GENERAL SHEET NOTES

1 PROVIDE DEDICATED NEUTRALS FOR ALL BRANCH CIRCUITS.

2 PROVIDE NEW TYPED PANEL SCHEDULES FOR ALL PANELS AFFECTED BY PROJECT.

3 ALL RECEPTACELS LOCATED WITHIN 6' OF THE EDGE OF A SINK SHALL BE GFCI PROTECTED.

4 REFER TO MRI VENDOR DRAWINGS AND FERROGUARD VENDOR DRAWINGS FOR ADDITIONAL CONTRACTOR RESPONSIBILITIES.

5 ALL ELECTRICAL FIXTURES, DEVICES, PATHWAYS, ETC. INSTALLED IN THE MRI SCAN ROOM SHALL BE NON-FERROUS AND NON-MAGNETIC.

SHEET KEYNOTES

1 PROVIDE A SINGLE POLE SWITCH FOR CRYOGEN FANS.

2 CONNECT TO CIRCUIT THAT PREVIOUSLY FED RECEPTACLES IN MRI ROOM. ROUTE CIRCUIT THROUGH NEW RF FILTER.

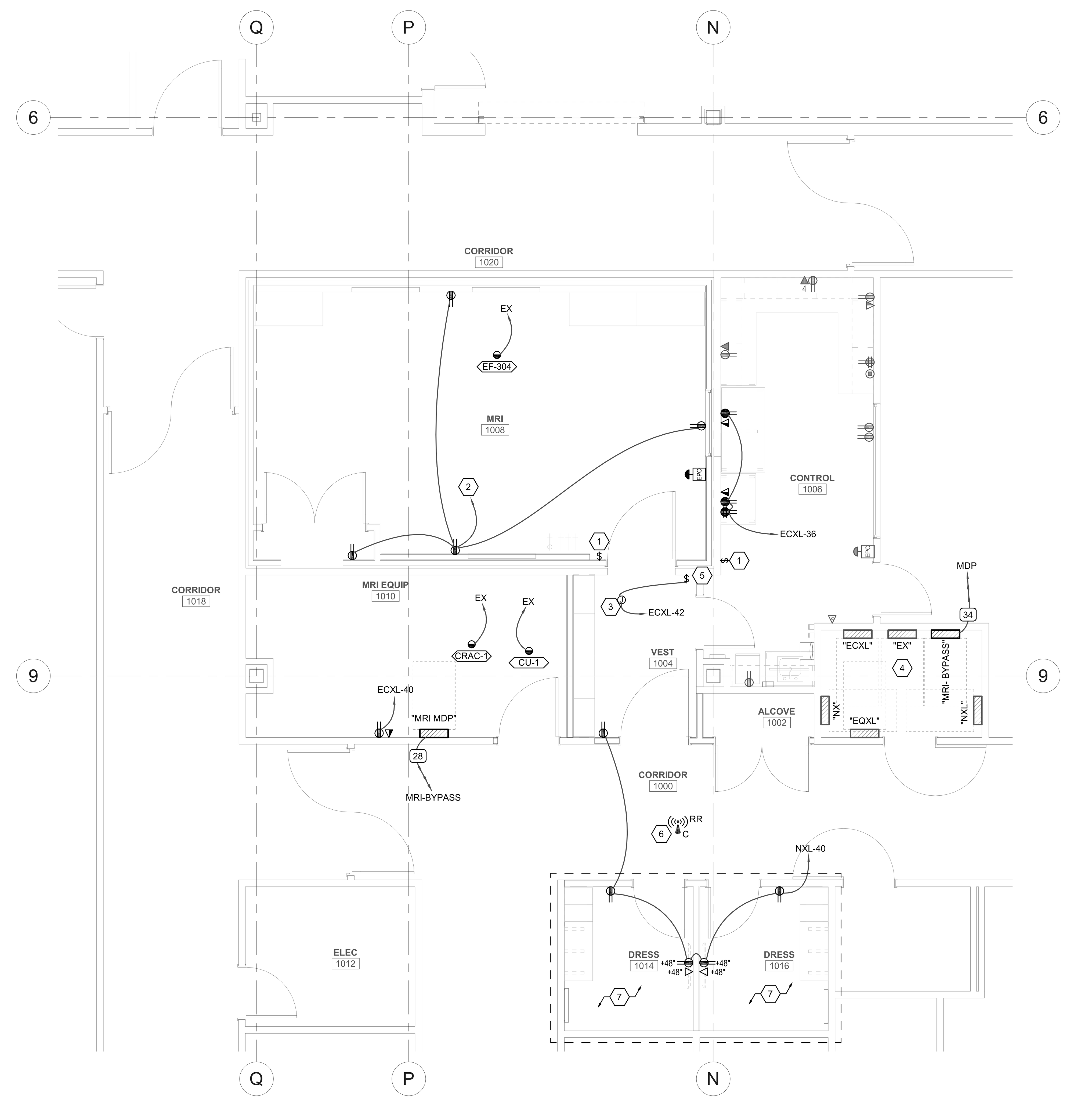
3 PROVIDE 120V CIRCUIT FOR FERROGUARD DOOR SYSTEM REFER TO FERROGUARD INSTALLATION REQUIREMENTS FOR ADDITIONAL CONTRACTOR RESPONSIBILITIES.

4 PROVIDE (1) NEW 100/3P CIRCUIT BREAKER AND (2) 20A/3P CIRCUIT BREAKERS IN EXISTING CUTLER HAMMER PANEL BOARD.

5 REFER TO FERROGUARD DRAWINGS FOR SWITCH MOUNTING HEIGHT.

6 REMOVE AND REINSTALL PER NEW PLANS AS REQUIRED TO FACILITATE INSTALLATION OF DUCTWORK.

7 WORK IN THIS AREA TO BE INCLUDED AS PART OF ADD ALTERNATE #1.



1 LEVEL 1 POWER PLAN

SCALE: 1/4" = 1'-0"

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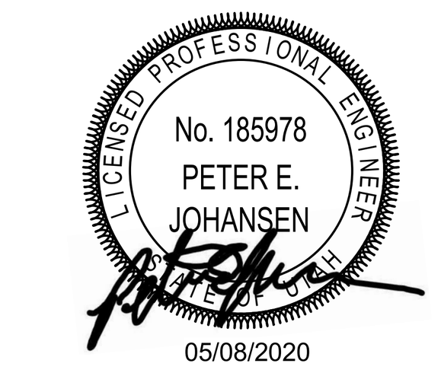

TIMPANOGOS MRI RETROFIT

KEY PLAN

REVISION
NO. DESCRIPTION DATE

HKS PROJECT NUMBER
23798.000
DATE
05/08/20
ISSUE
CONSTRUCTION DOCUMENTS
SHEET TITLE
LEVEL 1 POWER PLAN

SHEET NO.
EP101

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GENERAL SHEET NOTES

1. UPS UNITS AND PDU'S FOR TDR ROOMS AND THE TEC ROOM WILL BE OFCI.
2. ALL GROUND FAULT PROTECTION DEVICES MUST BE FIELD TESTED IN ACCORDANCE WITH NEC 230.95(C) PRIOR TO BEING PUT INTO SERVICE.
3. ALUMINUM FEEDER ARE ACCEPTABLE FOR SIZES 1/0 OR GREATER WITH THE FOLLOWING EXCEPTIONS: USE COPPER FEEDERS FOR RADIOLOGY EQUIPMENT AND MECHANICAL HEATING/COOLING EQUIPMENT.
4. THE CALCULATED FAULT CURRENTS PROVIDED TO EQUIPMENT MUST BE FIELD MARKED AS REQUIRED BY NEC 110.24(A).

SHEET KEYNOTES

1. PROVIDE ADDITIONAL SWITCHGEAR SECTION ADDED ON THE EXISTING CUTLER-HAMMER MAIN SWITCHGEAR.
2. PROVIDE EQUIPMENT GROUNDING CONDUCTOR OF THE SAME SIZE AS THE PHASE CONDUCTORS..
3. EQUIPMENT TO BE PROVIDED BY VENDOR AND INSTALLED BY CONTRACTOR.
4. PROVIDE NEW 100A/3P BREAKER IN EXISTING CUTLER-HAMMER PANELBOARD.
5. PROVIDE NEW 20A/3P BREAKER IN EXISTING CUTLER-HAMMER PANELBOARD.

COPPER CONDUCTOR AND CONDUIT SCHEDULE

SCHEDULE NUMBER
SUBSCRIPT (NOTE 5)
(E.G.) 5 IG

SYM	AMP	CONDUIT SIZE	CONDUCTOR(NOTE 1) QTY	SIZE	G	IG/HH	SE	NOTES
1	20	.75	2	12	12	12	8	2
2	20	.75	3	12	12	12	8	2,3
3	20	.75	4	12	12	12	8	2,3
4	30	.75	2	10	10	10	8	2
5	30	.75	3	10	10	10	8	2
6	30	.75	4	10	10	10	8	2
7	40	1	2	8	10	8	6	2
8	40	1	3	8	10	8	6	2
9	40	1	4	8	10	8	6	2
10	55	1	2	6	10	8	4	2
11	55	1	3	6	10	8	4	2
12	55	1.25	4	6	10	8	4	2
13	70	1	2	4	8	4	2	2
14	70	1.25	3	4	8	4	2	2
15	70	1.25	4	4	8	4	2	2
16	85	1.25	2	3	8	3	2	2
17	85	1.25	3	3	8	3	2	2
18	85	1.25	4	3	8	3	2	2
19	95	1.25	3	2	8	2	2	2
20	95	1.50	4	2	8	2	2	2
21	130	1.50	3	1	6	2	2	2
22	130	1.50	4	1	6	2	2	2
23	150	2	3	1/0	6	2	1/0	2
24	150	2	4	1/0	6	2	1/0	2
25	175	2	3	2/0	6	2	2/0	2
26	175	2	4	2/0	6	2	2/0	2
27	200	2	3	3/0	6	2	2/0	2
28	200	2.50	4	3/0	6	2	2/0	2
29	230	2.50	3	4/0	4	2	2/0	2
30	230	2.50	4	4/0	4	2	2/0	2
31	255	2.50	3	250	4	1	2/0	2
32	255	2.50	4	250	4	1	2/0	2
33	310	3	3	350	3	1/0	3/0	2
34	310	3	4	350	3	1/0	3/0	2
35	380	3.50	3	500	3	3/0	3/0	2
36	380	4	4	500	3	3/0	3/0	2
37	400	2 EA 2	3	3/0	3	3/0	3/0	2
38	400	2 EA 2.50	4	3/0	3	3/0	3/0	2
39	510	2 EA 2.50	3	250	1	4/0	3/0	2
40	510	2 EA 3	4	250	1	4/0	3/0	2
41	620	2 EA 3	3	350	1/0	4/0	3/0	2,4
42	620	2 EA 3	4	350	1/0	4/0	3/0	2,4
43	760	2 EA 3.50	3	500	1/0	4/0	3/0	2,4
44	760	2 EA 4	4	500	1/0	4/0	3/0	2,4
45	855	3 EA 3	3	300	2/0	4/0	3/0	2,4
46	855	3 EA 3	4	300	2/0	4/0	3/0	2,4
47	1000	3 EA 3.50	3	400	2/0	4/0	3/0	4
48	1000	3 EA 3.50	4	400	2/0	4/0	3/0	4
49	1140	3 EA 4	3	500	3/0	4/0	3/0	4
50	1140	3 EA 4	4	500	3/0	4/0	3/0	4
51	1240	4 EA 3	3	350	3/0	4/0	3/0	4
52	1240	4 EA 3	4	350	3/0	4/0	3/0	4
53	1675	5 EA 4	4	400	4/0	4/0	4/0	4
54	2010	6 EA 4	4	400	250	250	250	4
55	2660	7 EA 4	4	500	350	350	350	4
56	3040	8 EA 4	4	500	500	500	500	4
57	4180	11 EA 4	4	500	500	500	500	4
58		5 EA 4						6
59		5						6
60		10 EA 4						6

CONDUCTOR AND CONDUIT SCHEDULE NOTES

1. CONDUCTORS SHOWN ARE SHOWN FOR EACH CONDUIT WITH MODIFICATIONS AS NOTED IN NOTE 5. ALL CONDUCTORS SHOWN ARE THWN UNLESS OTHERWISE NOTED.
2. PROVIDE EQUIPMENT GROUND CONDUCTORS PER TABLE 250-122 WHEN CIRCUIT BREAKERS ARE SIZED GREATER THAN AMPERE RATING SHOWN IN TABLE.
3. PROVIDE #10 NEUTRALS FOR MULTIWIRE BRANCH CIRCUITS SERVING COMPUTERS.
4. GROUND (G) CONDUCTOR MAY BE DELETED ON SERVICE ENTRANCE CONDUCTORS.
5. SYMBOL SUBSCRIPTS:

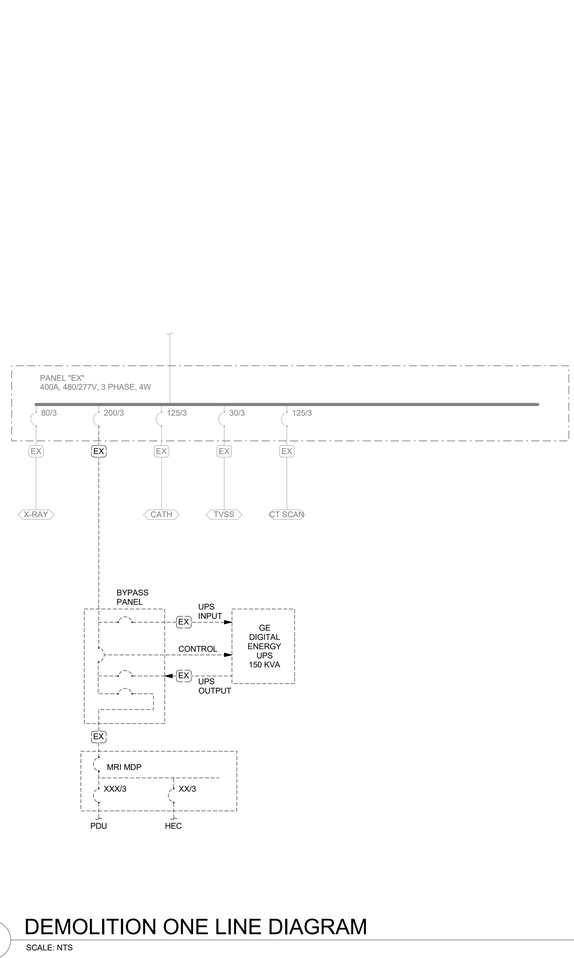
   "2N": INCLUDE TWO NEUTRAL CONDUCTORS, SIZED AS SCHEDULED FOR PHASED AND NEUTRAL CONDUCTORS.

   "FG": FULL SIZE GROUND, SIZE EQUIPMENT GROUNDING CONDUCTOR TO BE THE SAME SIZE AS THE PHASE CONDUCTORS.

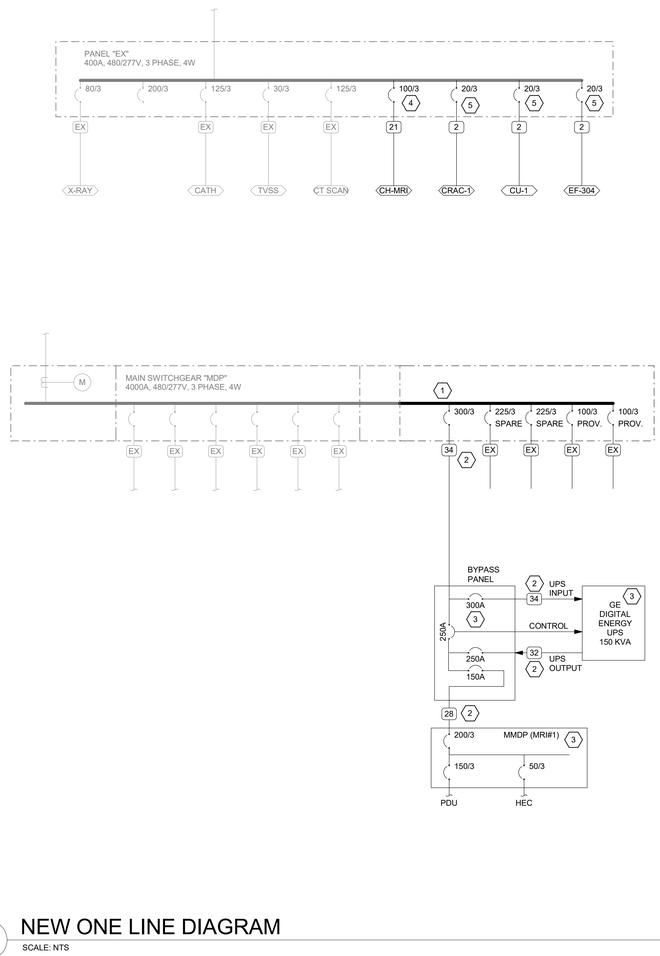
   "HH": NEUTRAL CURRENTS EXIST DUE TO HIGH HARMONIC "NONLINEAR" LOADS. CURRENT CARRYING CONDUCTORS DERATED ACCORDINGLY. PROVIDE THE IG/HH SIZE FOR THE EQUIPMENT GROUNDING CONDUCTOR.

   "IG": INCLUDE IG (INSULATED/ISOLATED GROUND CONDUCTOR) SCHEDULED ALONG WITH GROUND OF EQUIPMENT GROUND CONDUCTOR.

   "SE": SUBSTITUTE "SE" CONDUCTOR FOR "G" CONDUCTOR SHOWN, WHICH IS SIZED FOR THE GROUNDING OF THE SECONDARY OF THE SEPARATELY DERIVED SYSTEM.
6. RACEWAY ONLY. CONDUCTORS PROVIDED BY UTILITY.



1 DEMOLITION ONE LINE DIAGRAM
SCALE: NTS



2 NEW ONE LINE DIAGRAM
SCALE: NTS

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LICENSED PROFESSIONAL ENGINEER
No. 185978
PETER E. JOHANSEN
05/08/2020

TIMPANOGOS MRI RETROFIT

KEY PLAN

REVISION
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ONE-LINE DIAGRAM

SHEET NO.
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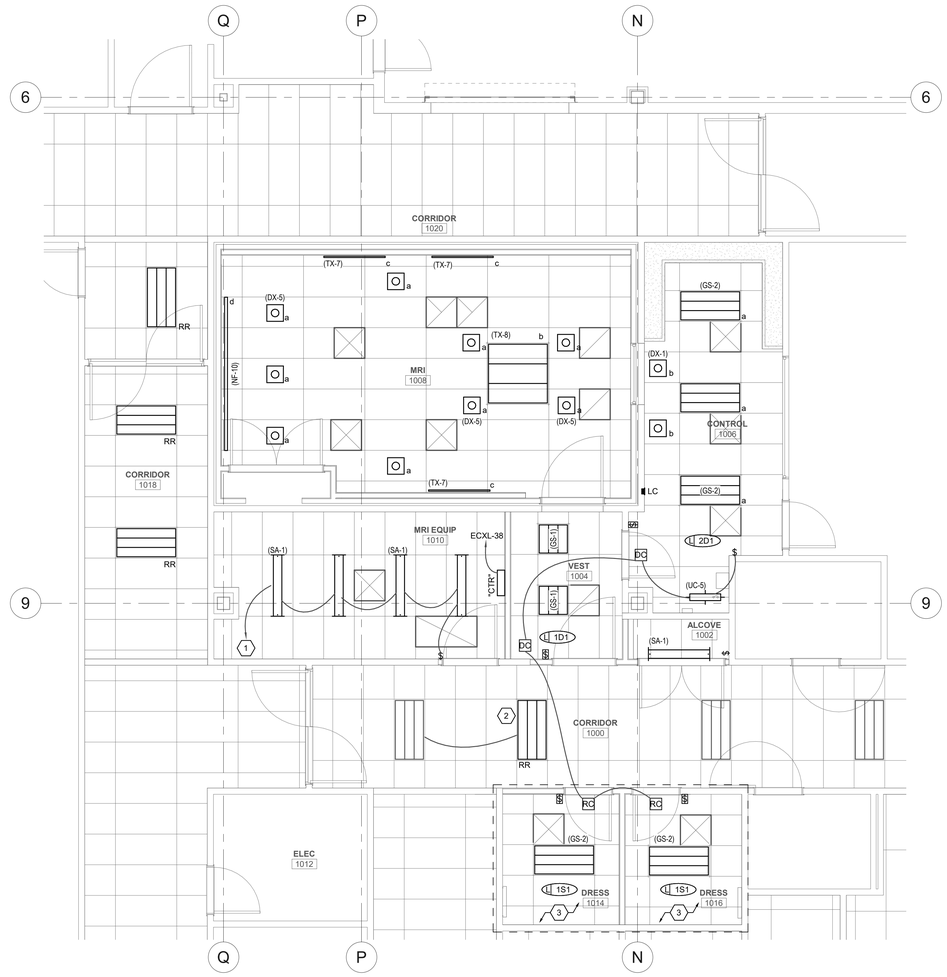

1 LEVEL 1 LIGHTING PLAN

SCALE: 1/4" = 1'-0"

GENERAL SHEET NOTES

1 ALL LIGHT FIXTURES AND DEVICES LOCATED WITHIN THE MRI SCAN ROOM SHALL BE LISTED FOR USE IN AN MRI SCAN ROOM AND BE NON-FERROUS AND NON-MAGNETIC.

SHEET KEYNOTES

1 CIRCUIT LIGHTING TO THE EXISTING LIGHTING CIRCUIT THAT PREVIOUSLY FED LIGHTING IN THIS AREA.

2 REMOVE AND REINSTALL PER NEW PLANS AS REQUIRED TO FACILITATE INSTALLATION OF DUCTWORK.

3 WORK IN THIS AREA TO BE INCLUDED AS PART OF ADD ALTERNATE #1.

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TIMPANOGOS MRI RETROFIT

KEY PLAN

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SHEET TITLE
LEVEL 1 LIGHTING PLAN

SHEET NO.
EL101

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INTERIOR LIGHTING FIXTURE SCHEDULE

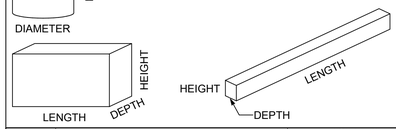
ABBREVIATIONS

MOUNTING

- B - BASE
- C - CEILING
- F - FLANGE
- G - GRID
- P - PENDANT
- PL - POLE
- R - RECESSED
- S - SURFACE
- W - WALL

LUMINAIRE OPTIONS

- ARHR - AIR RETURN AND HEAT REJECTION
- DL - DAMP LOCATION
- EQC - EARTHQUAKE CLIPS
- F - FUSING
- HLD - HINGED AND LATCHED DOOR
- HS - HOUSE SIDE SHIELD
- PS - PHOTOCELL SWITCH
- QRS - QUARTZ RESTRIKE
- ST - STATIC
- WG - WIRE GUARD
- WL - WET LOCATION



FINISH

- MW - MATTE WHITE
- BL - BLACK
- SL - SILVER
- GL - GOLD
- CL - CLEAR
- PW - PAINTED WHITE
- EA - EXTRUDED ALUMINUM
- S - STEEL
- GS - GALVANIZED STEEL
- C - CAST
- CBA - COLOR BY ARCHITECT
- SCBA - STANDARD COLOR BY ARCHITECT
- CCA - CUSTOM COLOR BY ARCHITECT
- FS 209D - MEETS FEDERAL STANDARD 209D
- TP - THERMALLY PROTECTED
- FL - FLUSH
- R - REGRESS
- M - MITERED

DIFFUSER/LENS

- #A - ACRYLIC #THICK
- #OA - ACRYLIC #THICK (OPAL)
- GC - GLASS (CLEAR)
- GO - GLASS (OPAL)
- GF - GLASS (FROSTED)
- SGL - SOFT GLOW LENS
- HPL - HIGH PERFORMANCE LENS
- DO - DROP OPAL
- CGL - CONVEX GLASS LENS
- S - SATIN LENS

REFLECTOR

- OP - NONE/OPEN
- SP - SPECULAR
- SS - SEMI-SPECULAR
- D - DIFFUSE (WHITE ENAMEL)
- SC - SPECULAR (COLORED)
- PR - PRISMATIC
- FDR - FULL DEPTH REFLECTOR
- DS - DIFFUSE (SEMI SPECULAR) SILVER
- LI - LOW IRIDESCENT
- IR - IRIDESCENT
- SL - SILVER
- GL - GOLD
- CA - CLEAR ALZAK

NOTES

GENERAL NOTES

1. PROVIDE UNIT PRICES AND FIXTURE BRAND SELECTED FOR ADD/DELETE CHANGES FOR EACH FIXTURE TYPES SHOWN WITHIN 48 BUSINESS HOURS OF THE BID DATE. FAILURE TO COMPLY WITH THIS REQUIREMENT MAY DISQUALIFY THE PRODUCTS AND EMPOWER THE ENGINEER TO DETERMINE FAIR VALUE FOR FIXTURE AND INSTALLATION CHANGES, WITHOUT FURTHER INPUT FROM THE CONTRACTOR OR INSTALLER.
2. CONTRACTOR ALLOWANCE PRICES ARE ACCURATE WHEN THIS JOB WAS SPECIFIED, CONTRACTOR AND ELECTRICAL DISTRIBUTOR SHALL VERIFY THIS ALLOWANCE AND REPORT ANY PROBLEMS TO THE ENGINEER BEFORE THE BID. ALLOWANCE PRICE MAY OR MAY NOT INCLUDE LAMP(S) OR FREIGHT AS NOTED, AND DO NOT INCLUDE ANY TAXES.
3. SUBSTITUTIONS AND/OR EQUAL FIXTURES MUST RECEIVE APPROVAL PRIOR TO BIDDING, THEY MUST BE SUBMITTED TO THE ENGINEER NO LESS THAN 2 WEEKS PRIOR TO BID OPENING.
4. SAMPLES MUST BE PROVIDED FOR ANY AND ALL FIXTURES UPON A/E REQUEST PRIOR TO RELEASING FIXTURES.
5. ALL FIXTURES SHALL BE LISTED AND APPROVED FOR THEIR INTENDED USE AND LOCATION.
6. VERIFY THE PROPER MOUNTING KITS OR ACCESSORIES TO FACILITATE INSTALLATION AS SHOWN AT EACH LOCATION ON THE DRAWINGS.
7. COMPLY WITH THE "INTERIOR LIGHTING" SECTION OF THE SPECIFICATIONS.
8. REFER TO SPECIFICATIONS FOR IMPORTANT TECHNICAL REQUIREMENTS FOR LIGHTING FIXTURES, DRIVERS, AND LAMPS.
9. ALL LIGHT FIXTURES TO BE EITHER "DLC" OR "LIGHTING FACTS" LISTED OR TO BE APPROVED BY ARCHITECT/ENGINEER AND OWNER.

ID	DESCRIPTION	NOMINAL SIZE				MOUNTING	TYPE	COLOR TEMP	CRI	DRIVER CONFIGURATION	VOLTAGE	WATTS	FINISH	FIXTURE LUMENS	DIFFUSER/LENS	REFLECTOR	OPTIONS	NOTES	MANUFACTURER (CATALOG SERIES)		
		LENGTH	DEPTH	HEIGHT	DIAMETER/ APERTURE														OPTION 1	OPTION 2	OPTION 3
(DX-1)	6" ROUND, RECESSED LED DOWNLIGHT, SEMI-SPECULAR REFLECTOR, WHITE TRIM FINISH	-	-	-	0' - 6"	CR	LED	3500K		0-10V DIMMING (10%)	120/277	19	WH	1500			-		GOTHAM (EVO-35/15-6AR-WD-LSS-MVOLT-EZ10-TWR)	LITON (LHALD612C034UE-D10/LRALD6SWF160-B60-T35)	KENALL (MRIDL6-FF-PAFW-31L-35K8-M-CS-T-RIMRI6-24V-DIM1)
(DX-5)	6" ROUND, LED MRI DOWNLIGHT, NON-FEROUS, REMOTE DIMMING DRIVERS, WHITE TRIM FINISH	-	-	-	0' - 6"	CR	LED	3500K		0-10V DIMMING (<1%)	120/277	32	WH	2000			-		KURTZON (MLIBD-4-8-DLH35-UNV-WBWT)	KIRLIN (MRR-06420-RFI-3100D-LPS-1220A)	KENALL (MRIDL6-FF-PAFW-31L-35K8-M-CS-T-RIMRI6-24V-DIM1)
(GS-1)	2' X 2' LED TROFFER, EDGE LIT PANELS, GRID LAY-IN	2' - 0"	2' - 0"	-	-	CR	LED	3500K		0-10V DIMMING (10%)	120/277	29	-	3400			-		METALUX (2EN)	PINACCLE (AD22)	
(GS-2)	2' X 4' LED TROFFER, EDGE LIT PANELS, GRID LAY-IN	4' - 0"	2' - 0"	-	-	CR	LED	3500K		0-10V DIMMING (10%)	120/277	38	-	4300			-		METALUX (24EN)	PINNACLE (AD24)	
(NF-10)	4" X 10' LINEAR RECESSED SLOT, MRI ROOM RATED, GRID MOUNT, WHITE TRIM FINISH	10' - 0"	0' - 4"	-	-	CR	LED	3500K		0-10V DIMMING (10%)	120/277	43	WH	5000			-		PINNACLE (EV4D-A-835-10'-GX-U-OL2-1-0-W-MRI-190776)		
(SA-1)	4' LED STRIP LIGHT, WHITE FINISH	4' - 0"	-	-	-	CS	LED	3500K		NO DIMMING	120/277	42	WH	3000	-	-	-		LITHONIA (ZL2N L48 MDD MVOLT 40K 80CRI WH)	DAYBRITE (LF4FR3140UDZT)	METALUX (4SNLED-LD4-30SL-LW-UNV-L840-CD1-U)
(TX-7)	4' X 8' LED FLAT PANEL MRI SCENE LIGHT, WALL MOUNTED, NON-ANTIMICROBIAL FINISH	4' - 0"	8' - 0"	-	-	W	LED	3500K		ELV DIMMING	120/277	64	-	0					FOLIO (ZERO-40)		
(TX-8)	4' X 4' LED FLAT PANEL MRI SCENE LIGHT, GRID LAY-IN MOUNTED, NON-ANTIMICROBIAL FINISH	4' - 0"	4' - 0"	-	-	CR	LED	6500K		ELV DIMMING	120/277	26	-	2500			-		FOLIO (ZERO-100)		
(UC-5)	24" LED UNDERCABINET LIGHT	2' - 0"	-	-	-	S	LED	3500K		ELV DIMMING	120/277	8	WH	600					DAY-BRITE (LINCS100E-L28-935-UNV-WHG-DIM)	KENALL (AUCLED-1-MW-11L35K-24-277)	AIREY-THOMPSON (13HC-N-35K-24-2-3-D11)

LIGHTING/SPACE CONTROL TYPE SCHEDULE

WIRING LEGEND

- LINE VOLTAGE WIRING
- 0-10V WIRING
- CAT5E CABLING
- WIRING BY OTHERS
- TMP SEGMENT NETWORK CABLING

APPROVED MANUFACTURERS

1. WATTSTOPPER (BASIS OF DESIGN)
2. NLIGHT
3. HUBBEL BUILDING AUTOMATION
4. GREENGATE

LIGHTING CONTROL ID

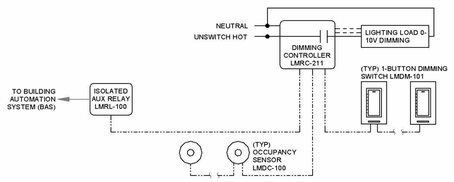
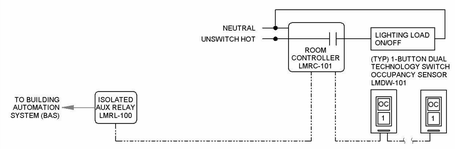
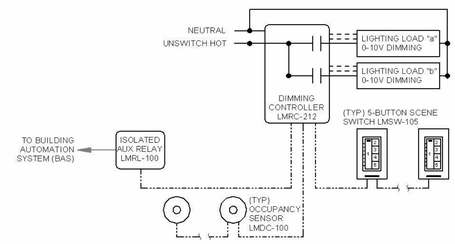
1. # = NUMBER OF ZONES
2. D = DIMMING, S = SWITCHING
3. P = DAYLIGHT PHOTOCELL
4. L = PLUG LOAD CONTROLLER
5. # = INSTANCE

GENERAL NOTES

1. COORDINATE INITIAL PROGRAMMING WITH OWNER AND MODIFY CONTROL TIMES AND OPERATION AS REQUESTED BY OWNER.
2. PROVIDE FINE TUNING PROGRAMMING AND ADJUSTMENTS UPON REQUEST BY OWNER WITHIN FIRST 6 MONTHS AFTER SUBSTANTIAL COMPLETION.
3. PROVIDE CUSTOMIZED ENGRAVED PERMANENT BUTTON LABELS ON EACH SWITCH, LABEL TO MATCH BUTTON LABEL ID OR AS DIRECTED BY OWNER.
4. PART NUMBERS SHOWN ARE BASED ON WATTSTOPPER AS THE BASIS OF DESIGN. ALL APPROVED MANUFACTURERS ARE SUBJECT TO MEETING ALL FUNCTIONS AND CAPABILITIES OF THE BASIS OF DESIGN SYSTEM AND PRODUCTS. FAILURE TO MEET THESE SHALL REQUIRE THE CONTRACTOR TO PROVIDE A SYSTEM THAT DOES AT NOT ADDITIONAL COST.

GENERAL NOTES

5. REFER TO PLANS FOR LOCATIONS AND QUANTITIES OF DEVICES.
6. INSTALL ONE OF EACH CONTROL TYPE WITH PROGRAMMING, ADJUST, AND OBTAIN OWNERS APPROVAL PRIOR TO PROGRAMMING THE REMAINING CONTROLS.
7. WIRING MAY VARY BETWEEN MANUFACTURERS. CONTRACTOR IS RESPONSIBLE FOR PROVIDING THE REQUIRED WIRING THAT WILL BOTH MEET THE MANUFACTURERS REQUIREMENTS AND MATCH WITH THE SHOWN SYSTEM.
8. PROVIDE COMPLETE SHOP DRAWING SUBMITTALS INCLUDING OCCUPANCY SENSOR LAYOUT AND COVERAGE PATTERNS. PROVIDE ADDITIONAL SENSORS AS REQUIRED FOR 100% COVERAGE OF SPACES WITH OCCUPANCY SENSOR CONTROL.

ID	DETAIL	LIGHTS ON CONTROL	LIGHTS OFF CONTROL	LIGHTING CONTROL TYPE	DAYLIGHT SENSOR SETTING (FC)	TIME DELAY TO OFF (MIN.)	BAS AUX RELAY SIGNAL	PLUG LOAD CONTROLLER	NETWORKED CONTROLS	BUTTON_1	BUTTON_2	BUTTON_3	BUTTON_4	BUTTON_5	BUTTON_6	BUTTON_7	BUTTON_8	BUTTON_9	NOTES
1D1		MANUAL & OCCUPANCY	MANUAL OR OCCUPANCY	DIMMING 0-10V	-	15	RELAY CLOSED ON OCCUPANCY	-	-	FUNCTION: PRESS TOP-ON, HOLD TOP-RAISE LABEL ID: TOP-"ON/RAISE" BOTTOM-"OFF/LOWER"	-	-	-	-	-	-	-	-	-	
1S1		MANUAL & OCCUPANCY	MANUAL OR OCCUPANCY	ON/OFF	-	15	RELAY CLOSED ON OCCUPANCY	-	-	FUNTION: PRESS-ON PRESS-OFF LABEL ID:"ON/OFF"	-	-	-	-	-	-	-	-	
2D1		MANUAL & OCCUPANCY	MANUAL OR OCCUPANCY	DIMMING 0-10V	-	15	RELAY CLOSED ON OCCUPANCY	-	-	TOGGLE PRESS TOP-ON, PRESS BOTTOM-OFF, HOLD TOP-RAISE, HOLD BOTTOM-"OFF/LOWER"	FUNCTION: PRESS-PRESET SCENE #01 ZONE "a" 75% ZONE "b" 75% LABEL ID: "PRE #1"	FUNCTION: PRESS-PRESET SCENE #02 ZONE "a" 0% ZONE "b" 50% LABEL ID: "PRE #2"	FUNCTION: PRESS-SELECT ZONE "a" FOR DIMMING LABEL ID: "ZONE a"	FUNCTION: PRESS-SELECT ZONE "b" FOR DIMMING LABEL ID: "ZONE b"	-	-	-	-		

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No. 185978
PETER E. JOHANSEN
05/08/2020

TIMPANOGOS MRI RETROFIT

KEY PLAN

REVISION

NO.	DESCRIPTION	DATE

HKS PROJECT NUMBER
23798.000
DATE
05/08/20
ISSUE
CONSTRUCTION DOCUMENTS
SHEET TITLE
INTERIOR LIGHTING FIXTURE SCHEDULE
SHEET NO.
EL601

CABLE/OUTLET COLOR SCHEDULE

COLOR	TYPE
BLACK	TV COAX

EQUIPMENT/CABLE LIST

THE ITEMS INDICATED BELOW SHALL NOT BE CONSTRUED AS A "BILL OF MATERIALS". THIS LIST IDENTIFIES ITEMS OF SIGNIFICANCE USED DURING THE DESIGN OF THE CABLING INSTALLATION. WHERE THE ITEMS INDICATED ARE ONE PORTION OF AN ASSEMBLY, THE ENTIRE ASSEMBLY SHALL BE PROVIDED UNLESS SPECIFIED OTHERWISE. PROVIDE ALL MISCELLANEOUS HARDWARE AND SUPPORTS WHICH MAY NOT BE LISTED HERE, FOR A COMPLETE INSTALLATION. COMPARE CATALOG NUMBERS WITH DESCRIPTIONS AND NOTIFY ENGINEER OF DISCREPANCIES PRIOR TO BID. IF CATALOG NUMBERS DO NOT MATCH DESCRIPTIONS, THE DESCRIPTIONS TAKE PRECEDENCE. PROVIDE COMPLETE SUBMITTAL FOR APPROVAL PRIOR TO PURCHASING ANY EQUIPMENT OR CABLE. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

SYMBOL	ITEM DESCRIPTION	ACCEPTABLE TYPES
	STATION CABLE, DATA - CATEGORY 6A UTP, PLENUM, BLACK, DATA	BELDEN 2413010
▽	DATA OUTLET, SINGLE GANG FACEPLATE, WHITE, 4 POSITION	BELDEN AX106663
	CATEGORY 6A JACK - DATA, BLACK	BELDEN AX10166
	BLANK INSERT, WHITE	BELDEN A0405538
◮	DATA OUTLET, SINGLE GANG FACEPLATE, WHITE, 4 POSITION	BELDEN AX106663
	CATEGORY 6A JACK - DATA, BLACK	BELDEN AX10166
	BLANK INSERT, WHITE	BELDEN A0405538
4 ▼	DATA OUTLET, SINGLE GANG FACEPLATE, WHITE, 4 POSITION	BELDEN AX106663
	CATEGORY 6A JACK - DATA, BLACK	BELDEN AX101066
SPP1	48 PORT, 2RU ANGLE PATCH PANEL WITH OUTLETS	BELDEN AX103255
HWM	HORIZONTAL WIRE MANAGERS, 4RU	PANDUIT NCMHAEF4

NOTE: ALL RACKS, LADDER, PATCH PANELS AND ACCESSORIES SHALL BE BLACK IN COLOR.

GENERAL PROJECT NOTES

1. UNLESS OTHERWISE NOTED, INSTALL ALL CABLE INSIDE RACEWAY SYSTEMS. WHERE RACEWAY SYSTEMS HAVE NOT BEEN PROVIDED OR SPECIFIED, INSTALL CABLE THROUGH THE SPECIFIED "CADDY" CLIPS AT THE MINIMUM INTERVALS IDENTIFIED IN THE SPECIFICATIONS. SUPPORT "CADDY" CLIPS DIRECTLY FROM THE BUILDING STRUCTURE, NOT FROM OTHER BUILDING SYSTEM SUPPORT WIRES OR CABLE.
2. PROVIDE PLENUM RATED CABLE IN ALL AIR PLENUMS. IF A PLENUM RATED CABLE IS NOT SPECIFIED, PROVIDE THE PLENUM RATED EQUIVALENT TO THE SPECIFIED CABLE.
3. LABEL ALL CABLE INSTALLED UNDER THIS CONTRACT REGARDLESS OF LENGTH.
4. THE EQUIPMENT LABELING IDENTIFIED ON DETAILS IN THESE DRAWINGS ARE EXAMPLES ONLY OF THE ACTUAL LABELING WHICH IS REQUIRED AS PART OF THIS CONTRACT. PRIOR TO FABRICATION, SUBMIT THE NOMENCLATURE FOR ALL LABELS TO THE OWNER FOR REVIEW. THIS REQUIREMENT INCLUDES BUT IS NOT LIMITED TO ALL CABLE LABELING, AND ALL EQUIPMENT LABELING.
5. IF OUTLET IS TERMINATED IN CEILING SPACE, LABEL THE T-BAR GRID WITH THE OUTLET NUMBER FOR EASY LOCATION AND IDENTIFICATION.
6. GROUND ALL EQUIPMENT RACKS INSTALLED UNDER THIS CONTRACT IN COMPLIANCE WITH THE CONTRACT DOCUMENTS.
7. FOR EVERY CABLE PULL SPECIFIED, COIL 15' OF EXCESS CABLE AT THE STATION END FOR FUTURE USE. NEATLY COIL 15' ABOVE THE CEILING OR BELOW FLOOR WHERE APPLICABLE.
8. PROVIDE THE QUANTITY OF PATCH PANELS REQUIRED +20% FOR THE TOTAL DATA OUTLETS SHOWN ON FLOOR PLANS FOR THE PARTICULAR LEVEL.
9. RACK SPACE ALLOCATION SHOULD BE FOLLOWED PER DRAWINGS. IF YOU HAVE A SYSTEM THAT HAS NOT RACK ALLOCATION PLEASE CALL BOE SAUSEDO AT 801-707-3805.
10. ALL DATA LOCATIONS ARE NOT SHOWN IN ET SHEETS. REFER TO ENLARGED POWER PLANS FOR DATA LOCATIONS IF NOT SHOWN ON ET SHEETS.

ABBREVIATIONS

NOTE: ALL ABBREVIATIONS MAY NOT BE USED.

A	AUGMENTED
CAT	CATEGORY
E	ENHANCED
EA	EACH
ER	EQUIPMENT ROOM
FPP	FIBER PATCH PANEL
GIG	GIGA HERTZ
HWM	HORIZONTAL WIRE MANAGEMENT
NIC	NOT IN CONTRACT
OE	OWNER ELECTRONICS
PNM	PLENUM
PR	PAIR
PS	POWER SUPPLY
RPP	RISER PATCH PANEL
SPP	STATION PATCH PANEL
TC	TELECOMMUNICATIONS ROOM
TYP	TYPICAL
VWM	VERTICAL WIRE MANANGEMENT

DEFINITIONS

NOTE: ALL DEFINITIONS MAY NOT BE USED.

INDICATED: THE TERM "INDICATED" REFERS TO GRAPHIC REPRESENTATIONS, NOTES, OR SCHEDULES ON THE DRAWINGS, OTHER PARAGRAPHS OR SCHEDULES IN THE SPECIFICATIONS, AND SIMILAR REQUIREMENTS IN THE CONTRACT DOCUMENTS. WHERE TERMS SUCH AS "SHOWN", "NOTED", "SCHEDULED", AND "SPECIFIED" ARE USED, IT IS TO HELP THE READER LOCATE THE REFERENCE, NO LIMITATION ON LOCATION IS INTENDED.

DIRECTED: TERMS SUCH AS "DIRECTED", "REQUESTED", AUTHORIZED", "SELECTED", "APPROVED", "REQUIRED", AND "PERMITTED" MEAN "DIRECTED BY THE ENGINEER", "REQUESTED BY THE ENGINEER", AND SIMILAR PHRASES.

APPROVE: THE TERM "APPROVED", WHERE USED IN CONJUNCTION WITH THE ENGINEER'S ACTION ON THE CONTRACTOR'S SUBMITTALS, APPLICATIONS, AND REQUESTS, IS LIMITED TO THE ENGINEER'S DUTIES AND RESPONSIBILITIES AS STATED IN GENERAL AND SUPPLEMENTARY CONDITIONS.

FURNISH: THE TERM "FURNISH" IS USED TO MEAN "SUPPLY AND DELIVER TO THE PROJECT SITE, READY FOR UNLOADING, UNPACKING, ASSEMBLY, INSTALLATION, AND SIMILAR OPERATIONS."

INSTALL: THE TERM "INSTALL" IS USED TO DESCRIBE OPERATIONS AT PROJECT SITE INCLUDING THE ACTUAL "UNLOADING, UNPACKING, ASSEMBLY, ERECTION, PLACING, ANCHORING, APPLYING, WORKING TO DIMENSION, FINISHING, CURING, PROTECTING, CLEANING, AND SIMILAR OPERATIONS."

PROVIDE: THE TERM "PROVIDE" MEANS "TO FURNISH AND INSTALL, COMPLETE AND READY FOR THE INTENDED USE."

INSTALLER: AN "INSTALLER" IS THE CONTRACTOR OR AN ENTITY ENGAGED BY THE CONTRACTOR, EITHER AS AN EMPLOYEE, SUBCONTRACTOR, OR SUB-SUBCONTRACTOR, FOR PERFORMANCE OF A PARTICULAR CONSTRUCTION ACTIVITY, INCLUDING INSTALLATION, ERECTION, APPLICATION, AND SIMILAR OPERATIONS. INSTALLERS ARE REQUIRED TO BE EXPERIENCED IN THE OPERATIONS THEY ARE ENGAGED TO PERFORM.

ELECTRONIC SYSTEMS: THE TERM "ELECTRONIC SYSTEMS" IS USED TO DESCRIBE ALL LOW VOLTAGE SYSTEMS GENERALLY REFERRED TO AS "SPECIAL SYSTEMS". THESE SYSTEMS INCLUDE BUT ARE NOT NECESSARILY LIMITED TO ALL SYSTEMS WHICH UTILIZE VOLTAGES OF LESS THAN 71 VOLTS SUCH AS SOUND SYSTEMS, VIDEO SYSTEMS, TV SYSTEMS, SECURITY SYSTEMS, VOICE AND DATA CABLING SYSTEMS, ETC...

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STATE OF UTAH
05/08/2020

TIMPANOGOS MRI RETROFIT

KEY PLAN

REVISION
NO. DESCRIPTION DATE

HKS PROJECT NUMBER
23798.000
DATE
05/08/20
ISSUE
CONSTRUCTION DOCUMENTS
SHEET TITLE
TELECOMM SYMBOLS

SHEET NO.
ET001

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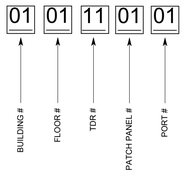
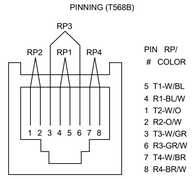


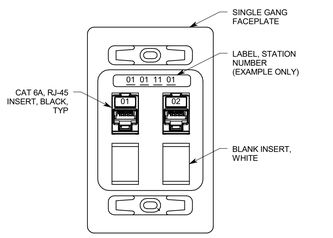
8 CABLE ID EXAMPLE DETAIL

NO SCALE



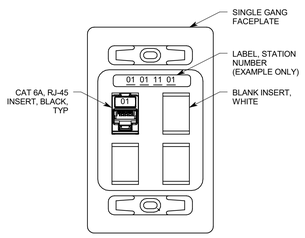
5 TYPICAL VOICE-DATA OUTLET PINNING DETAIL

NO SCALE



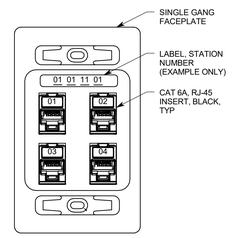
9 TYPICAL 2-PORT DATA OUTLET

NO SCALE



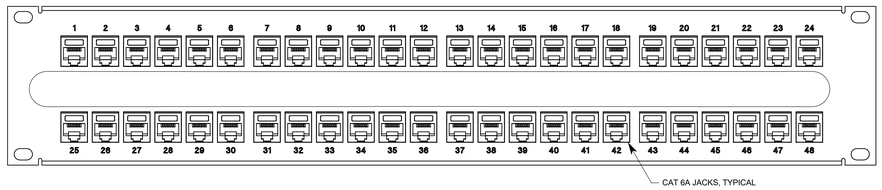
6 TYPICAL 1-PORT DATA OUTLET

NO SCALE



3 TYPICAL 4-PORT DATA OUTLET

NO SCALE



1 STATION PATCH PANEL, (SPP1)

NO SCALE

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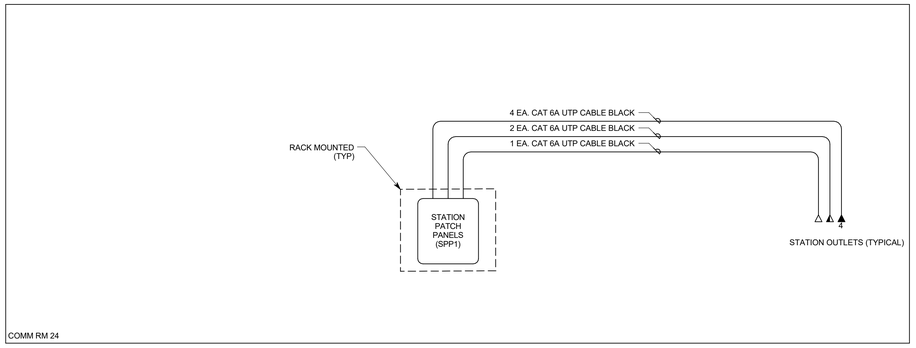
TIMPANOGOS MRI RETROFIT

KEY PLAN

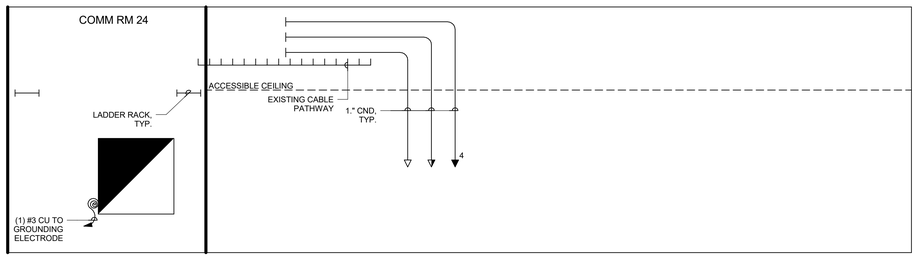
REVISION
NO. DESCRIPTION DATE

HKS PROJECT NUMBER
23798.000
DATE
05/08/20
ISSUE
CONSTRUCTION DOCUMENTS
SHEET TITLE
VOICE/ DATA CONDUIT RISER DIAGRAM
SHEET NO.
ET601



2 TELECOM CABLE RISER DIAGRAM

NO SCALE



1 TELECOM CONDUIT RISER DIAGRAM

NO SCALE

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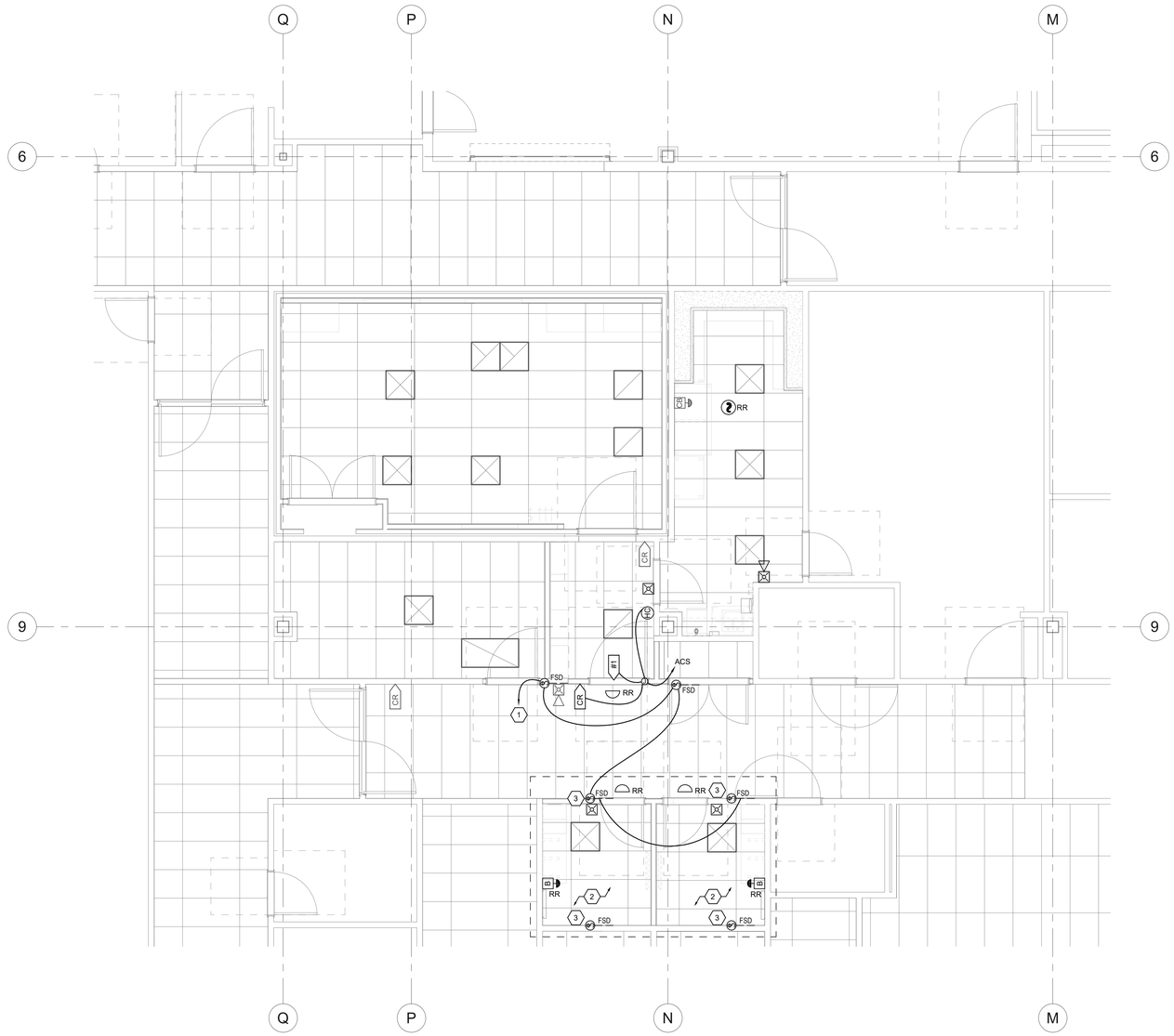
TIMPANOGOS MRI RETROFIT

KEY PLAN

REVISION
NO. DESCRIPTION DATE

HKS PROJECT NUMBER
23798.000
DATE
05/08/20
ISSUE
CONSTRUCTION DOCUMENTS
SHEET TITLE
TELECOM DETAILS

SHEET NO.
ET602



1 LEVEL 1 AUXILIARY PLAN
SCALE: 1/4" = 1'-0"

GENERAL SHEET NOTES

SHEET KEYNOTES

1 CONNECT TO EXISTING FIRE/SMOKE DAMPER CIRCUIT THAT PREVIOUSLY FED THE DEMOLISHED FIRE SMOKE DAMPERS.

2 WORK IN THIS AREA TO BE INCLUDED AS PART OF ADD ALTERNATE #1 WITH THE EXCEPTION OF THE FIRE SMOKE DAMPERS, WHICH SHOULD BE INCLUDED IN THE BASE BID.

3 IF ADD ALTERNATE IS ACCEPTED FIRE SMOKE DAMPER WILL BE INSTALLED IN THE EAST WALL. OTHERWISE IT WILL BE ISNTALLED IN THE WEST WALL.

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DATE
05/08/20
ISSUE
CONSTRUCTION DOCUMENTS
SHEET TITLE
LEVEL 1 AUXILIARY PLAN

SHEET NO.
EY101

REV	DATE	MODIFICATIONS
A	05/Mar/2020	FINAL DRAWING BASED ON REQUEST DC-221005

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

A mandatory component of this drawing set is the GE Healthcare Pre Installation manual. Failure to reference the Pre Installation manual will result in incomplete documentation required for site design and preparation.
Pre Installation documents for GE Healthcare products can be accessed on the web at: www.gehealthcare.com/siteplanning

TIMPANOGOS REGIONAL HOSPITAL
OREM, UTAH
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GE Healthcare

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SIGNA ARTIST
FINAL STUDY

Drawn by	Verified by	Concession	S.O. (GON)	PIM Manual	Rev
TNC	PMM	-	4856592	5670001	13

Format	Scale	File Name	Date	Sheet
A3	1/4"=1'-0"	MRI-M139562-FIN-00-A.DWG	05/Mar/2020	01/24

DISCLAIMER

GENERAL SPECIFICATIONS

- GE is not responsible for the installation of developers and associated equipment, lighting, cassette trays and protective screens or derivatives not mentioned in the order.
- The final study contains recommendations for the location of GE equipment and associated devices, electrical wiring and room arrangements. When preparing the study, every effort has been made to consider every aspect of the actual equipment expected to be installed.
- The layout of the equipment offered by GE, the dimensions given for the premises, the details provided for the pre-installation work and electrical power supply are given according to the information noted during on-site study and the wishes expressed by the customer.
- The room dimensions used to create the equipment layout may originate from a previous layout and may not be accurate as they may not have been verified on site. GE cannot take any responsibility for errors due to lack of information.
- Dimensions apply to finished surfaces of the room.
- Actual configuration may differ from options presented in some typical views or tables.
- If this set of final drawings has been approved by the customer, any subsequent modification of the site must be subject to further investigation by GE about the feasibility of installing the equipment. Any reservations must be noted.
- The equipment layout indicates the placement and interconnection of the indicated equipment components. There may be local requirements that could impact the placement of these components. It remains the customer's responsibility to ensure that the site and final equipment placement complies with all applicable local requirements.
- All work required to install GE equipment must be carried out in compliance with the building regulations and the safety standards of legal force in the country concerned.
- These drawings are not to be used for actual construction purposes. The company cannot take responsibility for any damage resulting therefrom.

CUSTOMER RESPONSIBILITIES

- It is the responsibility of the customer to prepare the site in accordance with the specifications stated in the final study. A detailed site readiness checklist is provided by GE. It is the responsibility of the customer to ensure all requirements are fulfilled and that the site conforms to all specifications defined in the checklist and final study. The GE Project Manager of Installation (PMI) will work in cooperation with the customer to follow up and ensure that actions in the checklist are complete, and if necessary, will aid in the rescheduling of the delivery and installation date.
- Prior to installation, a structrual engineer of record must ensure that the floor and ceiling is designed in such a way that the loads of the installed system can be securely borne and transferred. The layout of additional structural elements, dimensioning and the selection of appropriate installation methods are the sole responsibility of the structural engineer. Execution of load bearing structures supporting equipment on the ceiling, floor or walls are the customer's responsibility.

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

GLOBAL SITE READINESS CHECKLIST (DI)

DOC1809666 Rev. 6

Customer Name:	PMI Name:
GON/SO Number:	Field Service Name:
Equipment:	Country/City or City/State:
Site Visit Date for SRC:	SRC Status:

Site Ready Checks at Installation
General Site Planning
Room dimensions, including ceiling height, for all Exam, Equipment/Technical & Control rooms meets GE specifications.
Ceiling support structure, if on the GE drawing, is at correct location and height according to the drawing specifications. Levelness and spacing has been measured. Overhead support Structure has been confirmed with contractor to meet GE criteria.
Rooms that will contain equipment, including staging areas if applicable, are construction debris free. Precautions must be taken to prevent debris from entering rooms containing equipment.
Finished ceiling is installed. If applicable ceiling tiles installed per PMI discretion.
Delivery route from truck to installation space has been reviewed, all communications have occurred, arrangements made for special handling (if needed). Floors along delivery route will support weight of the equipment, reinforcements arranged if needed.
System power & grounding (PDB/MDP) is available as per GE specifications, installed at point of final connection and ready to use. Lock Out Tag Out is available.
System power and grounded audit has been scheduled to be completed during installation of equipment. (If Required) GEHC PM to confirmed if needed.
Adequate room illumination installed and working.
Cableways (floor, wall, ceiling, etc.) ready for GE cables and are of correct length and diameter. Cableways routed per GE Final drawings and access openings installed as determined by GEHC PM. Surface floor duct installed at time of system installation.
HVAC systems Installed, and the site meets minimum environmental operational system requirements.
Network outlets installed and computer network available and working.
Hospital IT/connectivity contacts have been engaged and information has been added to Project management tool. (If Required)
Floor levelness/flatness is measured and within tolerance, and there are no visible defects per GEHC specifications. Floor Strength and thickness have been discussed with customer/contractor and they have confirmed GE requirements are met.
Customer supplied countertops where GE equipment will be installed are in place.
Specific for MR
RF Shield installed with possible exception of magnet entrance. RF Shield Effectivity and Ground Isolation Test needed. If GE is supplying RF shield, the RF shield Effectivity and Ground Isolation Test data is a Mandatory attachment into MyProjects.
Power and connectivity is available for magnet monitoring.
Delivery route for He dewars & gradient coil cart to the scanning room is available.
Chilled water supply for Water Cooled Compressor or Air Cooled Compressor is ready and meets GE specifications.
Water drain available in the equipment room, if applicable.
Power for MR compressor & Chiller is available.
Ensure cryogen venting system is available for magnet connection.
Exhaust fan system is installed and operational per GE requirements.

PMI Signature:	
Customer Signature:	
FS Signatature: optional	

CUSTOMER SITE READINESS REQUIREMENTS

- Any deviation from these drawings must be communicated in writing to and reviewed by your local GE healthcare installation project manager prior to making changes.
- Make arrangements for any rigging, special handling, or facility modifications that must be made to deliver the equipment to the installation site. If desired, your local GE healthcare installation project manager can supply a reference list of rigging contractors.
- New construction requires the following;
  1. Secure area for equipment,
  2. Power for drills and other test equipment,
  3. Capability for image analysis,
  4. Restrooms.
- Provide for refuse removal and disposal (e.g. crates, cartons, packing)
- It is the customer's responsibility to contract a vibration consultant/engineer to implement site design modifications to meet the GE vibration specification. Refer to the system preinstallation manual for the vibration specification.

MRI SITE PLANNING REMINDERS

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

1. The layout should be arranged so that the 5g line is contained to the magnet room. If not possible, a barrier is recommended to prevent entry to the 5g field area.
2. The spaces around, above, and below the magnet must be reviewed for effects of the 5g, 3g, 1g, and .5g fields. Refer to the proximity limit chart in the MR pre-installation manual referenced on the cover sheet.
3. For moving metal, the restriction lines typically extend outside of the MR space. Please confirm there are no moving metal concerns within these areas.
4. For vibration, analysis to be completed as required per pre-installation manual.
5. For EMI, review the site for the location of the main electrical feeders, AC devices, or distribution systems. An EMI study is recommended if large AC systems are nearby.
6. Details of the floor below the magnet must be reviewed. The structural engineer must verify that the quantity of steel in the volume 10ft [3.1m] x 10ft [3.1m] x 1ft [.3m] deep (below the magnet) does not exceed the allowable steel content as given in the MR pre-installation manual referenced on the cover sheet.
7. Remove, cover, or fill-in abandoned ducts or troughs from the Equipment and Magnet rooms. Access/computer room flooring in the Equipment room can either be removed or assessed and reinforced to support heavier cabinets.

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

IMAGE QUALITY CONSIDERATIONS

Broadband RF noise is a single transient or continuous series of transient disturbances caused by an electrical discharge. Low humidity environmental conditions will have higher probability of electrical discharge. The electrical discharge can occur due to electrical arcing (micro arcing) or merely static discharge. Some potential sources capable of producing electrical discharge include:

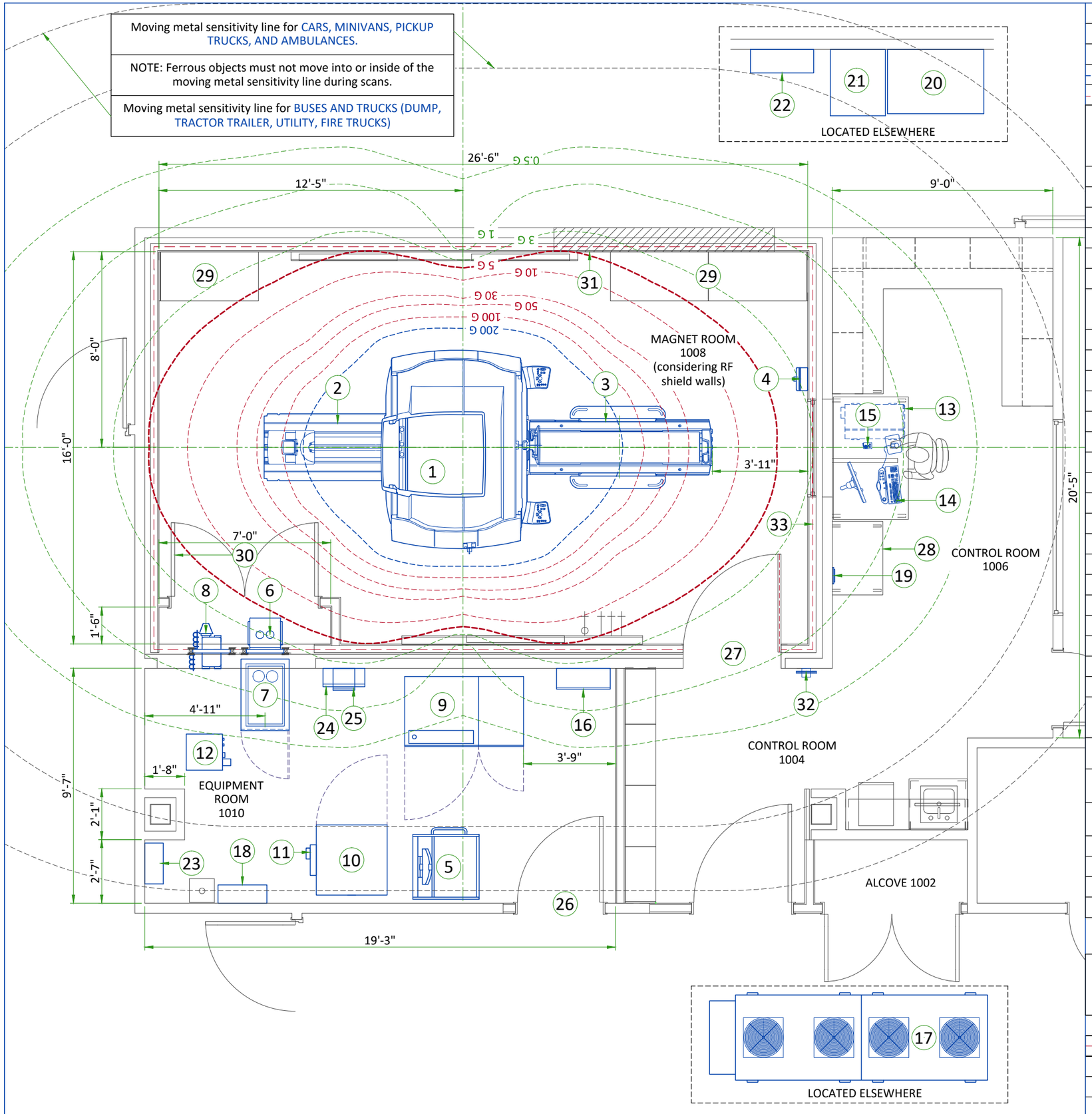
- Loose hardware/fasteners vibration or movement (electrical contunuity must always be maintained)
- Flooring material including raised access flooring (panels & support hardware) and carpeting
- Electrical fixtures (i.e. Lighting fixtures, track lighting, emergency lighting, battery chargers, outlets)
- Ducting for HVAC and cable routing
- RF shield seals (walls, doors, windows etc.)

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

MAGNETIC INTERFERENCE SPECIFICATIONS

- The customer must establish protocols to prevent persons with cardiac pacemakers, neurostimulators, and biostimulation devices from entering magnetic fields of greater than 5 gauss (exclustion zone).
- Main power transformers must remain outside the 3 gauss field. EMI < 20mg rms ac. EMI < 5.87mg dc.
- Potential exists under fault conditions that the 5 gauss line may expand radially to 9.35 ft. [2.85 m] and axially to 14.27 ft. [4.35 m] for 1 seconds or less. It should be noted that normal rampdowns or magnet rundown unit initiated quenches will not cause the magnetic field to expand.
- It is recommended every site consider the event of a quench and plan accordingly (such as placing 5 gauss warning signs at expanded locations).
- The ferrous metal objects listed below must not move into or inside of the moving metal sensitivity line during scans.

TYPCIAL MOVING MAGNETIC MASS	DISTANCE RADIALLY		DISTANCE AXIALLY	
Carts, Gurneys 100-400 lbs [45-182 kg]	3 Gauss line		3 Gauss line	
Forklifts, small elevator, cars, minivans vans, pickup trucks, ambulances (objects greater than 400 lbs [182 kg])	15.5 FT	4.72 M	24.6 FT	7.5 M
Buses and trucks (dump, tractor trailer, utility, fire trucks)	18.1 FT	5.52 M	28.75 FT	8.76 M



LEGEND

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

BY	ITEM	DESCRIPTION	MAX HEAT OUTPUT (btu)	WEIGHT (lbs)
A	1	1.5T Magnet	8189	11173
A	2	Rear pedestal	-	212
A	3	GEM Patient table	-	463
A	4	Magnet rundown unit	-	7
A	5	Phantom set storage cabinet	-	350
A	6	Blower box	1535	-
A	7	Penetration cabinet	1024/ 10697	639
A	8	Secondary penetration wall	-	92
A	9	Power, gradient, RF cabinet	20940	3144
A	10	Heat exchanger cabinet	3412	1350
A	11	Magnet monitor	819	10
A	12	Cryocooler compressor	1706	264
A	13	Operator console computer	4947	141.75
A	14	Operator workspace	-	26
A	15	Pneumatic patient alert	-	0.5
B	16	Main disconnect panel	901	130
B	17	Dimplex chiller	167300	4000
B	18	Water filter	-	-
B	19	Remote graphic display	-	-
B	20	150 kva UPS system	31795	2160
B	21	UPS Battery cabinet	-	3529
B	22	Maintenance bypass panel	-	350
B	23	Water bypass	-	-
C	24	DC Lighting control	-	-
C	25	DC Lighting transformer	-	-
C	26	Minimum opening for equipment delivery is 40 in. w x 82 in. h, contingent on a 72 in. corridor width		
C	27	Minimum opening for delivery is 43 in. w x 82 in. h, contingent on a 96 in. corridor width		
C	28	Counter top for equipment- provide grommeted openings as required to route cables		
C	29	Base cabinet for storage of: surface coils, patient positioning pads, phantoms, etc.		
C	30	Louvered doors - refer to preinstall for requirements		
C	31	Magnet access 9'-0"x9'-0"		
C	32	Metal Detector (hand held)		
C	33	Define RF shield's inset according to provisions made by the RF Shield vendor		

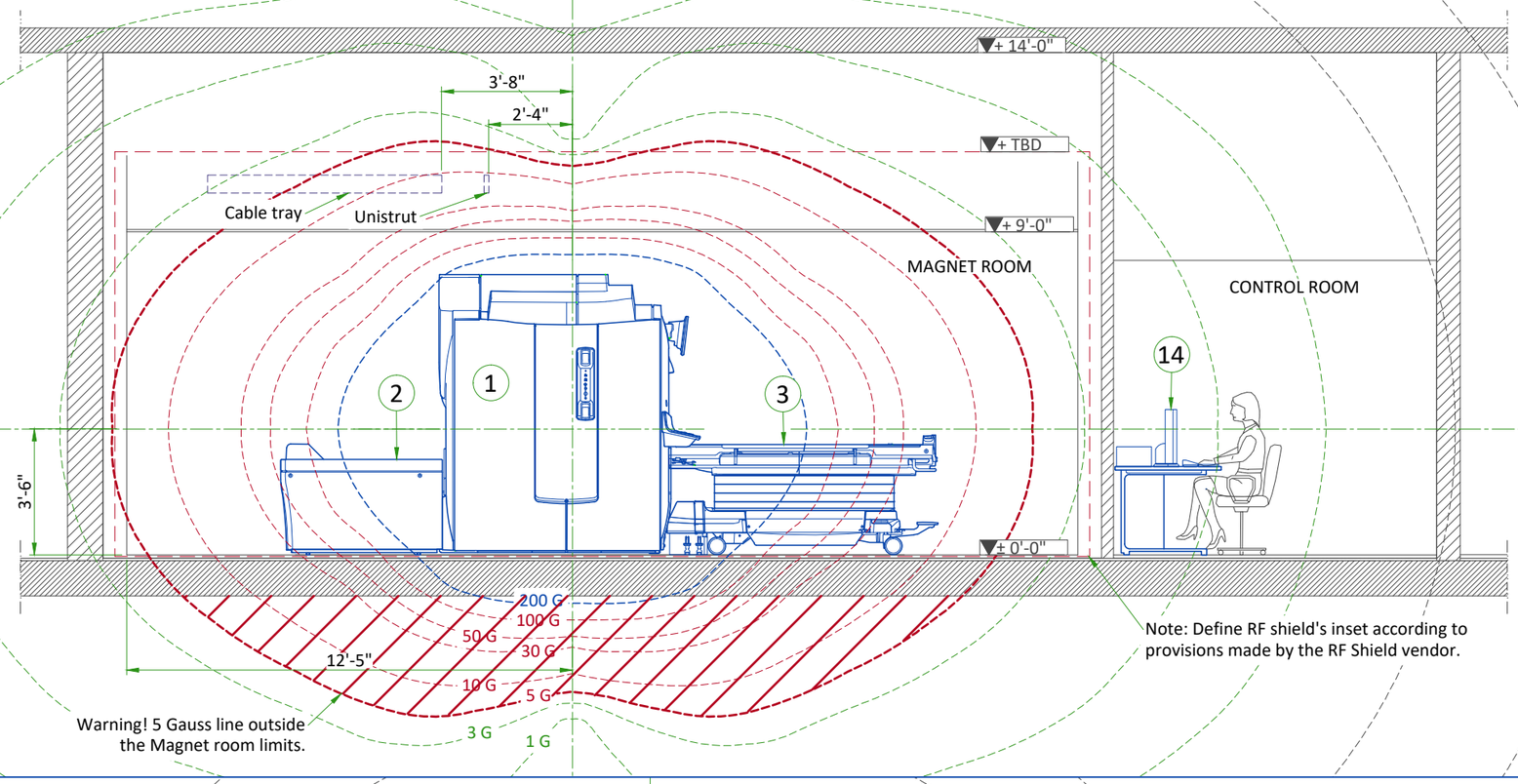
The GE HPI Technical Support Group is an additional resource that can provide answers for general GE product siting questions and can be reached at (877)-305-9677 or mail to:HPITechCOE@ge.com

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

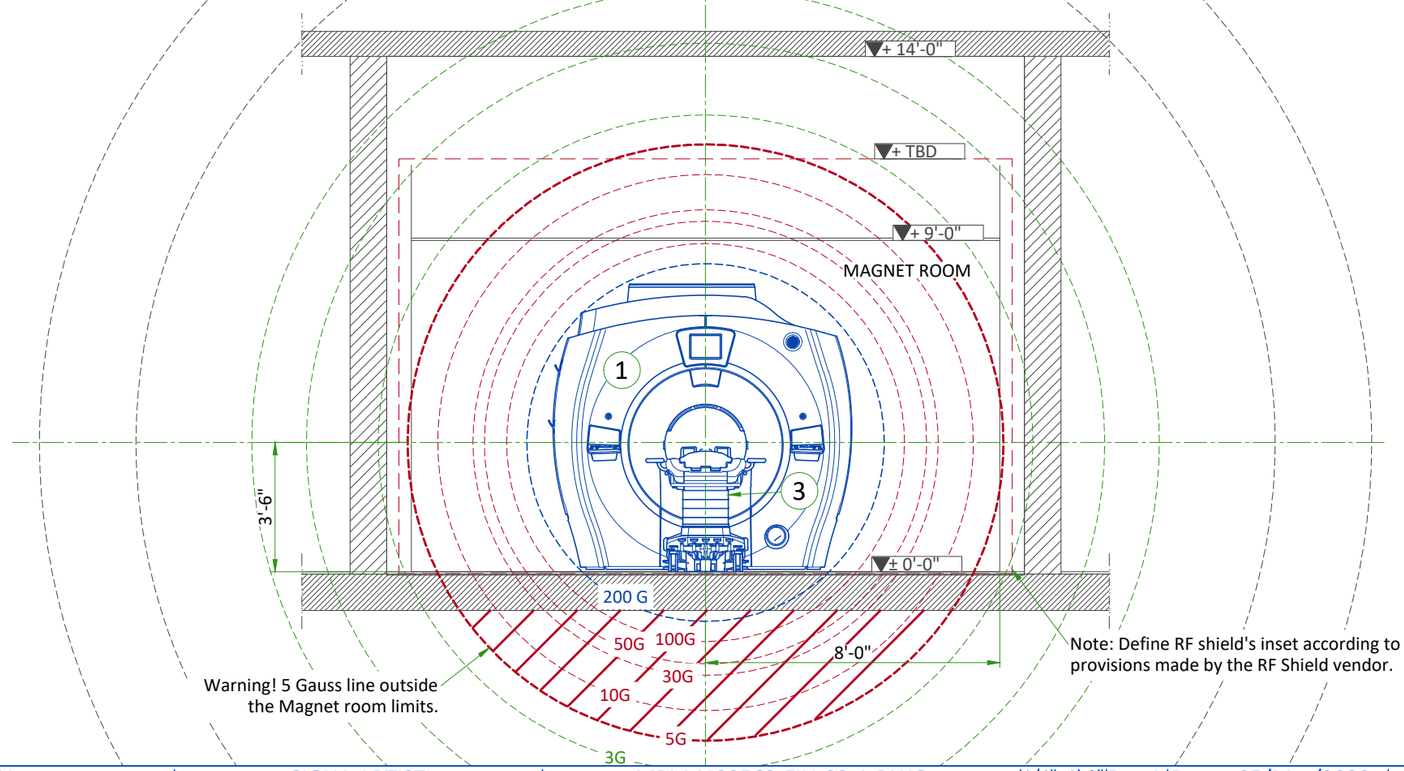
RF SHIELD - 100 dB ATTENUATION

Exam room height	
Finished floor to slab height	TBD
Finished ceiling height	9'-0"

SIDE VIEW WITH MAGNETIC FIELD



FRONT VIEW WITH MAGNETIC FIELD



ACOUSTICS SPECIFICATIONS

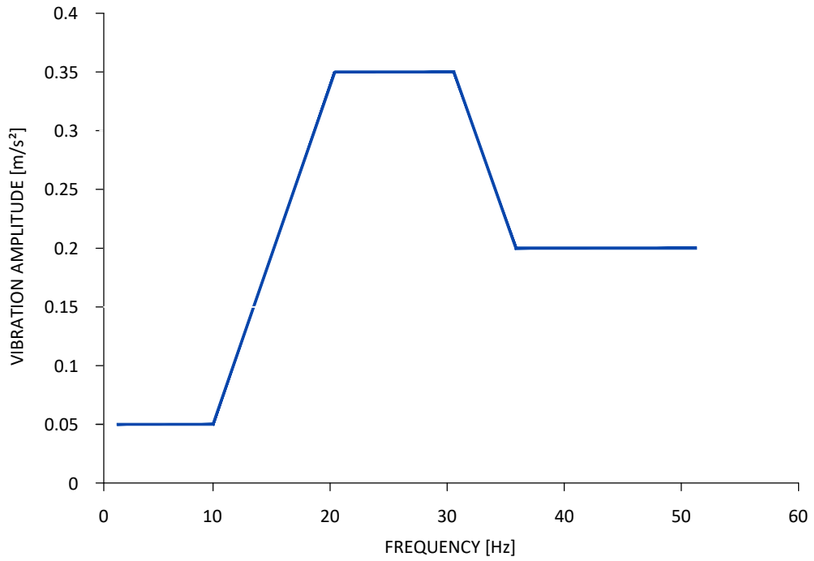
Acoustic and vibroacoustic information is provided for site planning and architectural design activities. It is the customer's responsibility to hire a qualified acoustic engineer for solutions to further attenuate this transmitted noise and vibration, if required. The actual room noise level may vary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

Control Room: 62 dBA
Equipment Room: 80 dBA
Magnet Room: 127 dBA*
(maximum sound pressure level at magnet bore isocenter)

* Frequency: 20 Hz to 20kHz

FREQUENCY (Hz)	AMPLITUDE (m/s²)
2	0.05
10	0.05
20	0.35
30	0.35
35	0.2
50	0.2

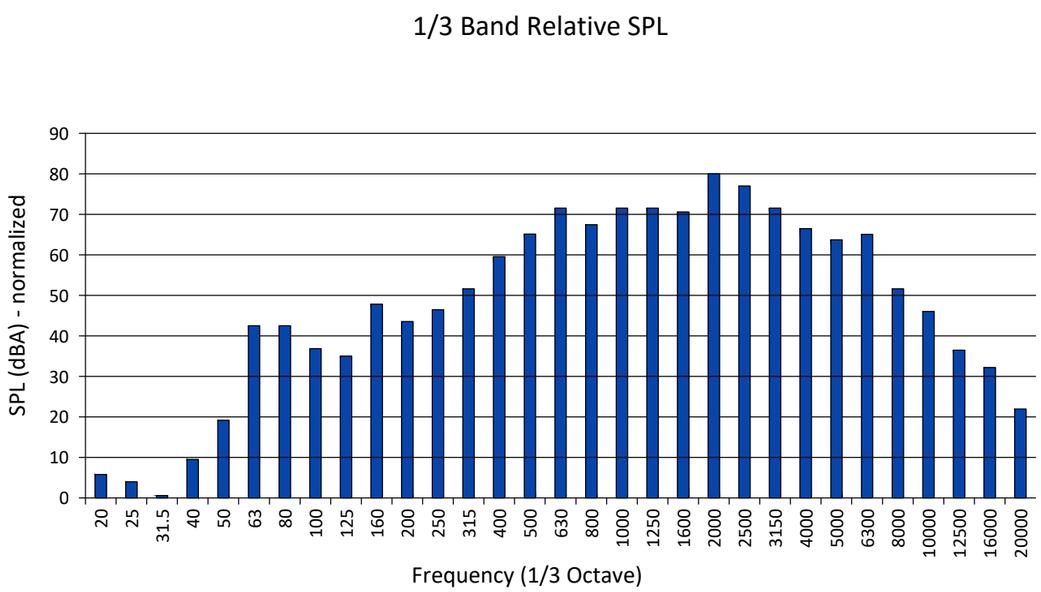
Low Frequency Magnet Floor Vibration (Vibration Amplitude at Each Foot)



ISOGAUSS PLOTS

* The isogauss contour plots depicted on this drawing represent magnetic fringe fields resulting from the normal operation of the magnet provided with the MR system. The actual magnetic field intensity at any point in the vicinity of the magnet when installed may vary from the contour plots due to factors such as the concentrating effects of nearby ferrous objects ambient magnetic fields, including the earth's magnetic field. Therefore, the contours shown are only approximations of actual field intensities found at a corresponding distance from the magnet's isocenter.

SOUND PRESSURE SPECTRAL DISTRIBUTION



MAGNETIC PROXIMITY LIMITS

Gauss (mT) Limit	Equipment
0.5 gauss (0.05mT)	Nuclear camera
1 gauss (0.1mT)	Positron Emission Tomography scanner, Linear Accelerator, Cyclotrons, Accurate measuring scale, Image intensifiers, Bone Densitometers, Video display (tube), CT scanner, Ultrasound, Lithotriptor, Electron microscope, Digital X-Ray
3 gauss (0.3mT)	Power transformers, Main electrical distribution transformers
5 gauss (0.5mT)	Cardiac pacemakers, Neurostimulators, Biostimulation devices
10 gauss (1mT)	Magnetic computer media, Line printers, Film processor, X-ray tubes, Emergency generators, Commercial laundry equipment, Food preparation area, Water cooling equipment, HVAC equipment, Major mechanical equipment room, Credit cards, watches, and clocks, Air conditioning equipment, Fuel storage tanks, Motors greater than 5 horsepower
50 gauss (5mT)	Metal detector for screening, LCD panels, Telephones
No Limit	Digital Detectors

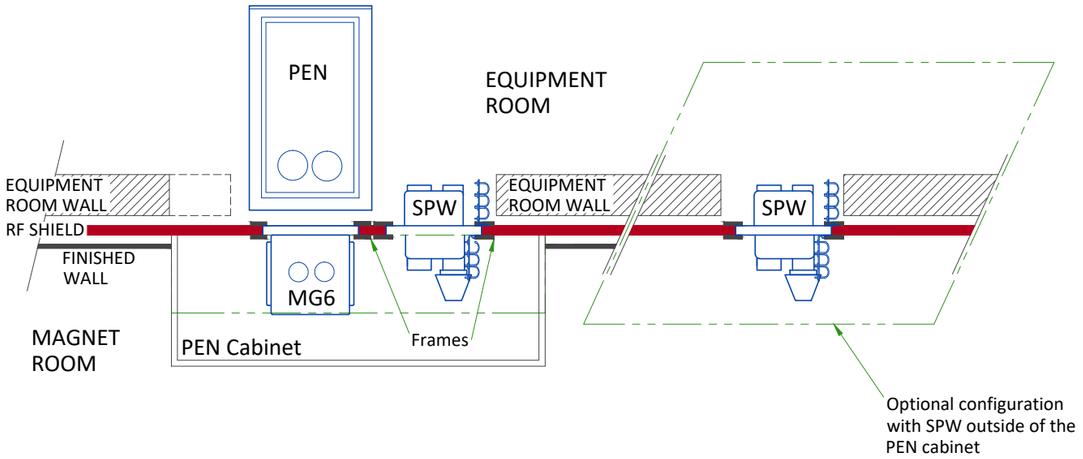
The customer must provide detail defining ferrous material below the magnet to the Project Manager so the GE Healthcare MR Siting and Shielding team can review for compliance.

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

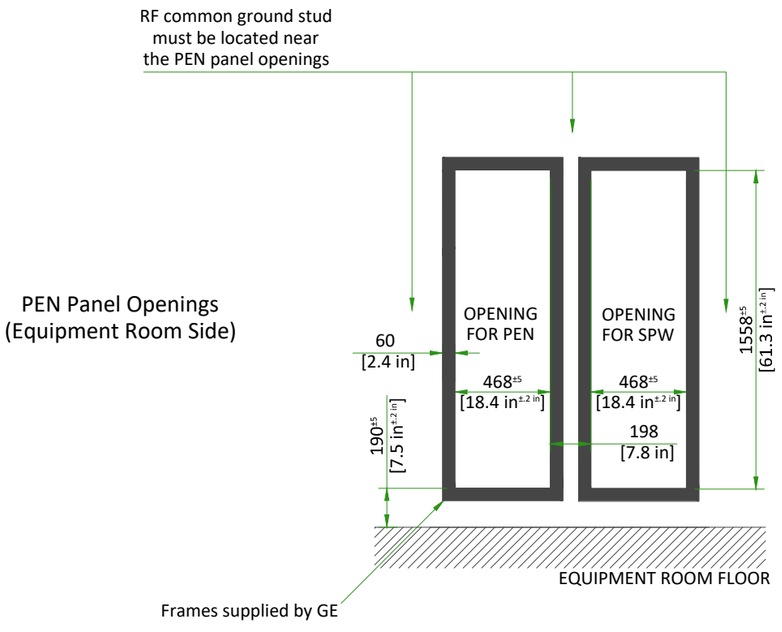
Limits Of Steel Mass		Distance From Magnet Isocenter		Distance Below Top Surface Of Floor	
kg/m²	lbs/ft²	mm	in	mm	in
0	0	0 - 1143	0-45	0 - 76	0-3
9.8	2	1143 - 1194	45-47	76 - 127	3-5
14.7	3	1194 - 1321	47-52	127 - 254	5-10
39.2	8	1321 - 1397	52-55	254 - 330	10-13
98.0	20	1397+	55+	330+	13+

The actual field strength can be affected by Magnetic shielding, Earth's magnetic field, other magnetic fields and stationary or moving metal. This information must be used to evaluate potential site interaction of GE Healthcare equipment with other non-GE Healthcare equipment. Magnetic shielding can be installed to prevent interaction between the magnet and nearby sensitive devices. The GE Healthcare Project Manager of Installation (PMI) can work with the customer to coordinate the magnetic shielding site evaluation. The customer is responsible for installation of all magnetic shielding.

PENETRATION PANEL WITH SPW



Maximum distance between PEN and SPW is 2743 [108 in]



SCALE 1:30

PENETRATION PANEL CLOSET

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

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

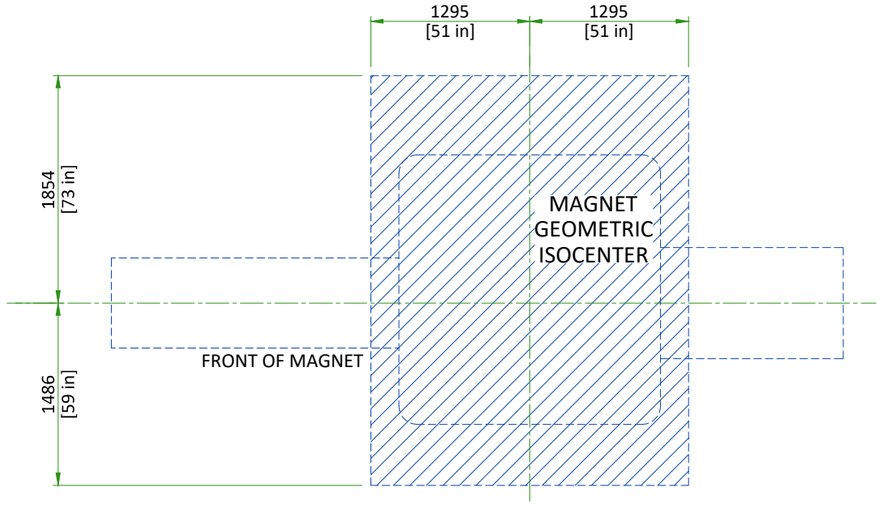
A closet service hatch must be provided if the room does not allow the PEN panel blower box removal path to remain completely outside the 200 Gauss line.
NOTE: If the room size is sufficiently large so the SPW blower box can be removed without entering the 200 Gauss line, a closet service hatch is not required.

The closet service hatch must meet the following requirements:

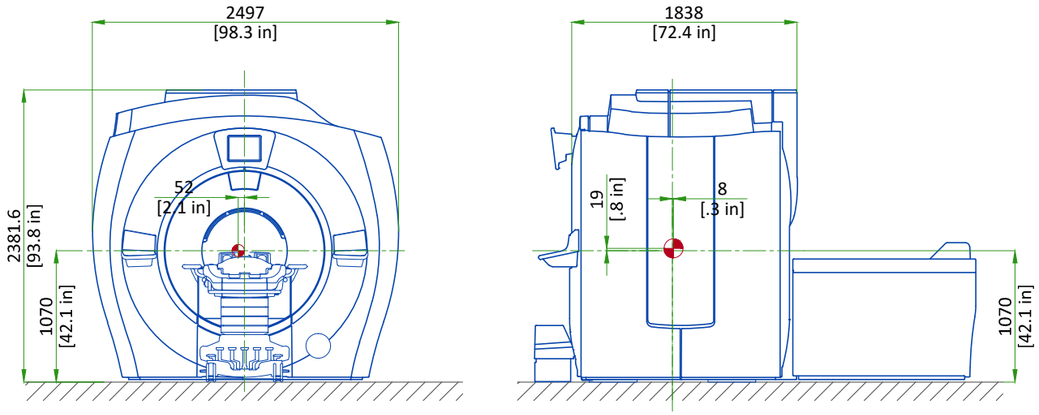
- Must be located within the PEN closet on the RF wall allowing access to the Equipment room
- May be located anywhere within the PEN closet (between 254 [10 in] and 1524 mm [60 in] with unobstructed pass-through)
- Must be minimum 508x508 mm [20x20 in]
- Must maintain RF shield integrity for all service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

MINIMUM MAGNET CEILING HEIGHT (TOP VIEW)

Shaded area indicates floor to ceiling minimum height of 2500 mm [98.42 in]. Special service procedures are required if ceiling height is between 2500 mm [98.42 in] and 2667 mm [105 in].

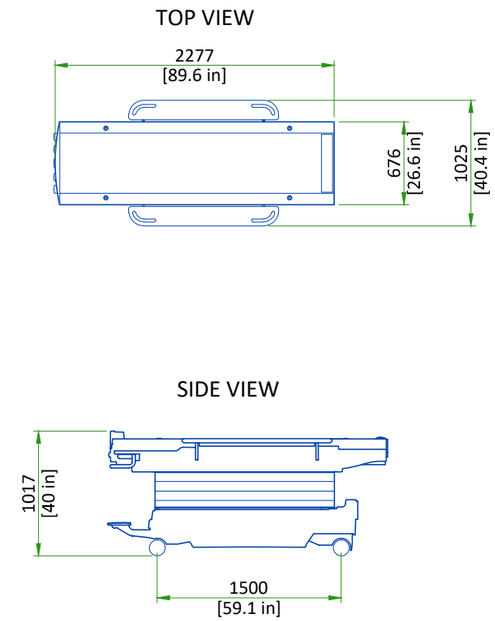


MAGNET ENCLOSURE

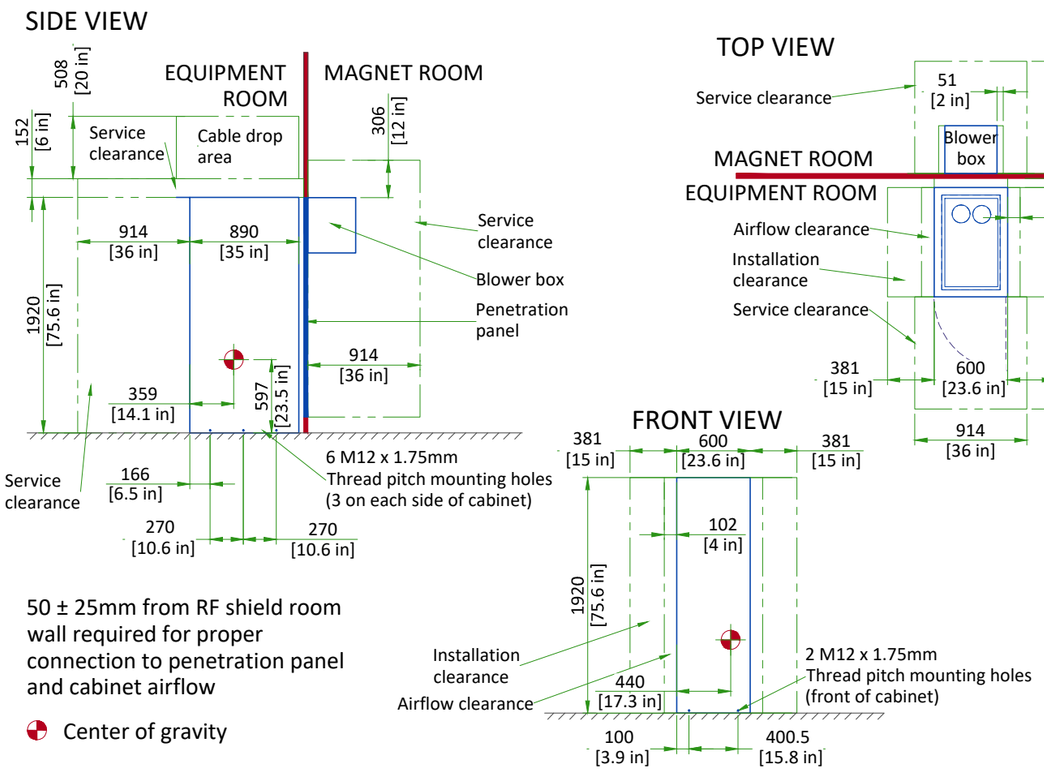


Note:
Center of gravity is approximate and includes the GE Healthcare supplied VibroAcoustic Dampening Kit, but does not include cryogens, gradient assembly, side mounted electronics, or enclosures.
Enclosure dimensions are for reference only, NOT FOR SITE PLANNING USE.
Center of gravity

PATIENT TRANSPORT TABLE (PT)



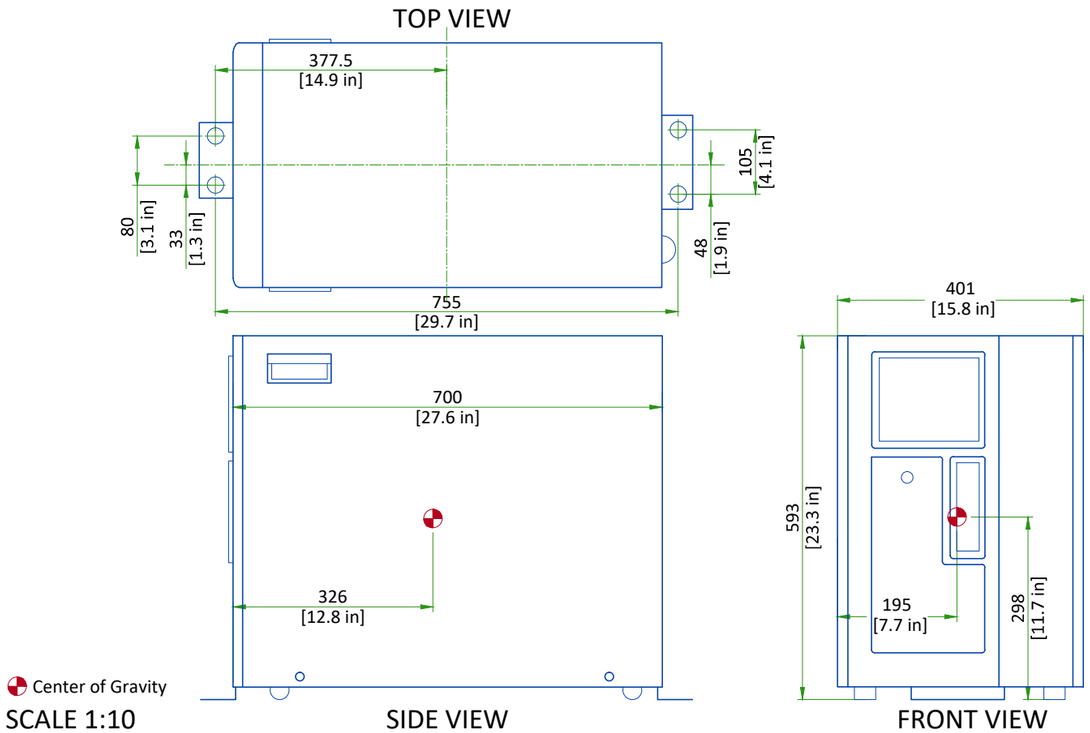
PENETRATION CABINET CLEARANCE



50 ± 25mm from RF shield room wall required for proper connection to penetration panel and cabinet airflow

Center of gravity

GLOBAL OPERATORS CABINET (GOC)



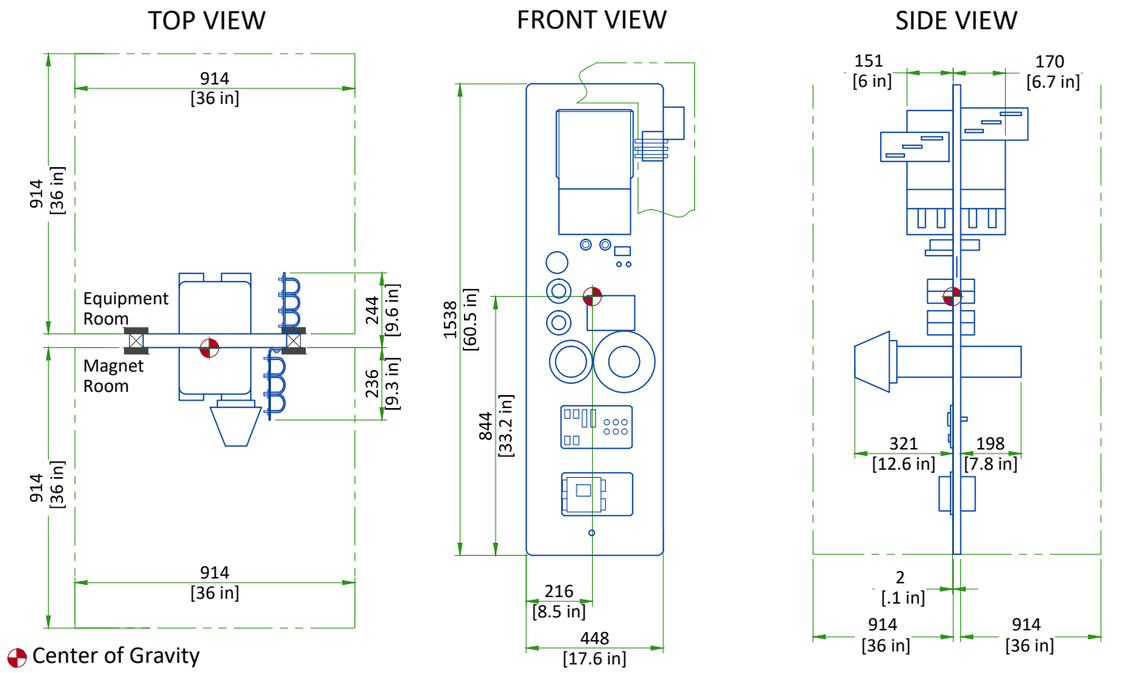
Center of Gravity

SCALE 1:10

SIDE VIEW

FRONT VIEW

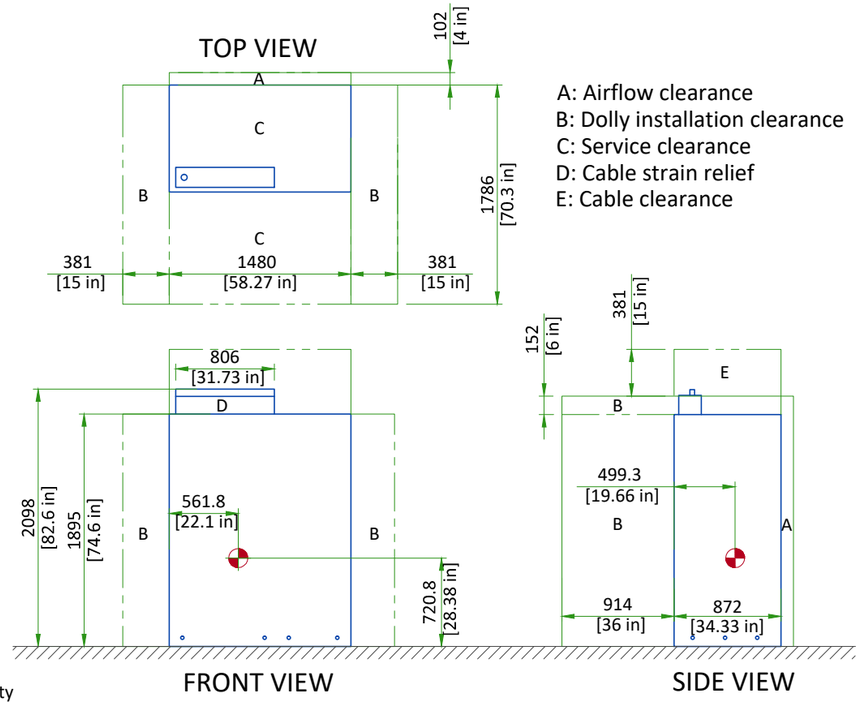
SECONDARY PENETRATION WALL (SPW)



Center of Gravity

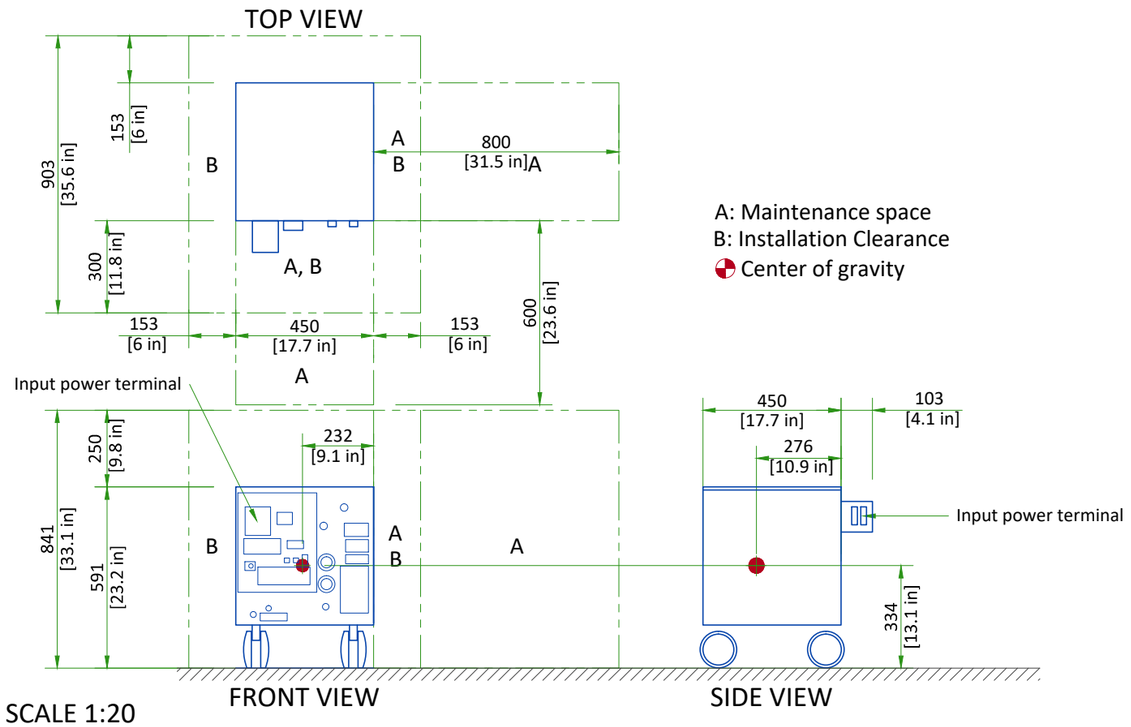
SCALE 1:20

POWER, GRADIENT, RF CABINET (PGR)



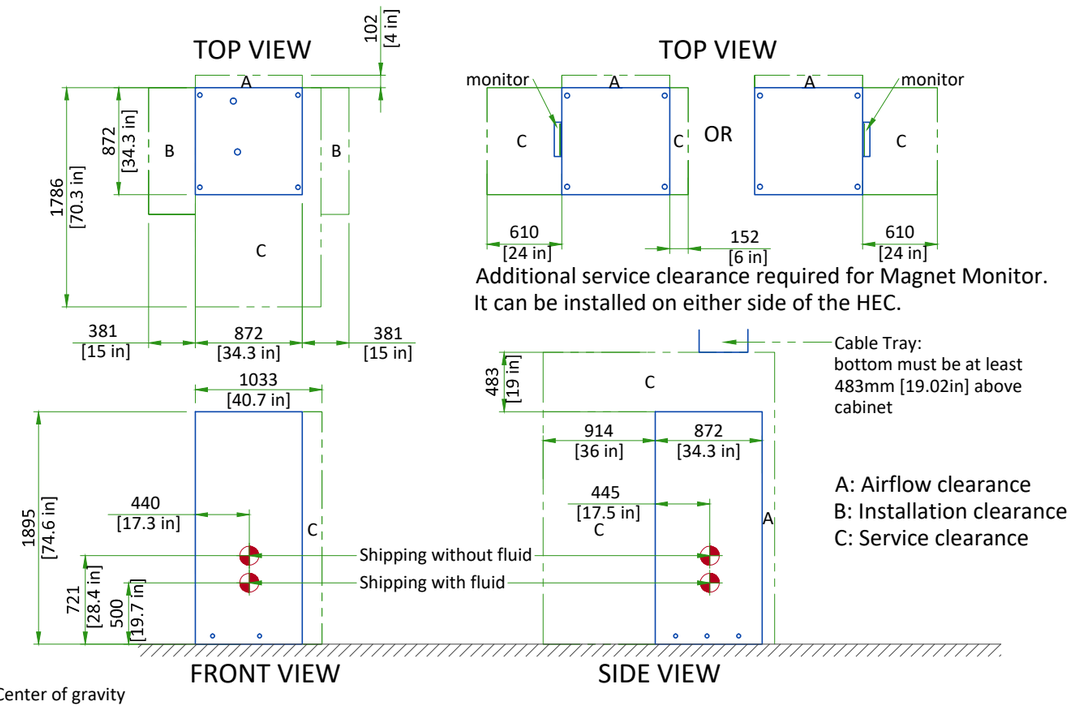
Center of gravity

CRYOCOOLER COMPRESSOR (CRY)



SCALE 1:20

HEAT EXCHANGER CABINET (HEC)



Center of gravity

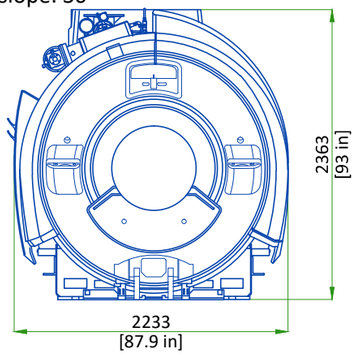
DELIVERY

ROUTING

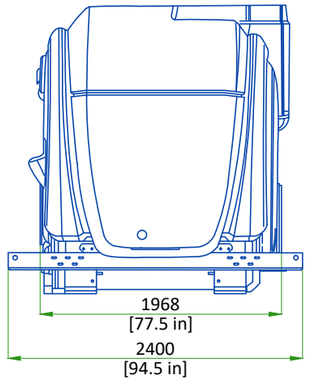
- The customer is solely liable for routing of components from dock to final site.
- GE must be able to move system components in or out with no need to uncrate or disassemble any of the components. The entire passageway must be cleared, adequately lighted and free from dust.
- The floor and it surfacing must be able to withstand the live load of components and handling equipment.
- Floor surfacing must be continuous.
- The customer must protect any fragile flooring surfaces.

MINIMUM SPECIFICATIONS FOR MAGNET ROUTING

- Floor must be able to withstand a moving load of 5323kg
- Height: 2362 mm [92.99in], width: 2235 mm [87.99in]
- Maximum slope: 30°



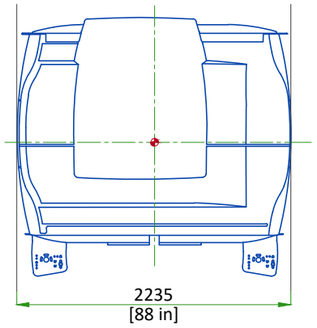
FRONT VIEW OF MAGNET



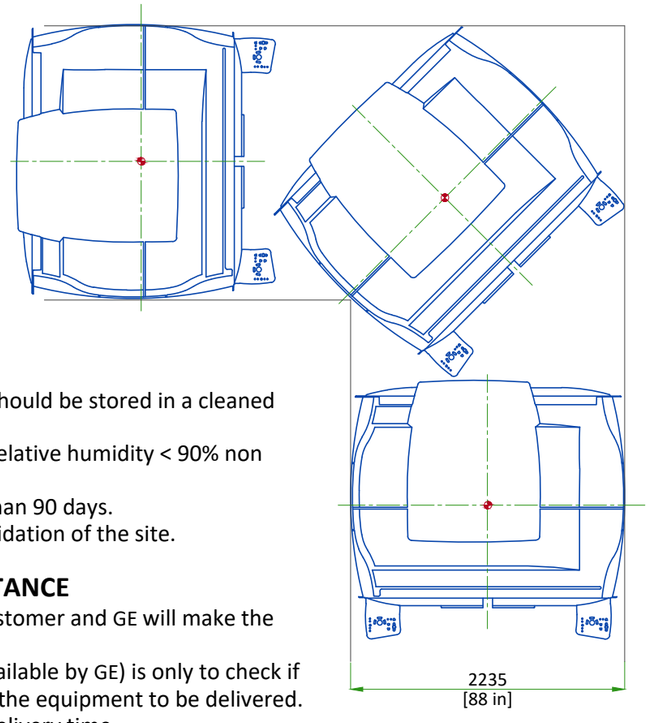
RIGHT SIDE VIEW OF MAGNET

Recommended opening for side (wall) delivery : 2400 mm [90.55in] (width) x 2500 mm [98.42in] (height)

STRAIGHT PATH
(Rigging wheels required)



PATH WITH 90 DEGREE TURN



STORAGE CONDITIONS

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

INSTALLATION AND DELIVERY ACCEPTANCE

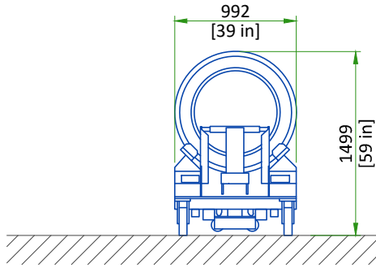
- A survey of the site established by the customer and GE will make the decision for the delivery time.
- This survey of the site (a form is made available by GE) is only to check if the apparent conditions of the site allow the equipment to be delivered.
- If the site is not ready, GE can delay the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

CRITICAL ITEMS FOR MAGNET DELIVERY

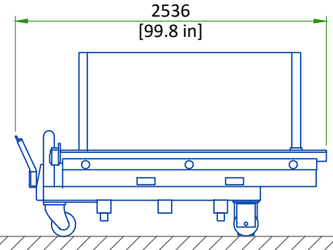
- 24/7 chilled water and 480v power for shield/cryo cooler
- 24/7 120v power for the magnet monitor
- Phone lines for magnet monitoring and emergency use
- Magnet room exhaust fan
- Cryogen venting (if roof hatch, completed within 24 hrs)

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

GRADIENT COIL REPLACEMENT



Front view of the BRM Gradient



Side view of the BRM Gradient

EQUIPMENT	DIMENSIONS LxWxH		WEIGHT		NOTE
	mm	in	kg	lbs	
Replacement BRM gradient coil assembly on a shipping cradle/cart	991x2536x1499	39x99.84x59	1449	3194	Initial gradient coil assembly is shipped installed in the magnet. Shipping/installation cart is used to install re-placement coil assembly only.

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

STRUCTURAL NOTES

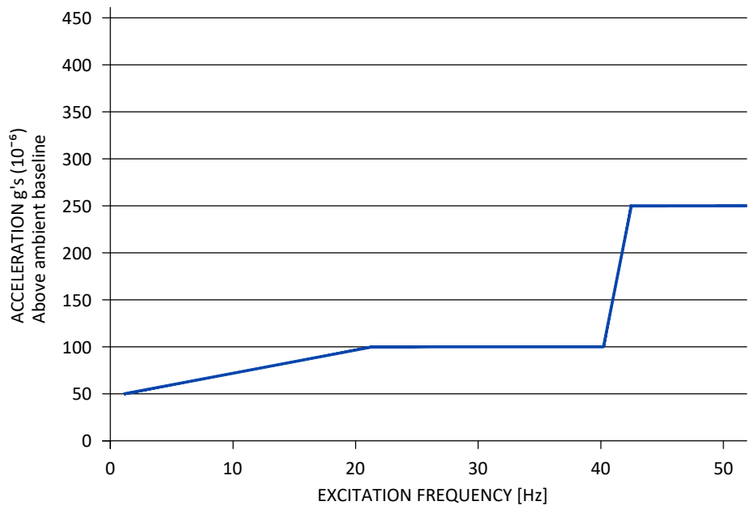
- All units that are wall mounted or wall supported are to be provided with supports where necessary. Wall supports are to be supplied and installed by the customer or his contractors.
- Dimensions are to finished surfaces of room.
- Certain MR procedures require an extremely stable environment to achieve high resolution image quality. Vibration is known to introduce field instabilities into the imaging system. The vibration effects on image quality can be minimized during the initial site planning of the mr suite by minimizing the vibration environment. See PROXIMITY LIMITS, PATIENT TABLE DOCK ANCHOR MOUNTING REQUIREMENTS AND VIBROACOUSTIC DAMPENING KIT details for additional information.
- Standard steel studs, nails, screws, conduit, piping, drains and other hardware are acceptable if properly secured. Any loose steel objects can be violently accelerated into the bore of the magnet. Careful thought should be given to the selection of light fixtures, cabinets, wall decorations, etc. To minimize this potential hazard. For safety, all removable items within the magnet room such as faucet handles, drain covers, switch box cover plates, light fixture components, mounting screws, etc. must be non-magnetic. If you have a specific question about material, bring it to the attention of your GE project manager of installations.
- Floor levelness refer to MAGNET ROOM FLOOR SPECIFICATIONS DETAIL, this floor levelness requirement is important for accurate patient table docking.
- Non-movable steel such as wall studs or hvac components will produce negligible effect on the active shield magnet.
- Customers contractor must provide all penetrations in post tension floors.
- Customers contractor must provide and install any non-standard anchoring. Documents for standard anchoring methods are included with GE equipment drawings for geographic areas that require such documentation.
- Customers contractor must provide and install hardware for "through the floor" anchoring and/or any bracing under access floors. This contractor must also provide floor drilling that cannot be completed because of an obstruction encountered while drilling by the GE installer such as rebar etc.
- Customers contractor to provide and install appropriate supports for the storage of excess cables.
- It is the customer's responsibility to perform any floor or wall penetrations that may be required. The customer is also responsible for ensuring that no subsurface utilities (e.g., electrical or any other form of wiring, conduits, piping, duct work or structural supports (i.e. post tension cables or rebar)) will interfere or come in contact with subsurface penetration operations (e.g. drilling and installation of anchors/screws) performed during the installation process. To ensure worker safety, GE installers will perform surface penetration operations only after the customer's validation and completion of the "GE surface penetration permit"

VIBRATION SPECIFICATIONS

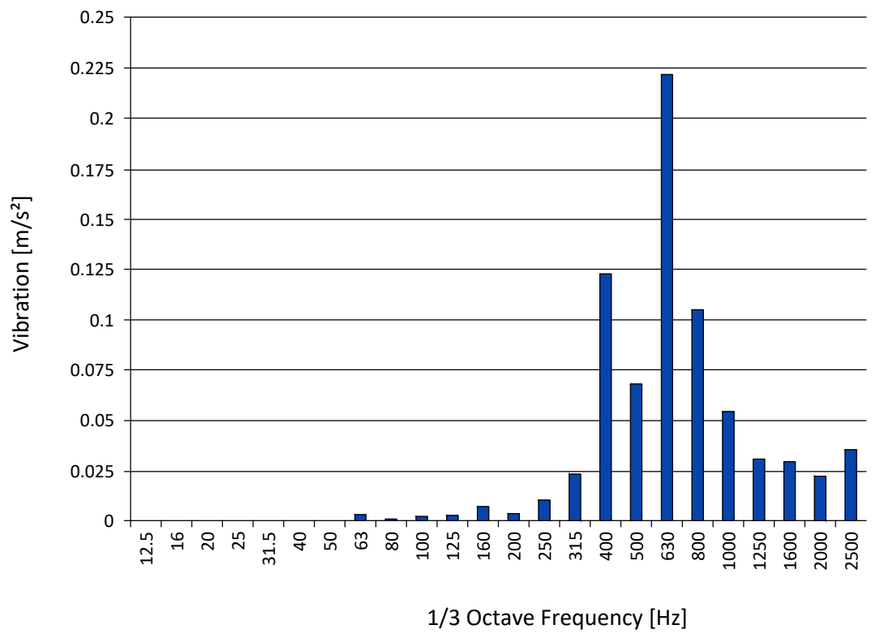
Excessive vibration can affect MR image quality. Vibration testing must be performed early in the site planning process to ensure vibration is minimized. Both steady state vibration (exhaust fans, air conditioners, pumps, etc.) and transient vibrations (traffic, pedestrians, door slamming, etc.) must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

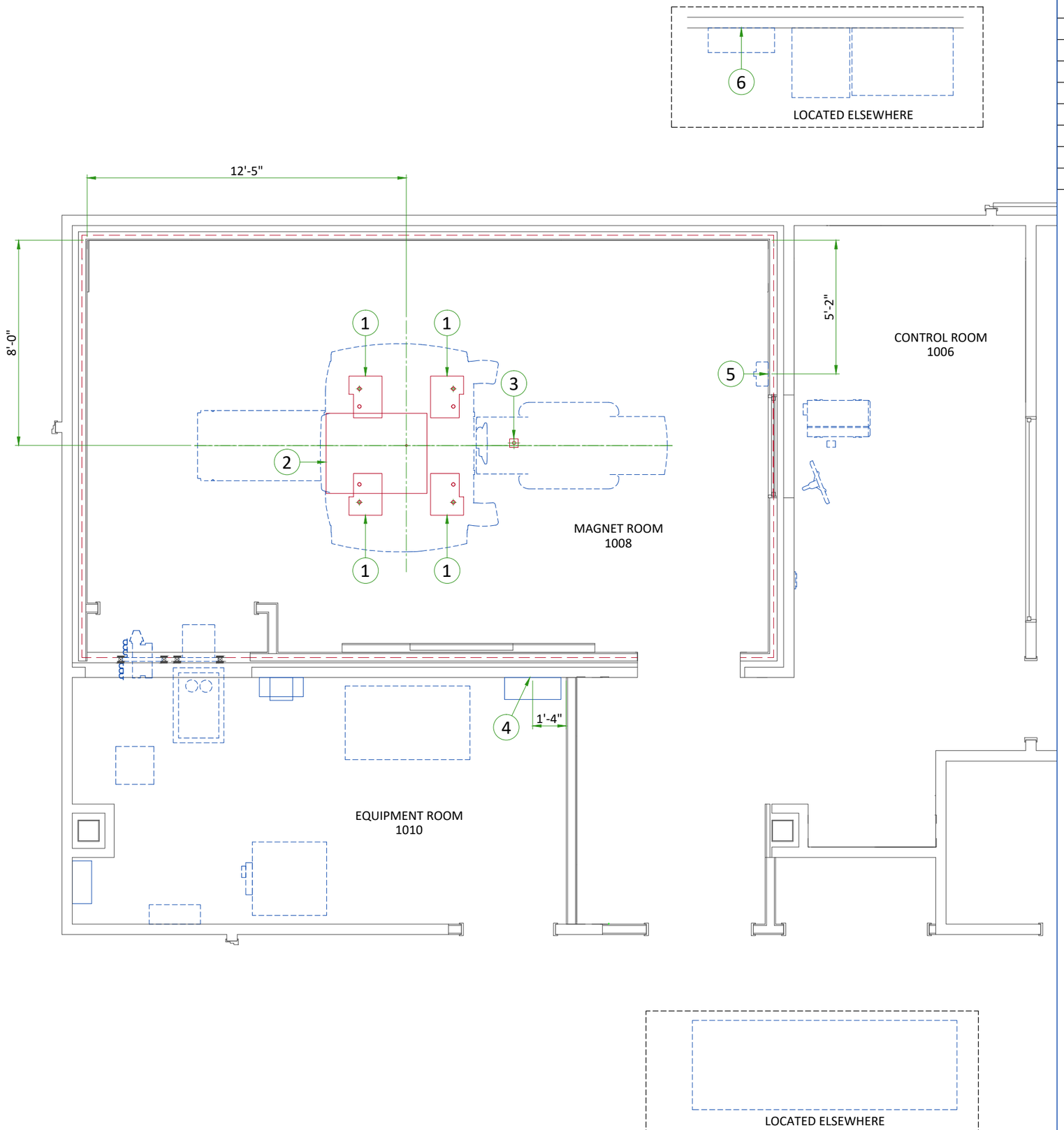
Transient vibration levels above the specified limits in the MR Site Vibration Test Guidelines must be analyzed. Any transient vibration that causes vibration to exceed the steady-state level must be mitigated.

MAGNET STEADY-STATE VIBRATION SPECIFICATIONS



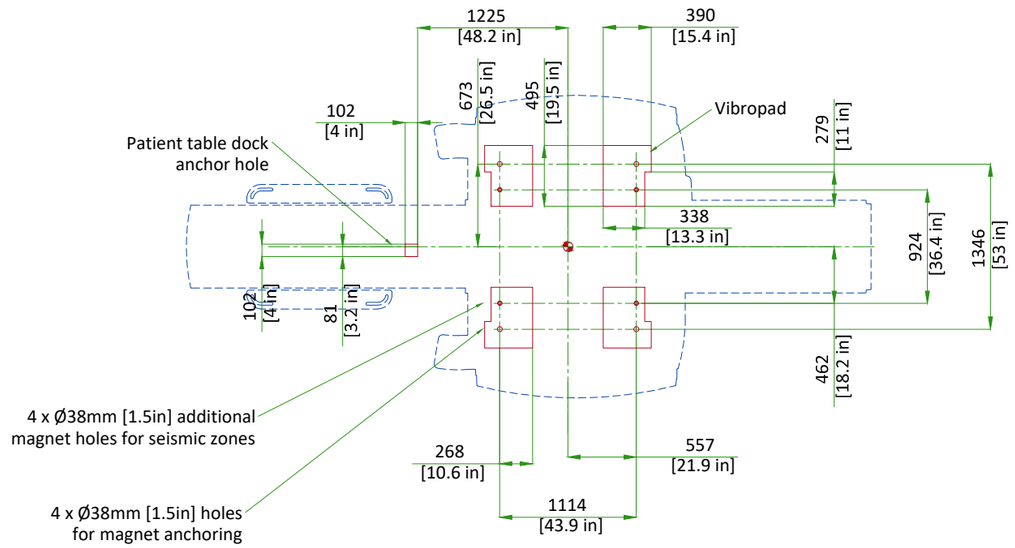
VIBRATION TRANSMITTED THROUGH VIBROACOUSTIC MAT





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

MAGNET ON VIBROACOUSTIC DAMPENING KIT "VIBROPAD"

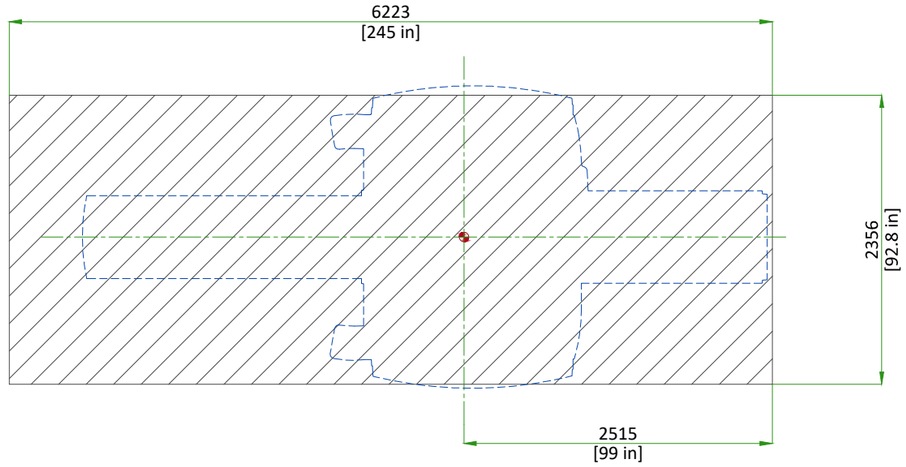


NOT TO SCALE

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

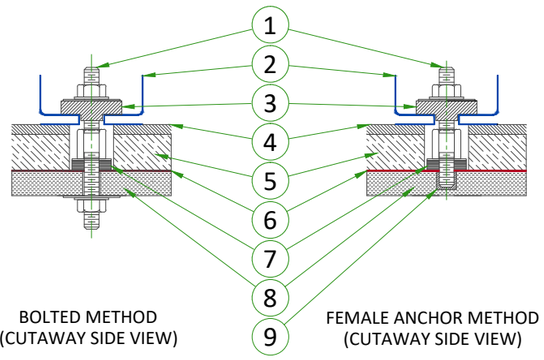
MAGNET ROOM FLOOR SPECIFICATIONS

Floor levelness must be **3 mm** between high and low spots in the rectangular area shown.



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

PATIENT TABLE DOCK ANCHOR MOUNTING REQUIREMENTS



BOLTED METHOD
(CUTAWAY SIDE VIEW)

FEMALE ANCHOR METHOD
(CUTAWAY SIDE VIEW)

1 Removable Anchor Rod (Male insert)
2 Dock
3 Clamp bracket
4 Finished floor
5 Filler Board or Grout
6 RF Shield
7 Conductive Fibrous Washer (RF seal)
8 Concrete
9 Female Anchor Insert

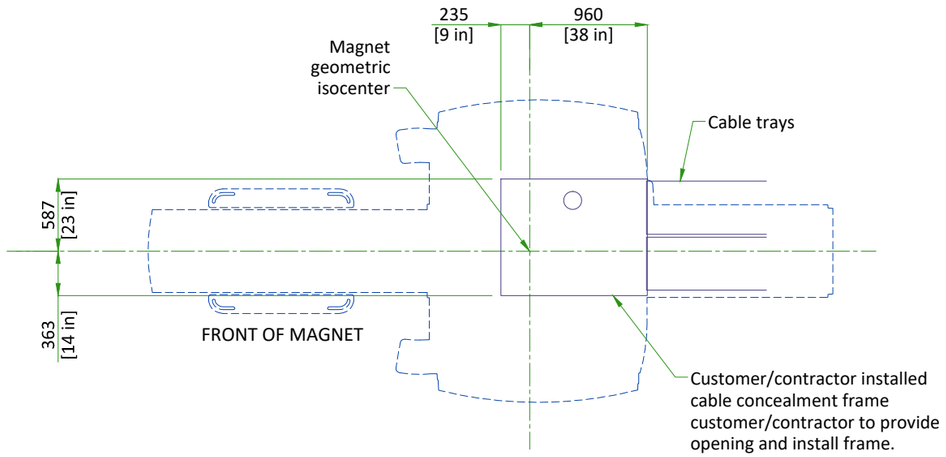
- The RF Shield vendor must design and install the dock anchor bolt
- The dock anchor hole must be drilled **after** the Magnet is installed
- The dock anchor must not contact floor rebar or other structural steel
- The dock anchor must electrically contact the RF shield at point of entry
- The RF shield vendor must perform a pull test on the anchor (equal to the clamping force).

The dock anchor properties must comply with the following requirements:

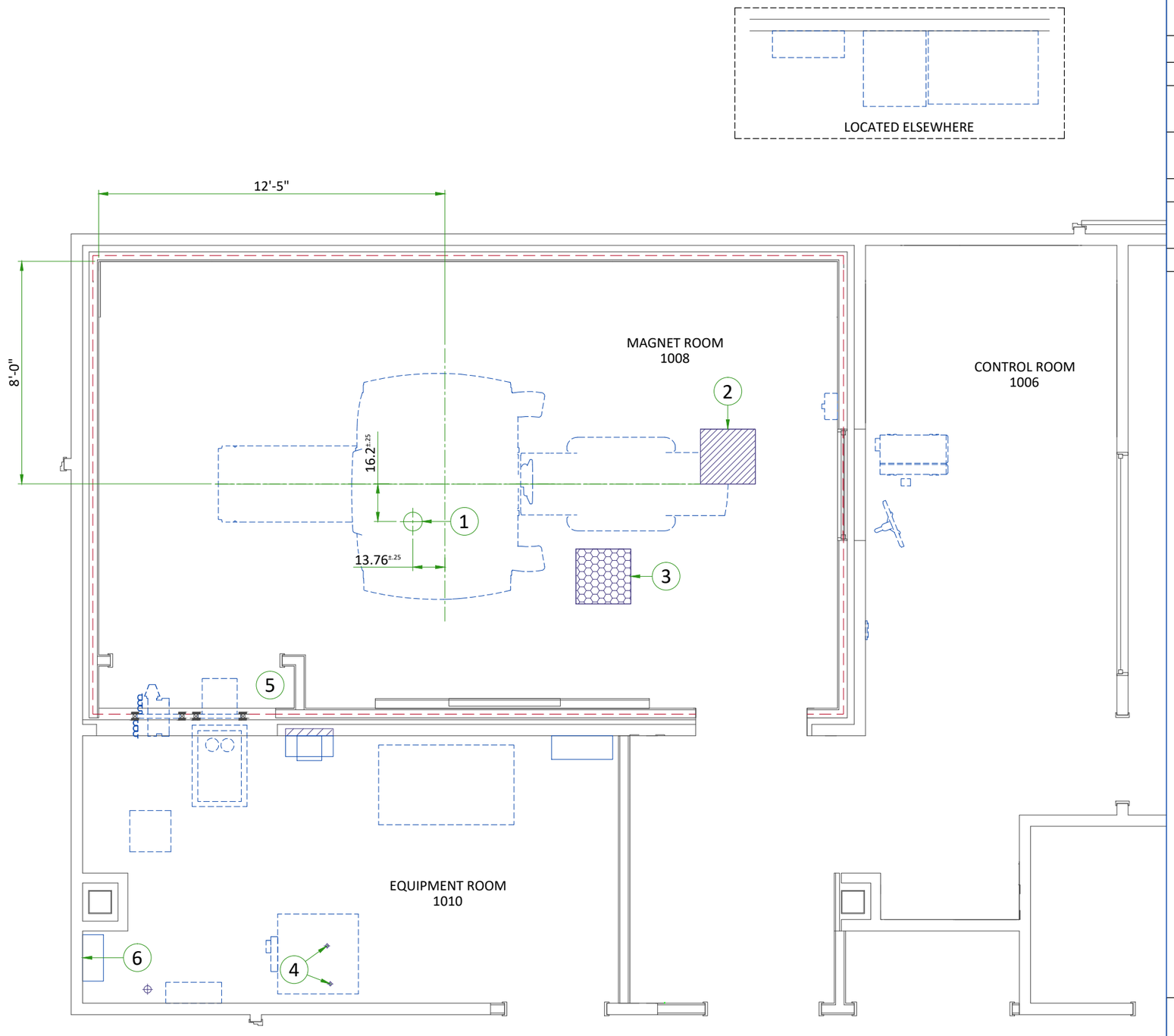
a. Anchors must be two-part assembly (male/female)
b. Female side must be expansion- or epoxy-type
c. Male side must be a bolt or threaded rod with appropriate-sized nut (bolt or rod must be removable - not epoxied or cemented in place)
d. Anchors must be electrically conductive
e. Anchors must be non-magnetic
f. Anchors must not induce galvanic corrosion with the RF shield
g. Anchors must be commercially procured
h. The anchor rod hole clearance in the table frame anchor base is 11mm [0.43 in]. The anchor rod diameter must be sized appropriately.
i. Anchors must meet the following clamping force: 2,669 N [600 lb]
j. The anchor rod must extend 60 mm ± 13 mm [2.25 in ± 0.5 in] above the finished floor
k. The anchor rod must be less tha 152 mm [6 in] in total length (length above the floor plus embedded length)
l. If underside of deck is metallic, then insulating bushing must be added to through bolt hardware to prevent grounding of shield at this point.

NOT TO SCALE

CABLE CONCEALMENT



NOTE:
- This drawing is to be used only as a design intent document. Refer to GE installation manual for tray install. Actual tray installation may be site dependent.
- THIS DRAWING NOT TO SCALE



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

MECHANICAL/PLUMBING NOTES

- All piping, fittings, supports, hoses, clamps, ventlation systems, etc. are to be supplied and installed by the customer or his contractors.
- For complete design and requirements, specifications and guidelines refer to the pre-installation manual: system cooling, cryogen venting, waveguides and exhaust venting.
- An emergency water cooling back-up supply is recommended for continuous cryogen compressor operation. if using an open loop back-up design, ensure a drain is provided. please refer to the pre-install manual for optional back-up coolant supply requirements

TEMPERATURE AND HUMIDITY SPECIFICATIONS

IN-USE CONDITIONS

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

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

AIR EXCHANGE

According to local standards.

NOTE
In case of using air conditioning systems or chilled water piping that have a risk of water leakage it is recommended not to install it above electric equipment or to take measures to protect the equipment from dropping water.

MAGNET ROOM VENTING REQUIREMENTS

HVAC VENT REQUIREMENTS

- HVAC vendor must comply with Magnet room temperature and humidity specifications and RF shielding specifications.
- RF Shield vendor must install open pipe or honeycomb HVAC waveguides.
- All serviceable parts in the Magnet room (e.g.: diffusers) must be non-magnetic.
- Waveguides must be nonmagnetic and electrically isolated.
- Incoming air must contain at least **5% air** from outside the Magnet room (inside or outside the facility) to displace residual helium.

EMERGENCY VENT REQUIREMENT

- Exhaust vent system is supplied by the customer.
- All items within the RF enclosure must be non-magnetic.
- The exhaust vent system must be tested and operational before the magnet is installed.
- The exhaust intake vent must be located near the magnet cryogenic vent at the highest point on the finished or drop ceiling.
- The Magnet room exhaust fan and exhaust intake vent must have a capacity of at least **1200 CFM (34 m^3/min)** with a minimum of **12 room air exchanges per hour.**
- The exhaust fan must be placed above RF shielding located outside 10 gauss (1mT) and with appropriate waveguide.
- The system must have a manual exhaust fan switch near the Operator Workspace and in the Magnet room near the door (the switches must be connected in parallel).
- All system components must be accessible for customer inspection, cleaning and maintenance

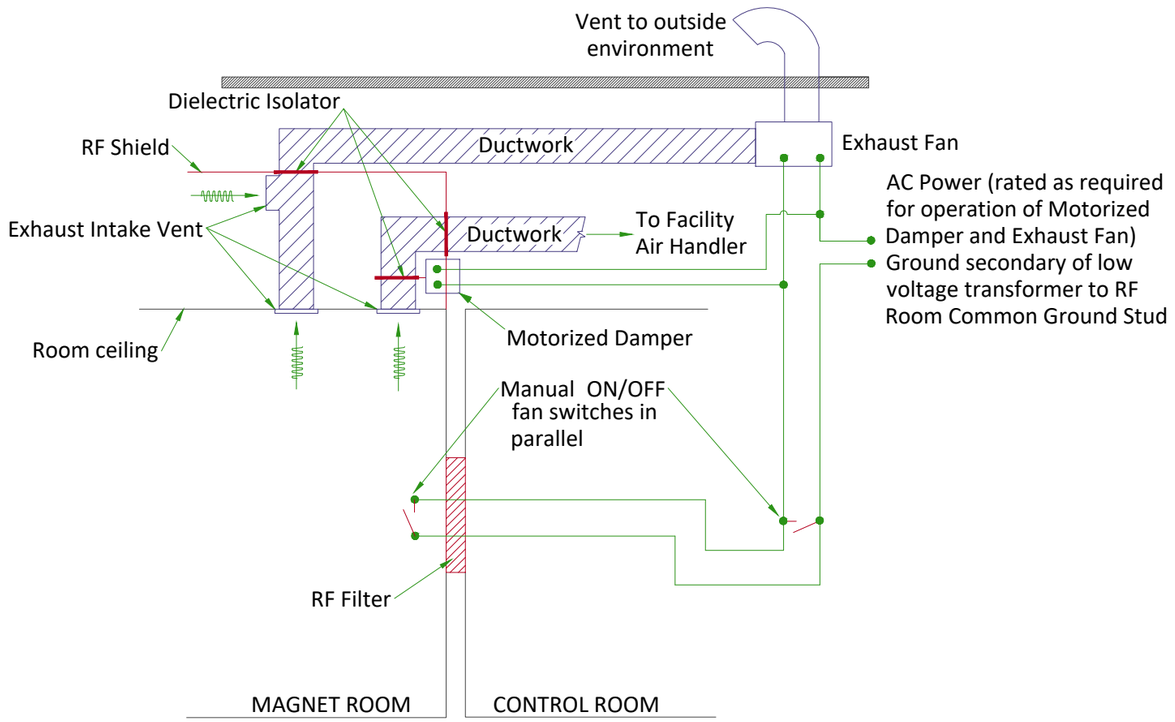
PRESSURE VENT REQUIREMENT

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

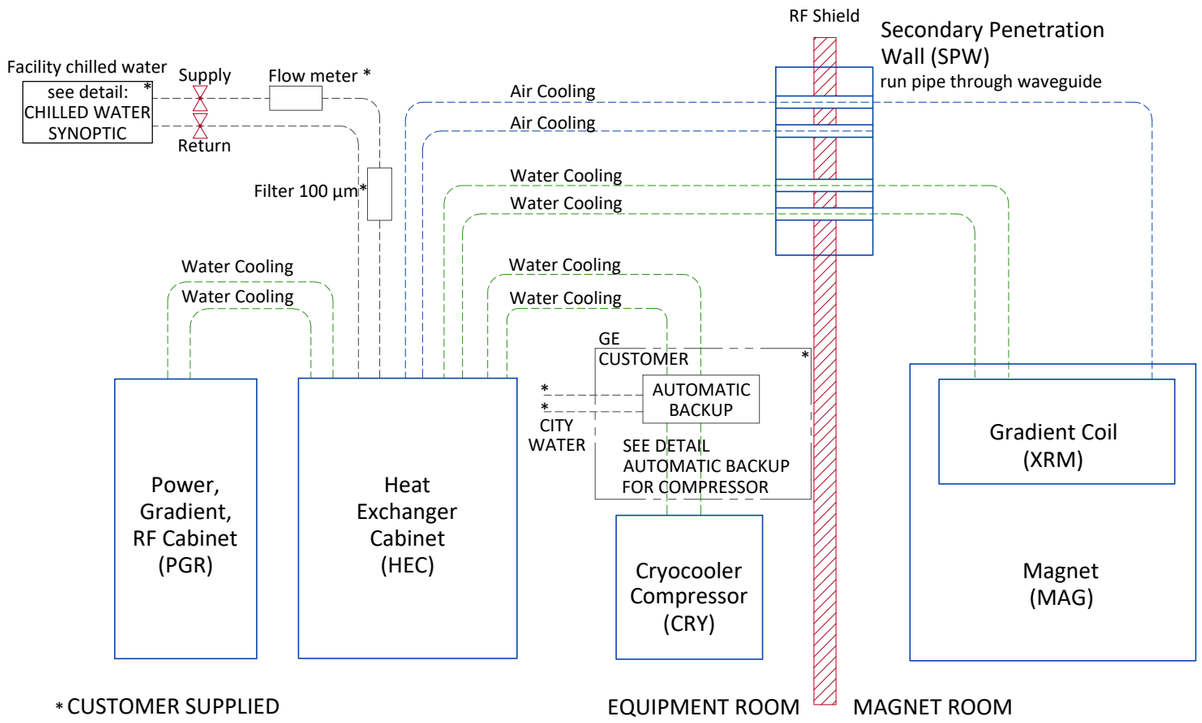
HEAT DISSIPATION DETAILS

DESCRIPTION	ROOM	IDLE		AVERAGE		MAX	
		W	btu	W	btu	W	btu
Magnet (MAG) and Patient Table (PT)	Magnet	561	1915	1200	4095	2400	8189
Blower Box (MG6)	Magnet	450	1535	450	1535	450	1535
Penetration Panel Cabinet (PEN)	Magnet	0	0	150	512	300	1024
Penetration Panel Cabinet (PEN)	Equipment	1568	5349	1568	5349	3135	10697
Secondary Penetration Wall (SPW)	Magnet/Equipment	0					
Main Disconnect Panel (MDP)	Equipment	132	450	132	450	264	901
Power, Gradient, RF Cabinet (PGR)	Equipment	2500	8530	3068	10470	6137	20940
Crycooler Compressor (CRY)	Equipment	500	1706	500	1706	500	1706
Heat Exchanger Cabinet (HEC)	Equipment	500	1706	500	1706	1000	3412
Magnet Monitor (MON)	Equipment	240	819	240	819	240	819
Operator Workspace equipment (OW)	Control	1450	4947	1450	4947	1450	4947
OPTIONS							
BrainWave HW Lite Cabinet (BW)	Equipment	685	2337	685	2337	685	2337
BrainWave HW Lite Cabinet with Options	Equipment	815	2781	815	2781	815	2781
CADstream	Equipment	350	1209	799	2725	1773	6049
MR Elastography (MRE)	Equipment	141	480	141	480	141	480

MAGNET ROOM EXHAUST FAN SCHEMATIC



CHILLED WATER BLOCK DIAGRAM



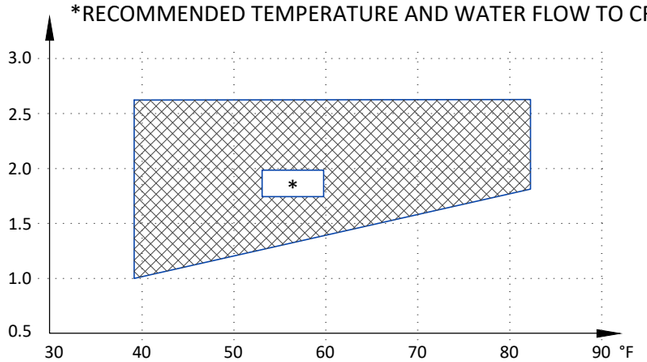
CHILLED WATER SPECIFICATIONS

PARAMETER		REQUIREMENTS	
Chiller size		Minimum 49 kW	
Inlet temperature		6 to 12°C [42.8 to 53.6°F] measured at the inlet to the HEC	
Hose connections to the HEC (supplied by customer)		1.5 inch (38.1 mm) male NPT	
		MINIMUM FLOW 114 l/min [30 gpm]	MAXIMUM FLOW 132 l/min [35 gpm]
PRESSURE DROP IN HEC CABINET	40% propylene glycol	2.4 bars [34.8 psi]	3.3 bars [47.8 psi]
Availability		Continuous	
Antifreeze		no more than 40% propylene glycol	
Temperature rise at minimum flow		6.8°C [12.2°F] with 40% propylene glycol-water 3730J/(kgK) specific heat, 1021kg/m³ density, 49kW heat	
Temperature rise at maximum flow		5.8°C [10.4°F] with 40% propylene glycol-water 3730J/(kgK) specific heat, 1021kg/m³ density, 49kW heat	
Maximum inlet pressure to HEC		6 bar [87 psi]	
Minimum continuous heat load		7.5 kW	
Hoses to be provided by customer		38.1 mm [1.5 in] minimum hose inside diameter	
pH level		6.5 to 8.2 at 25°C [77°F]	
Total hardness		Less than 200 ppm	
Suspended matter		Less than 10 ppm	
Particle size		Less than 100 micron	
Facility filter		100 micron or smaller with a field-changeable filter	
Condensation protection		Facility plumbing to the HEC must be properly routed and insulated to prevent equipment damage or safety hazards	

CITY WATER BACKUP SPECIFICATIONS FOR COMPRESSOR

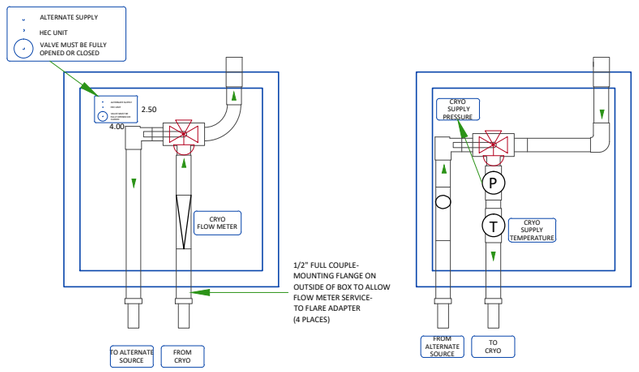
INLET WATER FLOW/TEMPERATURE FOR CRYOCOOLER COMPRESSOR

*RECOMMENDED TEMPERATURE AND WATER FLOW TO CRY ENTRY



	MIN	MAX
INLET TEMP	39.2°F (4°C)	82.4°F (28°C)
INLET FLOW	1.0 gpm (4 l/min)	2.6 gpm (10 l/min)
TEMP RISE	89.6°F at 1.0 gpm (32°C at 4 l/min flow)	53.6°F at 2.6 gpm (12°C at 10 l/min flow)
HEAT DISSIPATION (kW)	7.2 kW	
PRESSURE DROP	8.7 psi at 2.1 gpm flow (60 kPa at 8 l/min flow)	

MANUAL CITY WATER BACKUP SYSTEM (SAMPLE-DIMPLEX)



FRONT VIEW

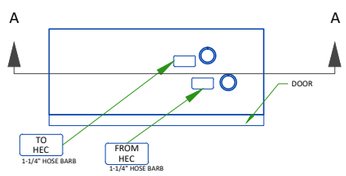
HEC = MAIN (NORMAL) COOLING SOURCE
ALTERNATE SUPPLY = BACKUP COOLING SOURCE
CRYO = EQUIPMENT TO BE COOLED

VALVE HANDLES WILL BE CONNECTED BY A MECHANICAL LINKAGE
COVER THREADED ROD WITH HEAT SHRINK TUBING.

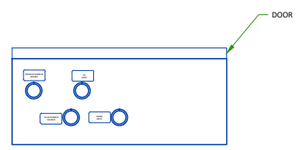
DETAIL NOT TO SCALE

SECTION A-A

THIS PIPING IS LOCATED BEHIND THE PIPING SHOWN IN "FRONT VIEW"

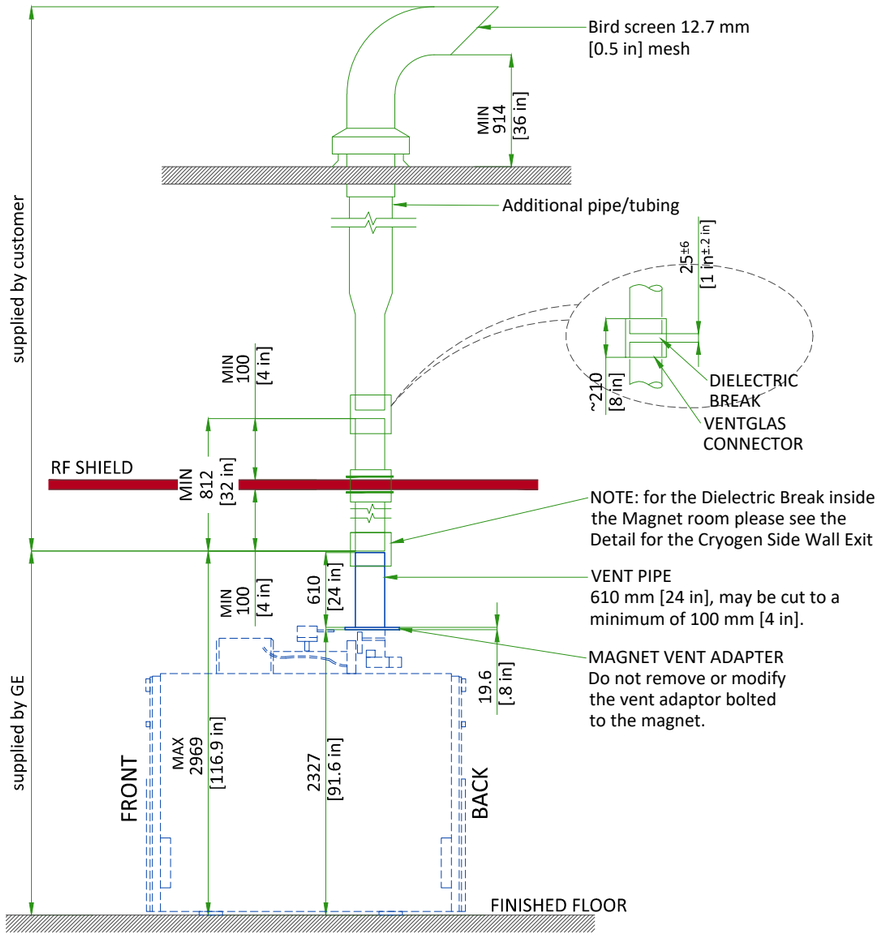


TOP VIEW



BOTTOM VIEW

TYPICAL CRYOGENIC VENT PIPE DETAIL



Waveguide is contractor supplied. Minimum 812 mm [32 in]. Must extend at least 100 mm [4 in] on magnet room side of the wall/ceiling and 25±6 mm [1±0.25 in] from the GE supplied pipe below isolation joint. Magnet room end must not be more than 2969 mm [117 in]above finished floor.

1. The 203 mm [8 in] OD vent material must be one of the following materials with the wall thickness indicated:

a. SS 304: Minimum 0.89 mm [0.035 in]; Maximum 3.18 mm [0.125 in]

b. AL 6061-T6: Minimum 2.11 mm [0.083 in]; Maximum 3.18 mm [0.125 in]

c. CU DWV, M or L: Minimum 2.11 mm [0.083 in]; Maximum 3.56 mm [0.140 in]

2. Either tubes or pipes may be used and must be seamless or have welded seams

NOTE

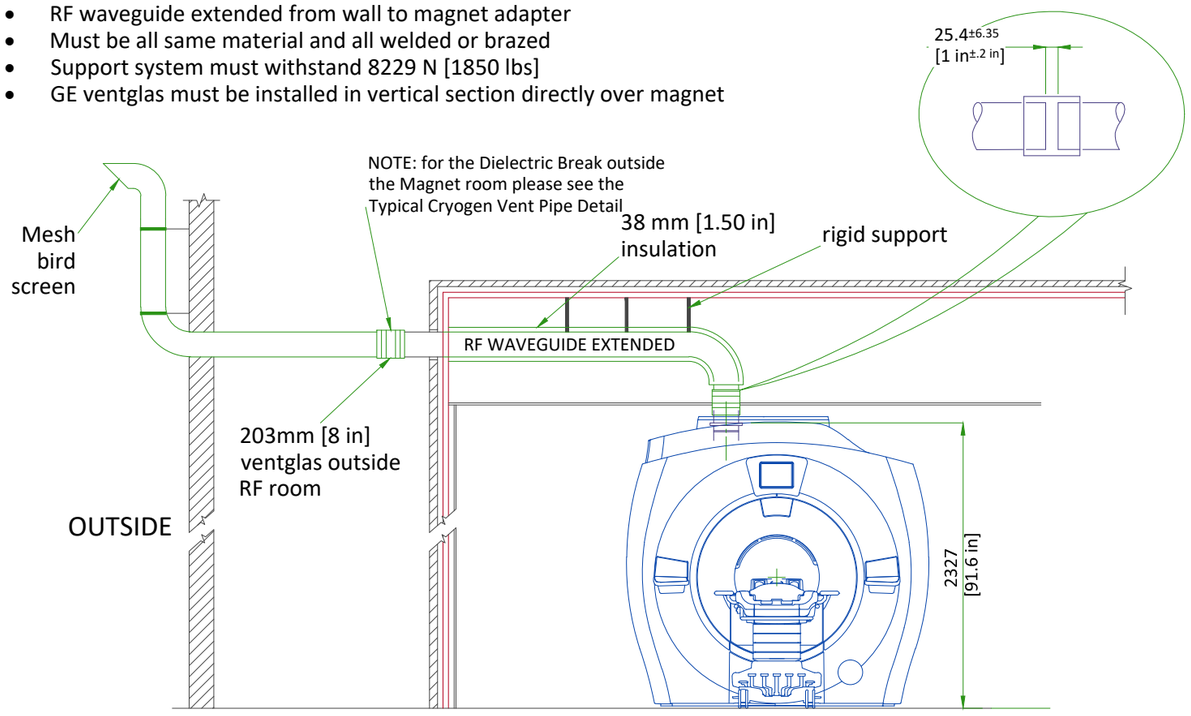
All welds on the pipe must be ground down to a smooth 203 mm [8 in] diameter so that it can be clamped to the Ventglas with enough force.

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

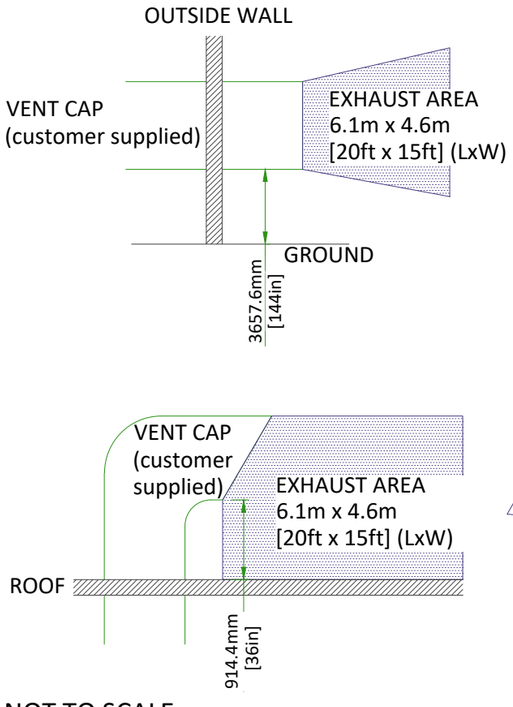
TYPICAL CRYOGEN SIDE WALL EXIT WITH LONG SWEEP ELBOW

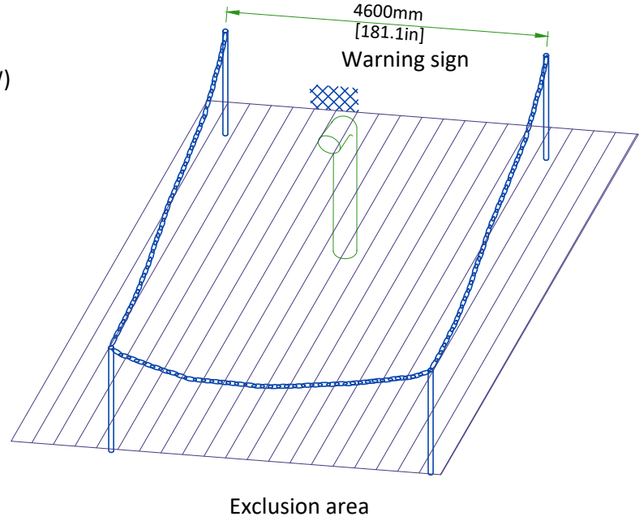
KEY COMPONENTS :

- RF waveguide extended from wall to magnet adapter
- Must be all same material and all welded or brazed
- Support system must withstand 8229 N [1850 lbs]
- GE ventglas must be installed in vertical section directly over magnet



CRYOGENIC VENTING (EXTERIOR)





Exclusion area

NOT TO SCALE

MAGNET CRYOGENIC VENT SYSTEM PRESSURE DROP MATRIX

Outer dia. of pipe (D)	Distance of vent system component from magnet		Pressure drop for straight pipe		Std sweep 45° elbow		Std sweep 90° elbow		Long sweep 45° elbow		Long sweep 90° elbow	
	ft	m	psi/ft	kPa/m	psi	kPa	psi	kPa	psi	kPa	psi	kPa
8 in. (200mm)	0-20	0-6.1	0.10	2.26	1.10	7.58	2.06	14.20	0.55	3.79	1.03	7.10
	20-40	6.1-12.2	0.21	4.75	2.10	14.48	3.70	25.51	1.03	7.10	1.85	12.76
	40-60	12.2-18.3	0.30	6.79	2.88	19.86	5.21	35.92	1.44	9.93	2.60	17.92
	60-80	18.3-24.4	0.38	8.60	3.70	25.51	6.71	46.27	1.85	12.76	3.36	23.17
	80-100	24.4-30.5	0.47	10.63	4.52	31.17	8.22	56.68	2.26	15.58	4.11	28.34
10 in. (250mm)	0-20	0-6.1	0.03	0.68	0.55	3.79	0.82	5.65	0.27	1.86	0.04	2.83
	20-40	6.1-12.2	0.07	1.58	0.82	5.65	1.51	10.41	0.41	2.83	0.75	5.17
	40-60	12.2-18.3	0.10	2.26	1.23	8.48	2.19	15.10	0.62	4.27	1.10	7.58
	60-80	18.3-24.4	0.12	2.71	1.51	10.41	2.74	18.89	0.75	5.17	1.37	9.45
	80-100	24.4-30.5	0.16	3.62	1.92	13.24	3.43	23.65	0.96	6.62	1.71	11.79
12 in. (300mm)	0-20	0-6.1	0.013	0.29	0.27	1.86	0.41	2.83	0.14	0.97	0.21	1.45
	20-40	6.1-12.2	0.027	0.61	0.41	2.83	0.82	5.65	0.21	1.45	0.41	2.83
	40-60	12.2-18.3	0.041	0.93	0.55	3.79	1.10	7.58	0.27	1.86	0.55	3.79
	60-80	18.3-24.4	0.054	1.22	0.69	4.76	1.37	9.45	0.34	2.34	0.69	4.76
	80-100	24.4-30.5	0.069	1.56	0.96	6.62	1.51	10.41	0.48	3.31	0.75	5.17
14 in. (350mm)	0-20	0-6.1	0.008	0.055	0.20	1.3800	0.301	2.08	0.102	0.70	0.15	1.03
	20-40	6.1-12.2	0.017	0.12	0.30	2.07	0.602	4.15	0.154	1.06	0.30	2.07
	40-60	12.2-18.3	0.026	0.18	0.40	2.76	0.808	5.57	0.198	1.37	0.40	2.76
	60-80	18.3-24.4	0.034	0.23	0.51	3.52	1.01	6.96	0.250	1.72	0.51	3.52
	80-100	24.4-30.5	0.043	0.30	0.71	4.90	1.11	7.65	0.353	2.43	0.55	3.79
16 in. (400mm)	0-20	0-6.1	0.0053	0.037	0.153	1.05	0.230	1.59	0.078	0.54	0.115	0.79
	20-40	6.1-12.2	0.013	0.09	0.229	1.58	0.460	3.17	0.188	0.81	0.229	1.58
	40-60	12.2-18.3	0.020	0.14	0.306	2.11	0.618	4.26	0.152	1.05	0.306	2.11
	60-80	18.3-24.4	0.026	0.18	0.390	2.69	0.773	5.33	0.191	1.32	0.390	2.69
	80-100	24.4-30.5	0.033	0.23	0.543	3.74	0.850	5.86	0.270	1.86	0.421	2.90

Notes

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

LIGHTING REQUIREMENTS

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

  NOTE: LED lighting could cause image quality issues due to RF interference. Make sure a MR-compatible LED lighting solution is chosen.
- Battery chargers (e.g., used for emergency lighting) must be located outside the magnet room.
- Short filament length bulbs are recommended.
- Linear lamps are not recommended due to the high burnout rate.

CONNECTIVITY REQUIREMENTS

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

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

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

ELECTRICAL NOTES

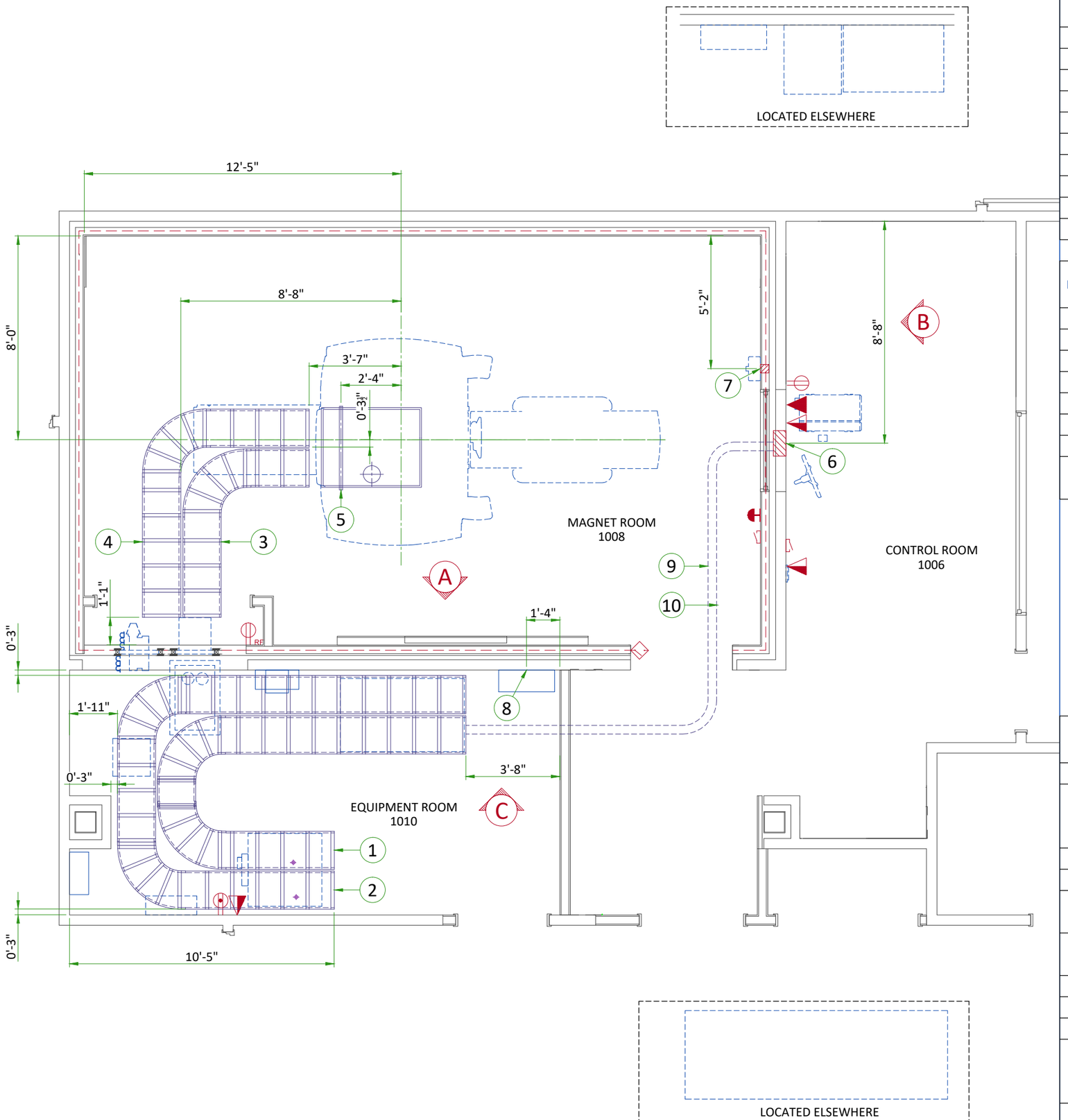
1. All wires specified shall be copper stranded, flexible, thermo-plastic, color coded, cut 10 foot long at outlet boxes, duct termination points or stubbed conduit ends. All conductors, power, signal and ground, must be run in a conduit or duct system. Electrical contractor shall ring out and tag all wires at both ends. Wire runs must be continuous copper stranded and free from splices.

1.1. Aluminum or solid wires are not allowed.

2. Wire sizes given are for use of equipment. Larger sizes may be required by local codes.
3. It is recommended that all wires be color coded, as required in accordance with national and local electrical codes.
4. Conduit sizes shall be verified by the architect, electrical engineer or contractor, in accordance with local or national codes.
5. Convenience outlets are not illustrated. Their number and location are to be specified by others. Locate at least one convenience outlet close to the system control, the power distritbution unit and one on each wall of the procedure room. Use hospital approved outlet or equivalent.
6. General room illumination is not illustrated. Caution should be taken to avoid excessive heat from overhead spotlights. Damage can occur to ceiling mounting components and wiring if high wattage bulbs are used. Recommend low wattage bulbs no higher than 75 watts and use dimmer controls (except MR). Do not mount lights directly above areas where ceiling mounted accessories will be parked.
7. Routing of cable ductwork, conduits, etc., must run direct as possible otherwise may result in the need for greater than standard cable lengths (refer to the interconnection diagram for maximum usable lengths point to point).
8. Conduit turns to have large, sweeping bends with minimum radius in accordance with national and local electrical codes.
9. A special grounding system is required in all procedure rooms by some national and local codes. It is recommended in areas where patients might be examined or treated under present, future, or emergency conditions. Consult the governing electrical code and confer with appropriate customer administrative personnel to determine the areas requiring this type of grounding system.
10. The maximum point to point distances illustrated on this drawing must not be exceeded.
11. Physical connection of primary power to GE equipment is to be made by customers electrical contractor with the supervision of a GE representative. The GE representative would be required to identify the physical connection location, and insure proper handling of GE equipment.
12. GEHC conducts power audits to verify quality of power being delivered to the system. The customer's electrical contractor is required to be available to support this activity.

- All junction boxes, conduit, duct, duct dividers, switches, circuit breakers, cable tray, etc., are to be supplied and installed by customers electrical contractor.
- Conduit and duct runs shall have sweep radius bends
- Conduits and duct above ceiling or below finished floor must be installed as near to ceiling or floor as possible to reduce run length.
- Ceiling mounted junction boxes illustrated on this plan must be installed flush with finished ceiling.
- All ductwork must meet the following requirements:

  1.Ductwork shall be metal with dividers and have removable, accessible covers.
  2.Ductwork shall be certified/rated for electrical power purposes.
  3.Ductwork shall be electrically and mechanically bonded together in an approved manner.
  4.PVC as a substitute must be used in accordance with all local and national codes.
- All openings in access flooring are to be cut out and finished off with grommet material by the customers contractor.
- General contractor to insert pull cords for all cable run conduits between the equipment room and the operators control room.
- 10 foot pigtails at all junction points.
- Grounding is critical to equipment function and patient safety. Site must conform to wiring specifications shown on this plan.

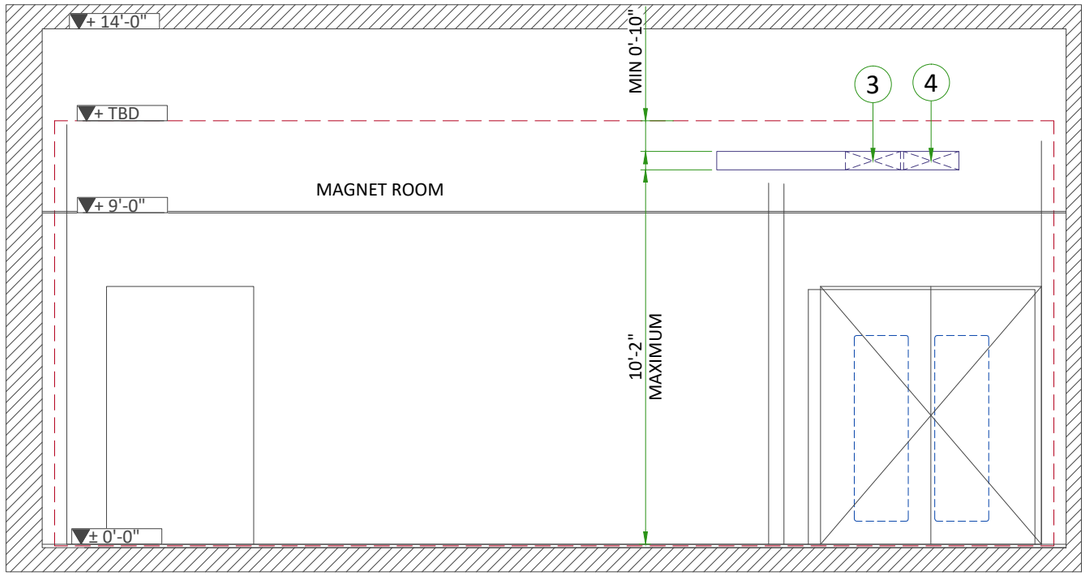


ITEM	DESCRIPTION (CONTRACTOR SUPPLIED & INSTALLED)
1	Cable ladder 450mm x 150mm [18" x 6"]
2	Cable ladder 450mm x 150mm [18" x 6"] for gradient cables
3	Non-ferrous cable ladder 450mm x 150mm [18" x 6"]
4	Non-ferrous cable ladder 450mm x 150mm [18" x 6"] for gradient cables
5	Non-ferrous unistrut cable support
6	300mm x 200mm x 150mm [12" x 8" x 6"] Junction box
7	100mm x 100mm x 50mm [4" x 4" x 2"] Junction box @ 5'-4" A.F.F. to center
8	Main disconnect panel
9	50mm [2"] Conduit above RF screen
10	75mm [3"] Conduit above RF screen

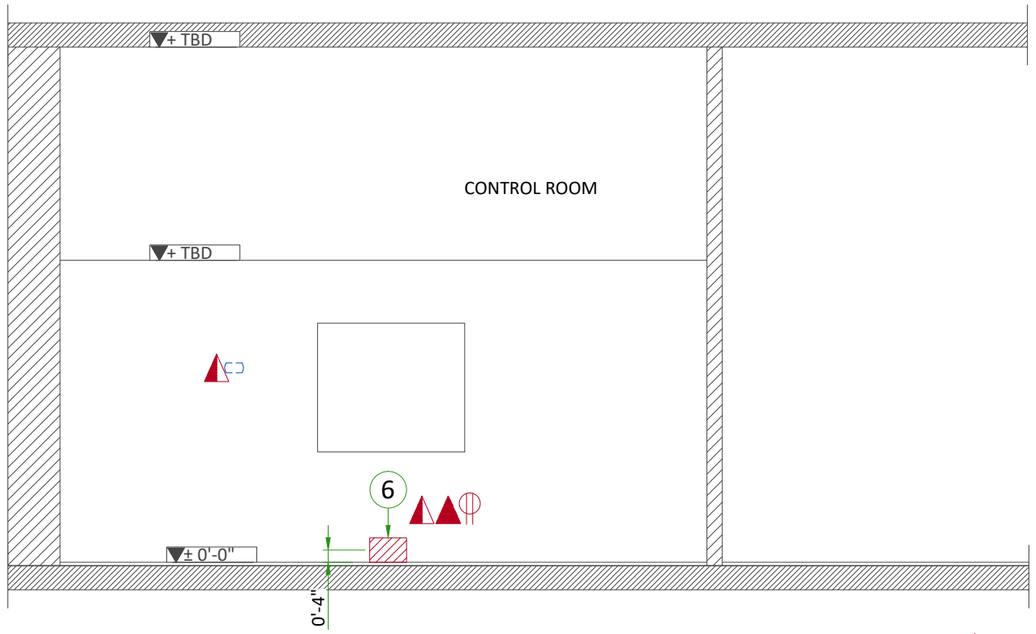
ITEM	QTY	Outlet Legend for GE Equipment
		System emergency off (SEO), (recommended height 1.2m [48"] above floor)
		Door interlock switch
		Emergency exhaust fan switch 1.2m [48"] height recommended)
		Duplex hospital grade, dedicated wall outlet 120-v, single phase power
		Network outlet
		Dedicated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

Additional Conduit Runs
(Contractor Supplied and Installed)

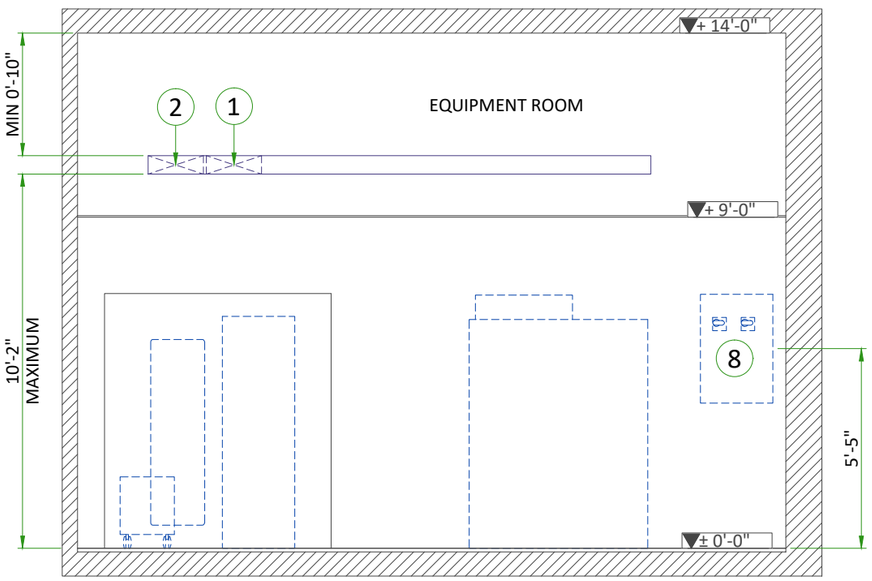
From	To	Qty	Size (in)	Size (mm)
Main Disconnect Panel	Power, Gradient, RF cabinet	1	as Req'd	
	Heat Exchange Cabinet	1	as Req'd	
	System emergency off	1	1/2	16
System emergency off	Secondary Penetration Wall	1	1/2	16
Door Switch	Power, Gradient, RF cabinet	1	3/4	20
System emergency off	Secondary Penetration Wall	1	3/4	20
	Additional system emergency off	1	1/2	16
Magnet Rundown Unit	Magnet	1	1	25
	120-V 1Ø Power from RF filter	1	as Req'd	
RF filter	120-V 1Ø Power	1	as Req'd	
Room Light	RF filter	1	as Req'd	
RF filter	Facility emergency power	1	as Req'd	
Main Bypass Panel	Main Disconnect Panel	1	as Req'd	
	UPS	2	as Req'd	
	Facility power		as Req'd	
Chiller	Remote graphic display	1	3/4	20
	Facility power	1	as Req'd	


+ 14'-0"
MIN 0'-10"
+ TBD
3
4
MAGNET ROOM
+ 9'-0"
10'-2"
MAXIMUM
± 0'-0"

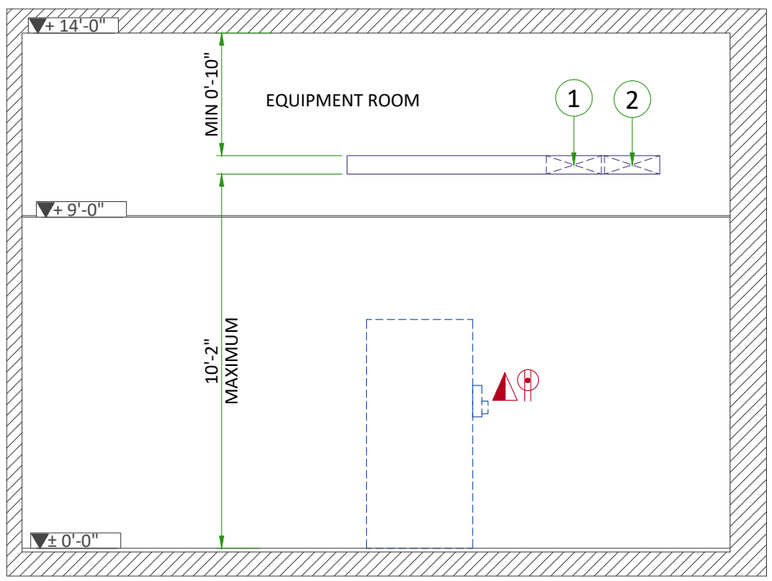
A


+ TBD
CONTROL ROOM
+ TBD
6
± 0'-0"
0'-4"

B


+ 14'-0"
MIN 0'-10"
2
1
EQUIPMENT ROOM
+ 9'-0"
10'-2"
MAXIMUM
8
5'-5"
± 0'-0"

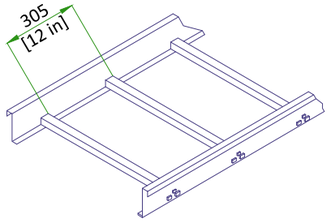
C


+ 14'-0"
MIN 0'-10"
EQUIPMENT ROOM
1
2
+ 9'-0"
10'-2"
MAXIMUM
± 0'-0"

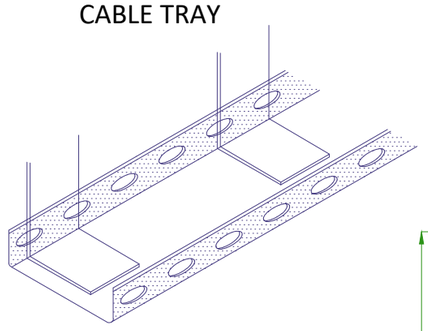
D

CABLE WAYS IN EQUIPMENT ROOM

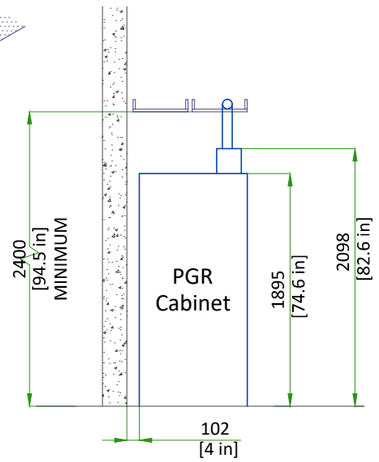
CABLE LADDER



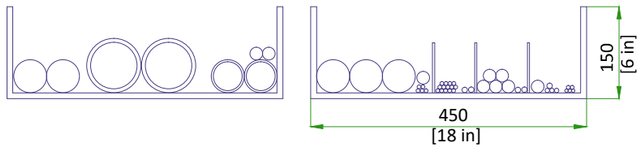
CABLE TRAY



SIDE-BY-SIDE



Cable trays detail side-by-side: (2x450mm [18in])

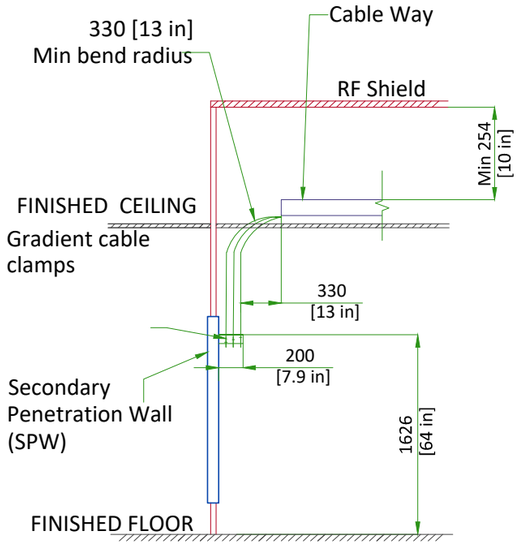


Water and air pipes

Cables

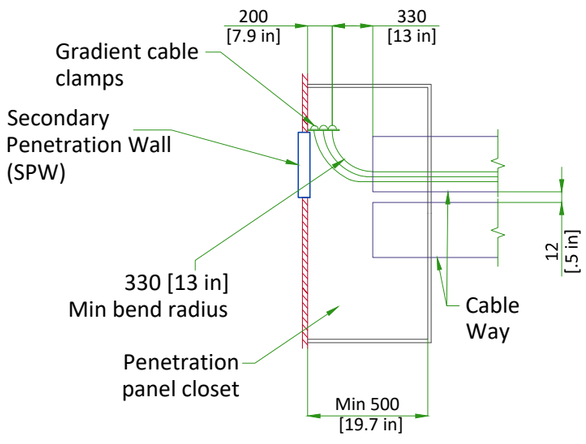
CABLE WAY TO PENETRATION PANEL

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



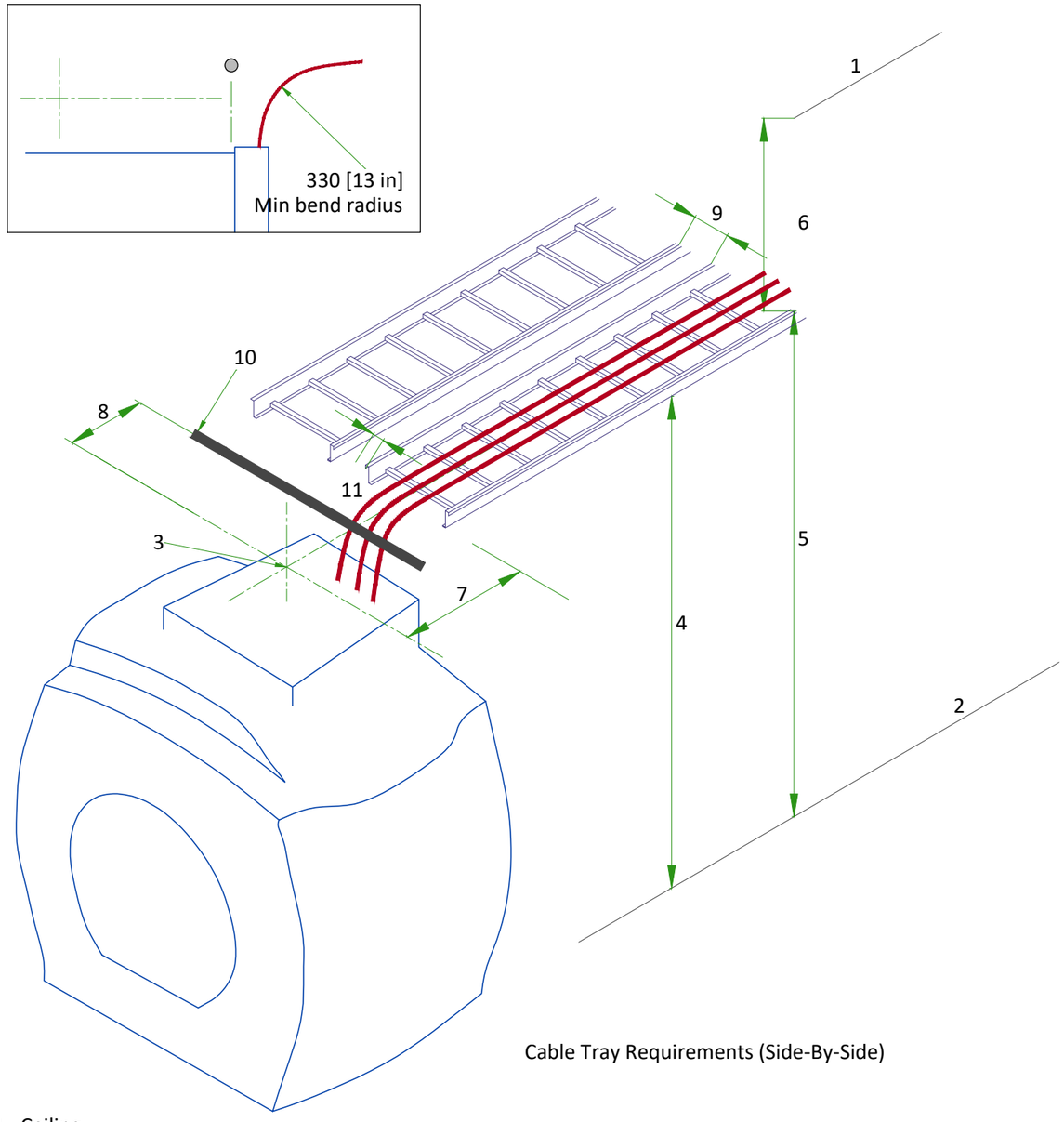
SIDE VIEW

The end of the cable way must be contained in the pen closet (cables must not rest directly on the wall opening)



TOP VIEW

CABLE TRAYS REQUIREMENTS IN MAGNET ROOM



Cable Tray Requirements (Side-By-Side)

1 - Ceiling
2 - Finished Floor
3 - Magnet isocenter. Gradient cables must be centered on magnet isocenter.
4 - Minimum cable tray height required at back of Magnet: 2578 mm [101.5 in].
Tray height may be lower at other points to avoid obstructions.
5 - Maximum height from floor to top of tray (anywhere in Magnet room): 3251 mm [128 in].
6 - Minimum distance from top of cable tray to ceiling or other obstruction: 254 mm [10 in].
7 - Tray end to isocenter: 1099 ±12 mm [43.25 ±0.5 in].
8 - Other cable termination to isocenter: 718 ±12 mm [28.25 ±0.5 in].
9 - Minimum distance between trays: 12 mm [0.5 in].
10 - Non-ferrous cable support

POWER REQUIREMENTS

SPECIFICATIONS OF MAIN POWER INPUT

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

- Power input must be separated from any others which may generate transients (elevators, air conditioning, radiology rooms equipped with high speed film changers...).
- Total harmonic distortion less than 2.5%.
- Phase imbalance must not exceed 2%
- Lock-out/Tag-out: The Main Disconnect Panel (MDP) shall provide an external single point lock-out/tag-out feature for the entire system and a means to externally lock-out/tag-out each output breaker independently. Each lock-out/tag-out feature shall accommodate a standard sized lock hasp..

SPECIFICATIONS OF BACK-UP POWER SUPPLY

MAGNET MONITOR REQUIRES A 110/220 VAC, 50/60 HZ, 2.0 A FACILITY SUPPLIED OUTLET. POWER AT THE OUTLET MUST BE CONTINUOUSLY AVAILABLE.

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

CABLES

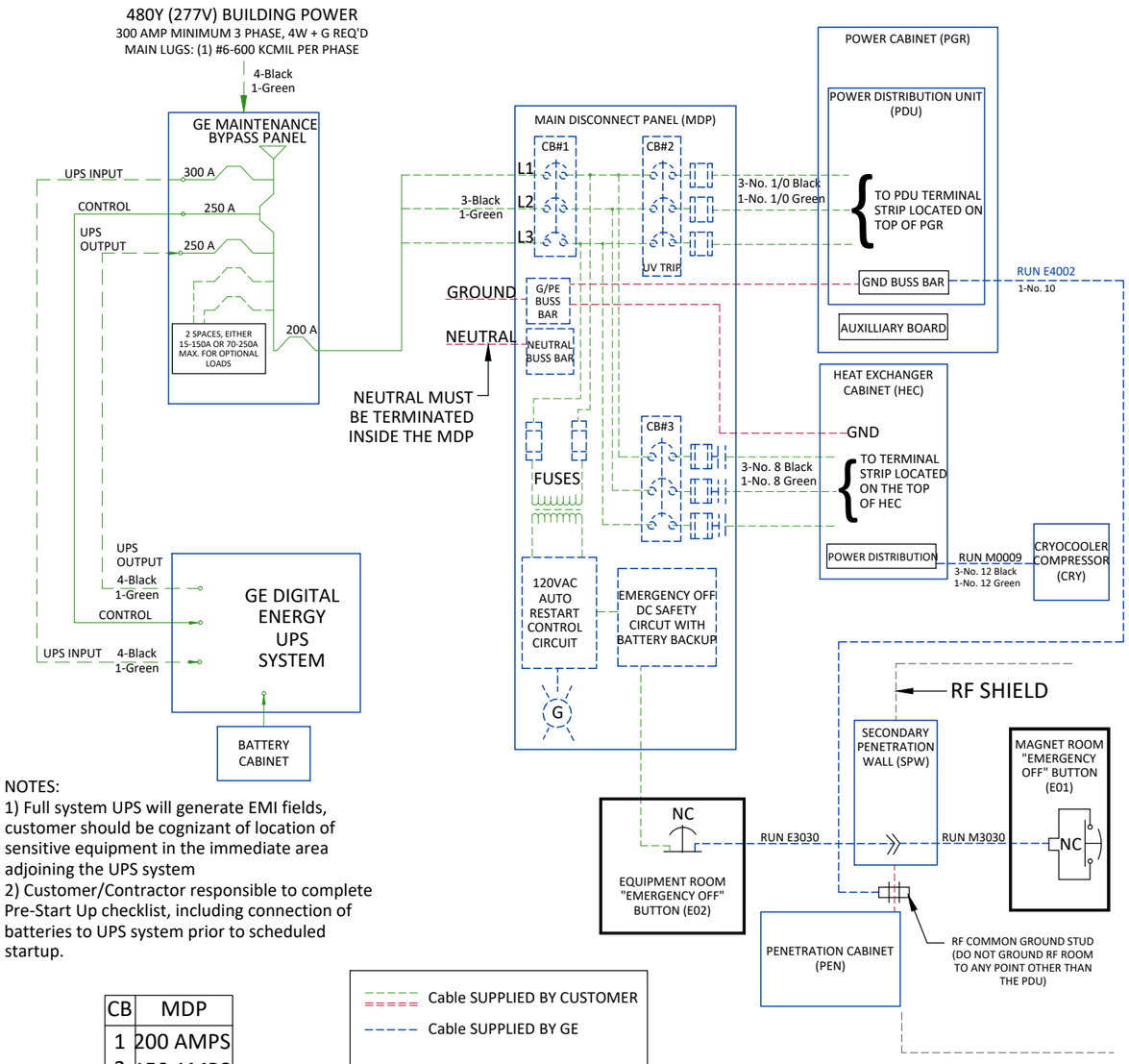
- Power and cable installation must comply with the distribution diagram.
- Size of the Main power input cable is determined by the customer, taking its length and admissible voltage drops into consideration.
- All cables must be isolated and flexible, cable color codes must comply with standards for electrical installation.
- The cables from signaling and remote control (Y,Emergency Off Buttons,L...) will go to Main Panel with a pigtail length of 1.5m [60in], and will be connected during installation.
- Each conductor will be identified and isolated (screw connector).

GROUND SYSTEM

- The equipotential link will be by means of an equipotential bar.
- The grounding point of MDP is directly connected to the building's ground by an isolated copper cable.
- The impedance of the earth bar should be less than or equal to 2 ohms.

FEEDER TABLE								
MIN. FEEDER WIRE SIZE, AWG OR MCM (sq. M)/VAC	MINIMUM FEEDER WIRE LENGTH - ft (m)							
	100 (30.5)	150 (46)	200 (61)	250 (76)	300 (92)	350 (107)	400 (122)	450 (137)
480 VAC	3/0 (85)	3/0 (85)	3/0 (85)	3/0 (85)	3/0 (85)	3/0 (85)	3/0 (85)	3/0 (85)
GROUND REQ'D	4	4	4	4	4	4	2	2
GENERAL NOTES								
In all cases qualified personnel must verify that the feeder (at the point of take-off) and the run to the MR system meet all the requirements stated in the PIM								
For a single unit installation, the minimum transformer size is 225KVa. Regulated transformer is not required unless voltage changes exceed +/- 10% over a period of 1 hour or longer								
Grounding conductor will run from the equipment back to the power source/main grounding point and always travel in the same conduit with the feeders								

POWER DISTRIBUTION



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

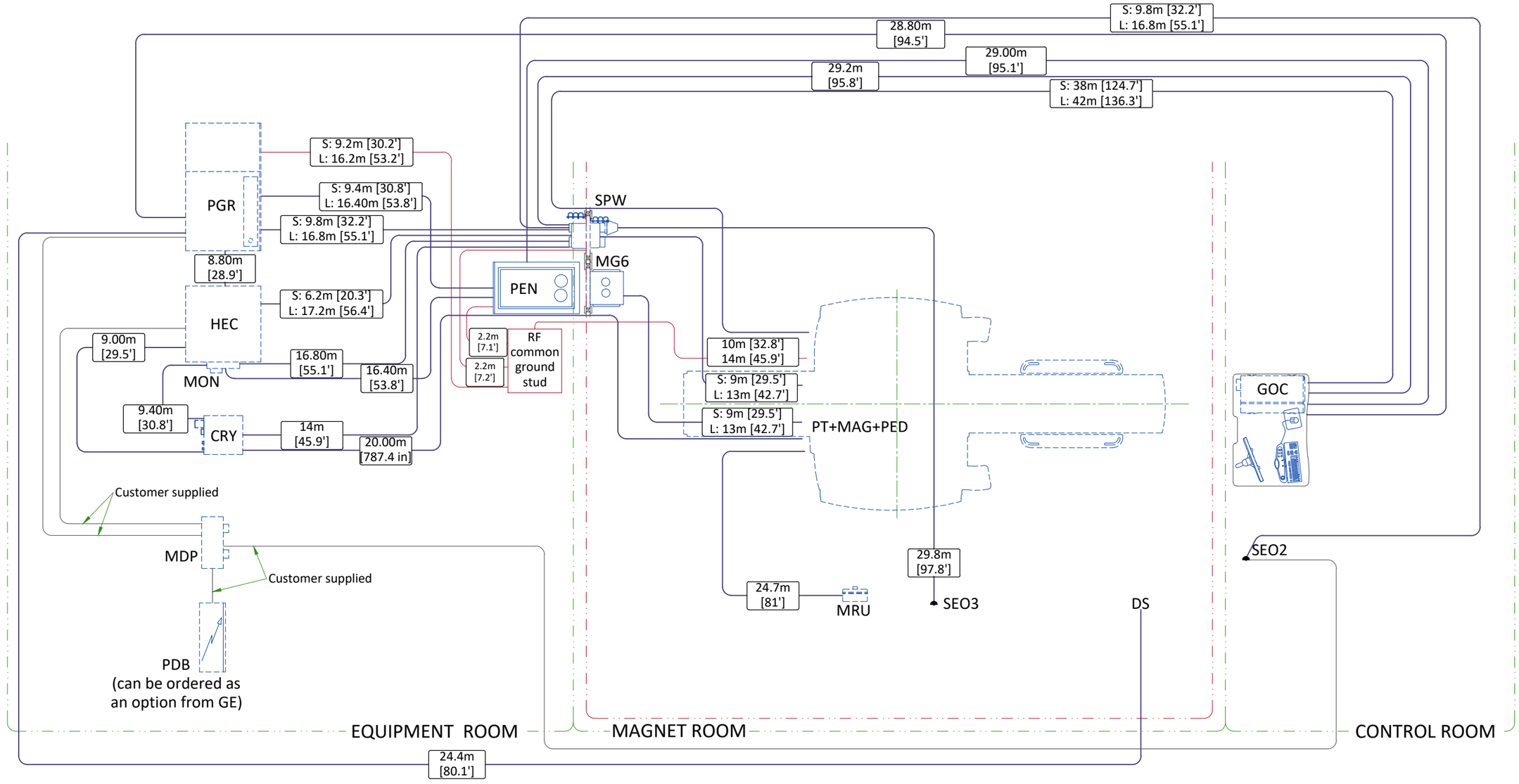
CB	MDP
1	200 AMPS
2	150 AMPS
3	50 AMPS

Cable SUPPLIED BY CUSTOMER
Cable SUPPLIED BY GE
Equipment SUPPLIED BY CUSTOMER
Equipment SUPPLIED BY GE

NOTE:

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

INTERCONNECTIONS



CABLES ROUTING FOR OPTIONS

OPTION	FROM	TO	CABLE LENGTH
BW	PEN	Brainwave cabinet	18.3m [60']
MRE	MRE	Magnet Isocenter	Nominal: 7.3m [24'] Maximum: 10.1m [33']
	MRE	PEN cabinet	15.2m [50']
	MRE	Ethernet Hub in PGR	15.2m [50']
	MRE	Customer Supplied Outlet	60Hz: 6.1m [20'] 50Hz: 7.6m [25']