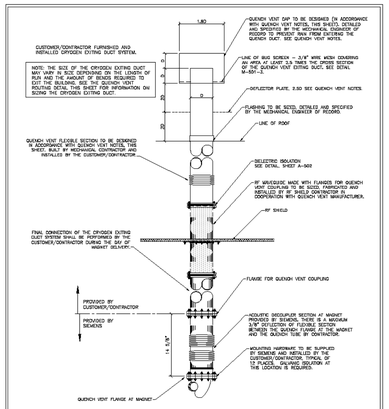
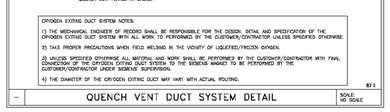
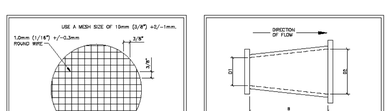






CRYOGEN NOTES

1) "CRYOGENS" IS A TERM USED TO IDENTIFY THE REFRIGERANT USED TO ACHIEVE THE MAGNET TEMPERATURE REQUIRED IN THIS APPLICATION. LIQUID HELIUM IS USED AS THE CRYOGEN IN THIS SYSTEM. DURING THIS TRANSITIONING OF THE MAGNET WITH CRYOGENS AND NORMAL EVAPORT OF CRYOGENS FROM THE SYSTEM, GASES FROM THE CRYOGENS DANGER OF FREEZING. HELIUM GAS WILL ALSO DISPLACE THE AIR IN THE ROOM. A CRYOGEN DETECTION SYSTEM BY AN APPROVED THIRDPARTY MONITORING SYSTEM IS RECOMMENDED.

2) THERE SHALL BE A TRANSPORT ROUTE FOR DELIVERY OF CRYOGENS TO THE EXAM ROOM. SPECIAL VESSELS CALLED DEWARS ARE USED TO TRANSPORT HELIUM. A 250 LITER DEWAR WEIGHS 335 POUNDS, IS 54" IN HEIGHT, 24" IN DIAMETER, A 250 LITER DEWAR WEIGHS 335 POUNDS, IS 60" IN HEIGHT, 24" IN DIAMETER.

3) HELIUM GAS CYLINDERS MAY BE USED DURING THE INITIAL FILLING OF HELIUM INTO THE MAGNET. THE FACILITY IN WHICH THESE MAY BE USED NEEDS TO HAVE THE ABILITY TO TEMPORARILY STORE AND SECURE THE CYLINDERS IN A WAY THAT WILL PREVENT THEM FROM TRANSPORTING/ FALLING OVER.

4) OUTSIDE VENTING OF THE HELIUM IS TO BE PROVIDED BY MEANS OF A VENT PIPE OF NON-MAGNETIC MATERIAL CALLED A QUENCH VENT.

REV 0

QUENCH VENT NOTES

QUENCH VENT DESIGN INSTRUCTIONS

1) THE QUENCH VENT IS DESIGNED TO DISPERSE THERMAL ENERGY OBSERVED DURING AN EXTREMELY RAPID BOIL OFF OF THE LIQUID HELIUM. THE SYSTEM MUST BE CAPABLE OF VENTING THE LARGE VOLUME OF GAS PRODUCED. THE GAS EXPANSION RATIO BETWEEN THE LIQUID AND GAS IS 1 LIQUID AT 4.2°K TO 900M TEMPERATURE GAS. THE QUANCHT SYSTEM IS CRITICAL FOR THE SAFE OPERATION OF THE MAGNET. THE DATA IN THE DESIGN SHEET IS BASED ON THE MAGNET VENDOR SPECIFICATION. THE DESIGN IS ADEQUATE IN LIMITED TIMES. COLD BURNS AND ASPIRATION BY LIQUID HELIUM GAS MUST ALWAYS OCCUR AT A POINT WHERE ACCESS BY PEOPLE IS NOT POSSIBLE. QUENCH TUBE PLUMBING MUST ONLY BE DONE BY QUALIFIED PERSONNEL. IT IS THE OWNER'S RESPONSIBILITY TO ENSURE THAT THE QUENCH TUBE IS MAINTAINED IN AN OPERABLE STATE.

2) IF THE QUENCH VENT IS NOT CONFIGURED CORRECTLY THERE IS A RISK OF THE QUENCH VENT TUBE BEING OVER PRESSURIZED. THIS RISK AND GAS RESULT IN STRUCTURAL DAMAGE. THE EXHAUST MUST NOT BE VENTED IN AN ENCLOSED SPACE. THE OPERATOR OF THE SYSTEM MUST PREPARE AN EMERGENCY PLAN IN THE EVENT OF A QUENCH.

3) THE QUENCH TUBE CONSISTS OF STRAIGHT, VERTICALLY-ORIENTED SECTIONS. THE TUBE MUST BE FREE FROM BENDS. THE DIAMETERS OF THE END OF THE TUBE MUST BE PROTECTED FROM RAIN, SNOW, AND FOREIGN OBJECTS. ROUND SECTIONS ONLY, NO SQUARE SECTIONS.

4) THE SIEMENS MAGNET HAS A QUENCH VALVE ASSEMBLY FOR CONNECTION TO THE TUBE LOCATED AT THE TOP LEFT SIDE OF THE MAGNET. THE CUSTOMER/CONTRACTOR MUST PROVIDE FLEXIBLE DIECOUPLER WILL SUPPLY AND INSTALL A QUENCH VENT TUBE WITH CAP(TO BE NON-MAGNETIC STAINLESS STEEL, 2x32 GAUGE RECOMMENDED).

5) THE QUENCH VENT TUBE CAP SHALL BE DESIGNED TO ENSURE NO GAUGE THE TUBE CAN CONTAIN UP TO 1mm-THICKNESS FOR A STAINLESS STEEL BELLOWS OR FLEXIBLE SECTION MUST BE INSTALLED A MINIMUM OF EVERY 10'-0" OF STRAIGHT PIPE NOT TO EXCEED 25 OF THE OVERALL LENGTH. THE QUENCH TUBE MAY ALSO BE MADE OF STAINLESS STEEL, COPPER, OR ALUMINUM. STAINLESS STEEL PIPE ONLY MUST BE USED. ROLLED AND WELDED TUBE FROM SHEET ALUMINUM GRADE 6061 ONLY MUST BE USED. THE WALL SECTIONS OF ALUMINUM TUBE MUST BE THICKER THAN 1/8" TO PREVENT BUCKLING. THE TUBE MATERIAL MUST BE CONSIDERED FOR ALUMINUM QUENCH TUBES. THE MOVEMENT OF THE BELLOWS MUST BE RESTRICTED TO PREVENT EXCESSIVE SUPPORTS DUE TO PRESSURE. THE WEIGHT OF THE TUBE MUST BE SUPPORTED BY THE BUILDING AND BE FLEXIBLE ENOUGH TO ALLOW MOVEMENT FROM THERMAL CONTRACTION. THE WALL CUT SHOULD ALSO BE FLEXIBLE.

PRESSURE CALCULATION

6) THE MAXIMUM INTERNAL PRESSURE IS CALCULATED AT 1-15 PSI. THE MAXIMUM PRESSURE SHOULD BE ENGINEERED FOR 4.5 PSI.

7) USE THE QUENCH LOSS CALCULATION PROVIDED BELOW TO DETERMINE THE QUENCH VENT PIPE DIAMETER. THE PIPE DIAMETER, LENGTH, NUMBER OF ELBOWS AND PRESSURE DROP. ALL BENDS MUST BE SMOOTH WALLED AND HAVE A CENTERLINE TO INTERNAL PIPE DIAMETER RATIO OF 1.5 TO 5.0. EXPANSION TO A GREATER DIAMETER TUBE CAN BE ACCOMPLISHED BY USE OF A DIFFUSER. THE TUBE SECTIONS MAY BE USED, RECTANGULAR SECTIONS ARE NOT ALLOWED.

8) THERE MUST BE A 12-18 INCH FLEXIBLE SECTION OF PIPE FOR CONNECTION TO THE QUENCH VALVE AT THE MAGNET WITH AN INSIDE DIAMETER GREATER THAN 4" (1.87) OR 6" (3.07) AND ABLE TO WITHSTAND 6.0 PSI.

CONNECTING SECTION

9) CONNECTING SECTIONS OF PIPE CAN ONLY BE JOINED BY WELDING OR BOLTED FLANGES WITH FIBER GASKETS. ROPAKT FLANGES ARE PERMITTED. VCE CLAMPED FLANGES MAY NOT BE USED.

QUENCH VENT EXIT

9) THE PROTECTION AT THE END OF THE TUBE SHALL BE 3/8" WIRE MESH WITH 1.5-2.5 INCH WIRES. COVERING AN AREA AT LEAST 3.5 TIMES THE CROSS SECTION AREA OF THE QUENCH PIPE.

10) WHERE THE QUENCH TUBE EXITS VERTICALLY, A RAIN COVER MUST ALSO BE FITTED WITH THE DIAMETER TO BE TWO TIMES THE DIAMETER OF THE QUENCH TUBE. THE CLEARANCE BETWEEN THE QUENCH TUBE AND THE RAIN COVER MUST BE 1.5 TIMES THE DIAMETER OF THE TUBE. A DEFLECTOR PLATE SHALL BE WELDED TO THE TUBE WHERE IT EXITS THE ROOF TO PREVENT HELIUM FROM RE-ENTERING THE BUILDING. THE DEFLECTOR PLATE MUST BE 2.5 TIMES THE DIAMETER OF THE QUENCH TUBE AND LOCATED TWO PIPE DIAMETERS ABOVE THE ROOF AND TWO PIPE DIAMETERS BELOW THE RAIN GUARD.

DURING A QUENCH THE HELIUM GAS EXITING THE QUENCH PIPE MAY REACH TEMPERATURES OF LESS THAN -100F. ADJACENT TO THE QUENCH PIPE THE TEMPERATURE MAY BE -100F. ADJACENT TO THE EXIT MAY BE ADDERELY AFFECTED. CONSIDERATION OF MATERIALS AND ITEMS PLACED NEAR THE VENT EXIT SHOULD BE TAKEN INTO ACCOUNT SO DAMAGE DOES NOT OCCUR.

12) WHERE THE QUENCH TUBE EXITS HORIZONTALLY, THE OUTLET MUST BE FITTED WITH A RAIN COVER OF THE ANGLED RAIN HOOD. THE OUTLET SHOULD NOT BE LOCATED WHERE HELIUM GAS CAN BE DRAWN INTO AN AIR INLET, ENTER AN OPEN WINDOW, OR BLOW DIRECTLY OVER STRUCTURE OR EQUIPMENT. PERSONNEL SHOULD NOT BE LOCATED WITHIN 10 FEET. COLD BURNS AND COLD BURNS AND ASPIRATION BY 6"-11" ON EACH SIDE, BELOW AND 18'-0" ABOVE. IF THE OUTLET IS POSITIONED TOO LOW A DEFLECTOR PLATE CAN BE USED WITH OPTION 1 AND 3.

WARNING SIGNS AND OUTLET RESTRICTIONS

13) WARNING SIGNS MUST BE PROVIDED WITHIN NEAR THE QUENCH VENT OUTLET. THE TUBE MUST HAVE WARNING PRINTED ALONG ITS ENTIRE LENGTH FOR EXTREMELY COLD HELIUM GAS – AUTHORIZED PERSONNEL ONLY.

13) AREAS WITH ACCESS IN THE AREA OF THE OUTLET MUST BE CLEARLY IDENTIFIED AND FENCED, FOR EXAMPLE, A POOL OUTLET WITH MAINTENANCE ACCESS.

INSULATION AND GALVANIC REPARDERS

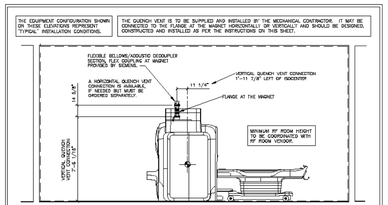
14) THE QUENCH TUBE MUST HAVE WELDING IN THERMAL 1" INSULATION FOR 6'-0" FROM THE TOP OF THE TUBE. THE MIN THICKNESS SHOULD BE 1.5". LAYER OF MINERAL FIBER INSULATION WITH A VAPOR BARRIER AND 1" CLASS B OR CLASS AA ARMAFLEX, OUTDOOR PIPES MUST BE PROTECTED FROM RAIN, SNOW, AND FOREIGN OBJECTS. THE MAGNET ASSEMBLY, TO AVOID BY DISCONNECTING THE INSULATION MUST NOT HAVE ELECTRICAL CONTACT WITH THE NON-EXUDIC.

15) GALVANIC REPARDERS MUST BE PROVIDED BETWEEN THE MAGNET, THE QUENCH VENT, THE RF FOOM, AND THE BUILDING. TWO SEPARATIONS ARE REQUIRED USING STAINLESS STEEL BOLTS, INSULATING BUSHES AND LOCKING NUTS. NO OTHER DESIGNS ARE PERMITTED FOR SAFETY.

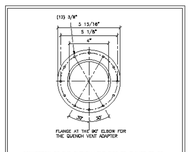
DOCUMENTOCIES

16) THE CALCULATIONS AND CONSTRUCTION OF THE QUENCH PIPE MUST BE DOCUMENTED WITH DRAWINGS AND CALCULATIONS THAT ARE KEPT WITH INSTALLATION DOCUMENTS. IT MUST COMPLY WITH THE REQUIREMENTS IN THIS DOCUMENT BEFORE BEING CONNECTED TO THE MAGNET.

REV 7



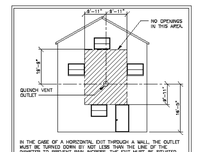
1 MAGNET SIDE ELEVATION — NO SCALE



CONNECTION OF THE QUENCH VENT PIPE TO FLANGE TO BE DESIGNED, DETAILED, AND SPECIFIED BY THE MECHANICAL ENGINEER OF RECORD TO BE FABRICATED AND INSTALLED BY THE MECHANICAL CONTRACTOR UNDER SIEMENS SUPERVISION. THE 90° ELBOW IS PART OF THE DELIVERY VOLUME, THE TWO FLANGES ARE OPTIONAL.

2 CONNECTING FLANGE — REV 0

QUENCH VENT — NO SCALE



OUTLET SAFETY CLEARANCES — REV 1

QUENCH VENT — NO SCALE

HELIUM CONTENT

MAXIMUM LIQUID FILL	1,250 LITERS	
TYPICAL BOIL OFF RATE	0.0 L/HR	FOR TYPICAL CLINICAL USE/ DEPENDING ON SEQUENCES AND OPERATING TIME
TYPICAL REFILL INTERVAL	NA	

WITHOUT THE COLD HEAD RUNNING THE LIQUID HELIUM WILL BOIL OFF FROM 8% TO 20% IN APPROXIMATELY 48 HOURS.
THE LOSS DURING SHIPPING IS APPROXIMATELY 48 LITERS PER DAY.

ALTEA REV 27

DW	DATE	DESCRIPTION
	08/10/26	

—ISSUE BLOCK—

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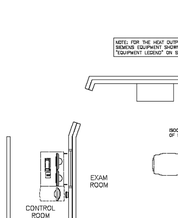
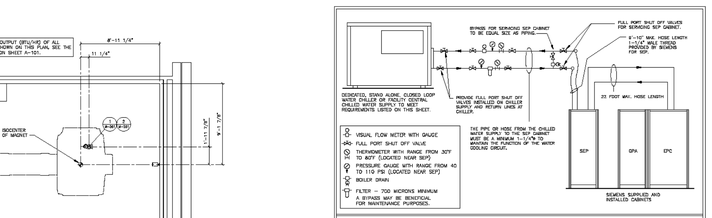
PROJECT #: **2611402**
SHEET 9 OF 10
DRAWN BY: R. HERRMANN
SCALE: AS NOTED
REV #: 30.51.48.6.4
DATE: 08/10/26

SHEET: **M-501**

ATTENTION:
– THE DRAWING IS DESIGNED TO CONFORM TO FEATURES AND EQUIPMENT REQUIREMENTS PRESENTED AT THE TIME OF THEIR PREPARATION. DUALT WITH THESE FACTORS ARE SUBJECT TO DESIGN MODIFICATION, THEY ARE NOT TO BE USED FOR CONSTRUCTION PURPOSES.
– THE SET OF PLANS REPRESENTS A COMPLETE SET OF DETAILS AND SHOULD NOT BE SEPARATED.
– IT IS RECOMMENDED THAT THE SIEMENS DRAWINGS BE INCORPORATED WITH THE CONSTRUCTION DOCUMENTS FOR REFERENCE.
– ALL DIMENSIONS SHOWN ON THE DRAWING ARE FROM FINISHED SURFACES.
– THE DRAWING DOES NOT PROVIDE MOMENTOS SHIELDING REQUIREMENTS FOR X-RAY AND ABSORBED EQUIPMENT. – THE CUSTOMER IS RESPONSIBLE FOR CONSULTING WITH A REGISTERED MOMENTOS PATHOLOGIST TO SPECIFY MOMENTOS PROTECTION.



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



NOTES:
ALL PIPING AND PLUMBING FIXTURES SHALL BE FURNISHED, INSTALLED, PRESSURE TESTED AND CHARGED BY THE MECHANICAL CONTRACTOR PRIOR TO THE DELIVERY AND INSTALLATION OF THE SIEMENS SUPPLIED AND INSTALLED EQUIPMENT UNLESS SPECIFIED OTHERWISE.
AT THE HIGHEST POINT OF THE WATER SUPPLY PIPE FROM THE CHILLER AN AUTOMATIC DEAERATION DEVICE (AIR VENT) WITH BALL VALVE MUST BE INSTALLED BY THE MECHANICAL CONTRACTOR. SYSTEM MUST BE PROVEN TO BE FREE FROM LEAKAGE.
THE MECHANICAL ENGINEER OF RECORD SHALL BE ULTIMATELY RESPONSIBLE FOR THE SITE SPECIFIC DESIGN AND SPECIFICATION OF THE MECHANICAL AND PIPING SYSTEMS AS SHOWN AND SHALL BE IN COMPLIANCE WITH ALL APPLICABLE LOCAL, STATE AND NATIONAL CODES. ALL WORK SHALL BE PERFORMED BY THE MECHANICAL CONTRACTOR AND SHALL BE SUBJECT TO COMPLIANCE WITH ALL APPLICABLE LOCAL, STATE AND NATIONAL CODES.
THE SUPPLY AND RETURN PIPES FROM THE CHILLED WATER SUPPLY TO THE SEP CABINET SHOULD BE SIZED TO SHOW FLOW DIRECTION AND CONTROL (WATER/BLOCKS).

1 PIPING SCHEMATIC FOR FACILITY PROVIDED CHILLED WATER — SCALE: NONE

CHILLED WATER SUPPLY

A CHILLED WATER SUPPLY IS REQUIRED TO THE MRI SYSTEM 24 HOURS A DAY, YEAR ROUND FOR THE COLD HEAD AND SIMGREAT SYSTEMS. THIS CAN BE PROVIDED BY A CENTRAL CHILLED WATER SUPPLY OR A REPARATE STAND ALONE CHILLER THAT MEETS THE REQUIREMENTS LISTED. CHILLED WATER CAN ALSO BE SUPPLIED BY A CHILLER PROVIDED BY SIEMENS.

A SEPARATOR CABINET (SEP) OR INTERFACE PANEL (EPP) MUST BE INCLUDED WITH THE SIEMENS ORDER. THE PIPE SIZE BETWEEN THE CHILLER AND THE SEP OR EPP MUST BE CONSIDERED. SPECIAL REQUIREMENTS, LARGER DIAMETER PIPE MAY BE REQUIRED DUE TO LENGTH OF RUN. FLOW AND PRESSURE REQUIREMENTS MUST BE MET.

POTABLE/ALE MATERIALS THAT CAN BE USED FOR THE PIPING ARE: STAINLESS STEEL, COA, YAGL, NON-FERROUS METAL, COPPOUS, BRASS, SYNTHETIC MATERIAL, PLASTICS, BRAZING SOLDER, HARD SOLDER, OR FITTING SOLDER TYPE 3 AND A. THERE ARE MATERIALS THAT MAY NOT BE USED FOR THE PIPING. THE MATERIALS THAT MAY NOT BE USED ARE: THOSE MATERIALS ARE ALUMINUM, IRON, CARBON STEEL, ZINC, ZINC PLATED STEEL, OR STANDARD STEEL PIPES.

27 GALLONS OF DISTILLED/DE-IONIZED WATER MUST BE PROVIDED AND INSTALLED BY CUSTOMER/CONTRACTOR FOR FILLING THE SECONDARY CHILLED WATER CIRCUIT.

SEE MANUFACTURER'S REQUIREMENTS FOR GLYCOL AND WATER QUALITY TO BE PROVIDED AND FILLED BY CUSTOMER/CONTRACTOR.

THE SUPPLY AND RETURN CHILLED WATER PIPES MUST BE LABELED. THE PIPES MUST HAVE ARROWS TO SHOW FLOW DIRECTION AND FILLING POINTS AND MUST CONTAIN FLOW DIRECTION AND CONTENTS.

CHILLED WATER REQUIREMENTS

WATER REQUIREMENTS TO BE MEASURED AT THE SEP CABINET.

FLOW (MAX):	33.78–39.05 GPM
WATER TEMPERATURE:	42.8°F – 53.8°F
BTU DISCHARGE TO THE WATER	170,758 BTU/HR
WATER PRESSURE	MAXIMUM 87 PSI
LOSS OF PRESSURE FOR SEP CABINET	<14.5 PSI 11.8 TYPICAL
CHILLED WATER ACIDITY RANGE	6 pH TO 8 pH
CHILLED WATER HARDNESS	<250 ppm CALCIUM CARBONATE
CHLORINE GAS CONCENTRATION	<200 ppm
FILTRATION	700 µm

ENVIRONMENTAL REQUIREMENTS

1) AIR CONDITIONING IS TO PROVIDE A TEMPERATURE OF 70°F ±2°F IN THE EXAM ROOM, 70°F±3°F IN THE EQUIPMENT & CONTROL AREAS, RELATIVE HUMIDITY OF 40-80% (NON-CONDENSING) IS REQUIRED. THERE SHOULD BE ENOUGH AIR CONDITIONING TO ENSURE THE EXAM AREAS AND SIEMENS EQUIPMENT IS INSTALLED. THESE CONDITIONS ARE TO BE MET AT ALL TIMES; 24 HOURS A DAY, 7 DAYS A WEEK.

2) A DEDICATED AIR CONDITIONING AND HUMIDIFICATION SYSTEM IS RECOMMENDED FOR THE EXAM ROOM. THE EXAM ROOM MUST HAVE 15 CFM OF 3 TIMES PER HOUR FOR THE EXAM ROOM IS REQUIRED. IT IS RECOMMENDED TO INSTALL A FRESH AIR SYSTEM WITH 30%-80% RECIRCULATED AIR. THE EXHAUST AIR FROM THE EXAM ROOM TO THE CEILING IN THE EXAM ROOM IS RECOMMENDED. EACH ROOM SHOULD HAVE A DEDICATED CONTROL AND SENSOR TO MONITOR AND ADJUST THE AIR.

3) THE HEAT INTO THE EXAM ROOM IS LESS THAN 10,536 BTU/HR. THE HEAT INTO THE COMPRESS ROOM IS LESS THAN 3,413 BTU/HR. ALL HEAT DISSIPATED FROM THE SIEMENS EQUIPMENT ONLY. AND HEAT DISSIPATED FROM PEOPLE, PIPES AND LIGHTING MUST BE CONSIDERED FOR TOTAL HEAT LOADS.

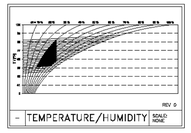
4) IT IS IMPORTANT FOR FRESH AIR INTAKE SYSTEMS TO EXHAUST AIR DIRECTLY OUT OF THE BUILDING. THE EXHAUST AIR MUST NOT BE DEFLECTED INTO ANOTHER ROOM. THE MAGNET ROOM EXHAUST AIR SHOULD BE INSTALLED AT LEAST 6"-6" ABOVE FINISHED FLOOR.

5) THE AIR INTAKE OF THE AIR CONDITIONING SYSTEM MUST NOT BE LOCATED IN THE VICINITY OF THE QUENCH VENT EXHAUST

6) IF THE INPUT DRAWS UPON AIR FROM OUTSIDE THE BUILDING, IT IS RECOMMENDED TO INSTALL AN ON-SITE FILTER TO REMOVE DUST PARTICLES GREATER THAN 10 MICRONS.

7) DO NOT LOCATE ANY HVAC DIFFUSERS ABOVE THE MAGNET. THERE SHALL NOT BE AIR BLOWING DIRECTLY ON THE MAGNET.

10/11/25



REV 0

TEMPERATURE/HUMIDITY — SCALE: NONE

CEILING HEIGHTS

EXAM ROOM 7'-11" MINIMUM
CONTROL ROOM 6'-11 MINIMUM
EQUIPMENT ROOM 7'-3" MINIMUM

MECHANICAL NOTES

1) THE AIR H.V.A.C. SYSTEM MUST OPERATE FOR A MINIMUM OF 48 CONSECUTIVE HOURS PRIOR TO THE DELIVERY OF THE EQUIPMENT.

2) THE FILTERS MUST BE CHANGED IMMEDIATELY PRIOR TO THE DELIVERY OF THE EQUIPMENT.

3) SIEMENS REQUIRES THE USE OF A DEDICATED H.V.A.C. SYSTEM FOR THE EQUIPMENT ROOM TO BE LOCATED, SIZED AND SPECIFIED BY THE MECHANICAL ENGINEER OF RECORD AND TO BE SUPPLIED AND INSTALLED BY THE MECHANICAL CONTRACTOR.

4) SIEMENS RECOMMENDS THAT THE CUSTOMER PROVIDE AND INSTALL AN ENVIRON MONITORING SYSTEM WITH VISUAL AND AUDIBLE ALARMS FOR THE EXAM ROOM TO MONITOR THE TEMPERATURE AND HUMIDITY BELOW PRE-PROGRAMMED SAFETY LEVELS WITH THE SENSOR TO BE LOCATED IN THE SCAN ROOM IN THE AREA DESIGNATED FOR OFFGOEN FILLING.

5) THE SIEMENS ACTIVE SHIELDED MAGNET RECIRCULATES LIQUID HELIUM WITHIN A CLOSED LOOP SYSTEM WITHOU