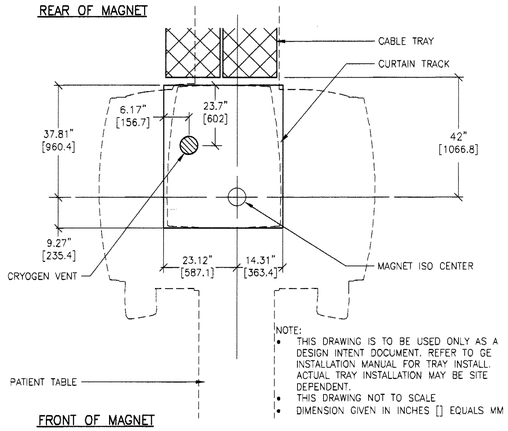
SUPPORT DETAIL
CURTAIN TRACK

M5816
REV. DATE: 25.JUN.12



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
- DIMENSION GIVEN IN INCHES [] EQUALS MM

ACOUSTICS AND VIBRATION GUIDELINES: MAGNET

M66-15G2
REV. DATE: 08/26/09

SYSTEM ACOUSTIC NOISE LEVELS

ANY GE FACTORY-INSTALLED PROTOCOL CAN BE MODIFIED BY OPERATORS, WHICH CAN INCREASE OR DECREASE ACOUSTIC SPL (SOUND PRESSURE LEVEL); OR OPERATORS MAY CREATE THIER OWN PROTOCOL WHICH COULD PRODUCE A HIGHER OR LOWER ACOUSTIC SPL AS STATED UNDER OPERATING CONDITIONS CONDITION 1 BELOW. TYPICAL SCANS GENERATE ACOUSTIC LEVELS AS STATED UNDER OPERATING CONDITIONS CONDITION 2 BELOW. IN ADDITION, THE EXPOSURE TIMES ARE COMPLETELY UNDER OPERATOR CONTROL. CONSEQUENTLY, HEARING PROTECTION IS REQUIRED FOR ALL PEOPLE IN THE MAGNET ROOM DURING SCANS TO PREVENT HEARING IMPAIRMENT, ACOUSTIC LEVELS MAY EXCEED 99 dBA. AGAIN, FOR MORE INFORMATION ABOUT RECOMMENDED SAFETY PROCEDURES REGARDING PATIENT EXPOSURE TO MR-GENERATED ACOUSTIC NOISE, SEE THE MR SAFETY GUIDE INCLUDED IN THE USER MANUAL.

AMBIENT CONDITIONS

TO REDUCE ANY BACKGROUND NOISE DUE TO CABINET BLOWERS, ETC., ACOUSTICAL CEILINGS, WALLS, AND FLOORS ARE RECOMMENDED. THE FOLLOWING ARE TYPICAL NOISE LEVEL READINGS:

- OPERATOR AREA .....62 dBA
- EQUIPMENT ROOM .....80 dBA

OPERATING CONDITIONS

CONDITION 1

MR SCANNERS UNDER "WORST-CASE" OPERATING CONDITIONS, COULD GENERATE ACOUSTIC LEVELS (AS MEASURED AT THE MAGNET ISO-CENTER) AS FOLLOWS:

AVERAGE SPL 127 dBA
FREQUENCY RANGE 20 TO 20k Hz

SPL = SOUND PRESSURE LEVEL

AS RECENT HISTORY HAS SHOWN AN EVOLUTION TOWARDS MORE POWERFUL (AND HENCE LOUDER) GRADIENT SUBSYSTEMS, ARCHITECTS SHOULD CONSIDER THE ACOUSTIC LEVELS STATED IN THE "WORST CASE" CONDITION 1, MENTIONED ABOVE. NOTE THAT HIGH-FIELD SIGNA SYSTEMS HAVE THE ABILITY TO RUN SCANNING PROTOCOLS WHICH CAN GENERATE ACOUSTIC LEVELS OVER THE ENTIRE HUMAN PERCEPTIBLE FREQUENCY RANGE (20 TO 20k Hz), THEREFORE ATTENUATION OVER THIS ENTIRE RANGE MUST BE CONSIDERED FOR SITE DESIGN.

VIBRATION

- THE MAGNET MAY BE SENSITIVE TO VIBRATIONS IN THE FREQUENCY RANGE OF 0.5 TO 45 Hz DEPENDING ON THE AMPLITUDE OF THE VIBRATION. IN THE PHYSICAL AREA WHERE THE MR SYSTEM IS TO BE LOCATED, EVERY PRECAUTION MUST BE TAKEN TO ENSURE THAT THE VIBRATION IS MINIMIZED. IN THE MAGNET SITING AREA, THE STRUCTURAL STABILITY AND BEHAVIORAL CHARACTERISTICS CAN BE ASSESSED. THE VIBRATION TESTS OUTLINED CAN BE USED TO ASSESS THE VIBRATION ENVIRONMENT. SITES WHICH CURRENTLY PASS THE VIBRATION STABILITY CRITERIA MAY PROCEED WITH INSTALLATION. SITES WHICH HAVE MARGINAL VIBRATION STABILITY REQUIRE SOURCE ISOLATION OR STRUCTURAL MODIFICATIONS. THEN IT IS THE CUSTOMER'S RESPONSIBILITY TO CONTRACT A VIBRATION CONSULTANT OR QUALIFIED ENGINEER TO IMPLEMENT DESIGN MODIFICATIONS TO MEET THE SPECIFIED LIMITS. WITH THE VIBRATION CONSULTANT PRESENT, LOCAL GE FIELD SERVICE AND/OR INSTALLATION SPECIALIST MUST VERIFY THE ELIMINATION/REDUCTION OF ALL IDENTIFIED SOURCES DO IMPROVE THE VIBRATION ENVIRONMENT. GE CAN ASSIST IN INTERPRETING MARGINAL SITE TEST RESULTS AND PREDICTING THE IMPACT ON SYSTEM PERFORMANCE. HOWEVER IT IS ULTIMATELY THE CUSTOMER/ARCHITECT/ENGINEER RESPONSIBILITY TO DESIGN SITE SOLUTION.
- TO MINIMIZE THE INTERFERENCE, THE MAGNET SHOULD BE PLACED ON A SOLID FLOOR, LOCATED AS FAR AS POSSIBLE FROM THE VIBRATION SOURCES, SUCH AS PARKING LOTS, ROADWAYS, SUBWAYS, TRAINS, HALLWAYS, ELEVATORS, HELIPORTS AND HOSPITAL PHYSICAL PLANTS CONTAINING PUMPS, MOTORS, AIR HANDLING EQUIPMENT, OR AIR CONDITIONING EQUIPMENT.

PLEASE NOTE THAT OTHER ITEMS NOT LISTED COULD ALSO BE POTENTIAL SOURCES OF VIBRATION.

VIBRATION ISOLATION IS RECOMMENDED AT FLOOR CONNECTION POINTS OF THE AIR CONDITIONING UNIT(S) TO BE INSTALLED FOR THE PURPOSE OF COOLING THE MR SUITE.

ISOLATION OF THE MR MAGNET IS NOT A RECOMMEDED SOLUTION FOR REDUCING ENVIRONMENTAL VIBRATION.

- VIBRATION MEASUREMENTS SHOULD BE MADE WHEN THE PROPOSED SITE IS LOCATED NEAR ANY OF THE SOURCES LISTED HERE. MEASUREMENTS SHOULD BE MADE USING A SPECTRUM ANALYZER CAPABLE OF PERFORMING THE TEST GUIDELINES.

MAGNET SITING REQUIREMENT

- THE MAGNET MUST BE RIGIDLY BOLTED TO THE FLOOR. VIBRATION MEASUREMENTS ON THE MAGNET SUPPORT MUST MEET THE GUIDELINES BELOW. CUSTOMER/CONTRACTOR IS RESPONSIBLE FOR THE PROPER MAGNET ANCHORING.

TRANSIENT VIBRATION

- TIME HISTORY VIBRATION LEVELS (WITH ALL STEADY STATE VIBRATION SOURCES POWERED DOWN) EXCEEDING TRIGGER OF **0.0005 g, ZERO TO PEAK** MUST BE FULLY ANALYZED TO ASSESS THE POTENTIAL IMPACT TO THE BUILDING STRUCTURE. THE BUILDING (SPECTRAL) RESPONSE IMMEDIATELY FOLLOWING THE **0.0005 g, ZERO TO PEAK TRIGGER LEVEL** (ENDING AT THE DECAY OF THE VIBRATION SIGNAL) MUST NOT CAUSE THE SITE ENVIRONMENT TO EXCEED THE **STEADY STATE VIBRATION** LEVELS DEFINDED BELOW.

STEADY STATE VIBRATION

- THE MAXIMUM STEADY STATE VIBRATION TRANSMITTED THROUGH THE FLOOR MUST NOT EXCEED THE FOLLOWING MAXIMUM SINGLE FREQUENCY COMPONENTS ABOVE AMBIENT BASELINE:
  - 5×10^{-5} g rms at 0 Hz ramping to 10×10^{-5} g at 20 Hz
  - 10×10^{-5} g rms 20-40 Hz
  - 25×10^{-5} g rms 40-50 Hz

IN ORDER TO ENSURE THAT ANY DISCRETE SIGNAL REPRESENTS A REAL MECHANICAL VIBRATION SOURCE, THE SIGNAL MUST HAVE A BANDWIDTH THAT TYPIFIES DYNAMIC SYSTEM RESPONSE.

TEST MEASUREMENTS (1.1)

VIBRATION MEASUREMENTS ARE IN THE RANGE OF 10^{-6}g. TEST EQUIPMENT MUST HAVE THE REQUIRED SENSITIVITY TO THESE LEVELS.

INSTRUMENTATION IS RECOMMENDED TO HAVE A LOW TOLERANCE TO TEMPERATURE EFFECTS AS MANY TIMES THE LOW FREQUENCY THERMAL DRIFT MAY INFLUENCE THE MEASUREMENTS.

IT IS HIGHLY RECOMMENDED ALL MEASURED DATA IS REAL TIME DATA ACQUISITION. RECORDING THE VIBRATION DATA WILL NOT ALLOW FOR A PROPER SITE SURVEY, SPECIFICALLY WHEN STUDYING TRANSIENT VIBRATION AND WHEN SEARCHING FOR SPECIFIC VIBRATION SOURCES.

ALL ANALYSES ARE TO BE NARROWBAND FAST FOURIER TRANSFORMS (FFT'S) OVER THE FREQUENCY BANDS LISTED BELOW:

FREQUENCYBAND	FREQUENCY RESOLUTION
0.2 TO 50 HZ	Δf = 0.125 HZ

TIME HISTORIES OF THE VIBRATION MUST BE RECORDED AS ACCELERATION LEVELS VS. TIME. THE RESOLUTION OF THE TIME HISTORY MUST BE ADJUSTED TO CLEARLY CAPTURE THE TRANSIENT EVENT. THE ANALYZER SET-UP WILL BE SITE DEPENDENT AND, IN SPECIAL CASES, VIBRATION RESPONSE DEPENDENT. IT IS THE RESPONSIBILITY OF THE VIBRATION CONSULTANT TO STUDY THE TRANSIENT ENVIRONMENT, CAPTURE DATA TO CONFIRM TRANSIENT ACTIVITY EXCEEDS THE TRIGGER LEVEL, THEN EXPAND THE TIME HISTORY DATA TO EXHIBIT THE STRUCTURAL RESPONSE.

EQUIPMENT (SPECTRAL ANALYZER) SET-UP (1.2)

- FREQUENCY AVERAGE A MINIMUM OF 20 LINEAR AVERAGES. DO NOT USE PEAK HOLD OR 1/3 OCTAVE ANALYSIS.
- AVERAGE AND STORE A MINIMUM OF 10 PLOTS TO SUPPORT THE SITE VIBRATIONS CONSISTENCY.
- HANNING WINDOW MUST BE APPLIED TO THE ENTIRE SPECTRA

SPECTRUM ANALYZERS CAPABLE OF THESE MEASUREMENTS ARE READILY AVAILABLE FOR PURCHASE OR RENTAL. MODELS SUCH AS THE HP 3560A, NICOLET PHASZER, B&K PULSE, AND HP 35670 ARE ALL CAPABLE OF MAKING THE SITE VIBRATION MEASUREMENTS. ACCELEROMETERS MUST HAVE THE CAPABILITY TO MEASURE FROM 0.2 Hz BEYOND 50 Hz. TIME HISTORIES CAN BE RECORDED USING ANY OF THE ANALYZERS LISTED ABOVE. PLEASE NOTE THAT THE EQUIPMENT MENTIONED ARE FOR EXAMPLE ONLY. IT IS THE RESPONSIBILITY OF THE ENGINEERING TEST FIRM TO PROVIDE EQUIPMENT THAT WILL ALLOW MEASUREMENTS COMPLIANT WITH THIS GUIDELINE.

DATA COLLECTIONS (1.3)

AMBIENT BASELINE CONDITION:

ALL OF THE MEASUREMENTS DEFINED IN 1.1 AND 1.2 (ABOVE) MUST BE MADE IN A "QUIET" ENVIRONMENT. THAT IS, IN AREAS WHERE EXCESSIVE TRAFFIC, SUBWAY TRAINS, ETC. EXISTS. A VIBRATION MEASUREMENT MUST ALSO BE MADE DURING PERIODS WITHOUT TRAFFIC OR DURING PERIODS OF LIGHT TRAFFIC. MEASUREMENTS MUST DEFINE THE LOWEST LEVELS OF VIBRATION POSSIBLE AT THE SITE.

THE SOURCE OF ANY STEADY STATE VIBRATION WHOSE LEVELS EXCEED THE SPECIFICATIONS MUST BE IDENTIFIED AS TO THE SOURCE OF THE VIBRATION DISTURBANCE. A SECOND MEASUREMENT SHOULD BE MADE WITH ALL OF THE IDENTIFIED CONTRIBUTORS POWERED DOWN IF POSSIBLE. IN SITUATIONS WHERE IT IS NOT POSSIBLE TO POWER DOWN EQUIPMENT, VIBRATION DATA MUST BE COLLECTED TO IDENTIFY SPECIFIC SOURCE OF THE VIBRATION CONCERN. THE MAJORITY OF STEADY STATE VIBRATION PROBLEMS CAN BE NEGATED BY ISOLATING THE VIBRATION SOURCE.

NORMAL CONDITION

ALL OF THE VIBRATION MEASUREMENTS LISTED ABOVE MUST BE REPEATED DURING PERIODS OF "NORMAL" ENVIRONMENTAL CONDITIONS INCLUDING THE FFT'S AND TIME HISTORIES. THE TRANSIENT MEASUREMENTS MUST BE PROVIDED TO DEFINE THE DYNAMIC DISTURBANCES THE MR SYSTEM MIGHT BE EXPOSED TO. TRANSIENT ANALYSIS IS REQUIRED FOR A TRUE ASSESSMENT OF THE SITE.

SPEICAL ATTENTION MUST BE PAID TO THE SITE ASSESSMENT DURING THE ENTIRE ANALYSIS. SINCE TRANSIENT VIBRATION IS NOT EASILY ADDRESSED ONCE THE MR SUITE IS FULLY CONSTRUCTED, THE TEST CONSULTANT MUST FULLY UNDERSTAND THE NEEDS FOR THIS ANALYSIS. THE SOURCE OF ANY TRANSIENT MUST BE IDENTIFIED AND SUPPORTED WITH VIBRATION PLOTS. IF THE SOURCE OF ANY TRANSIENT IS NOT ABLE TO BE LOCATED, IT IS RECOMMENDED THAT THE CUSTOMER SHOULD HAVE AN ALTERNATE LOCATION IDENTIFIED AND VIBRATION STUDIED.

TRANSIENT VIBRATION IS DIFFICULT TO ASSESS IF THE DETAILS OF THE TRANSIENT VIBRATION IS NOT UNDERSTOOD. THE **0.0005 g, ZERO TO PEAK TRIGGER LEVEL** IS A STARTING POINT TO BEGIN UNDERSTANDING THE VIBRATION STABILITY. THE TRANSIENT VIBRATION PEAK AMPLITUDE, STRUCTURAL (TIME VARIANT) RESPONSE, DECAY RATE AND AN ESTIMATE OF THE NUMBER OF EVENTS PER UNIT TIME WOULD CONSTITUTE A COMPLETE TRANSIENT ANALYSIS. ALL TRANSIENT FAILURES MUST BE SUPPORTED BY TIME HISTORY PLOTS. THE PLOTS MUST CLEARLY SHOW THE STRUCTURAL RESPONSE, THE FREQUENCY OF THE SIGNATURE AND THE DECAY RATE. FROM THIS DATA, GE CAN HELP DETERMINE COMPLIANCE TO THE VIBRATION GUIDELINES.

TEST CONSULTANT MUST PROVE DESIGN RECOMMENDATIONS FOR ALL SITES/BUILDING STRUCTURES WHICH ARE FOUND TO EXCEED THE SPECIFICATIONS.

PRESENTATION/INTERPRETATION OF RESULTS (1.4)

THE RECOMMENDED FORMAT FOR SITE VIBRATION DATA COLLECTION, PRESENTATION, AND ANALYSIS IS ILLUSTRATED IN THE EXAMPLES SHOWN IN ILLUSTRATIONS 1.1 THROUGH 1.4. IN THE PRE-INSTALLATION MANUAL. PRESENTATION OF THE DATA IN ANY OTHER FORMAT (LINEAR UNITS ONLY) MAY RESULT IN AN INCORRECT INTERPRETATION AND DIAGNOSIS OF THE SITE. ADDITIONAL DATA COLLECTION OR PRESENTATION METHODS IS AT THE OPTION OF THE VIBRATION TESTING SERVICE.

IT IS THE RESPONSIBILITY OF THE CUSTOMER'S VIBRATION TESTING SERVICE TO INTERPRET THE RESULTS AND DETERMINE IF THAT SITE MEETS GE'S SPECIFICATIONS. ILLUSTRATIONS A-1 AND A-2 ARE EXAMPLES PROVIDED TO ASSIST A TEST CONSULTANT IN THE USE OF GE STEADY STATE SPECIFICATIONS (VIBRATION SPECIFICATIONS ABOVE AMBIENT BASELINE). IF THE VIBRATION LEVELS ARE TOO HIGH, ADDITIONAL DATA ACQUISITION MAY BE NECESSARY TO:

- DETERMINE THE SOURCE OF THE VIBRATION
- PROPOSE A SOLUTION TO THE PROBLEM
- FIND AN ALTERNATE SITE LOCATION.

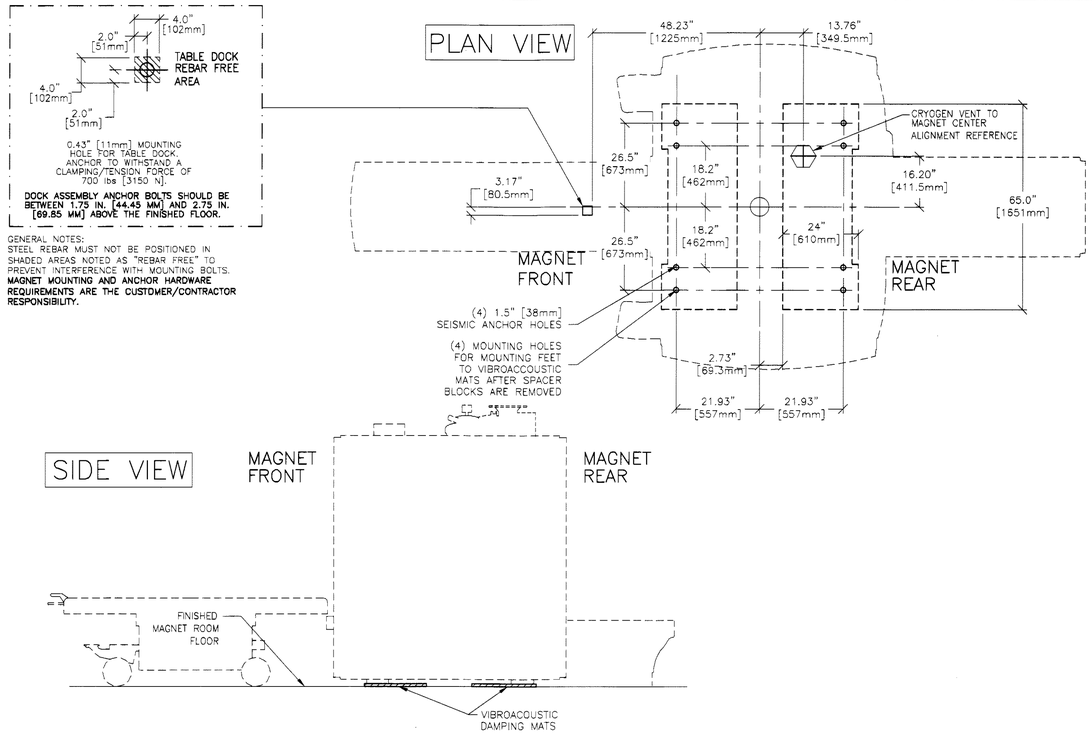
ILLUSTRATIONS A-3 AND A-4 IN THE PRE-INSTALLATION MANUAL ARE EXAMPLES PROVIDED TO ASSIST A TEST CONSULTANT IN THE USE OF GE TRANSIENT SPECIFICATIONS. THE **500 MICRO-G, ZERO TO PEAK TRIGGER LEVEL** IDENTIFIES DATA COLLECTION TO BEGIN ASSESSMENT OF THE SITE VIBRATION ANALYSIS. THE RESPONSE OF THE TRANSIENT MUST BE ASSESSED RELATIVE TO THE STEADY STATE VIBRATION SPECIFICATIONS IN SECTION SPECIFICATIONS.

ANY QUESTIONS REGARDING TEST EQUIPMENT REQUIREMENTS, TEST PARAMETERS, OR GENERAL QUESTIONS SHOULD BE DISCUSSED WITH YOUR GE PROJECT MANAGER OF INSTALLATIONS.

FLOOR MOUNTING DETAIL: MAGNET

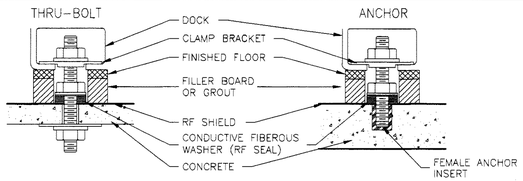
REFER TO SHEET A1 FOR ACTUAL MAGNET ORIENTATION

M6640
REV. DATE: 05.SEP.12



GENERAL NOTES:
STEEL REBAR MUST NOT BE POSITIONED IN SHADED AREAS NOTED AS "REBAR FREE" TO PREVENT INTERFERENCE WITH MOUNTING BOLTS. **MAGNET MOUNTING AND ANCHOR HARDWARE REQUIREMENTS ARE THE CUSTOMER/CONTRACTOR RESPONSIBILITY.**

TABLE DOCK ATTACHMENT METHODS



THE DOCK ANCHOR MUST BE A COMMERCIALLY AVAILABLE TWO PART ASSEMBLY WITH A REMOVABLE BOLT OR THREADED ROD/NUT. IT IS PROVIDED/INSTALLED BY THE RF VENDOR AFTER THE MAGNET IS DELIVERED.

ENVIRONMENTAL STEEL LIMITS

A STATIC MAGNETIC FIELD EXTENDS IN A THREE-DIMENSIONAL SPACE AROUND THE MAGNET ISOCENTER. ENVIRONMENTAL STEEL WITHIN THE STATIC MAGNETIC FIELD AFFECTS THE UNIFORMITY (OR HOMOGENEITY) OF THE FIELD. FIELD UNIFORMITY IS CRITICAL TO BOTH IMAGE QUALITY AND CHEMICAL SHIFT ANALYSIS (SPECTROSCOPY). AN ANALYSIS OF THE ENVIRONMENTAL STEEL IS REQUIRED WITHIN A 9.84 FEET (3 METERS) SPHERICAL RADIUS OF THE MAGNET ISOCENTER. ENVIRONMENTAL STEEL INCLUDES PIPES, BEAMS, CONCRETE REBAR, OR ANY OTHER STRUCTURAL STEEL IN THE FLOORS, WALLS, OR CEILING.

MAGNET TYPE	LIMITS OF STEEL MASS LBS/SQ FT [KG/SQ M]	DISTANCE FROM MAGNET ISOCENTER IN [MM]	DISTANCE BELOW TOP SURFACE OF FLOOR IN [MM]
1.5T ACTIVE SHIELD SEE NOTES	0 [0] 2 [9.8] 3 [14.7] 8 [39.2] 20 [98.0]	0-45 [0-1143] 45-47 [1143-1194] 47-52 [1194-1321] 52-55 [1321-1397] 55+ [1397+]	0-3 [0-76] 3-5 [76-127] 5-10 [127-254] 10-13 [254-330] 13+ [330+]

NOTE THE FOLLOWING ITEMS MUST BE LIMITED PER THE ABOVE TABLE
1. NON-MOVABLE STEEL CONSTRUCTION MATERIAL SUCH AS WALL STUDS OR HVAC COMPONENTS.
2. METALLIC PIPES AND DRAINS.
3 STEEL IN THE FLOOR IN A 10 FOOT BY 10 FOOT (3.1 METER BY 3.1 METER) AREA DIRECTLY BELOW THE MAGNET.

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

Reviewed for Code Compliance
Inspections Division
Approved with Conditions
Date: 05/16/13
Planner: Benjamin Wallace

GE Healthcare
Healthcare Project Implementation – Design
Milwaukee,

SHEET TITLE: STRUCTURAL DETAILS
MODALITY TYPE: OPTIMA MR450w

THIS PLAN IS SUBMITTED TO SUGGEST LOCATION OF GE HEALTHCARE EQUIPMENT AND ASSOCIATED APPARATUS, ELECTRICAL WIRING DETAILS AND ROOM ARRANGEMENTS. IN PREPARING THIS PLAN, EVERY EFFORT HAS BEEN MADE TO CONFORM DETAILS TO GENERAL INFORMATION SUPPLIED BY OTHERS. IT IS NOT TO BE USED FOR ACTUAL CONSTRUCTION PURPOSES, HOWEVER, AND THE COMPANY CANNOT ACCEPT RESPONSIBILITY FOR ANY DAMAGES RESULTING THEREFROM.

This drawing is based on Sketch No.: 13nef006

PROJECT TITLE:
ORTHOPAEDIC ASSOCIATES OF PORTLAND
PORTLAND, MAINE

PROJECT	REVISION
130261	00

DATE:	22.Jan.13
DRAWN BY:	TMS
CHECKED BY:	PMM
GON NO:	4057873
GON DT:	16.Jan.13

PIM R6

RQ – 132725

REVISION HISTORY:

SHEET
S2