additional lifting detail to be provided upon request.

(11.9)

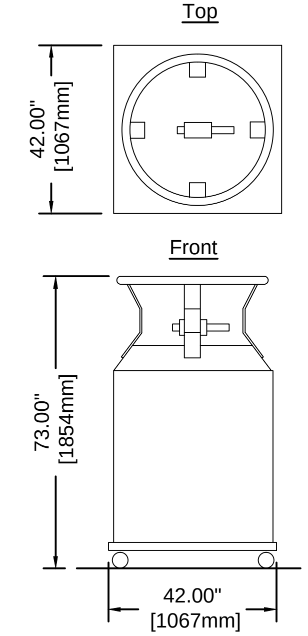
Helium Dewar Transport Path

MRI systems require occasional liquid helium refills. As such the following must be available for regular maintenance:

1. A minimum 34" (860mm) clear path from the loading and/or delivery area to the MRI Exam room, preferably 44" (1120mm).
2. Sufficient floor loading capacity for dewars along transport path.

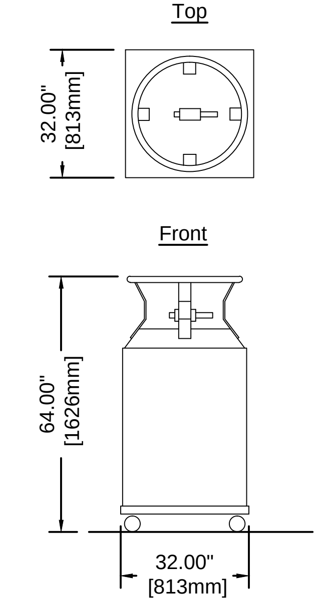
Please refer to sheet SN3 for details regarding liquid helium safety.

500L Dewar



700 lbs (295 kg)

250L Dewar



350 lbs (148 kg)

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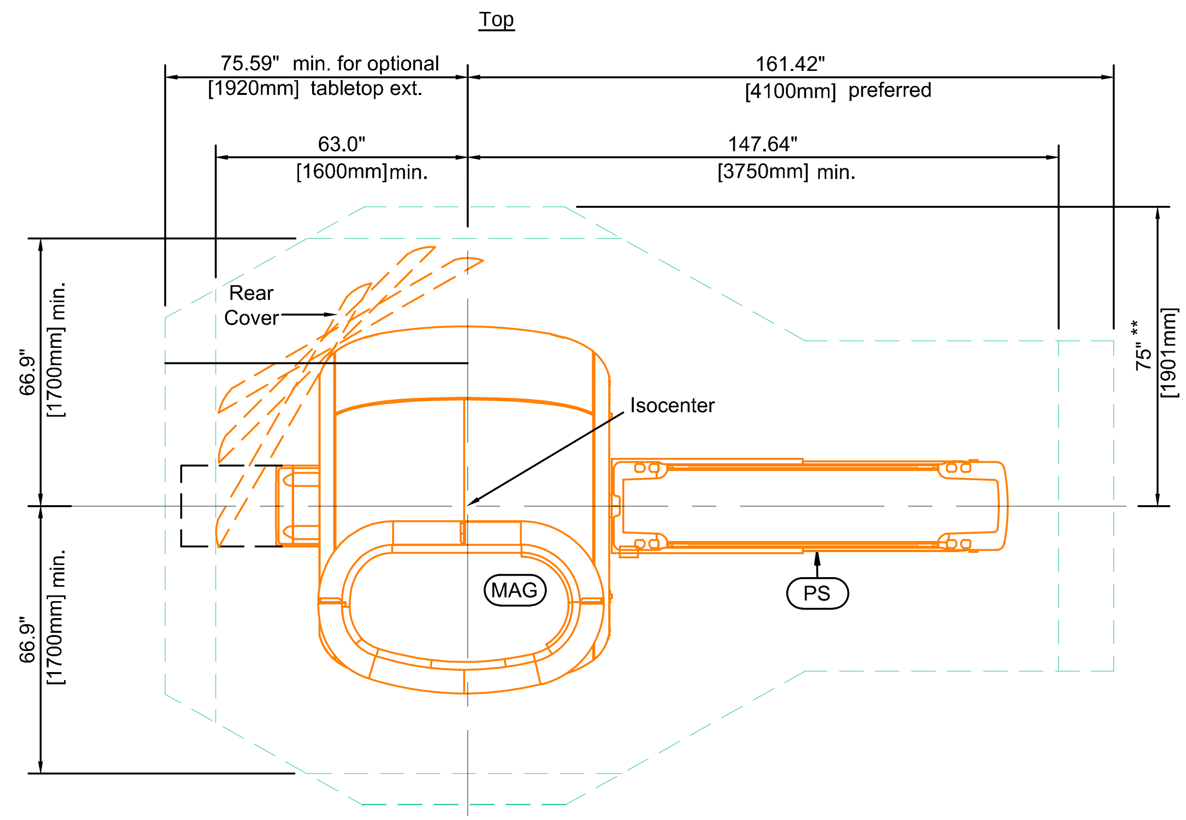
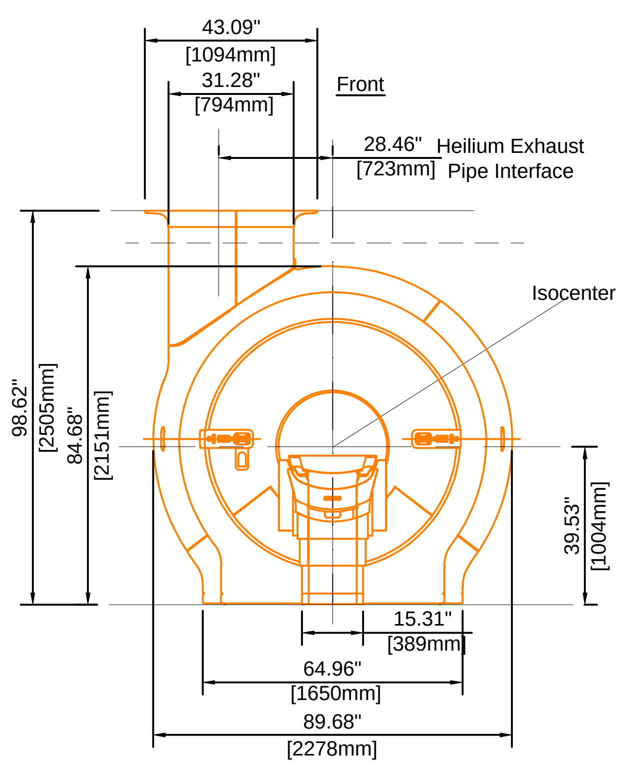
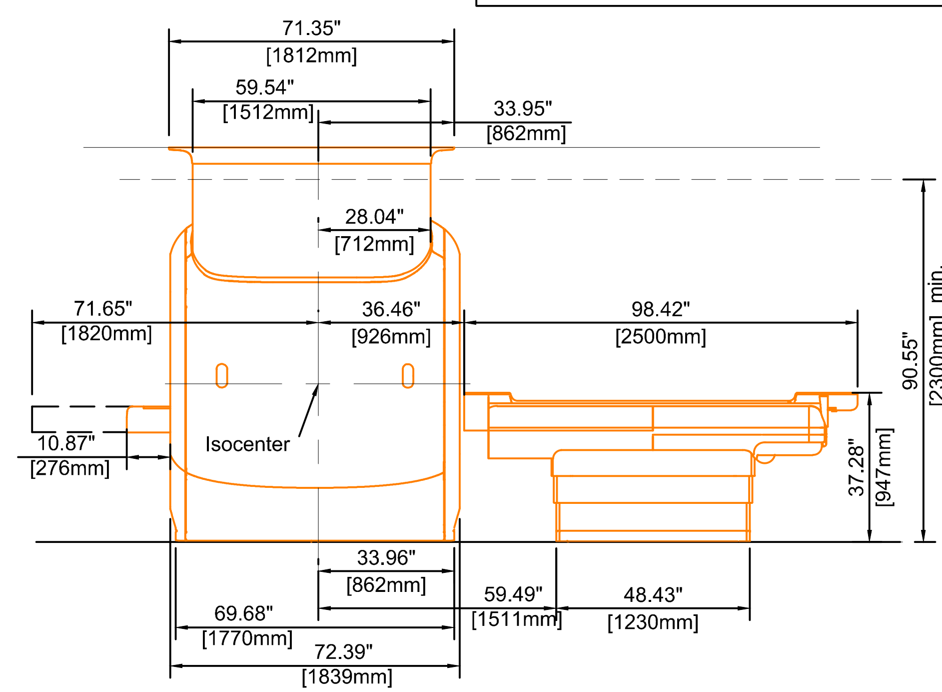


** Minimum 75.00" (1900mm) required on one side if isocenter to finished rear wall is less than 79.00" (2000mm) in order to install rear magnet cover.





*Maximum patient weight is 551 lbs (250 kg)

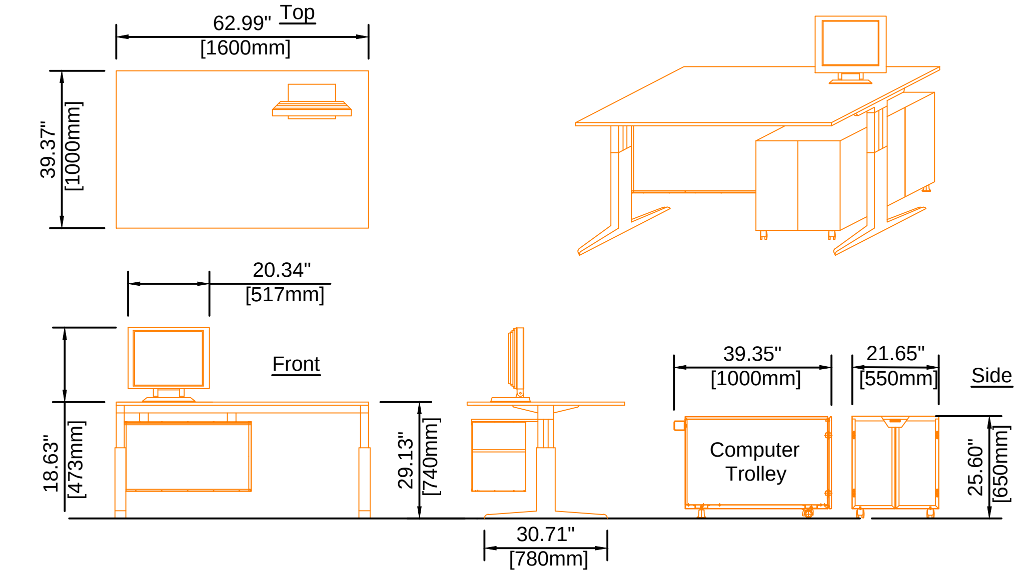
(08.0)

MAG	Magnet Assembly	
Weight	9,921 lbs	(4,500 kg)
Heat Dissipation	6,800 Btu/hr *	(1,720 kcal/hr)

* For gradient coil, 3,400 - 51,200 btu/hr removed via water cooling system.

(11.9)

PS	Patient Support (MT)	
Weight	573 lbs	(260 kg)
Heat Dissipation	1025 Btu/hr	(258.2 kcal/hr)



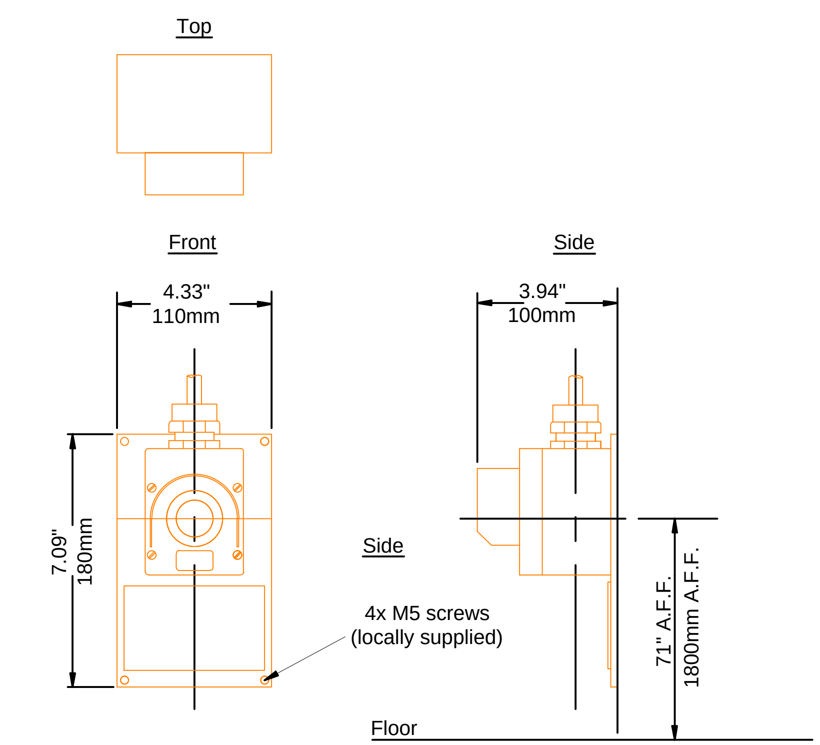
*Maximum distance between Monitor/Keyboard and Computer Trolley is 1'-8" (0.5m) if Operator Console table is not ordered.

(08.0)

OC	Operator's Console	
Computer Weight	145 lbs	(65 kg)
Heat Dissipation	1,700 Btu/hr	(430 kcal/hr)

(08.0)

OT	Operator's Table	
Weight	220 lbs	(100 kg)
Heat Dissipation	0 Btu/hr	(0 kcal/hr)



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ERB	Emergency Run-Down Button	
Weight	3 lbs	(1 kg)
Heat Dissipation	0 Btu/hr	(0 kcal/hr)

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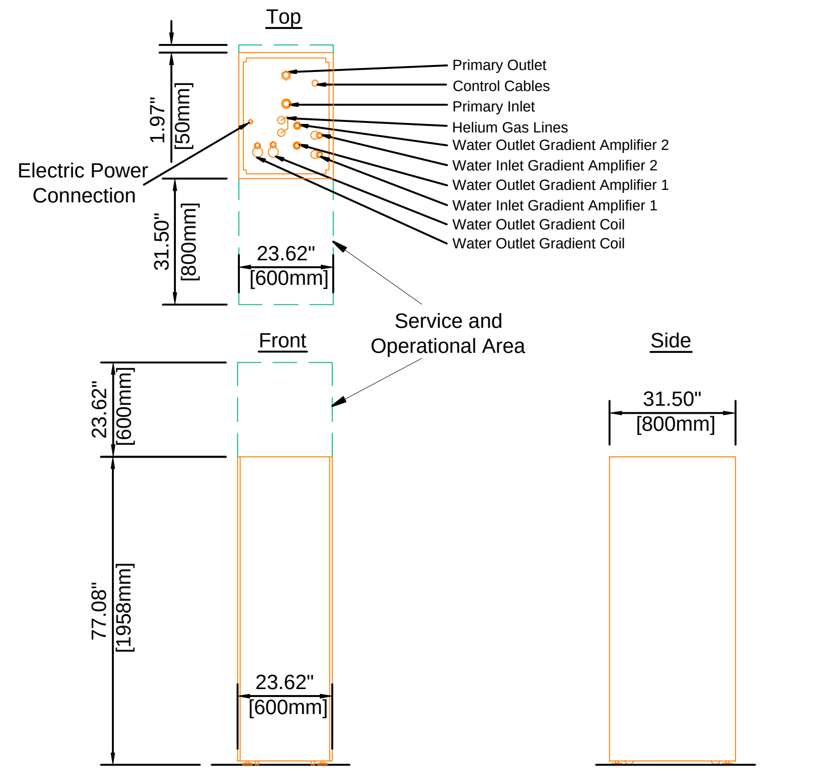

(08.1)

LCC	Liquid Cooling Cabinet	
Weight	660 lbs	(300kg)
Heat Dissipation	3,400 Btu/hr	(860 kcal/hr)

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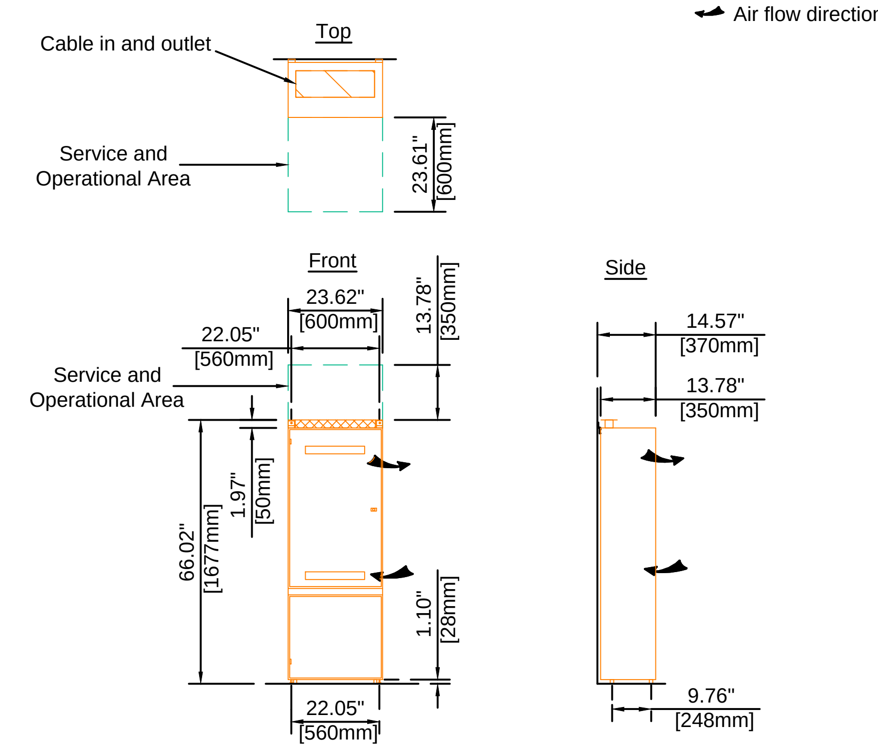
RFSC	RF Coil Storage Cabinet	
Weight	t.b.d.	(t.b.d.)
Heat Dissipation	0 Btu/hr	(0 kcal/hr)



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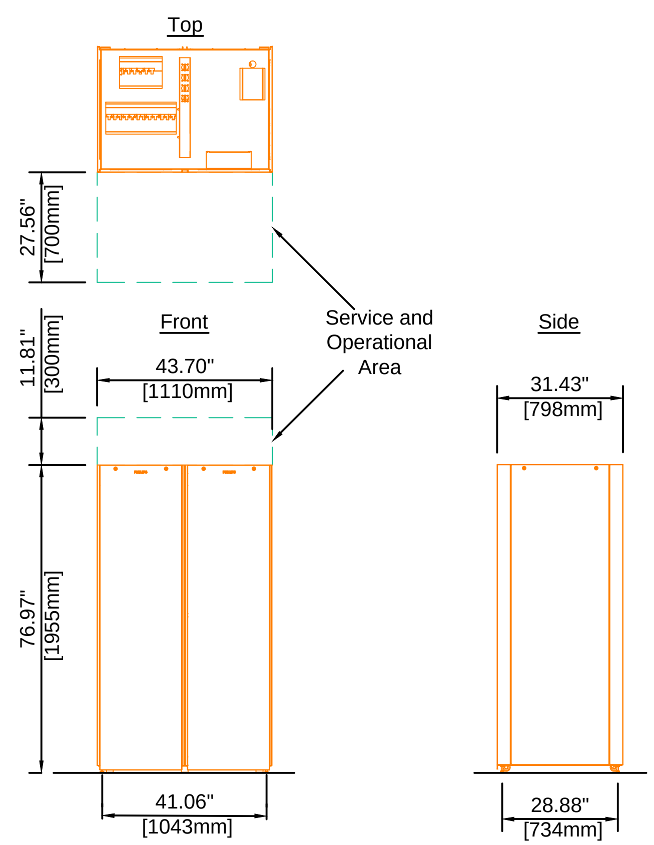
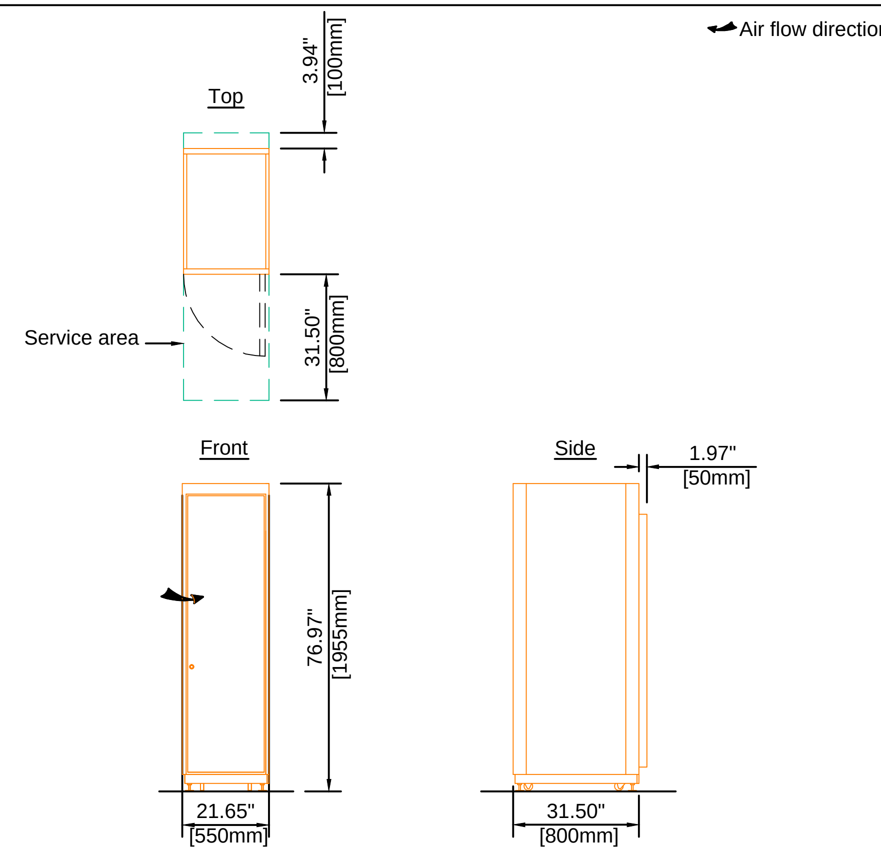
MDU	Mains Distribution Unit - 480V, 60Hz	
Weight	605 lbs	(275kg)
Heat Dissipation	1,700 Btu/hr	(430 kcal/hr)



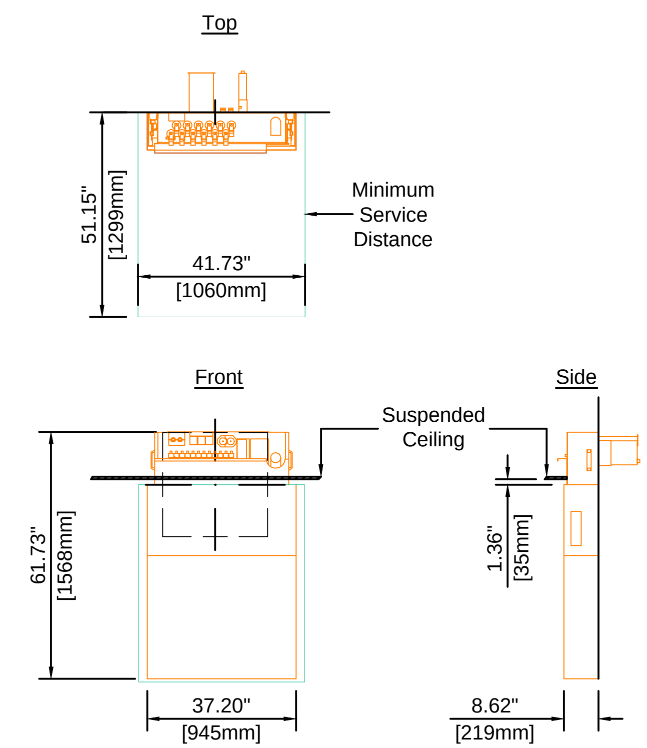
(08.0)

GAC	Gradient Amplifier 787 Double Cabinet	
Weight	2,015 lbs	(914kg)
Heat Dissipation	27,900 Btu/hr	(7022 kcal/hr)



(08.0)

DACC	Data Acquisition and Control Cabinet	
Weight	585 lbs	(265 kg)
Heat Dissipation	23,900 Btu/hr	(6,020 kcal/hr)



(13.0)

SFB	System Filter Box	
Weight	175 lbs	(80kg)
Heat Dissipation	3400 Btu/hr	(860 kcal/hr)

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Order: None

AD4

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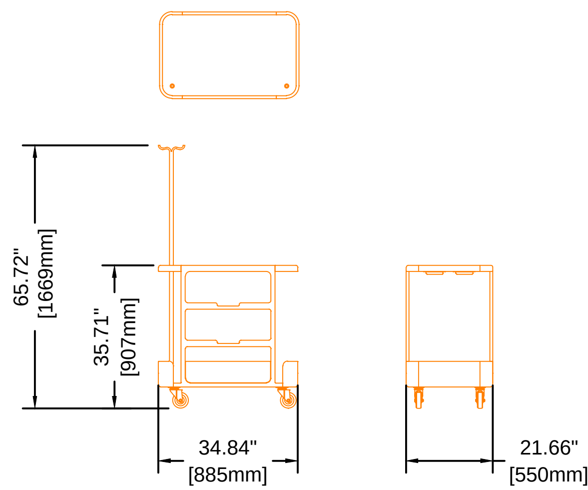
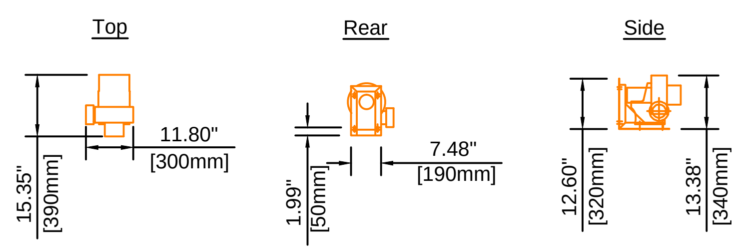


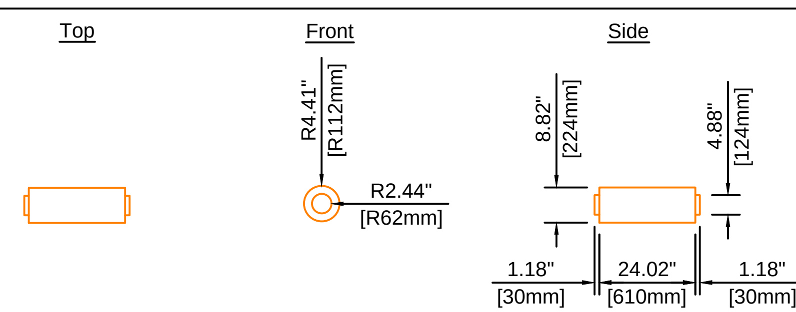
(11.0)

FC	Flex Caddy coil cart	
Weight	t.b.d.	(t.b.d.)
Heat Dissipation	0 Btu/hr	(0 kcal/hr)



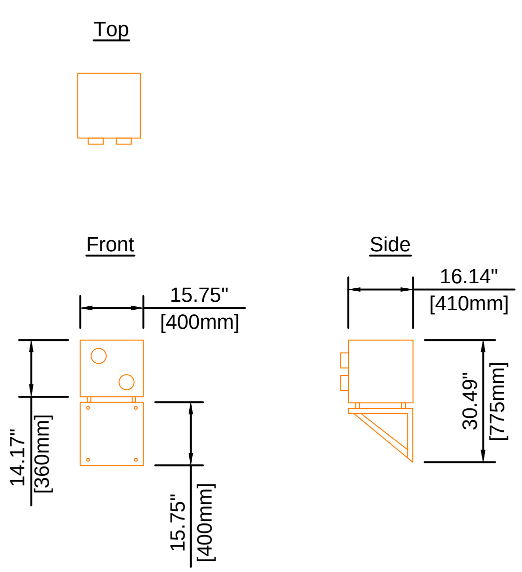
(12.0)

SACU	**System Air Cooling Unit**	
Weight	55 lbs	(25 kg)
Heat Dissipation	340 Btu/hr	(85 kcal/hr)



(12.0)

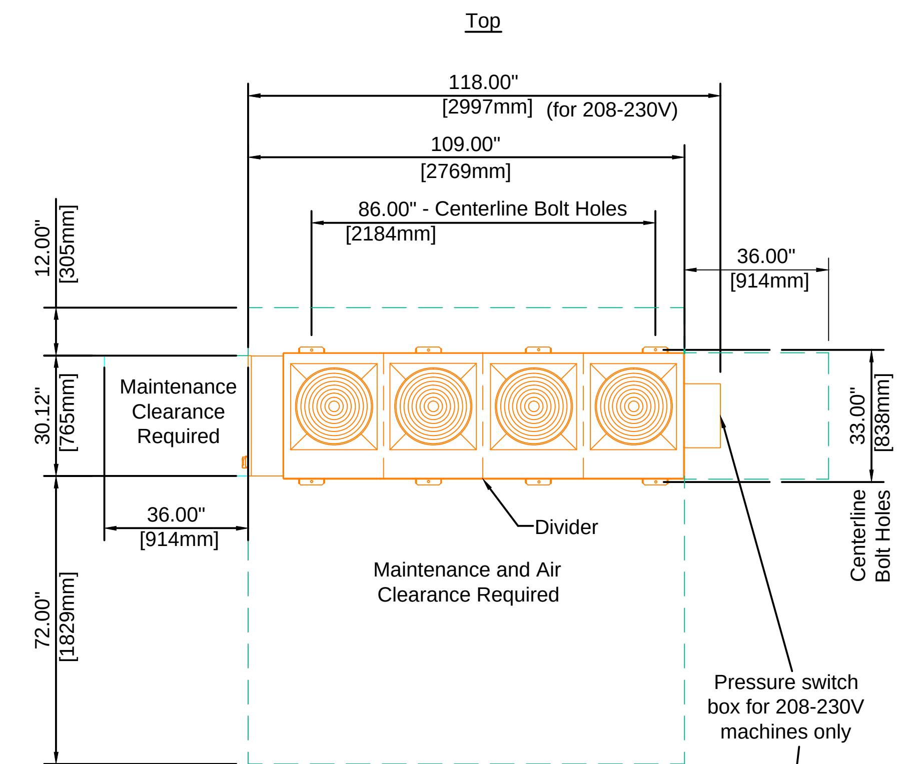
SIL	**SACU Silencer**	
Weight	9 lbs	(4 kg)
Heat Dissipation	--Btu/hr	(-- kcal/hr)

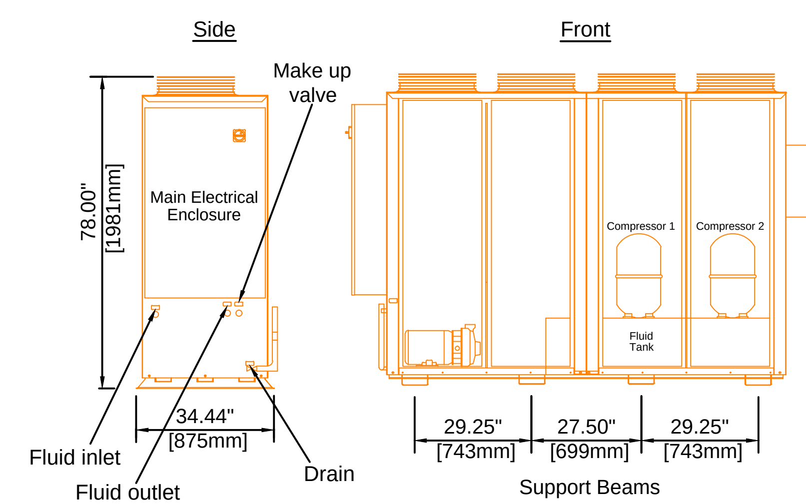


(99.3)

PV	Patient Ventilation Unit	
Weight	56 lbs	(25 kg)
Heat Dissipation	170 Btu/hr	(43 kcal/hr)

Note:
25' Air clearance required above the chiller.
Refer to sheet MP4 for additional notes and specifications regarding the chiller.





(08.2)

CH	Dimplex MEDKOOL 15000 Chiller	
Weight	2,600 lbs	(1180 kg)
Heat Dissipation (to air)	188,000 Btu/hr	(47,375 kcal/hr)

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Quote: None
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AD5

Magnetic Field Homogeneity Explained

Image quality is dependant on the homogeneity and stability of the magnetic field (B0). The homogeneity of B0 can be distorted by static ferromagnetic objects such as floor reinforcement (rebar, structural beams, etc.). The stability of the magnetic field (B0) can be disrupted by moving ferromagnetic objects (cars, trains, elevators, etc.). These can cause variations of B0 which will produce image artifacts such as ghosting.

Electromagnetic fields such as current in power lines, motors, generators, and transformers can also cause B0 variation. The magnitude of the variation will decrease as the source gets farther away from the magnet. As such, there are minimum required distances to the magnet for every type of disturbance, depending upon its properties (weight, current, etc.). Disturbances measured in the Z-axis (direction of the patient table) are most critical for image quality.

Solutions for sites violating requirements will depend on the source of disturbance and construction of the site. To help identify potential disturbances, sources can be classified into seven categories:

1. Static ferromagnetic objects (beams, rebar, etc.)
2. Moving ferromagnetic objects (cars, trucks, etc.)
3. Moving magnetized objects
4. Electrically Powered Rail Systems (trains, trams, subways)
5. Electromagnetic fields (power lines, transformers, motors)
6. Static magnetic fields (other magnets)
7. Coherent and non-coherent vibrations

1. Static Ferromagnetic Objects - (see Figure 1)

a. Floor Reinforcement:
For the square area of 9' - 10" x 9' - 10" (3 m x 3 m) symmetrically around magnet isocenter, ferro-magnetic reinforcment must be:
- **NO less** than than 2" (50 mm) below the finished floor.
- **NO greater** than 5.1 lbs / ft² (25 kg / m²) average concentration between 2" and 10" below the finished floor. Reinforcemnt below 10" (0.25 m) can be ignored.
- Evenly distributed.

Ferromagnetic beams are not considered floor reinforcement because they are not evenly spread over the floor area. The specifications for ferro magnetic beams are below:

b. Ferromagnetic beams perpendicular to the Z-axis of the magnet must be located at least 10" (0.25 m) below the finished floor.

c. All other ferromagnetic beams must be located at least 2' - 0" (0.6 m) below the finished floor.

d. Substantial ferro-magnetic objects or structures outside of the RF enclosure must be located at a minimum of 8' - 3" (2.5m) from magnet isocenter.

2. Moving Ferromagnetic Objects - (see Figure 2)

a. Minimum Distances: Ferromagnetic objects such as trucks, cars, and trolleys can magnetized by the Earth's magnetic field and by the magnet's fringe field. Figure 2 shows the minimum distances moving ferromagnetic objects must be from isocenter.

3. Moving Magnetized Objects

a. Minimum Distances: Some ferromagnetic objects are magnetized because of high currents repeatedly entering the fringe field of the magnet (e.g. elevators). The safety distance for these objects can be calculated by multiplying their weight by 10 and using the chart in Figure 2.

4. Electrically Powered Rail Systems - (see Table 1)

a. Minimum Distances: Electric trains, tramways, and subways are typically powered by electrical traction. For railways with overhead power lines, the current through the power lines (and the returning current through the rails) will induce high magnetic field variations that will extend over a large region. These fields will have a small variation in the direction perpendicular to the power lines. Therefore, B0 variation depends on the distance from the power line to the isocenter, the current, and the angle between the power line and the magnet's Z-axis (0° is parallel to Z-axis). Table 1 shows the minimum distance allowed for electrically powered rail systems versus current and its angle to the magnet Z-axis.

5. Electromagnetic Fields - (see Table 2)

a. Minimum Distances: Currents in power lines, large transformers or electric motors near an MR system can affect the stability of the magnet field since they also produce electromagnetic fields. Table 2 shows the minimum distances allowed.

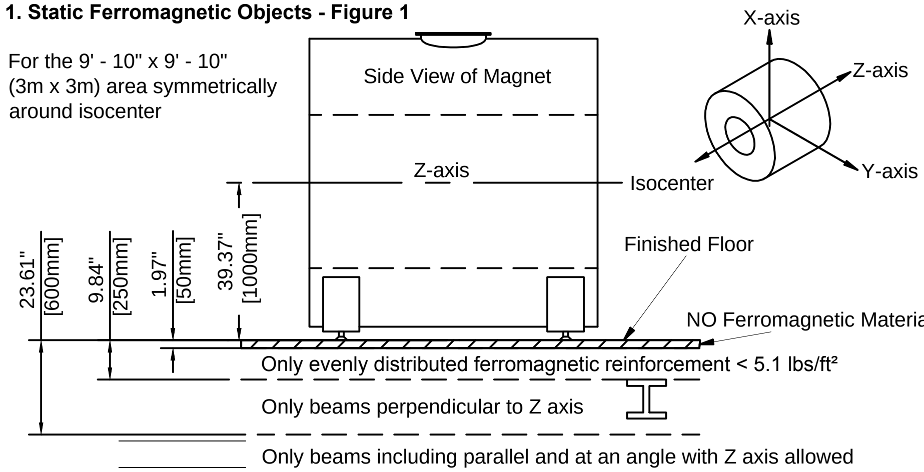
6. Static Magnetic Fields - (see Table 3)

a. Minimum Distances: If an MR system be installed next to another MR system, ensure that the strength of the magnet field from the other system does not exceed the specified values at isocenter of the future system. If the field is between certain values, then the magnet must be re-shimmed when the other system's field goes on or off. Table 3 shows the maximum gauss field allowed.

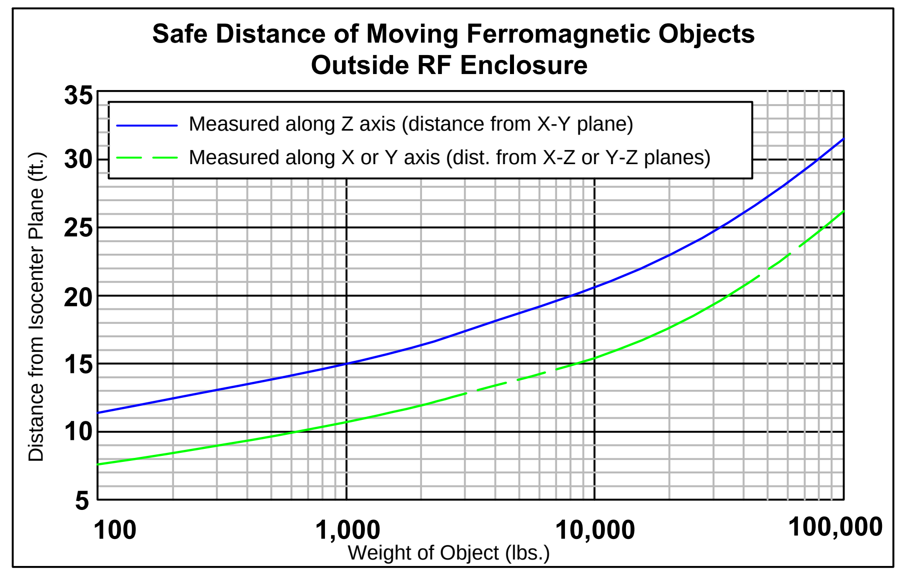
Possible Counter Measures:
If minimum distances are not met, image quality problems are likely to occur. B0 variations can be measured at various angles to find the most optimum angle to site the future Z-axis of the MR system if the distances or the angle to the isocenter are not exactly known. If minimum distances are not met, contact local Philips service to test and evaluate the site.

Magnetic Field Homogeneity Specifications

1. Static Ferromagnetic Objects - Figure 1



2. Moving Ferromagnetic Objects - Figure 2



3. Moving Magnetized Objects
For magnetized objects (because of high currents or repeatedly entering the fringe field of the magnet, e.g. elevators), multiply the weight by 10 to obtain a safety distance from Figure 2.

4. Electrically Powered Rail Systems - Table 1

Distance (feet) for Electrically Powered Subways and Trains *	Angle (degrees), 0° is parallel to Z-axis						
	0°	**15°**	**30°**	**45°**	**60°**	**75°**	**90°**
Current = 750 Amps	56' (14 m)	62' (19 m)	69' (21 m)	75' (23 m)	79' (24 m)	82' (25 m)	82' (25 m)
Current = 2000 Amps	59' (18 m)	105' (32 m)	115' (35 m)	125' (38 m)	131' (40 m)	135' (41 m)	135' (41 m)

* Note that for short distances, the weight of the trains must also be considered.

5. Electromagnetic Fields - Table 2

Object with Electromagnetic Field	Safety Distanced From Magnet Isocenter (in.)
Power Line	$8.8\sqrt{\text{Amperage (A)}}$
Transformer	$15.5\sqrt{\text{Power (kVA)}}$
Motor	$36\sqrt{\text{Power (kVA)}}$

6. Static Magnetic Fields - Table 3

Allowed Field Strength of Another MR System at Achieva Isocenter	
Field Strength of Other System *	**Result**
< 0.5 Gauss (0.05 mT)	Always Possible
> 0.5 Gauss (0.05 mT) AND < 3 Gauss (0.3 mT)	Re-shimming Required
> 3 Gauss (0.3 mT)	Not Allowed

* Note that these values are for Philips magnets only.

(08.0)

Magnetic Field Homogeneity - Vibration Specifcations

7. Coherent and Non-Coherent Vibrations

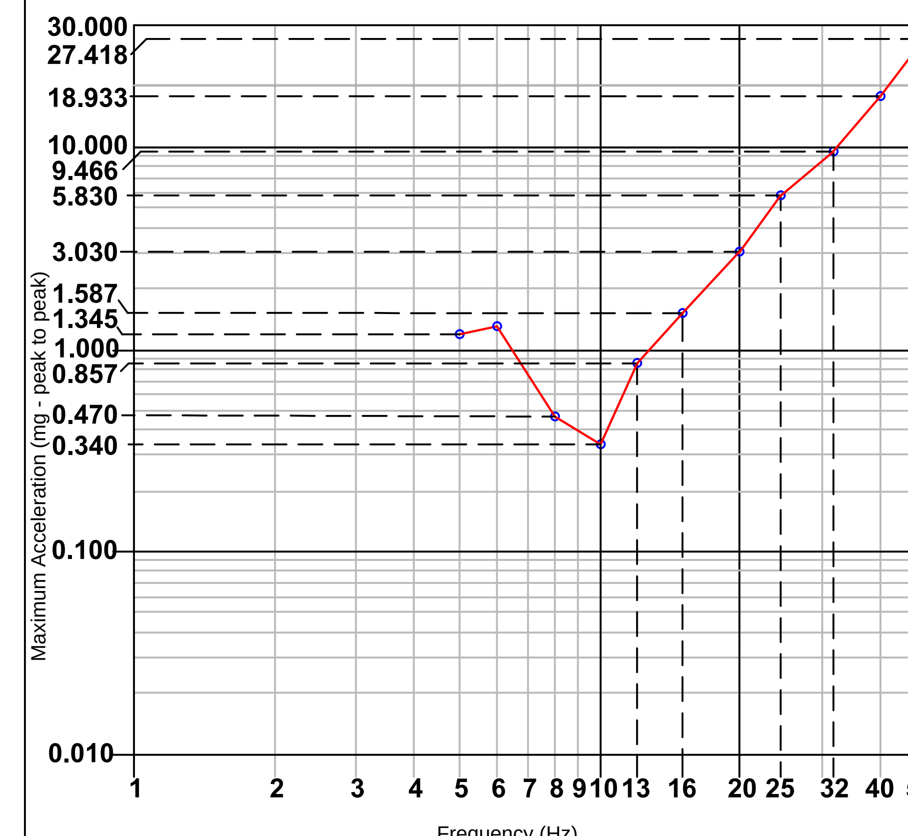
a. Mandatory Floor Vibration Testing: Floor vibrations can affect the stability of the magnetic field which leads to poor image quality. In order to evaluate the acceptance of a site, environmental testing is mandatory. Measurements are to be completed by local Philips service and evaluations are completed by Philips Site Planning department. Contact local Philips service to arrange an environmental test and evaluation.

b. Specifications:
- Coherent Vibration: Coherent vibrations have a signal with a constant amplitude and frequency. Typical sources are electrical powered motors, air handling systems, etc. These vibrations provide a constant disturbance during the entire measurement period (scan). Coherent signals result in distinct artifacts which are the main source of image quality problems. However, disturbing sources can typically be handled once the source is found. Solutions involve rebalancing, isolating on springs, or re-installing the source on vibration pads.

- Non-Coherent Vibration: Non-coherent vibrations can be categorized into pulse, transient, or noise-like vibrations. Pulse and transient vibrations are single events, and will decrease in a short time. Noise-like vibrations have no specific frequency and are broadband. Typical noise-like vibrations are caused by vehicular traffic, people walking, or the resonance of the building structure. These sources are difficult to eliminate. Furthermore, the building structure can have a negative response on the vibration induced. The only possible solution is to change the construction of the building (i.e. isolate MR floor slab). In this case, the customer must consult with a third party vibration and structural engineer.

- Settings for Fast Fourier Transformer Analyzer shown in table below:

Frequency (Hz)	Measurement Resolution	Number of Averages
0.2 - 80	0.2 Hz	20 (2 minutes sample time)



c. Third Party Consultation: Third party vibrations pads are not allowed. All other third party solutions to external vibration disturbances (i.e. pneumatic isolated floors, etc.) must be designed to meet all of the MR system's specifications (vibration specification, shimming requirements, proximity of ferromagnetic material, etc.). In addition, long term affects (such as creeping), must be considered since the magnet's relationship with the patient table is extremely critical. Philips does not review or approve any third party designed solutions.

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Order: None

SN1

MRI Support Notes

1. Door(s)

For convenient and safe transport of patients on trolleys, and for installation and maintenance actions, a minimum clearance of 48" W x 84" H (1220 mm W x 2130 mm H) is recommended. Smaller doors may hinder facility staff in getting access to the patient and in transferring the patient to a place where life saving actions can be performed in an emergency situation. The size of the door(s) and access path to the magnet room may need to be greater than the above figures to allow access for helium refill dewars, which vary in size depending on where they are obtained. For safety reasons the door(s) should comply with the following:

- **a.** To be opened or closed within 3 seconds, and with a force less than 22.5 lbs (100 N).
- **b.** Manual operator action required to close the door (not automatic).
- **c.** Threshold no more than 0.8" (20 mm), or 2.4" (60 mm) if provided with ramps no steeper than 10%.
- **d.** Simple to operate.
- **e.** Opening direction outwards to enable the operator to open the door under conditions of pressure build-up during a quench and a venting system failure.
- **f.** A power-assisted door must, in the event of a failure, be opened within 10 seconds with a force no greater than 56.2 lbs (250 N).
- **g.** The design of the door posts should be such that they are not damaged by typical contact with patient gurneys and helium dewars.

2. Magnet Transfer Opening

The magnet is the only system part that in most cases cannot be transferred through the door of the RF enclosure. A special opening to allow its installation in the enclosure must therefore be made available. **Refer to sheet AD2** for required dimensions. The underside of the magnet transfer opening should be flush with the floor. If building constraints make this impossible, the RF enclosure supplier must deliver ramp(s) with slopes no steeper than 5% and a maximum height of 4.75" (120 mm). The location of the transfer opening will naturally be site dependent. It should, however, comply with the following conditions:

- **a.** Preferably be accessible through existing hospital corridor(s), provided these meet other other necessary requirements (i.e. floor loading, corridor width and height).
- **b.** It should be accessible from outside through a wall or the roof.

If re-opening of magnet transfer opening is needed, it must be possible for Philips service to re-open the magnet transfer opening without invalidating the RF enclosure guarantee. Should specialist servicing be required, this should be done only by the RF shielding manufacturer's own personnel and any special tools used should be supplied by the RF shielding manufacturer.

3. RF Viewing Window

The recommended window size is 48" W x 40" H (1200 mm W x 1000 mm H) with the window base no more than 39" (1000 mm) above finished floor level. The minimum window size is 36" W x 24" H (900 mm W x 600 mm H). The transparency of window material (i.e. the mesh) must be better than:

- **a.** 30% for an angle between 40 and 140°.
- **b.** 50% for an angle between 70 and 110°.

The windowpane must be made of tempered safety glass. The window material must have an attenuation factor less than 2 in the light color range of 2600 to 4200 K. Moreover, it must cause no color change in the transmitted light to allow the operator to get an accurate impression of the patient's complexion. The window shielding material (mesh) must be sandwiched between two panes of glass. All parts of the window (e.g. the mesh) that contribute to the attenuation must be made of non ferro-magnetic material. For optional sound damping the two window panes should have a different thickness (e.g. 0.24" and 0.31" [6 and 8 mm]).

4. Floor - Covering Material

To avoid generating an electrostatic discharge safety issue, the floor must have a resistivity of **less than** 1.0 giga ohms or comply with DIN 51953: "Testing of organic floor coverings; testing the ability for electrostatic charge derivation in confined spaces liable to contain explosion mixtures."

5. Foundation of Magnet and Patient Support

Shocks and vibrations up to 0.1 g, in all directions, have to be anticipated. The friction between magnet and floor will normally be great enough to keep the magnet in place (friction factor > 0.1) so no fixing measures are required unless in a seismic area. The patient support is subject to forces induced by operators and patients. To prevent tilting, the patient support must be fastened to the floor.

6. Suspension Provisions

The provisions for system wiring, suspended ceiling, helium gas lines, and helium gas exhaust are not part of the RF enclosure delivery by Philips. However, fixing points for the suspension of these items must be available in the enclosure ceiling. Requirements are determined by the local situation. In addition, suspension points for the lighting, air-conditioning equipment, etc. maybe required. Finally, the suspension provisions must not affect RF enclosure integrity. The responsibility for ensuring this integrity lies with the manufacturer of the RF enclosure.

Acoustical Noise and Vibration Forces

1. Typical Acoustical Noise Levels*

Operator Position - PICU	99 dBA
Patient Table - Front	96 dBA
39.37" (1 m) beside the magnet	94 dBA
39.37" (1 m) from equipment room cabinet	75 dBA
39.37" (1 m) from Operator Console	55 dBA

* Maximum levels can increase by 4 dBA during various sequences and do not include noise produced by third party equipment.

* The SACU is normally installed inside the equipment room. Anticipate 72 dBA acoustical noise generated by the SACU. Never install SACU in the Operators or Reporting Room.

2. Acoustical Noise Suppression

Sound Absorption Coefficient of Materials To Be Used	
Suspended Ceiling - Exam Room	> 0.7
Suspended Ceiling - Control and Equipment Room	> 0.6
Main Frequency To Be Attenuated	600 to 1000 Hz

The use of sound absorbent materials in the examination room is required. Due to the variance of MR scanning sequences, acoustical noise will vary. To limit acoustical nuisances, worst case situations must be considered for site design (see charts above). Contact an architect to determine which of the following acoustical dampening means can be provided, as required.

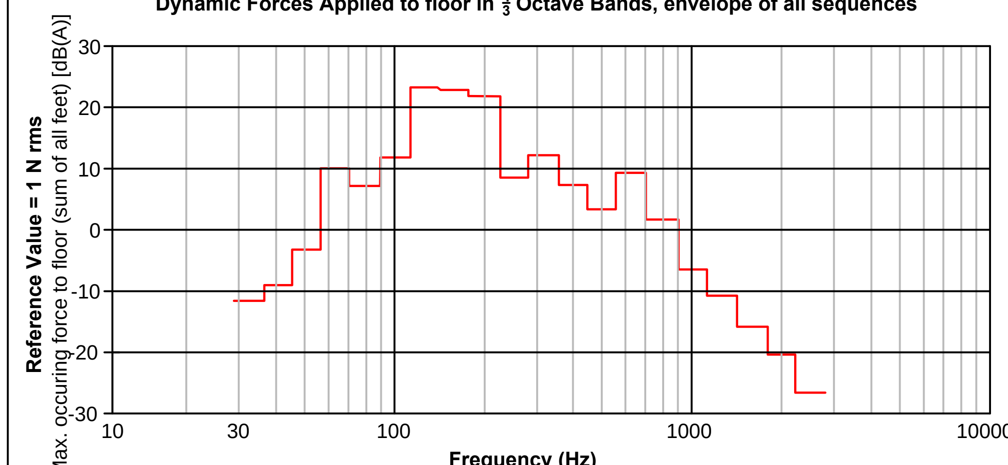
- **a.** An additional brick wall between the RF enclosure and adjacent rooms. Thickness to be approximately 4 3/8" to 4 3/4" (110 mm to 120 mm).
- **b.** A double wooden wall (0.08" x 0.50" [2 mm x 12.5 mm] thick) with 3.15" (80 mm) thick mineral fiber material in between parent structure and RF enclosure.
- **c.** RF doors and windows with sufficient acoustical attenuation: Door R' > 32 dB, Window R' > 40 dB (panes of different thicknesses).
- **d.** The exam room ceiling can be finished with a 4" (100 mm) thick mineral fiber material.
- **e.** Limited number of RF feedthroughs.
- **f.** Free standing RF enclosure.
- **g.** Limited coupling to the building (other than RF enclosure floor), i.e. all other interfaces to the building (wall and ceiling) de-coupled to avoid noise (flexible connection of A/C hoses, etc).

3. Vibration Forces Induced

The MR system produces vibration forces over a range of frequencies (see chart below). These forces are transmitted through the MR feet to the RF foot pads, exam room floor, and possibly through nearby columns and beams. Depending on building construction (floor slab type, beam/column size and type, etc.) and magnet location (slab on grade or suspended floor, proximity to beams/columns, etc.), the MR system can transfer structural noise to the building. To avoid structural noise nuisances, isolation methods can be used to dampen vibrations and mechanical noise. Contact an architect, structural engineer, and/or vibration specialist for consultation.

- **a.** The vibration forces shown in the chart below are measured at the magnet feet rubber pads (Philips provided). Any dampening that the rubber pads provide are not accounted for in these measurements, since they can not be taken directly on the floor (thereby accounting for the dampening of the pads) because vibration results on the floor are dependant on the construction of the floor. Actual floor vibrations are site dependant.
- **b.** Measurements for frequencies < 10 Hz were not taken due to instable and inaccurate data points.
- **c.** Acoustical noise transmitted via air is not integrated into these measurements. Acoustical noise (via air) values can be found in the table above.
- **d.** The vibration force measurements were taken over several different scans.
- **e.** Third party solutions to vibration dampening (pneumatic isolated floors, vibration pads) must be designed to meet all MR system specifications (vibration, proximity of ferromagnetic material, etc.). Also, long term affects such as creeping must be considered since the magnet's relationship with the patient table is critical. Philips does not review or approve any third party solutions.

Dynamic Forces Applied to floor in $\frac{1}{3}$ Octave Bands, envelope of all sequences



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RF Enclosure Requirements

1. RF Shielding Effectiveness

The room has to be built and tested to the following specifications that apply to all parts of the shielded enclosure, including seams, doors, windows, vents and mechanical penetrations:

Values measured analogue to MIL-STD-285		
H field	0 MHz - 10 MHz	irrelevant
	10 MHz - 15 MHz	90 dB
	15 MHz - 130 MHz	100 dB
E field and Plane Wave	5 MHz - 130 MHz	100 dB

These requirements are valid for Philips parts not installed and are subject to the following:

- **a.** The RF shielding is completely installed.
- **b.** Foundation provisions for the magnet and patient support are installed.
- **c.** Protective earth wiring (inside and outside the RF Enclosure) is installed.
- **d.** All components/equipment to be located inside the enclosure are installed and operational (including all external facilities and their interfaces to systems inside the enclosure, excluding Philips parts).
- **e.** All RF enclosure feedthrough frames covered with blind plates (provided by RF vendor).

2. RF Enclosure Materials

- **a. Copper RF Enclosures:**
  Philips recommends copper RF enclosures due to its shielding effectiveness, long term stability, flexible design capabilities, availability, and cost.
- **b. Ferromagnetic (Galvanized Steel) RF Enclosures:**
  Ferromagnetic RF enclosures may be acceptable, but are subject to the following restrictions:
  - The floor of the RF Enclosure must be made of non-ferrous material (i.e. copper) within a 9'-10" x 9'-10" (3m x 3m) box of magnet isocenter.
  - The total combined thickness of the ferrous material must achieve the specified shielding effectiveness with the magnetic field on.
  - All walls must be at least 63" (1600 mm) from magnet isocenter. The walls do not need to be symmetrically located around isocenter.
  - The RF enclosure must not vibrate. This can introduce B0 variations, especially at the RF enclosure ceiling.
- **c. Aluminum RF Enclosures:**
  Aluminum RF enclosures are acceptable, but require special attention. Over time, a layer of aluminum oxide will form. This causes electrical contact between RF enclosure parts to degrade, especially around doors, feedthroughs, and windows. As such, extra measures (such as special coating) must be taken. Also, the RF enclosure quality between moving contact points (doors) will rapidly degrade. To reduce degradation, a thin sheet of brass can be used between such surfaces. If the connection is made by an appropriate screw connection, the electrical resistance between the brass and the aluminum must be less than 10 Ohms. The use of gaskets for the door, in addition to the issues mentioned above must not degrade the RF enclosure such that it no longer meets the shielding requirements. Therefore, Philips strongly recommends the use of "finger stocks".

3. Environmental Conditions

The shielding must operate effectively and not suffer damage under the following conditions:

Temperature Range		50° to 104° F (10° to 40° C)	
Humidity		20% to 90% non condensing	
Air Pressure		7.25 to 16.0 PSI (50 to 110 kPa)	
Frequency		Drip	
Mechanical Vibration		Mechanical Shocks	
Water/Damp/Liquid	0 to 150 Hz	g-value	0 to 0.1 g
g-value	0 to 0.1 g	Pulse Duration	6 to 10 ms

These conditions also apply for the system wiring, ducts, gas exhausts and other interface provisions. During and shortly after installation, the shielding may be subject to extreme conditions due to construction activities. Power loss or temperature control failure can also cause extreme environmental conditions. Local earthquake regulations must be followed. Special measures may be required to fasten the magnet and patient support to the building.

4. Reliability / General Policy

- **a.** Specifications listed are MANDATORY REQUIREMENTS for the proper functionality of the MR system.
- **b.** Philips accepts no responsibility for correct operation of the RF enclosure. The performance of the MR system is only guaranteed if mandatory requirements are met.
- **c.** The RF enclosure effectiveness must be tested by the RF vendor, and the results accepted by Philips. If requested by the customer, a Philips representative can be present to witness the testing. The shielding effectiveness must be tested according to the following codes and standards applicable to the extent indicated:
  - MIL-STD-285: Method of attenuation measurements for electromagnetic shielding enclosures for electronic test purposes.
  - MIL-STD-220A: Standard of safety of electromagnetic interference filters.
  - UL 1283: Standard for safety of electromagnetic interference filters.
- **d.** The shielding must be designed for 100% operation throughout the year.

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Date Drawn: 1/13/2014
Quote: None
Order: None

SN2

MRI Safety

1. Safety with Magnetic Fields

It is the responsibility of the customer to satisfy the following safety requirements:

a. Controlled Zone:

- During the siting of a Philips MR system, a controlled access area around the MR system must be defined where the field strength will exceed 5 Gauss (0.5 mT). Warning signs "CAUTION" - Magnetic field permanently switched on" should be used to indicate this area. The area must be clearly visible, e.g. by markings on the floor, barriers or other means to control access to this area by unauthorized persons.
- Persons having pacemakers, neuro-stimulators, insulin pumps or similar devices, or implants of ferromagnetic material (i.e. surgical clips, artificial cardiac valves, prostheses or metal splinters) must stay outside the controlled access zone.
- The security procedures at the entrances of the examination room should prevent prohibited objects from being brought into the examination room. Metal detection equipment can be used.
- No liquid helium containers may be brought into the exam room area unless it has been determined that the container is made of non-ferrous material. Special non-ferrous containers are available from liquid gas suppliers and must be appropriately labeled.
- Ferromagnetic objects, such as scissors, tools, gas bottles, vacuum cleaners and stretchers, must be kept outside the examination room. Such objects will be pulled to the magnet, and may cause injury to patients and staff, or may damage the equipment.
- Magnetic shielding requirements to minimize the controlled zone, or contain it within the exam room are to be determined on a site by site basis. If additional shielding is required, consult with Philips service. The customer accepts full responsibility for all costs associated with additional magnetic shielding.

b. Emergency Magnet Run-down:

- The MR system is provided with two magnet emergency run-down remote push buttons to terminate the magnetic field. This should only be used in case of an emergency.
- If in a medical emergency, non MRI-safe instruments must be used, the patient must be removed from the examination room first.
- In case of a deliberate quench (magnet run-down) by the operator to implement life supporting and other safety procedures, the magnet field strength at the isocenter is reduced to a value below 200 G (20 mT) within 30 seconds.

2. Safety with Liquid and Gaseous Helium

a. A high concentration of helium gas in the examination room can lead to suffocation. When the magnet emergency run-down button is used for immediate shutdown of the magnetic field, or during a spontaneous magnetic field shutdown (quench) occurs, a large amount of helium will evaporate. The helium venting system ensures that the escaping helium gas is vented outside the building. In the unlikely event of a venting system failure (blockage, damage) during a quench, a high concentration of helium gas can disperse quickly into the examination room, visible as clouds of cold mist. In such an event, do not switch off the air conditioning in the room (normal procedure for fires). Instead, maintain circulation and replenishment the air to allow the helium gas to dissipate.

b. Liquid helium is extremely cold and will cause frostbite when in contact with the human body. Use protective gloves, goggles and clothing when handling liquid helium.

c. Only properly trained staff should handle cryogenic liquids.

d. The magnet's helium venting system, connected to a helium exhaust quench pipe leading outside the building should have an opening/outlet located in a non-accessible area. It should be periodically checked to ensure the pipe is not blocked, dislocated, or damaged.

e. Under no circumstances should the magnet be energized prior to the installation of the helium gas exhaust pipe and the emergency run-down buttons.

f. Monitoring of the oxygen content of exam room air maybe required by local regulations. The magnet must occasionally have its liquid helium replenished. During these refills, a small amount of helium gas will evaporate in the exam room and dilute the oxygen in the air. As such, it is highly recommended to install an oxygen detector (customer/contractor provided) with an audible alarm, and a remote sensor in the return AC ducts.

3. Safety Zones

MRI safety guidelines recommend that facilities be zoned to ensure patient safety. It is the sole responsibility of the customer to regulate and/or restrict staff and patient flow within the MR environment as necessary. MR safety zones are described as follows:

Zone I - Entrance to facility, reception and waiting areas. No restrictions to patient access.

Zone II - Patient holding area and/or dressing rooms. Patient access may be restricted, or staff supervision may be required.

Zone III - MR control area and equipment room. Accessible only by authorized or properly trained MR personnel. It is recommended that a card-key locking device be used to gain access to these areas.

Zone IV - Scanner room. This area should be accessible solely from Zone III, and access to the scanner room should be observed and controlled by authorized MR personnel. It is recommended that a warning light be illuminated at all times, with a 24-hour backup power system in the event of a power outage.

General Equipment Support Notes

1. General

The customer shall be solely responsible, at their expense, for preparation of the site, including any required structural alterations. The site preparation shall be in accordance with this plan and specifications, the architectural/construction drawings, and in compliance with all safety and building codes. The customer shall be solely responsible for obtaining all construction permits from jurisdictional authority.

2. Equipment Anchorage

Philips provides, with this plan and specifications, information relative to equipment size, weight, shape, anchoring hole locations and forces which may be exerted on anchoring fasteners. The customer shall be solely responsible, through the engineer of record for the building, to provide on the architectural/construction drawings, information regarding the approved method of equipment anchoring to floors, walls and/or ceiling of the building. Any anchorage test required by local authority shall be the customer's responsibility. Stud type anchor bolts should not be specified as they hinder equipment removal for service.

3. Floor Loading and Surface

Philips provides, with this plan and specifications, information relative to size, weight and shape of floor mounted equipment. The customer shall be solely responsible, through the engineer of record for the building, to provide on the architectural/construction drawings confirmation of the structural adequacy of the floor upon which the equipment will be placed. Any load test required by local authority, shall be the customer's responsibility. The floor surface upon which Philips equipment and floor plates are to be placed/anchored shall be super flat and level to within +0 / -1/8 inch (2.5 mm).

4. Ceiling Support Apparatus (If Applicable)

Philips provides, with this plan and specifications, information relative to size, weight and shape of ceiling supported equipment. The customer shall be solely responsible, through the engineer of record for the building, to provide on the architectural/construction drawings, information regarding the approved method of structural support apparatus, fasteners and anchorage to which Philips will attach equipment. Any anchorage and/or load test required by local authority shall be the customer's responsibility.

The structural support apparatus surface to which Philips equipment is to be attached, shall have horizontal equipment attachment surfaces parallel, square and level to within plus or minus 1/16 inch (2 mm) for the area the system covers.

Contractor to clearly mark Philips equipment longitudinal centerline on bottom of each structural support.

Any drilling and/or tapping of holes required to attach Philips equipment to the structural support apparatus shall be the responsibility of the customer.

Fasteners/anchors (i.e., bolts, spring nuts, lock and flat washers) and strip closures shall be provided by the customer.

5. Suspended Ceiling

Special requirements for the suspended ceiling within the RF enclosure:

a. It must be constructed from non-ferrous material. Tiles composed of high recycle metal composition (ie. USG490) are not allowed as they often contain ferrous ferromagnetic metal.

b. It is recommended to have sound damping

c. No hanging objects such as spot lamps are to hang lower than 8' - 3 $\frac{1}{4}$" (2520 mm) in order to give clearance for the removal of the magnet covers for servicing.

d. The access panel or opening in the ceiling to enable a cold head change shall comply with specifications given on SD1.

e. Ceiling grid hangers must be made of non-ferromagnetic material and must be insulated.

f. Any loose hardware or tools should not be installed or left above suspended ceiling. If the hardware vibrates it could cause image quality issues and if it is ferrous it could eventually end up inside the magnet gantry.

- To avoid spikes, (non ferromagnetic) metal e.g. aluminum strips, aluminum light fixtures, air handling grids etc. must be connected to the RF-enclosure grounding point. Beware of metal-on-metal connections where two metal parts rub against one another. This could cause image artifacts.
- In case of aluminum strips used for the suspended ceiling grid; each individual strip must be connected. In case aluminum tiles, each individual tile must be connected to the RF-enclosure grounding point.
- It is allowed to connect all individual parts to each other and finally to the RF-enclosure grounding point.
- For good electrical connection of the grounding wire a tooth washer is required.
- Before connection is made, coating / insulating finishing must be removed.
- The volume above the suspended ceiling above the magnet and service area must be free of obstacles for service activities. No third party equipment / installations are allowed here.
- The impedance between any conductive part and the central PE bus-bar/terminal must not exceed 100 mΩ.

General Equipment Support Notes - Con't.

6. Lighting

Lighting fixtures shall be placed in such a position that they are not obscured by any equipment or its movement, nor shall they interfere with Philips ceiling service clearances. Such lighting fixture locations shall be the sole responsibility of the customer. Recommend plastic conduit when it does not interfere/violate with local codes.

7. Ceiling Obstructions

There shall be no obstructions that project below the finished ceiling in the area covered by ceiling suspended equipment travel (if applicable).

8. Floor Obstructions

There shall be no obstructions on the floor (sliding door tracks, etc.) in front of the Philips technical cabinets. Floor must be clear to allow cabinets to be pulled away from the wall for service.

9. Seismic Anchorage (For Seismic Zones Only)

All seismic anchorage hardware, including brackets, backing plates, bolts, etc., shall be supplied and installed by the customer/contractor unless otherwise specified within the support legend on these drawings.

Installation of electronic cabinets to meet seismic anchorage requirements must be accomplished using expansion type (HILTI HDI, or eq.) anchor/bolt systems to facilitate the removal of a cabinet for maintenance. Do not use threaded rod/adhesive anchor systems for the cabinets. Consult with Philips regarding any anchor system issues.

10. Sprinkler System

All sprinkler pipes and sprinkler heads inside the RF-enclosure to be made of non-ferrous material. The sprinkler pipe must enter the RF-enclosure via one feedthrough and must not branch off into multiple pipes. Sprinkler heads must be located outside of the magnet's body.

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Drawing Number
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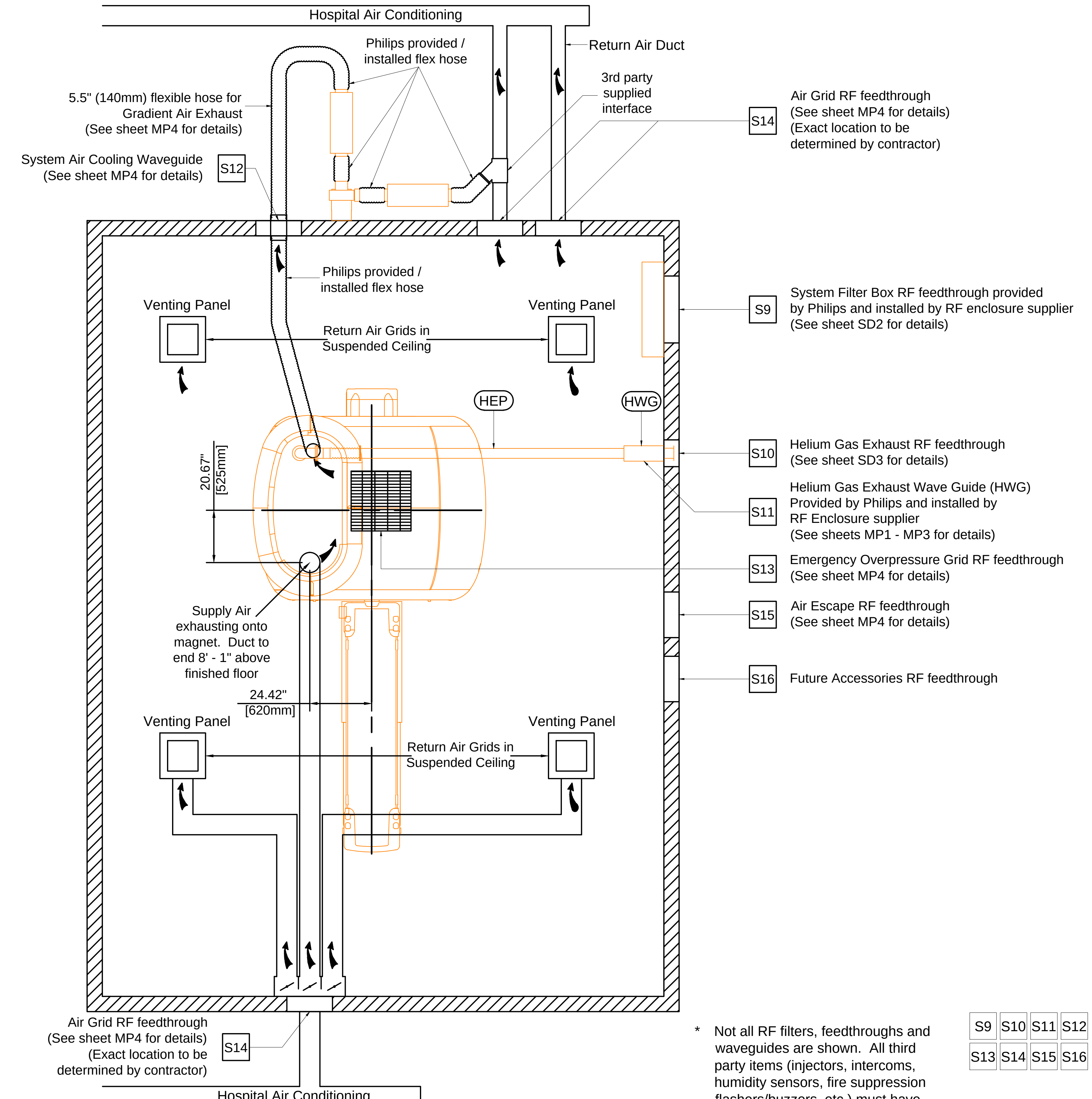
Date Drawn: 1/13/2014
Quote: None
Order: None

SN3

Waveguide/Feedthrough Summary



* Not all RF filters, feedthroughs and waveguides are shown. All third party items (injectors, intercoms, humidity sensors, fire suppression flashers/buzzers, etc.) must have their own RF filters or feedthroughs.

S9	S10	S11	S12
S13	S14	S15	S16

(12.0)

For reference only. Exact locations T.B.D. by customer/contractor/RF Vendor.

Floor & Wall Support Legend

- A Furnished and installed by Philips
- B Furnished by customer/contractor and installed by customer/contractor
- C Furnished by Philips and installed by RF Enclosure Supplier
- D Furnished by Philips and installed by contractor
- E Existing
- F Future
- G Optional
- H Furnished by RF Enclosure Supplier and installed by RF Enclosure Supplier

	Item Number	Description	Detail Sheet
H	S1	Aluminum magnet support pads (4x) by RF enclosure supplier.	SD1
H	S2	Aluminum patient support pads (2x) by RF enclosure supplier.	SD1
B	S3	Limited floor reinforcement / ferrous materials area, 9' - 10" x 9' - 10" (3m x 3m).	S1 SN1
B/H	S4	No false ceiling (tile or gride) in this area, 28" x 56.0" (700 mm x 1400 mm). This service area must be clear of obstructions from top of magnet to 10' - 0" above finished floor.	SD1
B/H	S5	Removable ceiling area, 23.75" x 46.0" (600 mm x 1170 mm) for servicing equipment. Grid work must be easily removed for access.	SD1
B	S6	Wall anchorage for Mains Distribution Unit. Not to penetrate RF shield.	---
B	S7	Wall anchorage for Emergency Run-Down Button mounted 71" A.F.F. Not to penetrate RF shield.	AD3
B/H	S8	Openings in suspended ceiling for ceiling speakers (exact location t.b.d., not shown)	SD1
H	S9	System Filter Box RF feedthrough (Frame to mount System Filter Box must be flush with finished wall)	SD2
H	S10	Helium Gas Exhaust Pipe RF feedthrough.	SD3
C	S11	Helium Wave Guide (HWG), installed at Helium Gas Exhaust Pipe RF Feedthrough	MP1 MP2
H	S12	System Air Cooling Waveguide, 6.25" (160mm) dia., do NOT use honeycomb-type wave guide. Must be located < 78.75" (2m) from exam room air out duct. Exact location to be determined by customer.	SD3 MP4
H	S13	Emergency Overpressure Grid RF feedthrough (exact location t.b.d., not shown).	MP4
H	S14	Air Grid RF feedthrough for conditioned air entering / exiting exam room (exact location t.b.d., not shown).	MP4
H	S15	Air Escape RF feedthrough (optional - for pressure balancing between magnet room and adjacent room (exact location and size t.b.d., not shown).	MP4
H	S16	12" (300mm) x 12"(300mm) RF panel with 3" (75mm) diameter waveguide for future accessories (exact location t.b.d., not shown).	---
B	S17	Wall anchorage for Patient Ventilation mounted 104" A.F.F.	SD4

CUSTOMER / CONTRACTOR SHALL RECOMMEND AND /OR PROVIDE EQUIPMENT ANCHORING SYSTEMS (I.E. "HILTI", "REDHEAD", ETC.) BASED UPON SPECIFIED "PULL" FORCES AND WALL / CEILING COMPOSITIONS.

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Drawing Number
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Date Drawn: 1/13/2014
Quote: None
Order: None

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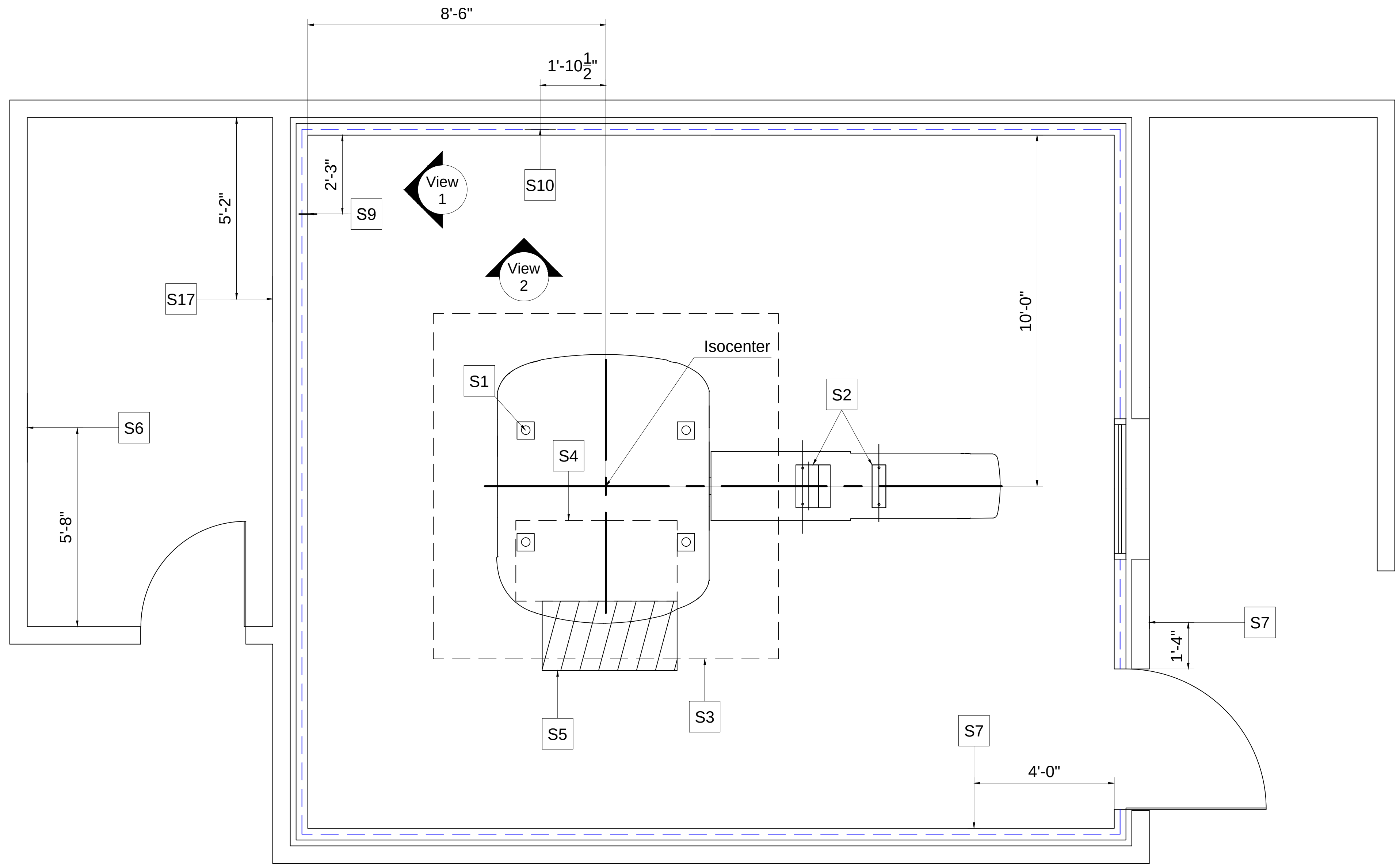

Support Layout

Ceiling Height Guide

Equipment Room:	10' - 6" (3200mm) Recommended 9' - 2" (2795mm) ***Minimum****
Exam Room Suspended Ceiling:	8' - 3 ¼" (2520mm) ***Required***
Exam Room RF Ceiling:	
Helium Waveguide Through RF Wall:	9' - 9" (2970mm) ***Minimum****
Helium Waveguide Through RF Ceiling:	10' - 0 ½" (3060mm) ***Minimum****
Control Room:	9' - 10" (3000mm) Recommended 7' - 3" (2200mm) ***Minimum***

*Ceiling Heights outside the minimum dimensions may be possible. These Ceiling Hieghts must be reviewed and approved.

0 1' 2' 4' 8'

0 .5m 1m 2m

* All floor support below the magnet including floor reinforcement and beams must be verified to meet the requirements shown on the SN1 page of the final drawing package. The "S3" box shows the critical area below the magnet.

All wall anchorages are dimensioned to centerlines.

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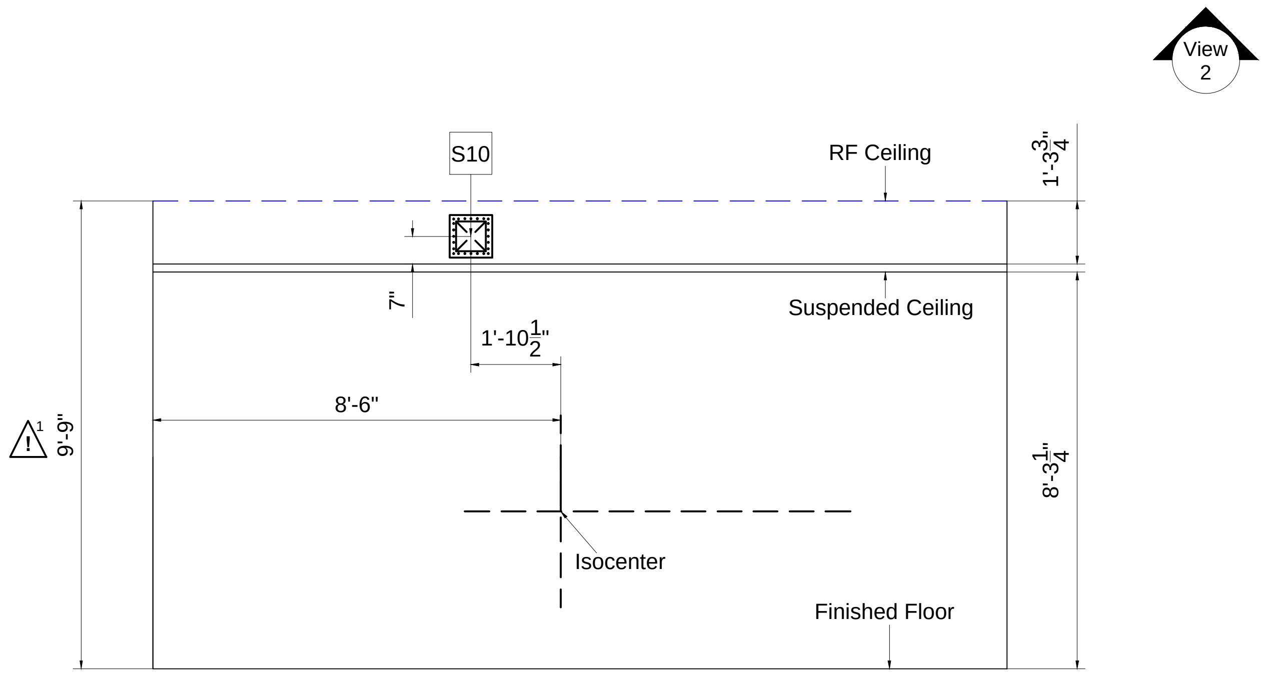
S1

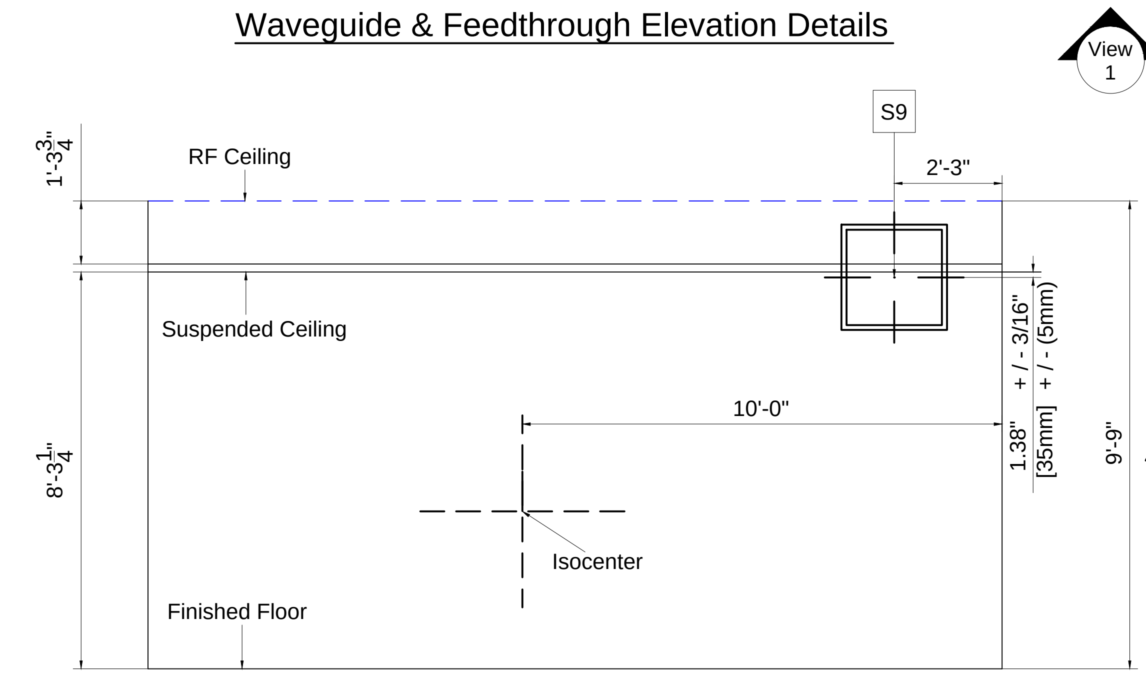
Waveguide & Feedthrough Elevation Details



Helium Gas Exhaust RF Feedthrough

Note:
Wall and location shown are preferred/recommended. If there are existing obstructions, alternate routing plans, more suitable option, please consult with your Philips Project Manager to investigate a more suitable location and have these details revised.

S10
(08.0)



System Filter Box RF Feedthrough

Note:
Wall and location shown are preferred/recommended. If there are existing obstructions, alternate routing plans, more suitable option, please consult with your Philips Project Manager to investigate a more suitable location and have these details revised.

S9
(08.0)

Gradient Exhaust Waveguide for System Air Cooling (SACU) location T.B.D. based on final location of SACU. SACU must be located less than 78.75" (2m) away from Examination Air Out Duct (see Sheet MP4).

S12
(08.0)

Genearal Notes:
RF and Suspended ceiling heights are shown using the best data available at the time. If actual or planned heights differ, please consult with your Philips Project Manager to have these details revised.

Planning Issues and Considerations

⚠1 General Ceiling Heights Shown. Plans must be revised to reflect the site specific ceiling heights and Helium Waveguide locations.

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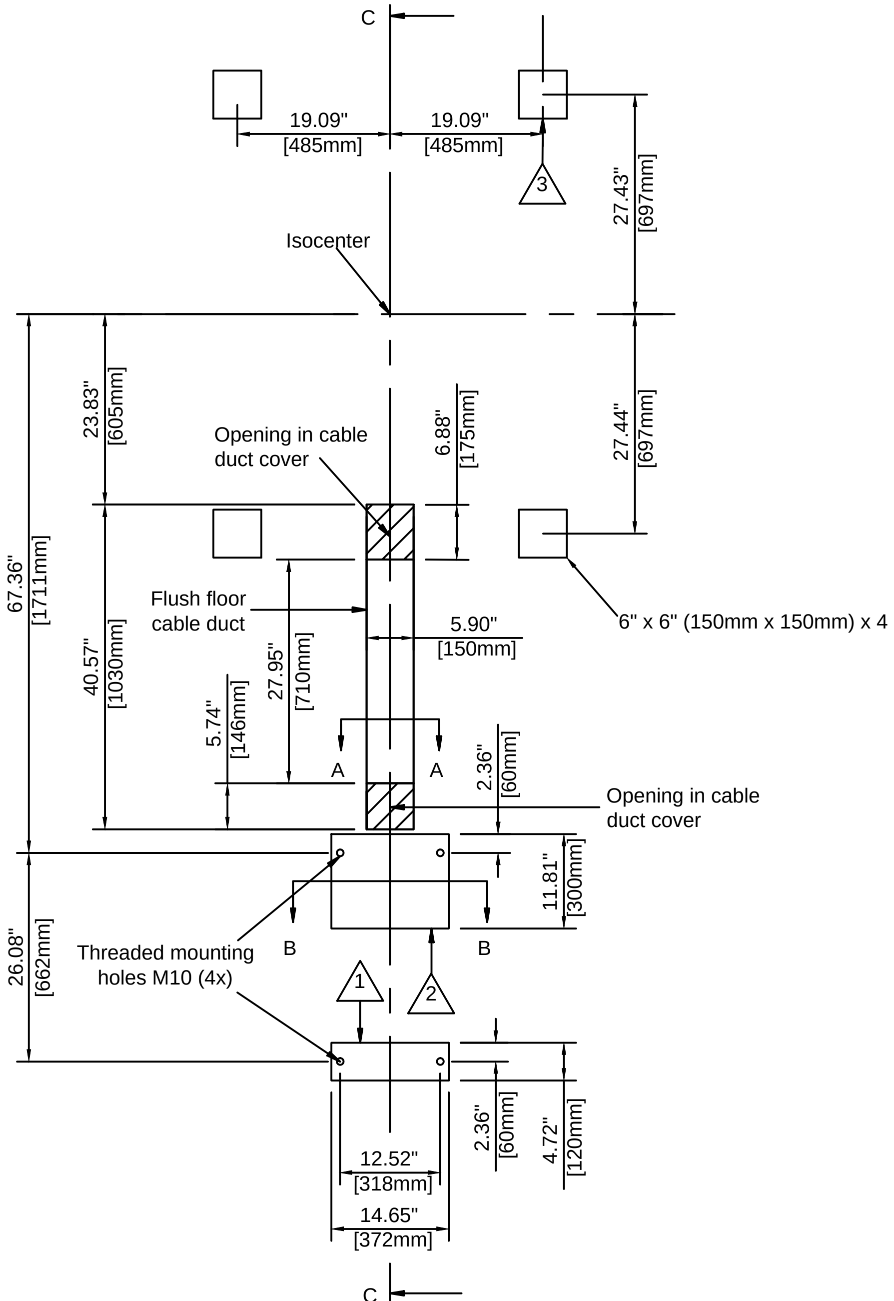
Project Details
Drawing Number
N-SRD110002
Date Drawn: 1/13/2014
Quote: None
Order: None

S2

Scale: 1/2" = 1'



Magnet and Patient Support Detail

Floor pads must have minimum thickness of:
Pad 3: 0.4" (10 mm) for stainless steel or 0.6" (15 mm) for aluminium.
Pad 1 & 2: 0.6" (15 mm) for stainless steel or aluminium.

Floorload Forces on Floor Pads:

	Pad 1 & 2	Pad 3
Horizontal:	900 lbs (4 kN)	340 lbs (1.5 kN)
Upwards:	2,250 lbs (10 kN) per bolt or 3,600 lbs (16 kN) per pad	n.a.
Downwards:	560 lbs (2.5 kN) per pad	2,810 lbs (12.5 kN) per foot 10,116 lbs (45 kN) total for 4 feet

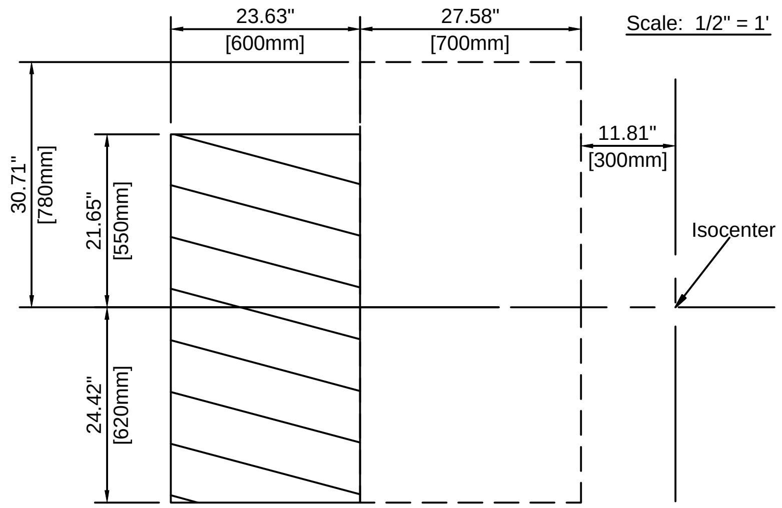
Threaded mounting holes must have at least 0.6" (15 mm) thread.
Bolts must be electrically isolated and anchored through the RF floor to a medium that can support above mentioned forces.

S1 S2 FR1

CUSTOMER / CONTRACTOR SHALL RECOMMEND AND / OR PROVIDE EQUIPMENT ANCHORING SYSTEMS (I.E. "HILTI", "REDHEAD", ETC) BASED UPON SPECIFIED "PULL" FORCES AND WALL / CEILING / FLOOR COMPOSTIONS

(07.0)

Scale: 1/2" = 1'



Removable suspended ceiling in this area.
Grid work must be easily removed for access.

Clear opening in suspended ceiling.
No tiles or grid work in this area.

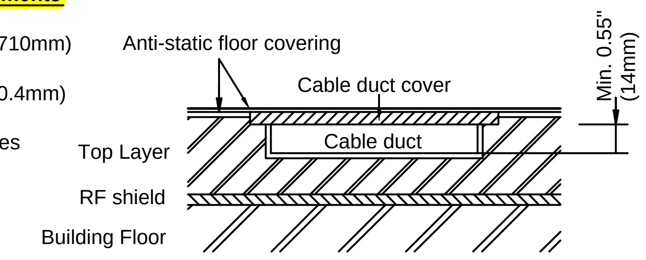
S4 S5

Suspended Ceiling Magnet Service Area

(08.0)

Cable Duct Cover Requirements

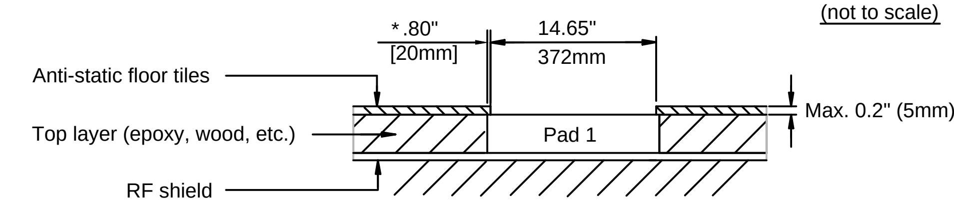
- 1 cover with length of 27.95" (710mm)
- Pressure force: 2000N
- Max. bending-through: 0.02" (0.4mm)
- Removable
- Smooth and well rounded edges
- Non-magnetic material
- Flush with finished floor



Cross Section A - A

FR1

(not to scale)

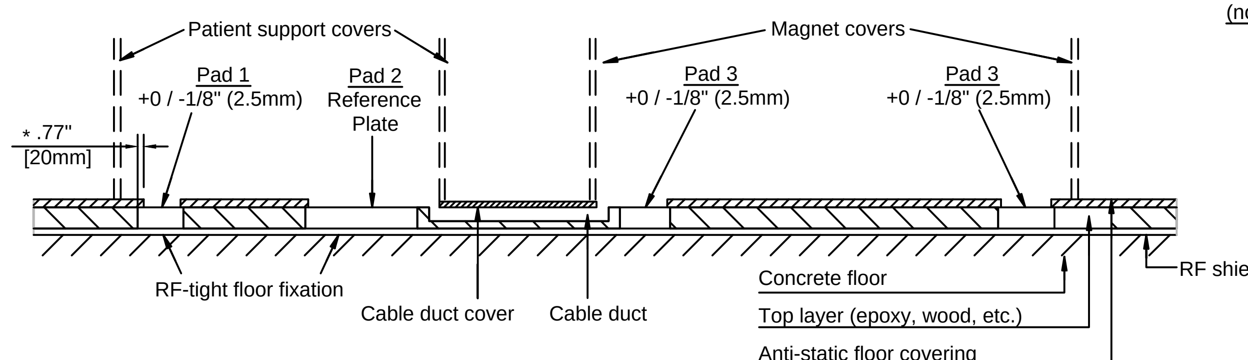


Cross Section B - B

(07.0)

(not to scale)

* The magnet and patient table mounting plates must be covered with 0.80" (20mm) overlapping final floor covering. The magnet feet must not be placed on the floor covering but directly on the floor plates.



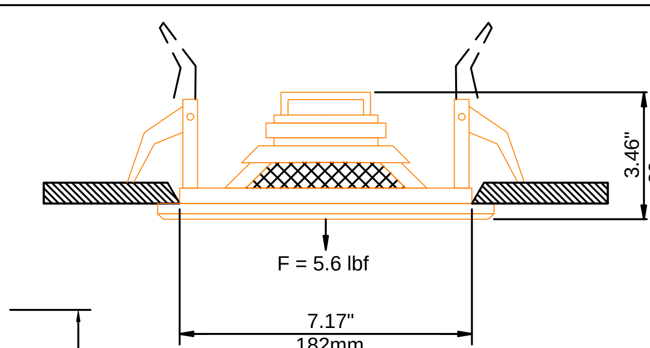
S1 S2

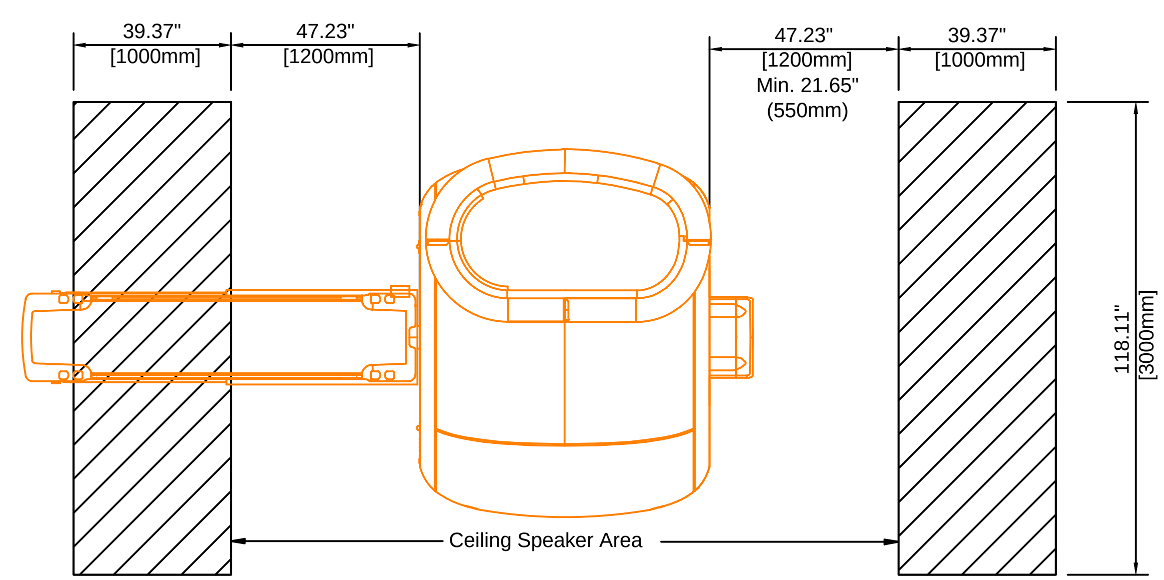
Cross Section C - C

(07.0)

Notes:

1. Two communcation speakers are supplied by Philips. Customer/contractor to flush mount one speaker on each side in the suspended ceiling.
2. Speaker wires provided by Philips.
3. Speakers must be located outside 100 Gauss line.
4. If gypsum or glass wool tiles are used we suggest reinforcing it with backing plates.





S8 CS

Ceiling Speakers in Exam Room

(08.0)

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Philips Contacts
Project Manager:
Contact Number:
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Project Details
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Date Drawn: 1/13/2014
Quote: None
Order: None

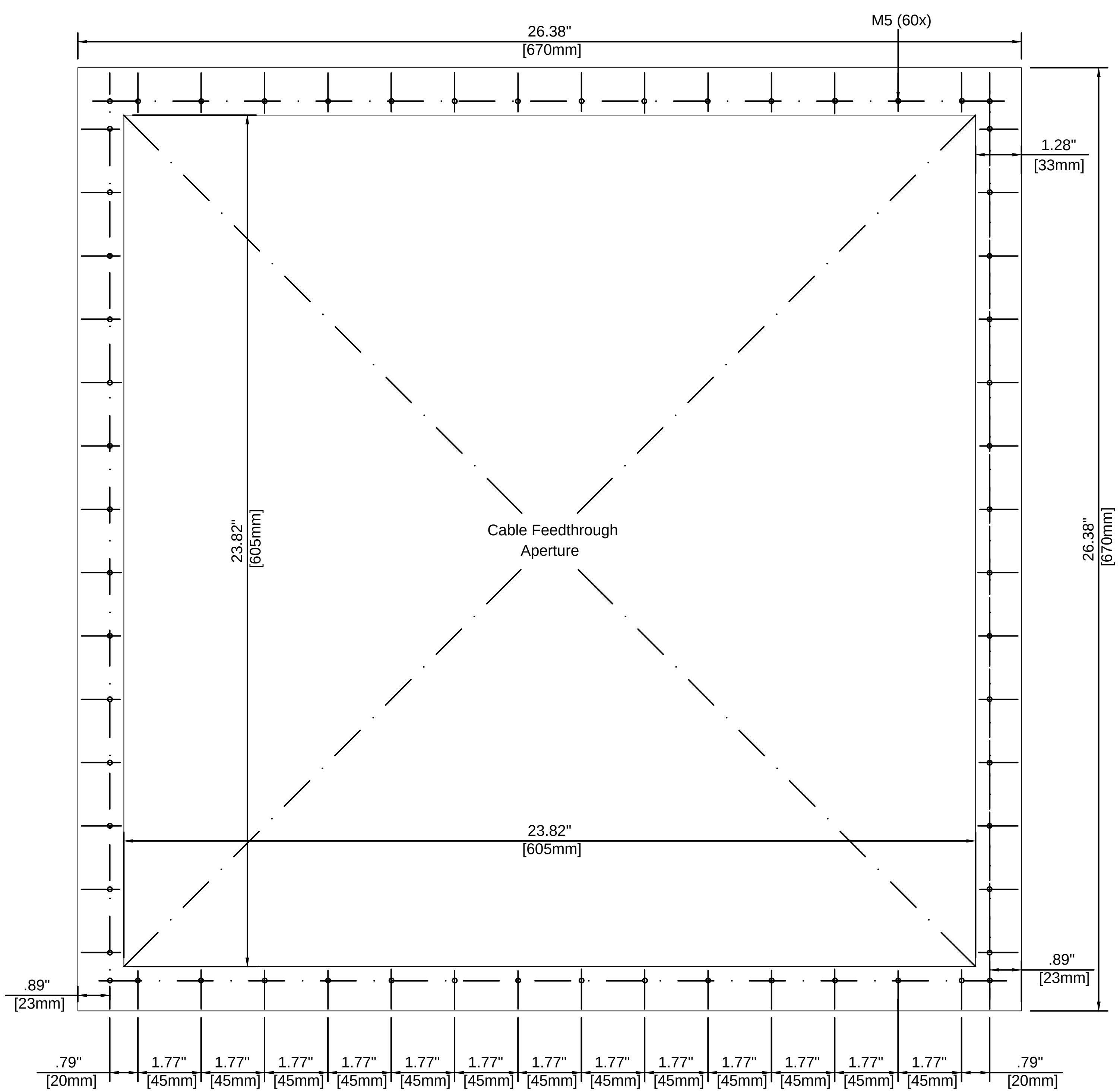
SD1

Notes:

1. 60 M5 threaded holes including 60 stainless steel screws (10 mm L) and washers (M5) to be provided by RF Enclosure supplier.
2. Mounting holes to be unblocked to ensure screws can fully penetrate frame. Leave a minimum 0.19" (5 mm) clearance around mounting holes.
3. Cable feedthrough reinforcement/height adaptation dimensions to be determined by RF Enclosure supplier
4. Mounting Frame to be flush with finished wall.
5. SFB frame can only be made of brass or copper.
   a. *Aluminum shield + intermediate layer + copper or brass RF-frame by the RF-enclosure supplier.
   b. *Galvanized shield + intermediate layer + copper or brass RF-frame by the RF-enclosure supplier.
   c. Copper shield + copper or brass RF-frame by the RF-enclosure supplier.

* For an aluminum or galvanized steel RF shielding material you need an intermediate metal to avoid galvanic corrosion between the brass/copper RF frame and the RF enclosure material. This is the responsibility of the RF-enclosure supplier.

Scale: 3" = 1'



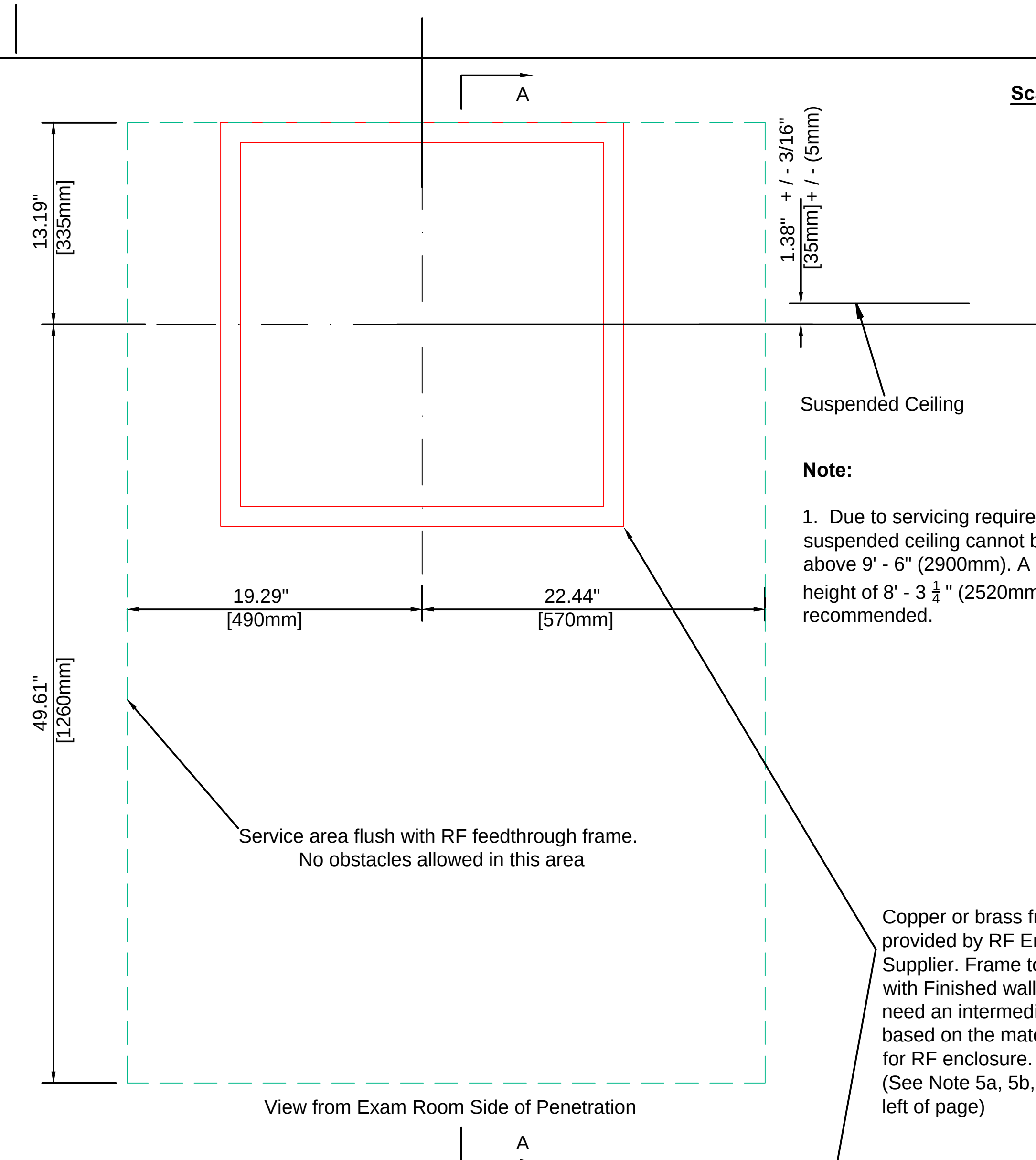
Note: Dimensions shown are to be used on all sides of panel.

Shear Force: 560 lbs (2500 N)
Tension Force: 225 lbs (1000 N)

System Filter Box RF Feedthrough

S9

Scale: 1" = 1'



Note:

1. Due to servicing requirements, suspended ceiling cannot be raised above 9' - 6" (2900mm). A ceiling height of 8' - 3 $\frac{1}{4}$" (2520mm) strongly recommended.

Copper or brass frame to be provided by RF Enclosure Supplier. Frame to be Flush with Finished wall and may need an intermediate layer based on the material used for RF enclosure. (See Note 5a, 5b, 5c on top left of page)

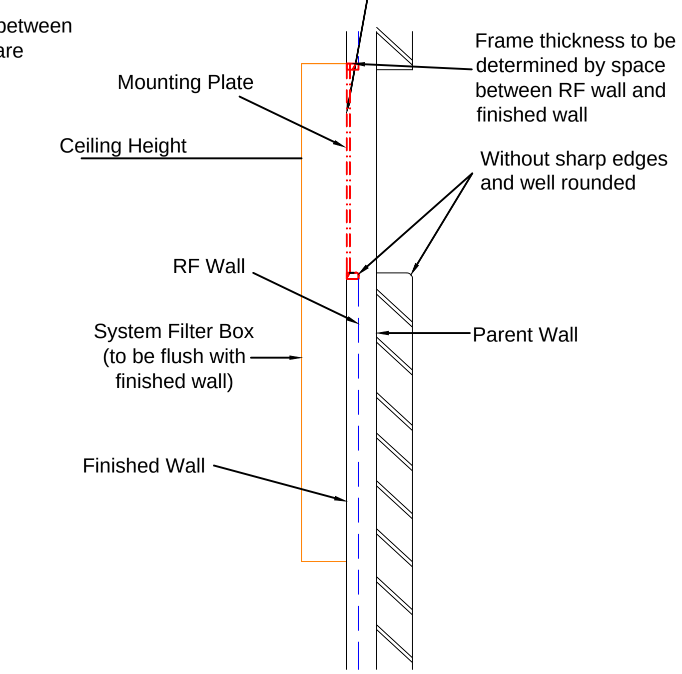
System Filter Box Service Clearance

The System Filter Box (SFB) is the MR system interface between equipment room and examination room. System cables are mounted and connected via the RF filters in the SFB.

The SFB consists of the following parts:

- Feed through for System power and signal cables
- Feed through for helium gas lines
- Feed through for gradient coil and coolant hoses
- Feed through for the patient ventilation hoses
- Feed through for for HOS filters
- System Filter Box covers

*** No Third-Party cables allowed through the SFB**



(A-A) System Filter Box Cross-Secction

(11.0)

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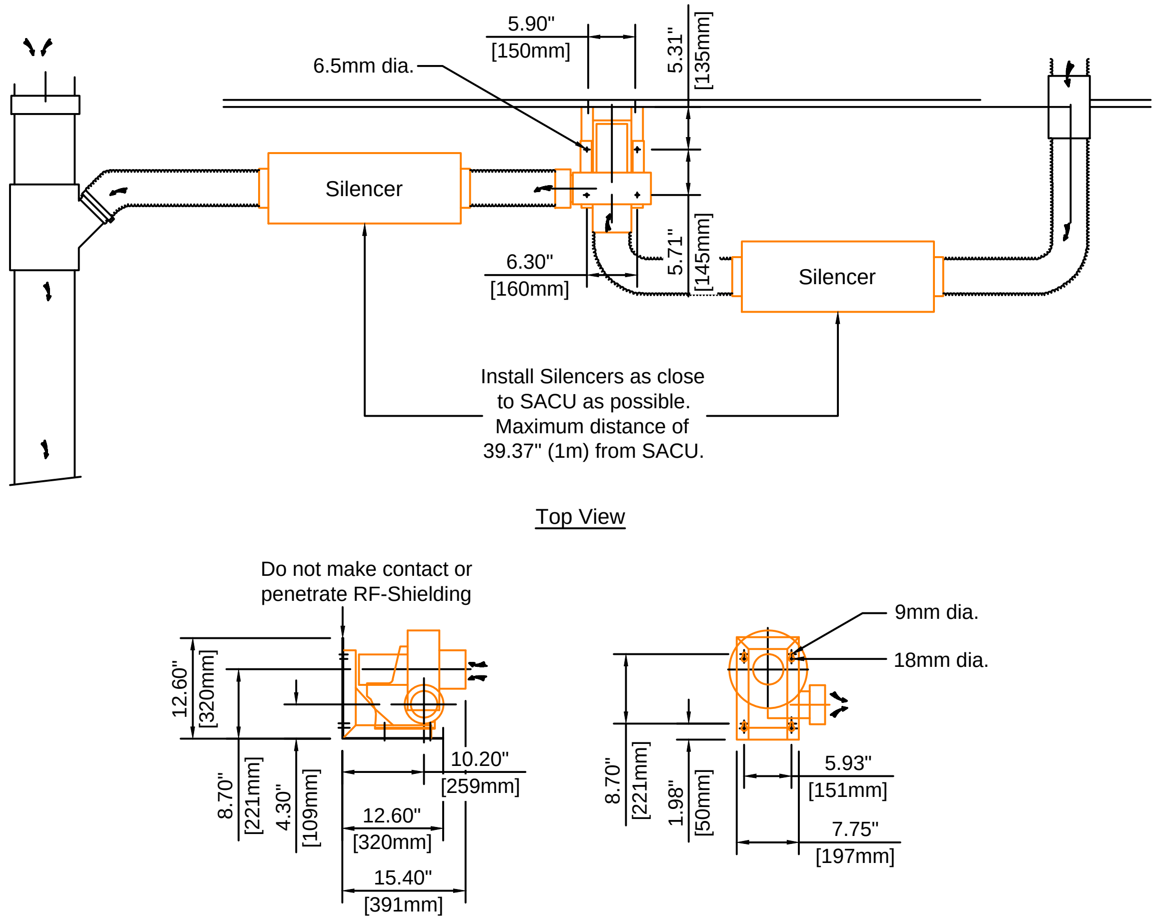
Order: None

SD2

Detail - System Air Cooling Unit Mounting with Silencer

(Not to scale)



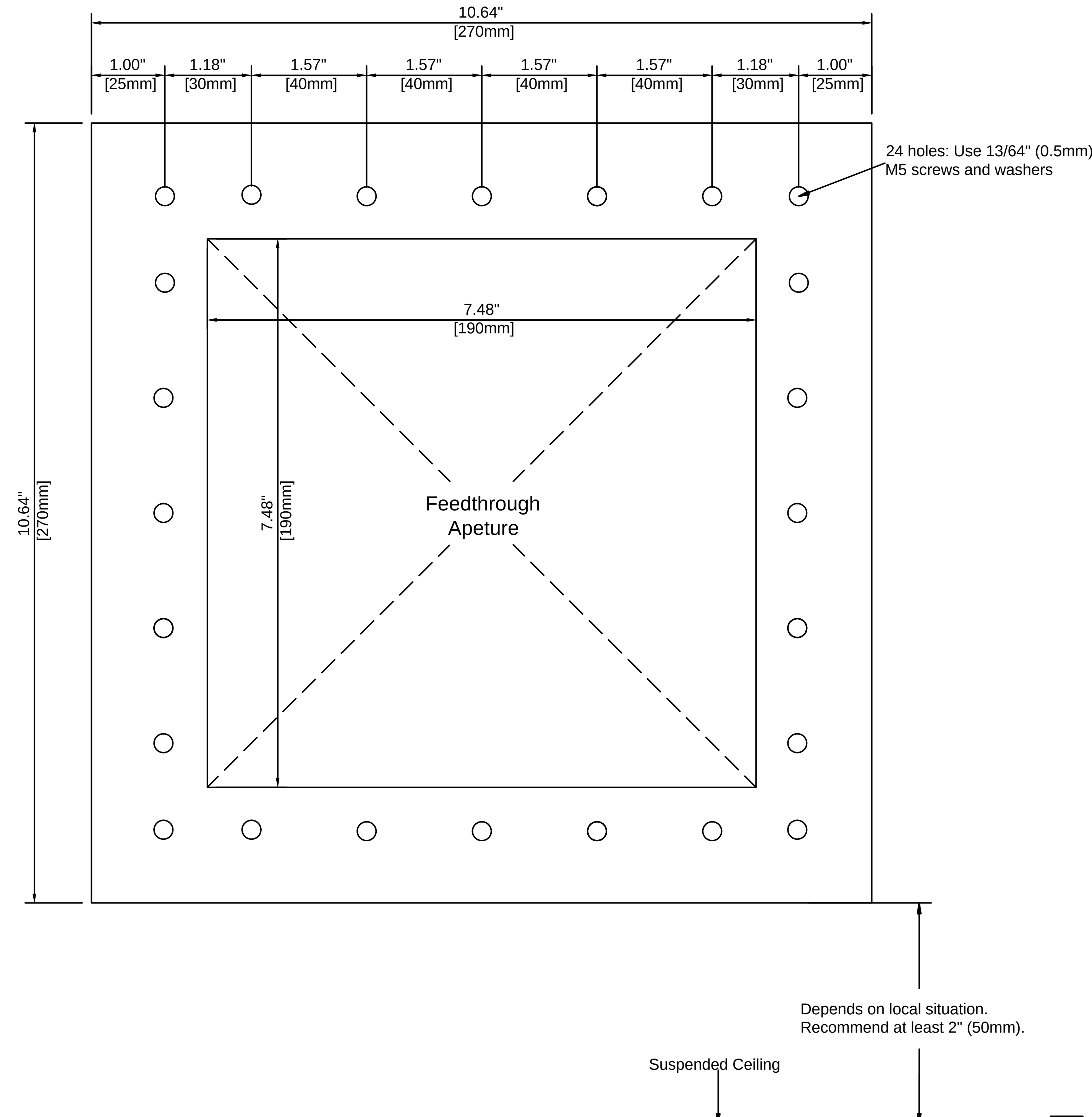
(12.2)

Notes:

1. Threaded holes shall provide reliable electrical contact with RF shield and RF tight fixation screws for interface plate.
2. 24x stainless steel screws and washers (M5) to be delivered by RF Enclosure supplier.
3. Mounting holes to be unblocked to ensure screws can fully penetrate frame. Leave a minimum 0.19" (5 mm) clearance around mounting holes.
4. Wooden mounting frame to be provided and installed by RF Enclosure supplier.

Scale 1/2" = 1'

Note: Dimensions shown are to be used on all sides of panel.



Helium Gas Exhaust Pipe RF Feedthrough

S10

(04.0)

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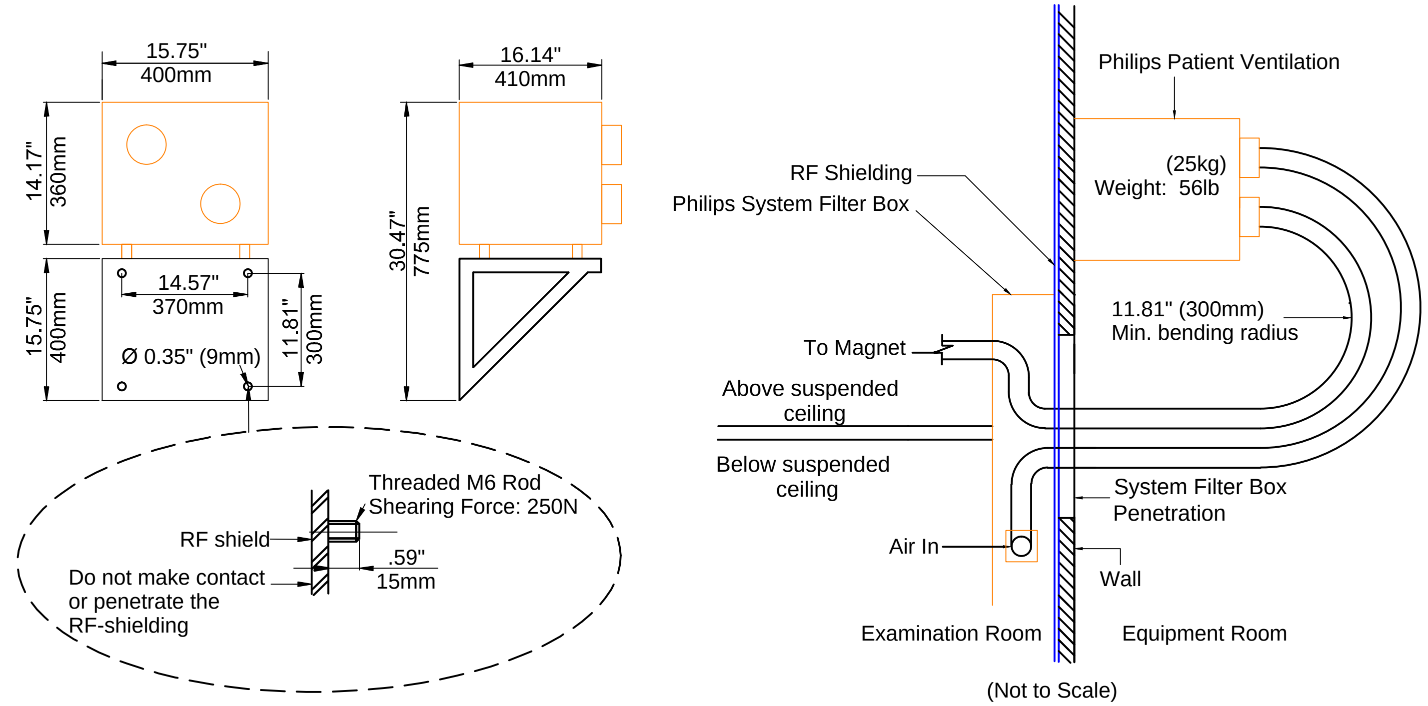
Quote: None
Order: None

SD3

11.16.12

Patient Ventilation RF Feedthrough

For the Patient Ventilation (PV), a RF feedthrough is not required.
The hoses will connect directly to Philips System Filter Box (SFB), one hose will connect to the magnet and the other hose will draw air in from the side of the System Filter Box.



Patient Ventilation Mounting Detail

S17

(11.8)

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Date Drawn: 1/13/2014
Quote: None
Order: None

SD4

General Electrical Information

1. General
The customer shall be solely responsible, at thier expense, for preparation of the site, including any required electrical alterations. The site preparation shall be in accordance with this plan and specifications, the architectural/construction drawings and in compliance with all safety and electrical codes, the customer shall be solely responsible for obtaining all electrical permits from jurisdictional authority.

2. Materials and Labor
The customer shall be solely responsible, at its expense, to provide and install all electrical ducts, boxes, conduit, cables, wires, fittings, bushings, etc., as separately specified herein.

3. Electrical Ducts and Boxes Outside the RF Enclosure
Electrical ducts and boxes shall be accessible and have removable covers. Floor ducts and boxes shall have watertight covers. Ducts shall be divided into as many as three separate channels by metal dividers, separately specified herein, to separate wiring and/or cables into groups as follows: Group a: power wiring and/or cables. Group b: signal and/or data and protective ground wiring and/or cables. Group c: x-ray high voltage cables. The use of 90° ells is not acceptable. On ceiling duct and wall duct use 45° bends at all corners. All intersecting points in duct to have cross over tunnels supplied and installed by contractor to maintain separation of cables.

4. Conduit Outside RF Enclosure
Conduit point-to-point runs shall be as direct as possible. Empty conduit runs used for cables may require pull boxes located along the run. Consult with Philips. A pull wire or cord shall be installed in each conduit run. All conduits which enter duct prior to their termination point must maintain separation from other cables via use of dividers, cross over tunnels, or flex conduit supplied and installed by contractor from entrance into duct to exit from duct. Maximum conduit lengths shown on these plans are calculated from electrical box entrance to electrical box entrance. Any conduit installed below grade must be water tight.

5. Conduits Inside RF Enclosure:
Conduits point-to-point runs shall be as direct as possible. Conduits to be made of non-ferromagnetic material and to be installed securely. If aluminum flex conduit is used, it needs to be secured so that it is not touching any other metal in the room. Common items that loose flex might rub against are ceiling grids and hangers, HVAC ducts, Ladder Tray, and cryogen gas lines. Metal-on-metal situations can cause artifacts that make patient images un-diagnostic.

6. Conductors / Earth Conductor
All conductors, separately specified, shall be 75° C stranded copper, rung out and marked. Do not use metal conduit or raceway as a ground conductor. The earth conductor for the MRI system must be dedicated and totally separate from the conduit, raceway, or structural ground. This is required to maintain the MR system "Quiet Ground" as permitted by NFPA 99. The earth conductor to be the same size as incoming phase conductor wires.

7. Disconnecting Means
A disconnecting means shall be provided as separately specified.

8. Grounding
Grounding must conform with current requirements for electrically susceptible patient areas. See Article 517, National Electrical code.

9. Lighting and Wall Sockets Inside the RF Enclosure
The use of incandescent AC lamps with reinforced filaments or quartz (halogen) lamps is recommended. The use of linear fluorescent lamps, compact fluorescent lamps (CFL), energy saving lamps, electronic light dimmers and low voltage track lighting are strictly prohibited to avoid RF interference.

- LED light fixtures are acceptable inside the RF enclosure, only if, they are non-ferrous low voltage DC LED light fixtures with their electronics (driver, power supply, power source, convertor) outside the RF enclosure. It is the LED supplier's responsibility to ensure their LED solution will not cause any interference for the magnet. If for whatever reason the LEDs negatively influence the magnet, the LED lighting supplier must be responsible for removing or correcting the issue.

The magnetic field may shorten the lifetime of the light bulb. For patient comfort, avoid direct light above the patient support and the rear of the magnet. A spotlight with a separate switch to assist the doctor during intervention procedures is recommended. Two lighting levels (separate control) are required around the magnet:

a. 200 lux for patient examination
b. 500 lux for servicing

Wall outlets should be located inside the RF enclosure for use of MRI compatible third party equipment. A duplex outlet (20 Amp) and a light with switch for servicing purposes must be provided above the suspended ceiling in the RF enclosure in the vicinity of the magnet turret. The location of the light switch must be reachable by the engineer when he/she opens the removable part of the suspended ceiling.

Power Quality Guidelines

1. Power supplied to medical imaging equipment must be separate from power feeds to air conditioning, elevators, outdoor lighting, and other frequently switched or motorized loads. Such loads can cause waveform distortion and voltage fluctuations that can affect MR image quality.

2. Equipment that utilizes the facility power system to transmit control signals (especially clock systems) may interfere with medical imaging equipment, thus requiring special filtering.

3. Static UPS systems, Series filters, Power conditioners, and Voltage regulators provide a high impedance, nonlinear voltage source, which may affect image quality. Do not install such devices at the mains supply to medical imaging equipment without consulting Philips installation or service personnel.

4. Line impedance is the combined resistance and inductance of the electrical system and includes the impedance of the power source, the facility distribution system, and all phase conductors between the source and the imaging equipment. Philips publishes recommended conductor sizes based on equipment power requirements, acceptable voltage drops, and assumptions about the facility source impedance. The minimum conductor size is based on the total line impedance and NEC requirements. Unless impedance calculations are performed by an electrical engineer, the recommended values must be used.

General Electrical Notes

1. The contractor will supply and install all breakers, shunt trips and incoming power to the breakers. The exact location of the breakers and shunt trips will be determined by the architect/contractor.

2. The contractor shall supply and install all pull boxes, raceways, conduit runs, stainless steel covers, etc. Conduit/raceways must be free from burrs and sharp edges over its entire length. A Greenlee pull string/measuring tape (part no. 435, or equivalent) shall be provided with conduit runs.

3. All pre-terminated, cut to length cables, will be supplied and installed by Philips service. All cables to the breakers, will be supplied and installed by the contractor, subject to local arrangements.

4. Electrical raceway shall be installed with removable covers. The raceway should be accessible for the entire length. In case of non-accessible floors, walls and ceilings, an adequate number of access hatches should be supplied to enable installation of cabling. Approved conduits may be substituted. All raceways must be designed in a manner that will not allow cables to fall out of the raceway when the covers are removed. In most cases, this will require above-ceiling raceway to be installed with the covers removable from the top. Any raceway system(s) illustrated in these drawings are based on length of furnished cables, and any changes in routing could exceed maximum allowable length. Conduit or raceway above ceiling must be kept as near to finished ceiling as possible.

5. Conduit sizes shall be verified by the architect, electrical engineer or contractor, in accordance with local or national electrical codes, whichever govern. Conduit sizes shown on these plans are minimum sizes. This is based on fill factor and cable connector size. Substituting smaller conduits is not permitted.

6. Convenience outlets are not illustrated. Their number and location are to be specified by the customer/architect.

7. All sections of raceway and conduit shall be grounded with an independent #6 AWG green wire that is to be attached using solderless lugs. All ceiling mounted structural support members and ceiling plates shall also be grounded. All grounding connections, terminals, etc. shall be installed in a manner to provide accessibility for inspection, maintenance, repair, etc.

RF Enclosure Electrical Notes

1. **Mains Safety Switches** - Mains safety switches may be installed inside the RF enclosure. Installation must follow all local regulations. There are no RF filters in the System Filter Box provided for this purpose.

2. **Door Open / Closed Switch** - Each door into the exam room must be provided with a switch that signals the open/closed status of the door to the system. The switch(es) must be mounted (mechanically or electrically) outside the RF enclosure and have a contact that closes when the door is closed. Switches must be wired in series with screened cable, and the wire must be rated at a minimum of 30 V DC, 100 mAmps. Use Grainger item 4B811, Telemecanique model XCKJ10541 or equivalent.

3. **Protective Earth** - The RF enclosure requires one central protective earth (PE) bus-bar/terminal. This PE point must be connected to the Hospital Earth Ground supplied near the Hospital Mains by a conductor at least #1 AWG. Refer to sheet ED1 for details.
The central PE bus-bar/terminal must be located as close as possible to the earth point inside the System Filter Box (< 39.4" [< 1000 mm]) and there cannot be any seams in the shielding between the two points. The MR system parts connect to the earth point inside the System Filter Box while all other items, (facilities heating and water supply, receptacles, etc.) must be connected to the central PE bus-bar/terminal.
The following requirements apply:
   - **a.** The impedance between any conductive part and the central PE bus-bar/terminal cannot exceed 100 mOhms.
   - **b.** All PE conductors used must be at least #8AWG. An earth leakage switch is not required.
   - **c.** For optimum shielding performance, "loops" inside the RF enclosure must be minimized.
   - **d.** A galvanic isolation layer between the RF enclosure and the building is recommended. Local regulations or the the RF vendor may require the enclosure be isolated from the building.
   - **e.** Isolated in this context means DC impedance greater than 3 kOhms.

4. **Auxiliary Electrical Filters** - Any electrical interconnection, that are not part of the MR system entering the RF enclosure requires an electrical filter. These filters may give rise to earth leakage currents in the RF enclosure, which could present a safety hazard. For complete safety, the total of all the earth leakage currents generated by all auxiliary electrical filters must not exceed 5 mAmps. If necessary, use an isolation transformer with the filters to minimize the effects of current leakage. Electrical filters are to be placed near the System Filter Box and they should be easily accessible. Beware of metal-on-metal connections that can occur near electrical filters which can cause imaging issues for the system. All 3rd party items (injectors, intercoms, humidity sensors, fire suppression flashers/buzzers, Invivo Esys, etc.) must have their own RF filters or feedthroughs. The filters and feedthrough of the PHILIPS System Filter Box cannot be used for these 3rd party items. RF Enclosure provider to verify that they have installed enough RF Filters for all the 3rd party items.

Electrical Power Distribution Requirement Notes

Electrical power distribution at the facility shall comply with:
- Utilization voltages per ANSI C84.1 - 1982 range A.
- ANSI / NFPA 70 - National Electrical Code
   - Article 250 - grounding
   - Article 517 - health care facilities
- ANSI / NFPA 99 - health care facilities
- NEMA standard XR9 - power supply guideline for x-ray machines

Phase conductors to be sized for instantaneous voltage drop per NEC 517 - 73 and Philips recommendations.

On sites without a PDU (typical case for 480V branch supply), the ground conductor for the power feeder shall be the same size as the phase copnductor wires. The separate ground wire connections from building steel to the ground busbar shall be sized per NEC at a minimum of #1 AWG.

On sites with a Universal PDU-MRPT2 (typical case for branch power other than 480V), the ground conductor for the power feeder shall be the same size as the phase conductor wires.

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Drawing Number
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Date Drawn: 1/13/2014
Quote: None
Order: None

EN

Electrical Legend

- A Furnished and installed by Philips
- B Furnished by customer/contractor and installed by customer/contractor
- C Installed by customer/contractor
- D Furnished by Philips and installed by contractor
- E Existing
- F Future
- G Optional

	Item Number	Description	Detail Sheet
B	CR1	4" (100mm) H x 24" (600mm) W non-ferro magnetic cable ladder tray mounted above suspended ceiling from "SFB" to behind magnet. "CR1" must be between 13' (4m) and 30' (9m) in length and divided into 3 compartments: 8" (200mm) W, 10" (250mm) W, and 6" (150mm) W. Cable tray must be non-ferro magnetic material, such as aluminum or glass-reinforced plastic (GRP). GRP material is recommended and wooden trays are not allowed. Must be a minimum of 2" (50mm) above the top of suspended ceiling.	
B	CR2	Upper Tray: 4" (100mm) H x 18" (460mm) W cable ladder tray mounted 4" (100mm) above "CR3", from "SFB" to above equipment cabinets. "CR2" must be at least 10' (3m) in length and divided into 2 compartments. Maximum cable weight will be 34 lbs/linear foot.	ED1
B	CR3	Lower Tray: 4" (100mm) H x 18" (460mm) W cable ladder tray mounted 7' - 6" (2285mm) a.f.f. to bottom of tray, from "SFB" to above equipment cabinets. "CR3" must be at least 10' (3m) in length.	ED1
B	R1	12" (300mm) W x 4" (100mm) H cable ladder tray mounted from "CR3" to "MDU".	ED1
B	FR1	Flush mounted floor duct. Refer to sheet SD1 for details.	SD1
B	JB	10" (250mm) W x 10" (250mm) H x 6" (150mm) D wall box with removable screw-type coverplate. Surface mounted above "CR2".	
B	OC	10" (250mm) W x 10" (250mm) H x 6" (150mm) D wall box with removable screw-type coverplate. Surface mounted 12" A..F.F. to bottom of box.	
B	CB1	480 V, 3 phase, 100 Amp circuit breaker. Run power from breaker to "MDU".	
B	CB2	Circuit breaker for Dimplex Chiller. Refer to sheet ED1 for power requirements. Run power from breaker to chiller. (Exact location t.b.d., not shown).	ED1
D	CS	Flush mounted ceiling speakers (not shown).	SD1
B	ERB	2" (50mm) W x 4" (100mm) H x 2" (50mm) D wall box with removable screw-type coverplate. Flush mounted 70" (1800mm) above finished floor to bottom of box.	
B	DS	RF door open switch - 120 V, 5 Amp switch limited to open when door is open. Mounted in upper corner on strike side of entry door. Use Grainger item 4B811, Telemecanique model XCKJ10541 or equivalent.	
D	SFB	Wall mounted System Filter Box.	
B	ISL	Incandescent Service Light (AC, 500 lux) above finished ceiling.	EN
B	LS	Electrical switch for service light (ISL) above finished ceiling.	

Electrical Legend

- A Furnished and installed by Philips
- B Furnished by customer/contractor and installed by customer/contractor
- C Installed by customer/contractor
- D Furnished by Philips and installed by contractor
- E Existing
- F Future
- G Optional

	Item Number	Description	Detail Sheet
B	WS	Wall Socket (duplex, single phase) above finished ceiling. See sheet EN for details.	EN
B	CZ	Patient comfort zone. No direct lighting in this area.	
D	REM	Chiller Remote Controller with flush mounted Gang box placed in a landscape orientation. Exact height to be determined by local Philips Service.	
B	S	120V/20A dedicated duplex outlet for service in the equipment room and control room. Additional outlets may be desired by customer or required by code. (Not shown on plan)	
G		120V/20A dedicated duplex outlet for "VFW".	
B	N1	RJ45 type ethernet 10/100/1000 Mbit network connector. Access to customer's network via their remote access server is needed for Remote Service Network (RSN) connectivity.	N1
B	N2	RJ45 type ethernet 10/100/1000 Mbit network connector with access to customer's network. Locate within 10' of network and "VFW". Network fiber optic and ethernet cabling, connectors, wall boxes, patch panels, etc. are the responsibility of the purchaser. Philips assumes no responsibility for procurement, installation, or maintenance of these components.	N1
B	e	RJ45 type ethernet 10/100/1000 Mbit network connector with internet access for Philips Field Service Engineer connectivity to on-line system documentation.	

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Date Drawn: 1/13/2014
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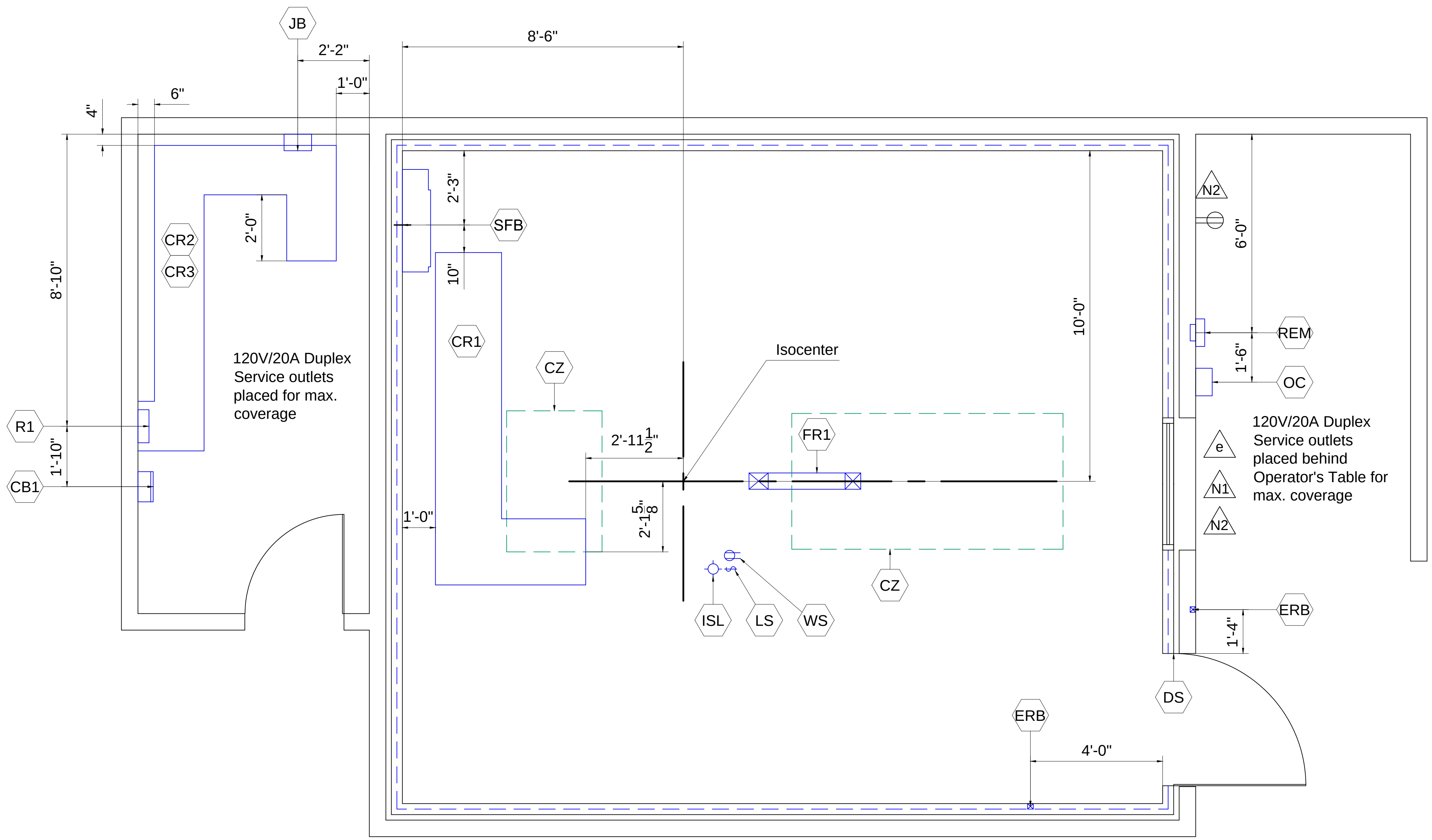
Order: None

EL

11.16.12

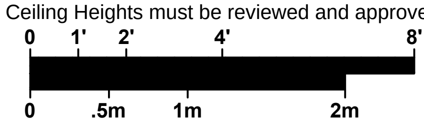


Electrical Layout

Ceiling Height Guide

Equipment Room:	10' - 6"	(3200mm) Recommended
	9' - 2"	(2795mm) ***Minimum****
Exam Room Suspended Ceiling:	8' - 3 1/4"	(2520mm) ***Required***
Exam Room RF Ceiling:		
Helium Waveguide Through RF Wall:	9' - 9"	(2970mm) ***Minimum****
Helium Waveguide Through RF Ceiling:	10' - 0 1/2"	(3060mm) ***Minimum****
Control Room:	9' - 10"	(3000mm) Recommended
	7' - 3"	(2200mm) ***Minimum***

*Ceiling Heights outside the minimum dimensions may be possible.
These Ceiling Heights must be reviewed and approved.



All risers and circuit breakers are dimensioned to centerlines.

Summary of Required Ducts and Ladder Trays

R1	12" (300mm) W x 4" (100mm) H (Ladder Tray)
CR2 CR3	18" (460mm) W x 4" (100mm) H (Ladder Tray)
CR1	24" (600mm) W x 4" (100mm) H (Ladder Tray)

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E1

Conduit Required

General Notes

1. All conduit runs must take most direct route point to point.
2. All conduit runs must have a pull string.

- A Conduit supplied/installed by contractor - Philips cables installed by Philips
- B Conduit supplied/installed by contractor - Philips cables installed by contractor
- C Conduits and cables supplied and installed by contractor
- D Conduit existing - cables supplied and installed by Philips
- E Conduit existing - cables supplied by Philips, installed by contractor
- F Conduit existing - cables supplied and installed by contractor
- G Optional equipment, verify with local Philips Service

*
- **P** Power (AC)
- **D** Power (DC)
- **G** Ground
- **S** Signal
- **H** High Tension
- **C** Cooling Hose
- **A** Air Supply Hose

	Conduit			Conduit Quantity	Cable Type (*)	Minimum Conduit Size	Maximum Conduit Length	Special Requirements
	Run No.	From	To					
C	1	Hosp Power	RF Filters	Per N.E.C.	(P)	Per N.E.C.	Per N.E.C.	
C	2	Hosp Power	CB1	Per N.E.C.	(P)	Per N.E.C.	Per N.E.C.	
C	3	MDU	CB1	1	(P)	Per N.E.C.	50'	
A	4	ERB	"SFB"	1	(P)	3/4"	80'	ERB in control room
A	5	ERB	"SFB"	1	(P)	3/4"	80'	ERB in exam room
C	6	"DACC"	DS	1	(S)	1"	75'	
A	7	OC	JB	1	(S)	3"	65'	Conduits to be routed outside RF enclosure
A	8	OC	JB	1	(P)	2"	65'	Conduits to be routed outside RF enclosure
C	9	Hosp Power	CB2	Per N.E.C.	(P)	Per N.E.C.	Per N.E.C.	
C	10	Chiller	CB2	1	(P)	Per N.E.C.	Per N.E.C.	
B	11	Chiller	REM	1	(S)	1/2"	150'	
A	12	"SACU"	"LCC"	1	(P)	1"	45'	Cable to be routed from "SACU" to "JB" to "CR3" to "LCC". Conduit not needed if "SACU" is close enough for cable to be directly routed onto "CR3". Refer to MP4 for more details.

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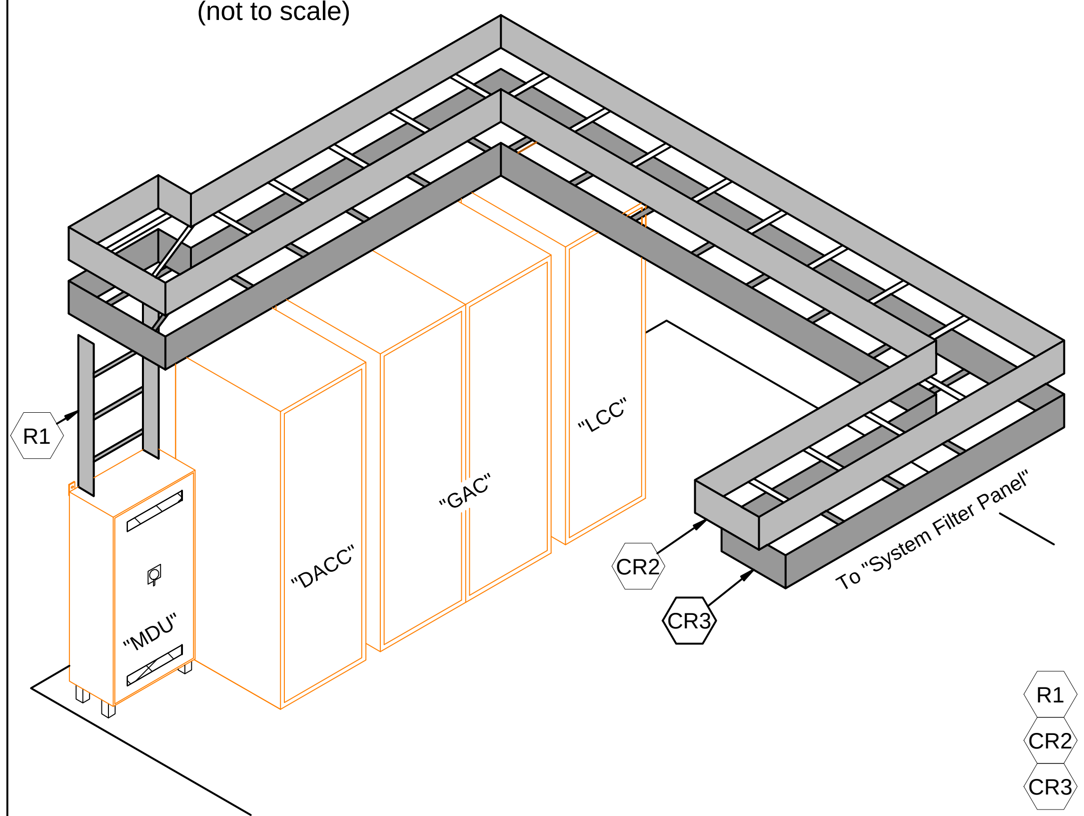
E2

Isometric Diagram for Equipment room
(not to scale)



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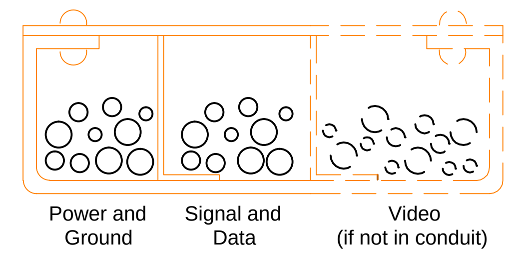
Cable Trough Divisions Outside RF Enclosure
(or as dictated by local code)

Ducts must be separated by metal barriers into three sections:

1. Power cables and ground cables can be run together.
2. Signal cables and data cables can be run together but must be separated from power cables.
3. Video cables must be run separately from all other cables.



4. It is important that all cables are placed in the appropriate trough and at no given point do any cables from one division cross with cables from another. Trough separation must be continuous from the beginning to the end of the run.
5. Trough or ducts: steel with steel dividers grounded per local code.
6. Contractor to provide cable restraints in all troughs.
7. Low cable duct is for Signal Cables
8. High cable duct is for:
   - Gradient Cables (it is not allowed to route the patient ventilation hose in the gradient cables section).
   - RF send cable
   - Helium Gas Lines
   - Hoses for gradient coild cooling liquid
   - Power Cables

CR2
CR3

(99.2)

Power Quality Requirements.

Branch/Max. Power Required	80 kVA
Supply Configuration	3 Phase + Ground
Nominal Input Voltage	480 VAC
Circuit Breaker (3ø, 60 Hz, 3 pole)	100 Amps
Mains Impedance	< 0.150 Ohms
Distortion Power Factor	0.9
Cos phi	> 0.98
Total Harmonic Distortion (THD)	< 45%
K-factor	< 10
Crest Factor	< 3
Power interruptions	< 0.5 period, every 5 periods
Neutral to ground voltage	< 3% of line to neutral voltage
% Load Voltage Regulation	5.21 %
Voltage Drop Allowed in Cable	2.40 V (0.5%)
Instantaneous Current (RMS Max.)	96 Amps
Peak Current	400 Amps < 5ms
Conductor Impedance	0.0249 Ohms

Maximum Cable Length per Wire Size
(based on 20 C copper ambient temperature)

#1 AWG	95'
#1/0 AWG	119'
#2/0 AWG	150'

#3/0 AWG	190'
#4/0 AWG	242'
250 MCM	283'
300 MCM	340'

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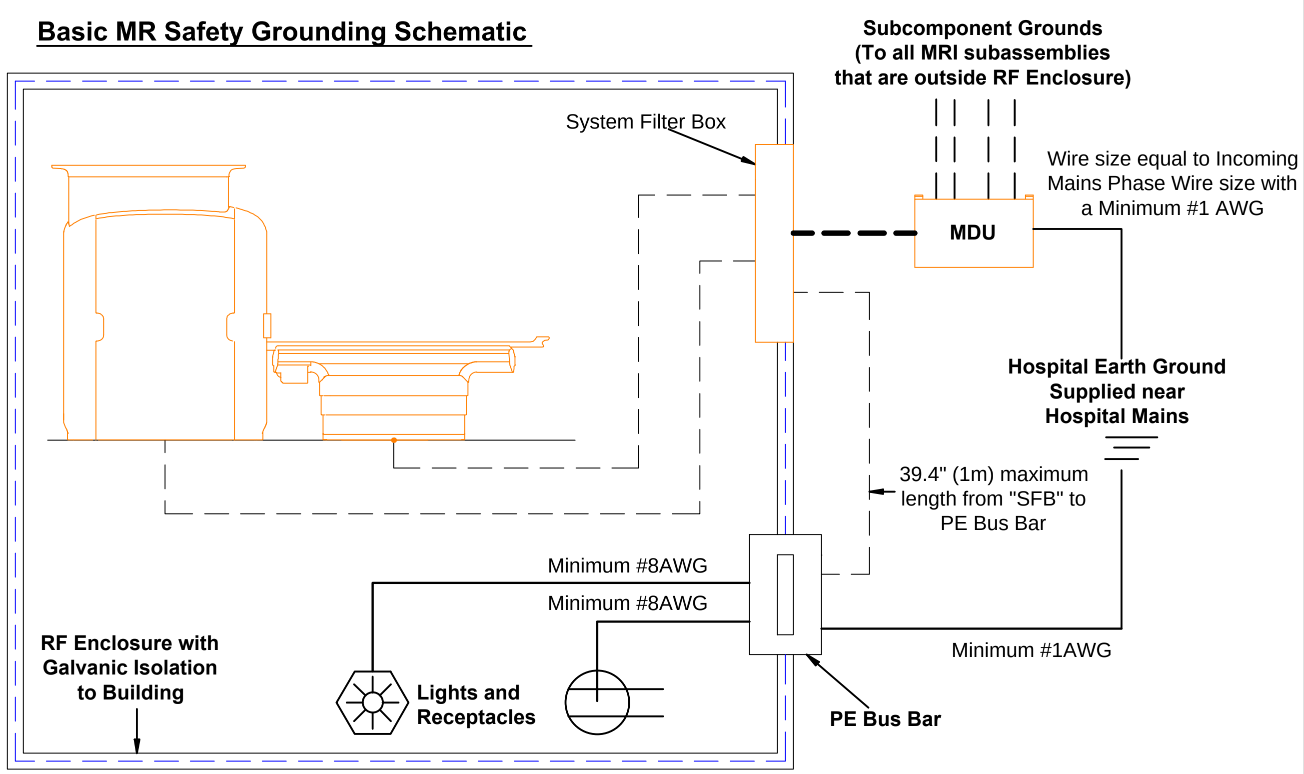
Basic MR Safety Grounding Schematic

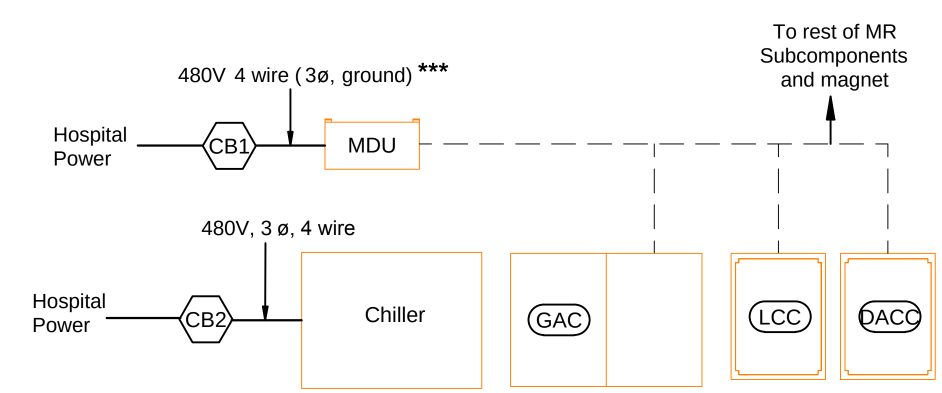


Notes:

1. For additional notes, see sheet EN (section "RF Enclosure Electrical Notes.")
2. All ground wires sized per NEC with minimums shown unless otherwise specified.

Ground wires provided and installed by customer/contractor
Ground wires provided and installed by Philips

Basic MR Power Schematic



Circuit Breaker for Chiller
480V, 60 Hz, 3ø + ground, 60 Amps
208V, 60 Hz, 3ø + ground, 115 Amps (208V Chiller must be special ordered from Dimplex)

Notes:

*** Universal PDU - MRPT2 (not shown) must be ordered if voltage other than 480 VAC is utilized.

CB1
CB2

Provided and installed by customer/contractor
Provided and installed by Philips

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Drawing Number
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Date Drawn: 1/13/2014
Quote: None
Order: None

ED1

11.16.12

Helium Gas Exhaust Pipe Inside RF Enclosure

1. Helium Gas Exhaust Pipe and RF Waveguide Notes

a. An exhaust pipe is required to evacuate rapidly evaporating helium gas to a safe location outside the building. This system must be capable of exhausting a large volume of helium gas that is between -438° F (12° Kelvin) and the ambient temperature. The pipe inside the RF enclosure is provided and installed by Philips. The helium exhaust pipe outside the RF enclosure must be provided and installed by customer/contractor. The helium exhaust RF feedthrough is provided by Philips and installed by the customer/contractor.

b. The Philips provided exhaust pipe and/or wave guide CANNOT be modified (i.e. cut, etc.) or replaced under any circumstances except drilling of 2mm water drainage holes on the low point of rigid pipes (drilling of 2mm holes on flexible pipes are not allowed).

c. The entire helium exhaust pipe inside the RF enclosure must be thermally insulated with 3" (75 mm) of 2.0 lbs/ft³ (32 kg/m³) expanded polystyrene equivalent to R11 or better (e.g. Armaflex) and externally sealed by a vapor barrier. The insulation thickness can be reduced if higher R-value insulation is used. Failing to insulate the pipe will cause liquid air to drip during a helium fill or magnet quench, causing a risk of severe cold burns to any persons inside the exam room and damage to surrounding materials. **Insulation for the entire pipe must be provided and installed by customer/contractor.**

2. Helium Gas Exhaust Pipe Routing

The following points must be considered when determining the route of the helium exhaust pipe inside the RF enclosure (HEP) and location of the helium wave guide (HWG).

a. Maximum distance between helium gas exhaust interface on magnet and helium wave guide is 18' (5.5 m). This is the absolute maximum length and cannot be extended under any circumstances.

b. The minimum allowed bending radius of the helium exhaust pipe is 1.5 times its diameter (6" [150 mm] inside the RF enclosure).

c. It is strongly recommended that the HWG be located on one of the RF walls, not the RF ceiling. However, if due to site constraints or routing path, the HWG has to be located on the RF ceiling, then the RF enclosure height must be at least 9' - 10 ½" (3010 mm), and the HWG must be installed backwards (short portion inside the RF enclosure, long portion outside the RF enclosure). The customer/contractor must verify that the space provided outside the RF enclosure will accommodate the length of the HWG.

d. **Exhaust Pipe Exclusion Zone**

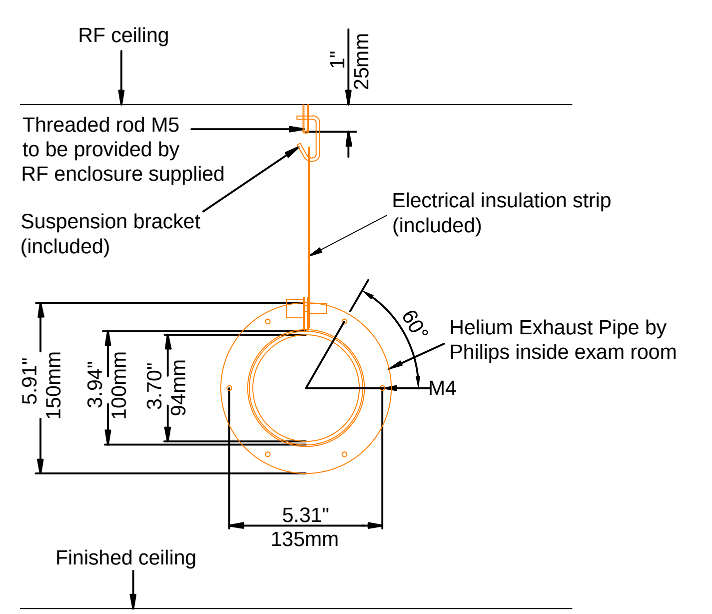
- Routing the HEP above the patient support and table top extender can lead to severe cold burns if liquefied air drips from the pipe.
- If the Helium Wave Guide (HWG) is located in the RF Enclosure ceiling, then it must be least 31.5" (800 mm) away from the exhaust pipe interface when using only the long flex pipe.
- Helium Exhaust Pipe (HEP) must be routed in between one of the two provided angles.
- 9' - 10 ½" (3010 mm) is the absolute minimum RF enclosure ceiling height when HWG is located in the RF ceiling and the short part of HWG is installed inside the RF enclosure. 10' - 11 ⅛" (3330 mm) is the absolute minimum when long part of HWG is installed inside the RF enclosure.

	Item	Length
1x	RF Feedthrough / Helium Wave Guide	15.75" (400 mm) + 3.94" (100mm) outside RF-enclosure
1x	Short flexible pipe	16.5" (420 mm) +/- 4" (100mm)
1x	Long flexible pipe	59.1" (1500 mm)
2x	Short rigid pipe	9.8" (250 mm)
1x	Short rigid pipe	19.7" (500 mm)
3x	Long rigid pipe	39.4" (1000 mm)
1x	90 degree rigid elbow	--

The internal pipe diameter is 4" (100mm)
Note: At least one flexible pipe needs to be installed to decoulple the magnet and the RF-enclosure from vibration. It is not allowed to connect the two flexible pipes to each other.

(12.0)

Helium Gas Exhaust Pipe (Inside RF Enclosure) Cross Section View



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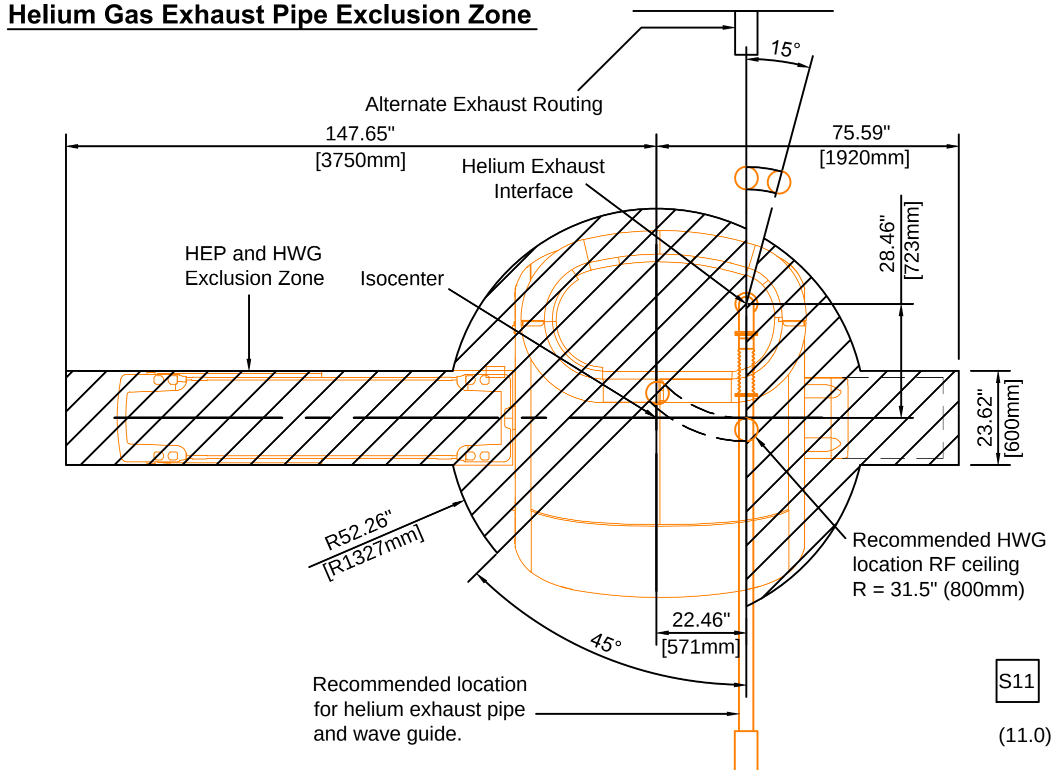
Helium Gas Exhaust Pipe Exclusion Zone



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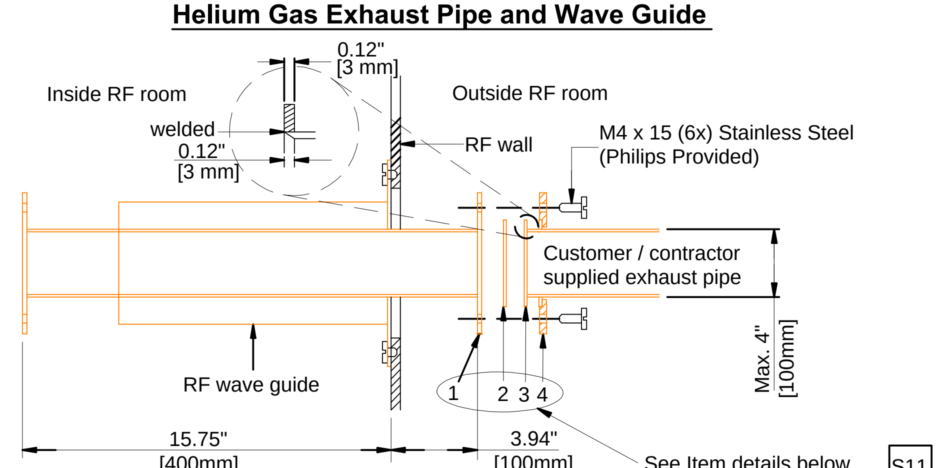
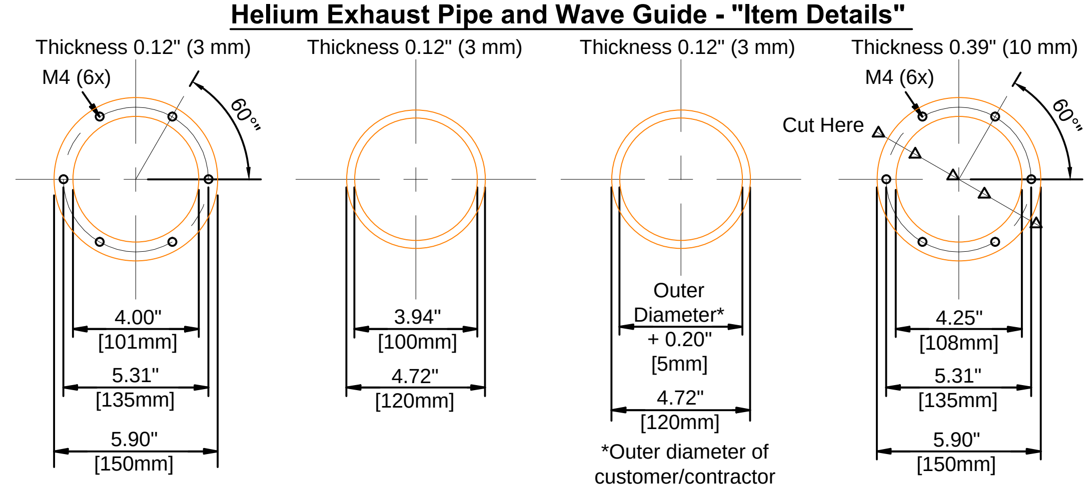
Helium Gas Exhaust Pipe and Wave Guide



Note 1: The pipe must expand from the 4" Diameter to at least 6" Diameter directly after the Helium Exhaust Pipe waveguide (see "Helium Exhaust Diffuser" detail for minimum diffuser dimensions).

Helium Exhaust Pipe and Wave Guide - "Item Details"

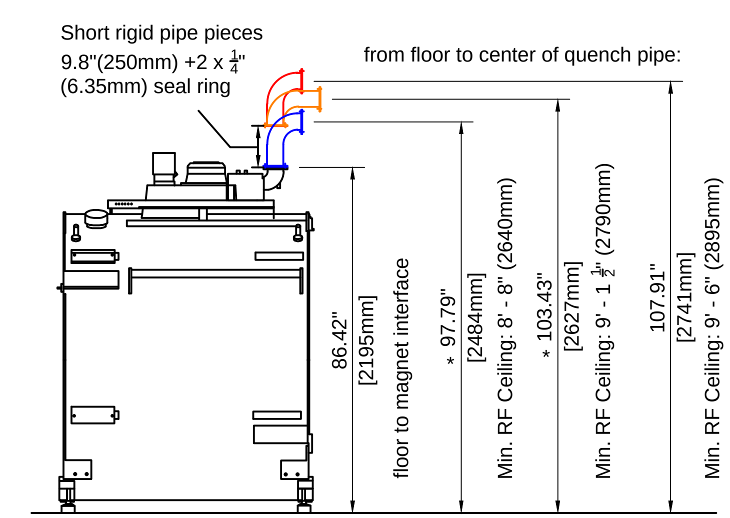


*Outer diameter of customer/contractor supplied exhaust pipe

Item 1:	Item 2:	Item 3:	Item 4:
Flange	**Insulation Ring**	**Flange**	**Insulation Ring**
(part of delivery)	**(part of delivery)**	**(NOT part of delivery)**	**(part of delivery)**

(13.0)

Possible Helium Gas Exhaust Pipe Locations and Resulting RF Ceiling Height and Suspended Ceiling



* The suspended ceiling must be lowered to allow sufficient space for routing the helium vent pipe in the void above the suspended ceiling. The top covers of the magnet can be cut to adjust to the new suspended ceiling height.

Project
Ingenia 1.5T Omega HP
Standard Reference Drawing
Not Site Specific
-

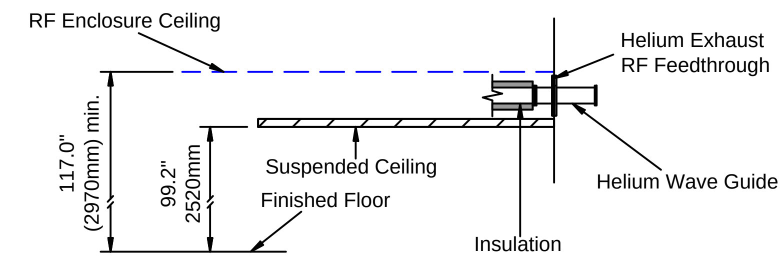
Philips Contacts
Project Manager:
Contact Number:
Email:
Drawn By:

Project Details
Drawing Number
N-SRD110002
Date Drawn: 1/13/2014
Quote: None
Order: None

MP1

11.16.12

HWG Exiting through an RF Wall

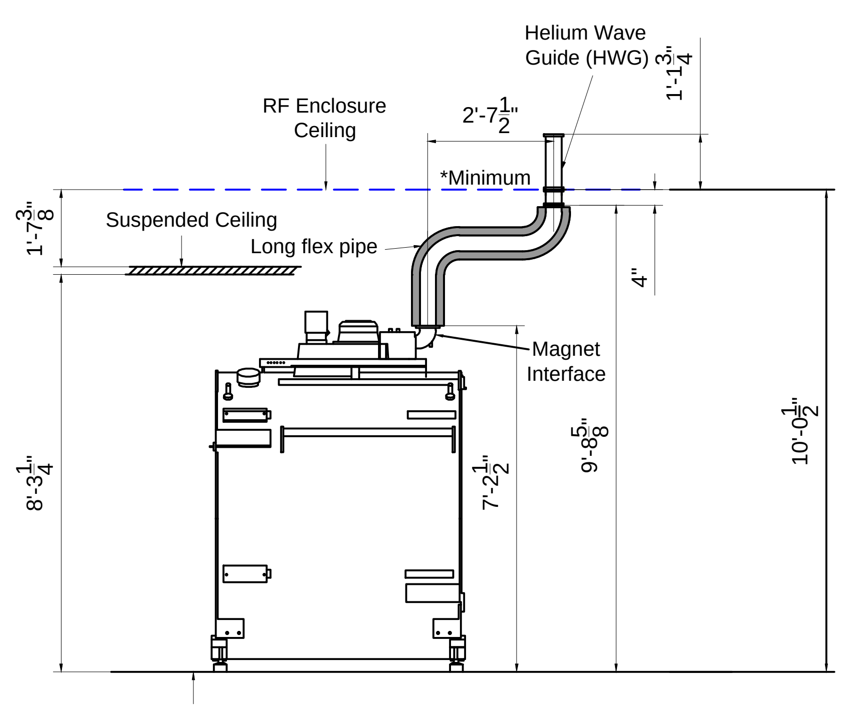


Minimum RF Ceiling Height for HWG exiting an RF Wall

(08.0)

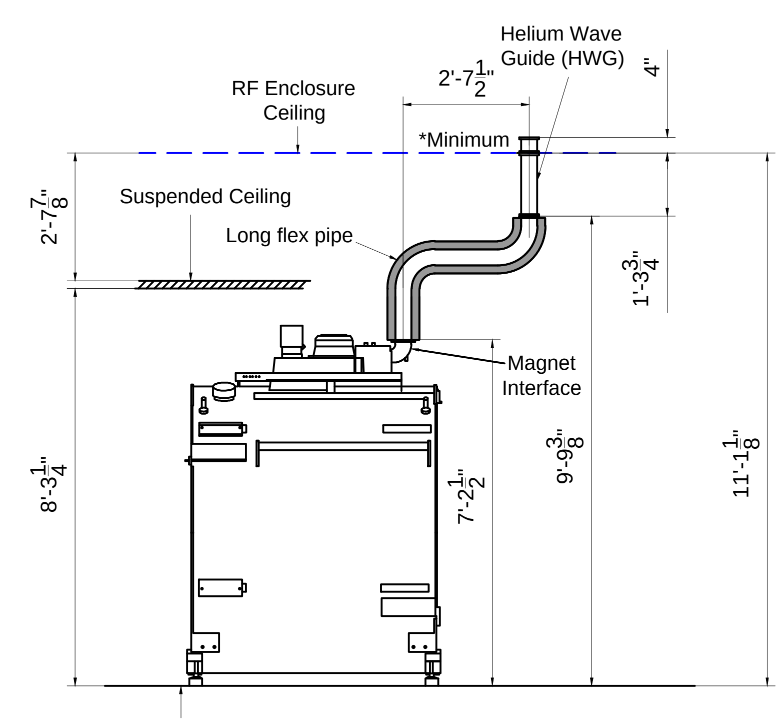
HWG Exiting through the RF Ceiling

* Minimum using the Long Flex Pipe



Short part of HWG installed inside RF Enclosure

* Minimum using the Long Flex Pipe



Long part of HWG installed inside RF Enclosure

(11.7)

THIS SHEET IS PART OF THE DOCUMENT SET LISTED ON SHEET C1 AND SHOULD NOT BE SEPARATED.

PHILIPS

Project
Ingenia 1.5T Omega HP
Standard Reference Drawing
Not Site Specific
-

Philips Contacts
Project Manager:
Contact Number:
Email:
Drawn By:

Project Details
Drawing Number
N-SRD110002
Date Drawn: 1/13/2014
Quote: None
Order: None

MP2

Helium Gas Exhaust Pipe Outside RF Enclosure

1. Material Requirement

- **a.** ☐ All materials including couplings, insulation, etc. must withstand the minimum temperature of helium gas in the pipe during a quench. The minimum temperature is -438° F (12° K). Due to temperature variation / thermal contraction; compensation pieces must be considered.
- **b.** ☐ The material of the pipe must be aluminum with a minimum wall thickness of 0.12" (3 mm) (8 ga), or stainless steel with a minimum wall thickness of 0.02" (0.5 mm)(25 ga).
- **c.** ☐ The helium exhaust pipe must be designed to handle a maximum of 4 bar pressure (58 PSI) during a quench.
- **d.** ☐ All pipe joints to be welded gas and water tight.
- **e.** ☐ Outside the RF enclosure, if a person cannot touch the pipe, be dripped on by liquid air, and no materials around the pipe can be damaged by liquid air, insulation is not required. Any insulation used to protect people must consist of 3" (75 mm) of 2.0 lbs/ft³ (32 kg/m³) expanded polystyrene or fiberglass insulation equivalent to R11 or better (e.g. Armaflex) and externally sealed by a vapor barrier. Do not use vapor barrier material that can cause spikes. The insulation thickness can be reduced if higher R-value insulation is used. **Insulation provided and installed by customer/contractor.**
- **f.** ☐ At every location of the vent pipe where water can accumulate, a 2 mm drainage hole must be installed and not covered by insulation. Water can turn into ice during ramping or refilling and can block the helium vent pipe. A label must be placed close to the burst disk (located on the top of the magnet interface) and must provide information about the amount and location of all water drains installed. All drains must be checked prior to any cryogenic action.
- **g.** ☐ Suspension of the helium vent pipe must handle the weight and Helium for reaction forces resulting from a quench. This is especially valid for corner pieces / elbows. Forces anticipated : 224.8 lbs (1000N).
- **h.** ☐ Suspension of the helium vent pipe must handle the possible thermal contraction of the helium vent pipe length when the vent temperature decreases from ambient to -450°F (4.5 K).
- **i.** ☐ Evaporating helium gas warms up and expands; therefore the diameter of the helium vent pipe length must increase (if applicable) away from the magnet. Expansions to larger diameter vent pipes be accomplished with a diffuser.

2. Helium Exhaust Pipe Run and Size Requirements

- **a.** ☐ The maximum allowed pressure drop over the entire exhaust pipe outside the RF enclosure is 0.725 PSI (50 mBar). See Helium Gas Exhaust Pressure Drop Table for details.
- **b.** ☐ The helium exhaust pipe diameter must never decrease as it gets further away from the magnet.
- **c.** ☐ All bend radii must be a minimum of 1.5 times the diameter of the pipe.
- **d.** ☐ Cannot modify Philips provided helium waveguide inside and outside the RF enclosure.

Helium Gas Exhaust Pipe Outside RF Enclosure - Con't.

3. Helium Exhaust Pipe Exit Location Requirements

- **a.** ☐ For exhaust outlets pointing down, there must be no access under the pipe, extending in a 9' - 10" (3 m) radius in the horizontal plane of the gas exhaust outlet.
- **b.** ☐ For horizontal discharge, human body parts must be minimally 19' - 8" (6 m) away in the direction of the gaseous jet, or 9' - 10" (3m) below the gaseous jet of the exhaust outlet.
- **c.** ☐ Between the outlet and any restricting area (e.g. the roof or a wall) there must be at least 3' - 3" (1 m) clear space.
- **d.** ☐ Areas within 9' - 10" (3m) of the exhaust outlet should be protected against frost damage. Brick and Concrete can crack due to the extreme cold temperatures of helium exhaust.
- **e.** ☐ The outlet must be positioned such that no rain, snow, small animals (birds, mice), or debris (paper, leaves) can enter or block the exhaust outlet. In order to guarantee that wind driven rain cannot enter the pipe, the length of the pipe extending downwards must be minimally 2 times the pipe diameter.
- **f.** ☐ No air inlets are allowed within 9' - 10" (3m) of the gas exhaust outlet.
- **g.** ☐ A screen is required on the exit. The net outlet area must be twice the preceding pipe cross-sectional area. The screen or mesh must be between 0.5" x 0.5" - 0.6" x 0.6" (13mm x 13mm - 15 mm x 15 mm). A smaller mesh is not allowed as this will increase the pressure drop too much and the mazecan freeze up during a refill or magnet quench. Thickness of wire must be 1mm +/- 0.3mm, if the wire thickness is too thin, it can break. If the wire thickness is too thick, the effectiveness of the opening is reduced and will increase pressure drop.
- **h.** ☐ The exit should be checked once a year for build-up, blockages, etc.

(12.0)

Helium Exhaust Pipe Verification

For patient and equipment safety, customer's architect or contractor to provide plan and elevation view details of helium exhaust pipe design for verification that all life-safety requirements are being met, prior to installation. Please consult with your Philips Project Manager to begin the verification process as soon as possible. Coordinating a safe design prior to fabrication will help to avoid rework costs and installation delays.

Details must include:

- Entire pipe run from RF Enclosure to discharge opening
- All pipe lengths
- All pipe diameters
- All bending angles
- All centerline bend radii

Helium Exhaust vertical Discharge Option

8' - 6' area of 12" x 12" x 1" thick concrete tiles under the helium exit on top of the roof and positioned on insulation. Recommend using Armflex or fiberglass insulation equivalent to R11 or better. Tiles must be glued together and to insulation. Glue used must be able to withstand -438F
or
8' x 6' plate with 1" upward folded edges under the helium exhaust opening on top of the roof and positioned on insulation. Recommend using Armaflex or fiberglass insulation equivalent to R11 or better. (08.0)

Helium Exhaust Pressure Drop Table

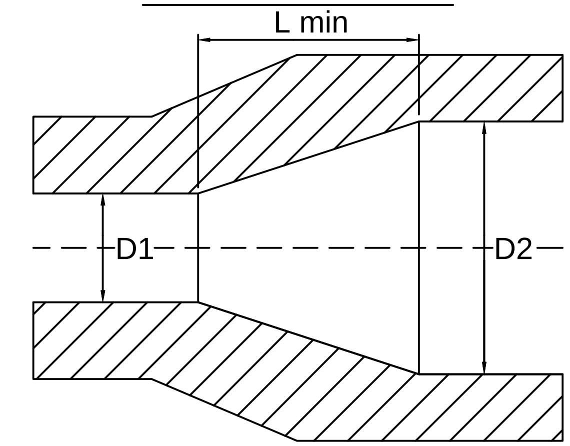
Pipe Building Blocks	D = 6" (150 mm)	D = 8" (195 mm)	D = 10" (260 mm)	D = 15" (390 mm)
Total # of bends (5 - 90 degrees)	(Inch)	(Inch)	(Inch)	(Inch)
1	196	905	3897	29291
2	157	866	3779	29015
3	157	787	3543	28228
4	157	748	3503	27952
5	78	669	3228	26771
6	78	669	3070	26456
7	39	551	2834	26062
8	39	511	2637	25157
9	78	472	2480	23503

How to use the Chart:
- You have a site and the total length is 393" and you have 6 bends: resulting diameter of the pipe is 8".
- You have a site and the total length of the helium pipe is 1181" and you have 4 bends: resulting diameter of the pipe is 10".

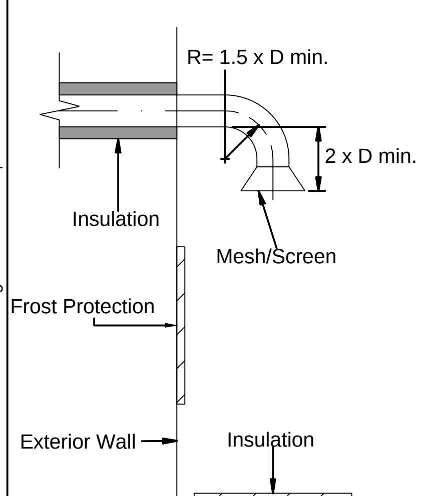
Note 1: The pipe must expand from the 4"Diameter to at least 6" Diameter directly after the Helium Exhaust Pipe waveguide (see "Helium Exhaust Diffuser" detail for minimum diffuser dimensions).
Note 2: The whole pipe run outside the RF Room must remain at one diameter size (i.e. 6", 8", 10", or 15") after expanding from the 4" Diameter Helium Exhaust Pipe waveguide until the final pipe expansion at the very end of the pipe run.

(13.0)

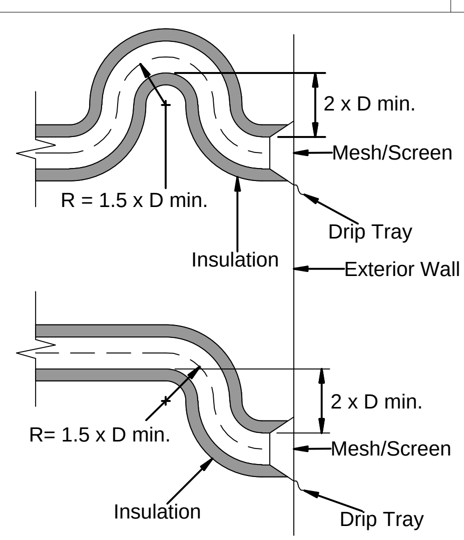
Helium Exhaust Diffuser



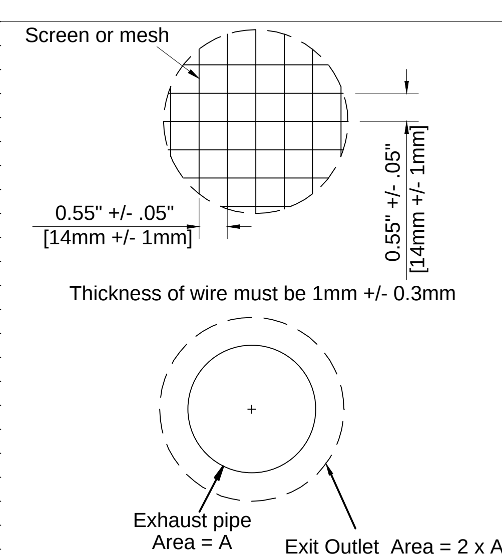
Minimum length of the diffuser: 2.5 x (D2 - D1) (11.0)



Vertical Discharge Option (shown exiting exterior wall)

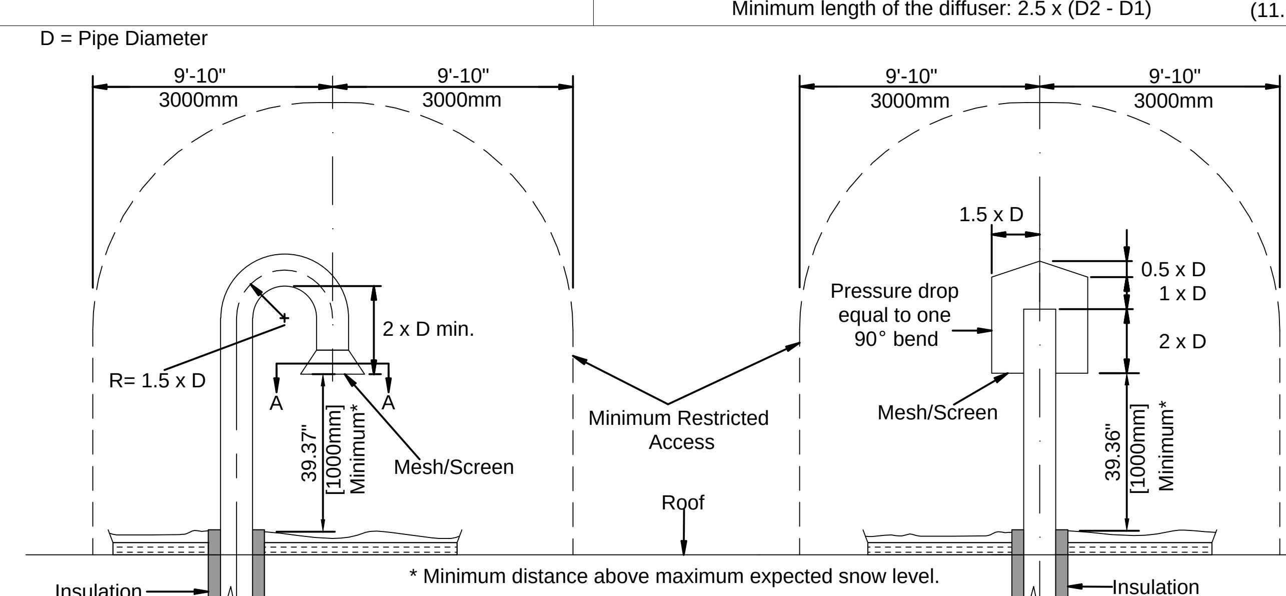


Horizontal Discharge Options (exiting an exterior wall)



Mesh/Screen Cross Section A-A

(08.0)



Vertical Discharge Options (shown exiting roof)

PHILIPS

Project
Ingenia 1.5T Omega HP
Standard Reference Drawing
Not Site Specific
-

Philips Contacts
Project Manager:
Contact Number:
Email:
Drawn By:

Project Details
Drawing Number
N-SRD110002
Date Drawn: 1/13/2014
Quote: None
Order: None

MP3

11.16.12

Air Conditioning Requirements.

1. Equipment Room Specifications

Ambient Requirements *	
Temperature	59° to 75° F (15° to 24° C)
Maximum Temperature Change	9° F per 10 min (5° C per 10 min.)
Relative Humidity	30% to 70%, no condensation
Total Heat Dissipation to Air	
Dissipation Standby	6,800 Btu/hr (2 kW)
Peak Dissipation Scanning	**27,300 Btu/hr (8 kW)**

* Requirements given are specified at the cabinet air intake.

a. The MR system heat dissipation is dependant on the type and duration of the acquisition. Therefore, actual heat dissipation will vary greatly. Equipment room air conditioning provided at average heat dissipation will result in dangerously high temperatures during peak loads, causing permanent damage and voiding system warranty. As such, air conditioning must be designed to handle peak loads.
b. Heat dissipation of an optional chiller, if installed in the equipment room, is not included.
c. A slight air overpressure is recommended to avoid dust build-up.
d. The HVAC system must be designed around equipment cabinet air flow/circulation. Modifying the room layout is allowed only after consulting the HVAC provider to avoid "hot spots".
e. Pollution: The equipment room is equipped with highly technical medical electronics. To avoid any potential failures due to pollution, dust containment should be considered (despite individual system parts having air filters). Ceilings walls and floors must be sealed to prevent dust particles from releasing into the air. Special attention shall also be considered when there is a cement floor slab under raised computer floors. Before the delivery of any equipment and after any construction, the site must be cleaned before turning on the MR system. The air conditioning system must be equipped with 90% less than 10 micron particles and 80% less than 5 micron particles filters.

2. Control Room Specifications

a. Comfort depends on local practice and preferences. For this reason, it is the responsibility of the customer to define the appropriate conditions for the control room. The values in the table below are recommended for patient and staff comfort. The Operator Console ambient requirements ranges from 50° to 90° F (10° to 32° C).

Ambient Requirements	
Temperature	64° to 75° F (18° to 24° C)
Maximum Temperature Change	9° F per 10 min (5° C per 10 min.)
Relative Humidity	30% to 70%, no condensation
Total Heat Dissipation to Air	
Dissipation	1,700 Btu/hr (0.5 kW)

3. Exam Room Specifications

Scan procedures involves the emission of RF energy. This can raise patient temperature. The amount of energy absorption (Specific Absorption Rate) is directly related to the ambient conditions. Therefore, the ambient requirements for the exam room are mandatory for safety.

Ambient Requirements	
Temperature ***	68° to 75° F (20° to 24° C) Preferred for patient comfort: 70° F (21° C)
Maximum Temperature Change	9° F per 10 min (5° C per 10 min.)
Relative Humidity ***	40% to 70%, no condensation
Total Heat Dissipation to Air *	
Dissipation**	6,800 Btu/hr (2 kW)

** Gradient coil heat dissipation (3,400 to 51,200 Btu/hr [1 to 15 kW]) will be removed by liquid cooling
*** Exam room temperature and humidity specifications are critical for the MR and must be met at all times. No exceptions are allowed.

a. The conditioned air must enter the examination room through RF feedthrough wave guides.
b. The air under the suspended ceiling must be routed via an air grill (opening) in the suspended ceiling to the void above the suspended ceiling but remain inside of the RF enclosure.
c. A slight overpressure is required to avoid dust penetration
d. The air exchange rate in the examination room (under the suspended ceiling) must minimally be 5 times per hour at a minimum air flow of 235 CFM (400 m³/h). The air inflow under the suspended ceiling must disperse evenly to ensure comfort and avoid "hot spots". Additional 235 CFM (400 m³/h) must be supplied above the suspended ceiling in the top covers near the magnet shroud.

Air Conditioning Requirements - Con't.

3. Exam Room Specifications - Con't.

e. If a dedicated HVAC system is used in the exam room, it is recommended that a system be designed to provide malfunction warnings, since excessive over/under temperatures or high/low relative humidity may damage the MR system.
f. Due to the use of helium in the magnet room, various precautionary measures can be taken to assure safety. One precautionary option is to have a high air refreshment degree (towards 100% ie. no re-circulation). Other solutions include having an oxygen monitor and emergency venting system. Consult an air conditioning supplier and/or RF enclosure supplier to determine the best solution. For all VA Medical Centers, Oxygen Monitors are required in air duct outside the RF Room.
g. The air flow through the magnet assembly must always be maintained while the system is in use.
h. Installation of Temperature and Humidity sensors in the RF-enclosure can be a problem due to the RF-filters required for each electrical cable entering and leaving the RF-enclosure and possible electrical interference. Best solution is to locate the sensors directly outside the RF Enclosure in the HVAC air return.
i. Smoke / fire detection system to be installed according to local code, fire and smoke detection common for medical devices and equipment with corresponding power rating. The use of these detectors inside the RF-enclosure is limited due to possible RF-interferences. A possible alternative is to install the detection device inside the air out / return duct located outside the RF-enclosure. Another alternative is to install an Aspirating Smoke Detector.
j. Smoke detection, temperature sensing, thermostats, humidity sensors, fire suppression duct control units, fire flashers/buzzers/annunciators and O2 Sensors, etc. inside exam room, MUST have a MR compatibility certification document. They must have NO INTELLEGENCE: No micro-processor control, no oscillators, no stepper motors, and no source of clock signal at all. If they do, and there is no MR compatibility certificate, it means that the device is disqualified for use inside the RF room.

k. System Air Cooling Unit:
Heat from the magnet gradient coil will be removed via the SACU (System Air Cooling Unit). The SACU and ventilation hose are delivered by Philips.
- The necessary 6.25" (160mm) System Air Cooling waveguide is to be provided by the RF enclosure supplier.
- 235 CFM (400 m³/h) of the inlet air will be directed through the magnet shroud. This will be pulled through the magnet by the SACU via the Gradient Exhaust RF Feedthrough and a Philips provided 5.5" hose (140mm).
- The exhaust air from the SACU must be directed back into the return air by a customer/contractor provided interface.

Additional Exam Room Air Feedthrough Requirements

1. Emergency Overpressure Grid RF Feedthrough
   a. If the exam room entry door does not swing outwards, it is required that an emergency overpressure RF feedthrough be installed. This will help avoid extreme pressure build-up if a quench were to ever occur and helium venting were to fail. Even if the door swings outwards, the emergency overpressure RF feedthrough is recommended, in case of an air exhaust or air conditioning malfunction. The volume behind this grid must be able to evacuate 24720 ft³ (700 m³) of helium gas in approximately 20 minutes, or the emergency venting system must extract the volume of the examination room 20 times per hour. The minimum size of this grid is 24" x 24" (600mm x 600 mm). The feedthrough can be coupled with an oxygen monitor which triggers a fan for added safety. To optimize air conditioning / air balancing of the Examination room, the overpressure RF-filter can be closed / covered with a lid or louvers (one direction valve) to avoid that air is routed inside the RF-enclosure from an unconditioned source. The lid or louvers must open automatically if an overpressure is present due to air handling or helium vent pipe failure.

2. Air Escape RF Feedthrough
   a. To ease the opening and closing of exam room entry doors, and prevent ceiling tiles from shifting when doors are opened or closed, an optional pressure balancing feedthrough can be installed between the exam room and adjacent room. Placing this feedthrough at the control room wall may lead to an increase in noise and affect comfort level.

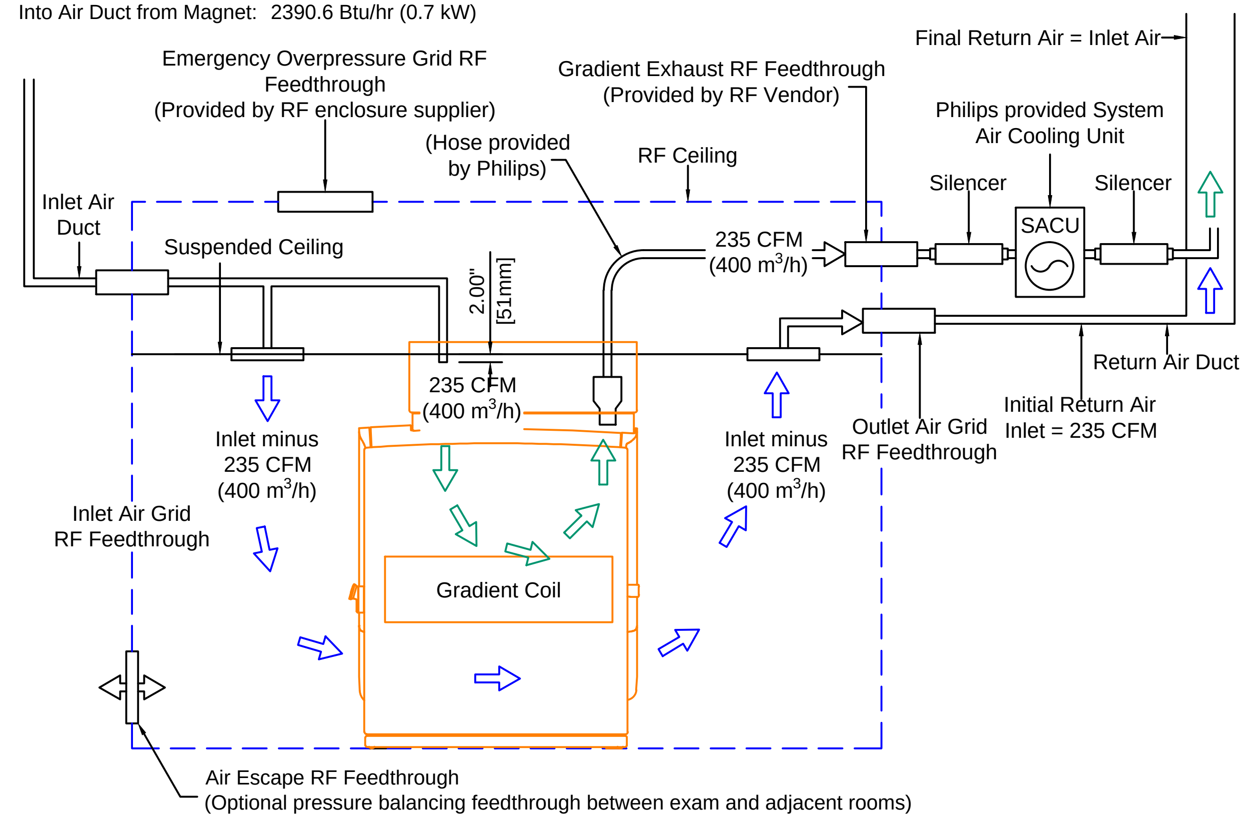
(08.0) S13 S15

Detail - System Air Cooling, Emergency Overpressure Grid RF Feedthrough

(Not to scale)

Minimum total supply of conditioned air required is 470 CFM (800 m³/h)
235 CFM above suspended ceiling and 235 below the suspended ceiling.

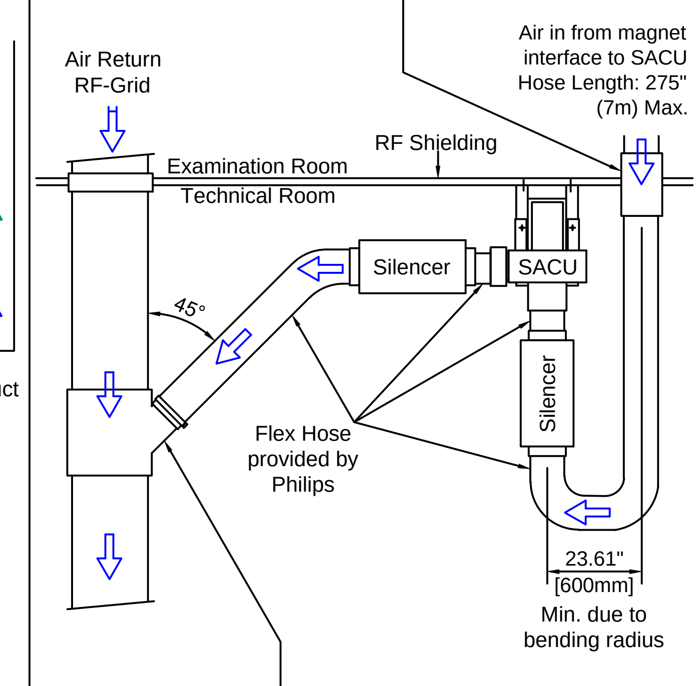
Heat Dissipation
Equipment Room: 341.5 Btu/hr (0.1 kw)
Into Air Duct from Magnet: 2390.6 Btu/hr (0.7 kW)



S12 S13 S14 S15

(12.2)

RF Feedthrough
Philips supplied hose through
Wave guide inner diameter min. 6.3" (160mm)
Typical location: above suspended ceiling of examination room near hospital air return duct.



Interface location
Third party supplied 5" (127mm) outer diameter interface
Hose Length: 78.7" (2m) Max. distance from SACU
Airflow: 235 CFM (400m³/h)
Heat Load: 2390 Btu/hr (0.7kW) during scanning

Diagram - System Air Cooling Unit Air Flow

(Not to scale)

PHILIPS

Project
Ingenia 1.5T Omega HP
Standard Reference Drawing
Not Site Specific
-

Philips Contacts
Project Manager:
Contact Number:
Email:
Drawn By:

Project Details
Drawing Number
N-SRD110002
Date Drawn: 1/13/2014
Quote: None
Order: None

MP4

MEDKOOL 15000 AC Chiller - Specifications/Notes

1. Dimplex MEDKOOL 15000 AC Chiller Siting Requirements

a. Customer/contractor required to flush out (with water) all piping prior to connecting to chiller. There must be no debris in the piping when final connections are made.
b. Mechanical contractors must supply and fill all chilled water systems, prior to "commissioning", with inhibited glycol and DI water solution, glycol shall be equal to Interstate NFP 50/50. Customer responsible for providing glycol.
c. Chiller must have a minimum of 25' (7.6 m) overhead clearance in order to exhaust hot air from the condenser. Siting must be such that the condenser constantly receives fresh outside air. In addition, chiller must be located such that there is no possibility of condenser fans ingesting lint (from hospital industrial dryers), sand, dirt or any other materials that can quickly obstruct the condenser fans.
d. The chiller cannot be located in any fully enclosed area (e.g. pits, unused stairwells, closets).
e. Locating the chiller in any partially enclosed area (e.g. parking garages, partially fenced areas, etc.) is possible only if all clearances are met. Refer to sheet AD5 for details.
f. Chiller cannot be located next to other heat generating devices or systems (HVAC condensers, etc.). Chiller must be positioned such that it avoids other systems hot air discharge.
g. Any actions and/or add-ons for noise abatement beyond what is provided with the chiller (if any) is solely and exclusively the responsibility of the customer/contractor and must not violate any service clearances.
h. Required ambient temperature must be between (-20° F to 120° F [(-28.9° C) to 48.9° C]).
i. Recommended chiller temperature set point for chiller water reservoir is 48° F to 50° F (8.89° C to 10° C).
j. If site is located within 100 miles of an ocean, salt water package is highly recommended.
k. If linear piping distance between LCC and chiller is greater than 200 ft. upgraded pumps may be required. (When calculating distance, add 3 ft. for each 90° bend, 2 ft. for each 45° bend, and 3 ft. for each T fitting for both supply and return feeds, to the one way piping distance)
l. If the elevation difference between LCC and Chiller is greater than 60 ft. upgraded pumps may be required.

2. Dimplex MEDKOOL 15000 AC Chiller Commissioning Notes

a. Dimplex shall commission the chiller. A completed "Chiller Pre-Commission Checklist" shall be forwarded to your Philips Project Manager prior to commissioning. Items incomplete at the time of the commissioning will generate delays and additional commissioning costs to be incurred by the installer.

b. Mandatory Commisioning Conditions:

- Completion of the chiller installation is required. This includes all piping connected and finished to equipment room, the reservoir being filled with proper water/glycol solution, and the chiller wired to electrical service.
- Because the "LCC" is delivered with the magnet, customer/contractor must provide a closed loop system so the Chiller can be tested prior to magnet delivery.
- 7 working days notice is required for commissioning service. Local Philips service is responsible for contacting Dimplex to arrange commissioning.
- The technician is not obligated to perform any work outside of the chiller.

c. Commission Summary: The commissioning technician will:

- Verify: inlet voltage, proper pump, compressor, and condenser fan rotation, control voltage (adjust primary multi-tap as required), and water levels in tank.
- Start unit and check: refrigerant operation, pumps and water hose connections for leaks, operation of remote controller (per customer's requirements), amperage of compressor/pump/condenser fans, correct minor installation problems, review proper operation with maintenance personnel, provide report to Philips.

* Installation, rigging, and support (i.e. concrete pad or roof curbing) of Chiller to be provided by customer/contractor.
** Installation and support of Chiller to follow local code(s).

(08.0)

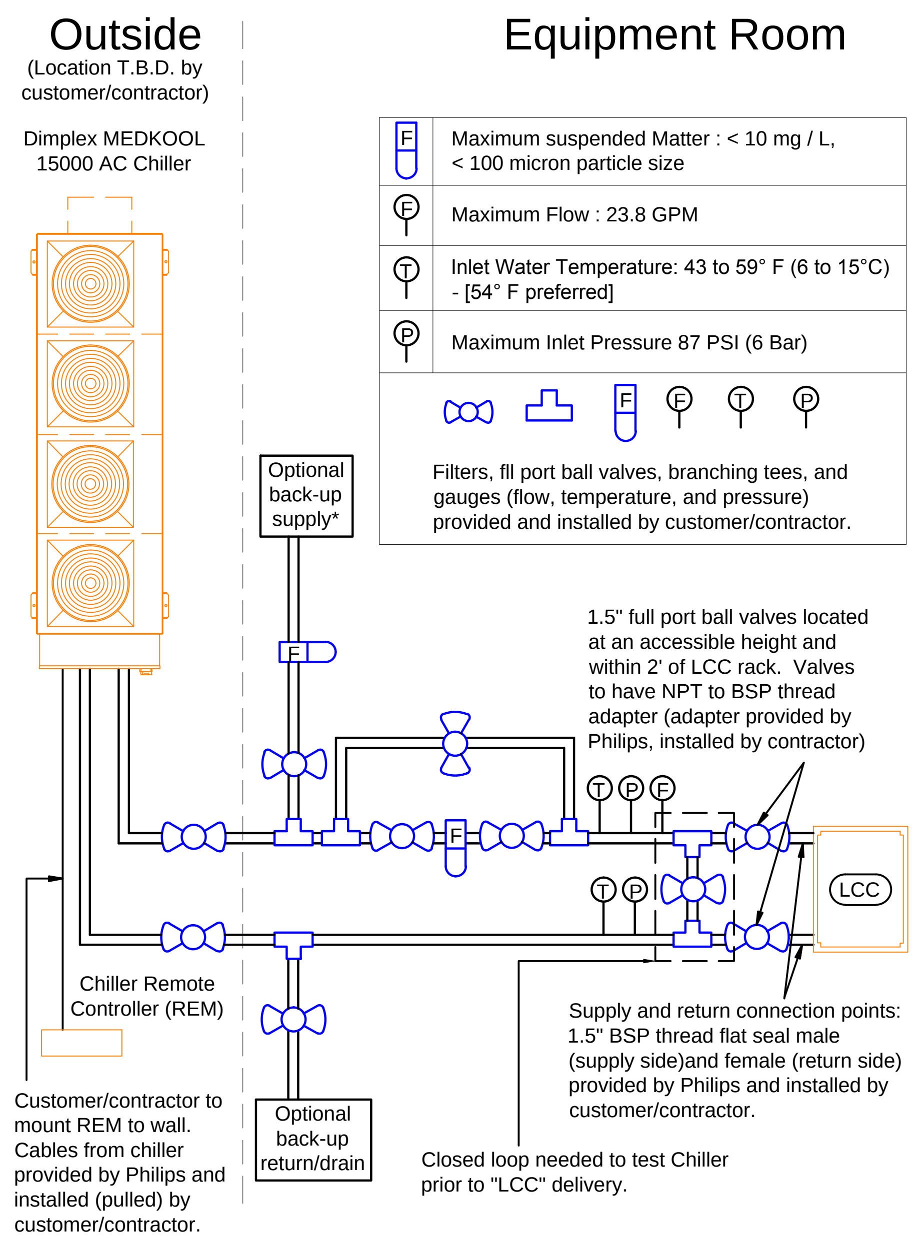
Mechanical / Plumbing Layout

All piping to be minimum 1.5" schedule 80 PVC or copper piping with long radius bends, provided and installed by customer/contractor. All Full port ball valves and branching tees to be provided and installed by customer/contractor.

Customer/contractor to insulate all piping to prevent condensation and to minimize heat gain from ambient air.

All flow, temperature, and pressure gauges shown on the diagram below are required and must be installed prior to chiller and magnet delivery.

Customer/contractor to supply and install flow, temperature, and pressure gauges for troubleshooting and monitoring purposes.



* **If a chilled water system is used, it is the customer/contractor responsibility to meet all codes concerning the dumping of glycol. The amount of glycol (by volume) drained during a switch-over is the total volume of piping between the chiller and MR equipment (LCC) multiplied by the concentration.**

**** Customer supplied and/or installed items shown bold ****

(10.0)

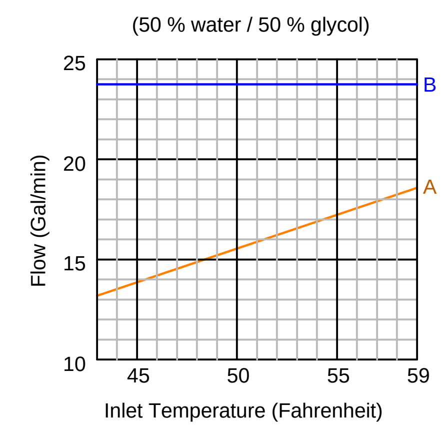
Mechanical / Plumbing Notes:

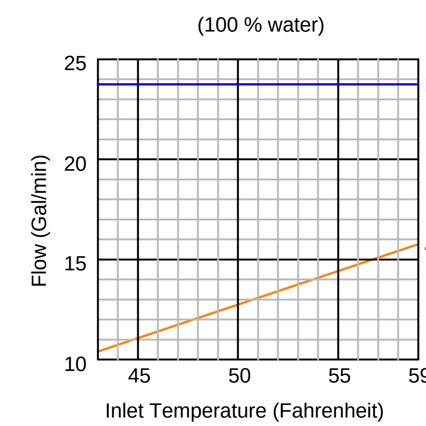
1. Liquid cooling is needed 24 hours a day, 7 days a week, and 365 days a year.
2. It is recommended to provide a water back-up system in case the chiller is down (due to servicing or failure). It is the customer/contractor responsibility to ensure that the backup water source meets the flow, temperature, pressure, and purity requirements provided below.
3. **Primary Coolant Requirements:**

Inlet Water Quality	Potable Distilled Water
Inlet Water Acidity	6.0 to 8.0 pH
$CaCO_3$	< 250 ppm
Chlorine	< 200 ppm
Maximum Suspended Matter	< 10 mg / L, < 100 micron particle size
Inlet Water Temperature	43 to 59° F (6 to 15° C) - [54 ° F preferred]
Maximum Flow	23.8 GPM
Maximum Inlet Pressure	87 PSI (6 Bar)
Inlet Water Temperature Stability	+/- 3.6° F (+/- 2° C)
Ethylene Glycol Concentration	Recommended: 35%
Propeylene Glycol Concentration	Recommended: 50%
Heat Dissipation to Liquid	23,900 to 136,600 Btu/hr (7 to 40 kW)

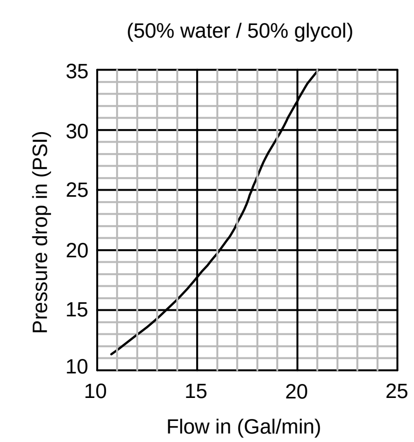
4. **Flow Requirements:**

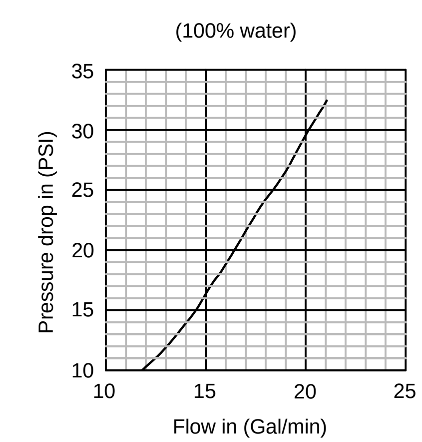
- Flow in gallons per minute / inlet temperature in °F of the chilled water needs to fall into the area on or between curves A and B for each of the graphs in order to maintain enough cooling capacity.
- Maximum flow not to be exceeded to avoid temperature instability in the secondary circuit.





5. **Pressure drop through Liquid Cooling Cabinet (LCC):**





PHILIPS

Project
Ingenia 1.5T Omega HP
Standard Reference Drawing
Not Site Specific
-

Philips Contacts
Project Manager:
Contact Number:
Email:
Drawn By:

Project Details
Drawing Number
N-SRD110002
Date Drawn: 1/13/2014
Quote: None
Order: None

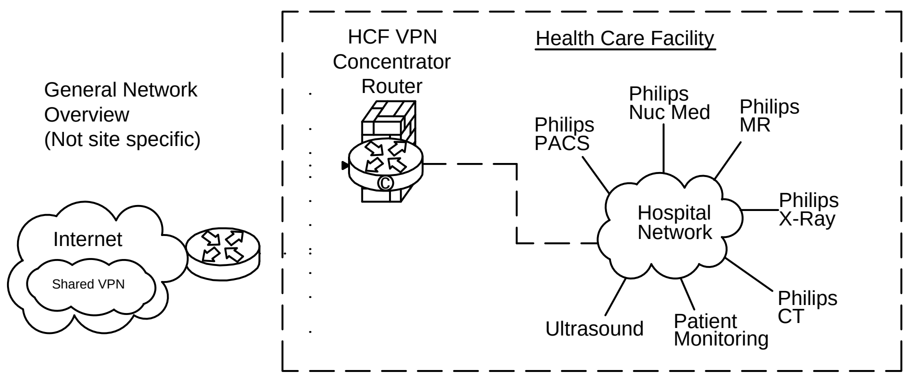
MP5

Philips Healthcare Remote Services Network (RSN)

Secure broadband connection required for Philips remote technical support, diagnostics, and applications assistance

Broadband Site-to-Site Connectivity (Preferred)
This connectivity method is designed for customers who prefer a connection from the RSN Data Center to the Health Care Facility (HCF) utilizing their existing VPN equipment.

Connectivity Details:
- A Site-to-Site connection from the RSN data center's Cisco router will be established to the HCF's VPN concentrator.
- The VPN Tunnel will be an IPSEC, 3DES encrypted Tunnel using IKE as standard, but alternative standards are also available, such as AES, MD5, SHA, Security Association lifetime and Encryption Mode.
- Every system that we will be servicing remotely will have a static NAT IP that we configure on the RSN Data center side.

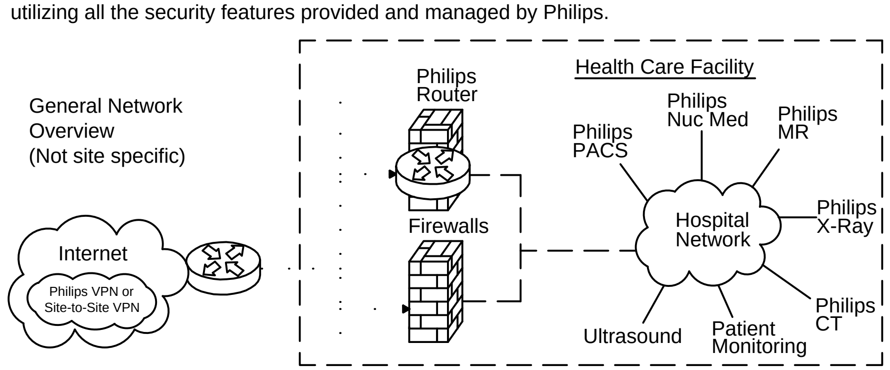


Action Required by Hospital:
- Review and approve connection details.
- Complete appropriate Site Checklist.
- Configure and allow Site-to-Site access prior to setting up connectivity depending on the access criteria that the HCF decides to implement (ex: Source IP filtering, destination IP filtering, NAT assignment, etc.).
- Route traffic from within the hospital network with destination addresses 192.68.48.0/22 to the designed IP provided by Philips.

Broadband Router Installed at Health Care Facility
This connectivity method is designed for customers who have a dedicated high speed connection for Philips equipment.

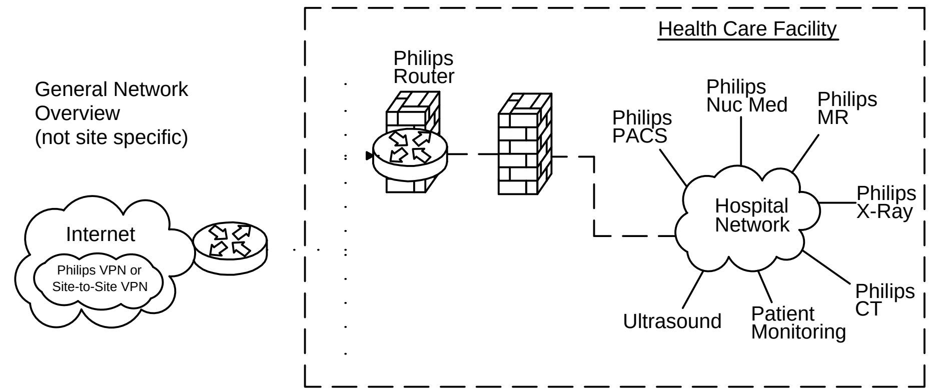
Connectivity Details:
- An RSN Cisco 1711 or 1712 router will be preconfigured and installed at the HCF by Philips in conjunction with the HCF IT representative.
- The VPN Tunnel will be an IPSEC, 3DES encrypted Tunnel using IKE and will be established from the RSN-DC and terminated at the RSN Router on-site.
- One to One NAT is used to limit access to Philips equipment only.
- Router Config and IP auditing is enabled for Customer IT to view via website 24/7.
- Dedicated DSL connections are also supported.

Option 1: Parallel to HCF Firewall Connectivity Method
This connectivity method is designed for customers who prefer a Philips RSN Router installed on site utilizing all the security features provided and managed by Philips.



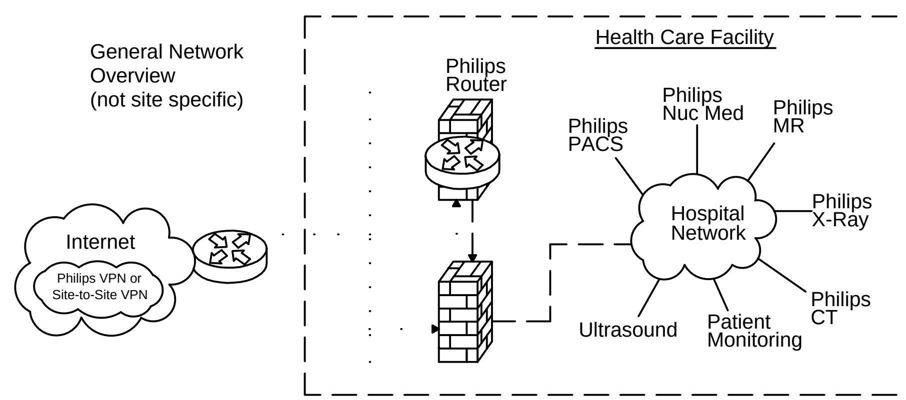
Action Required by Hospital:
- Assign a fixed public IP Address from the ISP to be configured on the Philips router. This is the DOTTED link on the picture connected to the firewall.
- Assign a Back end IP for the Philips router on the Hospital Network.
- Complete appropriate Site Checklist.
- Route traffic from within the hospital network with destination addresses 192.68.48.0/22 to internal Philips router Ethernet interface. This is the DASHED line connected to the firewall.

Option 2: Back End Connected to the HCF Firewall Connectivity Method
This connectivity method is designed for customers who prefer a Philips RSN Router installed on site by setting up an IP-Based policy allowing access thru existing HCF Firewall to Philips equipment.



Action Required by Hospital:
- Assign a fixed public IP Address from the ISP to be configured on the Philips router. This is the DOTTED link on the picture connected to the firewall.
- Assign a Back end IP for the Philips router on the Hospital Network.
- Complete appropriate Site Checklist.
- Route traffic from within the hospital network with destination addresses 192.68.48.0/22 to internal Philips router Ethernet interface. This is the DASHED line connected to the firewall.
- Configure and allow on the firewall on the DASHED line interface access between the IP address allocated by the hospital to the Philips internal Ethernet router interface and the target modality IP address.

Option 3: Router Installed Inside the HCF's DZM
This connectivity method is designed for customers who prefer the RSN Router installed inside and existing, or new DMZ, allowing access to Philips equipment.



Action Required by Hospital:
- Assign a fixed public IP Address from the ISP to be configured on the Philips router. This is the DOTTED link on the picture connected to the firewall.
- Assign a Back end IP for the Philips router on the Hospital Network.
- Complete appropriate Site Checklist.
- Route traffic from within the hospital network with destination addresses 192.68.48.0/22 to internal Philips router Ethernet interface. This is the DASHED line connected to the firewall.
- Configure and allow on the firewall on the DASHED line interface IPSec protocol communication by opening protocol 500, 50, 51, 47 and port 23 + TACACS. Traffic should be between external IP Address located on the Philips router and the RSN Data center IP address 192.68.48/24 and IP address AOSN TACAS.
- Configure and allow on the firewall on the DASHED line interface access between the IP address allocated by the hospital to the Philips internal Ethernet router interface and the target modality IP address.

System Network Information

IMPORTANT NOTE:
It is the customer's responsibility to coordinate with the local Philips Engineer to provide ALL required network information and install ALL required network cabling & drops according to Philips specifications PRIOR to the scheduled installation start date. Failure to do so may delay system installation and jeopardize the customer hand over date.

MRI Scanner

	Default	Hospital Preference
AE Title:	MR1	
Port Number:	104 >= R2.6.3 3010 < R2.6.3	
IP Address:		
Subnet Mask:		
Default Gateway:		

Extended Work Station (EWS)

	Default	Hospital Preference
AE Title:	EWS1	
Port Number:	3010	
IP Address:		

Hospital Network

	RIS	PACS (STORE)	PACS (Q/R)	DICOM PRINTER
AE Title:				
Port Number:				
IP Address:				

RSN Ports

Application	Port
Field Service Framework for MR	4440 and 80 (TCP)
McAfee ePolicy Orchestrator	80 (TCP)
Remote Desktop Sharing (lots/to)	5900 (TCP)
Secure FTP (Passive)	22 (TCP)
Telnet SSH2	22 (TCP)
Philips Service Agent (Outbound)	443 (TCP)

PHILIPS

Project
Ingenia 1.5T Omega HP
Standard Reference Drawing
Not Site Specific
-

Philips Contacts
Project Manager:
Contact Number:
Email:
Drawn By:

Project Details
Drawing Number
N-SRD110002
Date Drawn: 1/13/2014
Quote: None
Order: None

N1

Chiller Installation Checklist

- It is the responsibility of the customer/contractor to ensure that this unit is properly installed before Philips begins installation and commissioning of your chiller. Philips can provide at additional charge, contractors who can install this system and/or glycol in premixed concentrations if you so desire. Please contact your Project Manager or Field Service Engineer at 800-722-9377 for assistance.

- By signing the following checklist, you agree that all of the below steps have been properly completed before the commissioning begins. Additional charges may apply if any of the below are not completed properly. The unit must be powered (in operation) and meet all of the below a minimum of 8 hours before Dimplex arrives on site to commission the chiller system.

- ☐ Chiller has been off loaded, uncrated, and rigged into position. This is the Contractor's responsibility and usually requires a fork lift (terrain dependent).
- ☐ Chiller has not been damaged during shipment (if damage is observed please notify the Philips Project Manager or Field Service Engineer immediately. 800-722-9377
- ☐ Chiller location meets all air and service clearance requirements and is adequately anchored and supported according to specifications(refer to Sheet AD5 for details).
- ☐ Chiller is not located near a heat source.
- ☐ Incoming power to the chiller (phase, voltage and current rating) has been recorded and confirmed with the installation guide and chiller specification tag to meet all requirements.
- ☐ Field wiring is correct and to print. All connections and terminations are tight.
- ☐ Supply power to crankcase heaters (if applicable) for minimum of 8 hours prior to arrival of Service Tech for start-up. Most chillers will only require power supplied to the unit and the main disconnect turned on.
- ☐ Piping to be Copper (recommended) or Schedule 80 PVC (with long radius bends), insulated to prevent condensation and heat gain from ambient air.
- ☐ Piping (plumbing) has been tested, free of leaks and free of air.
- ☐ Fluid system has been flushed and the water/glycol level in reservoir is correct. Extra water and glycol should be on hand during startup to ensure the reservoir level maintained after the chiller is operational.
- ☐ Piping is terminated to the medical equipment and is not leaking. Field piping sized and installed according to specs.
- ☐ The chiller has been filled (after flushing any particulate matter) with a 50/50 concentration of water (preferably distilled) and glycol to the correct level. (50% glycol outdoors, 30% glycol indoors.)
  - If the water is not distilled, it must meet the requirements on Sheet MP5.
  - Water can freeze inside the chiller and algae can form in the system if this is not followed.
- ☐ Where applicable (for remote condensers / split systems): Refrigerant lines have been evacuated and charged with appropriate amount of refrigerant. See data tag for minimum refrigerant requirement and refer to chart on piping schematic in manual for amount of additional refrigerant required to charge system once chiller and condenser are connected
- ☐ All permits completed and installation approved by proper governing authorities.
- ☐ All of the above steps will be completed correctly prior to magnet delivery.

Chiller Installation Checklist One Week Prior to Delivery

- ☐ All criteria on Chiller Pre-Startup Checklist for commision completed and commissioning service scheduled.
- ☐ If a water bypass system is incorporated into the design, all associated filters, valves, gauges, plumbing, etc. completely installed.
- ☐ LCC adaptors ordered and delivered to site. This is the Project Manager's Responsibility.

Customer/Contractor Signature **Date** **Print Name** **Date**

Title **Accepted By (Philips)** **Date**

Site Readiness Checklist

Instructions:

- This form is to be used by Project Manager, Contractor and Service Engineer.
- Information is used to develop and determine site ready date.
- Items listed are go/no go items for delivery unless noted as delay only items.
- Items identified as delay items with must be completed after hours or on weekends. These items cannot be accomplished while installation is in progress and must be completed within 2 days of installation start or they may stop installation.

Control Room:

- ☐ Electrical / Mechanical / Network / Millwork completed .

Equipment Room:

- ☐ Electrical / Mechanical completed.

Exam Room:

- ☐ RF and magnetic shield constructed, including 3rd party RF feedthroughs (e.g. waveguides, electrical filters, door opens outward, isolation and attenuation met, etc.), and RF shield is tested. This is the RF vendor's responsibility.
- ☐ Finished floor installed.
- ☐ Magnet ladder tray, service light and switch, installed and operational
- ☐ Ceiling grid, function lighting, sprinklers, etc. installed (ceiling tile may be excluded around the magnet and System Filter Box (SFB). Sprinklers, lighting, HVAC ducts and all other 3rd party items above suspended ceiling positioned correctly.
- ☐ Sheet rock hung, taped, sanded, and primed (except for transport opening)
- ☐ All ferromagnetic materials have been removed from the examination room (required prior to system ramping - approximately day 4 of installation.
- ☐ All metal e.g. aluminum strips, aluminum light fixtures, air handling grids, supports etc. must be connected to the central RF-enclosure grounding point using a tooth washer. The impedance between any conductive part and the central PE bus-bat/terminal must not exceed 100 mΩ.

General Requirements:

- ☐ Power Solutions installed (option - not on every installation)
- ☐ RF supplier scheduled to close RF enclosure transport opening.
- ☐ Pull-strings are identified and installed in all conduits.
- ☐ Helium Exhause Pipe (HEP) feedthrough installed in RF enclosure and HEP design oustide exam room approved by Philips Site Planning is installed and insulated.
- ☐ All major electrical (raceway, ladder tray, conduits, etc.) installed.
- ☐ All HVAC components installed and functional.
- ☐ Common electrical power (e.g. house wiring, lighting, etc.) completed and functional.
- ☐ Construction resourse scheduled to finish transport opening (e.g. sheet rock, studding, sanding, painting, etc.)
- ☐ Resources scheduled to connect power to GMDU. Customer site preparation verified in general against the Philips final Planning drawings.
- ☐ Walls finished including painting
- ☐ Doors installed
- ☐ Floor leveled according to Philips drawings and specifications
- ☐ Floors are tiled/covered finished. Flooring is covered with protective covering (scratch protection)
- ☐ Ceiling lights installed

General Requirements Cont'd

- ☐ Cable conduit and ductwork installed and clean. Position checked. Duct covers in place but not finally closed. Cable opening are clear, without sharp edges. Pull strings in conduits. Installation per Philips Specifications.
- ☐ Electrical preparation according to Philips Specifications.
- ☐ All network cabling, drops installed according to Philips specifications. (Including hardcopy cameras)
- ☐ All pre-cabling identified on Philips drawings has been installed.
- ☐ Pre-move survey completed - Delivery route identified.
- ☐ Room has been cleaned
- ☐ Cabinets and casework installed
- ☐ HVAC environmental equipment installed and working according to Philips Specifications.
- ☐ Ceilings installation completed.

Rigging:

- ☐ Building access to RF shield is clear of workers, materials and cleaned in preparation of delivery.
- ☐ Magnet Delivery Path has been checked for sufficient opening sizes and floor weight tolerances

Items Specific for the MRI Systems:

- ☐ All Ferromagnetic materials removed from magnet room.
- ☐ Quench pipe design verified by site planning and installed from Philips connection point to the outside.
- ☐ RF shield installed, initial testing done, and prepared for magnet delivery.
- ☐ Magnetic shielding installed.
- ☐ All required plumbing, valves and gauges installed and tested.
- ☐ Rigging team and delivery route prepared for delivery.
- ☐ Wave guides installed.
- ☐ Final RF testing after magnet delivery, access opening enclosed
- ☐ Gradient air cooling complete and working according to specifications
- ☐ Blocking support as required for wall mounted equipment
- ☐ RF glass installed
- ☐ RSN Surveys completed and submitted.
- ☐ Philips RSN Champion contacted.
- ☐ RSN Connectivity to be established prior to the end of the installation. This is the Project Manager's Responsibility.
- ☐ Environmental Survey completed (Required for 3.0T and applicable for 1.5T if known disturbances are near the magnet)
- ☐ Helium Exhaust Pipe verification completed and approved by Site Planning.
- ☐ Helium has been ordered through service for initial Helium fill of magnet.

Site Requirements/Readiness - Signature
Approved for Delivery:

Service Engineer **Date**

Project Manager **Date**

(11.0)

PHILIPS

Project
Ingenia 1.5T Omega HP
Standard Reference Drawing
Not Site Specific
-

Philips Contacts
Project Manager:
Contact Number:
Email:
Drawn By:

Project Details
Drawing Number
N-SRD110002
Date Drawn: 1/13/2014
Quote: None
Order: None

CHK