MW STUDIOS
ARCHITECTURE
MASTER PLANNING

410.344.1460
10839 Philadelphia Road
White Marsh, Maryland 21162

ADDENDUM 3

PROJECT:	NVA Wilmington - EVC	MWS PROJECT NO:	22-127
ADDRESS:	5051 New Centre Drive	OWNER PROJECT NO.	
	Wilmington, NC 28403	ISSUE DATE:	2023-11-06

The following changes shall be incorporated into the work in accordance with all general requirements as if incorporated in the original documents.

CHANGES TO DRAWINGS:

1.) Drawing Sheet A401 – Replace sheet A401 with attached A401 – revisions dated 11/06/23.
2.) Drawing Sheet A402 – Replace sheet A402 with attached A402 – revisions dated 11/06/23.
3.) Drawing Sheet A714 – Replace sheet A714 with attached A714 – revisions dated 11/06/23.
4.) Drawing Sheet A715 – Replace sheet A715 with attached A715 – revisions dated 11/06/23.
5.) Drawing Sheet A801 – Replace sheet A801 with attached A801 – revisions dated 11/06/23.
6.) Drawing Sheet M202.C – Replace sheet M202.C with attached M202.C – revisions dated 11/06/23.
7.) Drawing Sheet M203 – Replace sheet M203 with attached M203 – revisions dated 11/06/23.
8.) Drawing Sheet P004 – Replace sheet P004 with attached P004 – revisions dated 11/06/23.
9.) Drawing Sheet P401 – Replace sheet P401 with attached P401 – revisions dated 11/06/23.
10.) Drawing Sheet P402 – Replace sheet P402 with attached P402 – revisions dated 11/06/23.
11.) Drawing Sheet P708 – Replace sheet P708 with attached P708 – revisions dated 11/06/23.
12.) Drawing Sheet P709 – Replace sheet P709 with attached P709 – revisions dated 11/06/23.

CHANGES TO SPECIFICATIONS:

1. Add the following to specification Section 01 1000 Summary paragraph 1.6 Work Under Owner's Separate Contracts:

B. "Concurrent Work: Owner has awarded separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract. Additional contract work may be indicated within the drawings or other Contract Documents.

1. GE: For the installation of medical devices; CT equipment. The General Contractor is responsible for preparing the site for the installation and final connection of such equipment. The following Pre-installation Manuals and checklists are made part of the work of the General Contractor and are appended following this Section:

    a. CT Site Ready Checklist
    b. CT Optima CT660 Pre-Installation Manual

2. Add Specification Section 01 1000a CT Site Ready Checklist.
3. Add specification Section 01 1000b CT Optima CT660 Pre-Installation Manual.
4. Add the following to specification 13 4900 Radiation Protection paragraph 2.2.B:

    1. Diagnostic Radiology Installation Shielding Analysis and Specification; Room: CT; Dated 8/4/2023.
    2. Diagnostic Radiology Installation Shielding Analysis and Specification; Room: X-Ray Room 135; Dated 8/3/2023.
    3. Diagnostic Radiology Installation Shielding Analysis and Specification; Room: X-Ray Room 239; Dated 8/3/2023.
    4. Diagnostic Radiology Installation Shielding Analysis and Specification; Room: OR Large 3 - 245; Dated 8/5/2023.
    5. Diagnostic Radiology Installation Shielding Analysis and Specification; Room: OR Surg 5 - 242; Dated 8/5/2023.

5. Add specification Section 07 2119 Foamed-In-Place Insulation.
6. Add specification Section 07 4213.23 Metal Composite Material Wall Panels.
7. Replace specification Section 08 4113 Aluminum Framed Entrances and Storefronts in its entirety with the attached specification Section 08 4113 Aluminum Framed Entrances and Storefronts.

ATTACHMENTS:

1.) A401, A402, A714, A715, A801

2.) M202.C, M203

3.) P004, P401, P402, P708, P709

4.) Airnetics Drawing "Wilmington REV B 8_29_2023"

5.) Airnetics Site-prep Responsibiliies_5.8.23

6.) Specifications:

- i) 01 1000 – Summary
- ii) 01 1000a – CT English SRC
- iii) 01 1000b – Preinstall Manual
- iv) 07 2119 – Foamed in Place Insulation
- v) 07 4213.23 – Metal Composite Material Wall Panels
- vi) 08 4113 – Aluminum Framed Entrances and Storefronts
- vii) 13 4900 – Radiation Protection

viii) 13 4900a – 660 CT Shielding.2023.08.03

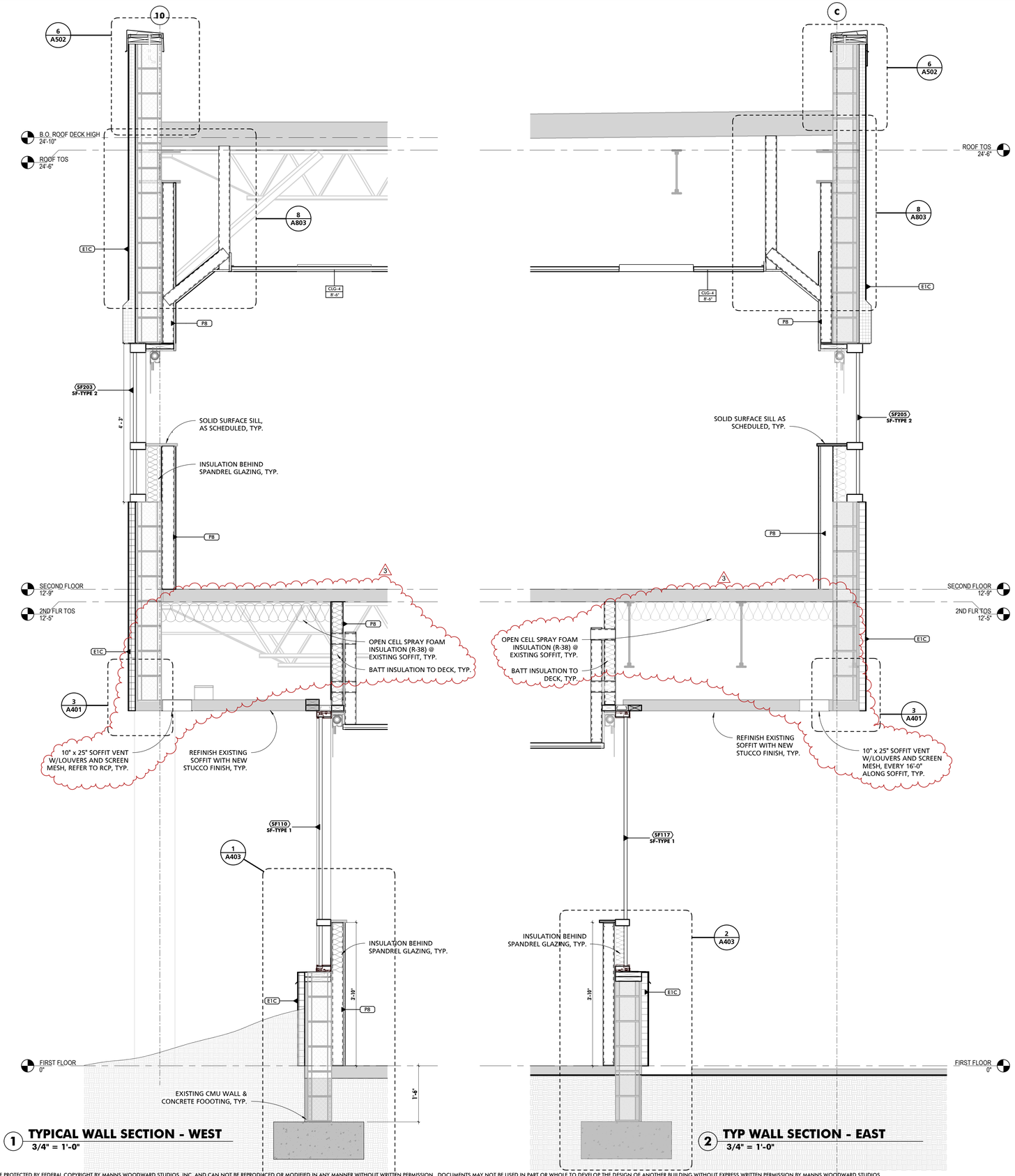
ix) 13 4900b – XRAY 135 Shielding.2023.08.03

x) 13 4900c – XRAY 239 Shielding.2023.08.03

xi) OR Large 3 – 245 C-Arm Shielding.2023.08.03

xii) OR Large 5 – 242 C-Arm Shielding.2023.08.03

END OF ADDENDUM



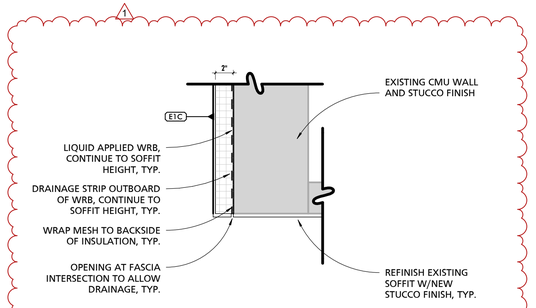
1 **TYPICAL WALL SECTION - WEST**
3/4" = 1'-0"

2 **TYP WALL SECTION - EAST**
3/4" = 1'-0"

SECTION LEGEND

EXISTING WALL TO REMAIN

NEW WALL/PARTITION/STOREFRONT



3 **TYPICAL EIFS DETAIL AT SOFFIT**
1 1/2" = 1'-0"

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WWW.MWSARCH.COM

CONSULTANT:

SEAL:

COA:

NORTH CAROLINA
MANNS WOODWARD STUDIOS, INC.
No. 53188
CERTIFICATE OF AUTHORIZATION

NATIONAL VETERINARY ASSOCIATES EASTERN CAROLINA VETERINARY REFERRAL CLINIC RENOVATION
5051 NEW CENTRE DR
WILMINGTON, NC 28403

PROJECT NUMBER: 22-127

SUBMISSION:
100% CONSTRUCTION DOCUMENTS
ORIGINAL ISSUE DATE:
9/20/2023

SHEET REVISION SCHEDULE:

No.	DATE
1	10-10-23
3	11-06-23

LAST PROJECT REVISION: No 3 | 11-06-23

WALL SECTIONS

SHEET NUMBER:

A401

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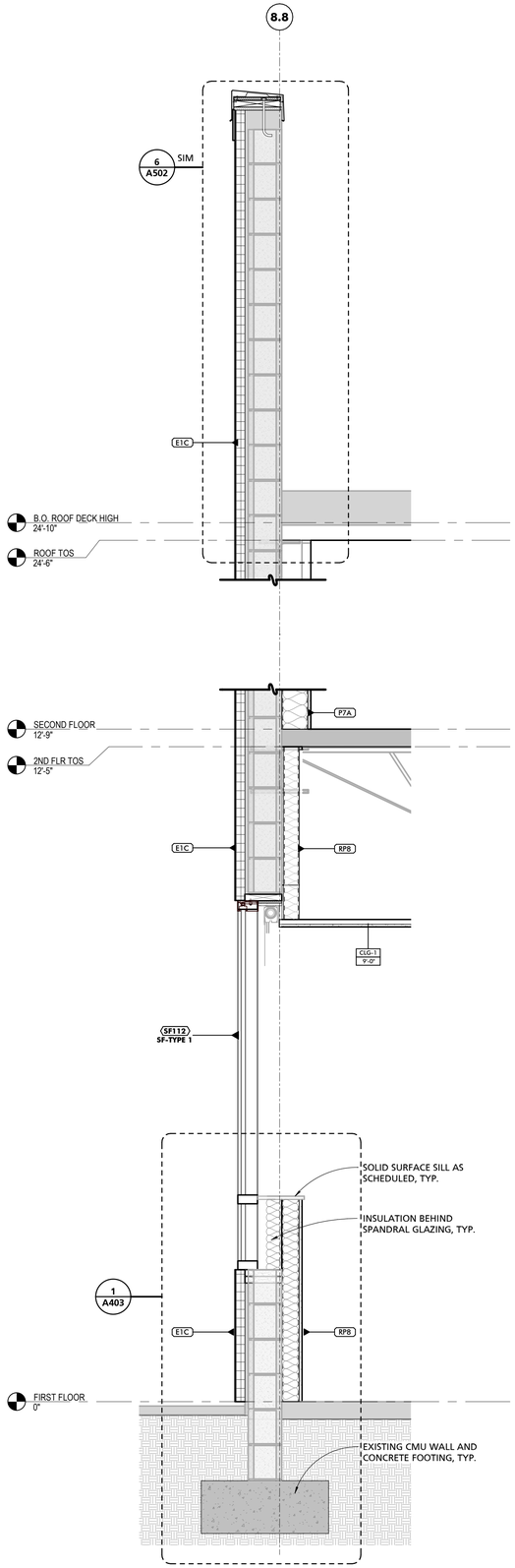
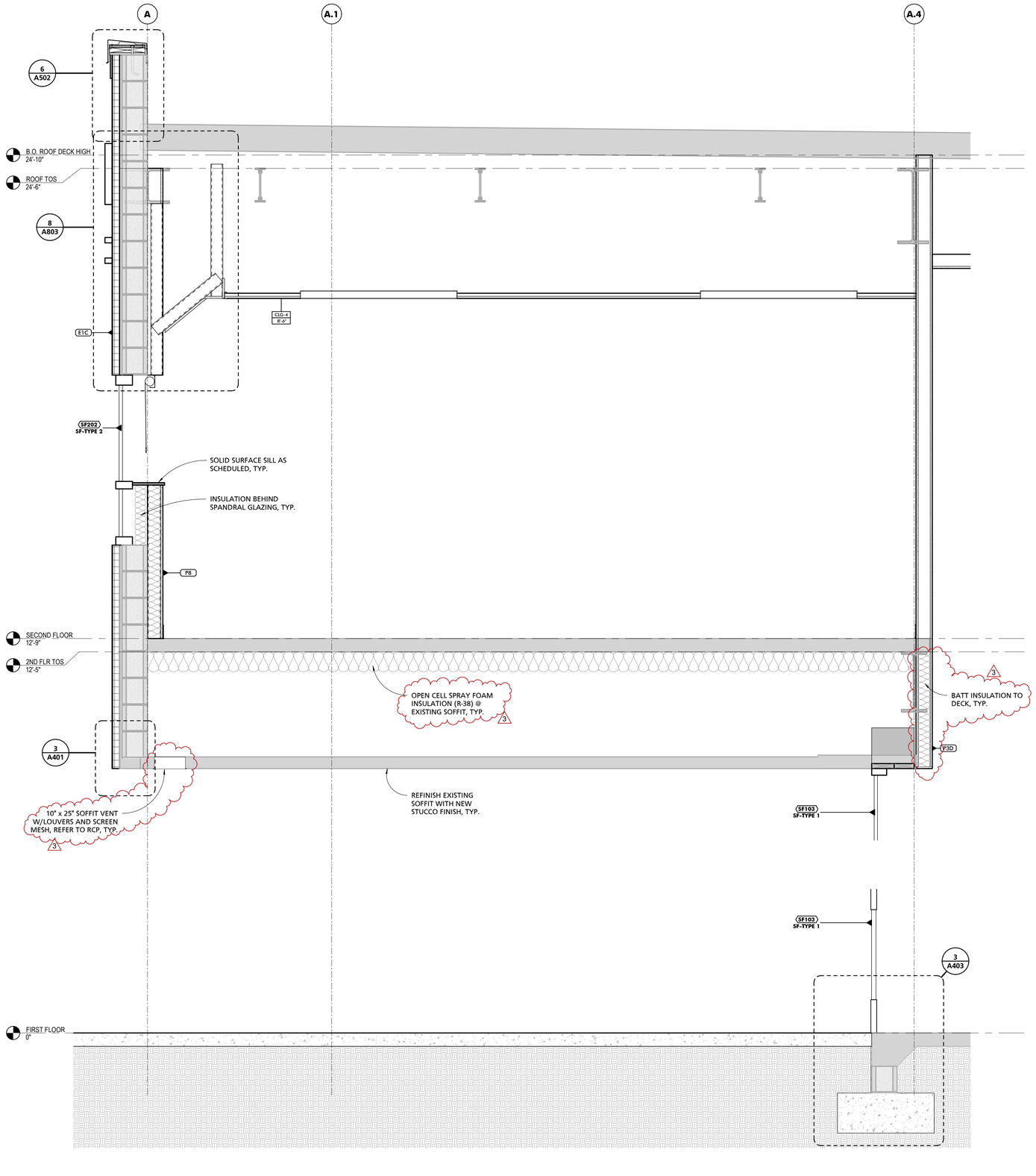


1 TYPICAL WALL SECTION
3/4" = 1'-0"



2 WALL SECTION - ENTRY
3/4" = 1'-0"

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SHEET REVISION SCHEDULE:

No.	DATE
3	11-06-23

LAST PROJECT REVISION: No 3 | 11-06-23

WALL SECTIONS

SHEET NUMBER:

A402

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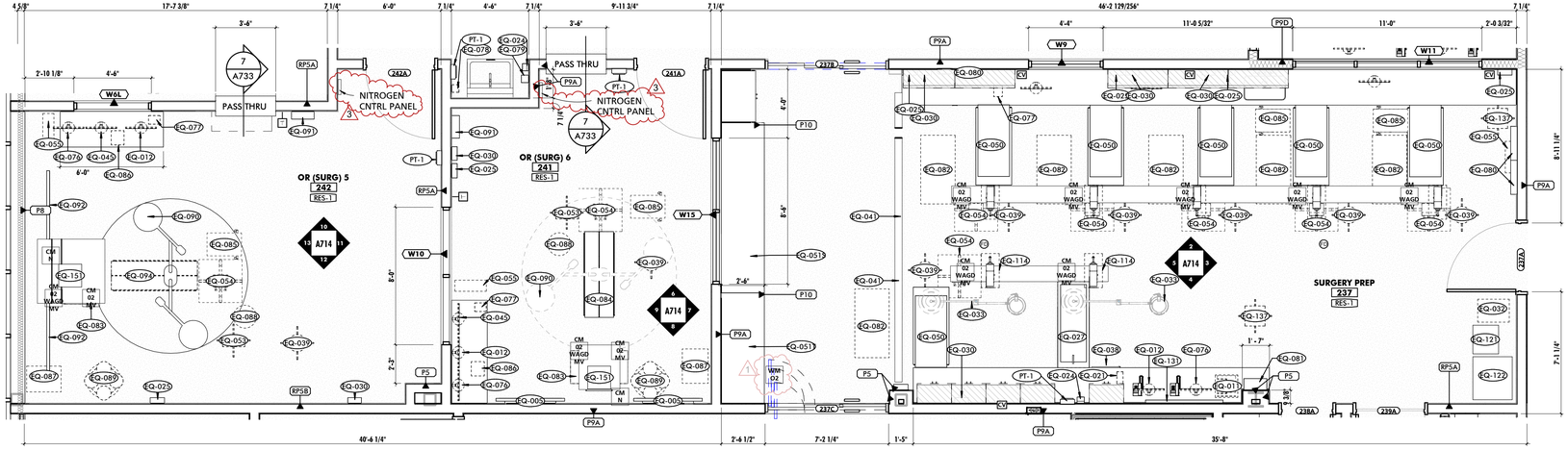
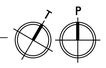
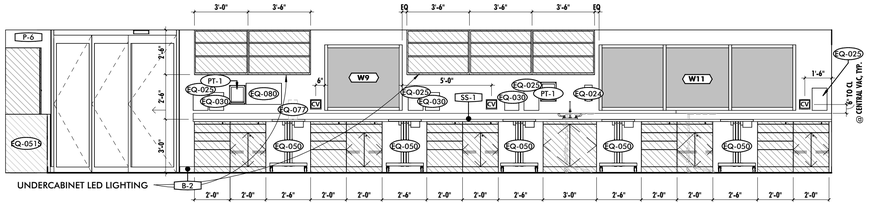
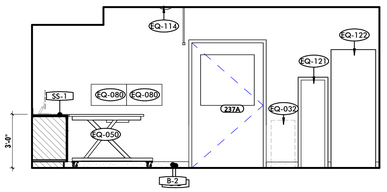


1 ENLARGED PLAN - SURGERY PREP & , OR 5 & OR 6
1/4" = 1'-0"

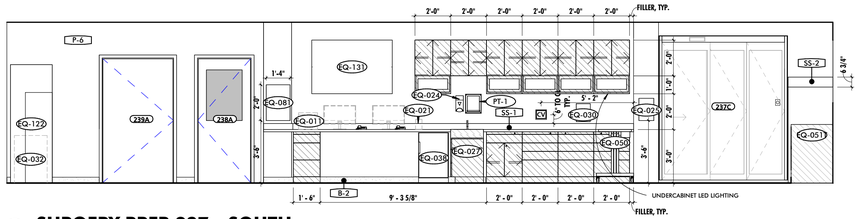




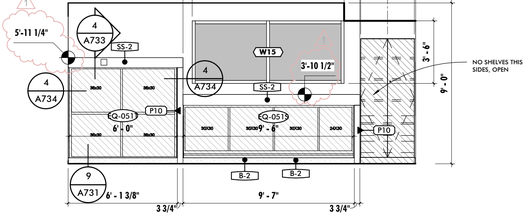
2 SURGERY PREP 237 - NORTH
1/4" = 1'-0"



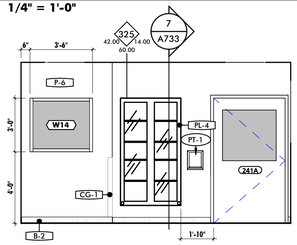
3 SURGERY PREP 237 - EAST
1/4" = 1'-0"



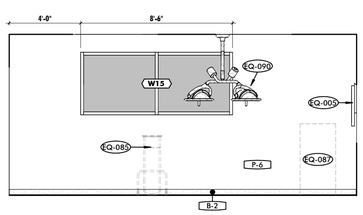
4 SURGERY PREP 237 - SOUTH
1/4" = 1'-0"



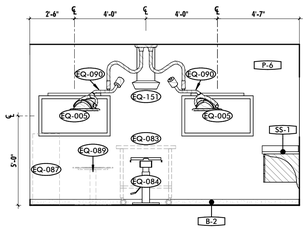
5 SURGERY PREP 237 - WEST
1/4" = 1'-0"



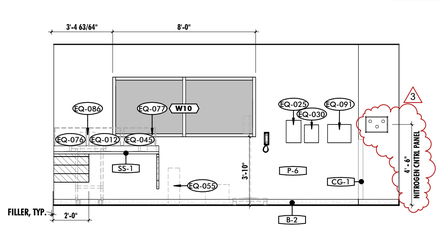
6 OR 6 241 - NORTH
1/4" = 1'-0"



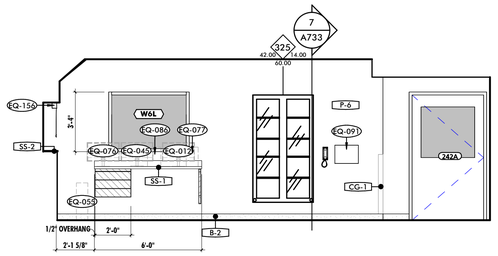
7 OR 6 241 - EAST
1/4" = 1'-0"



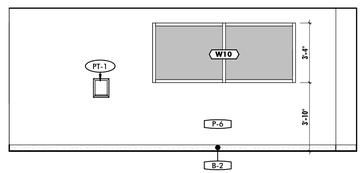
8 OR 6 241 - SOUTH
1/4" = 1'-0"



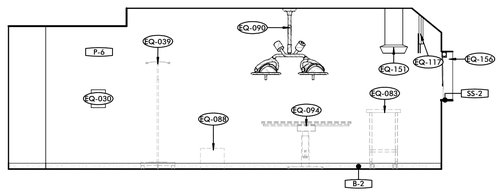
9 OR 6 241 - WEST
1/4" = 1'-0"



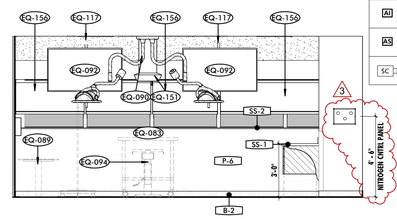
10 OR 5 242 - NORTH
1/4" = 1'-0"



11 OR 5 242 - EAST
1/4" = 1'-0"



12 OR 5 242 - SOUTH
1/4" = 1'-0"



13 OR 5 242 - WEST
1/4" = 1'-0"

EQUIPMENT SCHEDULE - OR #6

MARK	DESCRIPTION
241	
EQ-005	55" TV
EQ-012	COMPUTER MONITOR
EQ-025	EXAM GLOVE HOLDER
EQ-030	SHARPS CONTAINER
EQ-039	IV POLE
EQ-045	MULTI-PARAMETER MONITOR
EQ-053	MULTI-PARAMETER MONITOR W/PRINTER & STAND
EQ-054	ANESTHESIA MACHINE & MONITOR ON STAND
EQ-055	23 GALLON TRASH CAN
EQ-076	COMPUTER MONITOR FOR TV
EQ-077	SYRINGE PUMP
EQ-083	OVER INSTRUMENT TABLE
EQ-084	OPERATING TABLE W/V-TILT, NON HEATED
EQ-085	MAYO STAND
EQ-086	VENTILATOR
EQ-087	ELECTROCAUTERY UNIT ON STAND
EQ-088	KICK BUCKET
EQ-089	SUCTION REGULATOR / CANISTER CART
EQ-090	DUAL HEAD PROCEDURE LIGHT
EQ-091	SUTURE RACK - WALL MOUNT
EQ-151	CEILING MOUNTED MED GAS / ELECTRICAL SERVICE COLUMN

EQUIPMENT SCHEDULE - OR #5

MARK	DESCRIPTION
242	
EQ-012	COMPUTER MONITOR
EQ-025	EXAM GLOVE HOLDER
EQ-030	SHARPS CONTAINER
EQ-039	IV POLE
EQ-045	MULTI-PARAMETER MONITOR
EQ-053	MULTI-PARAMETER MONITOR W/PRINTER & STAND
EQ-054	ANESTHESIA MACHINE & MONITOR ON STAND
EQ-055	23 GALLON TRASH CAN
EQ-076	COMPUTER MONITOR FOR TV
EQ-077	SYRINGE PUMP
EQ-083	OVER INSTRUMENT TABLE
EQ-085	MAYO STAND
EQ-086	VENTILATOR
EQ-087	ELECTROCAUTERY UNIT ON STAND
EQ-088	KICK BUCKET
EQ-089	SUCTION REGULATOR / CANISTER CART
EQ-090	DUAL HEAD PROCEDURE LIGHT
EQ-091	SUTURE RACK - WALL MOUNT
EQ-092	55" CEILING MOUNTED TV MONITOR
EQ-094	SURGICAL TABLE, C-ARM COMPATIBLE
EQ-151	CEILING MOUNTED MED GAS / ELECTRICAL SERVICE COLUMN

EQUIPMENT SCHEDULE - SURG PREP

MARK	DESCRIPTION
237	
EQ-011	COUNTERTOP PRINTER
EQ-012	COMPUTER MONITOR
EQ-021	LABEL PRINTER
EQ-024	HAND SANITIZER
EQ-025	EXAM GLOVE HOLDER
EQ-027	WET TABLE - 60"
EQ-030	SHARPS CONTAINER
EQ-032	LAUNDRY CART
EQ-033	CEILING MOUNT 130 PROCEDURE LIGHT
EQ-038	UNDERCOUNTER REFRIGERATOR
EQ-039	IV POLE
EQ-041	CEILING MOUNTED IV TRACK & POLE
EQ-050	MOBILE ELECTRIC LIFT GURNEY
EQ-051S	9.5' CAGE BANK - SURGERY PREP
EQ-051T	6' CAGE BANK - SURGERY PREP
EQ-054	ANESTHESIA MACHINE & MONITOR ON STAND
EQ-055	23 GALLON TRASH CAN
EQ-076	COMPUTER MONITOR FOR TV
EQ-077	SYRINGE PUMP
EQ-080	ENDOTRACHEAL TUBE RACK
EQ-081	NARCOTICS CABINET - WALL MOUNT
EQ-082	GURNEY
EQ-085	MAYO STAND
EQ-121	CUBEX MINIPLUS
EQ-122	CUBEX FLEX
EQ-131	WALL MOUNTED 65" TV MONITOR
EQ-137	VENTILATOR ON POLE

EQUIPMENT LEGEND

AR	CARD READER LOCATION	CCC	CCTV CAMERA LOCATION
AI	AIPHONE LOCATION	C	HIDDEN CAMERA LOCATION
AS	AIPHONE CONTROL STATION	PB	PUSH BUTTON
SC	SECURITY CAMERA LOCATION	CV	CENTRAL VACUUM PORT

CASEWORK LEGEND

- MIDMARK PROVIDED, CONTRACTOR INSTALLED
- CONTRACTOR PROVIDED, CONTRACTOR INSTALLED
- TO BE PROVIDED IN FUTURE PHASE

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CONSULTANT:

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NORTH CAROLINA BOARD OF EXAMINERS FOR ENGINEERING AND SURVEYING
MANNS WOODWARD STUDIOS, INC.
No. 53188
CERTIFICATE OF AUTHORIZATION

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100% CONSTRUCTION DOCUMENTS
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9/20/2023

SHEET REVISION SCHEDULE:

No.	DATE
1	10-10-23
3	11-06-23

LAST PROJECT REVISION: No 3 | 11-06-23

ENLARGED PLANS & INT. ELEVATIONS

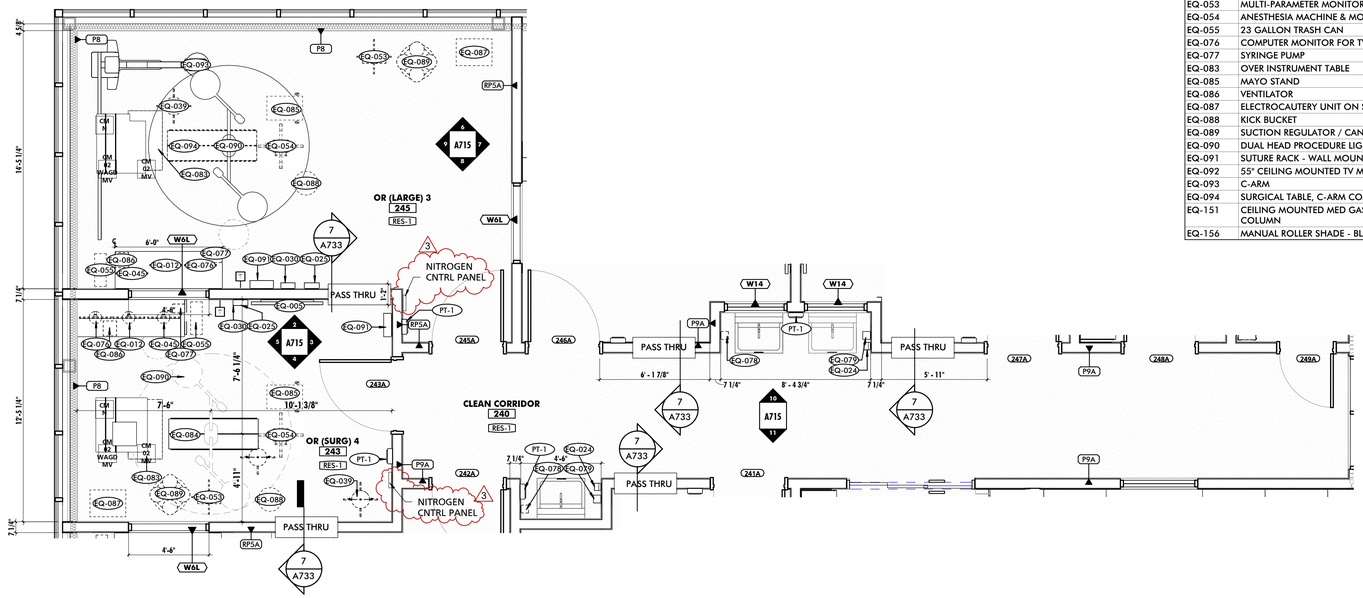
SHEET NUMBER:

A714

11/8/2023 8:32:04 AM

EQUIPMENT SCHEDULE - OR #3	
MARK	DESCRIPTION
245	
EQ-012	COMPUTER MONITOR
EQ-025	EXAM GLOVE HOLDER
EQ-030	SHARPS CONTAINER
EQ-039	IV POLE
EQ-045	MULTI-PARAMETER MONITOR
EQ-053	MULTI-PARAMETER MONITOR W/PRINTER & STAND
EQ-054	ANESTHESIA MACHINE & MONITOR ON STAND
EQ-055	23 GALLON TRASH CAN
EQ-076	COMPUTER MONITOR FOR TV
EQ-077	SYRINGE PUMP
EQ-083	OVER INSTRUMENT TABLE
EQ-085	MAYO STAND
EQ-086	VENTILATOR
EQ-087	ELECTROCAUTERY UNIT ON STAND
EQ-088	KICK BUCKET
EQ-089	SUCTION REGULATOR / CANISTER CART
EQ-090	DUAL HEAD PROCEDURE LIGHT
EQ-091	SUTURE RACK - WALL MOUNT
EQ-092	55" CEILING MOUNTED TV MONITOR
EQ-093	C-ARM
EQ-094	SURGICAL TABLE, C-ARM COMPATIBLE
EQ-151	CEILING MOUNTED MED GAS / ELECTRICAL SERVICE COLUMN
EQ-156	MANUAL ROLLER SHADE - BLACK OUT - CEILING MOUNT

EQUIPMENT SCHEDULE - OR #4	
MARK	DESCRIPTION
243	
EQ-005	55" TV
EQ-012	COMPUTER MONITOR
EQ-025	EXAM GLOVE HOLDER
EQ-030	SHARPS CONTAINER
EQ-039	IV POLE
EQ-045	MULTI-PARAMETER MONITOR
EQ-053	MULTI-PARAMETER MONITOR W/PRINTER & STAND
EQ-054	ANESTHESIA MACHINE & MONITOR ON STAND
EQ-055	23 GALLON TRASH CAN
EQ-076	COMPUTER MONITOR FOR TV
EQ-077	SYRINGE PUMP
EQ-083	OVER INSTRUMENT TABLE
EQ-084	OPERATING TABLE W/V-TILT, NON HEATED
EQ-085	MAYO STAND
EQ-086	VENTILATOR
EQ-087	ELECTROCAUTERY UNIT ON STAND
EQ-088	KICK BUCKET
EQ-089	SUCTION REGULATOR / CANISTER CART
EQ-090	DUAL HEAD PROCEDURE LIGHT
EQ-091	SUTURE RACK - WALL MOUNT
EQ-151	CEILING MOUNTED MED GAS / ELECTRICAL SERVICE COLUMN



1 ENLARGED PLAN - CLEAN CORRIDOR 240, OR 4 243 & OR 3 245
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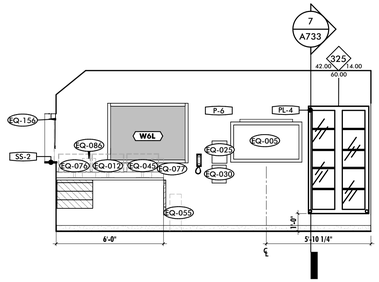
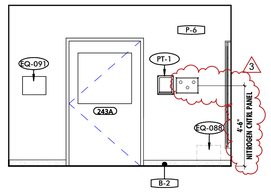
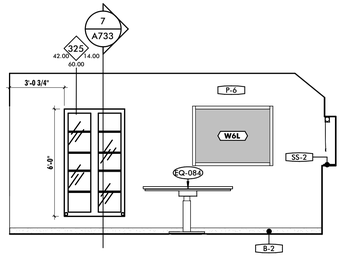


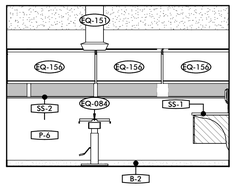
2 OR 4 243 - NORTH
1/4" = 1'-0"



3 OR 4 243 - EAST
1/4" = 1'-0"



4 OR 4 243 - SOUTH
1/4" = 1'-0"



5 OR 4 243 - WEST
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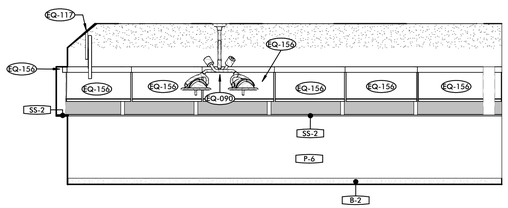
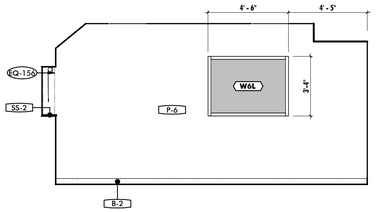
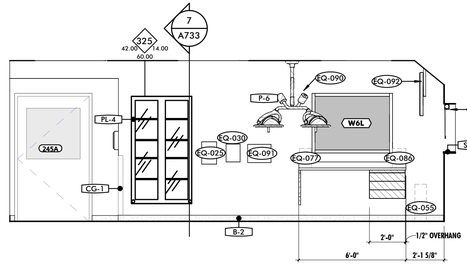


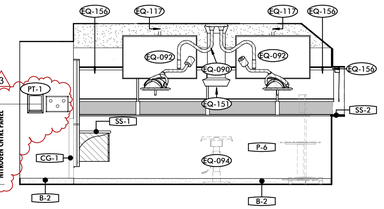
6 OR 3 245 - NORTH
1/4" = 1'-0"



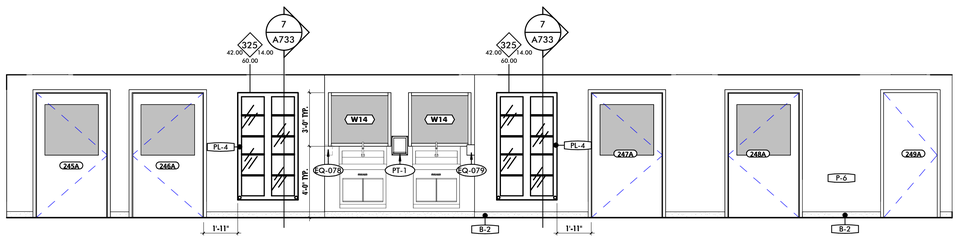
7 OR 3 245 - EAST
1/4" = 1'-0"



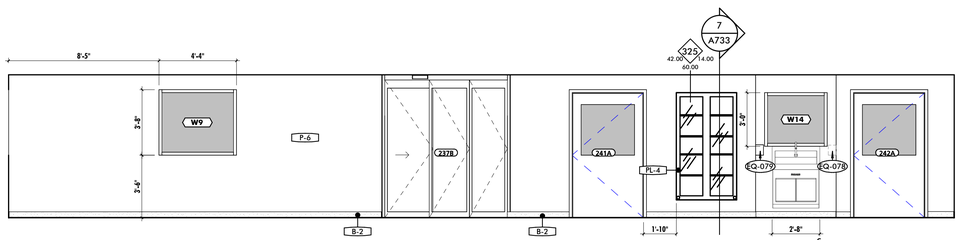
8 OR 3 245 - SOUTH
1/4" = 1'-0"



9 OR 3 245 - WEST
1/4" = 1'-0"



10 CLEAN CORRIDOR 240 - NORTH
1/4" = 1'-0"



11 CLEAN CORRIDOR 240 - SOUTH
1/4" = 1'-0"

CASEWORK LEGEND

- MIDMARK PROVIDED, CONTRACTOR INSTALLED
- CONTRACTOR PROVIDED, CONTRACTOR INSTALLED
- TO BE PROVIDED IN FUTURE PHASE

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No. 53188
CERTIFICATE OF AUTHORIZATION

NATIONAL VETERINARY ASSOCIATES EASTERN CAROLINA VETERINARY REFERRAL CLINIC RENOVATION
5051 NEW CENTRE DR
WILMINGTON, NC 28403

PROJECT NUMBER: 22-127

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No.	DATE
3	11-06-23

LAST PROJECT REVISION: No 3 | 11-06-23

ENLARGED PLANS & INT. ELEVATIONS

SHEET NUMBER:
A715

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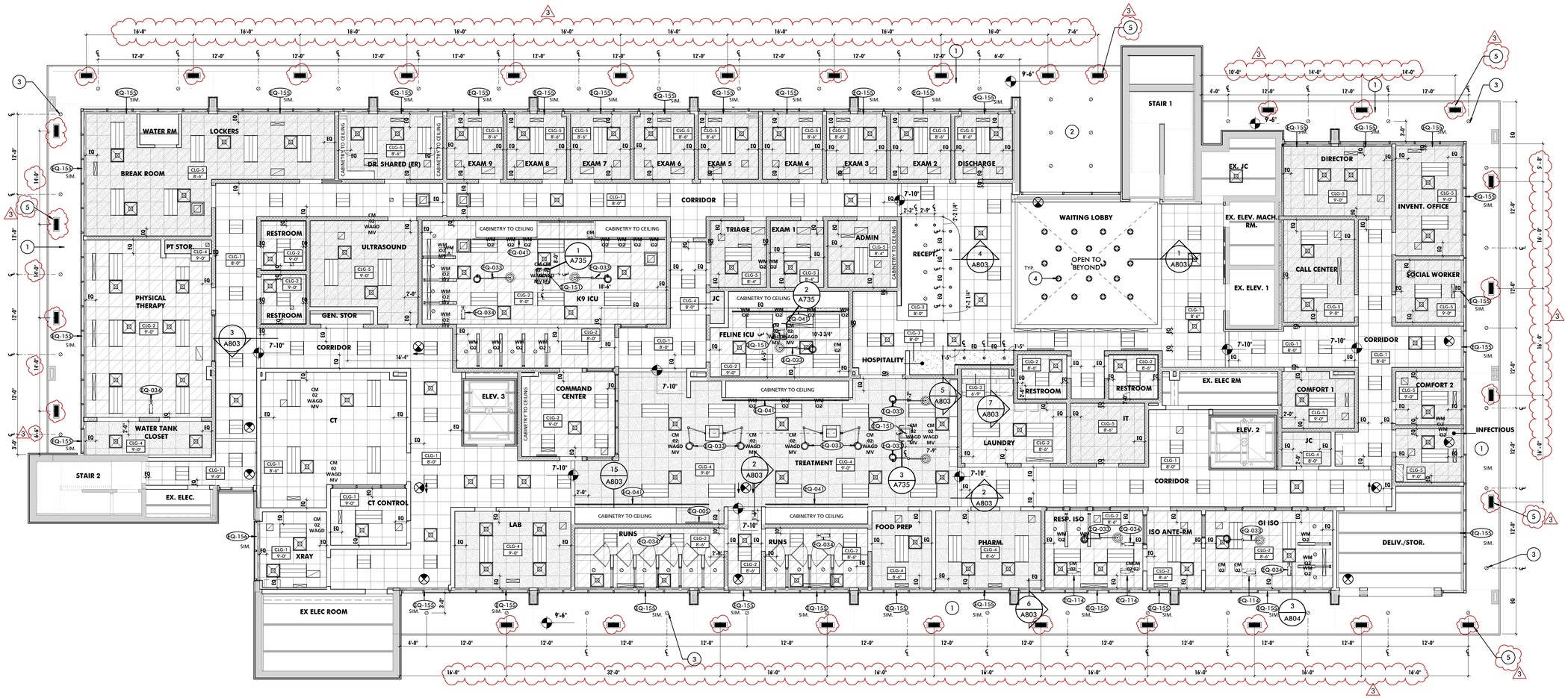

1 FIRST FLOOR - REFLECTED CEILING PLAN

1/8" = 1'-0"

GENERAL CEILING NOTES

1	UNDERSIDE OF EXPOSED STRUCTURE, PIPING, AND DUCTWORK IN ALL ROOMS, STAIRWAYS, AND OTHER SPACES SHALL BE PAINTED UNLESS NOTED OTHERWISE. CONTRACTOR SHALL COORDINATE COLOR SELECTION WITH THE ARCHITECT PRIOR TO PAINTING OR PRIMING, TYP.
2	CONTRACTOR SHALL COORDINATE FINAL FIELD LOCATION OF ALL EXIT SIGNS AND EMERGENCY LIGHTING WITH ARCHITECT PRIOR TO ROUGH-IN, TYP.
3	THE CONTRACTOR SHALL PROVIDE SPRINKLER SYSTEM SHOP DRAWINGS TO THE ARCHITECT FOR APPROVAL WHERE SPRINKLERS ARE REQUIRED BY CODE (SEE CODE SHEET). DRAWINGS SHALL INDICATE HEAD LOCATIONS, HEAD TYPES, AND PIPING DISTRIBUTION. IN EXPOSED OCCUPIED AREAS MAINS SHALL BE ROUTED THROUGH AREAS WITH ACCESSIBLE FINISHED CEILINGS TO THE MAXIMUM EXTENT FEASIBLE. WHERE CEILINGS ARE FINISHED ALL HEADS SHALL BE EQUIPPED WITH CONCEALMENT COVERS. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.
4	SPRINKLER LOCATIONS DEPICTED HEREIN ARE DIAGRAMMATIC AND ARE SHOWN FOR DESIGN INTENT ONLY.
5	ON ACT CEILINGS IN FIRE-RATED AREAS INSTALL HOLD DOWN CLIPS ON ACOUSTIC PANELS WEIGHING LESS THAN 1 LB. PER SQ. FT. PER SPEC.
6	ALL MECHANICAL, ELECTRICAL, PLUMBING, AND SPRINKLER WORK TO OCCUR IN AREAS WHERE THE STRUCTURE IS EXPOSED SHALL BE EXECUTED IN A COORDINATED, NEAT AND WORKMANLIKE MANNER. AT A MINIMUM ALL WIRING SHALL BE RUN THOUGH CONDUITS, PIPE AND DUCT INSULATION SHALL BE NEATLY INSTALLED AND PAINTABLE. ALL PIPES AND DUCTS SHALL BE RUN EITHER PERPENDICULAR OR PARALLEL TO WALL CONSTRUCTION AND SHALL BE INSTALLED AT THE SAME NOMINAL ELEVATION OR SLOPE. ALL MATERIALS AND INSTALLATION METHODS SHALL COMPLY WITH APPLICABLE CODES AND STANDARDS. WHERE MECHANICAL, ELECTRICAL, AND PLUMBING DRAWINGS INDICATE OTHER REQUIREMENTS THE GREATER QUALITY SHALL PREVAIL.
7	WHERE CEILINGS ARE EXPOSED ALL TIES, CABLES, AND SUPPORTS FOR CLOUDS, ELECTRICAL, MECHNICAL EQUIPMENT AND OTHER APPURTENANCES SHALL BE INSTALLED IN A NEAT, ORGANIZED AND WORKMAN LIKE MANNER. VISIBLE TIES SHALL BE PLUMB/TRUE/SQUARE TO ELEMENTS, TIGHTLY WRAPPED, WITH EXCESS WIRE NEATLY CUT.
8	CONTRACTOR SHALL COORDINATE THE COLOR AND FINISH OF ALL CEILING MOUNTED EQUIPMENT SUCH AS DIFFUSERS, RETURNS, SPEAKERS, ETC. WITH THE ARCHITECT TO ENSURE THERE ARE NO STARK CONTRASTING COLORS.
9	WHERE ACT GRID LAYOUT AT EDGE CONDITIONS FOR 2X2 TILES REQUIRE TILES TO BE CUT TO LESS THAN 3", UTILIZE A 2X4 TILE IN LIEU OF THE 2X2 TILE. OMIT CILING GRID CROSS MEMBERS AS REQUIRED. NO TILE SHALL EXCEED 27" OR BE LESS THAN 3" AT PERIMETER CONDITIONS. IT IS THE CONTRACTORS RESPONSIBILITY TO COORDINATE GRID MAINS AS REQUIRED TO ACHIEVE THIS DESIGN INTENT.
10	CENTER LIGHT FIXTURES OVER KENNELS TO THE EXTENT THAT ACT CEILING ALLOWS.
11	IN ADDITION TO GENERAL REQUIREMENTS, ALL ELECTRICAL WIRING, INCLUDING, BUT NOT LIMITED TO GENERAL POWER SUPPLY, LOW VOLTAGE POWER SUPPLY, COMMUNICATIONS WIRING, A/V, AND DATA WIRING TO BE RUN IN PAINTED METAL CONDUIT IN AREAS WHERE THE METAL DECK/STRUCTURE ABOVE IS FULLY OR PARTIALLY EXPOSED.

SCHEDULE - CEILING TYPES

MARK	DESCRIPTION	BOD MANUFACTURER	BOD MODEL	COMMENTS
CLG-1	2x2 ACOUSTICAL CEILING TILE SYSTEM - SQUARE	USG	TILE: ACT-1, GRID: ACTG-1	
CLG-2	2x2 ACOUSTICAL CEILING TILE ASSEMBLY -SQUARE - CLEANABLE W/ SOUND INSULATION	USG	TILE: ACT-2, GRID: ACTG-1	
CLG-3	5/8" GWB ON 3 5/8" METAL STUDS @ 16" O.C.	N/A	N/A	
CLG-4	2x2 ACOUSTICAL CEILING TILE ASSEMBLY - SQUARE LAY IN, CLEANABLE	USG	TILE: ACT-2, GRID: ACTG-1	
CLG-5	2x2 ACOUSTICAL CEILING TILE ASSEMBLY - SQUARE LAY IN - SOUND INSULATION	USG	TILE: ACT-1, GRID: ACTG-1	

LEGEND - KEYNOTE LEGEND

KEY	NOTE
1	EXISTING SOFFIT ASSEMBLY TO REMAIN
2	EXISTING LIGHT FIXTURES TO BE REPLACED, LOCATIONS TO REMAIN.
3	NEW RECESSED LIGHT FIXTURE IN EXISTING SOFFIT. CONTRACTOR TO CONFIRM STRUCTURE OF EXISTING SOFFIT PRIOR TO INSTALLATION OF NEW LIGHTING.
4	ALL EXTERIOR SITE FURNISHINGS SHALL BE PROCURED AND INSTALLED BY THE OWNER.
5	NEW PREFINISHED 10" X 25" METAL SOFFIT VENT W/LOUVERS/SCREEN, MIN. 80 SQ. INCH FREE AIR SPACE. REFER TO REFLECTED CEILING PLAN FOR SPACING.

RCP EQUIPMENT LEGEND

WM 02	WALL MOUNTED OXYGEN ONLY LOCATION
CM 02	CEILING MOUNTED OXYGEN ONLY LOCATION
WM 02 WAGD	WALL MOUNTED OXYGEN & WASTE ANESTHETIC GAS DISPOSAL LOCATION
CM 02 WAGD	CEILING MOUNTED OXYGEN & WASTE ANESTHETIC GAS DISPOSAL LOCATION
WM 02 MV	WALL MOUNTED OXYGEN & MEDICAL VACUUM LOCATION
CM 02 MV	CEILING MOUNTED OXYGEN & MEDICAL VACUUM LOCATION
CM 02, WAGD MV	CEILING MOUNTED OXYGEN, WASTE ANESTHETIC GAS DISPOSAL & MEDICAL VACUUM LOCATION
CM N	CEILING MOUNTED NITROGEN LOCATION
WM A	WALL MOUNTED MEDICAL AIR
CM A	CEILING MOUNTED MEDICAL AIR

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PROJECT NUMBER: 22-127

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REFLECTED CEILING PLAN - FIRST FLOOR

SHEET NUMBER:

A801

11/7/2023 3:54:44 PM

MECHANICAL KEY NOTES: (#)

1. 10"X10" EXHAUST DUCTWORK SHALL BE ROUTED UP TO ROOF ABOVE AND SHALL TRANSITION AS NECESSARY TO CONNECT TO EFR-O2 AT ROOF ABOVE. INSTALL PER THE 02 GENERATOR MANUFACTURER'S INSTALLATION REQUIREMENTS. 10"X10" EXHAUST SHALL TERMINATE AT EXHAUST GRILLE LOCATED 12" ABOVE FINISHED FLOOR (A.F.F.)
2. SUPPLY DUCTWORK SHALL PENETRATE EXISTING MECHANICAL CHASE AND SHALL BE ROUTED DOWN TO FLOOR BELOW. PROVIDE FIRE DAMPER AT CHASE PENETRATION.
3. RETURN DUCTWORK SHALL PENETRATE EXISTING MECHANICAL CHASE AND SHALL BE ROUTED DOWN TO FLOOR BELOW. PROVIDE FIRE DAMPER AT CHASE PENETRATION.
4. SUPPLY AIR DUCTWORK SHALL BE ROUTED TO ROOF ABOVE AND SHALL TRANSITION TO ROOFTOP UNIT SUPPLY AIR OPENING. MC SHALL PROVIDE TRANSITIONS AS NECESSARY TO MAKE CONNECTION.
5. RETURN AIR DUCTWORK SHALL BE ROUTED TO ROOF ABOVE AND SHALL TRANSITION TO ROOFTOP UNIT RETURN AIR OPENING. MC SHALL PROVIDE TRANSITIONS AS NECESSARY TO MAKE CONNECTION.
6. 3/4" TUBING PIPING SHALL BE ROUTED FROM ASSOCIATED STERILIZER TO 2" SCH. 40 PVC PIPE THROUGH ROOF. 3/4" TUBING SHALL CONNECT TO 2" SCH. 40 PVC PIPING WITH ADAPTER CAP AS INDICATED IN STERILIZER MANUFACTURER'S INSTALLATION REQUIREMENTS. PROVIDE QUICK RELEASE CONNECTOR AT STERILIZER. PVC PIPING SHALL ELBOW TO HORIZONTAL SLANTED TERMINATION WITH BIRD/INSECTSCREEN IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION REQUIREMENTS.
7. TRANSFER GRILLE SHALL BE INSTALLED AT WALL. MC SHALL COORDINATE WITH EC TO LOCATE GRILLE SUCH THAT IT IS NOT INSTALLED AT OR ABOVE ELECTRICAL EQUIPMENT IN ELECTRICAL ROOM.
8. 8" ROUND DRYER FLUE DUCTWORK SHALL BE ROUTED TO TERMINATION AT ROOF LEVEL ABOVE. FLUE DUCTWORK SHALL TERMINATE NO LESS THAN 36" ABOVE FINISHED ROOF LEVEL AND ELBOW DOWNWARDS IN ACCORDANCE WITH INSTALLATION REQUIREMENTS. DRYER DUCTWORK SHALL MAINTAIN SLIGHT SLOPE BACKWARDS TOWARDS RESPECTIVE DRYER. INSTALL BACKDRAFT DAMPER AT ACCESSIBLE LOCATION IN DRYER FLUE DUCTWORK .
9. EXHAUST DUCTWORK STUBS INTO CEILING PLENUM RETURN. PROVIDE BIRDSCREEN AT DUCT OPENING TERMINATION ABOVE CEILING.
10. BACNET MS/TP CONTROL PANEL SHALL BE INSTALLED IN ELECTRIC ROOM. MC SHALL COORDINATE WITH EC TO PLACE CONTROL PNAEL WITHIN ROOM SUCH THAT IT DOES NOT INTERFERE WITH EQUIPMENT/FFE IN ROOM. EC SHALL PROVIDE 120V CIRCUIT TO CONTROL PANEL. CONTROL PANEL SHALL CONTAIN 5 AMP CIRCUIT BREAKER AND 120/24v CONTROL TRANSFORMER.
11. (2) 2-1/2" ASTM B819, HARD DRAWN TYPE K SEAMLESS COPPER PIPES (OR OTHER CODE APPROVED PIPING MATERIALS) FOR MEDICAL GAS SYSTEMS SHALL BE VENTED FROM VACUUM PUMP VENT OUTLET TO ROOF AND SHALL TERMINATE AT ROOF LEVEL. THE VACUUM VENT PIPING SHALL BE PROMINENTLY LABELED AND DISTINGUISHED AS VACUUM EXHAUST. VENTING SHALL BE INSTALLED FREE OF DIPS AND LOOPS THAT MAY TRAP CONDENSATE OR OIL. IF SUCH INSTALLATION IS NOT POSSIBLE, PROVIDE DRIP LEG AND VALVED DRAIN AT BOTTOM OF LOW POINT AS REQUIRED. COORDINATE ROUTING OF VENT PIPING WITH EQUIPMENT AND DEVICES INSTALLED IN AND ABOVE CEILING. COORDINATE INSTALLATION WITH FINAL LOCATION OF VACUUM PUMP.
12. 3/4" ASTM B819, HARD DRAWN TYPE K SEAMLESS COPPER PIPE (OR OTHER CODE APPROVED PIPING MATERIALS) FOR MEDICAL GAS SYSTEMS SHALL BE VENTED FROM MANIFOLD VENT OUTLET TO ROOF AND SHALL TERMINATE AT ROOF LEVEL. THE MANIFOLD VENT PIPING SHALL BE PROMINENTLY LABELED AND DISTINGUISHED AS MANIFOLD EXHAUST. COORDINATE INSTALLATION WITH FINAL LOCATION OF MANIFOLD.

1 3

MECHANICAL GENERAL NOTES:

1. ALL MECHANICAL EQUIPMENT SHALL BE INSTALLED AND HELD TIGHT TO STRUCTURE ABOVE. NO EQUIPMENT, DUCTWORK, OR APPURTENANCES SHALL BE INSTALLED BELOW 8'-0" ABOVE FINISHED FLOOR (A.F.F.). ROUTE DUCTWORK UP AND DOWN AROUND BEAMS AS NECESSARY. PROVIDE EXTREME CARE WHILE COORDINATING BETWEEN ALL TRADES.
2. PROVIDE PROPER CLEARANCE AT ALL AIR TERMINAL UNITS AND THEIR ASSOCIATED ELECTRIC RESISTANCE HEATERS IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION AND SERIVCE REQUIREMENTS.
3. MC SHALL PROVIDE ACCESS PANELS IN INACCESSIBLE CEILINGS FOR AIR TERMINAL UNITS, VOLUME DAMPERS, MECHANICAL CONTROLS AND OTHER MECHANICAL EQUIPMENT/CONTROLS REQUIRING ACCESS FOR ADJUSTMENT, REPLACEMENT AND SERIVCE. SIZE OF DAMPER SHALL BE IN ACCORDANCE WITH EQUIPMENT OR APPURTENANCE MANUFACTURER'S REQUIREMENTS. PROVIDE RATED ACCESS PANELS WITH EQUAL FIRE RATING FOR ANY PANELS LOCATED WITHIN RATEDS WALLS, CEILINGS OR ASSEMBLIES.
4. MECHANICAL CONTRACTOR SHALL PROVIDE DETAILED SHOP DRAWINGS AND COMPLETE COORDINATION WITH ALL TRADES PRIOR TO CONSTRUCTION. FIELD COORDINATION SHALL BE REQUIRED DUE TO CEILING HEIGHT AND STRUCTURAL BEAM DEPTHS.
5. COORDINATE FINAL LOCATION OF DIFFUSERS, REGISTERS AND GRILLES IN CEILINGS WITH LIGHTING, SPRINKLERS, FIRE ALARM DEVICES, COMMUNICATIONS DEVICES, MEDICAL GAS, MEDICAL EQUIPMENT, AND ARCHITECTURAL REFLECTED CEILING PLAN.
6. MC SHALL VERIFY EXISTING CONDITIONS AND LOCATIONS OF EQUIPMENT, DUCTWORK, PIPING, AND GRILLES, REGISTERS AND DIFFUSERS IN FIELD PRIOR TO BID. MC SHALL VERIFY EQUIPMENT IS IN GOOD WORKING ORDER AND THAT ANY COMPONENTS OF EQUIPMENT THAT REQUIRE REPLACEMENT ARE REPLACED PRIOR TO RE-INSTALLATION. EXISTING GRILLES, REGISTERS AND DIFFUSERS TO REMAIN SHALL BE CLEANED OF DUST AND DEBRIS PRIOR TO FINAL RE-INSTALLATION AND EQUIPMENT STARTUP.
7. DUCTWORK DIMENSIONS ARE PERMITTED TO BE ADJUSTED AS NECESSARY SO LONG AS THE NET FREE SQUARE AREA OF THE INSIDE DUCT DIMENSIONS ARE MAINTAINED AND THE WIDTH TO HEIGTH RATIO OF THE DUCTWORK DOES NOT EXCEED 3:1.
8. THERMOSTATS SHALL BE INSTALLED AT 48" ABOVE FINISHED FLOOR UNLESS OTHERWISE NOTED.
9. CEILING SPACE ABOVE OCCUPIABLE SPACES SHALL BE DESIGNATED AS A PLENUM RETURN CEILING. MC SHALL COORDINATE WITH ALL TRADES SUCH THAT NO NON-PLENUM RATED MATERIALS ARE LOCATED WITHIN THE MECHANICAL CEILING RETURN PLENUM.
10. CONDENSATE DRAIN PIPING SHALL BE SLOPED NO LESS THAN 1/4" PER LINEAL FOOT TOWARDS THE POINT OF INDIRECT TERMINATION.
11. VACUUM EXHAUST PIPING SHALL BE CONSTRUCTED OF SEAMLESS HARD DRAWN ASTM B88 TYPE K, TYPE L, OR TYPE M COPPER PIPING, SEAMLESS ASTM B280 COPPER PIPING OR SEAMLESS ASTM B819 TYLE L OR TYPE K COPPER PIPING IN ACCORDANCE WITH NFPA 99.5.110.2.1

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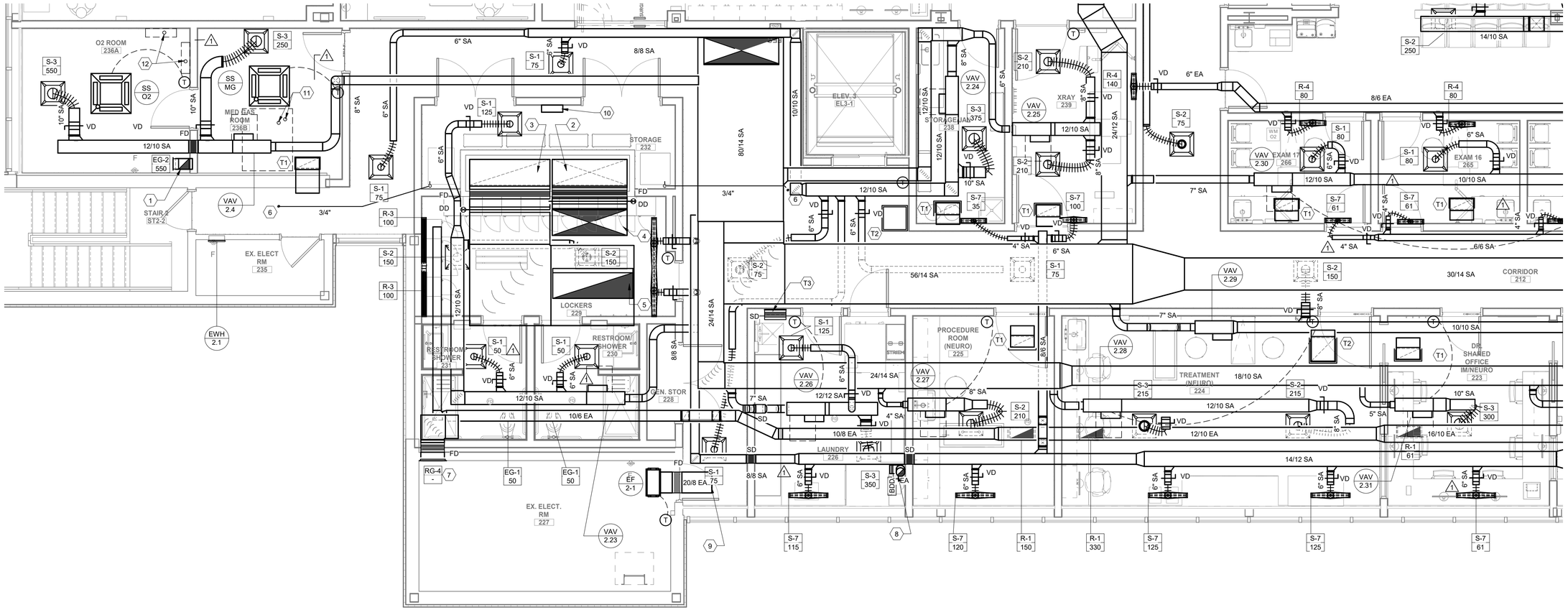

1 M202.C **ENLARGED MECHANICAL PLAN - SECOND FLOOR AREA C**
1/4" = 1'-0"

0' 1' 2' 4' 8' 12'

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

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1	10/6/23	ADDENDUM #1
3	11/06/23	ADDENDUM #3

LAST PROJECT REVISION: No 3 | 11/06/23

SECOND FLOOR ENLARGED MECHANICAL PLAN AREA C

SHEET
M202.C

11/7/2023 3:23:09 PM

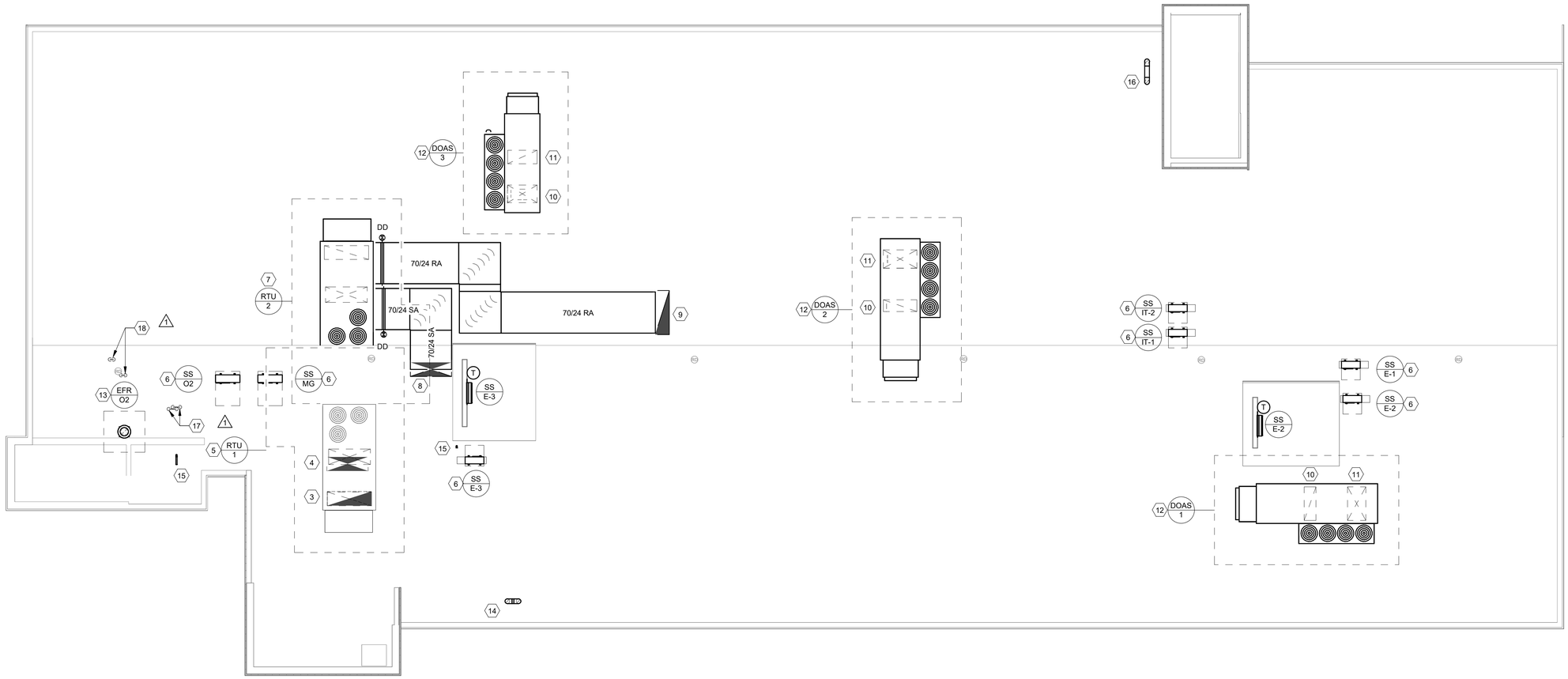
ASC PROJECT NUMBER: 21-000

MECHANICAL GENERAL NOTES:

1. MC SHALL VERIFY EXISTING CONDITIONS AND LOCATIONS OF EQUIPMENT, DUCTWORK, PIPING, AND GRILLES, REGISTERS AND DIFFUSERS IN FIELD PRIOR TO BID. MC SHALL VERIFY EQUIPMENT IS IN GOOD WORKING ORDER AND THAT ANY COMPONENTS OF EQUIPMENT THAT REQUIRE REPLACEMENT ARE REPLACED PRIOR TO RE-INSTALLATION. EXISTING GRILLES, REGISTERS AND DIFFUSERS TO REMAIN SHALL BE CLEANED OF DUST AND DEBRIS PRIOR TO FINAL RE-INSTALLATION AND EQUIPMENT STARTUP.
2. ALL MECHANICAL EQUIPMENT, SENSORS AND DAMPERS LOCATED ABOVE HARD CEILINGS OR WITHIN WALLS SHALL BE PROVIDED WITH ACCESS PANELS SIZED IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION REQUIREMENTS AND SUCH THAT THE FULL REMOVAL OF THE EQUIPMENT AND/OR DAMPER IS POSSIBLE. PROVIDE RATED ACCESS PANELS FOR ALL ACCESS PANELS LOCATED WITHIN RATED CEILINGS OR WALLS. ACCESS DOORS SHALL BE TAMPER AND VANDAL PROOF.
3. MC SHALL VERIFY ALL EQUIPMENT TO REMAIN IS FUNCTIONING PROPERLY AND IS IN GOOD WORKING CONDITION.
4. MC SHALL COORDINATE WITH GC TO PATCH ALL EXISTING TO REMAIN WALL, FLOOR AND CEILING PENETRATIONS TO MATCH EXISTING MATERIAL AT ALL DEMOLISHED PIPE, DUCT, AND MECHANICAL SYSTEMS RELATED PENETRATIONS.
5. MC SHALL COORDINATE WITH GC TO VERIFY FINAL LINTEL SIZE REQUIREMENTS FOR STRUCTURAL PENETRATIONS REQUIRING LINTELS. FINAL LINTEL SIZE SHALL BE VERIFIED TO MATCH DIMENSIONS OF MECHANICAL CONTRACTOR'S APPROVED DUCT SHOP DRAWINGS.
6. CONDENSATE DRAIN PIPING SHALL BE SLOPED NO LESS THAN 1/4" PER LINEAL FOOT OF HORIZONTAL RUN. PIPING SHALL BE SLOPED TOWARDS POINT OF TERMINATION.
7. THE MC SHALL ENGAGE THE TESTING, ADJUSTING, AND BALANCING AGENT TO RE-BALANCE EXISTING AIR HANDLING UNITS SERVING THE SPACES WITHIN THE PROJECT SCOPE TO THE NEW AIRFLOW VALUES.
8. ALL MECHANICAL EQUIPMENT SHALL BE INSTALLED NO LESS THAN 10 FEET FROM ROOF EDGE OR PARAPET. NEW MECHANICAL EQUIPMENT INSTALLED WITHIN 10 FEET OF ROOF EDGE WITH A PARAPET HEIGHT OF LESS THAN 42" SHALL BE PROVIDED WITH SERVICE AND MAINTENANCE RAILING IN ACCORDANCE WITH THE 2015 IMC AND OSHA REQUIREMENTS.
9. MECHANICAL FRESH AIR INTAKES SHALL BE LOCATED NO LESS THAN 10 FEET FROM ALL EXHAUST OUTLETS. MC SHALL VERIFY MECHANICAL EQUIPMENT INSTALLATION IS IN ACCORDANCE WITH THIS REQUIREMENT.
10. MC SHALL PROVIDE HORIZONTAL DUCTWORK SUPPORT (BIGFOOT H FRAME: BASIS OF DESIGN) WITH RUBBER BASE AND METAL VERTICAL SUPPORTS AT A MINIMUM SPACING OF 5 FEET PER LINEAR FEET OF EXTERIOR DUCTWORK.
11. MECHANICAL FRESH AIR INTAKES SHALL BE LOCATED NO LESS THAN 10 FEET FROM ALL EXHAUST OUTLETS. MC SHALL VERIFY MECHANICAL EQUIPMENT INSTALLATION IS IN ACCORDANCE WITH THIS REQUIREMENT.
12. MC SHALL PROVIDE HORIZONTAL DUCTWORK SUPPORT (BIGFOOT H FRAME: BASIS OF DESIGN) WITH RUBBER BASE AND METAL VERTICAL SUPPORTS AT A MINIMUM SPACING OF 5 FEET PER LINEAR FEET OF EXTERIOR DUCTWORK.
13. MC SHALL PROVIDE HORIZONTAL PIPING SUPPORT (DURA-BLOK: BASIS OF DESIGN) WITH RUBBER BASE AND METAL VERTICAL CHANNEL AT A MINIMUM SPACING OF 5 FEET PER LINEAR FEET OF EXTERIOR REFRIGERANT PIPING.
14. MC SHALL PROVIDE 14" INSULATED PIPE PORTAL CURB AND CAP AT LOCATIONS IN WHICH REFRIGERANT PIPING PENETRATES ROOF.
8. ALL MECHANICAL EQUIPMENT SHALL BE FASTENED, BOLTED SECURED AND/OR ANCHORED TO THEIR RESPECTIVE EQUIPMENT CURBS OR EQUIPMENT STANDS. FASTENER/ANCHOR TYPE, QUANTITY AND LOCATION OF SECURE INSTALLATION SHALL BE IN ACCORDANCE WITH ASCE 7-16 AND FEMA P-424. STRATEGIES SUCH AS CABLE TIEDOWNS OR METAL STRAPS FOR EQUIPMENT SUCH AS EXHAUST FANS, BOLTS AND TIEDOWNS FOR CONDENSING UNITS.
9. THE BASIS OF WIND DESIGN PARAMETERS SHALL BE BASED ON THE ASCE 7-16 WIND DESIGN VALUES FOR A RISK CATEGORY II FACILITY LOCATED AT THE ADDRESS/SITE.
10. THE GAUGE OF DUCTWORK FOR EXPOSED DUCTWORK ON THE ROOF SHALL BE CAPABLE OF RESISTING THE DESIGN WIND LOAD FOR THE SITE (144 VMPH) FOR RISK CATEGORY II FACILITY.
11. ALL ROOF AND EQUIPMENT CURBS SHALL BE DESIGNED TO RESIST THE DESIGN WIND LOAD SPECIFIED BY ASCE 7-16 FOR A RISK CATEGORY III FACILITY AND THE PROJECT SITE LOCATION.
12. TERMINATION OF VACUUM PUMP VENTING AND MANIFOLD VENTING SHALL BE FACED TOWARDS WEST (AWAY FROM PREVAILING WINDS).
13. TERMINATION OF VACUUM PUMP VENTING AND MANIFOLD VENTING SHALL BE LOCATED NO LESS THAN 25 FEET FROM ANY DOOR, WINDOW, AIR INTAKE, OR OTHER OPENINGS IN BUILDING OR PLACES OF PUBLIC ASSEMBLY.
14. VACUUM EXHAUST PIPING SHALL BE CONSTRUCTED OF SEAMLESS HARD DRAWN ASTM B88 TYPE K, TYPE L, OR TYPE M COPPER PIPING, SEAMLESS ASTM B280 COPPER PIPING OR SEAMLESS ASTM B819 TYLE L OR TYPE K COPPER PIPING IN ACCORDANCE WITH NFPA 99.5.110.2.1 (1)

MECHANICAL KEY NOTES: (#)

1. GRAVITY RELIEF VENTILATOR SHALL BE INSTALLED ON 14" INSULATED ROOF CURB. PROVIDE RELIEF DUCT INTO EXISTING ELECTRICAL ROOM SPACE. PROVIDE MOTORIZED DAMPER AT ROOF OPENING.
2. ROOFTOP EXHAUST FAN SHALL BE INSTALLED ON ROOF ON 14" INSULATED ROOF CURB WITH SPRING VIBRATION ISOLATION RAILS. PROVIDE MOTORIZED DAMPER AT ROOF OPENING. EXHAUST DUCTWORK DOWN TO EXISTING ELECTRICAL ROOM CEILING.
3. EXISTING RETURN DUCT TO REMAIN. VERIFY EXACT SIZE AND LOCATION OF PENETRATION IN FIELD.
4. EXISTING SUPPLY DUCT TO REMAIN. VERIFY EXACT SIZE AND LOCATION OF PENETRATION IN FIELD.
5. EXISTING ROOFTOP UNIT AND ALL ASSOCIATED ACCESSORIES AND APPURTENANCES TO REMAIN. VERIFY EXACT SIZE AND LOCATION IN FIELD.
6. SPLIT SYSTEM HEAT PUMP SHALL BE INSTALLED ON 14" HEAT PUMP STANDS WITH VIBRATION ISOLATION PADS. MC SHALL PROVIDE REFRIGERANT PIPING FROM OUTDOOR HEAT PUMP TO ASSOCIATED INDOOR FAN COIL UNIT.
7. NEW RTU-2 SHALL BE INSTALLED ON NEW INSULATED ROOF CURB WITH VIBRATION ISOLATION RAILS., PROVIDE KINESTICS KSI 2.0 SPRING VIBRATION ISOLATION RAIL OR APPROVED EQUAL. PROVIDE 24" CURB WITH HORIZONTAL CURB KNOCKDOWN FOR HORIZONTAL SUPPLY AND RETURN DISTRIBUTION.
8. NEW SUPPLY DUCT TO DN TO CEILING BELOW. COORDINATE ROOF PENETRATION WITH STRUCTURAL DRAWINGS. PROVIDE DUCT SMOKE DETECTOR AT ACCESSIBLE PORTION OF CEILING BELOW.
9. NEW RETURN DUCT TO DN TO CEILING BELOW. COORDINATE ROOF PENETRATION WITH STRUCTURAL DRAWINGS. PROVIDE DUCT SMOKE DETECTOR AT ACCESSIBLE PORTION OF CEILING BELOW.
10. NEW RETURN DUCT TO DN TO CEILING BELOW THROUGH ROOF CURB. COORDINATE ROOF PENETRATION WITH STRUCTURAL DRAWINGS. PROVIDE DUCT SMOKE DETECTOR AT ACCESSIBLE PORTION OF CEILING BELOW.
11. NEW SUPPLY DUCT TO DN TO CEILING BELOW THROUGH ROOF CURB. COORDINATE ROOF PENETRATION WITH STRUCTURAL DRAWINGS. PROVIDE DUCT SMOKE DETECTOR AT ACCESSIBLE PORTION OF CEILING BELOW.
12. NEW DOAS UNIT SHALL BE INSTALLED ON NEW 24" ROOF CURB. PROVIDE KINESTICS KSI 2.0 SPRING VIBRATION ISOLATION RAIL OR APPROVED EQUAL AT ADAPTER CURB.
13. DOWNBLAST EXHAUST FAN SHALL BE INSTALLED ON NEW 14" ROOF CURB. PROVIDE KINESTICS KSI 2.0 SPRING VIBRATION ISOLATION RAIL OR APPROVED EQUAL. EXHAUST DUCTWORK SHALL TRANSITION DOWN TO FLOOR BELOW.
14. 8" ROUND DRYER FLUE DUCTWORK SHALL BE ROUTED FROM TERMINATION AT ROOF LEVEL TO FLOOR BELOW. FLUE DUCTWORK SHALL TERMINATE NO LESS THAN 36" ABOVE FINISHED ROOF LEVEL AND ELBOW DOWNWARDS IN ACCORDANCE WITH INSTALLATION REQUIREMENTS. DRYER DUCTWORK SHALL MAINTAIN SLIGHT SLOPE BACKWARDS TOWARDS RESPECTIVE DRYER. INSTALL BACKDRAFT DAMPER AT ACCESSIBLE LOCATION IN DRYER FLUE DUCTWORK .
15. 3/4" TUBING PIPING SHALL BE ROUTED FROM ASSOCIATED STERILIZER TO 2" SCH. 40 PVC PIPE THROUGH ROOF. 3/4" TUBING SHALL CONNECT TO 2" SCH. 40 PVC PIPING WITH ADAPTER CAP AS INDICATED IN STERILIZER MANUFACTURER'S INSTALLATION REQUIREMENTS. PROVIDE QUICK RELEASE CONNECTOR AT STERILIZER. PVC PIPING SHALL ELBOW TO HORIZONTAL SLANTED TERMINATION WITH BIRD/INSECTSCREEN IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION REQUIREMENTS.
16. 8" EXHAUST DUCTWORK SHALL TERMINATE AT ROOF. INSTALL PER THE HOOD MANUFACTURER'S INSTALLATION REQUIREMENTS. PROVIDE ROOF CAP, BIRDSCREEN AND TERMINATION ACCESSORIES AS REQUIRED BY THE MANUFACTURER. 8" EXHAUST DUCTWORK SHALL BE ROUTED DN TO FLOOR BELOW. (3)
17. (2) 2-1/2" ASTM B819, HARD DRAWN TYPE K SEAMLESS COPPER PIPES (OR OTHER CODE APPROVED PIPE MATERIAL) FOR MEDICAL GAS SYSTEMS SHALL BE VENTED FROM VACUUM PUMP VENT OUTLET TO ROOF AND SHALL TERMINATE AT ROOF LEVEL. PROVIDE ELBOWS AND TURN TERMINATION DOWNWARDS AND PROVIDE SCREEN PER LATEST NFPA. TERMINATION SHALL BE NO LESS THAN 24" ABOVE EXISTING PARAPET HEIGHT FOR PROPER. EXHAUST DILUTION.
18. 3/4" ASTM B819, HARD DRAWN TYPE K SEAMLESS COPPER PIPE (OR OTHER CODE APPROVED PIPE MATERIAL) FOR MEDICAL GAS SYSTEMS SHALL BE VENTED FROM MANIFOLD VENT OUTLET TO ROOF AND SHALL TERMINATE AT ROOF LEVEL. TERMINATE AT ROOF LEVEL. PROVIDE ELBOWS AND TURN TERMINATION DOWNWARDS AND PROVIDE SCREEN PER LATEST NFPA. TERMINATION SHALL BE NO LESS THAN 24" ABOVE EXISTING PARAPET HEIGHT FOR PROPER. EXHAUST DILUTION. (1)



1 M203 **MECHANICAL PLAN - ROOF**
1/8" = 1'-0"

0' 2' 4' 8' 16' 24'
SCALE : 1/8" = 1'-0"

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No.	DATE	Revision Description
1	10/6/23	ADDENDUM #1
3	11/06/23	ADDENDUM #3

LAST PROJECT REVISION: No 3 | 11/06/23

ROOF MECHANICAL PLAN

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M203

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ASC PROJECT NUMBER: 21-000

MEDICAL GAS SYSTEMS SPECIFICATION 3

PART 1 - GENERAL

1.1 GENERAL

A. PROVIDE MEDICAL GAS SYSTEMS FOR THE FOLLOWING SERVICES: OXYGEN, MEDICAL VACUUM, AND NITROGEN. SYSTEMS SHALL INCLUDE PIPING, FITTINGS, VALVES, OUTLETS, ALARMS, ETC., REQUIRED TO PROVIDE A COMPLETE WORKING SYSTEM.

B. SUBMIT RECORD OF EXPERIENCE TO ARCHITECT FOR APPROVAL. INSUFFICIENT EXPERIENCE IN THE MEDICAL GAS SYSTEM FIELD MAY BE CAUSE FOR REJECTION BY THE ARCHITECT. INSTALLERS, INSPECTORS, AND VERIFIERS OF MEDICAL GAS SYSTEMS SHALL COMPLY WITH ASSE 6000 STANDARD.

C. OUTLET TYPE SHALL BE EQUIVALENT AND COMPATIBLE TO THE EXISTING STYLE PRESENTLY USED BY THE FACILITY.

1.2 MINIMUM PIPE SIZE SHALL BE ½ INCH FOR ALL GASES EXCEPT MEDICAL VACUUM WHICH SHALL BE ¾ INCH. SIZES SHALL BE NOMINAL PIPE SIZE.

PART 2 - PRODUCTS

2.1 OUTLETS AND EQUIPMENT

A. MEDICAL GAS OUTLETS

1. OUTLETS SHALL BE FOR OXYGEN, MEDICAL VACUUM, WAGD, AND NITROGEN. OUTLETS SHALL BE OF A TYPE SELECTED BY OWNER.
   1.1. PROVIDE NITROGEN CONTROL PANEL WITH NITROGEN OUTLET. COORDINATE LOCATION OF CONTROL PANEL WITH ARCHITECT.
2. PRIMARY VALVES SHALL BE CHROME PLATED STEEL FIELD ADJUSTABLE FOR WALL FINISH THICKNESS. THE PRIMARY GAS CHECK SHALL BE SERVICEABLE WITHOUT SHUTTING OFF GAS SUPPLY.
3. OUTLET FACE PLATE SHALL BE STAINLESS STEEL MOUNTED ON CHROME COVER PLATE. COVER PLATE FOR A PARTICULAR GAS SHALL BE INDEXED TO FIT ONLY THAT GAS OUTLET.
4. OUTLETS SHALL BE PERMANENTLY MARKED AND COLOR CODED AS TO TYPE OF GAS. OUTLET SHALL PREVENT INSERTION OF SECONDARY EQUIPMENT INTO THE WRONG GAS OUTLET.
5. MEDICAL GAS OUTLETS SHALL BE CLEANED FOR OXYGEN SERVICE IN ACCORDANCE WITH NFPA 99. ASSEMBLY SHALL BE CAPPED AND SHIPPED TO JOB SITE IN INDIVIDUALLY SEALED BAGS.
6. OUTLETS SHALL HAVE A 7 INCH LONG 1/2 INCH O.D. COPPER PIGTAIL WHICH SWIVELS 360.
7. PROVIDE BOTTLE SLIDES FOR MEDICAL GAS OUTLET ACCESSORIES. BOTTLE SLIDES SHALL BE INCORPORATED INTO GANGED OUTLETS. COORDINATE WITH OWNER SIZE OF VACUUM COLLECTION CANISTERS PRIOR TO ORDERING.
8. REFER TO ARCHITECTURAL DRAWINGS FOR EXACT OUTLET LOCATIONS, BOTTLE SLIDE LOCATIONS, AND ELEVATIONS. MOUNTING HEIGHTS SHALL BE 60 INCHES FROM OUTLET CENTER TO FINISHED FLOOR UNLESS INSTALLED ON CAGE SHELVING AND CEILING/COLUMNS LOCATIONS AS NOTED ON ARCHITECTURAL ELEVATIONS.
9. APPROVED MANUFACTURERS: AMICO, GENTEC, AND BEACON MEDAES.

B. ZONE VALVE BOX ASSEMBLIES

1. ZONE VALVE BOX ASSEMBLIES SHALL BE 18 GAUGE SHEET STEEL WITH LACQUER FINISH.
2. ASSEMBLY SHALL HAVE THE ABILITY TO GANG UNITS TOGETHER VERTICALLY WITH MULTIPLE UNITS ASSEMBLED TO HAVE UNIFORM APPEARANCE.
3. UNIT SHALL CONTAIN FULL PORT BALL VALVES, 1-1/2 INCH PRESSURE GAUGES WITH RANGE APPROPRIATE FOR GAS, PERMANENT MARKINGS AND COLOR CODING FOR EACH GAS SERVICE. WITH VALVE IN OFF POSITION, HANDLE SHALL NOT PROTRUDE BEYOND OPENING TO PREVENT COVER FROM CLOSING.
4. ZONE VALVE BOX ASSEMBLIES SHALL COMPLY WITH NFPA 99.
5. BALL VALVES AND PIPING EXTENSIONS SHALL BE CLEANED FOR OXYGEN SERVICE AS REQUIRED BY NFPA 99.
6. UNLESS OTHERWISE INDICATED, MOUNT ZONE VALVE BOXES 66 INCHES FROM TOP OF BOX TO FINISHED FLOOR.
7. ZONE VALVE BOXES SHALL BE LABELED WITH PHENOLIC ENGRAVED LABELS STATING AREA OR ROOMS SERVED.
8. APPROVED MANUFACTURERS: GENTEC, AMICO, AND BEACON MEDAES.

C. AREA ALARM PANELS

1. AREA ALARM PANELS SHALL BE LOCATED WHERE INDICATED ON THE DRAWINGS.
2. PANEL SHALL HAVE A PUSH-TO-TEST BUTTON AND SHALL ALARM VISUALLY AND AUDIBLY THE CONDITIONS LISTED IN PARAGRAPH 2.1 E.6. BELOW.
3. PANELS SHALL ALARM AND MONITOR THE FOLLOWING GASES: OXYGEN, MEDICAL VACUUM, AND NITROGEN.
4. VOLTAGE SHALL BE 120 VOLTS. REFER TO ELECTRICAL DRAWINGS FOR POWER CONNECTION. UNIT SHALL INCLUDE ALL TRANSFORMERS, CIRCUITRY, AND CONNECTIONS TO PROVIDE CONTROL CIRCUIT POWER.
5. PANEL SHALL HAVE ELECTRONIC PRESSURE TRANSMITTERS FOR PRESSURE SENSING. SENSING WIRING SHALL RUN FROM SENSING LOCATION TO PANEL. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION OF TRANSMITTER TYPE AND VOLTAGE REQUIRED FOR ALARM PANEL TYPE.
6. AREA ALARM PANEL SHALL SIGNAL THE FOLLOWING WHEN THE PRESSURE INCREASES OR DECREASES BY 20 PERCENT:
   a. LOW PRESSURE - OXYGEN, MEDICAL VACUUM, AND NITROGEN.
   b. HIGH PRESSURE - OXYGEN AND NITROGEN.
7. AREA ALARM PANEL SHALL INCLUDE GAUGES, POWER SUPPLIES, ALARMS, PRESSURE SWITCHES AND OTHER EQUIPMENT REQUIRED FOR AN OPERATIONAL, COMPLETE SYSTEM.
8. APPROVED MANUFACTURERS: GENTEC, AMICO, AND BEACON MEDAES.

D. MASTER ALARM PANEL

1. MASTER ALARM PANELS SHALL BE LOCATED WHERE INDICATED ON THE DRAWINGS.
2. PANEL SHALL HAVE A PUSH-TO-TEST BUTTON AND SHALL ALARM VISUALLY AND AUDIBLY THE CONDITIONS LISTED IN PARAGRAPH J.2.
3. PANEL SHALL ALARM THE FOLLOWING GASES: OXYGEN, MEDICAL VACUUM, AND NITROGEN.
4. VOLTAGE SHALL BE 115 VOLTS. REFER TO ELECTRICAL DRAWINGS FOR POWER CONNECTION AND PRESSURE SWITCH WIRING.
5. MASTER ALARM PANEL SHALL INCLUDE POWER SUPPLIES, ALARMS, PRESSURE SWITCHES, AND OTHER EQUIPMENT REQUIRED FOR A COMPLETE, OPERATIONAL SYSTEM.
6. APPROVED MANUFACTURERS: GENTEC, AMICO, AND BEACON MEDAES.

E. MANIFOLDS

1. PROVIDE FULLY AUTOMATIC MANIFOLD AND CONTROLLER HAVING THREE (3) CYLINDERS IN THE SERVICE AND THREE (3) CYLINDERS IN THE RESERVE FOR THE SUPPLY OF OXYGEN. UNIT SHALL HAVE NECESSARY HEADER AND PIGTAILS.
2. PROVIDE FULLY AUTOMATIC MANIFOLD AND CONTROLLER HAVING TWO (2) CYLINDERS IN THE SERVICE AND TWO (2) CYLINDERS IN THE RESERVE FOR THE SUPPLY OF NITROGEN. UNIT SHALL HAVE NECESSARY HEADER AND PIGTAILS.
3. CONTROLLER FOR EACH MANIFOLD SHALL AUTOMATICALLY SWITCH FROM SERVICE TO RESERVE WITHOUT LINE PRESSURE DROP.
4. CONTROLLER FOR EACH MANIFOLD SHALL VISUALLY SIGNAL THAT RESERVE IS IN USE, AND BY GAUGES SHOW REMAINING PRESSURE IN EACH BANK AND LINE PRESSURE.
5. PROVIDE NECESSARY PRESSURE SWITCHES TO SEND "RESERVE IN USE" SIGNAL TO MASTER ALARM PANELS.
6. THE CONTROLLER SHALL BE EQUIPPED TO REDUCE GAS PRESSURE TO 55 PSIG FOR OXYGEN AND 185 PSIG FOR NITROGEN.
7. APPROVED MANUFACTURERS: GENTEC, AMICO, AND BEACON MEDAES

F. MEDICAL VACUUM PUMPS

1. REFER TO DRAWING P601 FOR VACUUM PUMP BASIS OF DESIGN.
2. ELECTRICAL CONTROLS SHALL INCLUDE FACTORY WIRED AND MOUNTED NEMA-1 CONTROL PANEL ENCLOSURE CONTAINING TWO (2) MAGNETIC ACROSS THE LINE, NON-COMBINATION, NON-REVERSING MOTOR STARTERS WITH CIRCUIT BREAKERS, TWO (2) 120 VOLT CONTROL CIRCUIT TRANSFORMERS WITH FUSED SECONDARY, TWO (2) HOA SELECTOR SWITCHES AND AN AUTOMATIC ELECTRIC ALTERNATOR. STARTERS SHALL HAVE 3 PHASE PROTECTION AND UNDERCURRENT RELEASE.
3. PROVIDE PRESSURE SWITCHES AND ADJUST FOR THE LEAD PUMP TO START AT 18 INCHES HG AND STOP AT 22 INCHES HG; THE LAG PUMP TO START AT 16 INCHES HG AND STOP AT 22 INCHES HG. LEAD-LAG PUMP ASSIGNMENT SHALL REVERSE ON EACH CYCLE. PROVIDE LAG ALARM AT 16 HG SET POINT.
4. THE VACUUM SYSTEM SHALL BE STARTED BY FACTORY TECHNICIAN OF THE SUPPLIER WHO SHALL PROVIDE IN-SERVICE INSTRUCTION TO THE OWNER'S REPRESENTATIVE AT START-UP.
5. MANUFACTURER SHALL PROVIDE TWO (2) YEAR WARRANTY ON COMPONENTS FROM DATE OF SHIPMENT.
6. FILTRATION SHALL BE PROVIDED WITH VACCUM SYSTEM IN ACCORDANCE WITH 2018 NFPA 99.
7. APPROVED MANUFACTURERS: GENTEC, AMICO, AND BEACON MEDAES

PART 3 - EXECUTION

3.1 GENERAL

A. INSTALLERS, INSPECTORS, AND VERIFIERS OF MEDICAL GAS SYSTEMS SHALL COMPLY WITH ASSE 6010 (INSTALLERS), 6020 (INSPECTORS), AND 6030 (VERIFIERS) STANDARDS.

B. WHERE CONNECTION TO EXISTING SYSTEMS OCCURS, DO NOT MAKE CONNECTION UNTIL TESTS ARE COMPLETE.

C. PROVIDE GAS VERIFICATION FOR EACH OUTLET AS PER NFPA 99. VERIFICATION SHALL INCLUDE VERIFICATION OF PROPER GAS FOR EACH OUTLET. ALSO, AN ANALYSIS SHALL BE DONE TO CONFIRM THE DESIRED PERCENTAGE OF OXYGEN. ALL OUTLETS SHALL BE FLOWED AT 100 LITERS PER MINUTE TO CHECK FOR DIRT.

D. VERIFICATION SHALL BE BY AN INDEPENDENT TESTING AGENCY. PROVIDE NOTARIZED REPORT STATING TESTING AND VERIFICATION OF SYSTEM.

E. OUTLET LOCATIONS, ZONE VALVE LOCATIONS, ETC., SHALL BE FIELD CHECKED BY THE ARCHITECT BEFORE ACTUAL INSTALLATION BEGINS.

F. MEDICAL GAS SYSTEMS SHALL BE INSTALLED AND TESTED IN STRICT ACCORDANCE WITH NFPA 99.

G. REFER TO ARCHITECTURAL DRAWINGS FOR BOTTLE SLIDE LOCATIONS. COORDINATE WITH OWNER THE SIZE OF COLLECTION CANISTERS.

H. AREA ALARM PANELS

H.A. REFER TO DRAWINGS FOR LOCATIONS OF AREA ALARM PANELS. COORDINATE EXACT LOCATIONS WITH OTHER TRADES.

H.B. PROVIDE PIPING CONNECTIONS TO EACH MEDICAL GAS PIPING AS FOLLOWS:

a. PROVIDE CONNECTION IN BRANCH ON PATIENT SIDE OF ZONE VALVES.

b. IF ELECTRONIC TRANSMITTERS ARE PROVIDED, PROVIDE WIRING FROM TRANSMITTER TO PANEL WITH WIRING SIZED FOR VOLTAGE AND AMPERAGE OF TRANSMITTER PER THE LATEST EDITION OF THE NATIONAL ELECTRIC CODE. LOCATION OF CONNECTIONS SHALL BE AS FOLLOWS:

b.a. PROVIDE CONNECTION IN BRANCH ON PATIENT SIDE OF ZONE VALVES.

I. MASTER ALARM PANELS

1. MASTER ALARM SIGNALS

1.1. PROVIDE MASTER ALARM SIGNALS FOR THE FOLLOWING SOURCE EQUIPMENT:

1) MANIFOLD SYSTEMS

2) OXYGEN GENERATOR (COORDINATE FINAL ALARM POINTS WITH AIRNETICS)

3) OXYGEN MANIFOLD (BACK-UP TO OXYGEN GENERATOR)

4) VACUUM PUMPS

2. MASTER ALARM SIGNALS SHALL BE PER THE LATEST NFPA 99. AT MINIMUM, PROVIDE THE FOLLOWING:

1) OXYGEN SYSTEM

a. OXYGEN HI-LOW

b. MAIN SUPPLY HI-LOW OXY

c. RESERVE SUPPLY LOW OXY

d. RESERVE IN USE OXY

e. LOCAL ALARM PANEL ALARM

f. FUTURE

2) VACUUM PUMP SYSTEM

a. VACUUM HI-LOW

b. VACUUM VAC FAN

c. VACUUM SEPARATOR WATER LEVEL

d. VACUUM RECEIVER WATER LEVEL

e. VACUUM LAG PUMP IN USE

f. LOCAL ALARM PANEL ALARM

g. VACUUM FUTURE

3) NITROGEN SYSTEM

a. NITROGEN HI-LOW

b. PRIMARY SUPPLY HI-LOW

c. RESERVE SUPPLY LOW

d. RESERVE IN USE

e. LOCAL ALARM PANEL ALARM

f. FUTURE

3. PROVIDE WIRING FROM SENSING DEVICES TO MASTER ALARM PANELS WITH WIRING SIZED FOR VOLTAGE AND AMPERAGE AND DISTANCE PER THE LATEST EDITION OF THE NATIONAL ELECTRIC CODE.

L. MOUNTING HEIGHTS

1. REFER TO ARCHITECTURAL DRAWINGS FOR COORDINATED LOCATION AND HEIGHT OF MEDICAL GAS DEVICES. IF NOT SHOWN ON THE ARCHITECTURAL DRAWINGS, USE THE FOLLOWING:
   a. ZONE VALVES - 66 INCHES TO THE TOP OF ZONE BOX.
   b. ALARM PANELS - 54 INCHES TO THE CENTERLINE.
   c. MEDICAL GAS OUTLETS - 60 INCHES FROM OUTLET CENTER TO FINISHED FLOOR UNLESS INSTALLED ON CAGE SHELVING AND CEILING/COLUMNS LOCATIONS AS NOTED ON ARCHITECTURAL ELEVATIONS.

M. PIPE IDENTIFICATION

1. PIPE IDENTIFICATION LABELING SHALL COMPLY WITH NFPA 99 GUIDELINES.
2. PIPING SHALL BE LABELED IN THE FOLLOWING LOCATIONS:
   2.1. AT INTERVALS OF NOT MORE THAN 20 FT.
   2.2. AT LEAST ONCE IN OR ABOVE EVERY ROOM.
   2.3. ON BOTH SIDES OF WALLS OR PARTITIONS PENETRATED BY THE PIPING.
   2.4. AT LEAST ONCE IN EVERY STORY HEIGHT TRAVERSED BY RISERS.

MEDICAL GAS PIPING MATERIAL SPECIFICATION

POSITIVE PRESSURE MEDICAL GAS SYSTEM PIPING SHALL BE CLEANED FOR OXYGEN SERVICE BY THE MANUFACTURER IN ACCORDANCE WITH CGA G-4.1, CLEANING EQUIPMENT FOR OXYGEN SERVICE; EACH LENGTH OF TUBE, FITTINGS, AND VALVES SHALL BE DELIVERED PLUGGED OR CAPPED BY THE MANUFACTURER AND KEPT SEALED UNTIL PREPARED FOR INSTALLATION. PIPING SHALL BE ASTM B819, STANDARD FOR SEAMLESS COPPER TUBE FOR MEDICAL GAS SYSTEMS, MEDICAL GAS TUBE, TYPE L, EXCEPT TYPE K SHALL BE USED WHERE OPERATING PRESSURES EXCEED 185 PSI AND/OR PIPE SIZES ARE GREATER THAN 3"Ø. JOINING METHODS SHALL COMPLY WITH NFPA 99 GUIDELINES.

VACUUM AND WAGD SYSTEM PIPING SHALL BE ONE (1) OF THE FOLLOWING:

- HARD-DRAWN SEAMLESS COPPER TUBE COMPLYING WITH ASTM B88, STANDARD SPECIFICATION FOR SEAMLESS COPPER WATER TUBE, TYPE K OR L
- COPPER MEDICAL GAS TUBING COMPLYING WITH ASTM B819, STANDARD SPECIFICATION FOR SEAMLESS COPPER TUBE FORE MEDICAL GAS SYSTEMS, TYPE K OR L
- VACUUM AND WAGD SYSTEM PIPING JOINING METHODS SHALL COMPLY WITH NFPA 99 GUIDELINES.

MEDICAL VACUUM COMPRESSOR SYSTEM (BASIS OF DESIGN): 3

AMICO MODEL# V-CCD-D-200P-SS-N-090-46063-MV MEDICAL VACUUM SYSTEM:
- DUPLEX DRY CONTACTLESS CLAW VACUUM SYSTEM
- SKID MOUNTED STACKING CONFIGURATION
- 200 GALLON PAINTED VERTICAL ASME AIR RECEIVER
- DUPLEX 5" PREMIUM HMI TOUCH SCREEN CONTROL PANEL WITH CIRCUIT BREAKER DISCONNECTS
- ETHERNET CONNECTIVITY, ALARM LOGGING, ALARM EMAIL CAPABILITIES AND MULTI VSD
- 9 HP, 460V, 60 HZ., 3 PHASE
- PUMP CAPACITY 77 SCFM AT 19 IN HG
- SYSTEM CAPACITY 77 SCFM AT 19 IN HG AS PER NFPA
- FILTRATION SYSTEM SHALL BE PROVIDED BY THE MANUFACTURER; FILTRATION SHALL BE IN COMPLIANCE WITH 2018 NFPA 99

OXYGEN MANIFOLD AND HEADER (BASIS OF DESIGN):

AMICO MANIFOLD MODEL# M4D-DL-HH-U-OXY WITH M2-HBXC-06U-OXY HEADER:
- SIX (6) "H" SIZED TANKS ORIENTED IN A STAGGERED ARRAY; 3 TANKS SHALL BE PRIMARY WITH 3 TANK SECONDARY
- PROVIDE AMICO WALL BRACKET MODEL# M-X-HB-WLBRKIT WITH HEADER
- SYSTEM OUTLET PRESSURE: 55 PSI
- MANIFOLD SHALL BE CONNECTED TO OXYGEN GENERATION SYSTEM'S EMERGENCY SWITCH OVER CONNECTION: GENERATION SYSTEM TO BE PROVIDED BY OTHERS. REFER TO GENERATION SYSTEM'S VENDOR DOCUMENTATION FOR CONNECTION REQUIREMENTS.

NITROGEN MANIFOLD AND HEADER (BASIS OF DESIGN):

AMICO MANIFOLD MODEL# M4D-DL-HH-U-NIT WITH M2-HBXC-04U-NIT HEADER:
- FOUR (4) "H" SIZED TANKS ORIENTED IN A STAGGERED ARRAY; 2 TANKS SHALL BE PRIMARY WITH 2 TANK SECONDARY
- PROVIDE AMICO WALL BRACKET MODEL# M-X-HB-WLBRKIT WITH HEADER
- SYSTEM OUTLET PRESSURE: 185 PSI

SPRINKLER PERFORMANCE SPECIFICATION (CONTINUED FROM P003)

11. FIRE PROTECTION PIPING SWING CHECK VALVES SHALL BE UL LISTED AND APPROVED, RATED FOR 175 PSIG WORKING PRESSURE, AND HAVE A IRON BODY, BRONZE TRIM, CAST IRON OR BRONZE DISC, BOLTED COVER AND SCREWED OR FLANGED ENDS. SWING CHECK VALVES SHALL BE INSTALLED IN HORIZONTAL PIPING ONLY. VALVES MANUFACTURED BY KENNEDY, CRANE, JENKINS, GRINNELL, STOCKHAM OR NIBCO-SCOTT WILL BE ACCEPTABLE IF THEY COMPLY WITH THESE SPECIFICATIONS.

12. FLOW AND TAMPER SWITCH ALARM ANNUNCIATION SHALL BE INTERLOCKED WITH THE CORRESPONDING ALARM SYSTEMS FOR PROPER ANNUNCIATION. WATER FLOW SWITCHES SHALL BE SIMILAR TO AUTOCALL WF-4. COORDINATE ALL REQUIREMENTS WITH THE ELECTRICAL CONTRACTOR. IF THEY COMPLY WITH THESE SPECIFICATIONS, WATER FLOW SWITCHES MANUFACTURED BY AUTOCALL, POTTER ELECTRIC SIGNAL COMPANY, GRINNELL, OR STAR SPRINKLER CORPORATION WILL BE ACCEPTABLE. SUPERVISORY (TAMPER) SWITCHES SHALL BE SINGLE POLE, DOUBLE THROW TYPE WITH CAST ALUMINUM HOUSING AND TAMPER-PROOF COVER. SWITCH RATING SHALL BE AT LEAST 7 AMPERES AT 125/250 VOLTS. SWITCHES SHALL BE POTTER ELECTRIC SIGNAL CO. MODEL OSYS-B, STAR SPRINKLER CORP. SERIES NGV, OR APPROVED EQUAL.

13. DRY SYSTEMS SHALL BE INSTALLED IN ANY UNCONDITIONED SPACES. DRY PIPE AIR COMPRESSORS FOR DRY PIPE SPRINKLERS SYSTEM SHALL BE WITH BRACKET FOR MOUNTING. EACH COMPRESSOR SHALL BE AUTOMATICALLY CONTROLLED BY A FACTORY-MOUNTED PRESSURE SWITCH. IN ADDITION, FOR EACH COMPRESSOR PROVIDE A HIGH/LOW PRESSURE SWITCH WITH SET POINTS HIGHER AND LOWER OPERATING SWITCH, TO PROVIDE A SUPERVISORY SIGNAL TO AN ALARM ANNUNCIATOR PANEL. DRY PIPE AIR COMPRESSOR SHALL BE UL LISTED FOR THE INTENDED SERVICE. STORAGE TANKS, IF REQUIRED, SHALL BE ASME LISTED.

14. ALL PACKAGED EQUIPMENT SHALL BE INDEPENDENTLY THIRD PARTY LABELED AS A SYSTEM FOR ITS INTENDED USE BY A NATIONALLY RECOGNIZED TESTING LABORATORY (NRTL) IN ACCORDANCE WITH OSHA FEDERAL REGULATIONS 29CFR1910.303 AND .399, AS WELL AS NFPA PAMPHLET NO. 70, THE NATIONAL ELECTRICAL CODE (NEC) ARTICLE 90-7.

15. THE CONTRACTOR SHALL MODIFY THE EXISTING SPRINKLER PIPING IN THE AREAS BEING MODIFIED TO CONFORM TO THE REQUIRED FIRE SPRINKLER AND FIRE ALARM ZONES. MODIFICATIONS, ADDITIONS, REPAIRS, EQUIPMENT AND DEVICES REQUIRED FOR THE WET/DRY SPRINKLER AND STANDPIPE SYSTEMS TO CONFORM TO LOCAL CODES AND TO PROVIDE A COMPLETE AND WORKING SYSTEM IN COMPLIANCE WITH THE CODE REGULATIONS AND BUILDING STANDARDS SHALL BE AT NO ADDITIONAL COST OVER THE CONTRACT. CONTRACTOR SHALL EXTEND SPRINKLER SYSTEM FROM EXISTING SPRINKLER SYSTEM. MODIFICATIONS TO SPRINKLER SYSTEMS SHALL INCLUDE BUT NOT LIMITED TO THE FOLLOWING:
- ADJUSTMENT TO THE ELEVATIONS OF EXISTING SPRINKLER PIPING MAINS, BRANCHES, AND ARM-OVERS TO ACCOUNT FOR NEW OR RENOVATED CEILING HEIGHTS AND TYPES.
- COORDINATION AND ADJUSTMENTS OF EXISTING SPRINKLER PIPING (MAINS, BRANCHES, ETC.) WITH ARCHITECTURAL, INTERIOR DESIGN, AND MEP DRAWINGS AND ELEMENTS.
- REPLACEMENT OF SPRINKLER HEAD TYPES AND/OR FINISHES AS REQUIRED BY ARCHITECTURAL DIRECTION.
- ADDITION OF SPRINKLER HEADS TO ACCOUNT FOR CODE REQUIRED COVERAGE.
- REWORKING OR RELOCATION OF ANY FIRE PROTECTION ZONE VALVES/ALARMS THAT MAY INTERFERE WITH RENOVATION OF SPACE.

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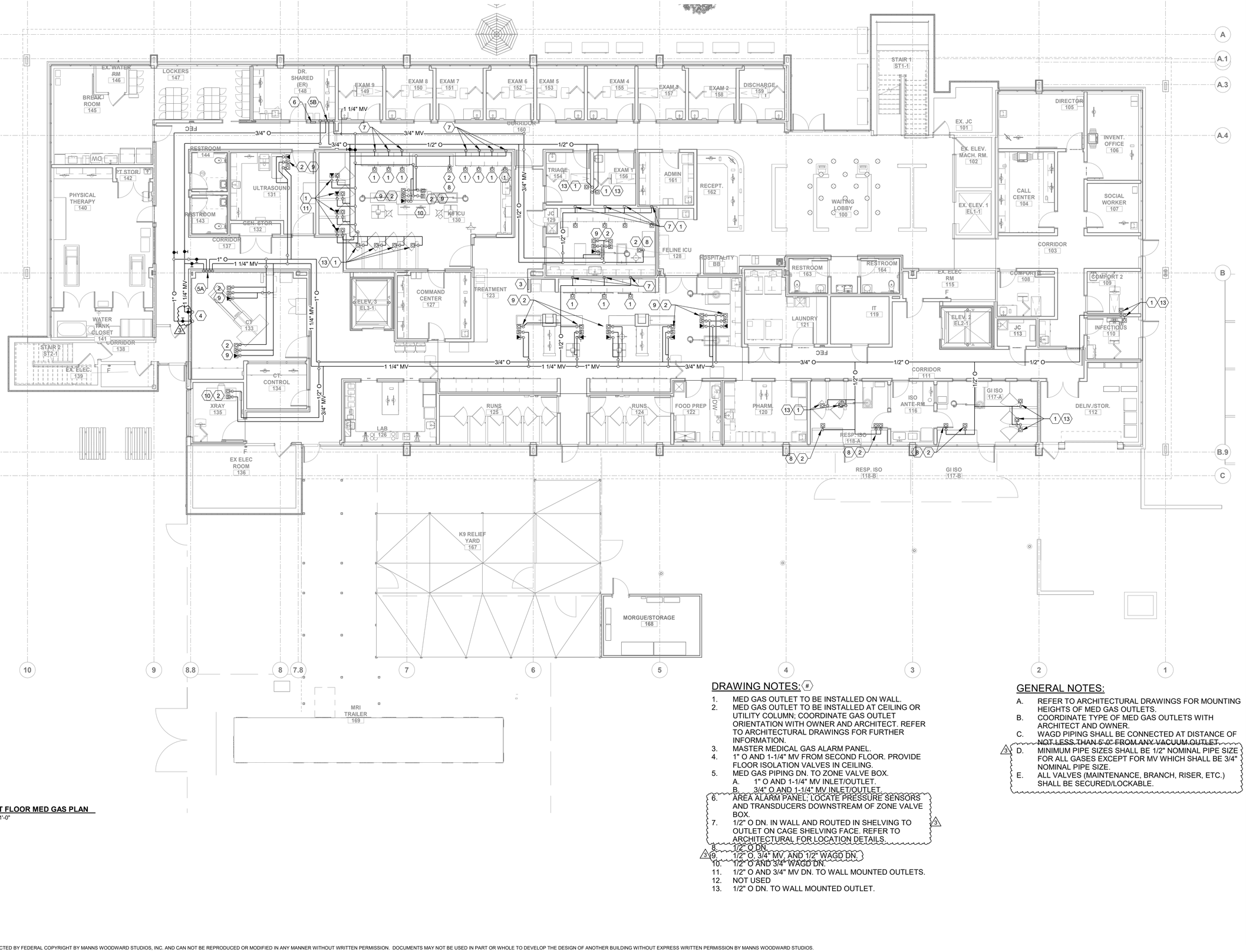

1 P401 **FIRST FLOOR MED GAS PLAN**
1/8" = 1'-0"

DRAWING NOTES: (#)

1. MED GAS OUTLET TO BE INSTALLED ON WALL.
2. MED GAS OUTLET TO BE INSTALLED AT CEILING OR UTILITY COLUMN; COORDINATE GAS OUTLET ORIENTATION WITH OWNER AND ARCHITECT. REFER TO ARCHITECTURAL DRAWINGS FOR FURTHER INFORMATION.
3. MASTER MEDICAL GAS ALARM PANEL.
4. 1" O AND 1-1/4" MV FROM SECOND FLOOR. PROVIDE FLOOR ISOLATION VALVES IN CEILING.
5. MED GAS PIPING DN. TO ZONE VALVE BOX.
   A. 1" O AND 1-1/4" MV INLET/OUTLET.
   B. 3/4" O AND 1-1/4" MV INLET/OUTLET.
6. AREA ALARM PANEL; LOCATE PRESSURE SENSORS AND TRANSDUCERS DOWNSTREAM OF ZONE VALVE BOX.
7. 1/2" O DN. IN WALL AND ROUTED IN SHELVING TO OUTLET ON CAGE SHELVING FACE. REFER TO ARCHITECTURAL FOR LOCATION DETAILS. (3)
8. 1/2" O DN.
9. 1/2" O, 3/4" MV, AND 1/2" WAGD DN. (3)
10. 1/2" O AND 3/4" WAGD DN.
11. 1/2" O AND 3/4" MV DN. TO WALL MOUNTED OUTLETS.
12. NOT USED
13. 1/2" O DN. TO WALL MOUNTED OUTLET.

GENERAL NOTES:

A. REFER TO ARCHITECTURAL DRAWINGS FOR MOUNTING HEIGHTS OF MED GAS OUTLETS.
B. COORDINATE TYPE OF MED GAS OUTLETS WITH ARCHITECT AND OWNER.
C. WAGD PIPING SHALL BE CONNECTED AT DISTANCE OF NOT LESS THAN 5'-0" FROM ANY VACUUM OUTLET.
D. (3) MINIMUM PIPE SIZES SHALL BE 1/2" NOMINAL PIPE SIZE FOR ALL GASES EXCEPT FOR MV WHICH SHALL BE 3/4" NOMINAL PIPE SIZE.
E. ALL VALVES (MAINTENANCE, BRANCH, RISER, ETC.) SHALL BE SECURED/LOCKABLE.

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ALLEN + SHARIFF CORPORATION No. C - 1486120
CERTIFICATE OF AUTHORIZATION

NATIONAL VETERINARY ASSOCIATES EASTERN CAROLINA VETERINARY REFERRAL CLINIC RENOVATION
5051 NEW CENTRE DR
WILMINGTON, NC 28403

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FIRST FLOOR MED GAS PLAN

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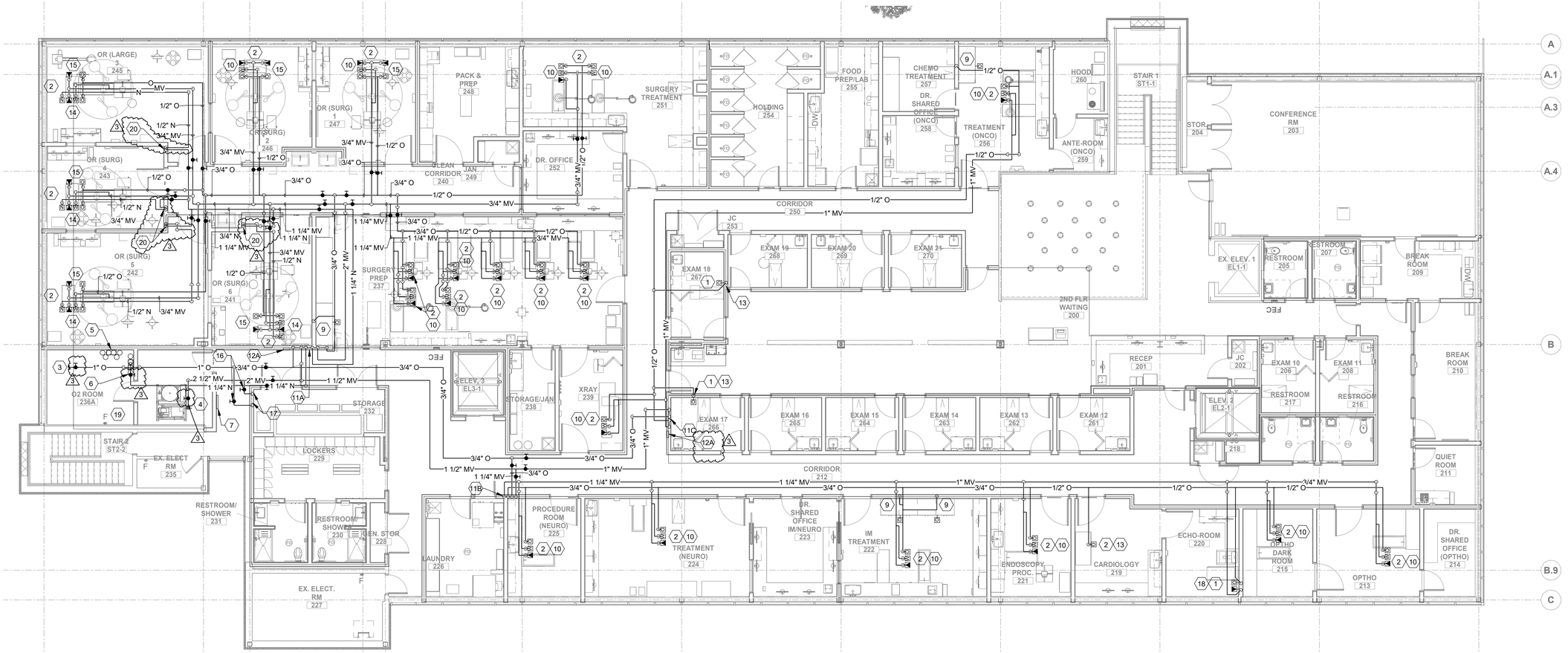

1 / P402 **SECOND FLOOR MED GAS PLAN**
1/8" = 1'-0"

DRAWING NOTES: (#)

1. MED GAS OUTLET TO BE INSTALLED ON WALL.
2. MED GAS OUTLET TO BE INSTALLED AT CEILING OR UTILITY COLUMN; COORDINATE GAS OUTLET ORIENTATION WITH OWNER AND ARCHITECT. REFER TO ARCHITECTURAL DRAWINGS FOR FURTHER INFORMATION.
3. 1" O (55 PSI SOURCE PRESSURE) WITH SOURCE VALVE TO OXYGEN GENERATION SYSTEM; SYSTEM BY OTHERS. COORDINATE CONNECTION WITH SYSTEM VENDOR.
4. 2-1/2" MV (19 IN. HG SOURCE PRESSURE) WITH SOURCE VALVE TO MEDICAL VACUUM COMPRESSOR SYSTEM. (3)
5. OXYGEN TANK MANIFOLD (BACK-UP FOR OXYGEN GENERATOR PLANT) AND H-CYLINDER TANKS TO BE CONNECTED TO OXYGEN GENERATOR EMERGENCY SWITCH OVER SYSTEM. REFER TO SYSTEM VENDOR'S DRAWINGS FOR CONNECTION REQUIREMENTS.
6. 1-1/4" N (180 PSI SOURCE PRESSURE) WITH SOURCE VALVE TO NITROGEN TANK MANIFOLD. (3)
7. MASTER MEDICAL GAS ALARM PANEL.
8. 1/2" O DN.
9. 1/2" O DN. IN WALL AND ROUTED IN SHELVING TO OUTLET ON CAGE SHELVING FACE. REFER TO ARCHITECTURAL FOR LOCATION DETAILS.
10. 1/2" O, 3/4" MV, AND 1/2" WAGD DN.
11. MED GAS PIPING DN. TO ZONE VALVE BOX.
    - A. 1-1/4" N, 3/4" O, AND 2" MV INLET/OUTLET.
    - B. 3/4" O AND 1-1/4" MV INLET/OUTLET.
    - C. 3/4" O AND 1" MV INLET/OUTLET
12. AREA ALARM PANEL. (3)
    - A. LOCATE PRESSURE SENSORS AND TRANSDUCERS ON PATIENT SIDE OF ZONE VALVE BOX.
13. 1/2" O DN.
14. 1/2" O, 3/4" MV, 1/2" WAGD, AND 1/2" N DN.
15. 1/2" O AND 3/4" MV DN.
16. SECURED RISER VALVE. (3)
17. 1" O AND 1-1/4" MV DN. TO FIRST FLOOR CEILING.
18. 1/2" O AND 3/4" MV DN. TO WALL MOUNTED OUTLETS.
19. APPROXIMATE LOCATION OF "E" TANK STOARGE RACK.
20. PROPOSED LOCATION OF NITROGEN CONTROL PANEL. COORDINATE LOCATION WITH ARCHITECTURAL ELEMENTS AND OTHER TRADES.

GENERAL NOTES:

A. REFER TO ARCHITECTURAL DRAWINGS FOR MOUNTING HEIGHTS OF MED GAS OUTLETS.
B. COORDINATE TYPE OF MED GAS OUTLETS AND COLUMN ORIENTATION WITH ARCHITECT AND OWNER.
C. WAGD PIPING SHALL BE CONNECTED AT DISTANCE OF NOT LESS THAN 5'-0" FROM ANY VACUUM OUTLET.
D. MINIMUM PIPE SIZES SHALL BE 1/2" NOMINAL PIPE SIZE FOR ALL GASES EXCEPT FOR MV WHICH SHALL BE 3/4" NOMINAL PIPE SIZE.
E. ALL VALVES (MAINTENANCE, BRANCH, RISER, ETC.) SHALL BE SECURED/LOCKABLE.
F. REFER TO MECHANICAL DRAWINGS FOR ROUTING OF MEDICAL SYSTEM VACUUM EXHAUST AND OXYGEN AND NITROGEN MANIFOLD RELIEF PIPING.
    - a. TERMINATION OF VACUUM PUMP VENTING AND MANIFOLD VENTING SHALL BE FACED TOWARDS WEST (AWAY FROM PREVAILING WINDS).
    - b. TERMINATION OF VACUUM PUMP VENTING AND MANIFOLD VENTING SHALL BE LOCATED NO LESS THAN 25 FEET FROM ANY DOOR, WINDOW, AIR INTAKE, OR OTHER OPENINGS IN BUILDING OR PLACES OF PUBLIC ASSEMBLY.
    - c. EXHAUST PIPES FOR MEDICAL GAS SYSTEMS SHALL BE VENTED FROM VACUUM PUMP VENT OUTLET TO ROOF AND SHALL TERMINATE AT A MINIMUM OF 2'-0" ABOVE EXISTING PARAPET. THE VACUUM VENT PIPING SHALL BE PROMINENTLY LABELED AND DISTINGUISHED AS VACUUM EXHAUST. VENTING SHALL BE INSTALLED FREE OF DIPS AND LOOPS THAT MAY TRAP CONDENSATE OR OIL. IF SUCH INSTALLATION IS NOT POSSIBLE, PROVIDE DRIP LEG AND VALVED DRAIN AT BOTTOM OF LOW POINT AS REQUIRED. COORDINATE ROUTING OF VENT PIPING WITH EQUIPMENT AND DEVICES INSTALLED IN AND ABOVE CEILING. COORDINATE INSTALLATION WITH FINAL LOCATION OF VACUUM PUMP.
    - d. 3/4" ASTM B819, HARD DRAWN TYPE K SEAMLESS COPPER PIPE FOR MEDICAL GAS SYSTEMS SHALL BE VENTED FROM MANIFOLD VENT OUTLET TO ROOF AND SHALL TERMINATE AT ROOF LEVEL. THE MANIFOLD VENT PIPING SHALL BE PROMINENTLY LABELED AND DISTINGUISHED AS MANIFOLD EXHAUST. COORDINATE INSTALLATION WITH FINAL LOCATION OF MANIFOLD.

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SECOND FLOOR MED GAS PLAN

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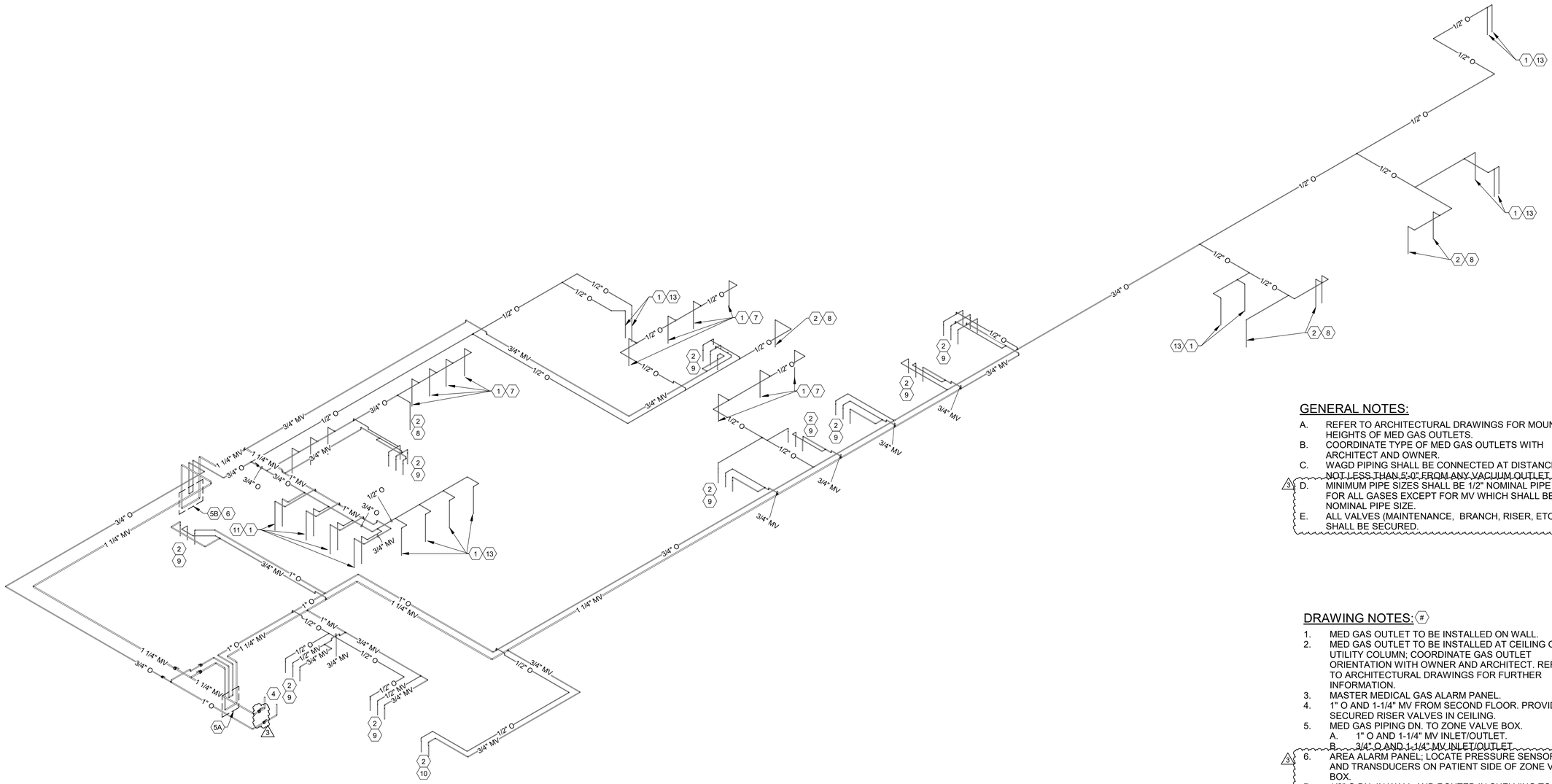

1 P708 **MEDICAL GAS RISER DIAGRAM - FIRST FLOOR**

GENERAL NOTES:

A. REFER TO ARCHITECTURAL DRAWINGS FOR MOUNTING HEIGHTS OF MED GAS OUTLETS.
B. COORDINATE TYPE OF MED GAS OUTLETS WITH ARCHITECT AND OWNER.
C. WAGD PIPING SHALL BE CONNECTED AT DISTANCE OF NOT LESS THAN 5'-0" FROM ANY VACUUM OUTLET.
3 D. MINIMUM PIPE SIZES SHALL BE 1/2" NOMINAL PIPE SIZE FOR ALL GASES EXCEPT FOR MV WHICH SHALL BE 3/4" NOMINAL PIPE SIZE.
E. ALL VALVES (MAINTENANCE, BRANCH, RISER, ETC.) SHALL BE SECURED.

DRAWING NOTES: (#)

1. MED GAS OUTLET TO BE INSTALLED ON WALL.
2. MED GAS OUTLET TO BE INSTALLED AT CEILING OR UTILITY COLUMN; COORDINATE GAS OUTLET ORIENTATION WITH OWNER AND ARCHITECT. REFER TO ARCHITECTURAL DRAWINGS FOR FURTHER INFORMATION.
3. MASTER MEDICAL GAS ALARM PANEL.
4. 1" O AND 1-1/4" MV FROM SECOND FLOOR. PROVIDE SECURED RISER VALVES IN CEILING.
5. MED GAS PIPING DN. TO ZONE VALVE BOX.
   A. 1" O AND 1-1/4" MV INLET/OUTLET.
   B. 3/4" O AND 1-1/4" MV INLET/OUTLET.
3 6. AREA ALARM PANEL; LOCATE PRESSURE SENSORS AND TRANSDUCERS ON PATIENT SIDE OF ZONE VALVE BOX.
7. 1/2" O DN. IN WALL AND ROUTED IN SHELVING TO OUTLET ON CAGE SHELVING FACE.
3 8. 1/2" O DN.
3 9. 1/2" O, 3/4" MV, AND 1/2" WAGD DN.
10. 1/2" O AND 3/4" WAGD DN.
11. 1/2" O AND 3/4" MV DN. TO WALL MOUNTED OUTLETS.
12. NOT USED
13. 1/2" O DN. TO WALL MOUNTED OUTLET.

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PLUMBING RISER DIAGRAMS

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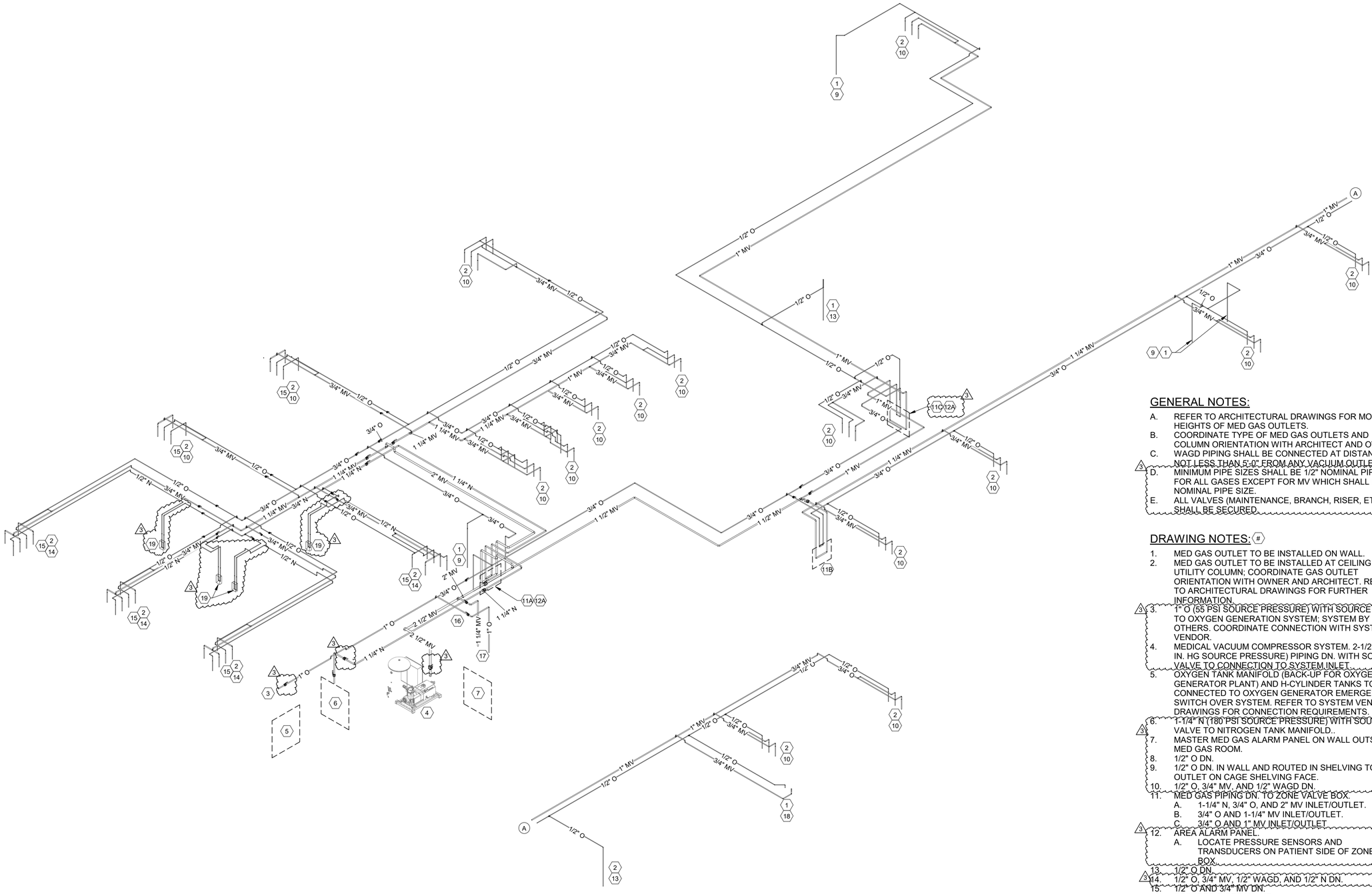

1 P709 **MEDICAL GAS RISER DIAGRAM- SECOND FLOOR**

GENERAL NOTES:

A. REFER TO ARCHITECTURAL DRAWINGS FOR MOUNTING HEIGHTS OF MED GAS OUTLETS.
B. COORDINATE TYPE OF MED GAS OUTLETS AND COLUMN ORIENTATION WITH ARCHITECT AND OWNER.
C. WAGD PIPING SHALL BE CONNECTED AT DISTANCE OF NOT LESS THAN 5'-0" FROM ANY VACUUM OUTLET.
D. MINIMUM PIPE SIZES SHALL BE 1/2" NOMINAL PIPE SIZE FOR ALL GASES EXCEPT FOR MV WHICH SHALL BE 3/4" NOMINAL PIPE SIZE.
E. ALL VALVES (MAINTENANCE, BRANCH, RISER, ETC.) SHALL BE SECURED.

DRAWING NOTES: (#)

1. MED GAS OUTLET TO BE INSTALLED ON WALL.
2. MED GAS OUTLET TO BE INSTALLED AT CEILING OR UTILITY COLUMN; COORDINATE GAS OUTLET ORIENTATION WITH OWNER AND ARCHITECT. REFER TO ARCHITECTURAL DRAWINGS FOR FURTHER INFORMATION.
3. 1" O (55 PSI SOURCE PRESSURE) WITH SOURCE VALVE TO OXYGEN GENERATION SYSTEM; SYSTEM BY OTHERS. COORDINATE CONNECTION WITH SYSTEM VENDOR.
4. MEDICAL VACUUM COMPRESSOR SYSTEM. 2-1/2" MV (19 IN. HG SOURCE PRESSURE) PIPING DN. WITH SOURCE VALVE TO CONNECTION TO SYSTEM INLET.
5. OXYGEN TANK MANIFOLD (BACK-UP FOR OXYGEN GENERATOR PLANT) AND H-CYLINDER TANKS TO BE CONNECTED TO OXYGEN GENERATOR EMERGENCY SWITCH OVER SYSTEM. REFER TO SYSTEM VENDOR'S DRAWINGS FOR CONNECTION REQUIREMENTS.
6. 1-1/4" N (180 PSI SOURCE PRESSURE) WITH SOURCE VALVE TO NITROGEN TANK MANIFOLD.
7. MASTER MED GAS ALARM PANEL ON WALL OUTSIDE OF MED GAS ROOM.
8. 1/2" O DN.
9. 1/2" O DN. IN WALL AND ROUTED IN SHELVING TO OUTLET ON CAGE SHELVING FACE.
10. 1/2" O, 3/4" MV, AND 1/2" WAGD DN.
11. MED GAS PIPING DN. TO ZONE VALVE BOX.
    A. 1-1/4" N, 3/4" O, AND 2" MV INLET/OUTLET.
    B. 3/4" O AND 1-1/4" MV INLET/OUTLET.
    C. 3/4" O AND 1" MV INLET/OUTLET.
12. AREA ALARM PANEL.
    A. LOCATE PRESSURE SENSORS AND TRANSDUCERS ON PATIENT SIDE OF ZONE VALVE BOX.
13. 1/2" O DN.
14. 1/2" O, 3/4" MV, 1/2" WAGD, AND 1/2" N DN.
15. 1/2" O AND 3/4" MV DN.
16. SECURED RISER VALVE.
17. 1" O AND 1-1/4" MV DN. TO FIRST FLOOR CEILING.
18. 1/2" O AND 3/4" MV DN. TO WALL MOUNTED OUTLETS.
19. NITROGEN CONTROL PANEL. COORDINATE LOCATION WITH ARCHITECTURAL ELEMENTS AND OTHER TRADES.

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PLUMBING RISER DIAGRAMS

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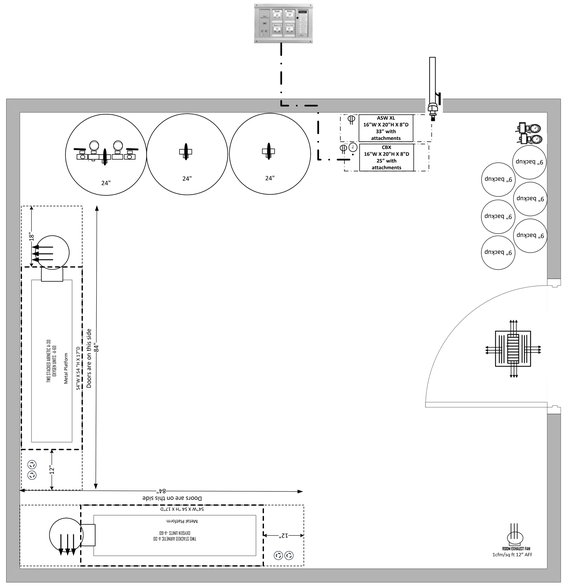
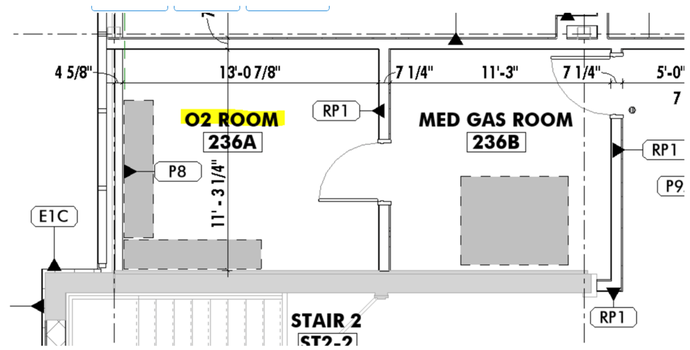
Wilmington





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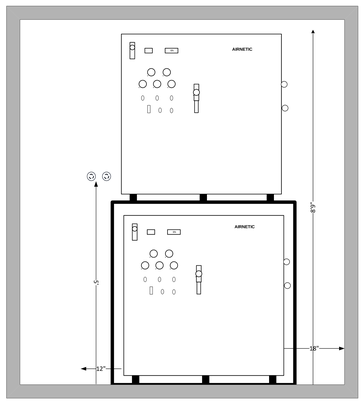

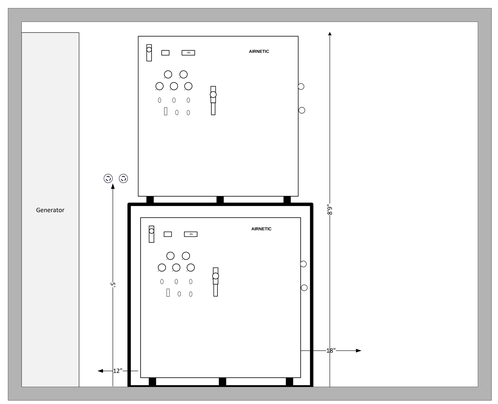

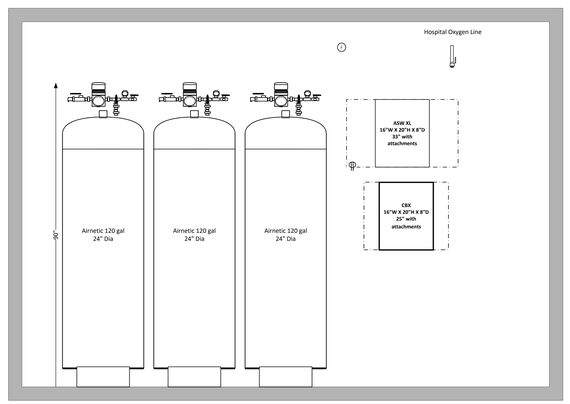

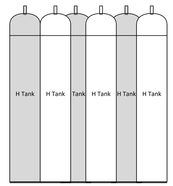

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Simple List of Responsibilities for Install/Site Prep

- Airnetic:
  - Supplies
    - Generator(s)
    - Control box
    - Auto Switchover box
    - Airnetic Tank(s)
    - Interconnecting hoses
      - Between generators and CBX
      - Between CBX and Airnetic Tanks
      - Between Airnetic tanks and ASW
      - Between reserve regulator and ASW
      - Between ASW and hospital line.
    - Interconnecting cables
      - Between generators and ASW
      - Between CBX and J-box to Medgas panel.
  - Airnetic Support:
    - On-site setup & securing (typically one day)
    - Interconnections
    - Testing
    - Via zoom training.
- Customer/GC:
  - Site prep
    - Responsible for all aspects of the site.
    - Electric
      - Power to generator(s)
      - Power to control box
      - Power to ASW (switchover).
      - Connection with wire to med gas panel.
    - Air flow/HVAC
      - Two options
        - Exhaust into room and provide 1.5Ton of cooling in room (minisplit)
        - Exhaust out of the room and provide conditioned 500 CFM make up air
      - Room needs to be 45-90 F
      - Room needs <65% humidity
      - Tank room should have Always on exhaust 1scfm/sq ft
      - Room needs conditioned make up air
    - Med Gas
      - Hospital feed line.
      - reserve manifold w/regulator and tanks.
      - Programming med gas panel
  - Receiving shipment
    - Airnetic generator and tank shows up on a pallet.
    - Needs to be received and brought into secure covered location

If a two room set up slightly more needed on site prep.

SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work under Owner's separate contracts.
5. Owner-furnished/Contractor-installed (OFCI) products.
6. Contractor-furnished/Owner-installed (CFOI) products.
7. Contractor's use of site and premises.
8. Work restrictions.
9. Specification and Drawing conventions.
10. Miscellaneous provisions.

B. Related Requirements:

1. Section 01 5000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.
2. Section 01 7300 "Execution" for coordination of Owner-installed products.

1.3 PROJECT INFORMATION

A. Project Identification: National Veterinary Associates Eastern Carolina Veterinary Referral Clinic Renovation.

1. Project Location: 5051 New Centre Dr, Wilmington NC 28403.

B. Owner: National Veterinary Associates.

1. Owner's Representative: Mark McCormick, Stacey Thompson.

C. Architect: Manns Woodward Studios, Inc..

1. Architect's Representative: Jessica Sweigart, jsweigart@mwsarch.com; 410-344-1460.

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. Civil Engineer: Timmons Group

    a. Representative: John Wall
    b. Address: 430 Eastwood Rd., Suite 100, Wilmington, NC 28403
    c. Phone: 910-746-1144

2. MEP Engineer: Allen Shariff

    a. Representative: David Van der Vossen
    b. Address: 226 N Front St. Wilmington NC 28401
    c. Phone: 910-218-3856

3. Structural Engineer: Lynch Mykins Strucutral Engineers

    a. Representative: Justin Trent
    b. Address: 301 N West Street #105, Raleigh, NC 27603
    c. Phone: 919-782-1833

E. Construction Manager: SouthCon Building Group, LLC..

1. Construction Manager Representative: Brandon Needham.
2. Address: 682 Johnnie Dodds Blvd, Suite 101, Mount Pleasant, SC, 29464
3. Phone: 843-628-2913
4. Construction Manager for this Project is Project's constructor. The terms "Construction Manager" and "Contractor" are synonymous.

F. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.

1. Web-Based Project Software shall be Autodesk Build or other comparable web-based project software acceptable to the Owner and the Architect.
2. Contractor shall be responsible for purchasing/leasing licenses/seats for use by the contractor (number as determined necessary by contractor to facilitate communication between the project team and the transfer of submittals, RFI's, COR's, and other documentation for the project), the contractors sub-contractors (number as determined necessary by contractor to facilitate communication between the project team and the transfer of submittals, RFI's, COR's, and other documentation for the project), the Owner (2 seats), the Architect (2 seats), each listed Architect Consultant (2 seats each), and each Owner Consultant (1 seat each.)

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. The Work generally consists of the renovation of an existing 2-story building of approximately 33,027 gross square feet and other Work indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 PHASED CONSTRUCTION

A. Construct the Work in a single phase.

1.6 WORK UNDER OWNER'S SEPARATE CONTRACTS

A. Work with Separate Contractors: Cooperate fully with Owner's separate contractors, so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under Owner's separate contracts.

B. Concurrent Work: Owner has awarded separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract. Additional contract work may be indicated within the drawings or other Contract Documents.

1. GE: For the installation of medical devices; CT equipment. The General Contractor is responsible for preparing the site for the installation and final connection of such equipment. The following Pre-installation Manuals and checklists are made part of the work of the General Contractor and are appended following this Section:
   a. CT Site Ready Checklist
   b. CT Optima CT660 Pre-Installation Manual

1.7 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS

A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:

1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
2. Provide for delivery of Owner-furnished products to Project site.
3. Upon delivery, inspect, with Contractor present, delivered items.

   a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.

4. Obtain manufacturer's inspections, service, and warranties.
5. Inform Contractor of earliest available delivery date for Owner-furnished products.

B. Contractor's Responsibilities: The Work includes the following, as applicable:

1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
3. Receive, unload, handle, store, protect, and install Owner-furnished products.
4. Make building services connections for Owner-furnished products.
5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
6. Repair or replace Owner-furnished products damaged following receipt.

C. Owner-Furnished/Contractor-Installed (OFCI) Products:

1. Items shall be as indicated on drawings..

1.8 CONTRACTOR'S USE OF SITE AND PREMISES

A. Unrestricted Use of Site: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.9 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to between 7:00 a.m. to 5:00 p.m., Monday through Friday, unless otherwise indicated. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.

1. Weekend Hours: Restricted to Owner approval. Provide minimum 5 days notice..
2. Early Morning Hours: Restricted to Owner approval. Provide minimum 5 days notice..

C. Smoking and Controlled Substance Restrictions: Use of tobacco products , alcoholic beverages, and other controlled substances on Owner's property is not permitted.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

1.11 MISCELLANEOUS PROVISIONS

A. Prime Contractor(s) shall be responsible for ensuring all sub-contractors contracted to perform a portion of the Work have possession of ALL CONTRACT DOCUMENTS. Sub-contractors shall be responsible for reviewing all contract documents including but not limited to drawings and specifications and providing all items outlined withn the documents to be provided along with all connections, systems, supports, and miscellaneous items required for the items to function properly as intended.

B. Drawing Coordination: Generally, requirements for materials and products identified on Drawings are described in detail in the Specifications. However, items may be indicated either only on the drawings or only within the specifications. If items are indicated in one document only it shall be the responsibility of the Contractor to provide the item indicated along with all the components, connections, systems, supports or other miscellaneous items required for the proper operation and installation of the item identified within the single document.

C. References within the Drawings of Specifications to other Drawings of Specifications indicates the potential existence of additional information. If no additional information exists within the referenced drawing(s) or specification(s), the Contractor shall remain responsible for the installation of the Work indicated or graphically depicted. Where Work typically would be structural or load bearing in nature, the Contractor shall provide reinforcement, bracketing, bracing, or otherwise attach such Work as indicated within similar details existing within the Drawings or Specifications. It is also the Contractors responsibility to seek clarification for such items prior to submitting a bid to perform Work. If no clarification is requested prior to the submission of a bid, it shall be deemed that the Contractor understands the extent of Work both indicated and graphically depicted and has included such within the Contract Sum.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1000

CT Site Ready Checklist	Task	GE Healthcare	Customer / Contractor		Reference
Equipment Storage (If Applicable)	Sufficient & secured storage space is planned.	☐			
	HVAC system installed and meets minimum environmental system requirements.	☐			
	Customer / Contractor has obtained required permits. PMI has the appropriate permission to rig and deliver through the designated path.	☐			
	Room and staging area that will receive the equipment are dust free. Precautions must be taken to prevent dust from entering room containing equipment.	☐ 📷			
	Delivery route from truck to room has been reviewed, all communications have occurred, arrangements made for special handling if needed.	☐			
	Floor along delivery route will support weight of equipment, reinforcement arranged if needed.		*Person responsible*	☐	Pre-Installation Manual
Pre-Construction	Delivery route from truck to room has been reviewed, all communications have occurred, arrangements made for special handling if needed.	☐			
	Floor along delivery route will support weight of equipment, reinforcement arranged if needed.		*Person responsible*	☐	Pre-Installation Manual
	Arrangements have been made for special handling of equipment if rigging, elevator, fork lift, etc. are required.	☐			
	The site IT/connectivity contact information has been entered in MyProjects. Site IT is engaged and supplying any local network and remote connectivity information that is required.	☐			
	Check for toilets (portable acceptable), washing facilities, area for food / drink breaks. Guidance 1 toilet for every 7 people.	☐			
	GE and other employees can easily evacuate the area if the need arises and the exits are signed and clear from obstruction.	☐			
Construction	Customer / Contractor has obtained required permits. PMI has the appropriate permission to rig and deliver through the designated path.	☐			
	Ceiling support steelwork height, levelness and spacing has been measured, and is ready for the installation of any GE supplied components.	☐			
	Cable ways are of correct length & size, warning lights and door switches (if applicable) are per GE PIM specifications and final drawing.	☐ 📷			
	HVAC must be installed and meet the minimum environmental requirements. The HVAC system must be operational by system turn on.		*Person responsible*	☐	Pre-Installation Manual
	All feeder wires and circuit breakers are sized appropriately and the emergency power off (EPO) button(s) installed.		*Person responsible*	☐	Pre-Installation Manual
	PMI to confirm with electrician all power and signal cables are well terminated ensuring there are no loose connections.	☐			
	Lead doors and windows complete or scheduled before calibration phase. Radiation shielding finished & regulatory approval for installation obtained.	☐			
	Customer / contractor has confirmed that the floor meets GE specifications for levelness and flatness.		*Person responsible*	☐	Pre-Installation Manual
	Room dimensions, including ceiling height, for all Exam, Equipment / Technical & Control rooms meets GE PIM specifications and final drawing.	☐			
Pre-Equipment Delivery	Check the area of the installation. The floor is complete, no trailing cables, no obstructions, no surface water.	☐			
	No adjacent ongoing / planned activities that may affect personnel safety.	☐			
	No potential exposure to hazards or odors during installation.	☐			
	Equipment must be in a clean environment where construction dust and debris are prevented from coming in contact with the equipment.	☐ 📷			
	A single source lockable electrical panel for GE equipment that can be locked from the outside. Lock Out Tag Out applied prior to commencing.	☐ 📷			
	Sufficient & secured storage space is planned with the customer.	☐			
	PMI should confirm that threshold at room entry meets GE specifications in appropriate Pre-Installation Manual.	☐			
	Ceiling has been completed, with the exception of removable tiles, which is at the GE Project Managers discretion.	☐			
	Room lighting is adequate to install equipment in a safe and effective manner. Permanent lighting may not yet be available.	☐			
	Countertops and / or tables are in place for equipment installation. Temporary tables of suitable size can be used to start installation.	☐			
	System power & ground cabling provided from PDB / MDP to equipment per GE Pre-Installation Manual specifications and final drawings.	☐			
	A power and grounding audit may be scheduled for all installations where power issues may be a concern.	☐			
	Network connection is active for equipment. Verified with site IT has provided the Connectivity information required and Remote Connectivity (Internet or VPN) will be available before install completion.	☐			
Documents	**Customer Documentation Portal - https://customer-doc.cloud.gehealthcare.com/#/cdp/dashboard**				
	Search by Document Number and desired language				
	Manual		**Document Number**		
	Pre-Installation Manual		Refer to page 1 of drawing		

Customer / Contractor CT Data Sheet

HVAC

Room	Temp (C or F)	Humidity %RH
Exam Room		
Control Room		
Technical Room		

Floor Levelness and Flatness

Measurement	Max (mm or in)	Min (mm or in)
Equipment location area		

Connectivity

Contacts	Name	Phone	Email
Director/Lead Tech			
Network Admin			
PACS Admin			
Comments			

INSITE - REMOTE CONNECTIVITY

Depending on product family and software revision, GE systems can be connected to the GE Back Office/Online Center for remote diagnostic, system health monitoring and to facilitate troubleshooting. To enable InSite remote service, Selecting One of the below options and providing the requested information is Required:

☐ **1.** TLS Internet Access TCP Port 443* - DNS Resolution *(Preferred – Please provide DNS in Network Info*)

☐ **2.** TLS Internet Access TCP Port 443* - Customer Provided Proxy

Proxy IP		Port	
Username		Password	

*If firewall rules or exemptions are required for successful connectivity, add the following URLs to allow outbound TLS communication:

https://insite.gehealthcare.com
https://as1-insite.gehealthcare.com
https://as2-insite.gehealthcare.com
https://gehealthcare-ns.flexnetoperations.com
https://download.flexnetoperations.com

☐ **3.** Site-to-Site IPSec VPN (GEHC VPN Proxy) *(Requires Static IP)*

NETWORKING - LOCAL CONNECTIVITY

IP Information	IP Address*	Netmask*	Gateway*	Port#*	AE Title*	Notes
System 1						
System 2						
System 3						
System 4						
DNS Server 1		N/A	N/A	N/A	N/A	
DNS Server 2		N/A	N/A	N/A	N/A	

PACS and HIS/RIS

PACS HIS/RIS INFO	IP Address *	Port#*	AE Title*	Notes
PACS 1				
PACS 2				
HIS/RIS				
OTHER				
OTHER				

*Required Fields

GE Healthcare

Optima CT660

Pre-Installation Manual

OPERATING DOCUMENTATION

5368510-1EN
Rev 7

The information in this manual applies to the following GE Healthcare Optima CT Scanners:

- Optima CT660

The information in this manual does NOT apply to non-fixed (mobile) installations.

IMPORTANT PRECAUTIONS

LANGUAGE

ПРЕДУПРЕЖДЕНИЕ (BG)	Това упътване за работа е налично само на английски език. • Ако доставчикът на услугата на клиента изиска друг език, задължение на клиента е да осигури превод. • Не използвайте оборудването, преди да сте се консултирали и разбрали упътването за работа. • Неспазването на това предупреждение може да доведе до нараняване на доставчика на услугата, оператора или пациента в резултат на токов удар, механична или друга опасност.
警告 (ZH-CN)	本维修手册仅提供英文版本。 • 如果维修服务提供商需要非英文版本，客户需自行提供翻译服务。 • 未详细阅读和完全理解本维修手册之前，不得进行维修。 • 忽略本警告可能对维修人员，操作员或患者造成触电、机械伤害或其他形式的伤害。
警告 (ZH-HK)	本服務手冊僅提供英文版本。 • 倘若客戶的服務供應商需要英文以外之服務手冊，客戶有責任提供翻譯服務。 • 除非已參閱本服務手冊及明白其內容，否則切勿嘗試維修設備。 • 不遵從本警告或會令服務供應商、網絡供應商或病人受到觸電、機械性或其他的危險。
警告 (ZH-TW)	本維修手冊僅有英文版。 • 若客戶的維修廠商需要英文版以外的語言，應由客戶自行提供翻譯服務。 • 請勿試圖維修本設備，除非 您已查閱並瞭解本維修手冊。 • 若未留意本警告，可能導致維修廠商、操作員或病患因觸電、機械或其他危險而受傷。
UPOZORENJE (HR)	Ovaj servisni priručnik dostupan je na engleskom jeziku. • Ako davatelj usluge klijenta treba neki drugi jezik, klijent je dužan osigurati prijevod. • Ne pokušavajte servisirati opremu ako niste u potpunosti pročitali i razumjeli ovaj servisni priručnik. • Zanemarite li ovo upozorenje, može doći do ozljede davatelja usluge, operatera ili pacijenta uslijed strujnog udara, mehaničkih ili drugih rizika.
VÝSTRAHA (CS)	Tento provozní návod existuje pouze v anglickém jazyce. • V případě, že externí služba zákazníkům potřebuje návod v jiném jazyce, je zajištění překladu do odpovídajícího jazyka úkolem zákazníka. • Nesnažte se o údržbu tohoto zařízení, aniž byste si přečetli tento provozní návod a pochopili jeho obsah. • V případě nedodržování této výstrahy může dojít k poranění pracovníka prodejního servisu, obslužného personálu nebo pacientů vlivem elektrického proudu, respektive vlivem mechanických či jiných rizik.

ADVARSEL (DA)	Denne servicemanual findes kun på engelsk. • Hvis en kundes tekniker har brug for et andet sprog end engelsk, er det kundens ansvar at sørge for oversættelse. • Forsøg ikke at servicere udstyret uden at læse og forstå denne servicemanual. • Manglende overholdelse af denne advarsel kan medføre skade på grund af elektrisk stød, mekanisk eller anden fare for teknikeren, operatøren eller patienten.
WAARSCHUWING (NL)	Deze onderhoudshandleiding is enkel in het Engels verkrijgbaar. • Als het onderhoudspersoneel een andere taal vereist, dan is de klant verantwoordelijk voor de vertaling ervan. • Probeer de apparatuur niet te onderhouden alvorens deze onderhoudshandleiding werd geraadpleegd en begrepen is. • Indien deze waarschuwing niet wordt opgevolgd, zou het onderhoudspersoneel, de operator of een patiënt gewond kunnen raken als gevolg van een elektrische schok, mechanische of andere gevaren.
WARNING (EN)	This service manual is available in English only. • If a customer's service provider requires a language other than English, it is the customer's responsibility to provide translation services. • Do not attempt to service the equipment unless this service manual has been consulted and is understood. • Failure to heed this warning may result in injury to the service provider, operator or patient from electric shock, mechanical or other hazards.
HOIATUS (ET)	See teenindusjuhend on saadaval ainult inglise keeles. • Kui klienditeeninduse osutaja nõuab juhendit inglise keelest erinevas keeles, vastutab klient tõlketeenuse osutamise eest. • Ärge üritage seadmeid teenindada enne eelnevalt käesoleva teenindusjuhendiga tutvumist ja sellest aru saamist. • Käesoleva hoiatuse eiramine võib põhjustada teenuseosutaja, operaatori või patsiendi vigastamist elektrilöögi, mehaanilise või muu ohu tagajärjel.
VAROITUS (FI)	Tämä huolto-ohje on saatavilla vain englanniksi. • Jos asiakkaan huoltohenkilöstö vaatii muuta kuin englanninkielistä materiaalia, tarvittavan käännöksen hankkiminen on asiakkaan vastuulla. • Älä yritä korjata laitteistoa ennen kuin olet varmasti lukenut ja ymmärtänyt tämän huolto-ohjeen. • Mikäli tätä varoitusta ei noudateta, seurauksena voi olla huoltohenkilöstön, laitteiston käyttäjän tai potilaan vahingoittuminen sähköiskun, mekaanisen vian tai muun vaaratilanteen vuoksi.
ATTENTION (FR)	Ce manuel d'installation et de maintenance est disponible uniquement en anglais. • Si le technicien d'un client a besoin de ce manuel dans une langue autre que l'anglais, il incombe au client de le faire traduire. • Ne pas tenter d'intervenir sur les équipements tant que ce manuel d'installation et de maintenance n'a pas été consulté et compris. • Le non-respect de cet avertissement peut entraîner chez le technicien, l'opérateur ou le patient des blessures dues à des dangers électriques, mécaniques ou autres.

WARNUNG (DE)	Diese Serviceanleitung existiert nur in englischer Sprache. • Falls ein fremder Kundendienst eine andere Sprache benötigt, ist es Aufgabe des Kunden für eine entsprechende Übersetzung zu sorgen. • Versuchen Sie nicht diese Anlage zu warten, ohne diese Serviceanleitung gelesen und verstanden zu haben. • Wird diese Warnung nicht beachtet, so kann es zu Verletzungen des Kundendiensttechnikers, des Bedieners oder des Patienten durch Stromschläge, mechanische oder sonstige Gefahren kommen.
ΠΡΟΕΙΔΟΠΟΙΗΣΗ (EL)	Το παρόν εγχειρίδιο σέρβις διατίθεται μόνο στα αγγλικά. • Εάν ο τεχνικός σέρβις ενός πελάτη απαιτεί το παρόν εγχειρίδιο σε γλώσσα εκτός των αγγλικών, αποτελεί ευθύνη του πελάτη να παρέχει τις υπηρεσίες μετάφρασης. • Μην επιχειρήσετε την εκτέλεση εργασιών σέρβις στον εξοπλισμό αν δεν έχετε συμβουλευτεί και κατανοήσει το παρόν εγχειρίδιο σέρβις. • Αν δεν προσέξετε την προειδοποίηση αυτή, ενδέχεται να προκληθεί τραυματισμός στον τεχνικό σέρβις, στο χειριστή ή στον ασθενή από ηλεκτροπληξία, μηχανικούς ή άλλους κινδύνους.
FIGYELMEZTETÉS (HU)	Ezen karbantartási kézikönyv kizárólag angol nyelven érhető el. • Ha a vevő szolgáltatója angoltól eltérő nyelvre tart igényt, akkor a vevő felelőssége a fordítás elkészíttetése. • Ne próbálja elkezdeni használni a berendezést, amíg a karbantartási kézikönyvben leírtakat nem értelmezték. • Ezen figyelmeztetés figyelmen kívül hagyása a szolgáltató, működtető vagy a beteg áramütés, mechanikai vagy egyéb veszélyhelyzet miatti sérülését eredményezheti.
AÐVÖRUN (IS)	Þessi þjónustuhandbók er aðeins fáanleg á ensku. • Ef að þjónustuveitandi viðskiptamanns þarfnast annas tungumáls en ensku, er það skylda viðskiptamanns að skaffa tungumálaþjónustu. • Reynið ekki að afgreiða tækið nema að þessi þjónustuhandbók hefur verið skoðuð og skilin. • Brot á sinna þessari aðvörun getur leitt til meiðsla á þjónustuveitanda, stjórnanda eða sjúklings frá raflosti, vélrænu eða öðrum áhættum.
AVVERTENZA (IT)	Il presente manuale di manutenzione è disponibile soltanto in lingua inglese. • Se un addetto alla manutenzione richiede il manuale in una lingua diversa, il cliente è tenuto a provvedere direttamente alla traduzione. • Procedere alla manutenzione dell'apparecchiatura solo dopo aver consultato il presente manuale ed averne compreso il contenuto. • Il mancato rispetto della presente avvertenza potrebbe causare lesioni all'addetto alla manutenzione, all'operatore o ai pazienti provocate da scosse elettriche, urti meccanici o altri rischi.
警告 (JA)	このサービスマニュアルには英語版しかありません。 • サービスを担当される業者が英語以外の言語を要求される場合、翻訳作業はその業者の責任で行うものとさせていただきます。 • このサービスマニュアルを熟読し理解せずに、装置のサービスを行わないでください。 • この警告に従わない場合、サービスを担当される方、操作員あるいは患者さんが、感電や機械的又はその他の危険により負傷する可能性があります。

경고 (KO)	본 서비스 매뉴얼은 영어로만 이용하실 수 있습니다 . • 고객의 서비스 제공자가 영어 이외의 언어를 요구할 경우 , 번역 서비스를 제공하는 것은 고객의 책임입니다 . • 본 서비스 매뉴얼을 참조하여 숙지하지 않은 이상 해당 장비를 수리하려고 시도하지 마십시오 . • 본 경고 사항에 유의하지 않으면 전기 쇼크 , 기계적 위험 , 또는 기타 위험으로 인해 서비스 제공자 , 사용자 또는 환자에게 부상을 입힐 수 있습니다 .
BRĪDINĀJUMS (LV)	Šī apkopes rokasgrāmata ir pieejama tikai angļu valodā. • Ja klienta apkopes sniedzējam nepieciešama informācija citā valodā, klienta pienākums ir nodrošināt tulkojumu. • Neveiciet aprīkojuma apkopi bez apkopes rokasgrāmatas izlasīšanas un saprašanas. • Šī brīdinājuma neievērošanas rezultātā var rasties elektriskās strāvas trieciena, mehānisku vai citu faktoru izraisītu traumu risks apkopes sniedzējam, operatoram vai pacientam.
ĮSPĖJIMAS (LT)	Šis eksploatavimo vadovas yra tik anglų kalba. • Jei kliento paslaugų tiekėjas reikalauja vadovo kita kalba – ne anglų, suteikti vertimo paslaugas privalo klientas. • Nemėginkite atlikti įrangos techninės priežiūros, jei neperskaitėte ar nesupratote šio eksploatavimo vadovo. • Jei nepaisysite šio įspėjimo, galimi paslaugų tiekėjo, operatoriaus ar paciento sužalojimai dėl elektros šoko, mechaninių ar kitų pavojų.
ADVARSEL (NO)	Denne servicehåndboken finnes bare på engelsk. • Hvis kundens serviceleverandør har bruk for et annet språk, er det kundens ansvar å sørge for oversettelse. • Ikke forsøk å reparere utstyret uten at denne servicehåndboken er lest og forstått. • Manglende hensyn til denne advarselen kan føre til at serviceleverandøren, operatøren eller pasienten skades på grunn av elektrisk støt, mekaniske eller andre farer.
OSTRZEŻENIE (PL)	Niniejszy podręcznik serwisowy dostępny jest jedynie w języku angielskim. • Jeśli serwisant klienta wymaga języka innego niż angielski, zapewnienie usługi tłumaczenia jest obowiązkiem klienta. • Nie próbować serwisować urządzenia bez zapoznania się z niniejszym podręcznikiem serwisowym i zrozumienia go. • Niezastosowanie się do tego ostrzeżenia może doprowadzić do obrażeń serwisanta, operatora lub pacjenta w wyniku porażenia prądem elektrycznym, zagrożenia mechanicznego bądź innego.
ATENÇÃO (PT-BR)	Este manual de assistência técnica encontra-se disponível unicamente em inglês. • Se outro serviço de assistência técnica solicitar a tradução deste manual, caberá ao cliente fornecer os serviços de tradução. • Não tente reparar o equipamento sem ter consultado e compreendido este manual de assistência técnica. • A não observância deste aviso pode ocasionar ferimentos no técnico, operador ou paciente decorrentes de choques elétricos, mecânicos ou outros.

ATENÇÃO (PT-PT)	Este manual de assistência técnica só se encontra disponível em inglês. • Se qualquer outro serviço de assistência técnica solicitar este manual noutro idioma, é da responsabilidade do cliente fornecer os serviços de tradução. • Não tente reparar o equipamento sem ter consultado e compreendido este manual de assistência técnica. • O não cumprimento deste aviso pode colocar em perigo a segurança do técnico, do operador ou do paciente devido a choques eléctricos, mecânicos ou outros.
ATENŢIE (RO)	Acest manual de service este disponibil doar în limba engleză. • Dacă un furnizor de servicii pentru clienţi necesită o altă limbă decât cea engleză, este de datoria clientului să furnizeze o traducere. • Nu încercaţi să reparaţi echipamentul decât ulterior consultării şi înţelegerii acestui manual de service. • Ignorarea acestui avertisment ar putea duce la rănirea depanatorului, operatorului sau pacientului în urma pericolelor de electrocutare, mecanice sau de altă natură.
ОСТОРОЖНО! (RU)	Данное руководство по техническому обслуживанию представлено только на английском языке. • Если сервисному персоналу клиента необходимо руководство не на английском, а на каком-то другом языке, клиенту следует самостоятельно обеспечить перевод. • Перед техническим обслуживанием оборудования обязательно обратитесь к данному руководству и поймите изложенные в нем сведения. • Несоблюдение требований данного предупреждения может привести к тому, что специалист по техобслуживанию, оператор или пациент получит удар электрическим током, механическую травму или другое повреждение.
UPOZORENJE (SR)	Ovo servisno uputstvo je dostupno samo na engleskom jeziku. • Ako klijentov serviser zahteva neki drugi jezik, klijent je dužan da obezbedi prevodilačke usluge. • Ne pokušavajte da opravite uređaj ako niste pročitali i razumeli ovo servisno uputstvo. • Ne pokušavajte da opravite uređaj ako niste pročitali i razumeli ovo servisno uputstvo.
UPOZORNENIE (SK)	Tento návod na obsluhu je k dispozícii len v angličtine. • Ak zákazníkov poskytovateľ služieb vyžaduje iný jazyk ako angličtinu, poskytnutie prekladateľských služieb je zodpovednosťou zákazníka. • Nepokúšajte sa o obsluhu zariadenia, kým si neprečítate návod na obluhu a neporozumiete mu. • Zanedbanie tohto upozornenia môže spôsobiť zranenie poskytovateľa služieb, obsluhujúcej osoby alebo pacienta elektrickým prúdom, mechanické alebo iné ohrozenie.

ATENCION (ES)	Este manual de servicio sólo existe en inglés. • Si el encargado de mantenimiento de un cliente necesita un idioma que no sea el inglés, el cliente deberá encargarse de la traducción del manual. • No se deberá dar servicio técnico al equipo, sin haber consultado y comprendido este manual de servicio. • La no observancia del presente aviso puede dar lugar a que el proveedor de servicios, el operador o el paciente sufran lesiones provocadas por causas eléctricas, mecánicas o de otra naturaleza.
VARNING (SV)	Den här servicehandboken finns bara tillgänglig på engelska. • Om en kunds servicetekniker har behov av ett annat språk än engelska, ansvarar kunden för att tillhandahålla översättningstjänster. • Försök inte utföra service på utrustningen om du inte har läst och förstår den här servicehandboken. • Om du inte tar hänsyn till den här varningen kan det resultera i skador på serviceteknikern, operatören eller patienten till följd av elektriska stötar, mekaniska faror eller andra faror.
OPOZORILO (SL)	Ta servisni priročnik je na voljo samo v angleškem jeziku. • Če ponudnik storitve stranke potrebuje priročnik v drugem jeziku, mora stranka zagotoviti prevod. • Ne poskušajte servisirati opreme, če tega priročnika niste v celoti prebrali in razumeli. • Če tega opozorila ne upoštevate, se lahko zaradi električnega udara, mehanskih ali drugih nevarnosti poškoduje ponudnik storitev, operater ali bolnik.
DİKKAT (TR)	Bu servis kılavuzunun sadece ingilizcesi mevcuttur. • Eğer müşteri teknisyeni bu kılavuzu ingilizce dışında bir başka lisandan talep ederse, bunu tercüme ettirmek müşteriye düşer. • Servis kılavuzunu okuyup anlamadan ekipmanlara müdahale etmeyiniz. • Bu uyarıya uyulmaması, elektrik, mekanik veya diğer tehlikelerden dolayı teknisyen, operatör veya hastanın yaralanmasına yol açabilir.

DAMAGE IN TRANSPORTATION

You should closely examine all packages at time of delivery. If you notice any damage, have the notation "Damage in Shipment" written on all copies of the freight or express bill before delivery is accepted or "signed for" by any General Electric representative or hospital receiving agent. Whether noted or concealed, you MUST report damage to the carrier immediately upon discovery and within 14 days after receipt, and you must hold the contents and containers for inspection by the carrier. A transportation company will not pay a claim for damage if you do not request an inspection within this 14-day period.

To file a report:

- Call 1-800-548-3366 and use option 8.
- Fill out a report on http://egems.med.ge.com/edq/home.jsp
- Contact your local service coordinator for more information on this process.

Rev. June 13, 2006

CERTIFIED ELECTRICAL CONTRACTOR STATEMENT

All electrical installations that are preliminary to positioning of the equipment at the site prepared for the equipment shall be performed by licensed electrical contractors. In addition, electrical feeds into the Power Distribution Unit shall be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations and testing shall be performed by qualified GE Healthcare personnel. The products involved (and the accompanying electrical installations) are highly sophisticated, and special engineering competence is required. In performing all electrical work on these products, GE will use its own specially trained field engineers. All of GE's electrical work on these products will comply with the requirements of the applicable electrical codes.

The purchaser of GE equipment shall only utilize qualified personnel (i.e., GE's field engineers, personnel of third-party service companies with equivalent training, or licensed electricians) to perform electrical servicing on the equipment.

IMPORTANT...X-RAY PROTECTION

X-ray equipment if not properly used may cause injury. Accordingly, the instructions herein contained should be thoroughly read and understood by everyone who will use the equipment before you attempt to place this equipment in operation. The General Electric Company, Medical Systems Group, will be glad to assist and cooperate in placing this equipment in use.

Although this apparatus incorporates a high degree of protection against x-radiation other than the useful beam, no practical design of equipment can provide complete protection. Nor can any practical design compel the operator to take adequate precautions to prevent the possibility of any persons carelessly exposing themselves or others to radiation.

It is important that anyone having anything to do with x-radiation be properly trained and fully acquainted with the recommendations of the National Council on Radiation Protection and Measurements as published in NCRP Reports available from NCRP Publications, 7910 Woodmont Avenue, Room 1016, Bethesda, Maryland 20814, and of the International Commission on Radiation Protection, and take adequate steps to protect against injury.

The equipment is sold with the understanding that the General Electric Company, Medical Systems Group, its agents, and representatives have no responsibility for injury or damage which may result from improper use of the equipment.

Various protective materials and devices are available. It is urged that such materials or devices be used.

OMISSIONS & ERRORS

Customers: please contact your GE Healthcare Sales or Service representatives. GE personnel: please use the GE Healthcare Complaint Process to report all omissions, errors, and defects in this publication.

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Revision History

Revision	Date	Reason for change
7	January 06, 2014	Chapter 4, Section 1: Added sub-section 1.3 (Condition References). Updated Fig 4-1 and Fig 4-2. Chapter 5, Section 1: Added a Note. Chapter 5, Section 2: Updated Fig 5-12. Chapter 6, Section 1: Updated Fig 6-1. Added sub-section 1.1 (Gantry Service Clearance). Chapter 7, Section 1: Removed the value of the room layout. Chapter 9, Section 6: Added this section (System Component Noise Levels). Chapter 12, Section 2: Updated the value of idle power demand. Chapter 13, Section 3: Upated part number of standard cable set and part list of Cj M40 fuse kit.
6	April 13, 2012	Chapter 4, Section 1: Added sub-section 1-3 (Condition References). Updated Fig 4-1 and Fig 4-2. Chapter 5, Section 1: Added a Note. Chapter 6, Section 1: Updated Fig 6-1. Chapter 7, Section 1: Removed the value of the room layout. Chapter 9, Section 6: Added this section (System Component Noise Levels).
5	April 13, 2012	Chapter 5, Section 1: Updated the clearance for VT2000. Chapter 5, Section 2: Updated title of section 2.5 Chapter 8, Section 4 and Section 6: Removed [PDU-80] word. Updated the dimension of the center of gravity for VT2000. Chapter 9, Section 5: Updated description for Edition 3.0. Chapter 10, Section 1: Updated scatter radiation. Changed unit from mGy to µGy. Chapter 12, Section 2: Added section 2.7 (Potential Equalization Conductor). Chapter 13, Section 3: Updated title of section 3.4. Chapter 14, Section 4: Updated size of Gantry dollies.
4	November 17, 2011	Chaper 12, Section 2 and Section 3: Added information of 50kVA option

Revision	Date	Reason for change
3	October 11, 2011	Chapter 4, Section 1: Updated Fig 4-1, 4-2 Figure 4-1 Regulatory Clearance Requirements. Updated Table 4-4 Table Minimum Workspace Clearances. Chapter 6, Section 1: Updated Table 6-1 Scan Room Size Dimensions for GT1700V and GT2000. Removed Suggested and Typical Room Sizes. Chapter 6, Section 2: Removed Suggested and Typical Room Layouts and updated the minimum room layouts for GT1700V and GT2000. Chapter 6, Section 4: Added description for RIO Long Cable Option. Chapter 8, Section 4: Added a note for Max. uplift load in Table 8-2. Chapter 9, Section 4: Corrected value in ambient static magnetic fields. Chapter 12, Section 3: Updated Average Power demand. Appendix_A: Added Alternate Cover Removal Options.
2	February 16, 2011	Added Information for VT2000 Table
1	Mar.20, 2010	Initial Release

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Chapter 1 Introduction

This document contains the physical and electrical data necessary for planning and preparing a site for system installation. The responsibility of arranging and paying for this work rests solely with the purchaser.

Section 1.0: What is Pre-Installation?

Pre-installation is any site preparation required prior to the installation of the system. This manual states all pre-installation siting and regulatory requirements. The Pre-Installation Kit may not answer all of your questions, contact your GE Healthcare Project Manager of Installation (PMI) for answers.

Likewise, prior to any construction or approval, General Healthcare Headquarters Architectural Planning must review all CT site plans, preliminary concepts, and final working drawings. Contact your GE Project Manager of Installation (PMI) for complete information regarding your site-specific room layout.

Section 2.0: What is Pre-Installation Work?

Pre-Installation work includes:

- Site renovation.
- Alterations or modifications to products not specifically included in the sales contract.
- Installation of electrical conduit, junction boxes, ducts, outlets, and line safety switches.
- Installation of AWG stranded copper interconnection wiring, conforming to the following requirements:
    * The electrical contractor shall ring out and tag all wires at both ends.
    * Wires shall be continuous and without splices.
    * Ground wires shall conform to product requirements.
    * Color-coded wires shall be used whenever possible, to enable easier identification.
- All work shall conform to IBC (International Building Code) and local building and safety codes.

Note: GE Healthcare neither provides nor installs the wires, conduits, junction boxes, or ducts illustrated in this publication, unless specifically mentioned.

Section 3.0: Pre-Installation Tools

A list of primary customer tools for successfully completing the pre-installation process for a Optima CT660 system appears below.

3.1 Customer Pre-Installation Task

- **Customer Pre-Installation Tasks**
- **Regulatory and Service Clearance Information**
- **Floor Template** (GT1700V/VT2000: P/N 5341997-2, Lite Table: P/N 5193991)
  Included with system, and also available from your PMI. Use this to determine equipment layout and anchoring locations.
- **Site Print**
  Supplied by your PMI or sales rep. Must show actual room size, location of all equipment in the finished room, all service and operating clearances, and meet all regulatory requirements.

3.1.1 Pre-Installation Manual Guide

Table 1-1 shows the location in this Pre-Installation Manual of the information necessary for fulfilling each the corresponding pre-installation requirements.

Installation Site Requirement Information	
Determining Your Installation Type on page 31	System Siting Requirements on page 35
Room Dimensions on page 69	Structural and Mounting Requirements on page 77
Regulatory Requirements on page 41	Service Clearance Requirements on page 65
Radiation Protection Requirements on page 105	Network Requirements on page 109
Environmental Requirements on page 95	Power Requirements on page 111
Delivery and Storage Requirements on page 131	Handling Requirements on page 139
Contractors must complete ALL WORK before the scheduled delivery date.	

Table 1-1 Locations of Site Requirement Information in this manual

Section 4.0: Customer Pre-Installation Tasks

Required Information for Site

Must be completed before the scheduled delivery date

Hospital Name as it appears on the system screens:

_____

Network ID numbers / IP addresses Camera:_____
PACS: _____ AW:_____

Other - Specify type & ID:_____

Other - Specify type & ID:_____

Camera setup information:_____

_____

_____

AW Direct Connect address:_____

Do you want HIPAA enabled? No___ Yes ___

Do you want automatic downloads enabled? No___ Yes ___

:

GE	Cust	Dates
Y N	Y N	
	❒ ❒	Has the project schedule been verified with facilities department, contractor, and GE?
	❒ ❒	Will the committed site-ready date be met?
❒ ❒	❒ ❒	Does the completion date for any/all construction meet or proceed the delivery date?
❒ ❒	❒ ❒	Is the Power & Ground survey complete? Date: _____ Hospital contact: _____
	❒ ❒	Is the Site-Ready visit scheduled? Date: _____
	❒ ❒	Is the delivery date scheduled? Date: _____
	❒ ❒	Is the installation date scheduled? Date: _____
❒ ❒	❒ ❒	Is the installation timing determined?A: Weekdays___B: Weekend___C: Quick Install___ If B or C, have all sub-contractors been notified? No___ Yes ___
❒ ❒	❒ ❒	Does the delivery and/or installation date need to be adjusted?
	❒ ❒	Is the first-use date scheduled? Date: _____
❒ ❒	❒ ❒	Applications/Training dates scheduled? On-Site TrainingDate: _____ Healthcare Institute Training Date: _____

Table 1-2 Schedule Date Commitments

GE		Cust		General / Site Requirements
Y	N	Y	N	*Must be completed 5 weeks before scheduled delivery date*
❒	❒	❒	❒	Were final drawings approved and distributed to the contractors?
❒	❒	❒	❒	Are final drawings “signed off” to approve equipment layout / orientation?
❒	❒	❒	❒	Do the actual room dimensions match those on the final drawings?
		❒	❒	Has the radiologist health physician reviewed and approved the room layout and shielding requirements?
		❒	❒	Have any additional requirements or questions about the installation been discussed with GE? List: _____ _____ _____ _____
		❒	❒	Is there a person assigned to review and verify that all installation requirements are met? Name: _____
		❒	❒	Have the specific site requirements been discussed with the contractor? Refer to the GE final drawings specifications. (See Table 1-4 below.)
		❒	❒	Has the responsibility of cabling, installing, and interfacing accessories not on the order been discussed?
		❒	❒	Are all third-party vendors identified, notified and scheduled? (Examples: Netcom, Medrad, etc.)
		❒	❒	Have all regulatory requirements been met per *Regulatory Clearances*, on page 41?
		❒	❒	Will existing network, broadband, and camera cable drops reach new locations and will they meet the requirements and function with Optima CT660? If not, what are the requirements? List: _____ _____ _____

Table 1-3 General Site Planning

GE		Cust		Equipment
Y	N	Y	N	*Must be completed 5 weeks before scheduled delivery date*
❒	❒	❒	❒	Has the order been reviewed for completeness and compatibility with existing equipment? Typical equipment: Remote monitors ____ AW relocation ____ Cardiac monitor ____ Injectors ____
❒	❒			Are interfaces to existing and/or new accessories ordered and planned for accordingly?
❒	❒	❒	❒	Have the following peripheral locations been included in the site drawings? Cardiac monitor___ Injector control___ Laser camera ___ UPS ___ 2nd Monitor___
❒	❒	❒	❒	Will GE Healthcare provide additional services per contract negotiations?
❒	❒			Are correct length cables on order?

Table 1-4 Equipment Compatibility

GE	Cust	Network Installation and Setup
Y N	Y N	*Must be completed 5 weeks before scheduled delivery date*
❒ ❒	❒ ❒	Have IP addresses and Host Names been obtained? No___ Yes ___
❒ ❒	❒ ❒	Will a network camera be used? No___ Yes ___
❒ ❒	❒ ❒	**Required:** Is the network installed, are network jacks installed, and is the entire network tested?
❒ ❒	❒ ❒	**Required:** Broadband VPN installed/setup?
❒ ❒	❒ ❒	**Required:** Are network software options ordered ____ HIS RIS option ___ DICOM print ___ AW ____
	❒ ❒	**Optional:** Has modem option ordered? _____ (Requires a site escalation)
❒ ❒	❒ ❒	**Optional:** Is the Optima CT660 service telephone line identified and installed for InSite? *(Electrical, mechanical, etc.)*

Table 1-5 Network Connections

GE	Cust	Other
Y N	Y N	*Must be completed 5 weeks before scheduled delivery date*
	❒ ❒	Arrangements made in the schedule to allow adequate time for remodeling, if required (such as wall, floor, or ceiling repair work, painting, other cosmetic finishes)
	❒ ❒	Have arrangements been made to clean the floor *after* equipment removal and *prior* to the installation of the new equipment?
❒ ❒	❒ ❒	Is de-installation of existing equipment required? No__ Yes ___ Removal date _____
❒ ❒	❒ ❒	Is there a trade-in of existing equipment? No __ Yes __ GoldSeal _____
❒ ❒	❒ ❒	Delivery route identified and verified with the proper hospital personnel? No__ Yes __ Elevators and doors checked for size and weight constraints? No__ Yes __
❒ ❒	❒ ❒	Have appropriate arrangements been made with traffic for delivery? No__ Yes __
❒ ❒	❒ ❒	Will acceptance/performance testing or bio-medical testing be required? No__ Yes __ Date: _____
❒ ❒	❒ ❒	Are trash and/or recycling bins available for the removal of papers, boxes, etc. during the installation? No__ Yes __
❒ ❒	❒ ❒	Has the GEHC Surface Penetration Permit been completed before equipment delivery? (A copy of this form must be sent to GEHC as defined in the permit.) No__ Yes __

Table 1-6 Miscellaneous Tasks

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Chapter 2
Installation Types

Section 1.0: Determining Your Installation Type

1.1 How to Determine the Best Installation Type for Your Site

Discuss installation options with your PMI to determine which of the installation types listed below best fits your site and schedule.

1.2 Typical Installations

Typical installations occur at established sites with finished, dust-free, occupancy-ready scan suites. The rooms range from suggested to minimum room sizes, and have NO ongoing construction on-site. A typical installation allows customers flexibility for room upgrades and site improvements. Upgrades and improvements may require additional planning prior to system delivery, especially when involving:

- Seismic approval
- Floor structural improvements
- HVAC improvements
- Electrical Improvements
- Review of scan room shielding requirements by a qualified radiological health physicist.

As with any installation, the final site design for a typical installation must meet all service and regulatory requirements detailed in this manual.

1.3 Construction Site Installations

A construction installation describes installations at sites without an occupancy permit, often with ongoing construction. In general, construction sites fail to meet the recommended specifications for delivery of the system. GE Healthcare does not recommend construction installations, as they can result in delays, increased costs, and possible damage to the system. When construction-site delivery proves unavoidable, the installation falls into one of two categories:

- Full construction site with completed radiology area
- Full construction site with limited delivery access

Review the following categories to determine which most closely matches the condition of the planned installation site.

1.3.1 Full Construction Site with Completed Radiology Area

This type of site consists of a finished, dust-free, occupancy-ready radiology suite. While there is no remaining construction in or around the scan suite area, there may be ongoing construction in other areas. At the time of delivery such sites feature:

- Dust control measures deployed in the radiology suite area.
- Scan suite access limited to a single entrance (see Figure 2-1).
- Radiology suite sealed off from the remaining construction area.
- Operational HVAC, with a positive air pressure within the radiology suite.

In addition, the radiology suite at such a site REMAINS in a dust-free, occupancy-ready state after delivery and throughout the remaining construction phase.

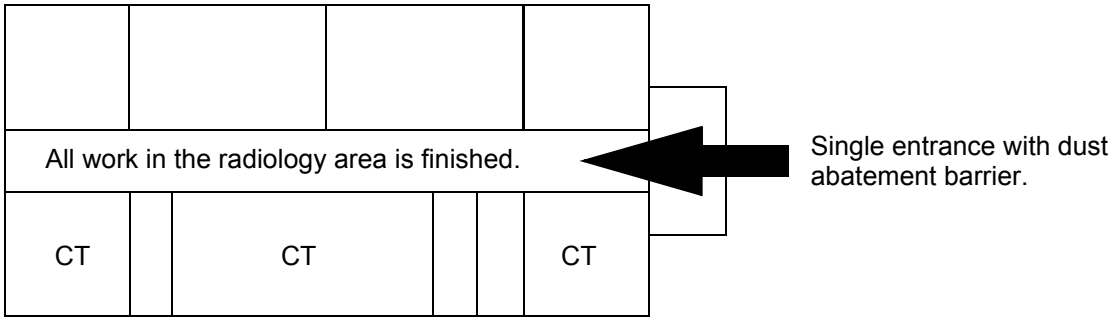


Figure 2-1 Full construction site with completed radiology area

1.3.2 Full Construction Site with Limited Delivery Access

This type of site allows delivery during ongoing construction of the radiology suite area. At such sites, delivery occurs prior to site completion, but the product remains stored until a finished, dust-free, occupancy-ready radiology suite area is ready. This type of site requires the Optima CT660 Series to be delivered in a sealed package with dollies. Delivery to the storage area may require a lift truck or riggers. Installation work begins only when the site reaches the completed, dust-free, occupancy-ready radiology suite requirement.

Note: If delivery requires vertical or horizontal lifting, the PMI adds the necessary identifier to the order.

1.4 Relocatable Building Installations

A relocatable building is made in a factory and delivered to the site of its permanent location. Relocateable buildings qualify as fixed sites and must satisfy all of the requirements of a fixed site. The gantry and table must be mounted on a solid concrete floor. Any other floor type installations must be designed by the customer's structural engineer and meet all GE Healthcare's specifications listed in this manual.

Refer to Chapter 8, Structural and Mounting Requirements of this manual for further information.

1.5 Upgrade Installations

Upgrade installations occur after the installation of another system. A change in the customer's needs requires the installation of additional equipment at the same site. For example, adding a PET system to an existing CT system.

To proceed with an upgrade installation, the customer’s room size must be large enough to accommodate the new product without violating the regulatory and service requirements of the new product. When planning for an upgrade installation, siting requirements of the new equipment may exceed those of your existing system. Requirements needing additional consideration include:

- Floor thickness
- Room shielding
- Additional electrical capacity
- Increased cooling capacity
- Scan room shielding requirements

The final site design must include a room layout showing the equipment room with the recommended room size dimensions. All upgrade installations must meet all service and regulatory requirements detailed in this manual.

1.6 Quick Installations

Quick Installations involve sites requiring minimum room improvements. These installations typically consist of a weekend de-installation and room prep completion, with a next-business-day delivery and installation.

1.6.1 Requirements

A site must meet a number of requirements to qualify for a Quick Installation, including:

- Existing electrical disconnect device, wire size, and grounds must meet all requirements referenced in Chapter 3, Section 2.2, on page 36.
- Existing structural specifications met, including floor thickness, and all requirements referenced in Chapter 3, Section 2.3, on page 37.
- Existing HVAC capacity and regulation must meet all requirements referenced in Chapter 3, Section 2.5, on page 38.
- Existing CT suite must meet all regulatory and minimum size requirements referenced in Chapter 3, Section 2.7, on page 39.
- Existing facility must accommodate delivery and meet all delivery requirements referenced in Chapter 3, Section 2.9, on page 39.
- Existing facility must meet all scan room shielding requirements referenced in Chapter 10.

Consult your Project Manager of Installation (PMI) for information about any additional requirements.

1.6.2 Restrictions

The following restrictions govern Quick Installations:

- Quick Installs require a new room print that accurately reflects the rooms targeted for upgrade.
- You CANNOT re-use existing floor anchors from a non-Optima system.
- New floor anchors must be a minimum of 102 mm (4 in.) from any existing floor penetrations.
- Rooms not meeting the minimum requirements for the final product must undergo an upgrade/ enlargement prior to installation.

1.7 Two-Step (Temporary) Installations

Two-Step installations are the temporary installation of one system in a site, with the intention of upgrading the site to another system at a later date. The following restrictions apply to two-step installations:

- Must comply with ALL siting requirements necessary for the upgraded or final system. This includes the recommended room size and all electrical, structural, and HVAC requirements.
- All requirements referenced in Chapter 3, Section 1.0: and Chapter 3, Section 2.0: apply to these installations.
- The customer is responsible for verifying compliance with all requirements.
- Rooms not meeting minimum requirements for the final product must undergo sufficient upgrading/enlargement.

Note: Temporary installations include all systems installed at a site for a period ranging from two weeks to six months.

Chapter 3
System Siting Requirements

Section 1.0: System Siting Requirements

The requirements listed in this manual apply to all fixed-site customer installations, including installations within relocatable buildings. The following requirements represent the MINIMUM that a site must meet before beginning ANY new or replacement system installation. All parties should review these requirements to ensure that the site:

- Meets all service requirements.
- Meets all regulatory requirements.
- Meets all minimum structural, flooring, and vibration requirements.
- Meets minimum HVAC requirements.
- Meets minimum electrical requirements.
- Meets all network requirements.
- Meets radiation protection requirements.
- Meets all operational clearances.
- Includes all finished doors, floors, windows, ceilings, and walls, with all plumbing and cabinets already installed. (FINISHED FLOOR EXCEPTION 1, on page 37 and FINISHED FLOOR EXCEPTION 2, on page 38 may apply. Finished Walls Requirements on page 81 may apply.)
- Does not have ANY continuing construction in the scan room OR neighboring suite areas.
- Conforms to the final GE Healthcare site print, which must be kept ON-SITE and must show all items intended for the finished room.

Note: Each site receives a Quick Start Kit from its PMI. Use the Pre-Install Checklist in the Pre-Installation Manual to confirm that the site meets all of the requirements listed above. GE Healthcare recommends completing all work to meet these requirements PRIOR to starting installation.

Section 2.0: Customer System Siting Requirements

This section provides a breakdown of customer tasks crucial for ensuring proper site preparation, regardless of whether planning for a replacement system at an existing site, or designing a new scan room for a first system.

Installation cannot proceed until verification of site-readiness occurs. A site is ready ONLY when it meets ALL delivery, regulatory, system, network, radiation protection, and operational requirements, as well as requirements for any options. The purchaser is responsible for completing all work necessary to install the system, and includes:

- Completion of all items in Section 2.3, Structural (recommended before installation begins).
- PMI verification that ALL items on the Pre-Installation Checklist are completed.
- Review and preparation of all site-ready items.

To ensure timely delivery and installation, GE Healthcare recommends that the customer complete all necessary work and schedule a site-ready visit prior to the delivery date.

To confirm that the site meets all requirements, you may need to employ these and other contractors:

- Structural Engineer and/or Architect
- HVAC Contractor
- Electrical Contractor
- Qualified Radiological Health Physicist
- Cleaning Services

⚠ **NOTICE** **SERVICE NOTICE: An improperly prepared site.one that is in a state of construction-can result in a delayed installation date and/or damage to the system.**

2.1 Regulatory Requirements

Verify that the site conforms to all of the following:

- The room meets all regulatory clearance requirements.
- The room meets all minimum size requirements.
- The site print is on-site, reflects actual room size and layout, and has received final approval.
- The room meets all local codes.

2.2 Electrical

- Install the correct size junction boxes with covers at locations shown in the installation plan.
- Install appropriate conduits and duct work for system cables. If the suite houses additional components, determine the necessary considerations and complete the connections.
- Install a power supply of correct voltage output and adequate kVA rating.
- Install local disconnects, including proper over-current protection. This includes the A1 main disconnect with Lock-out and Tag-out (LOTO) installation.

2.3 Structural

- Install "steelwork" or other suitable support work for mounting equipment from walls or ceilings.
- Review structural requirements, including:
  - Floor vibration
  - Floor levelness
  - Floor thickness,
  - Any seismic considerations, if applicable.
- Complete all suite and room renovations and modifications prior to delivery.

2.3.1 Air / Dust Quality

Ensure that the scan suite area is free of all dust, and not subject to ANY ongoing construction, including the installation of cabinets, hanging doors, and ceiling tiles.

NOTICE SERVICE NOTICE: Because the system's air-intake is near the bottom of the gantry and draws in air through a filter in the gantry heater assembly, fine dust -like that created during room construction or renovation -can clog this and other filters found on the DAS, tube, and console. If this occurs, dust may become deposited throughout the gantry, table, console, and PDU electronics. Once inside the unit, removal becomes impossible, resulting in potential DAMAGE to electronic components and EARLY SYSTEM FAILURE. Consequently, the system is the LAST item installed in the scan suite area.

TYPES OF DUST TO AVOID

Ensure that NO construction occurs in or immediately around the scan suite area that results in:

- Concrete dust
- Drywall dust
- Ceiling tile dust
- Wood sawdust or shavings
- Dust tracked into the CT suite from adjoining rooms

Failure to take appropriate precautions to protect the system against these types of dust may result in DAMAGE to the system and early SYSTEM FAILURE.

2.3.2 Environmental Influences

CT systems are designed with commercial components that are sensitive to air contaminants like sulfide, chloride and nitrates. It is the responsibility of the purchaser to ensure that the levels of these contaminates are low (Class 1). See IEC60654-4 for air quality guidelines.

2.3.3 Finished Floor Requirements

Installation requires a finished floor in the scan and control rooms. The scan room must be level by 6 mm (1/4 in) over the table and gantry area to be acceptable. You cannot use shims to level the floor. Eight or more floor covering openings that are 102 mm (4 in) in diameter are made to ensure the table and gantry rest on a solid surface. These floor penetrations can be sealed if required. These requirements apply to all installation types.

FINISHED FLOOR EXCEPTION 1

For sites replacing their scan room floor covering after the table and gantry are installed, the floor can be clean-finished with dust-free concrete. The finish floor in the scan room requires no dust-producing operations when applying final floor covering.

FINISHED FLOOR EXCEPTION 2

Facilities under new construction that have a finished radiology area with a single controlled-access and dust abatement barrier, can have a finished concrete floor in the scan room. The finished concrete floor in the scan room requires no dust-producing operations when applying final floor covering.

2.3.4 Finished Walls

Finished walls inside the scan and control rooms must be painted at the time of installation. This requirement applies to all installation types.

A finished walls exception is made for the following condition:

In new construction and upgraded facilities, a primer coat of paint is acceptable for equipment installation. However, the final coat of paint must be applied using a brush of some type (e.g. roller or bristle). The final coat of paint cannot be applied using a spray method.

2.4 Radiation Protection

A qualified radiological health physicist should verify that the scan room's radiation shielding provides adequate radiation protection for the planned system.

2.5 Environmental

Review HVAC requirements, including system environmental controls and patient comfort needs. Make sure the site provides an HVAC system capable of maintaining the recommended temperature and humidity specifications at the time of installation.

2.6 Options

Confirm the following:

- All customer installation options reviewed and final locations determined.
- All GE-supplied installation options reviewed and final locations determined.
- The laser camera should be on-site at the time of system installation.

2.7 Clearances

- Review operational clearances to verify whether daily use items fit (e.g. beds and carts).
- Consider clearances for emergency medical equipment.
- Ensure that all storage cabinets and sinks appear on the site print in their proper locations.
- Confirm that adequate space exists in the scan suite for delivery and installation of all replacement parts following installation of the system.

2.8 Network

Ensure that network communication is in place and active.

2.9 Chemical Contamination

Never install wet film processors in the same room as the system, as this may result in possible contamination of the system components. Chemicals utilized by such processors can contribute to increased equipment failures and downtime, and decreased reliability.

When siting this equipment, consider the effects that contact with these chemicals and the resulting fumes might have on human subjects in proximity to them. In addition, film processor equipment installation must meet all manufacturer requirements (e.g. ventilation specifications) as well as all applicable local, state, and national codes.

2.10 Delivery

- Determine room dimensions and verify that doorways adequately accommodate the system.
- Verify the existence of an accessible, dust-free, non-construction-zone route to the scan suite that accommodates delivery.
- Identify elevators, doorways, and hallways that can accommodate delivery.
- Provide floor protection, if needed.
- Request rigging, if needed.

Section 3.0: Site Readiness

3.1 Pre-Installation Tasks

The GE Healthcare Project Manager of Installation (PMI) assists the purchaser in meeting all system siting requirements.

3.1.1 Pre-Installation Delivery Tasks

The PMI also performs the following pre-installation delivery tasks:

- Determines the delivery type: ground, dock, or tilt-bed truck.
- Determines if delivery requires tilt dollies or riggers; orders dollies and lifting crates, as needed.
- Determines if the delivery requires the use of floor protection.
- Determines if ground delivery requires the use of a tilt-bed truck, and informs GE Transportation of the need for a tilt-bed truck.

3.1.2 Site Review with Customer

A site-ready visit should occur prior to the delivery date. This visit verifies that the site meets all system siting requirements and confirms that installation can proceed. During the site-ready visit, a GE representative confirms that the site meets all of the required site-ready conditions including floor levelness, and delivery route readiness. Lifting options and construction site packaging must be ordered prior to delivery and cannot be added on-site.

Chapter 4
Regulatory Requirements

Section 1.0: Regulatory Clearances

1.1 Regulations

Review all codes in your area prior to your installation date. US customers should consider these codes:

- **29 CFR 1910 (OSHA)**
- **NFPA 70E (STANDARD FOR ELECTRICAL SAFETY IN THE WORKPLACE)**
- **NFPA 101 (LIFE SAFETY CODE)**
- **AMERICANS WITH DISABILITIES ACT**

NOTICE All systems installed within the United States and United States territories, and within U.S. government facilities, regardless of country, must comply with all United States Federal and local regulations. All systems installed outside the United States must comply with either the national, state, or local regulatory clearance requirements for the country in which the installation occurs, or U.S. Federal regulations, whichever is greater.

1.2 Clearance Requirements

A map of clearance requirements necessary for U.S. regulatory compliance is provided in Figure 4-1, on page 42.

Note: A similar map of detailed dimensional clearance measurements necessary for safe servicing of the system is provided in Figure 6-1, on page 65.

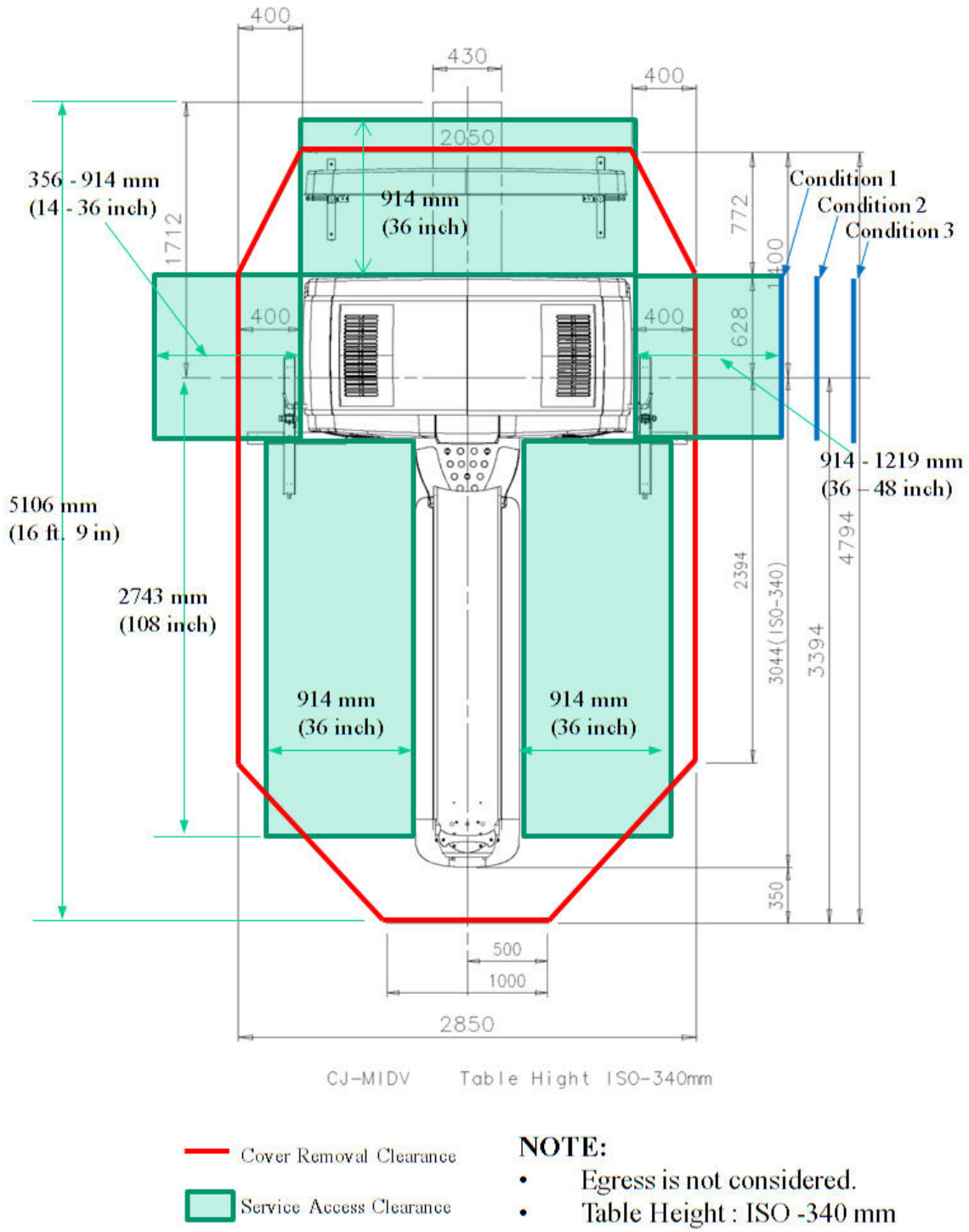
NOTICE The maps and dimensions shown in this manual depict the required clearances for proper equipment operation and service only. The customer/purchaser is responsible for federal, state and/or local codes regarding facility egress and related facility requirements.

NOTICE The use of alternative layouts from the appendix puts severe limitations on space for patient care and work flow. Customer approval of site drawings signifies customer agreement to these limitations.

1.3 Condition References

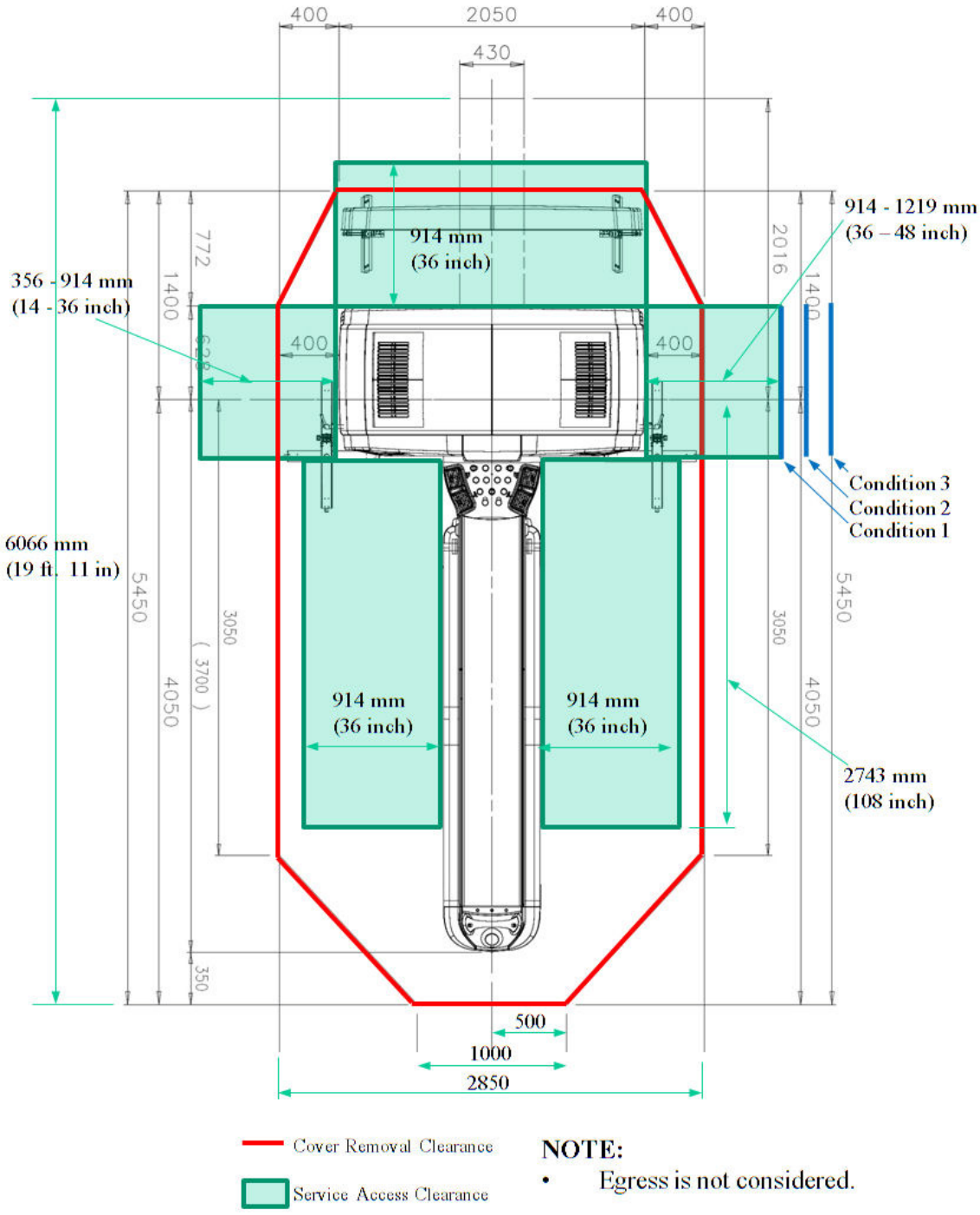
There are three possible minimum service space requirements based on the construction of the wall directly adjacent to the side of the gantry. The following three conditions determine the minimum space requirement that would apply to the room based on the special conditions of the wall:

- **Condition 1** If the side of the system being serviced is directly facing an ungrounded surface of wall without live voltage panels and without surface mounted ducts or conduits the minimum space requirement is 914 mm (36 in).
- **Condition 2** If side of the system being serviced is directly facing a grounded surface or wall the minimum space requirement is 1067 mm (42 in).
- **Condition 3** If the side of the system being serviced is directly facing a surface or wall with live voltage panels, surface mounted ducts, or conduits the minimum space requirement is 1249 mm (48 in).



Note: Gantry left side service access clearance can be reduced to 356mm (14in.) by small room kit.

Figure 4-1 Regulatory Clearance Requirements for the Optima CT660 with GT1700V Table



Note: Gantry left side service access clearance can be reduced to 356mm (14in.) by small room kit.

Figure 4-2 Regulatory Clearance Requirements for the Optima CT660 with GT2000V Table

1.3.1 Minimum Regulatory Workspace Clearances by Major Subsystem

Note the following when referring to the tables below:

- These requirements apply to equipment operating at 600 V or less, where examination, adjustment, servicing, or maintenance is likely to be performed with live parts exposed.
- The customer MUST maintain the required regulatory clearance distances and may NOT use these areas for storage. This applies during normal system operation as well as during service inspection and maintenance.
- Direction of Service Access refers to a direction perpendicular to the surface of the equipment serviced.

Workspace Requirement	MINIMUM CLEAR SPACE	ADDITIONAL CONDITIONS
Direction of Service Access (Front and Rear of Console)	N/A (No exposed live part hazards.)	
Service Access Width (Front-Back of Workspace)		Refers to the width of the working space in front of equipment. 762 mm (30 in.) min or the equipment width, whichever is greater.
Head Clearance	1981 mm (78 in.)	Refers to the height of the workspace measured from the floor at the front edge of the equipment to the ceiling or any overhead obstructions. 1981 mm (78 in.) or the height of the equipment, whichever is greater.
Note: Distances are measured to the finished covers.		

Table 4-1 Console . Minimum workspace Clearances

Workspace Requirement	Minimum Clear Space	Additional Conditions
Direction of Service Access (Front of PDU)	914 mm (36 in.)	1219 mm (48 in.) if exposed live parts of 151 - 600 volts are present on both sides of operator between. 1067 mm (42 in.) if the opposite wall is grounded and exposed live parts of 151 - 600 volts are present.
Service Access Width (Front of Workspace)	762 mm (30 in.)	Refers to the width of the working space in front of equipment. 762 mm (30 in.) min or the equipment width, whichever is greater.
Head Clearance	1981 mm (78 in.)	Refers to the height of the workspace measured from the floor at the front edge of the equipment to the ceiling or any overhead obstructions. 1981 mm (78 in.) or the height of the equipment, whichever is greater.

Table 4-2 PDU Minimum Workspace Clearances

Note: For the Gantry and Table, distances are measured from the finished covers

Workspace Requirement	Minimum Clear Space	Additional Conditions
Direction of Service Access (All Sides)	914 mm (36 in.)	1219 mm (48 in.), if exposed live parts of 151 - 600 volts are present on both sides of the workspace with the operator between. 1067 mm (42 in.), if the opposite wall is grounded and exposed live parts of 151 - 600 volts are present.
Service Access Width (Left-Right of Workspace)	762 mm (30 in.)	Refers to the width of the working space in front of equipment. 762 mm (30 in.) minimum or the equipment width, whichever is greater.
Head Clearance	1981 mm (78 in.)	Refers to the height of the workspace measured from the floor at the front edge of the equipment to the ceiling or any overhead obstructions. 1981 mm (78 in.) or the height of the equipment, whichever is greater.

Table 4-3 Gantry . Minimum Workspace Clearances

Workspace Requirement	Minimum Clear Space	Additional Conditions
Direction of Service Access (Table Head)	N/A	
Direction of Service Access (Table Sides)	914 mm (36 in.)	*Can reduce to 711 mm (28 in.), provided the local team obtains written and signed approval from the local AHJ (Authority Having Jurisdiction). GE must have the signed document on file.
Direction of Service Access (Table Foot)	711 mm (28 in.)	350 mm (14 in.) minimum for Front Gantry Cover removal, only if an unobstructed egress space of 711 mm (28 in.) exists around the equipment for room exit, and no trip hazards exist along the path of egress.
Service Access Width (Left-Right of Workspace)	762 mm (30 in.)	Refers to the width of working space in front of equipment. 762 mm (30 in.) minimum or the equipment width, whichever is greater.
Head Clearance	1981 mm (78 in.)	Refers to the height of the workspace measured from the floor at the front edge of the equipment to the ceiling or any overhead obstructions. 1981 mm (78 in.) or the height of the equipment, whichever is greater.

Table 4-4 Table . Minimum Workspace Clearances

1.4 How to Measure

Figure 4-3 offers guidance on the proper way to measure to check minimum regulatory clearances.

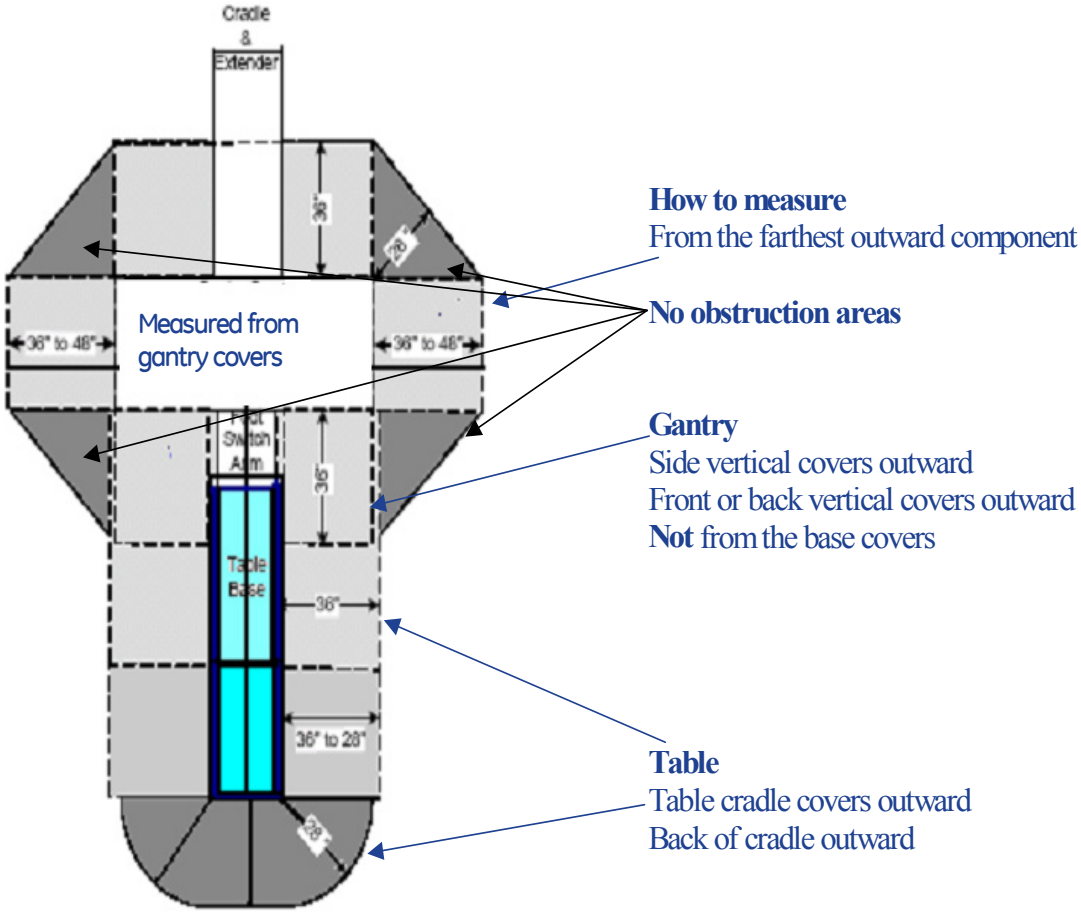


Figure 4-3 Measuring Minimum Regulatory Clearances

CAUTION **Regulatory Caution:** All system installations, relocations, and moves, require site prints. The CT room layout shall match the layout shown on your site print and meet all regulatory requirements described in the installation manual. Additional room components, such as cabinets and sinks, reduce room size. Consequently, equipment not shown on the site print may void the caution statement, making the room NON-COMPLIANT. Actual site measurements obtained by the mechanical installer before installation determines room size and compliance.

CAUTION **Operational Caution:** In the minimum room layout, the customer should consider workflow, customer access for patient care, and critical-care operations space requirements. Additionally, this layout may offer only limited equipment access on the gantry left side when loading patients or when positioning patient equipment in the room between the gantry and the wall.

1.5 NEC Conduit and Duct Fill Rate

Full operation, service, and safety of the system requires the maintenance of sufficient regulatory and service clearances around equipment.

Cable length is an important consideration in room layout. The Optima CT660 system ships with standard (short) length cables, with a set of longer cables available as an option. Refer to the electrical page of your GE site print for the specific requirements of your site. The following rules govern cable usage for the system:

- When possible, use the rear cable cover assembly to let cables enter the gantry from the rear.
- Do not cut or otherwise shorten long cables.
- Do not store excess cable length behind the Console, gantry, or PDU.
- Store excess cable in wall or floor ducts, if desired, provided that sufficient space exists. Refer to NEC code to determine cable fill rates for conduits and ducts.
- All installed systems shall comply with NFPA 70-E Electrical Regulations governing conduit or duct fill.

Section 2.0: Terms and Definitions

CLEARANCES

Clearances are the clear space or distance between or around objects and equipment, governed by all applicable safety, service, and regulatory requirements and representing the lowest margin of freedom permissible for equipment siting.

DIMENSIONS

Dimensions are the length, width, depth, and height of equipment.

EGRESS

An egress is the single path of exit from within any room. It is the customer's responsibility to provide a means of egress.

(PRE-INSTALLATION) ESCALATION

Pre-installation escalation is the process used to consult CT Engineering, the Design Center, or EHS to resolve pre-installation issues related to siting concerns and requirements.

GROUNDED WALL

A grounded wall is any wall with electrical conductivity to earth. Conductive materials generally found in walls include masonry, concrete, and tile. Treat as grounded additional elements commonly found in walls, including but not limited to:

- Medical gas ports and plates
- Metal doors and window frames
- Water sources and metallic sink structures
- Metallic wall-mounted cabinets
- A1 main disconnect panel
- Equipment Emergency Off panels
- Industrial equipment (such as air conditioners and vents)
- Expansion joints
- Surface raceway
- Exposed wall conduits
- Floor outlet boxes
- Floor HVAC boxes
- Floor medical gas

Common wall components NOT constituting grounded elements include:

- Standard wall outlet
- Light switches
- Telephones
- Communication wall jacks
- Ceiling tile grids

HEAD CLEARANCE

Head clearance represents the height dimension of the workspace, measured from the floor at the front edge of the equipment to the ceiling or any overhead obstructions. It requires a minimum of 1981 mm (78 in.), or the height of equipment, whichever is greater.

MINIMUM

Minimum indicates the lowest limit permitted by law or other authority.

SERVICE ACCESS WIDTH

Service access width refers to the width of the working space in front of the equipment, and requires a minimum of 762 mm (30 in.) or the width of the equipment, whichever is greater.

WORKSPACE

The *workspace* represents a three-dimensional box of space required for safe inspection or service of energized equipment. It consists of depth, width, and height, with the depth dimension measured perpendicular to the direction of access. U.S. regulation requires a minimum depth of 914 mm (36 in.). Additional conditions can increase the minimum requirement. For example, FCT defines *workspace* as the envelope of the component superstructure, measured for the PDU with the front panel removed, and measured for the gantry and table with the external covers removed.

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Chapter 5
System Component Dimensions

Section 1.0: Minimum Operating Clearances

The sections in this chapter provide the minimum dimension and operating clearance information for each category of components listed. Be sure that the site conforms to each of these specifications.

1.1 Ceiling Pedestal Mount Installation

The distance from the floor to the lowest point of the ceiling pedestal mount for the Injector or Monitor CANNOT measure LESS than 2134 mm (84 in.). Refer to the installation guides of those components for the length of the mounting post.

Note: The down post or ceiling mounted pedestal used to mount injectors, remote monitors or other devices shall not be installed within the tube crane area. See Gantry Service Clearance.

⚠

NOTICE Failure to maintain a distance of at least 2134 mm (84 in.) from the floor to the lowest point of the Injector or Monitor ceiling pedestal mount may pose a safety hazard. For installations with a finished ceiling height that is less than suggested, consideration should be given to utilizing floor mounted components, or attaching the mounting plate in the overhead (for example, above dropped ceiling tiles).

1.2 Injector Control Installation

Minimum dimensions and clearances include the following requirements for the injector control:

- Provision of a suitable work area for placement of the injector control, within reach of the console.
- Wall mounted, ceiling mounted, and pedestal units require routing of cables from the gantry area to the console area. The supplied cable measures 15.2 m (50 ft).
- Injectors require an AC power source that is powered from the console. The IEC power cord is supplied with the injector.
- Available mounts come in several different lengths and configurations. Refer to the injector documentation for detailed installation instructions.

Note: For RIO console systems, the console requires IEC power plugs to power GE approved options. All Options used with the system must be powered using the console or gantry power plugs.

For systems using any NEC power plugs, Options (such as Video splitter) must be plugged inside the console power strip.

1.3 System Operational Clearances

The clearances listed in Table 5-1 govern system operation; be sure that the site maintains each of these clearances.

System Operation	mm	inches
Ceiling Pedestal mount (optional) Lowest point to floor injector or monitor	2134 mm	84 in.
Finished ceiling to floor (suggested)	2743 mm	108 in.
Finished ceiling to floor (minimum)	2286 mm	90 in.
Table to maximum extension head end with extender from Center Line	2016 mm (VT2000) 1712 mm (GT1700V) 1537 mm (Lite Table)	80 in. 80 in. 61 in.
Table extension head end with extender to obstruction	150 mm	6 in.
Table in lowest position. with cradle at home position to surface of Gantry front cover.	3327 mm (VT2000) 2744 mm (GT1700V) 2610 mm (Lite Table)	131 in. 108 in. 103 in.
Back of Console to wall	96 mm	4 in.
Back of PDU to wall	152 mm	6 in.

Table 5-1 Minimum Dimensions and Operational Clearances

Section 2.0: Component Dimensions

2.1 Gantry Dimensions

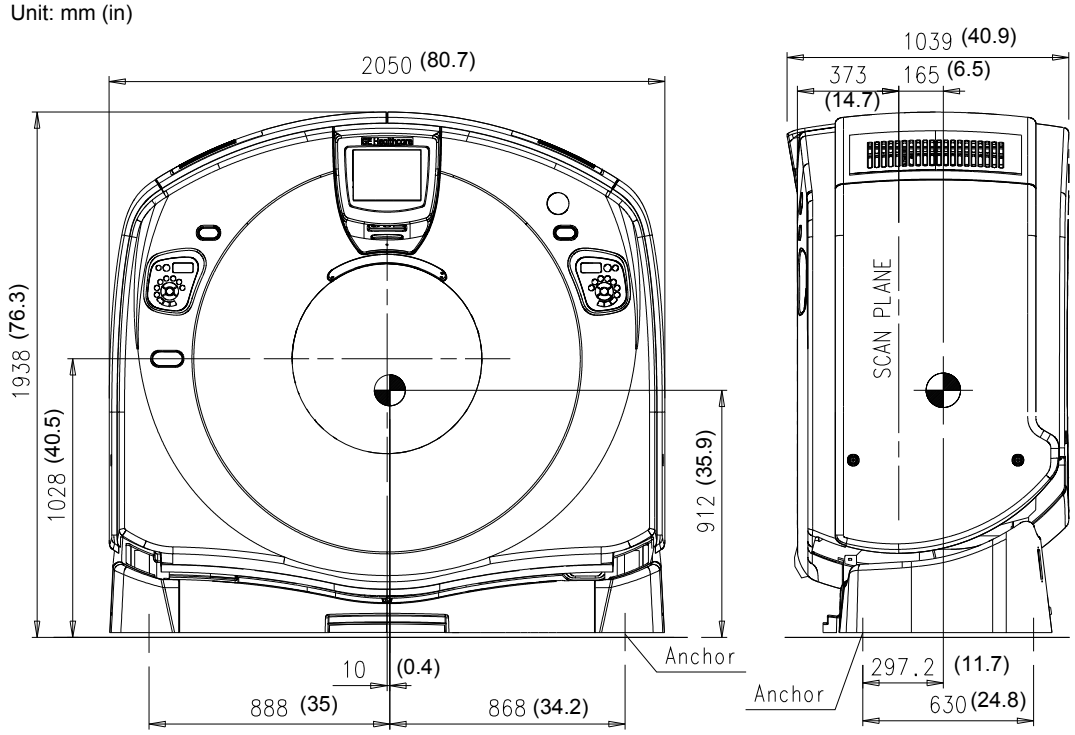

Figure 5-1 Gantry Dimensions with Covers

2.2 Table and Gantry Dimensions (with Lite Table)

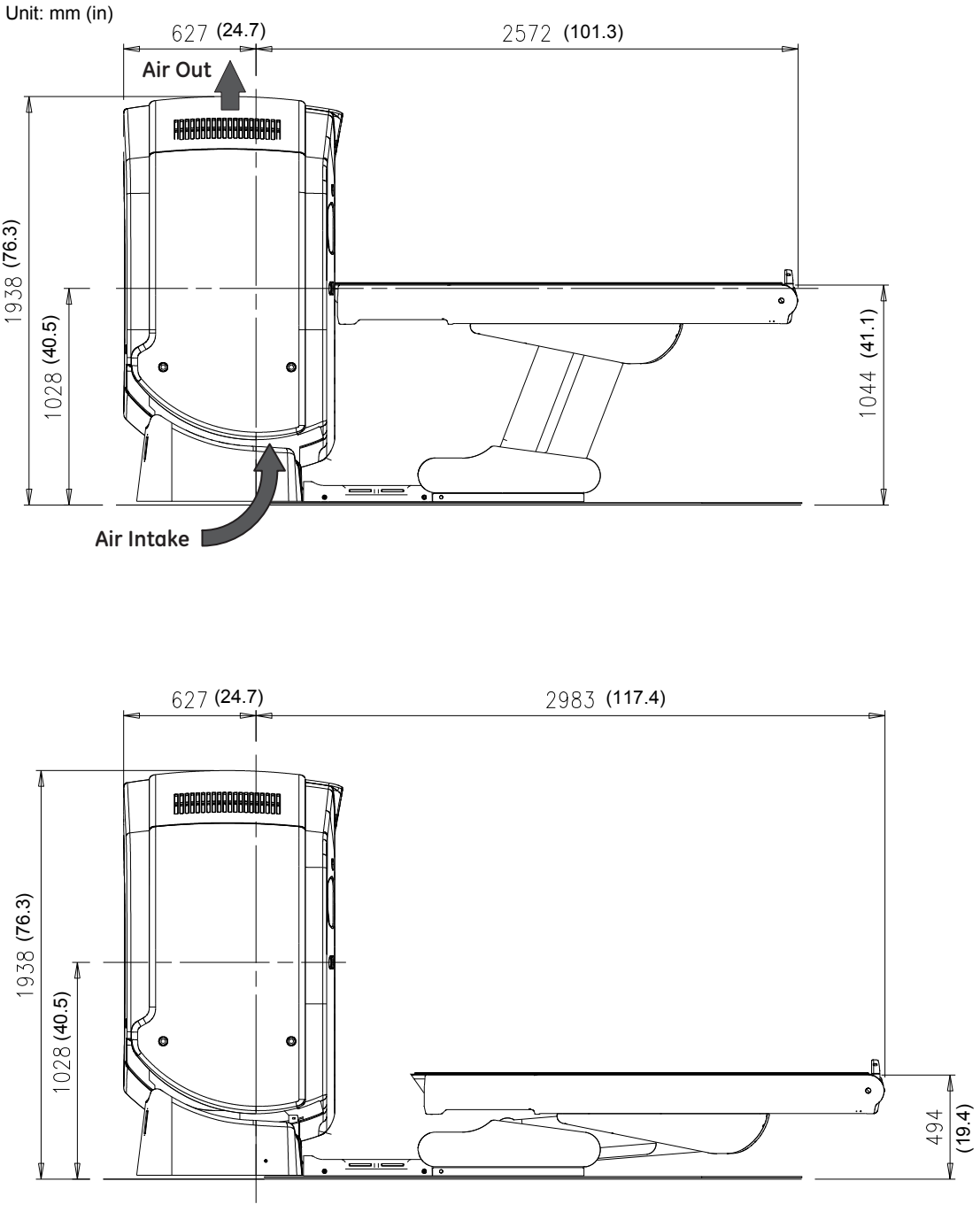

Figure 5-2 Lite Table and Gantry (Side View)

Unit: mm (in)

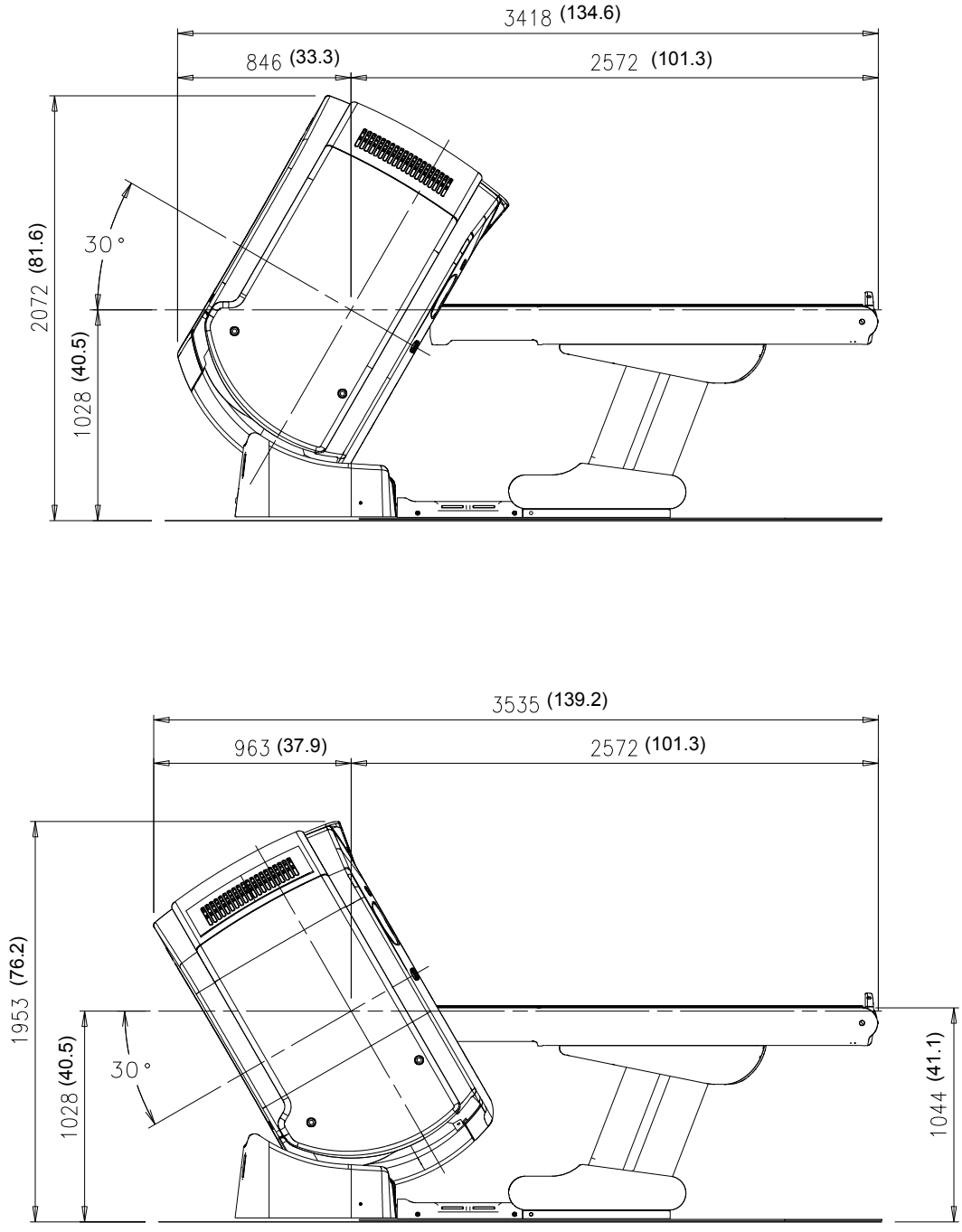

Figure 5-3 Gantry Tilted +30º (top) and -30º (bottom) - Lite Table Options

2.3 Table and Gantry Dimensions (with GT1700V Table)

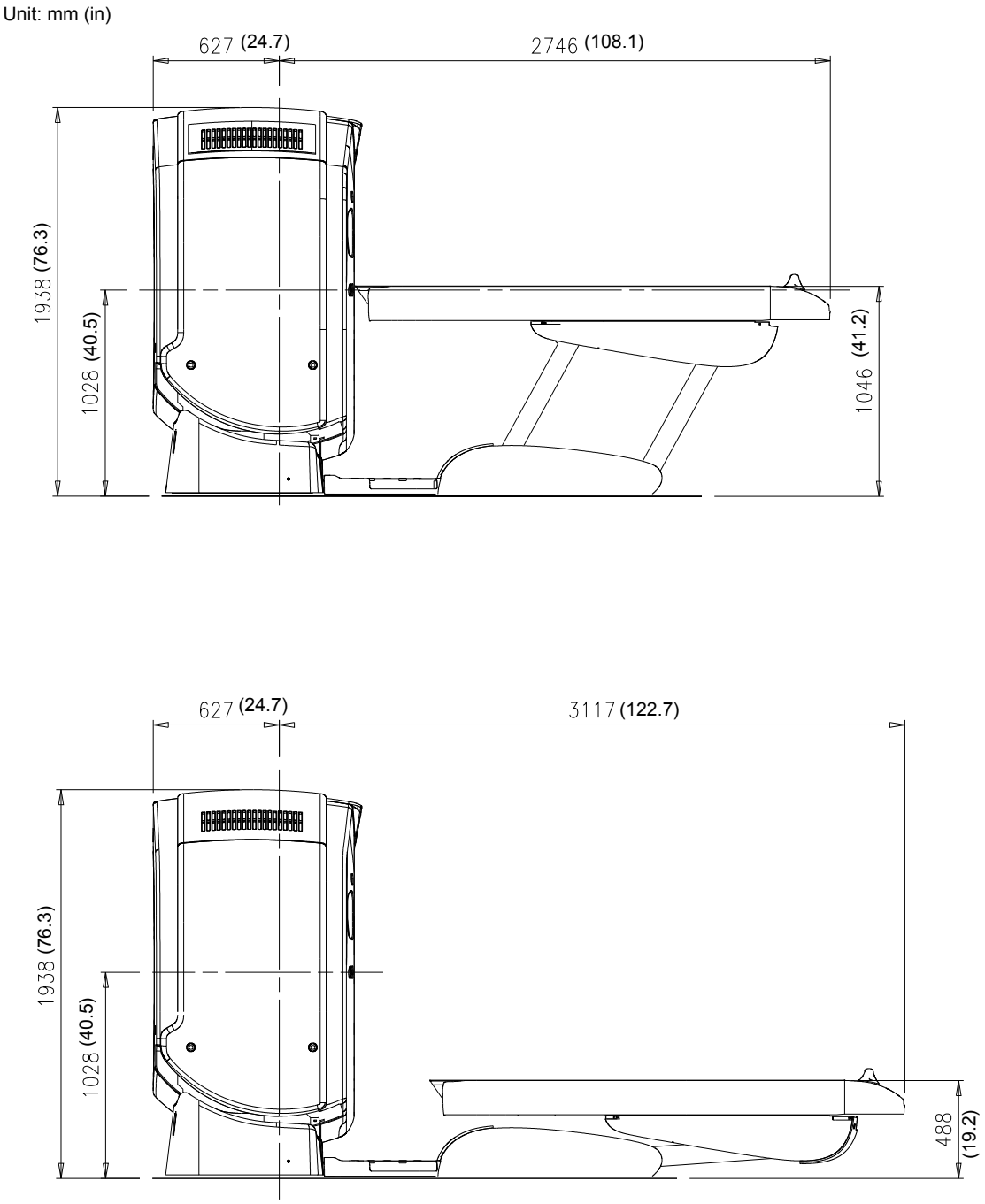

Figure 5-4 GT1700V Table and Gantry (Side View)

Unit: mm (in)

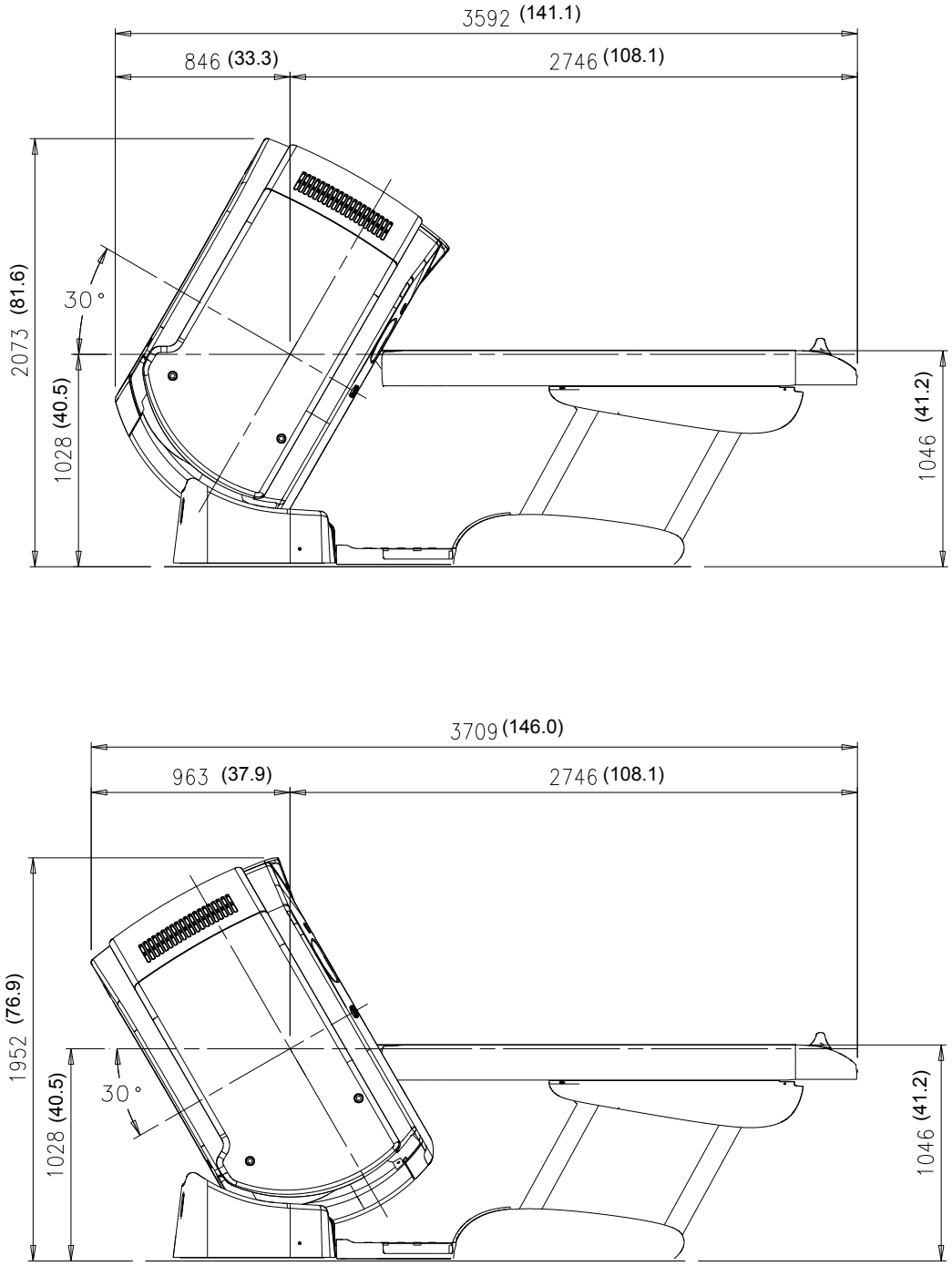

Figure 5-5 Gantry Tilted +30º (top) and -30º (bottom) - GT1700V Table Options

2.4 Table and Gantry Dimensions (with VT2000 Table)

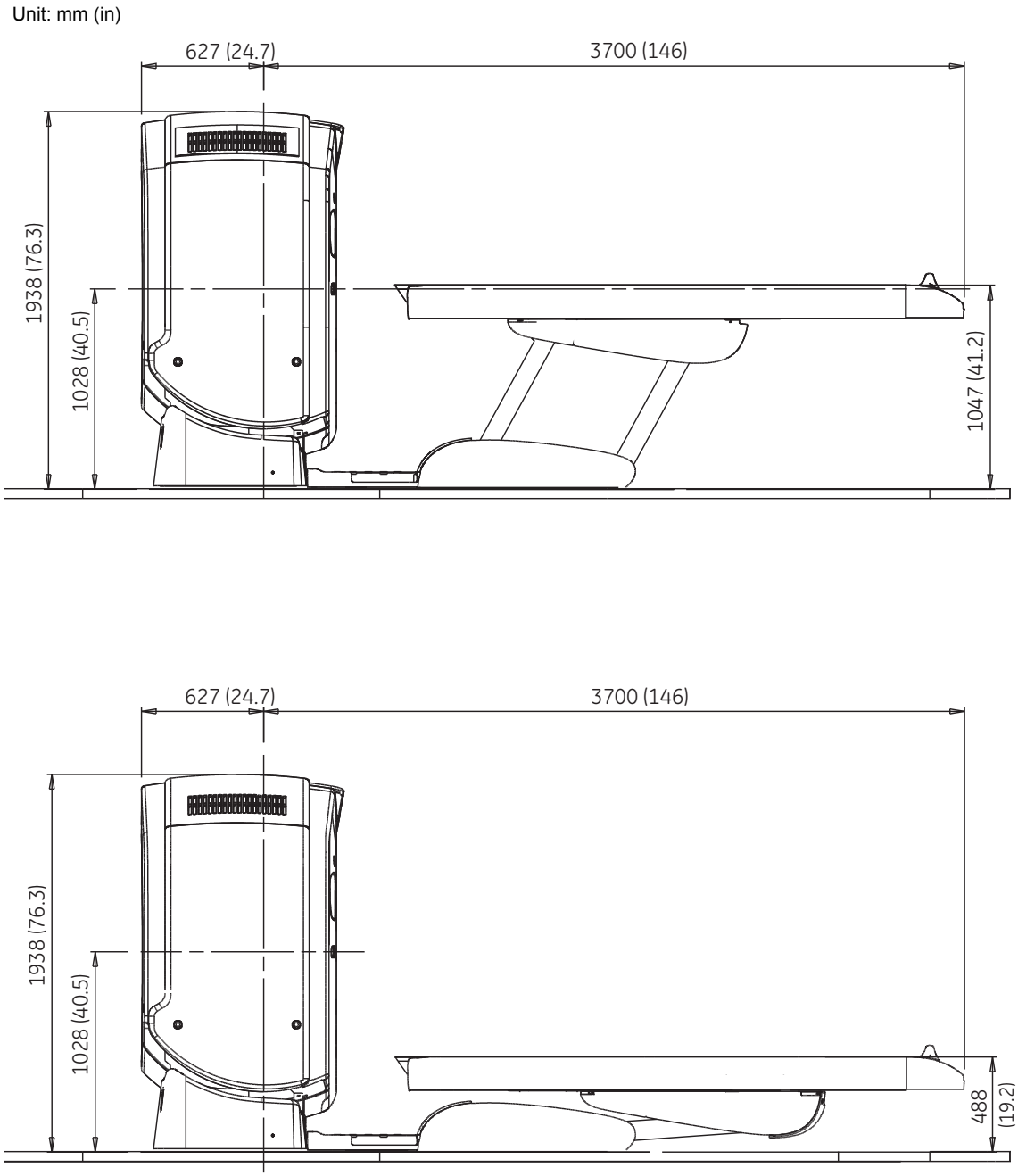

Figure 5-6 VT2000 Table and Gantry (Side View)

Unit: mm (in)

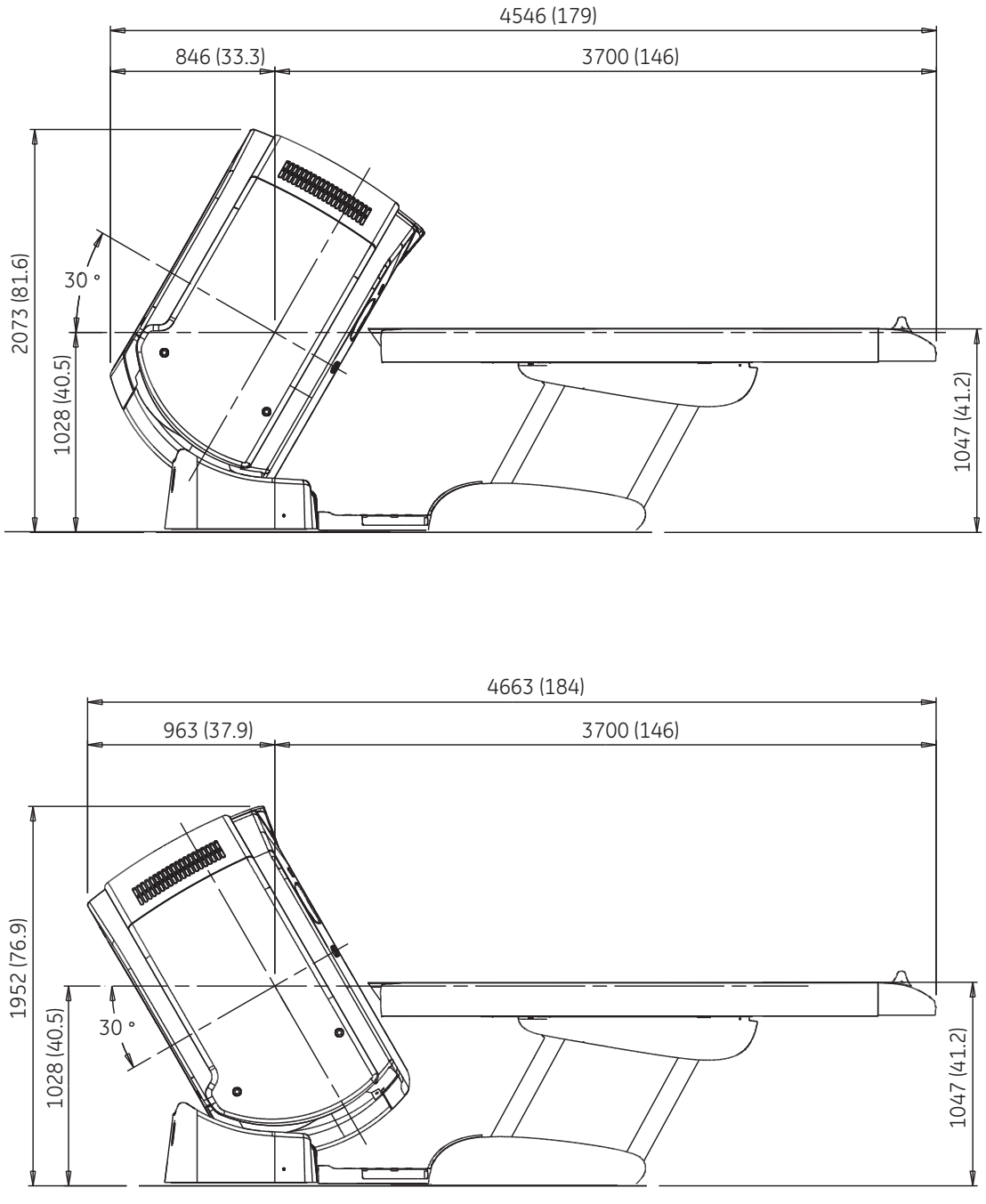

Figure 5-7 Gantry Tilted +30º (top) and -30º (bottom) - VT2000 Table Options

2.5 Power Distribution Unit Dimensions

PDU dimensions, air intake/exhaust, seismic bracket locations, and service areas appear below.

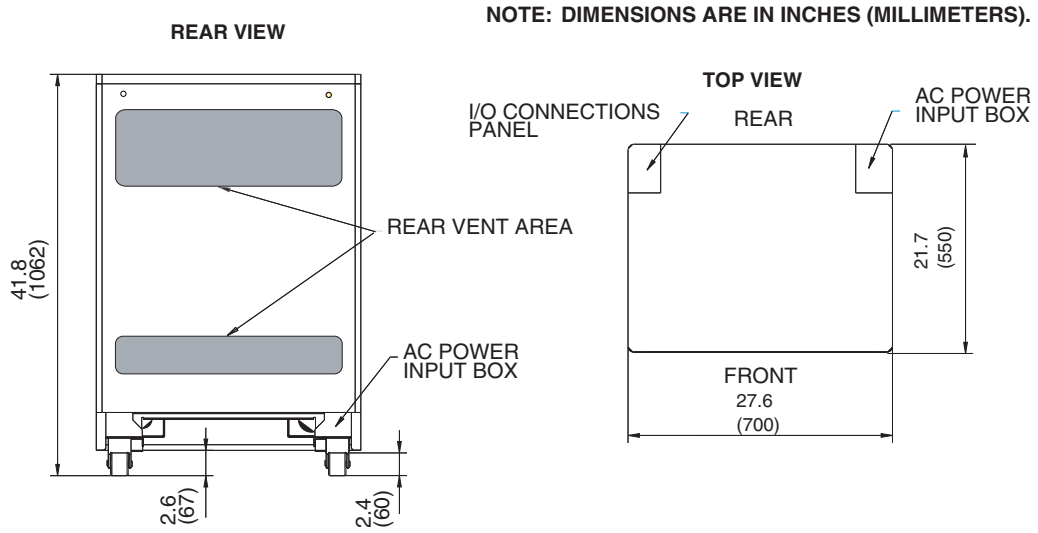

Figure 5-8 Power Distribution Unit

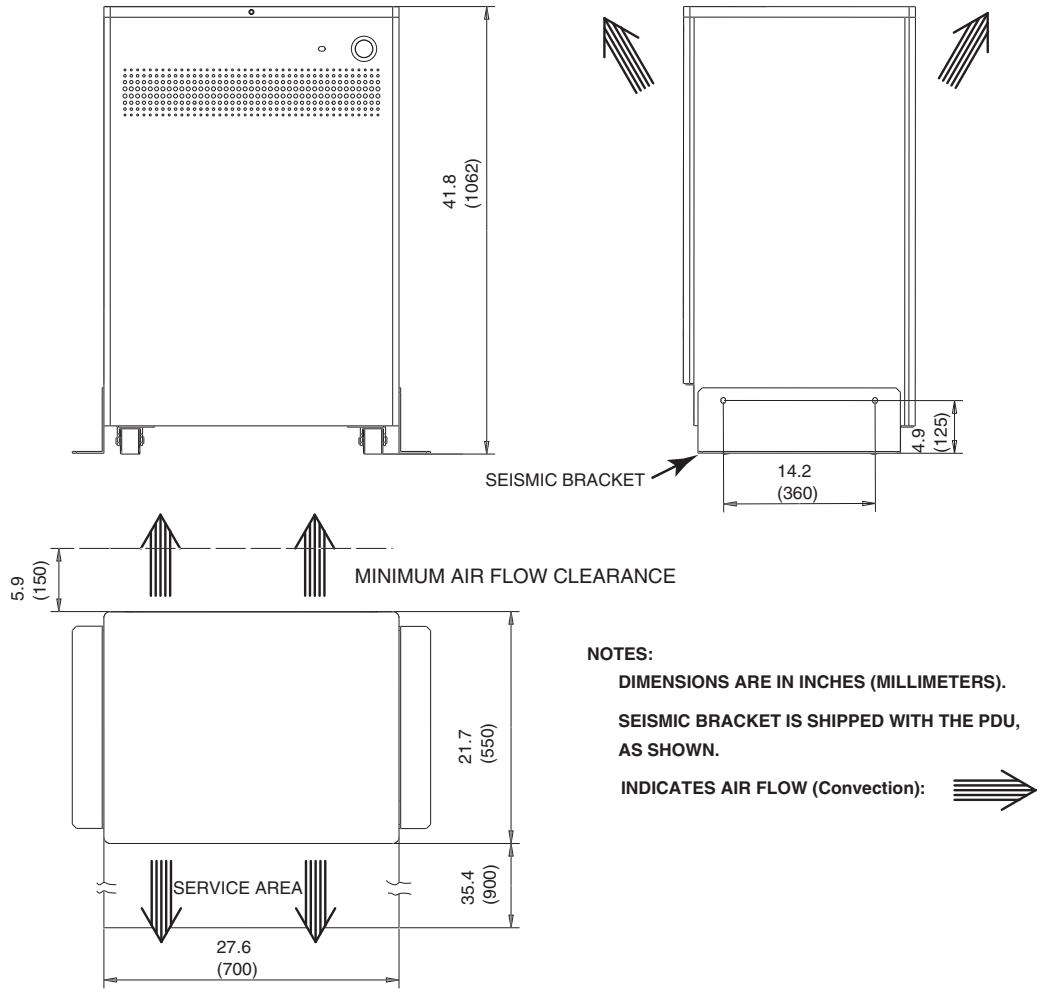

Figure 5-9 Power Distribution Unit

2.6 Console Dimensions

Unit: mm (in)

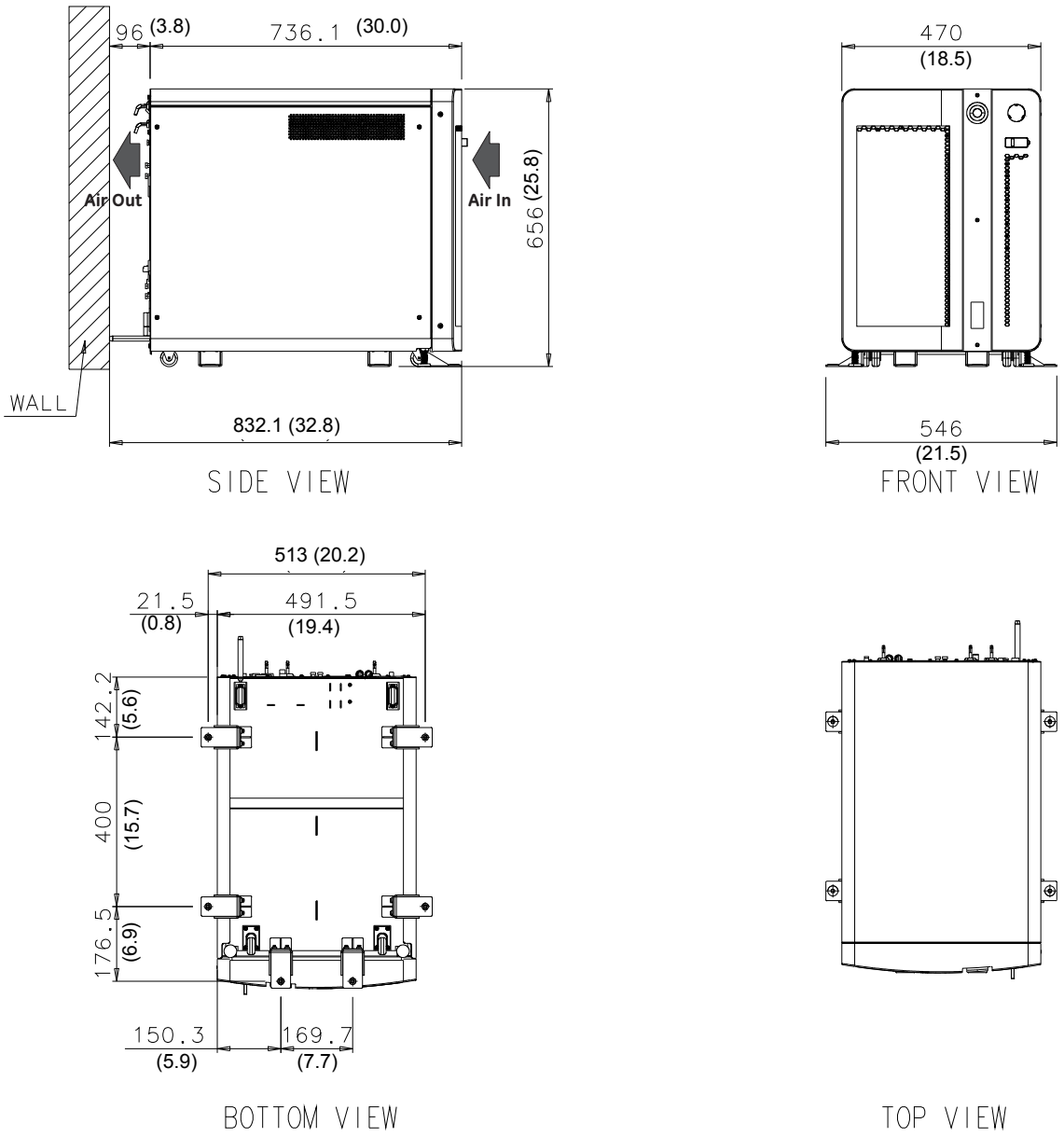

Figure 5-10 Operator's Console

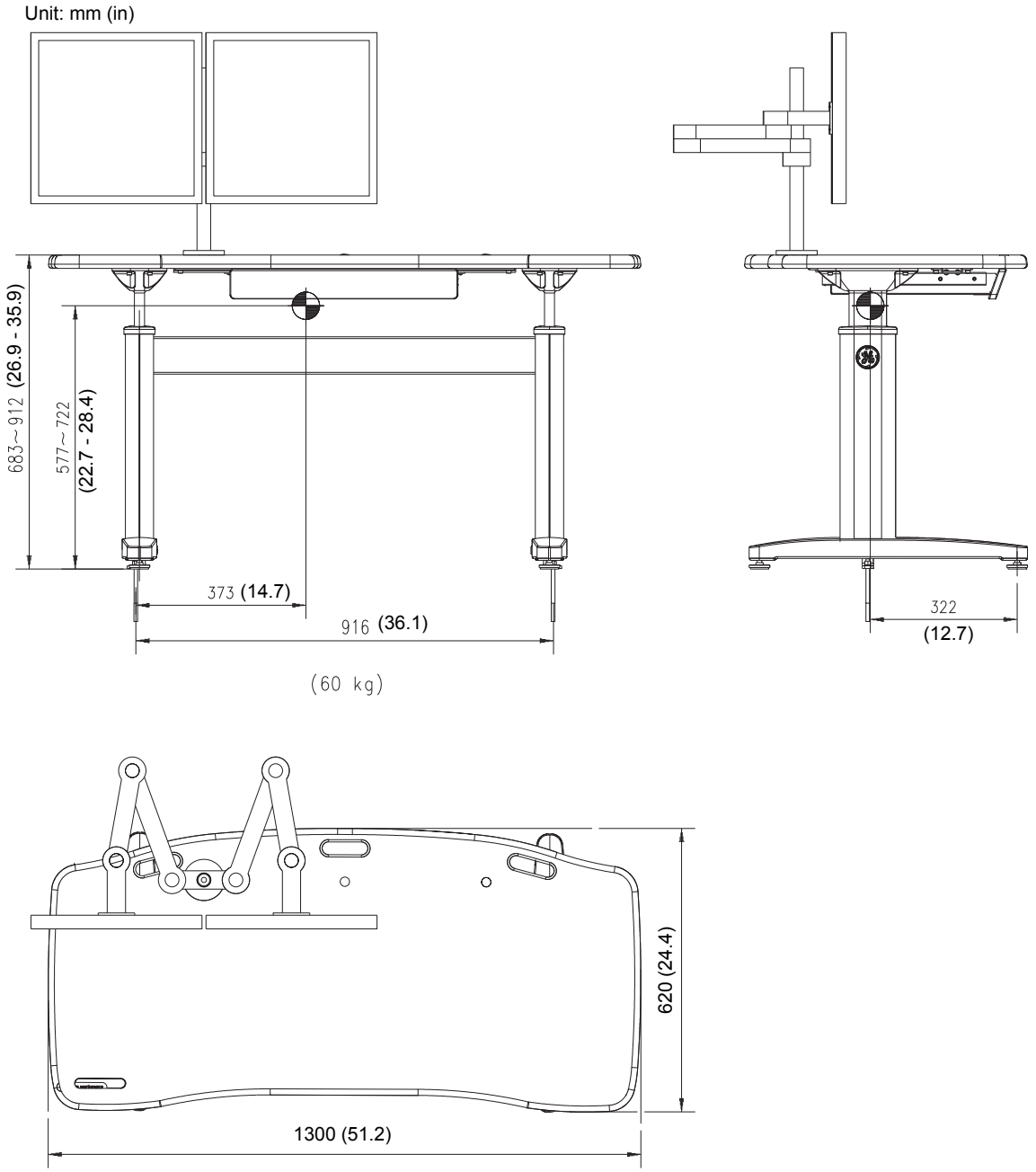

Figure 5-11 Freedom Workspace Table (part 5168666-3)

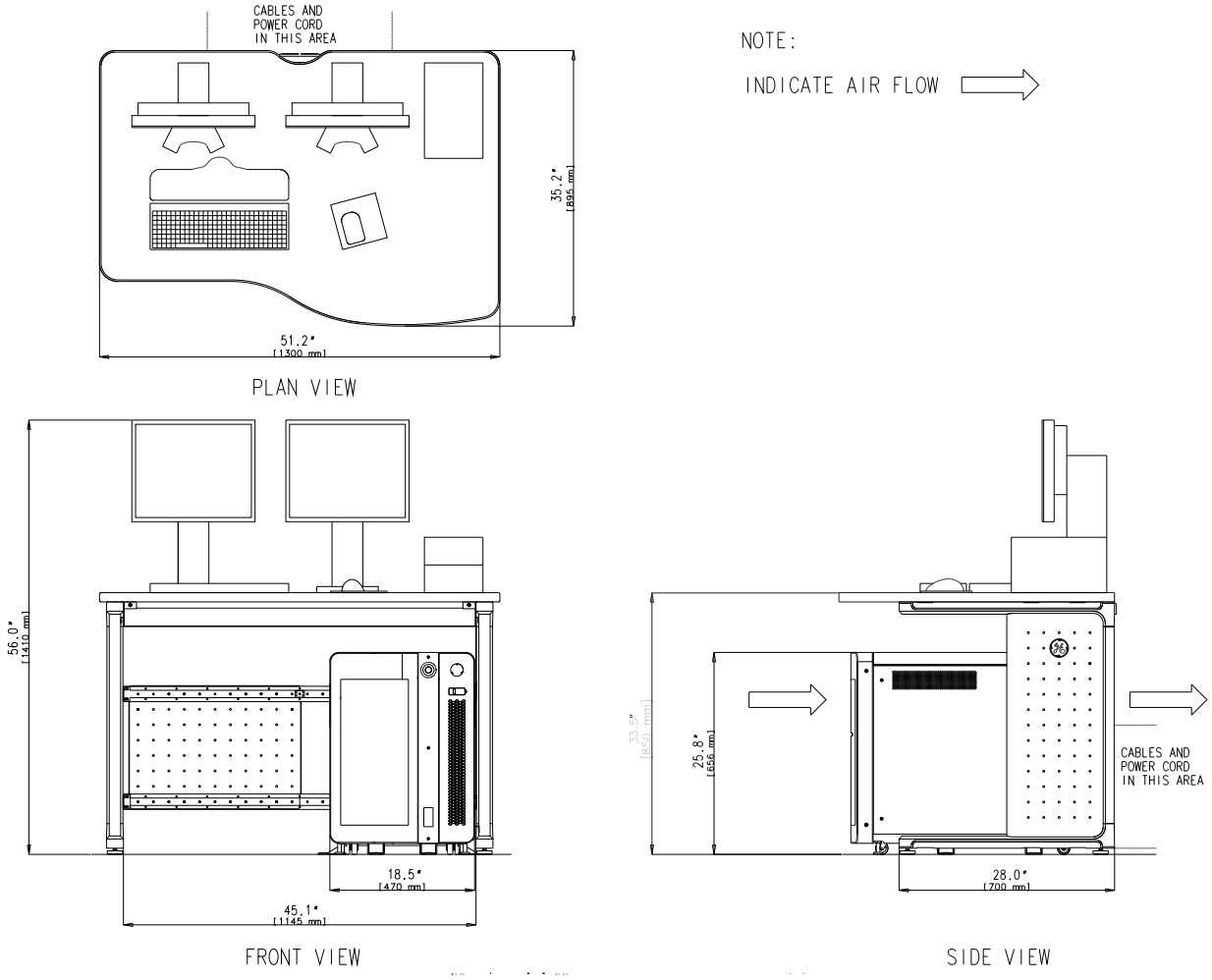

Figure 5-12 Cj Console with Optima Table

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Chapter 6
Service Clearance Requirements

Section 1.0: Service Clearance Requirements

- Sufficient space to remove the covers Figure 6-1.
- One service engineer shall be able to accomplish all service component replacement tasks without needing special tools or equipment.
- ALL room layouts to provide service space and access around the table to the gantry right side. This is needed for replacement procedures that require components that ship in large boxes, such as the tube, detector, and HV tank.

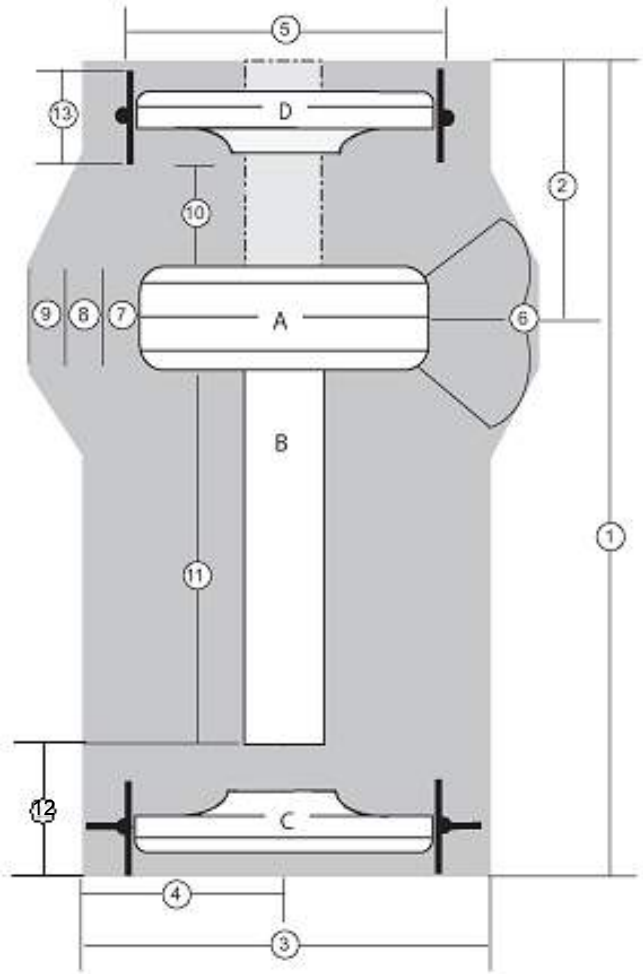


Figure 6-1 Minimum Service Clearances

Minimum Clearances

Item		Dimension
1	GT1700V VT2000 Lite Table	5434 mm (18 ft.) 6657 mm (22 ft) 5179 mm (17 ft.) (travel distance of table)
2	GT1700V VT2000 Lite Table	1712 mm (68 in.) 2016 mm (80 in.) 1537 mm (61 in.) (cover with dolly)
3		2830 mm (112 in.)
4		1415 mm (56 in.)
5		2006 mm (79 in.)
6		914 mm (36 in.) minimum
7		356 mm (14 in.)
8		711 mm (28 in.)
9		914 mm (36 in.)
10		914 mm (36 in.)
11	GT1700V VT2000 Lite Table	2744 mm (108 in.) 3590 mm (141 in.) 2610 mm (103 in.)
12		678 mm (27 in.) *
13		500 mm (20 in.)

* If the gantry front cover is not parked at table rear, the clearance can be reduced to 350 mm (14 in.).

CT Components

Item	Description
A	Gantry with covers installed
B	Table cradle footprint, coverage as extended in both directions
C	Front gantry cover removed with dolly
D	Back gantry cover removed with dolly

1.1 Gantry Service Clearance

Specifications for Boom Assembly clearance arc are defined in . The boom assembly is used during tube and detector replacement. The minimum ceiling height within the clearance radius is 2286 mm (90 in).

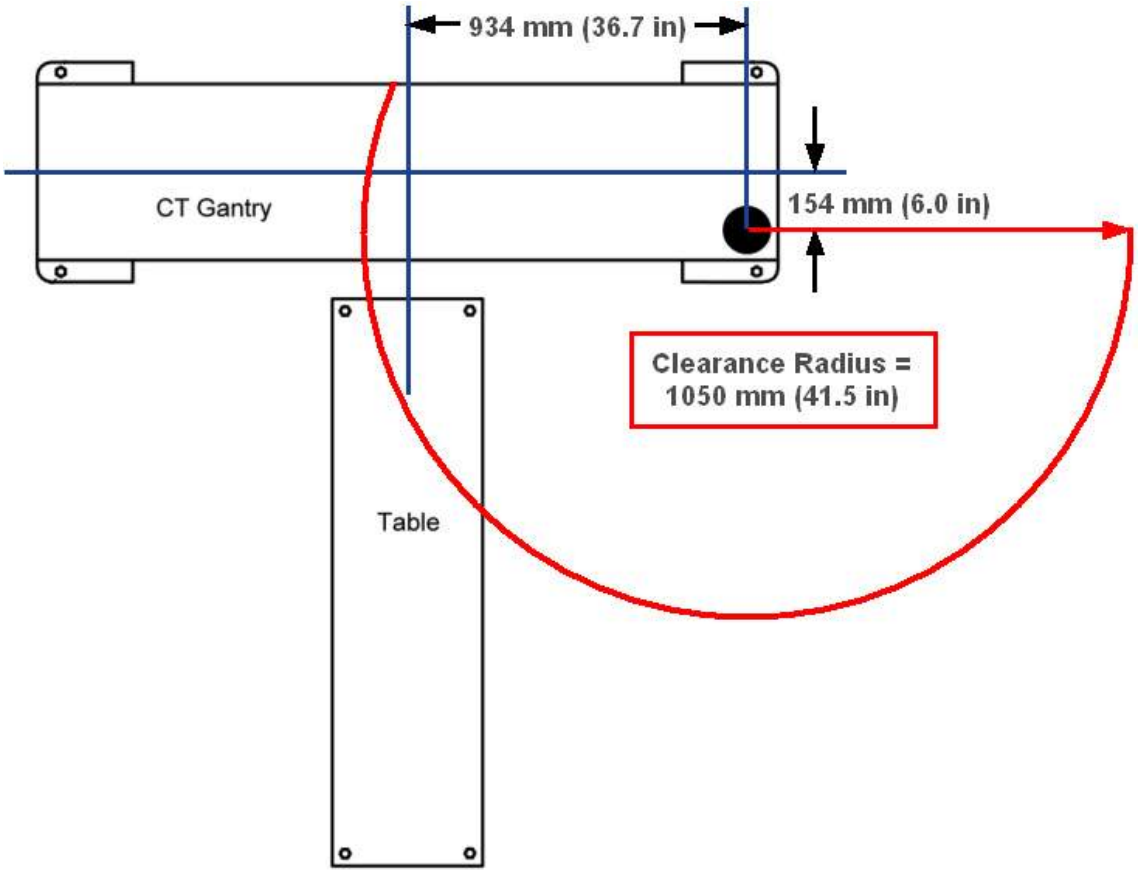


Figure 6-2 Boom Assembly Clearance

Section 2.0: Service Clearances for Single Service Engineer

Note: When calculating service clearances, refer to Figure 6-1 for all service clearance needs.

2.1 Cover Removal

- Gantry front cover removal requires the use of the Tilting Cover Dollies and a minimum clearance space of 2830 mm (112 in.) to maneuver the cover, as illustrated in Figure 6-1. The dollies allow the service engineer to separate the cover from the gantry, tilt it 90 degrees, roll it to the foot end of the table, and then tilt it an additional 90 degrees, so that it is upside-down relative to its normal system-mounted condition. After removal, the service engineer must then move the gantry front cover to a position that satisfies the minimum regulatory clearances.
- The gantry rear cover, with service dollies installed, requires a clearance width of 2006 mm (79 in.) and a depth of 914 mm (36 in.) for removal, as shown in Figure 6-1. Sufficient space to allow the service engineer to move the cover either straight back or to one side of the table to satisfy the minimum service clearances shown in Figure 6-1 must be maintained. The rear cover with dollies cannot extend past the allowable clearance space within the room (see Figure 6-1). If the system is not sited straight (it is positioned diagonally), full service space is still required. The PMI and customer should discuss this consideration and make the necessary provisions.
- The scan room must offer sufficient space to allow adequate egress during service operations that require both front and rear cover removal. If the customer and PMI have any concern that site will not provide adequate space for egress under these conditions, they should discuss these requirements and make the necessary provisions to accommodate this event.
- A single service engineer can safely perform servicing of the table. Ensure sufficient clear space to maintain egress clearances with the table covers or cradle removed.
- A single service engineer can safely perform servicing of the system. Ensure sufficient clear space to maintain egress clearances with covers or cradle removed.
- A tube change box is 700 mm x 1813 mm (28 in. x 6 ft.), with the handles extended. The box rolls like a wheelbarrow and must have access to the right side of the gantry. It is the PMI's responsibility to demonstrate that the tube change box can be positioned in the tube change area next to the gantry and that the front and rear covers can be removed.

2.2 Power Distribution Unit (PDU)

When positioning the Power Distribution Unit (PDU), consider regulatory compliance, as defined in Chapter 6, Section 1.0:, Regulatory Clearances. See Table 4-2 in that section.

2.3 Console

The console does not present an exposed live parts hazard. However, the site shall maintain a working space at all times with a minimum depth of 1219 mm (48 in.), extending the full width of the console for service activity.

The console is on wheels. As some service activities require access to the rear of the console, be sure to maintain sufficient space for moving the console to allow rear service access.

See Figure 7-4 for a typical control room layout.

2.4 Storage Cabinet

GE Healthcare provides a storage cabinet (see Note below) for storing all supplied service equipment (see Table 5-1). Situate this storage cabinet within the scan room suite area to allow easy service access. The dimensions of the cabinet measure 457 mm D x 914 mm W x 1067 mm H; ~ 41 kg (18 in. D x 36 in. W x 42 in. H; ~90 lbs).

Note: A storage cabinet is provided as option (B77292CA).

Item	Size	Weight (total)	
QA Phantom (water filled)	20 cm x 15 cm (7.9 in. x 5.9 in.)	5.5 kg	12 lb
35CM Phantom	35 cm x 7 cm (13.8 in. x 2.8 in.)	8.2 kg	18 lb
Phantom Holder	25 cm x 25 cm (9.8 in. x 9.8 in.)	3.6 kg	8 lb
FE Box (Purple)	30 cm x 38 cm x 30 cm (11.8 in. x 15 in. x 11.8 in.)	6.8 kg	15 lb
Install Support Kit (box)	30 cm x 30 cm x 38 cm	9.1 kg	20 lb
Three Piece Tube Hoist Assembly	77 cm x 8 cm and 38 cm x 15 cm (30.3 in. x 3.1 in. and 15 in. x 5.9 in.)	9.1 kg	20 lb
Balance Weight Kit		33 kg	73 lb
Front Cover Dollies	85 cm x 20 cm and 85 cm x 15 cm (33.5 in. x 7.9 in. and 33.5 in. x 5.9 in.)	15.9 kg	35 lb

Table 6-1 Equipment Stored in Storage Cabinet

Chapter 7
Room Sizes

Section 1.0: Room Dimensions

System Configuration	Minimum Room Size *1
Optima CT660 with GT 1700V Table	5563 mm x 3327 mm (18 ft, 3 in. x 10 ft, 11 in.)
Optima CT660 with VT2000 Table	6223 mm x 3327 mm (20 ft, 5 in. x 10 ft, 11 in.)
Optima CT660 with Lite Table (Japan Only)	5377 mm x 3320 mm (17 ft, 8 in. x 10 ft, 11 in.)
[1]All service/regulatory requirements apply, with the addition of no energized left-side service.	

Table 7-1 Scan Room Size Dimensions

1.1 Minimum Room Size

The minimum room configuration represents the smallest functionally acceptable space for this product and represents the type of room often found at doctor's offices and smaller clinics and outpatient facilities. Due to its limited size, and to functional and regulatory requirements, this room usually provides only LIMITED workspace, and leaves to NO space to add in-room millwork and sinks and still meet the necessary regulatory and service requirements. This room can accommodate the transportation of patients into the scan area using wheelchairs, and provides access for crash carts and other emergency medical equipment on only one side of the table.

Sites considering a minimum room size may not have been designed with the structural requirements necessary to support the system and consequently may require upgrading prior to installation.

Customers considering a minimum room size should discuss their workspace requirements and future upgrade plans with their PMI, as the size and layout of these rooms often eliminates them from any future upgrade considerations and offers NO compatibility with future two-step installations.

If using the square meters (square footage) to determine regulatory compliance, please note that the front and rear cover clearances are wider than the regulatory clearance along the table length, and that the cover park position is behind the table in the home position.

Note: Sites must provide sufficient space to allow the removal of the rear cover, which is on wheels, from behind the gantry during service operations.

⚠ **CAUTION** Operational Caution: In a minimum room layout, the customer should consider workflow, customer access for patient care, and critical-care operations space requirements. Additionally, this room provides only limited equipment access on the gantry left side when loading patients or when positioning patient equipment in the room between the gantry and the wall.

Section 2.0: Minimum Room Layouts

This room layout provides less than 711 mm (28 in.), but greater than 356 mm (14 in.) of space on the gantry left side, measured from covers to left-side wall, compromising service, egress, and workspace on the gantry's left side.

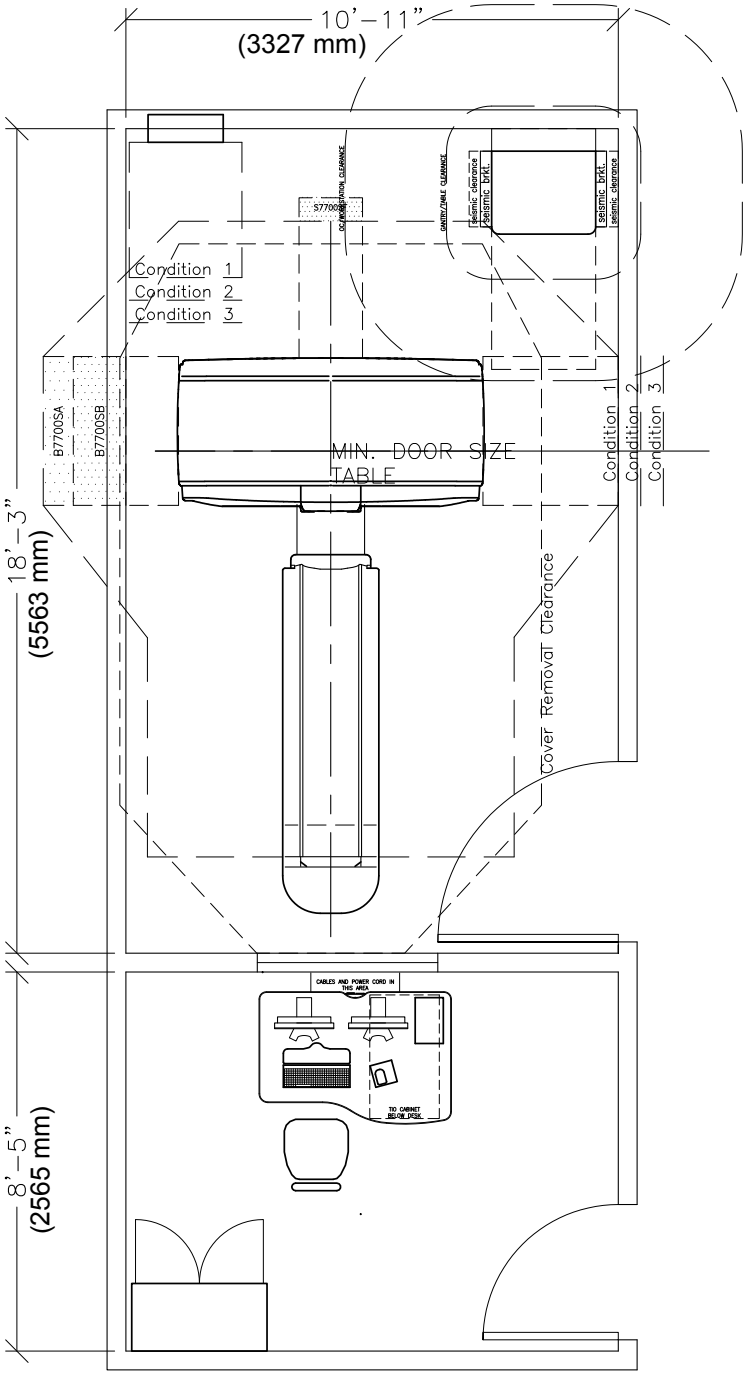


Figure 7-1 Minimum Room Size for Optima CT 660 w/ GT1700V Table

Note: This minimum room size does not allow for the UPS option or Surface mounted floor duct.

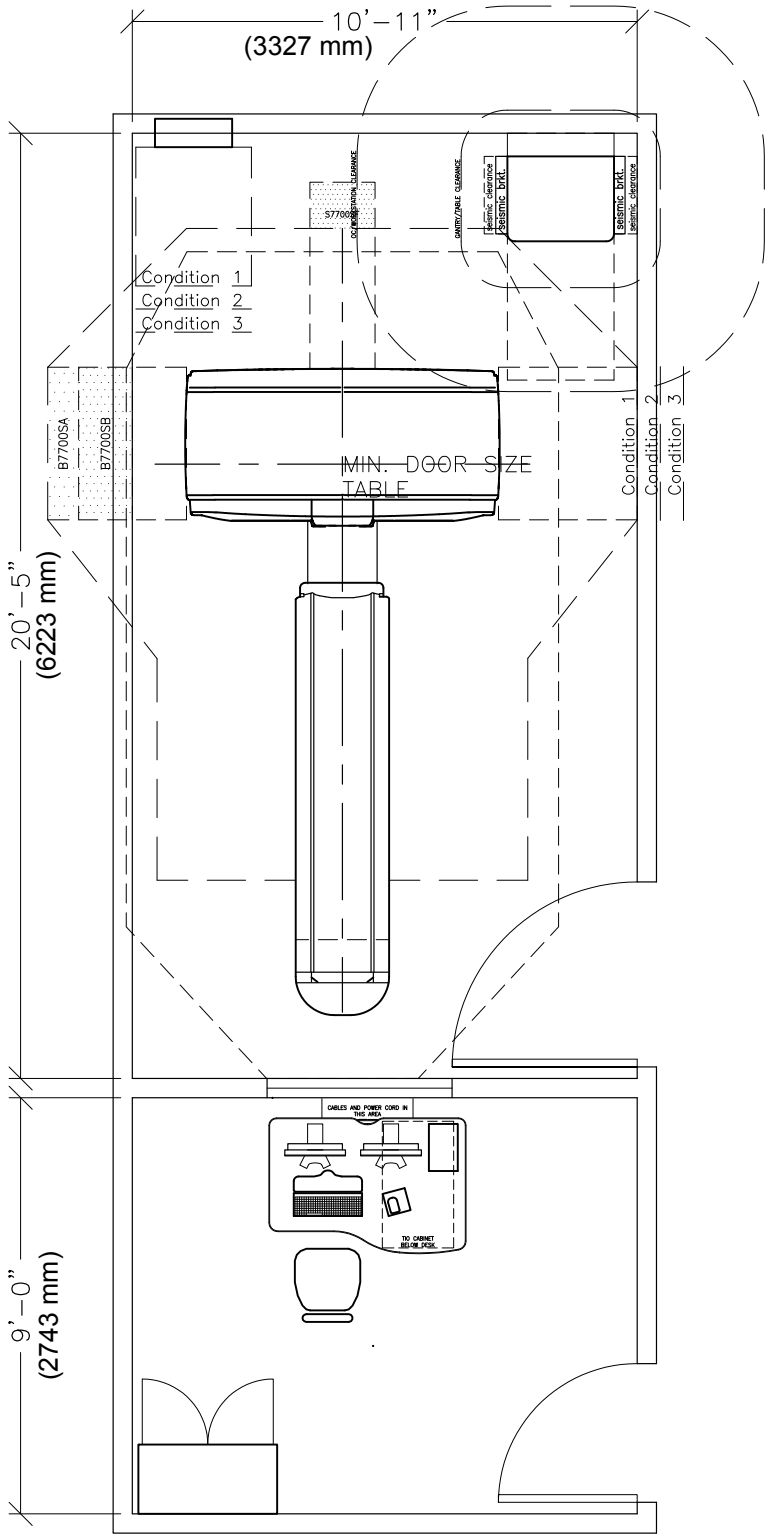


Figure 7-2 Minimum Room Size for Optima CT 660 w/ GT2000V Table

Note: This minimum room size does not allow for the UPS option or Surface mounted floor duct.

Section 3.0: Short Footprint Considerations

If the site room length cannot satisfy the requirements for standard mode. Short Footprint mode can be considered. (VT2000 Table does not have Short Footprint mode.)

The Short Footprint mode limits the distance of the cradle travel so that cradle does not collide with the wall behind Gantry. The scannable range is limited accordingly.

The Short Footprint features are as follows:

- Cradle Movement limitation can be set at any position.
- Table height limitation cannot be set.
- Scannable range depends on the Gantry Rear space (distance to the wall), but need to consider the Service Clearance and country's local regulation for Gantry Rear space.

3.1 Instruction of using Short Footprint function

NOTICE Cradle limitation must comply with country or local regulatory clearance requirements.

Cradle movement limitation set by short footprint mode must be approved by customer during pre-installation.

1.) Refer to Figure 7-3, use floor template with ruler to prearrange the layout and calculate the cradle scannable limitation (A).

2.) Make GE siting print to meet regulatory and service clearance requirements.

3.) Record the distance from cradle limitation to wall (X) and cradle scannable limitation (A) for installation.

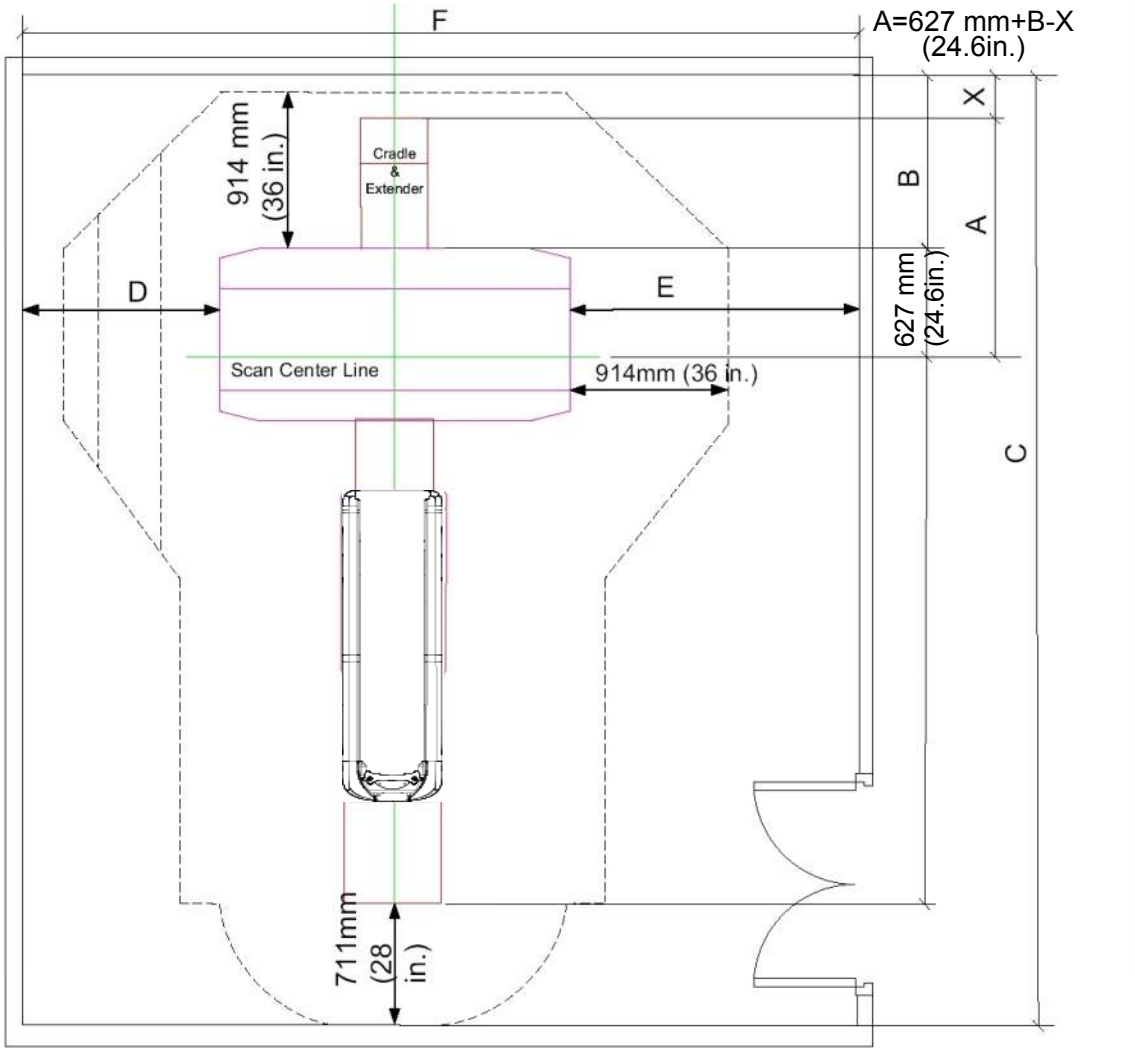


Figure 7-3 Short Footprint Calculation diagram

A: Cradle Scannable Limitation, the value to be set using Short Footprint function

A(Scannable Range(approx.)) = 627mm (24.6in.) (Scan Center Line to Gantry Rear Cover) + B(Gantry Rear Cover to Wall) - X(Safety Clearance to prevent hitting cradle to wall).

B: Gantry rear cover to wall, no less than 914 mm (36 in.)

C: Room Length

D: Gantry left side to wall, no less than 356mm (14 in.). Refer to Section 3.0 for details about Limited Access.

E: Gantry right side to wall, no less than 914 mm (36 in.).

F: Room Width

X: Distance from cradle limitation to wall.

⚠ **NOTICE** It is suggested that safety clearance from cradle IN-limit to wall should be no less than 150 mm.

Section 4.0: Control Room Considerations

- The control room must provide an operating environment suitable for the console electronics and the operator's working comfort. See Chapter 9, Environmental Requirements.
- As the console requires adequate venting, maintain 96 mm (4 in.) of clear, unobstructed space on all sides of the console to allow the four fans located on the rear of the console to exhaust air to both the left and right.
- Provide a suitable work area within reach of the console for the placement of the injector control. Injector controls differ in dimensions depending on the brand selected.
- A PACS, workstation, image printer, or filming device may appear in the console control room area. These devices or other components, though having a direct link to the console via network or ethernet cable, shall NOT receive power from the console (if outlets exists on the console). If you are using additional devices or components, consider additional room power and network connections when reviewing the console workspace.

4.1 Typical Control Room Layout

4.1.1 Console Considerations

- The console must remain in the same configuration as shipped. Do not dismantle the console, or remove or rearrange its components.
- Cable lengths must remain as shipped (cables cannot be cut or extended to mount the monitor on the customer's counter).

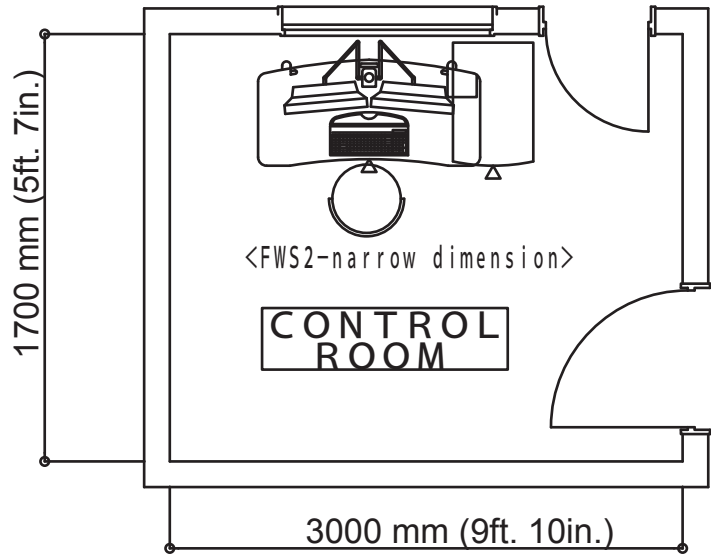


Figure 7-4 Typical Control Room Layout (Console with FWS Table)

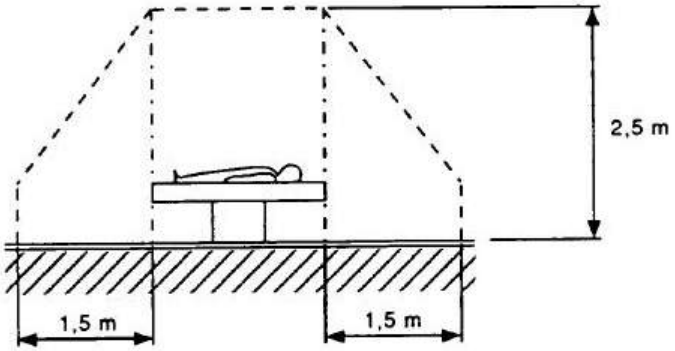
4.1.2 RIO Long Cable Option

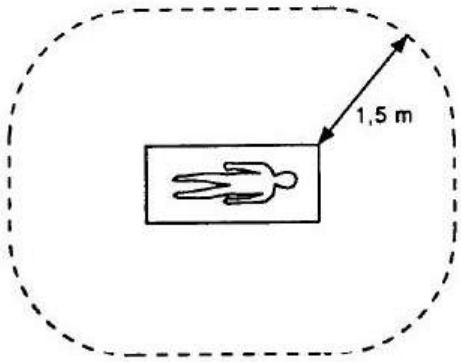
RIO console cabinet can be placed approximately 3 meters away from LCD monitor, SCIM and keyboard by using RIO Long Cable Option.
Refer to RIO Long Cable Option Installation Manual (Direction 5400875-1EN) for the details.

NOTICE **Do not install the RIO console cabinet in the scan room. CT console is classified as an information technology equipment which is not allowed to be placed in the scan room by IEC (international Electrotechinical Commission).**

Section 5.0: Patient Environment

The patient environment is defined as the following picture.





IEC 2513/2000

Only Scanning Gantry, Patient Table components and the following options can be placed in this area.

- Advantage 4D
- In room monitor
- SmartStep
- Extream Injector

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Chapter 8
Structural and Mounting Requirements

Section 1.0: Overview

1.1 Importance of Meeting Structural Requirements

System performance specifications require close consideration of the customer's floor properties. The information in this chapter provides critical information and guidelines that the customer or PMI should communicate to the architect, structural engineer, and contractor prior to construction or renovation. Failure to properly evaluate the customer's floor and ceiling properties may result in limited performance and possible safety hazards.

1.1.1 Levelness, Vibration, and Floor Loading

All floors, whether configured to use the recommended GE-supplied anchoring system or an equivalent anchoring method, must meet the requirements for LEVELNESS, VIBRATION, and FLOOR LOADING listed in Section 3.0: on Page 80.

1.1.2 Seismic Loading

Local laws and building codes in some areas may require the customer's contractor and structural engineer to consider seismic loads. Section 6.0: on Page 89 provides the information necessary for the customer's contractor and structural engineer to complete the proper seismic calculations.

1.1.3 Anchoring

Section 5.0: on Page 85 lists the information necessary for the customer's contractor or structural engineer to properly implement the GE-supplied anchoring system, if appropriate for the site. Please note that local laws, building codes, seismic considerations, and building or structural limitations may require the use of anchoring methods other than the GE-supplied anchoring system. In such cases, responsibility for providing an equivalent anchoring method rests solely with the customer's contractor or structural engineer.

Consult your architect, structural engineer, contractor, or PMI to resolve any questions.

⚠ **NOTICE** Responsibility for providing an approved support structure and mounting method for all floor types, other than those listed in this chapter, rests with the purchaser. General Electric accepts no responsibility for any failure of the support structure or anchoring method, including seismic mounting and anchoring. GE accepts no responsibility for methods other than those listed.

Section 2.0: Ceiling Requirements

The minimum ceiling height above the table and gantry shall measure at least 2286 mm (90 in.) or the minimum distance allowed by local laws and codes, whichever is greater, when measured from the floor to the finished ceiling or to the ceiling pedestal mounts of any ceiling-mounted components. The purchaser or their contractor shall complete the installation of all pedestals for ceiling-mounted components. The PMI will provide the necessary bolt hole information upon request.The support structure for a ceiling-mounted option using a Mavig pedestal, requires a flush ceiling mounting

plate. This flush ceiling mounting plate must be designed by a structural engineer and installed by a qualified contractor prior to the system installation.

Note: A finished ceiling is required.

2.1 Mounting Plate

The pedestal-ceiling mount requires a flush ceiling mounting plate that is structurally supported to handle the weight of the load as shown in Figure 8-1. You can order a Mavig-designed ceiling plate (p/n E8007PJ / E8004NG). This 356 mm x 356 mm (14 in. x 14 in.) plate has pre-drilled 1/2 in. mounting holes in each of the four (4) mounting corners. It can be used for GE approved injector or Remote monitor.

Note: Some options may require different option plates than those listed below. Refer to the options install manual to determine which plate is required.

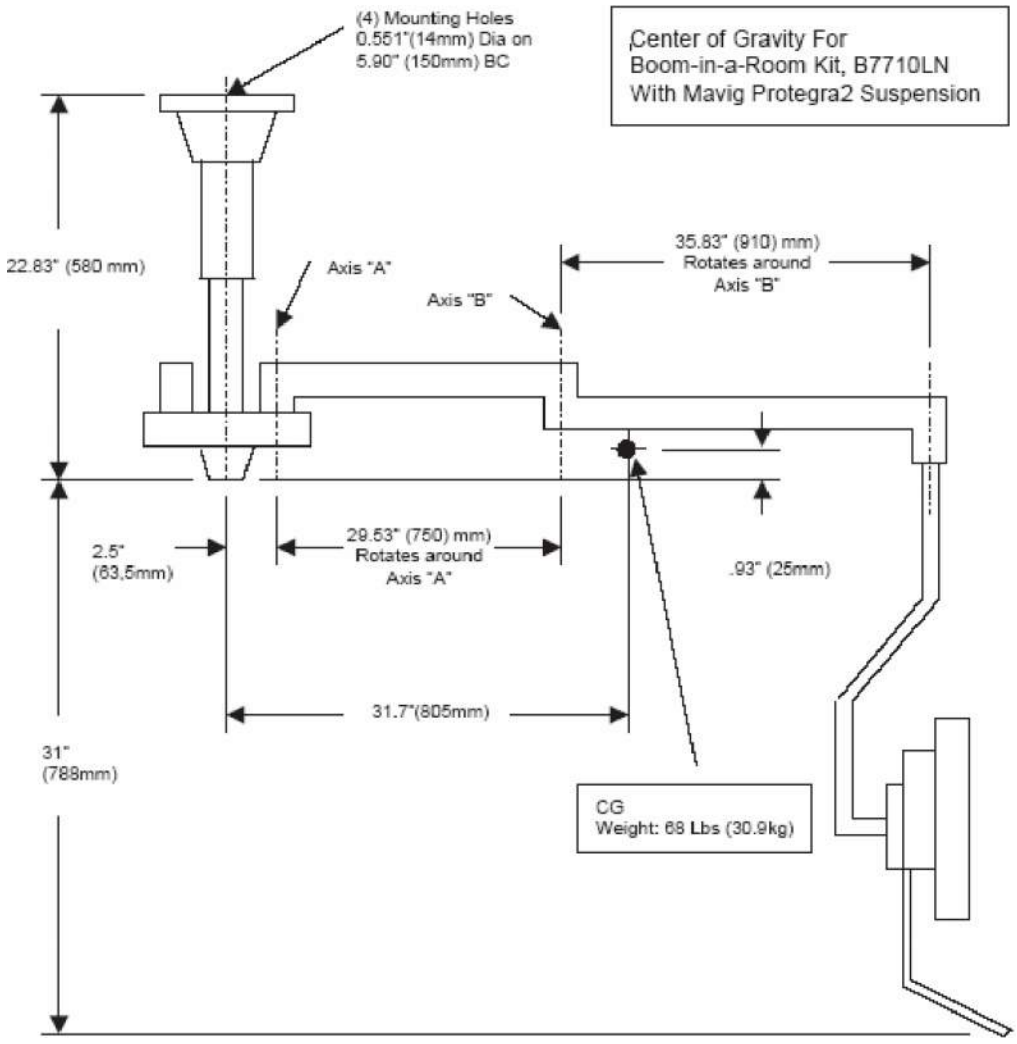


Figure 8-1 Center of Gravity for Boom-in-a-Room Kits, shown on the site print

If a structural contractor designed an equivalent plate, use the supplied template to drill the required four 0.39 in. holes in a pattern as shown in Figure 8-2. An additional 0.32 in. hole is required for the pedestal-ceiling mount safety chain.

Detailed instruction for hole size and a template is available from Mavig or in their Portegra Installation Manual. Refer to Figure 8-2.

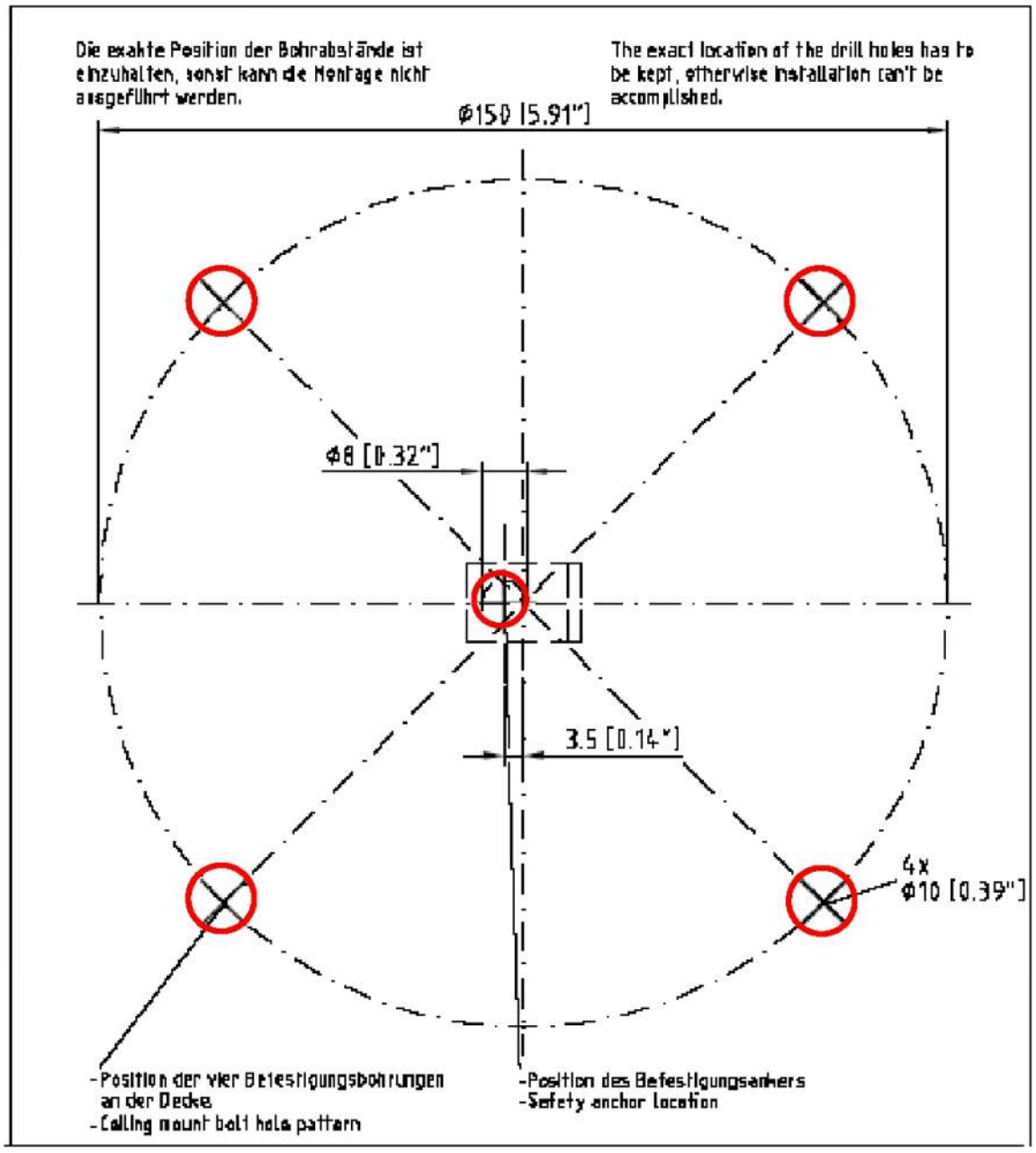


Figure 8-2 Mounting hole pattern for Mavig ceiling pedestal base

2.2 Pedestal Length Requirement

The pedestal-ceiling mount assembly must be installed at least 2134 mm (84 in.) from the lowest point to the finished floor.

2.3 Electrical Box Requirement

A 152 mm x 152 mm x 102 mm (6 in. x 6 in. x 4 in.) or equivalent ceiling box is required to be flush mounted next to the ceiling plate. There should be two (2) conduits exiting into the box and the box grounded to the mounted plate. The electrical box cover plate must be flush mounted to the finished ceiling and with provision to add a 102 mm x 102 mm (4 in. x 4 in.) centered GE-supplied electrical cover plate.

Note:
- Additional mounting information is available on the Mavig website. Refer to the Protegra 2 Installation manual.
- Seismic information is also available on the same website.

Section 3.0: Minimum Floor Requirements

3.1 Floor Levelness Specifications

3.1.1 Critical Specifications

Accurate patient positioning during scanning depends on proper alignment of the gantry and the table. The floor levelness specifications in Table 8-1 ensure that the table and gantry height adjusters have enough range to allow proper leveling of the system.

Specification	Metric (minimum)	English (minimum)
Levelness	6 mm maximum variance over 3048 mm	1/4 in. maximum variance over 10 ft

Table 8-1 CRITICAL SPECIFICATIONS for Floor Levelness

3.1.2 Floor Levelness Guidelines

Consider the following factors when determining floor levelness:

- Factors that can disturb the levelness of a weak floor, including:
  - Moving weights such as gurneys or heavy personal equipment.
  - Changes in the system's center-of-gravity when the table moves, as the table can carry a patient load of up to 227 kg (500 lbs).
- Resilient tile, carpeting, or equivalent that may yield or compress over time. At sites with such floor coverings, be sure to cut away the tile or carpeting where the table and gantry adjusters touch the floor to expose the stable base material upon which to seat the adjusters.
- Floor shims are NOT PERMITTED.
- Refer to the steps listed in Section 3.1.3 and to Figure 8-3 to check whether the floor of the scan suite meets the floor levelness specifications for the system.

3.1.3 Measuring Floor Levelness

1.) Using the GE Floor Template (GT1700V/VT2000: P/N 5341997-2, Lite Table: P/N 5193991) to establish the room layout and system location, locate the table and gantry anchor holes.

Note: To order a GE Floor Template (GT1700V/VT2000: P/N 5341997-2, Lite Table: P/N 5193991), contact the GE Project Manager of Installation.

2.) Place the gantry template on the floor and align it according to the GE site print.

3.) Place the table template over the top of the gantry template, and align the scan and table centerlines.

4.) Secure the templates to the floor.

5.) Use a laser to check the levelness of the floor across the entire area covered by the template,

as shown in Figure 8-3.

Note: If the floor is not level, your system cannot be properly aligned.

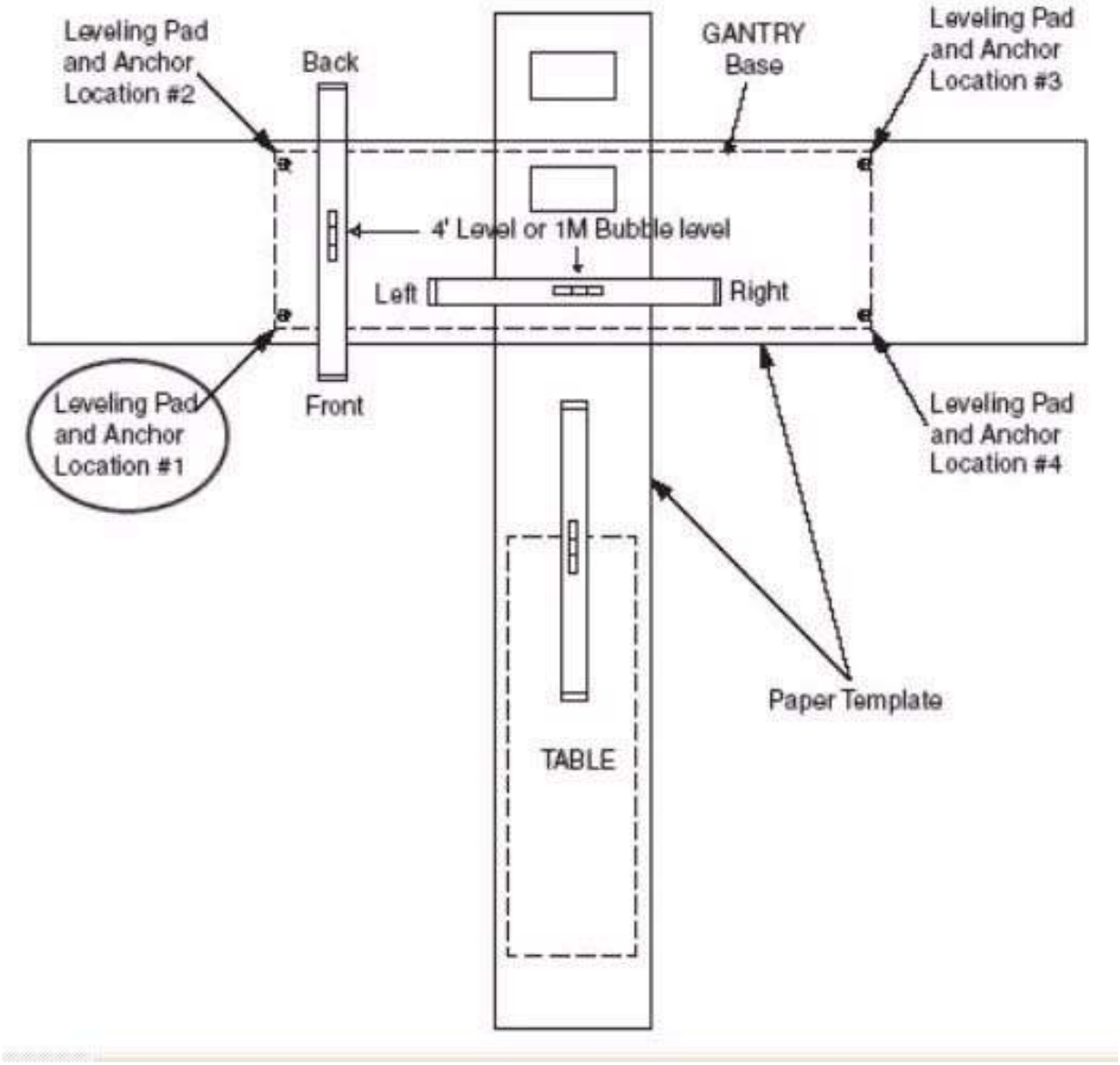


Figure 8-3 Determining Floor Levelness

3.2 Walls

3.2.1 Scan Window

The recommended patient viewing window dimensions are 1219 mm wide x 1067 mm high (48 in. x 42 in.). The location of the window is dependent on the position of the operator workspace position. Consult Chapter 10, Radiation Protection Requirements and a qualified radiological health physicist for radiation protection requirements of the window glass (lead content and thickness).

Note: The operator at the operator workspace must be able to view the patient during a scan.

3.3 Floor Vibration Specifications

3.3.1 Requirements

CT systems are sensitive to vibration and may display limited performance if exceeding the vibration limits listed below. The band of frequencies in which systems exhibit the most sensitivity appears at or near the resonant frequencies of the gantry and the patient table, the latter of which varies depending on patient mass and location. These frequencies fall within the following ranges:

- Patient Table: 2 - 10 Hz
- Gantry: 8 - 14 Hz

Floor vibration from any intermittent or continuous source, such as walking, running, exercising, mechanical equipment, and traffic, must not exceed the levels shown in Figure 8-4 or Figure 8-5, as represented by the solid line labeled CT system/Table. These figures compare this limit to the limits of what the AISC (American Institute of Steel Construction) and the ISO (International Organization for Standardization) call Class A (VC-A) and Class B (VC-B).

Note: In Figure 8-4 and Figure 8-5 the symbol μ represents 10^{-6}.

The preferred format for measuring vibration is velocity versus frequency, as shown in Figure 8-4. However, should it prove necessary to measure acceleration and there is no means to convert the measured data to velocity, then use the equivalent acceleration limit shown in Figure 8-5, derived from the velocity spectrum.

Frequency [Hz]	Acceleration [mm/s^2, rms]
4	2.5
10	2.5
12.5	3.1
16	5
80	25

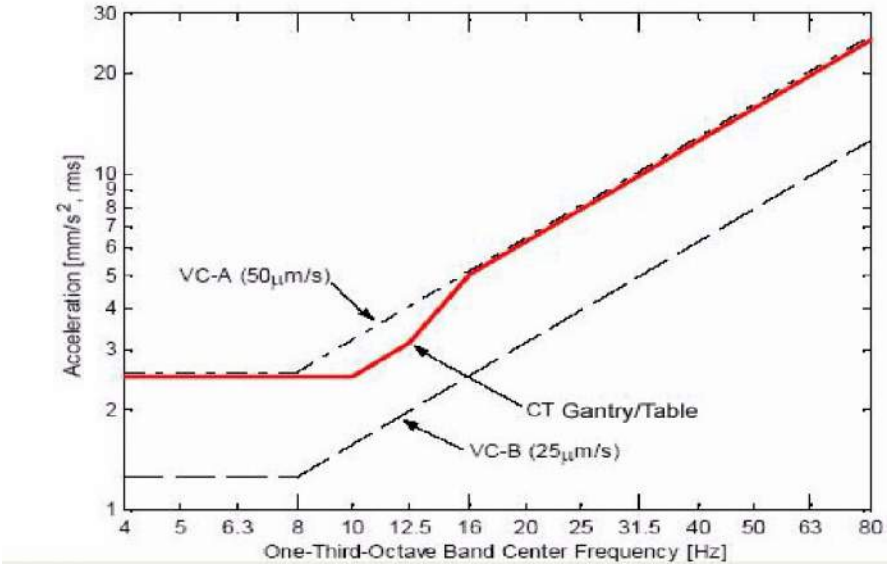


Figure 8-4 Allowable floor vibration in velocity units compared to ISO class A & B limits

Frequency [Hz]	Velocity [µm/s, rms]
4	100
10	40
12.5	40
16	50
80	50

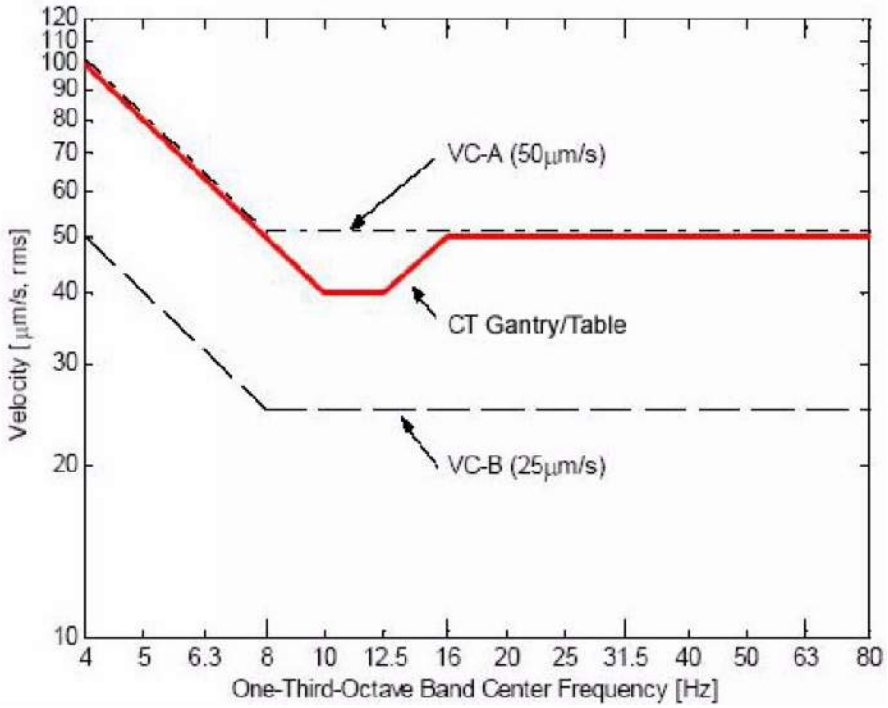


Figure 8-5 Allowable floor vibration in acceleration units compared to ISO class A & B limits

3.3.2 Sources of Floor Vibration

Consider that vibrations strong enough to affect the floor may emanate from the following sources in and around the scanning facility, requiring possible isolation of the floor or structure from them:

- Hospital power plants housing pumps, motors, air handling equipment, or air conditioning units
- Hallway foot traffic
- Elevators
- Parking lots
- Roadways
- Subways
- Trains
- Heliports

Section 4.0: Floor Loading and Component Weights

The customer's contractor and structural engineer should use the information in Table 8-2 to help determine if the floor structure in the scan suite possesses sufficient strength to support the weight of the system.

System Component	NET Weight kg (lb)	Overall Width x Depth mm (in.)	Max Uplift Load N (lb)[2]	Max Compressive load N (lb)	Supports mm (in.)
Gantry	1810 (3990)	2050 x 1039 (81 x 41)	0	4588 (1031)	Four round 64 mm (2.5 inch) pads in rectangular pattern.
Dollies (each)	114 (250)		0	4588 (1031)	
VT2000 Table *with 227 kg(500 lb) patient*	710 (1566)	650 x 2910 (25.6 x 114.5)	1455 (327)	5210 (1170)[1]	Four round 64 mm (2.5 inch) pads in rectangular pattern.
GT1700V Table *with 227 kg(500 lb) patient*	707 (1559)	650 x 2370 (25.6 x 93.3)	1455 (327)	4745 (1067)[1]	Four round 64 mm (2.5 inch) pads in rectangular pattern.
Lite Table *with 205 kg(450 lb) patient*	525 (1157)	650 x 2347 (26 x 92)	2358 (530)	4972 (1118)[1]	Four round 50 mm (2 inch) pads in rectangular pattern.
Power Distribution Unit	370 (816)	711 x 559 (28 x 22)	0	1070 (240)	Four casters
Console	80 (176)	470 x 736 (19 x 29)	0	318 (71)	Four casters
Monitor - LCD (each)	9 (20)	420 x 247 (16.5 x 9.7)			
Freedom Workspace (P/N 5168666-3)	44 (97)	1300 x 620 (51 x 24)			
Optima desk	57 (126)	1300 x 895 (51.2 x 35.2)			

[1]**Note:** Loads provided for table support with patient in worst-case-scenario positioning.

[2]**Note:** Indicates maximum load for one anchor bolt.

Table 8-2 Optima CT660 Component Weight and Floor Loading Data

4.1 Floor Loading and Anchoring Guidelines

Follow the floor loading and anchoring guidelines below when preparing a site for system installation:

- The table and gantry require secure anchoring to the scan room floor. The power distribution unit and the console sit on the floor with casters; anchoring of these components to the floor is optional, unless required because of seismic considerations.
- For total floor load of a Optima CT660 with a GT1700V/Lite/VT2000 table and no UPS refer to Table 8-2.
- When carrying the heaviest possible patient, the table-gantry-footswitch assembly represents a concentrated load within the scan room. Refer to Table 8-2 for total weight.
- Anchors mount through the table and gantry supports. Use the floor template or its dimensions to locate the table and gantry support positions within the scan room, making sure that any anchors that pass through the supports clear all structural beams and interferences in the floor.
- If a loading analysis determines that the gantry and table position should change relative to their position on the GE site print, be sure to take into account the clearance requirements in Chapter 4, Regulatory Requirements and Chapter 6, Service Clearance Requirements when determining an appropriate location for the system.
- Hospitals and scanning facilities throughout the world may utilize a variety of floor types, and the disposition of different floor types may necessitate additional planning to adequately accommodate the system:
  - Wood floors often require substantial reinforcement. GE does not recommend using wood floors.
  - Temperature variation in blacktop or marble floors may allow anchor movement and pullout. GE does not recommend using these floors.
  - GE recommends using concrete floors with a minimum thickness of 102 mm (4 in.) for Gantry, GT1700V and VT2000 Table and 110 mm (4-1/3 in.) for Lite Table, when using GE-supplied anchoring or any other equivalent anchoring method.

NOTICE Responsibility for providing an approved support structure and mounting method for all floor types other than the GE-recommended floor rests with the purchaser. General Electric accepts no responsibility for any failure of the support structure or anchoring method, including those used for seismic mounting. GE accepts no responsibility for methods other than those listed.

Section 5.0: GE-Supplied Anchoring

GE supplies anchors for mounting the table and gantry. The console and power distribution unit do not require anchoring to the floor. It is the responsibility of the customer to have a structural engineer and trained contractor use either the GE-supplied anchoring method or to provide an equivalent anchoring method to mount the table and gantry to the floor.
Consult your architect, structural engineer, contractor, or PMI to resolve any questions.

WARNING **POTENTIAL FOR PATIENT INJURY!**

AN IMPROPERLY SECURED TABLE MAY TIP, DISLODGING THE PATIENT. PATIENT SAFETY DURING SYSTEM OPERATION REQUIRES PROPER ANCHORING OF SYSTEM COMPONENTS.

5.1 Specifications of GE-supplied Anchors

Table 8-3 lists the specifications of GE-supplied anchors for the system. For a detailed view, including dimensions and additional specifications, see Figure 8-6 and Figure 8-7 of this section.

GE-Supplied Anchors	Gantry/GT1700V/VT2000 Table	Lite Table
Part Number	2106573	2106573-3
Description	Hilti Kwik Bolt 2	Hilti Kwik Bolt 3
Diameter	12.7 mm (0.5 in.)	12.7 mm (0.5 in.)
Length	203 mm (8 in.)	140 mm (5-1/2 in.)

Table 8-3 GE-Supplied Anchor Specifications

5.2 Requirements for Using GE-supplied Anchors

Use of GE-supplied anchors (P/N 2106573, 2106573-3) shall adhere to the following requirements:

- Use the GE-supplied anchors ONLY when mounting components on concrete floors.
- Adhere to all anchoring requirements listed in Table 8-4.
- Any anchors showing more than 21 mm (~0.9 in.) of thread above the torqued nut requires the installation of a second anchor in the closest adjacent mounting location. The second anchor shall meet the same requirements in Table 8-4.
- Non-seismic installations must use a minimum of four (4) anchors to mount the gantry and four (4) anchors to mount the table.
- Fully engage the Adjuster Lock Rings (P/N 2106207) with at least one full thread showing below the notched portion on the Adjuster Screw.

Note: The table does not have the Adjuster Lock Rings shown in Figure 8-6 and Figure 8-7 of this section.

Mounting Requirements	Gantry	GT1700V/VT2000 Table	Lite Table
Minimum Floor Thickness	102 mm (4 in.)	102 mm (4 in.)	110 mm (4-1/3 in.)
Recommended Drilling Depth	95 mm (3-3/4 in.)	95 mm (3-3/4 in.)	100 mm (4 in.)
Average Anchor Embedment	89 mm (3-1/2 in.)	89 mm (3-1/2 in.)	90 mm (3-1/2 in.)
Minimum Anchor Embedment	76 mm (3 in.)	76 mm (3 in.)	80 mm (3 in.)
Available Alternate Anchor Locations	Yes	Yes	Yes
Shipped Anchor Size	203 mm (8 in.)	203 mm (8 in.)	140 mm (5-1/2 in.)
Alternate Anchoring Methods	Yes (see note, above)	Yes (see note, above)	Yes (see note, above)
Floor Levelness Requirement	6 mm (1/4 in.) over 3 m (10ft)	6 mm (1/4 in.) over 3 m (10ft)	6 mm (1/4 in.) over 3 m (10ft)

Table 8-4 Table and Gantry Anchoring Requirements

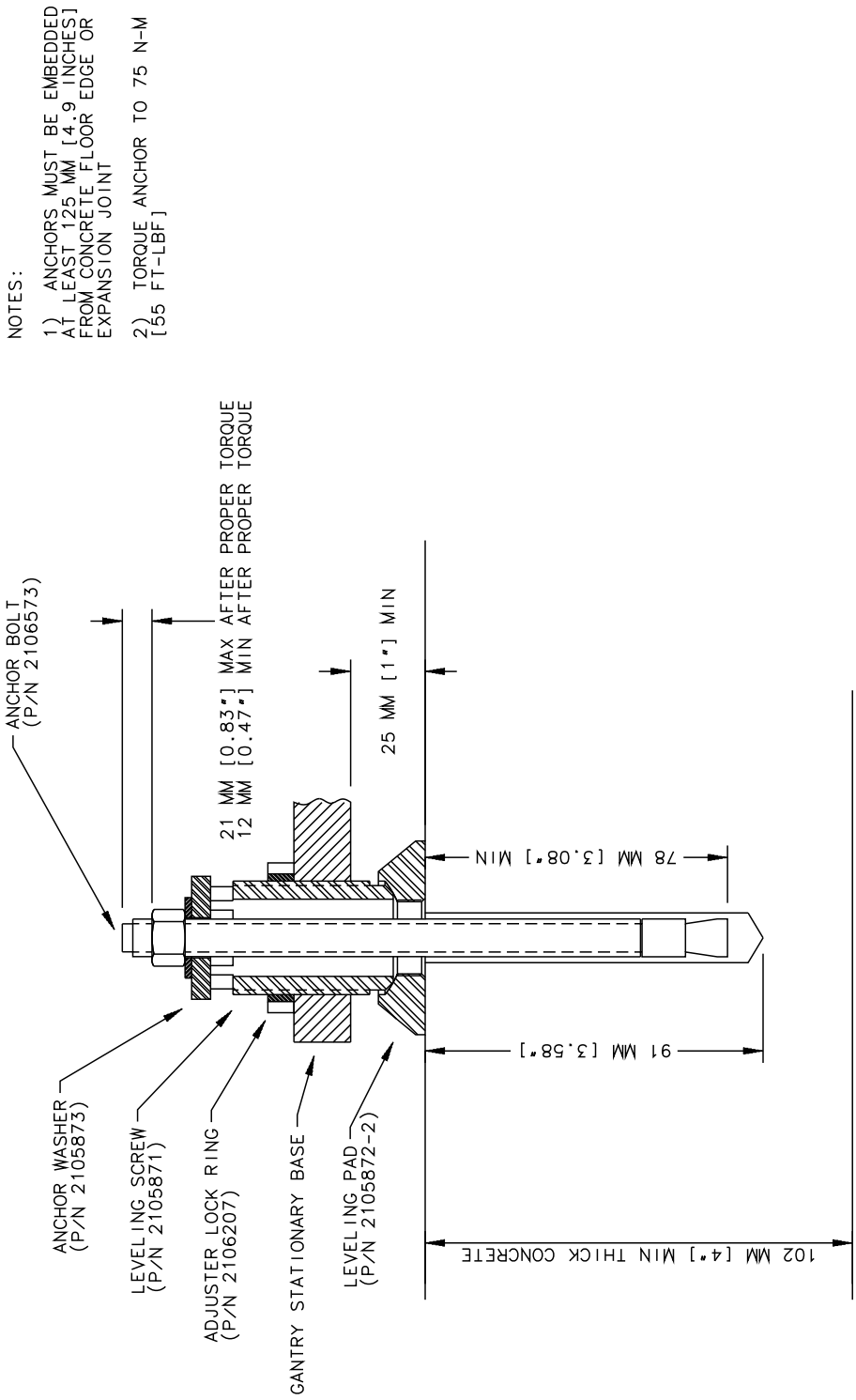


Figure 8-6 Gantry, GT1700V and VT2000 Table Anchoring

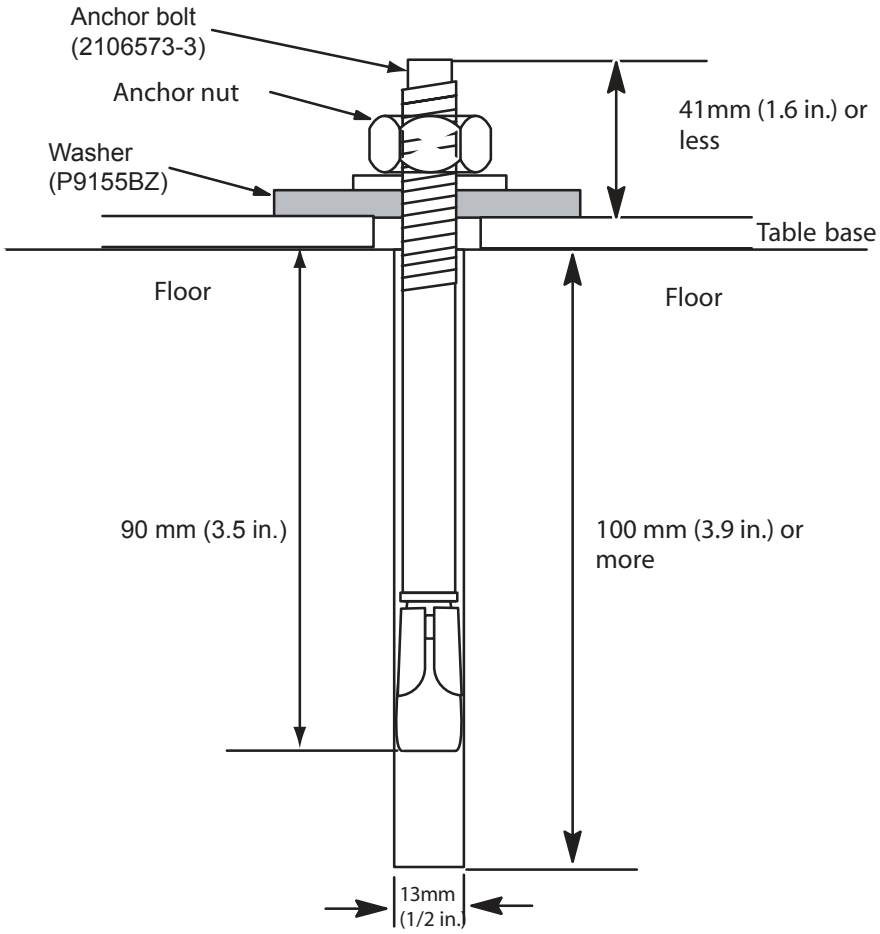


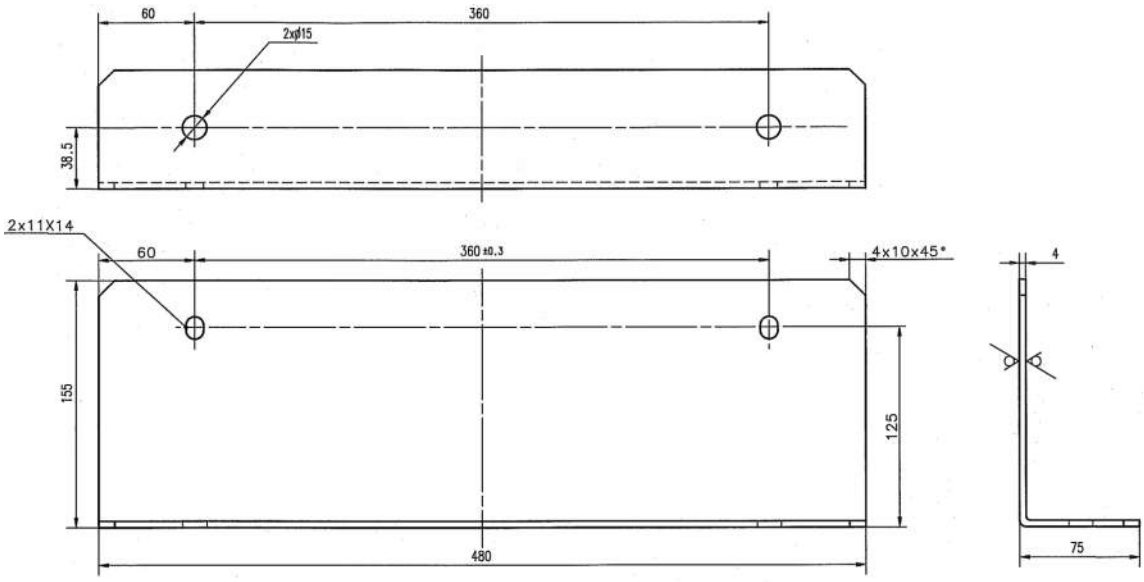
Figure 8-7 Lite Table Anchoring

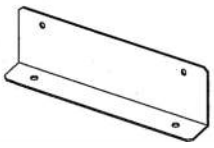
Section 6.0: Seismic Mounting

6.1 Overview

Refer to the guidelines in this section when mounting the system in seismic zones:

- Responsibility for proper seismic mounting rests with the customer. Refer to all applicable laws and codes for your locality.
- GE-supplied anchors may not meet local seismic laws and codes. Use them only if a qualified structural engineer approves them for use in local seismic applications.
- The customer's contractor often supplies a state-certified print or equivalent, showing seismic installation instructions.
- Consider seismic requirements for ceiling-mounted fixtures and refer to the appropriate installation instructions for ceiling-mounted fixtures.





PDU Seismic bracket
shipped with the unit

6.2 Center-of-Gravity Information

The information in the following figures provides the customer's contractor and/or structural engineer with center-of gravity information to assist in seismic calculations for the system:

- Gantry: Figure 8-9
- Table: Figure 8-10 ~ Figure 8-12
- Power Distribution Unit: Figure 8-13 (PDU Seismic Mounting Bracket)
- Console: Figure 8-8

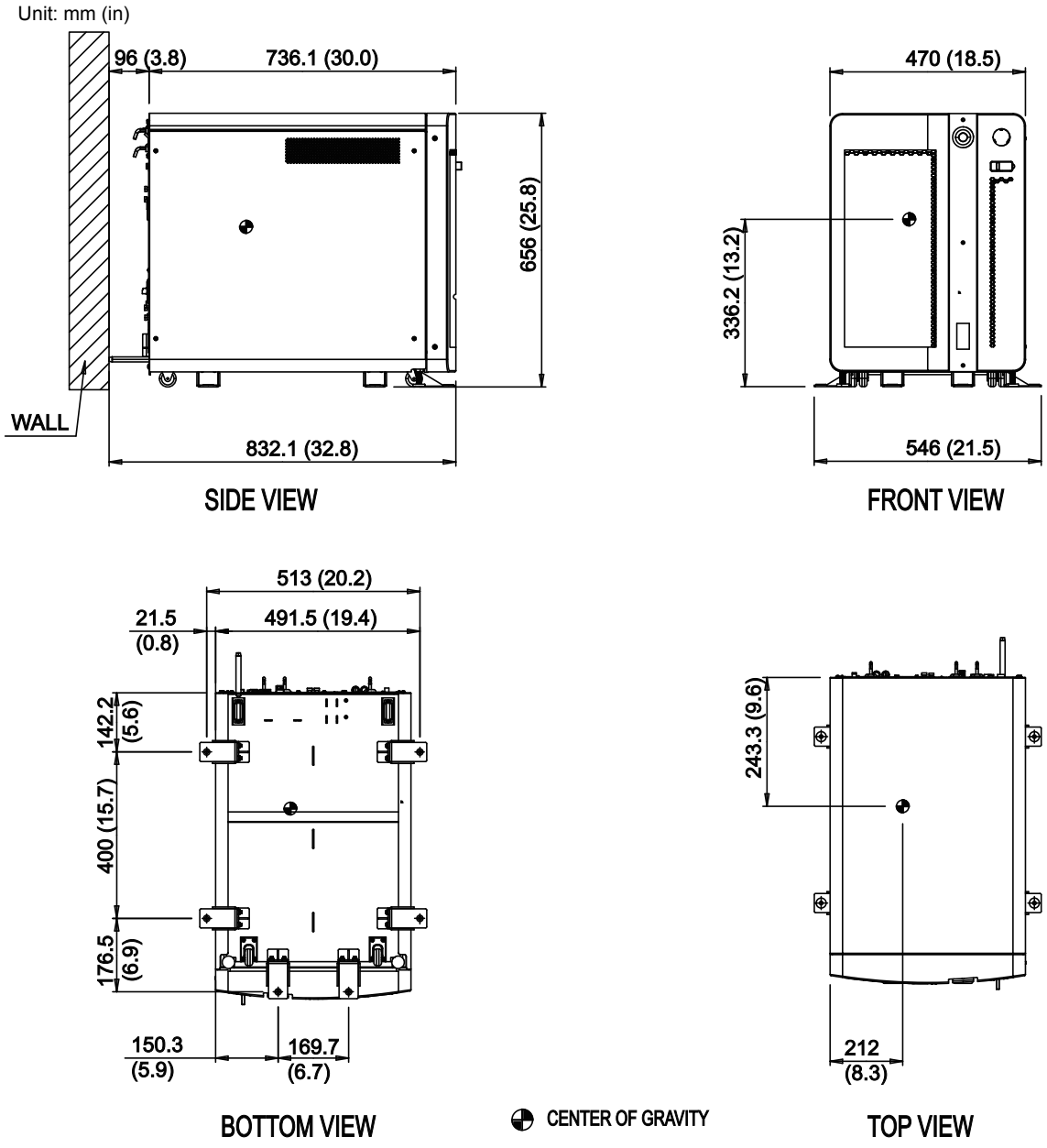


Figure 8-8 Console Center-of-Gravity

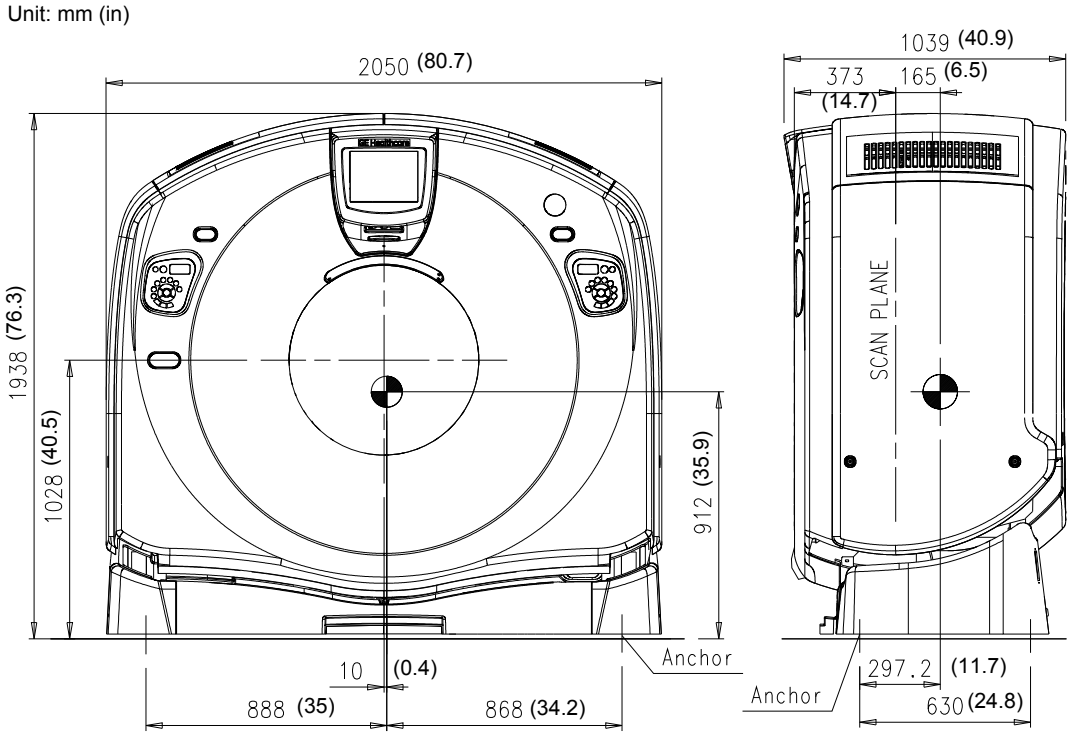


Figure 8-9 Gantry Center-of-Gravity

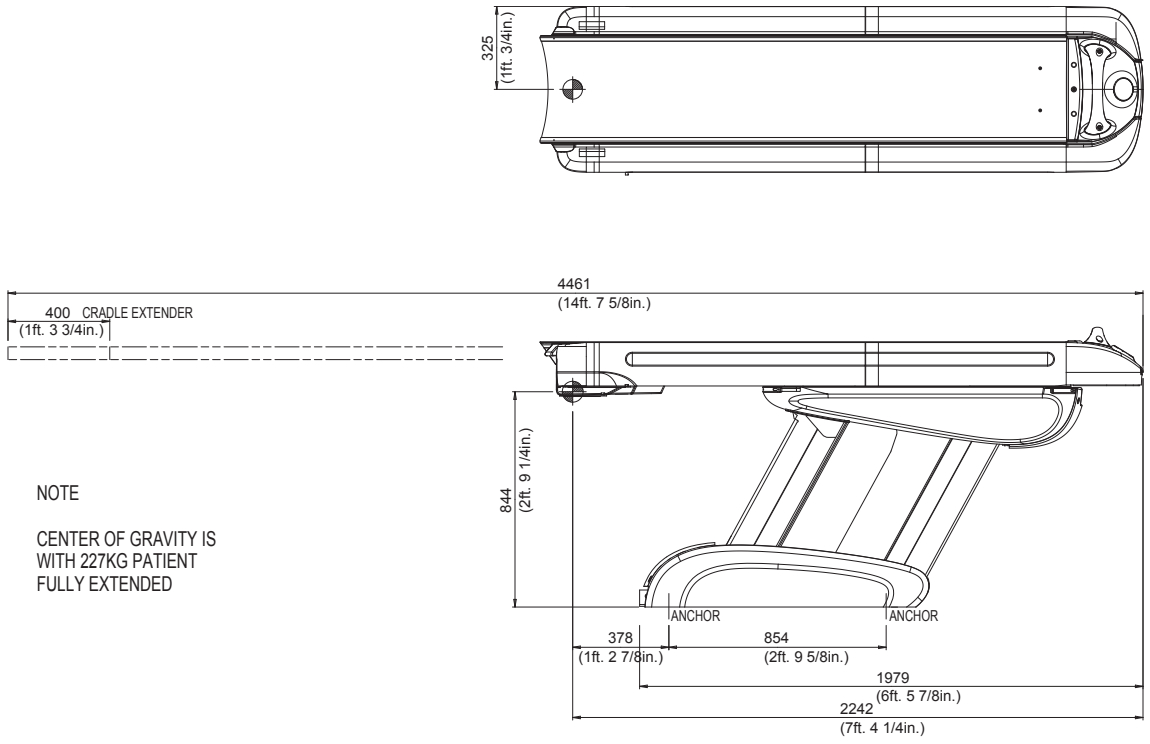


Figure 8-10 GT1700V Center-of-Gravity

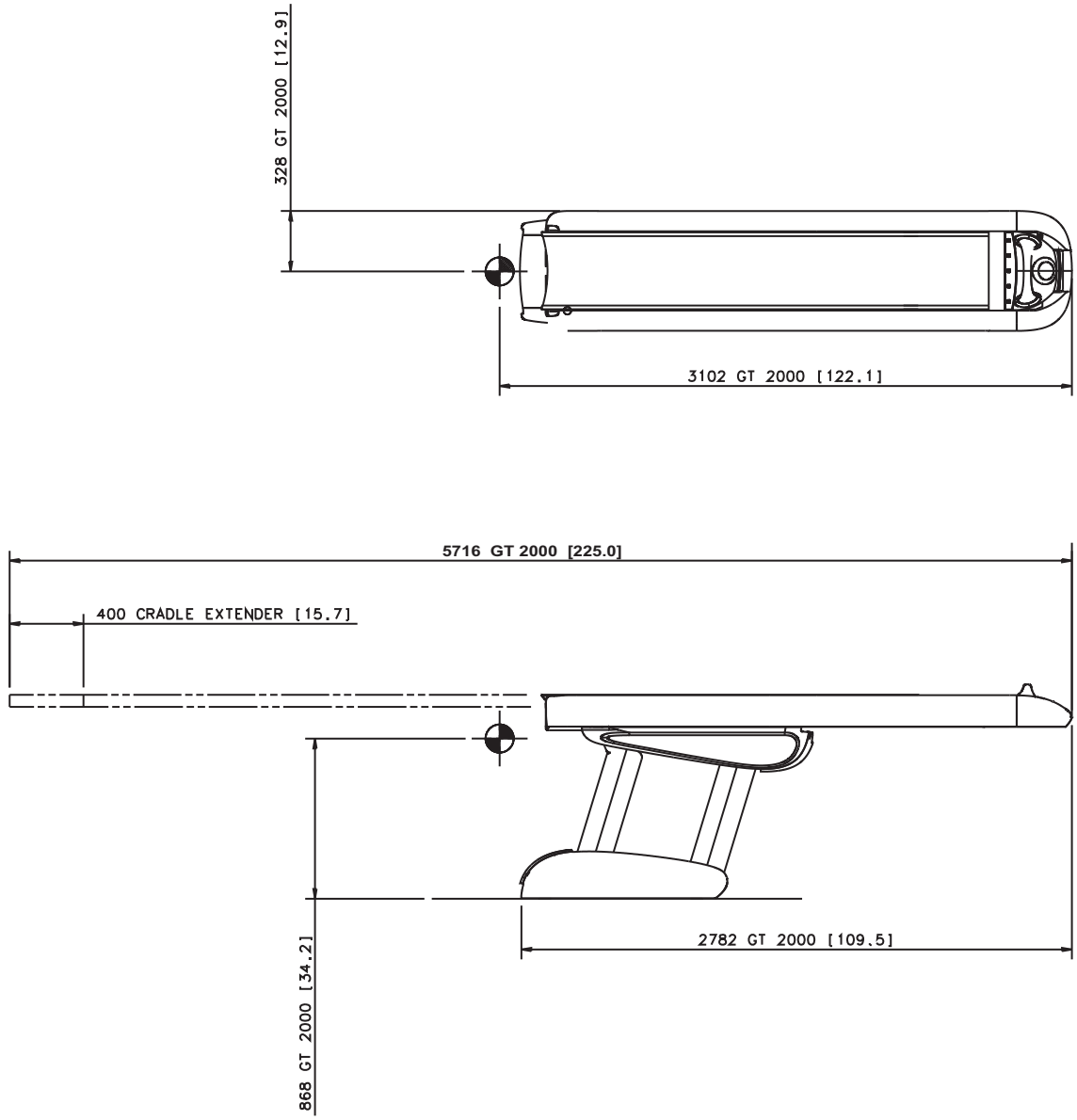


Figure 8-11 VT2000 Center-of-Gravity

Note: Center of Gravity location marked above includes the mass of a maximum weight patient on the table with a fully extended cradle.

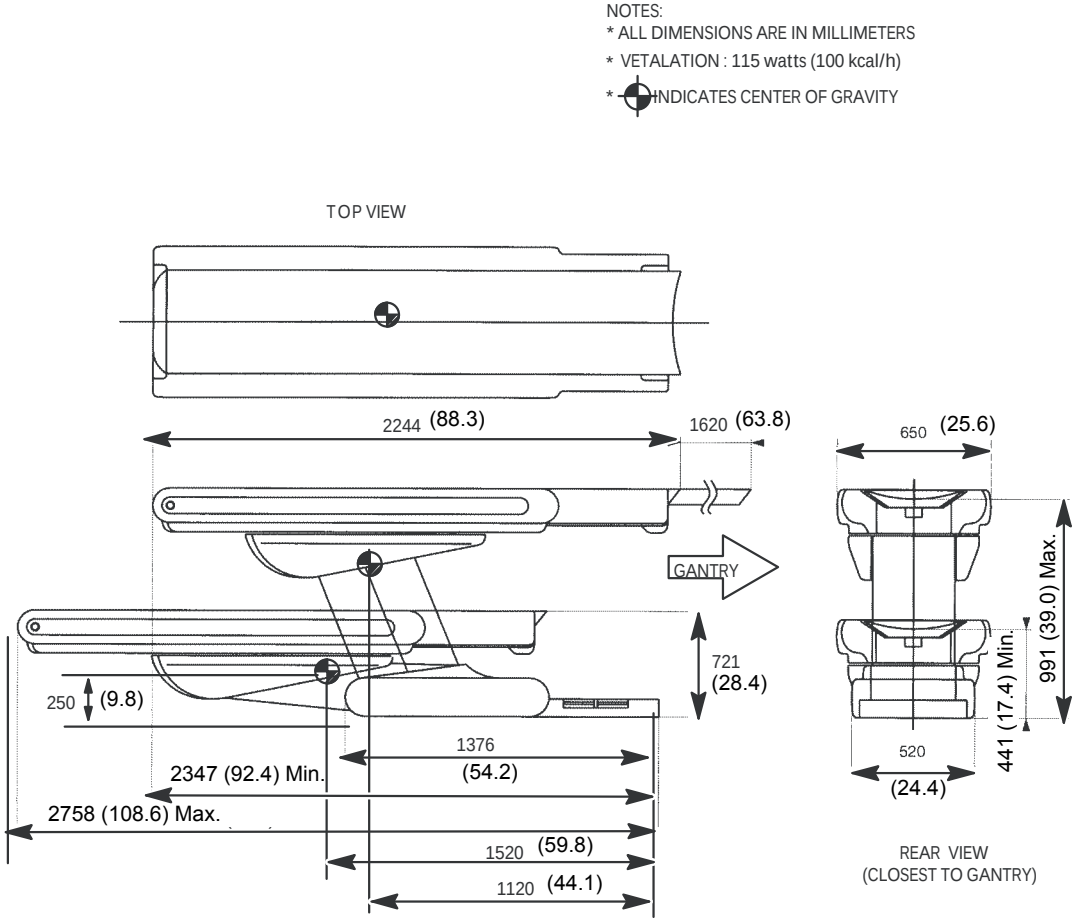


Figure 8-12 Lite Table Center-of-Gravity

Note: Center of Gravity location marked above includes the mass of a maximum weight patient on the table with a fully extended cradle.

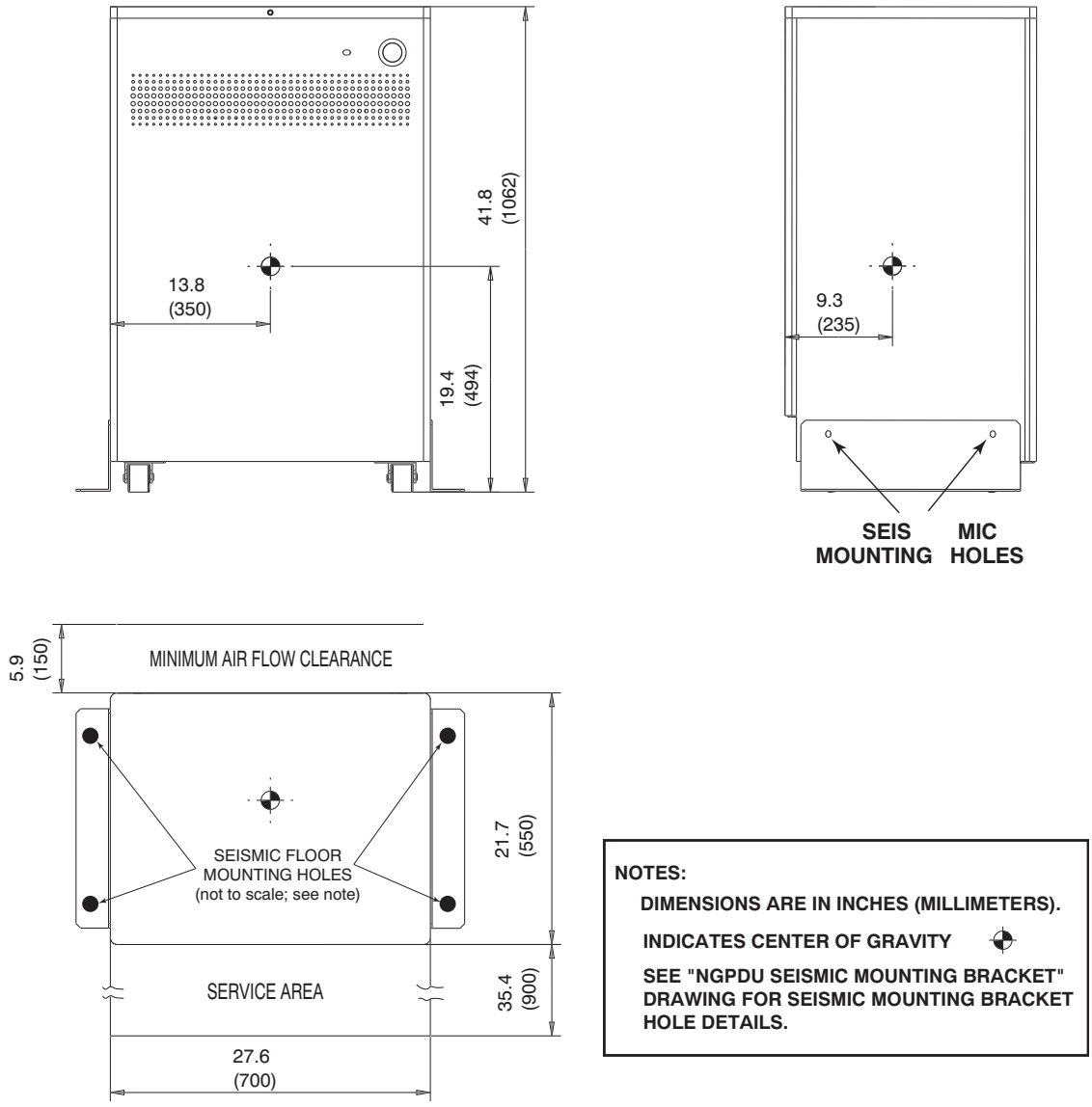


Figure 8-13 PDU Center-of-Gravity

Chapter 9
Environmental Requirements

Ensure the operational readiness and proper system calibration of HVAC prior to installation. Maintain the environmental conditions listed below at ALL times, including over nights, weekends, and holidays. Shut down the CT system if air conditioning is not working. When shutting down the system for major repair, you may also shut down the air conditioning.

Section 1.0: Temperature and Humidity Specifications

Environmental specifications apply to the table, gantry, power distribution unit, and console.

⚠ **NOTICE** **Exceeding environmental specifications may adversely affect system operation and image quality.**

1.1 Temperature (Scan and Control Rooms)

Maximum allowable ambient room temperature:	26ºC (79º F)
Recommended ambient room temperature:	22ºC (72ºF)
Minimum allowable ambient room temperature:	18ºC (64ºF)

Table 9-1 System Temperature Limits

Note: Be certain to account for ANY cooling equipment cycle control range, ensuring that the maximum and minimum ambient room temperatures do not exceed those shown in Table 9-1 during room thermal cycling. For example, if the HVAC is capable of ± 2ºC control, then the limits would be 20ºC - 24ºC to maintain absolute limits.

1.2 Humidity (Scan Room & Control Room)

Maximum allowable non-condensing relative humidity:	60%
Minimum allowable non-condensing relative humidity:	30%

Table 9-2 System Humidity Limits

1.3 Other Guidelines

- Accurate determination of hospital room environmental conditions may require the temporary installation of a temperature and humidity recorder near the location designated for system installation. Record temperature and humidity readings before and after installation to verify the site's true environmental conditions.
- Consider heating, ventilating, air conditioning (HVAC) needs, and redundancy (back-up). An air conditioner with two compressor units rather than one, may prevent system downtime. A redundant (back-up) air conditioner permits CT system operation during an extended repair of the primary air conditioner.

Section 2.0: Cooling Requirements

Use Table 9-3 to assist in cooling requirements planning. Gantry operation requires over half of the cooling utilized by your system. Contact an HVAC specialist to determine optimal placement of the thermostat and all HVAC vents, bearing in mind that:

- Gantry air INTAKE occurs across the BOTTOM of the gantry.
- Gantry air EXHAUST occurs across the TOP of the gantry.

System Component	Max BTU/HR	Max Watt
Gantry maximum (See Note 1)	18,700	5,480
Table		
VT2000 Table (2000mm)	1030	300
GT1700V Table (1700mm)	1030	300
Lite Table (1400mm)	680	200
Power Distribution Unit	3400	1000
Scan Room Subtotal (w/ GT1700V Table)	23,130	6,780
Scan Room Subtotal (w/ Lite Table)	22,780	6,680
Console	2860	840
LCD Monitor (Total amount of 2 monitors)	340	100
Control Room Subtotal	3200	940
System Total (w/ GT1700V Table)	26,330	7,720
System Total (w/ Lite Table)	25,980	7,620
NOTE 1: Maximum heat output reached at tube change (Detailed Calibration).		
NOTE 2: Heat output does not include heat from room lighting, personnel, or non-CT equipment.		

Table 9-3 System Heat Output

Refer to Figure 5-2, Figure 5-4, Figure 5-9, and Figure 5-10 for component air flow requirements.

Figure 9-1 and Figure 9-2 show the recommended placements of the thermostat and HVAC vents (intake and output) for the scan and control rooms.

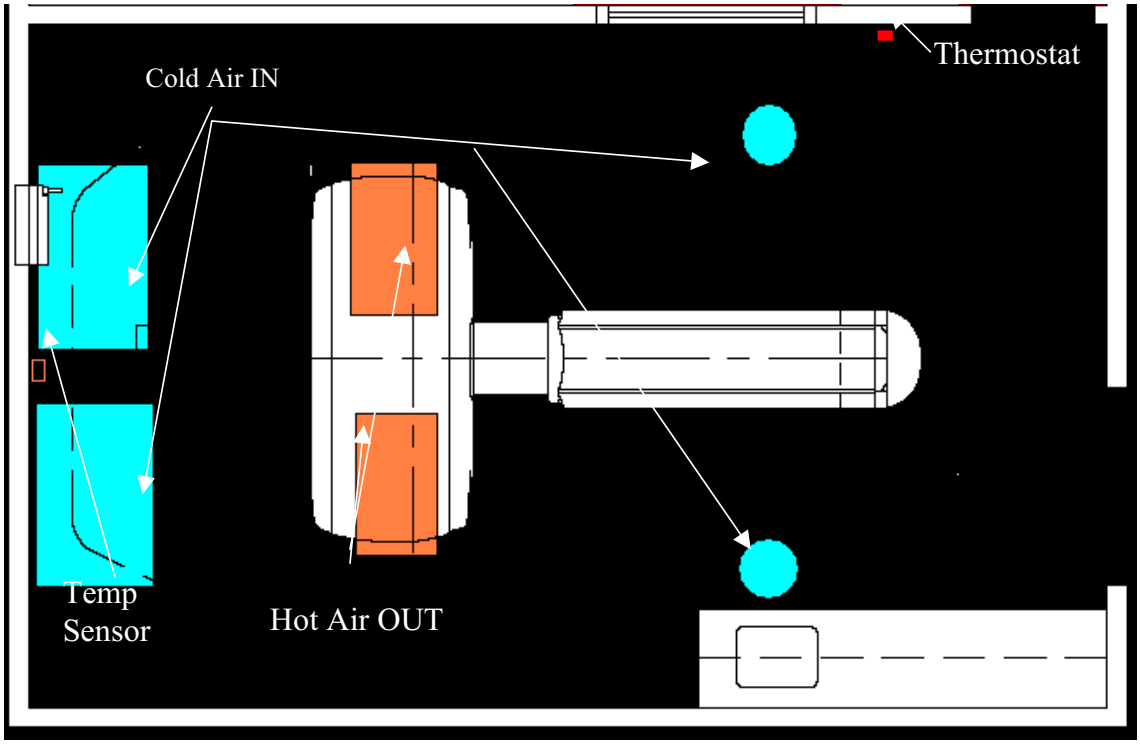


Figure 9-1 HVAC Air Vent Placement in Scan Room

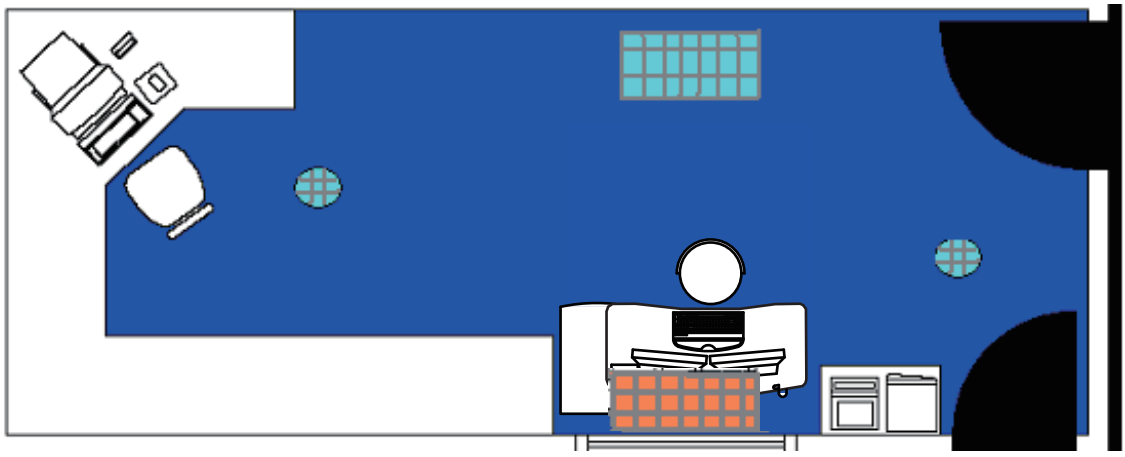


Figure 9-2 HVAC Air Vent Placement in Control Room

Section 3.0: Altitude

The system shall meet all functional and performance specifications when placed in a room that is at an elevation of -150 m to 2,400 m (-492 ft to 7,875 ft) above sea level.

Note: For sites with altitudes 2,400 m to 3,048 m (7,875 ft to 10,000 ft), you need a deviation to site a product at this altitude. Altitudes above 2,400 m (7,875 ft) require engineering approval.

Section 4.0: Electro-Magnetic Interference (EMI)

4.1 Gantry

Locate the gantry in ambient static magnetic fields of less than 10^{-4} tesla (1000 milligauss) to guarantee the specified imaging performance. Ambient AC magnetic fields must measure below 10^{-6} tesla (10 milligauss) peak.

4.2 Console / Computer Equipment

Locate computer equipment in ambient static magnetic fields of less than 10^{-3} tesla (10,000 milligauss) to guarantee data integrity (see Figure 9-3).

4.3 PDU

The PDU produces an electromagnetic field that radiates outward from its cabinet in all directions. Do not place the gantry or patient table within 0.3 meters (12 inches) of the edge of the Power Distribution Unit. Do not place other sensitive electronics (e.g. the operator console or computer equipment) within 1.0 meters (39 inches) of the edge of the Power Distribution Unit in any direction, including above or below it. The UPS is not classified as sensitive electronics. (see Figure 9-3).

4.4 EMI Reduction

If you know of or suspect the presence of fields of excessive EMI, consult GE Healthcare Sales & Service for recommendations. Consider the following when attempting to reduce EMI:

- External field strength decreases rapidly with distance from source of the magnetic field.
- External leakage magnetic field of a three-phase transformer measures much less than that of a bank of three single-phase transformers of an equivalent power rating.
- Large electric motors constitute a source of substantial EMI.
- High-powered radio signals constitute a source of EMI.
- Maintain good screening of cables and cabinets.
- Consider and measure EMI fields of sites with main facility power running UNDER the floor or WITHIN the walls or ceilings of the scan room.
- Pay special attention to power substations and high-voltage power lines in proximity to the scan facility.
- If any concerns remain regarding excessive EMI fields, be sure to measure to confirm that your site meets all required specifications.

4.5 Equipment EMI "Envelopes"

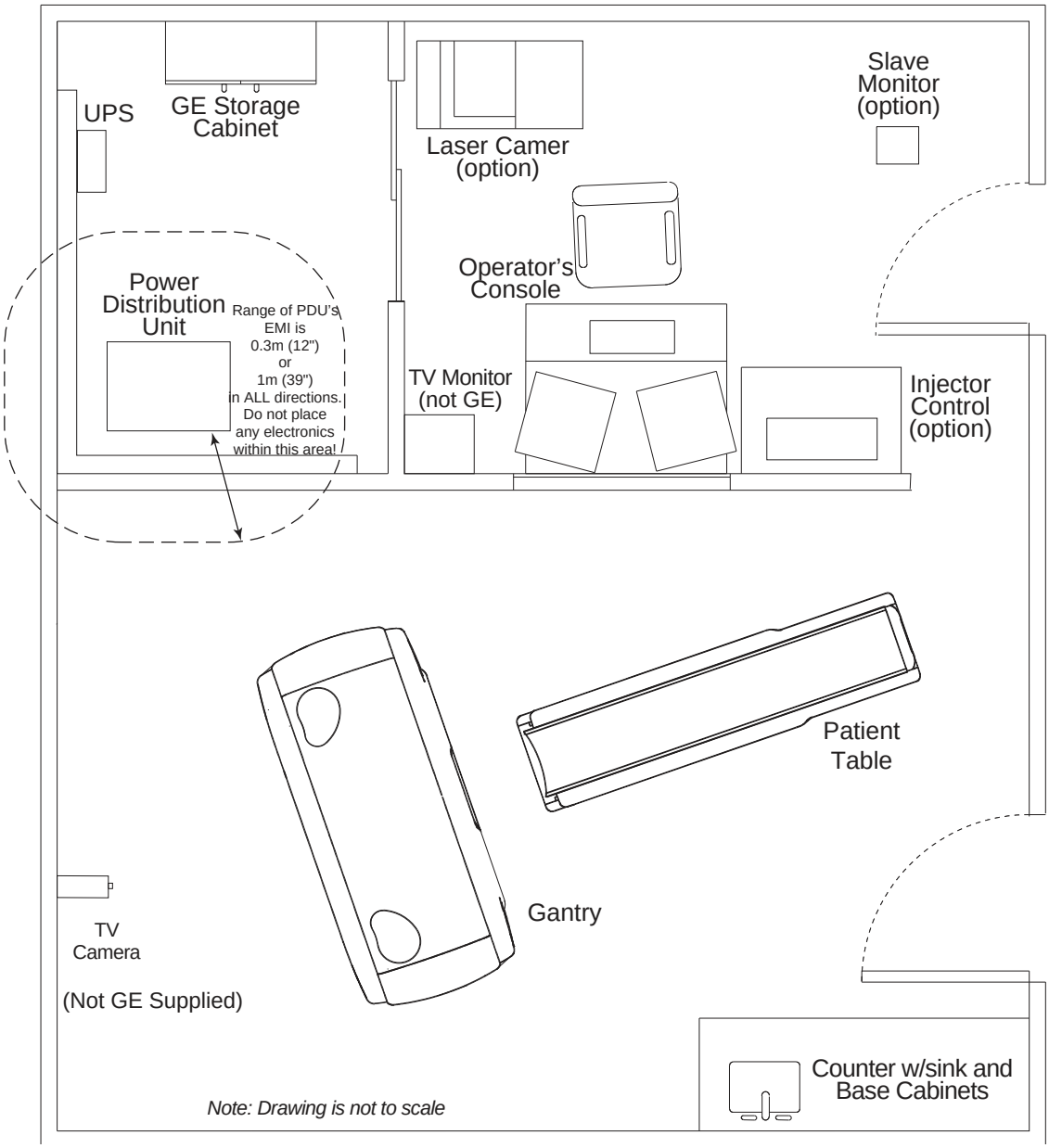


Figure 9-3 Sample Room Layout (Showing Approximate EMI Requirements)

Section 5.0: Electro-Magnetic Compatibility (EMC)

5.1 General Scope

This system complies with IEC60601-1-2 Edition 2.1 (2004) / 3.0 (2007) EMC standard for medical devices.The system is suitable to use in the electromagnetic environment, as per the limits and recommendations described in the following tables:

- Emission Compliance level and limits (Table 9-4).
- Immunity Compliance level and recommendations to maintain equipment clinical utility (Table 9-4 and Table 9-6).

Note: This system complies with the EMC standard when used with supplied cables. If different cable lengths are required, contact a qualified GE service representative for advice.

5.2 Electromagnetic Emission

The system is intended for use in the electromagnetic environment specified below. The customer or the user of the system should assure that it is used in such an environment.

Emissions Test	Compliance	Electromagnetic Environment Guidance
RF emissions CISPR 11	Group 1	The system uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	When installed in such a shielded location, the system is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Not applicable	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Not applicable	

Table 9-4 Electromagnetic Emissions

5.3 Electromagnetic Immunity

The system is intended for use in the electromagnetic environment specified below. The customer or the user of the system should assure that it is used in such an environment.

Immunity Test	EC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	± 6 kV contact ± 8 kV air	± 6 kV contact ± 8 kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	± 2 kV for power supply lines ± 1 kV for input/ output lines	± 2 kV for power supply lines ± 1 kV for input/ output lines	Mains power quality should be a typical commercial or hospital environment
Surge IEC 61000-4-5	± 1 kV differential mode ± 2 kV common mode	± 1 kV differential mode ± 2 kV common mode	Mains power quality should be a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	< 5 % U_T (> 95% dip in U_T) for 5 sec	< 5 % U_T (> 95% dip in U_T) for 5 sec	Mains power quality should be a typical commercial or hospital environment. If the user of the system requires continued operation during power mains interruptions, it is recommended that the system is powered from a partial uninterruptible power supply or a battery.
Power frequency (50/ 60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

Table 9-5 Electromagnetic Immunity

Immunity Test	EC 60601-1-2 Test Level	Compliance Level	Electromagnetic Environment Guidance
Conducted RF IEC 61000-4-6	3 V_{RMS} 150 kHz to 80 MHz	3 V 150 kHz to 80 MHz	Do not use portable and mobile RF communications equipment closer to any part of the system, including cables, than the recommended separation distance calculated from the equation appropriate for the frequency of the transmitter. **Recommended Separation Distance:** $d = \left[\frac{3.5}{3}\right]\sqrt{P}$ (seeTable 9-6) $d = \left[\frac{3.5}{3}\right]\sqrt{P}$ 80 MHz to 800 MHz (seeTable 9-6) $d = \left[\frac{7}{3}\right]\sqrt{P}$ 800 MHz to 2,5 GHz (seeTable 9-6) where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range[b]. Interference may occur in the vicinity of equipment marked with the following symbol: 
Radiated RFIEC 61000-4-3 (Alternative method: Full range IEC 61000-4-21 test in lieu of Large, Permanently-Installed Equipment exemption)	3 V/m 150 kHz to 80 MHz	3 V/m 150 kHz to 80 MHz	

a Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast, and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the system is used exceeds the applicable RF compliance level above, the system should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the system.

b Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

NOTE: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

NOTE: U_T is the AC mains voltage prior to application of the test level.

Table 9-5 Electromagnetic Immunity

The system is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the system can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the system as recommended below, according to the maximum output power of the communications equipment.

Rated Maximum Output Power (P) of Transmitter Watts (W)	Separation Distance (Meters) by Frequency of Transmitter		
	150 kHz to 80 MHz $d = \left[\frac{3.5}{3}\right]\sqrt{P}$	80 MHz to 800 MHz $d = \left[\frac{3.5}{3}\right]\sqrt{P}$	800 MHz to 2.5 GHz $d = \left[\frac{7}{3}\right]\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.69	3.69	7.38
100	11.7	11.7	23.3

For transmitters rated at a maximum output power not listed above, the separation distance can be estimated using the equation in the corresponding column, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1:At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

NOTE 2:These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Table 9-6 Recommended Separation Distances

As an example, keep a 1 W mobile phone (800 MHz to 2.5 GHz carrier frequency) at least 2.3 m from the system (in order to avoid image interference risks.)

LIMITATIONS MANAGEMENT: Adhering to the distance separation recommended in Table 9-6, between 150 KHz and 2.5 GHz, reduces disturbances recorded at the image level, but may not eliminate all disturbances. However, when installed and operated as specified, the system maintains its essential performance by continuing to acquire, display, and store diagnostic quality images safely.

5.4 Installation Requirements and Environment Control

In order to minimize interference risks, the following requirements apply.

5.4.1 Cable Shielding and Grounding

All interconnect cables to peripheral devices must be shielded and properly grounded. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference.

The manufacturer is not responsible for any interference caused by using other than recommended interconnect cables or panels, or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the users' authority to operate the equipment.

All interconnect cables to peripheral devices must be shielded and properly grounded, except when technologically prohibited. Use of cables not properly shielded and grounded may result in the equipment causing radio frequency interference.

Section 6.0: System Component Noise Levels

Maximum Gantry Audible Noise Level The maximum ambient noise level is produced by the gantry during a CT scan acquisition. It is less than 70 dBA when measured at a distance of one meter from the nearest gantry surface, in any direction.

Maximum Console Audible Noise Level The Maximum audible noise level is less than 54dBA when measured at a distance of one meter from the nearest console surface, in any direction.

Chapter 10
Radiation Protection Requirements

Section 1.0: Shielding Requirements

NOTICE **Engage a QUALIFIED RADIOLOGICAL HEALTH PHYSICIST to review your scan room shielding requirements, taking into consideration:**

- **Scatter radiation levels within the scanning room (see Figure 10-1).**
- **Equipment placement.**
- **. Weekly projected work-loads (number of patients/day technique (kvp*ma))**
- **Materials used for construction of walls, floors, ceiling, doors, and windows.**
- **Activities in surrounding scan room areas.**
- **Equipment in surrounding scan room areas (e.g., film developer, film storage)**
- **Room size and equipment placement within the room relative to room size.**

The illustrations in this Chapter depict measured radiation levels within the scanning room, while scanning a 32 cm or 16 cm CTDI phantom with the technique shown. Use the mAs, kV and aperture scaling factors shown in Table 10-1 to adjust exposure levels to the scan technique used at the site. *Example* (from Figure 10-1): The exposure level for a 120 kV, 800 mA, 1 sec. scan at 1270 mm (50 in.) away from the scan plane is: 10.4 µGy × 0.71 × 800/100 = 59.2 µGy.

Note: Actual measurements can vary. Expected deviation equals ±15%, except for the 5 mA and 1 mm techniques, where variation may be greater (up to a factor of 2), due to the inherent deviation in small values. The maximum deviation anticipated for tube output equals ±40%.

Changed Parameter	Multiplication Factor
mAs	new mAs/100
80 kV	0.24
100 kV	0.45
120 kV	0.71
140 kV	1.00
1mm aperture	0.20
3 mm aperture	0.22
5 mm aperture	0.27
10 mm aperture	0.38
15 mm aperture	0.48
20 mm aperture	0.59
30 mm aperture	0.79
40 mm aperture	1.00

Table 10-1 Shielding Requirements Scaling

NOTICE **This publication uses µGy (micrograys) to measure radiation levels. The conversion factor from mR to µGy (micrograys) is: 1 mR = 8.69 µGy.**

Typical Scatter Survey (Large Filter (Body) - Phantom 32cm CTDI)
NOTE: The 32cm CTDI Phantom should be placed on the patient table.
ISO-Contour 1.3, 2.6, 5.2, and 10.4 µGray/scan Technique 140kV, 100mA, 1second(s), 40mm

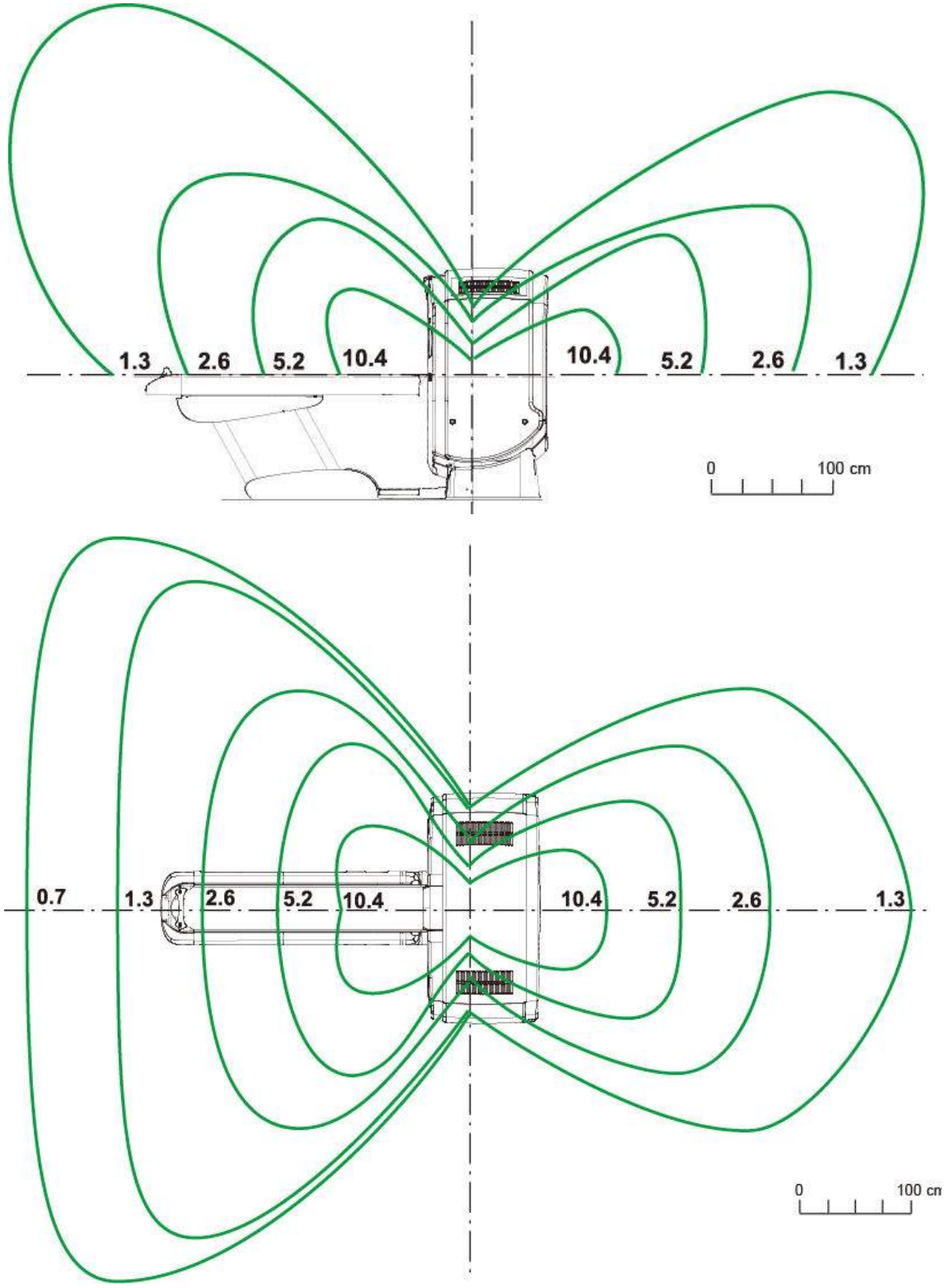


Figure 10-1 Typical Scatter Survey (Large Filter)

Typical Scatter Survey (Small Filter (Heal) - Phantom 16cm CTDI)
NOTE: The 16cm CTDI Phantom should be placed on the patient table.
ISO-Contour 0.7, 1.3, 2.6, and 5.2 µGray/scan Technique 140kV, 100mA, 1second(s), 40mm

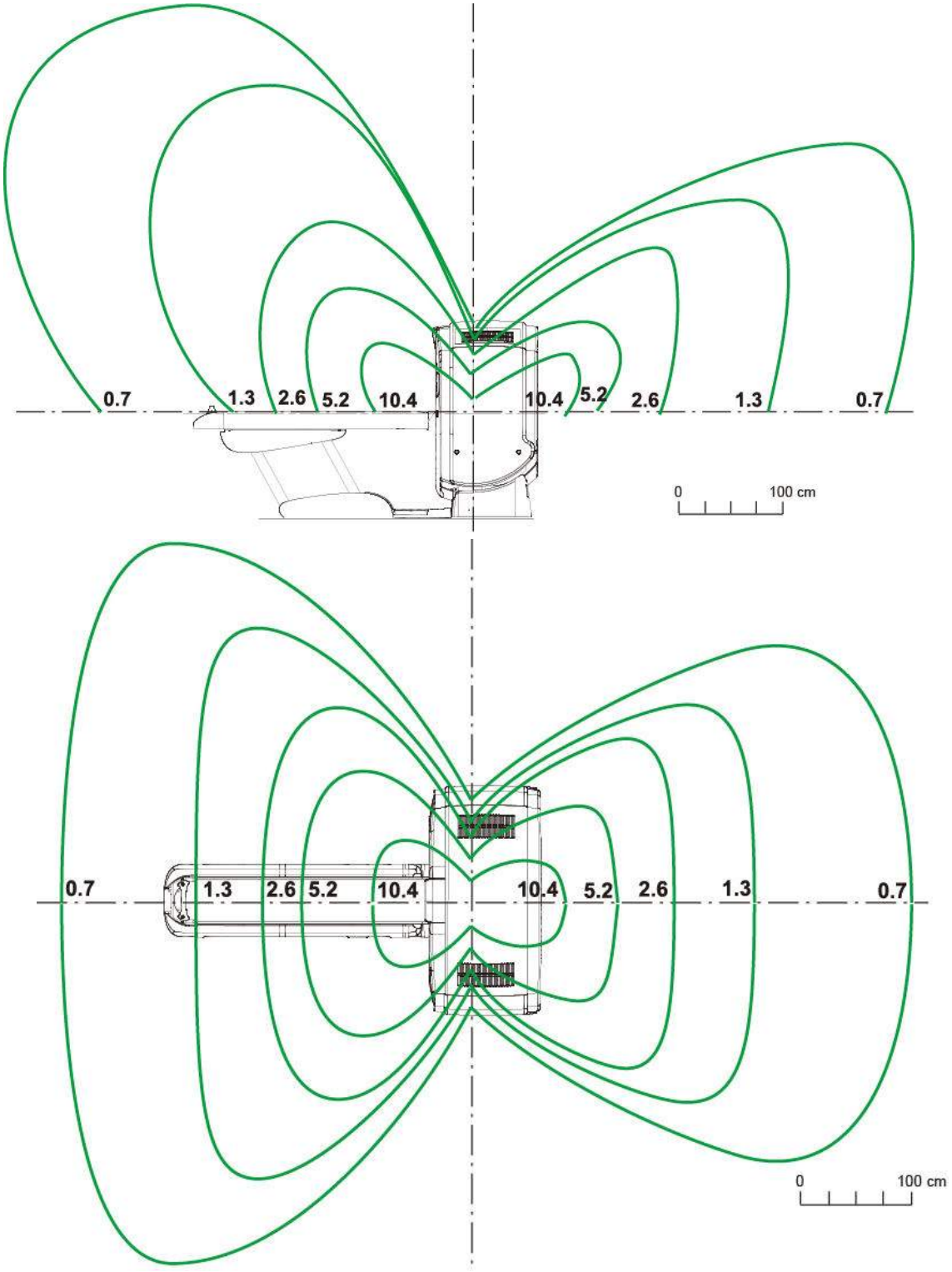


Figure 10-2 Typical Scatter Survey (Small Filter)

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Chapter 11
Network Requirements

Section 1.0: Network Connections

The network requirements listed in this chapter should allow you to connect the system to:

- Hospital/facility networks
- Filming cameras
- PACS
- Workstations
- Patient Information Systems

1.1 Network Type

Optima CT660 systems require a broadband network connection.

1.2 Network Speed

The customer and the customer's IT contact should ensure that the site provides access to broadband using one of the following interface types:

- 100BASE-TX (100 Mbit/s)
- 1000BASE-T (1000 Mbit/s [1 Gbit/s]).

1.3 Network Cable Routing

The CT system connects to the facility's network through the console. To enable proper network cabling, the customer and the customer's IT contact should:

- Provide an RJ45 wall outlet within 2 m (79 in.) of the console location.
- Provide a patch cable, not to exceed 3.05 m (10 ft), to connect the console to a wall box. (See Notes on Figure 13-1)
- Complete any cable duct-work or conduit installation that the customer site-unit might require to route connecting network cables to the workstation, camera, and console.
- Ensure that the run from the hospital/facility switch to the CT wall outlet does not exceed 88 m (290 ft). Bandwidth performance degrades significantly when the length exceeds 91 m (300 ft).
- Use of STP (Shielded Twisted Pair) cable is not allowed.

Section 2.0: Customer Broadband Responsibilities

2.1 Contact GE to Find Zone Broadband Specialist

Contact your GE PMI to obtain the name of the zone broadband specialist who will:

- Work with the Customer Champion to complete any identified infrastructure changes.
- Provide IP addresses for new CT equipment.
- Provide a VPN compatible appliance that will support the IPSec tunneling protocol and 3DES data encryption.
- Utilize an Internet Service Provider that supports static routing.

2.2 Provide GE with IT Contact Information for the Site

Provide your GE PMI with an accurate site address, telephone number, contact name, and e-mail address for the customer IT contact who will:

- Coordinate VPN activities between Radiology/Cardiology and the Information Technology (IT) departments.
- Act as a focal point in assuring site broadband infrastructure meets GE Healthcare requirements for connection, as determined by a mutual assessment with the GE Healthcare connectivity team.
- Complete an equipment assessment with the GE Healthcare connectivity team to determine site readiness for broadband.

Chapter 12
Power Requirements

Be sure to communicate all necessary information in this chapter to the electrical contractor employed at the installation site.

Section 1.0: Introduction

The Power Distribution Unit (PDU) supplied with the system transforms and distributes power to all system components. The PDU constitutes the only power entry point required to operate the system. To minimize voltage regulation effects, keep power wiring between the facility main distribution panel and the PDU as short as possible.

When routing the power wiring, all three-phase wires and ground must run in the same conduit or raceway duct. Route power wires separate from the system control and signal cables, using a separate conduit or trough in a raceway duct. You may use a metallic conduit, floor duct, or surface raceway for running cables, depending upon local codes and practices. However, ensure that cable passageways are large enough to install additional cables with all other cables already installed. Do not use non-metallic conduit.

Section 2.0: System Input Power

2.1 Power Source Configuration

The system operates on a three-phase, solidly grounded four-wire wye or Delta power source. The neutral wire does not need to run to the system, (i.e., four-wire connection). If you are running a NEUTRAL wire, terminate it in the A1 box.

A dedicated feeder from the nearest Main Distribution Panel (MDP) should supply power to the system. In accordance with the National Electric Code (U.S.) and similar applicable national and local codes, the site MUST provide a protective disconnect device with LOCK-OUT and TAG-OUT provisions in the power line supplying the PDU, and MUST locate the protective disconnect device within 10 m (32 ft) of the PDU, visible to PDU service personnel. The disconnect device appears as *A1* in the interconnection schematic diagrams.

2.2 Rating

The system operates on three-phase power that meets the following specifications:

For 100kVA Standard

- Voltage: 200 to 240VAC, 380 to 480 VAC
- Capacity: 100 kVA
- Frequency: 50 or 60 Hz ± 3 Hz
- Maximum power demand = 100 kVA @ 0.85 PF at a selected technique of 140 kV, 515 mA.
- Average effective (RMS) power demand at maximum duty cycle = 20 kVA.
- Idle power demand (without rotation and X-ray) = 5 kVA.

For 75kVA Option (For Japan Only)

- Voltage: 200 to 240VAC, 380 to 480 VAC
- Capacity: 75 kVA

- Frequency: 50 or 60 Hz ± 3 Hz
- Maximum power demand = 75 kVA @ 0.85 PF at a selected technique of 120 kV, 400 mA.
- Average effective (RMS) power demand at maximum duty cycle = 20 kVA.
- Idle power demand (without rotation and X-ray) = 5 kVA.

For 50kVA Option (For Japan Only)

- Voltage: 200 to 240VAC, 380 to 480 VAC
- Capacity: 50 kVA
- Frequency: 50 or 60 Hz ± 3 Hz
- Maximum power demand = 50 kVA @ 0.85 PF at a selected technique of 120 kV, 280 mA.
- Average effective (RMS) power demand at maximum duty cycle = 20 kVA.
- Idle power demand (without rotation and X-ray) = 5 kVA.

The A1 disconnect device referenced above must provide overcurrent protection for the system and have at least one Emergency Off switch within the scan suite, near the console. The preferred disconnect utilizes undervoltage release control, rather than shunt trip devices. The rating of the A1 disconnect device depends on the nominal line voltage at the site. Refer to Section Section 3.0:, Recommended Power Distribution System for minimum rating requirements and suggested disconnect devices.

2.3 Regulation

Total load regulation, as measured at the PDU input terminals, must not exceed 6%. The capacity of the facility transformer and size and length of feeder wires directly affect the load regulation presented to the system. Refer to Section Section 3.0:, Recommended Power Distribution System, for recommended single-unit installation specifics.

2.4 Phase Imbalance

The difference between the highest line-to-line voltage and lowest line-to-line voltage must not exceed 2% of the lowest line-to-line voltage.

2.5 Sags, Surges and Transients

Sags and surges of the power line must not exceed the absolute range limits shown in Table 12-1. Limit maximum transient voltages to 1500 V peak.

2.6 Grounding

The customer's electrician needs to perform the following tasks:

- Bond metal conduit, raceway, or the armor of armored cable used to power the system to the PDU cabinet and to the A1 Disconnect
- Run a dedicated 1/0 (55 mm^2) or larger insulated copper ground wire from the main distribution panel to the PDU with the phase wires.
- Run the ground wire with the three-phase wires from the power source to the A1 Disconnect and from A1 Disconnect to the PDU. Grounding does not require a neutral wire.

Note: The shield or armor of armored cable ALONE does NOT provide sufficient grounding.

Bond the ground wire to the intermediate distribution panels through which it passes in accordance with local codes. The resistance between the PDU ground and the facility earth ground must not exceed 0.5 ohm. In addition, the total resistance between the PDU ground and earth must not exceed 2 ohms.

2.7 Potential Equalization Conductor

IEC 60601-1 Clause 18.e) (Edition 2 Scheme) / IEC 60601-1 Clause 8.6.7 (Edition 3 Scheme)

The voltage of a conductor or body to earth is called the “potential” of this conductor or body. The earth is electrically neutral and thus has the potential “zero”. The unit of measurement for the potential is volt. This terminal will be used for Option installation. Refer to each Option manual of instruction for use.

Section 3.0: Recommended Power Distribution System

In all cases, qualified personnel must verify that the transformer and feeder (at the point of take-off) and the run to the CT system meet all the requirements stated in this document.

3.1 Using a Dedicated Distribution Transformer (Recommended)

The recommended power distribution system for a CT system is a dedicated feeder from the facility main isolation transformer. The minimum recommended transformer size for a dedicated distribution transformer provided for the system is 125 kVA (100kVA standard) or 93.75kVA (75kVA option), rated 2.4% regulation at unity power actor. Table 12-2 shows the minimum recommended feeder size and overcurrent protection device based on line voltage for this configuration.

3.2 Using an Existing Distribution Transformer

If it proves necessary to power the system from an existing distribution transformer and secondary feeder, such as the equipment distribution panel of an X-ray department, avoid installation with other X-ray equipment that uses rapid film changers. These changers use a large number of high-powered, closely-spaced exposures, which may coincide with the CT scan and produce image artifacts.

3.3 System Power Requirements

Be sure that the site can meet all of the minimum power requirements listed below before installing the system:

For 100kVA Standard

- Maximum power demand = 100kVA @ 0.85 PF: at a Selected Technique of 140 kV, 515 mA.
- Average effective (RMS) power demand at maximum duty cycle = 20 kVA.
- Average power demand at maximum duty cycle = 10 kVA
- Maximum allowable total source regulation is 6%.
- Minimum recommended transformer size: 125 kVA, with 2.4% rated regulation at unity power factor. Resultant maximum allowable feeder regulation is 3.6%.

Nominal line voltage MUST fall within ONE of these ranges.									
Average Power [VA]	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Peak Power [VA]	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Nominal Line Voltage [V]	200	220	240	380	400	420	440	460	480
Hi-Line Limit, +10% [A]	220	242	264	418	440	462	484	506	528
Lo-Line Limit, -10% [A]	180	198	216	342	360	378	396	414	432
Continuous Line Current [A]	58	52	48	30	29	27	26	25	24
Momentary Line Current [A]	289	262	241	152	144	137	131	126	120
Maximum Line Current [A]	321	292	267	169	160	153	146	139	134
Minimum Recommended Circuit Breaker [A]	150	150	150	110	110	100	100	90	90

Table 12-1 Nominal Line Voltage Ranges

Feeder Length (Power Substation to A1 Disconnect)	**Minimum Feeder Wire Size, AWG or MCM (sq. mm)/ VAC**					
	380 VAC	**400 VAC**	**420 VAC**	**440 VAC**	**460 VAC**	**480 VAC**
15 m (50 ft)	2 (35)	2 (35)	3 (30)	3 (30)	3 (30)	3 (30)
30 m (100 ft)	2 (35)	2 (35)	3 (30)	3 (30)	3 (30)	3 (30)
46 m (150 ft)	2 (35)	2 (35)	3 (30)	3 (30)	3 (30)	3 (30)
61 m (200 ft)	2 (35)	2 (35)	3 (30)	3 (30)	3 (30)	3 (30)
76 m (250 ft)	1 (45)	1 (45)	2 (35)	2 (35)	2 (35)	3 (30)
91 m (300 ft)	1/0 (55)	1/0 (55)	1 (45)	1 (45)	2 (35)	2 (35)
107 m (350 ft)	2/0 (70)	1/0 (55)	1/0 (55)	1 (45)	1 (45)	1 (45)
122 m (400 ft)	2/0 (70)	2/0 (70)	1/0 (55)	1/0 (55)	1/0 (55)	1 (45)

Table 12-2 Minimum Feeder Wire Size

Feeder Length (Power Substation to A1 Disconnect)	**Minimum Feeder Wire Size, AWG or MCM (sq. mm)/ VAC**		
	200 VAC	**220 VAC**	**240 VAC**
15 m (50 ft)	1/0 (55)	1/0 (55)	1/0 (55)
30 m (100 ft)	2/0 (70)	1/0 (55)	1/0 (55)
46 m (150 ft)	4/0 (100)	3/0 (85)	3/0 (85)
61 m (200 ft)	5/0 (125)	4/0 (100)	4/0 (100)
76 m (250 ft)	6/0 (170)	5/0 (125)	5/0 (125)

Table 12-3 Minimum Feeder Wire Size

Feeder Length (Power Substation to A1 Disconnect)	Minimum Feeder Wire Size, AWG or MCM (sq. mm)/ VAC		
	200 VAC	220 VAC	240 VAC
91 m (300 ft)	7/0 (215)	6/0 (170)	5/0 (125)
107 m (350 ft)	8/0 (275)	7/0 (215)	6/0 (170)
122 m (400 ft)	8/0 (275)	7/0 (215)	7/0 (215)

Table 12-3 Minimum Feeder Wire Size

Note: In all cases the recommended ground wire is a 55 sq. mm (1/0) ground wire.

Sub-feeder Length (A1 to PDU)	Minimum Sub-feeder Wire, AWG or MCM (sq. mm)					
	380 VAC	400 VAC	420 VAC	440 VAC	460 VAC	480 VAC
9.7536 m (32 ft)	2 (35)	2 (35)	3 (30)	3 (30)	3 (30)	3 (30)

Table 12-4 Minimum Sub-Feeder Wire Size

Sub-feeder Length (A1 to PDU)	Minimum Sub-feeder Wire, AWG or MCM (sq. mm)		
	200 VAC	220 VAC	240 VAC
9.7536 m (32 ft)	1/0 (55)	1/0 (55)	1/0 (55)

Table 12-5 Minimum Sub-Feeder Wire Size

For 75kVA Option

- Maximum power demand = 75kVA @ 0.85 PF: at a Selected Technique of 120 kV, 400 mA.
- Average effective (RMS) power demand at maximum duty cycle = 20 kVA.
- Average power demand at maximum duty cycle = 10 kVA
- Maximum allowable total source regulation is 6%.
- Minimum recommended transformer size: 93.75 kVA, with 2.4% rated regulation at unity power factor. Resultant maximum allowable feeder regulation is 3.6%.

Nominal line voltage MUST fall within ONE of these ranges.									
Average Power [VA]	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Peak Power [VA]	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
Nominal Line Voltage [V]	200	220	240	380	400	420	440	460	480
Hi-Line Limit, +10% [A]	220	242	264	418	440	462	484	506	528
Lo-Line Limit, -10% [A]	180	198	216	342	360	378	396	414	432
Continuous Line Current [A]	58	52	48	30	29	27	26	25	24
Momentary Line Current [A]	217	197	180	114	108	103	98	94	90
Maximum Line Current [A]	241	919	200	127	120	115	109	105	100
Minimum Recommended Circuit Breaker [A]	120	110	110	70	60	60	60	60	50

Table 12-6 Nominal Line Voltage Ranges

Feeder Length (Power Substation to A1 Disconnect)	**Minimum Feeder Wire Size, AWG or MCM (sq. mm)/ VAC**					
	380 VAC	**400 VAC**	**420 VAC**	**440 VAC**	**460 VAC**	**480 VAC**
15 m (50 ft)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)
30 m (100 ft)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)
46 m (150 ft)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)
61 m (200 ft)	2 (35)	3 (30)	3 (30)	4 (22)	4 (22)	4 (22)
76 m (250 ft)	2 (35)	2 (35)	2 (35)	3 (30)	3 (30)	4 (22)
91 m (300 ft)	1 (45)	1 (45)	2 (35)	2 (35)	2 (35)	3 (30)
107 m (350 ft)	1/0 (55)	1/0 (55)	1 (45)	1 (45)	2 (35)	2 (35)
122 m (400 ft)	2/0 (70)	1/0 (55)	1/0 (55)	1 (45)	1 (45)	1 (45)

Table 12-7 Minimum Feeder Wire Size

Feeder Length (Power Substation to A1 Disconnect)	**Minimum Feeder Wire Size, AWG or MCM (sq. mm)/ VAC**		
	200 VAC	**220 VAC**	**240 VAC**
15 m (50 ft)	1 (45)	2 (35)	3 (30)
30 m (100 ft)	1/0 (55)	1/0 (55)	1 (45)
46 m (150 ft)	3/0 (85)	2/0 (70)	2/0 (70)
61 m (200 ft)	4/0 (100)	4/0 (100)	3/0 (85)
76 m (250 ft)	5/0 (125)	5/0 (125)	4/0 (100)

Table 12-8 Minimum Feeder Wire Size

Feeder Length (Power Substation to A1 Disconnect)	Minimum Feeder Wire Size, AWG or MCM (sq. mm)/ VAC		
	200 VAC	220 VAC	240 VAC
91 m (300 ft)	6/0 (170)	5/0 (125)	5/0 (125)
107 m (350 ft)	7/0 (215)	6/0 (170)	5/0 (125)
122 m (400 ft)	7/0 (215)	7/0 (215)	6/0 (170)

Table 12-8 Minimum Feeder Wire Size

Sub-feeder Length (A1 to PDU)	Minimum Sub-feeder Wire, AWG or MCM (sq. mm)					
	380 VAC	400 VAC	420 VAC	440 VAC	460 VAC	480 VAC
9.7536 m (32 ft)	2 (35)	2 (35)	3 (30)	3 (30)	3 (30)	3 (30)

Table 12-9 Minimum Sub-Feeder Wire Size

Sub-feeder Length (A1 to PDU)	Minimum Sub-feeder Wire, AWG or MCM (sq. mm)		
	200 VAC	220 VAC	240 VAC
9.7536 m (32 ft)	1/0 (55)	1/0 (55)	1/0 (55)

Table 12-10 Minimum Sub-Feeder Wire Size

For 50kVA Option

- Maximum power demand = 50kVA @ 0.85 PF: at a Selected Technique of 120 kV, 280 mA.
- Average effective (RMS) power demand at maximum duty cycle = 20 kVA.
- Average power demand at maximum duty cycle = 10 kVA
- Maximum allowable total source regulation is 6%.
- Minimum recommended transformer size: 62.5 kVA, with 2.4% rated regulation at unity power factor. Resultant maximum allowable feeder regulation is 3.6%.

Nominal line voltage MUST fall within ONE of these ranges.									
Average Power [VA]	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Peak Power [VA]	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Nominal Line Voltage [V]	200	220	240	380	400	420	440	460	480
Hi-Line Limit, +10% [A]	220	242	264	418	440	462	484	506	528
Lo-Line Limit, -10% [A]	180	198	216	342	360	378	396	414	432
Continuous Line Current [A]	58	52	48	30	29	27	26	25	24
Momentary Line Current [A]	144	131	120	76	72	69	66	63	60
Maximum Line Current [A]	160	146	134	84	80	76	73	70	67
Minimum Recommended Circuit Breaker [A]	80	80	70	50	50	50	50	50	50

Table 12-11 Nominal Line Voltage Ranges

Feeder Length (Power Substation to A1 Disconnect)	**Minimum Feeder Wire Size, AWG or MCM (sq. mm)/ VAC**					
	380 VAC	**400 VAC**	**420 VAC**	**440 VAC**	**460 VAC**	**480 VAC**
15 m (50 ft)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)
30 m (100 ft)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)
46 m (150 ft)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)
61 m (200 ft)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)
76 m (250 ft)	3 (30)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)
91 m (300 ft)	3 (30)	4 (22)	4 (22)	4 (22)	4 (22)	4 (22)
107 m (350 ft)	2 (35)	3 (30)	3 (30)	3 (30)	4 (22)	4 (22)
122 m (400 ft)	1 (45)	2 (35)	2 (35)	3 (30)	3 (30)	3 (30)

Table 12-12 Minimum Feeder Wire Size

Feeder Length (Power Substation to A1 Disconnect)	**Minimum Feeder Wire Size, AWG or MCM (sq. mm)/ VAC**		
	200 VAC	**220 VAC**	**240 VAC**
15 m (50 ft)	4 (22)	4 (22)	4 (22)
30 m (100 ft)	2 (35)	3 (30)	3 (30)
46 m (150 ft)	1/0 (55)	1 (45)	1 (45)
61 m (200 ft)	3/0 (85)	2/0 (70)	1/0 (55)
76 m (250 ft)	3/0 (85)	3/0 (85)	2/0 (70)

Table 12-13 Minimum Feeder Wire Size

Feeder Length (Power Substation to A1 Disconnect)	Minimum Feeder Wire Size, AWG or MCM (sq. mm)/ VAC		
	200 VAC	220 VAC	240 VAC
91 m (300 ft)	4/0 (100)	3/0 (85)	3/0 (85)
107 m (350 ft)	5/0 (125)	4/0 (100)	3/0 (85)
122 m (400 ft)	6/0 (170)	5/0 (125)	4/0 (100)

Table 12-13 Minimum Feeder Wire Size

Sub-feeder Length (A1 to PDU)	Minimum Sub-feeder Wire, AWG or MCM (sq. mm)					
	380 VAC	400 VAC	420 VAC	440 VAC	460 VAC	480 VAC
9.7536 m (32 ft)	2 (35)	2 (35)	3 (30)	3 (30)	3 (30)	3 (30)

Table 12-14 Minimum Sub-Feeder Wire Size

Sub-feeder Length (A1 to PDU)	Minimum Sub-feeder Wire, AWG or MCM (sq. mm)		
	200 VAC	220 VAC	240 VAC
9.7536 m (32 ft)	1/0 (55)	1/0 (55)	1/0 (55)

Table 12-15 Minimum Sub-Feeder Wire Size

Note: Note: In all cases the recommended ground wire is a 55 sq. mm (1/0) ground wire.

The information in Table 12-1, Table 12-2, and Table 12-4 (above) assumes the use of copper wire, rated 75 C and run in steel conduit. All ampacity is determined in accordance with the National Electrical Code (NFPA 70), Table 310-16 (2002). The ampacity of the circuit protection device listed above determines the minimum feeder size, except where total source regulation limits require a larger size.

NOTICE Power feeders running under the scan room floor, as well as power vault substations under the floor, above the scan suite, or in adjacent rooms, may cause excessive EMI fields. The responsibility for meeting all site EMI requirements rests with the customer.

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Chapter 13
Interconnection Data

Section 1.0: Introduction

The customer and the customer's electrical contractor should refer to the information in this section when establishing network and power interconnections for the system. Please note the following:

- Figure 13-1 shows interconnection runs for a 50/60 Hz system.
- Table 13-1 shows component designators for supplied equipment and options and wall power outlets.
- Table 13-7 lists customer-installed wiring and supplied cables. The actual length of each run is less than the length of supplied cables to allow for routing inside the equipment. Cable diameters and sizes of connectors are provided to aid in sizing conduit and access plates.
- Table 13-2 lists details for connection to the system and GE approved accessories using standard (short) length and non-standard (long) length cables, respectively. Details appear for the following types of runs, when appropriate:

  - Flush-floor duct
  - Computer floor
  - Through-wall bushing
  - Junction box
  - Surface floor duct
  - Through-floor duct
  - Wall duct
  - Conduit

- To minimize the need for additional junction boxes, use either a cable raceway system or a raised computer floor. Optima CT660 systems use prefabricated cables with large plugs. Therefore, try to avoid conduit or pipe for cable runs.

Section 2.0: Component Designators

DESIGNATOR	APPLIES TO	SOURCE
A1	Primary power disconnect	**Contractor supplied**
CT1	Patient table	System
CT2	Gantry	System
OC1	console/computer	System
PDU	Power Distribution Unit	System
SEO	System emergency off	**Contractor supplied**
SM	Slave monitor	Option
WL	"X-ray on" warning light	**Contractor supplied**
DS	Door Interlock Switch	**Contractor supplied**
BBNC	Broad-band network connection	**Contractor supplied**

Table 13-1 Component Designators

Section 3.0: Interconnect Runs, Wiring and Cables

3.1 GE Healthcare Supplied (Standard Length 5444556)

(Reference IEC 60601-1-2 6.8.3.201(IEC 60601-1 Edition 2 Scheme) / 5.2.2(IEC60601-1 Edition 3 Scheme))

Run #	Length, Actual (Usable)		Part #	Description	UL Cable Information								Pull Size mm (Inches)
	ft	m			UL Style	Flam. Rating	Voltage Rating	Voltage Actual	Temp. Rating (C)	Dia. mm (inch)	# of Cond	Size AWG	
050	28 (20)	9 (6)	2343529-2	HVDC, PDU to Gantry	2587	FT4	600	+ & - 350VDC	90	19 0(.751)	3	(2) 4 (1) 8	22 (0.87) Dia
051	28 (20)	9 (6)	2343530-2	HVAC, PDU to Gantry	2587	FT4	600	440Y/254	90	15 (0.604)	4	14	11 (0.44) Dia
052	28 (20)	9 (6)	2343528-2	LVAC, PDU to Gantry	2587	FT4	600	120/208Y	90	14 0(.542)	5	8	56 (2.22) Dia
053	65 (60)	20 (18)	2343531-2	LVAC, PDU to Console	2587	FT4	600	120VAC	90	12 (0.483)	3	10	56 (2.22) Dia
054			n/a	LVAC, Gantry to Table	1015		600	120VAC			3	14	
055	28 (20)	9 (6)	2371450-2	Ground, PDU to Raceway	1284	VW-1 (FT-1)	600	0	105	16 0(.608)	1	1/0	16 (0.62) Dia
056	69 (56)	21 (17)	2371450-4	Ground, Raceway to Console	1283	VW-1 (FT-1)	600	0	105	12 (0.467)	1	2	12 (0.48) Dia
100	32.5 (20)	10 (6)	5120646-2	Signal, Gantry TGPU to PDU		FT-4	300	<30VDC	80	11 (0.440)	25	22	17 x 58 (0.68 x 2.30) 19 x 51 (0.75 x 2.01)
101	71 (60)	22 (18)	5120645-2	Signal, Gantry TGPU to OC		FT-4	300	<30VDC	80	11 (0.440)	25	22	17 x 58 (0.68 x 2.30) 19 x 51 (0.75 x 2.01)
102	68 (60)	22 (18)	2373436-3	Signal (LAN), Gantry to OC			1900	<30VDC		6 (0.234)	8	24	15 (0.59) Dia
103	65 (60)	20 (18)	5125259-2	Fiber Optic, Gantry to OC			N/A	N/A			1	N/A	10 (0.39) Dia
104			n/a	Signal, Gantry to Table		FT-4	300		80	6 (0.234)	25	22	

Table 13-2 GE Healthcare Supplied Cables (Standard Run) - UL Information

3.2 GE Healthcare-Supplied (Optional, Long Run Length 5444556-2)

(Reference IEC 60601-1-2 6.8.3.201(IEC 60601-1 Edition 2 Scheme) / 5.2.2(IEC60601-1 Edition 3 Scheme))

Run #	Length, Actual (Usable)		Part #	Description	UL Cable Information								Pull Size mm (Inches)
	ft	m			UL Style	Flam. Rating	Voltage Rating	Voltage Actual	Temp. Rating (C)	Dia. mm (inch)	# of Cond	Size AWG	
050	62 (56)	19 (17)	2343529	HVDC, PDU to Gantry	2587	FT4	600	+ & - 350VDC	90	19 0(.751)	3	(2) 4 (1) 8	22 (0.87) Dia
051	62 (56)	19 (17)	2343530	HVAC, PDU to Gantry	2587	FT4	600	440Y/254	90	15 (0.604)	4	14	11 (0.44) Dia
052	62 (53)	19 (16)	2343528	LVAC, PDU to Gantry	2587	FT4	600	120/208Y	90	14 0(.542)	5	8	56 (2.22) Dia
053	82 (76)	25 (23)	2343531	LVAC, PDU to Console	2587	FT4	600	120VAC	90	12 (0.483)	3	10	56 (2.22) Dia
054	-	-	n/a	LVAC, Gantry to Table	1015		600	120VAC			3	14	
055	62 (53)	19 (16)	2371450	Ground, PDU to Raceway	1284	VW-1 (FT-1)	600	0	105	16 0(.608)	1	1/0	16 (0.62) Dia
056	86 (72)	26 (22)	2371450-3	Ground, Raceway to Console	1283	VW-1 (FT-1)	600	0	105	12 (0.467)	1	2	12 (0.48) Dia
100	69 (56)	21 (17)	5120646	Signal, Gantry TGPU to PDU		FT-4	300	<30VDC	80	11 (0.440)	25	22	17 x 58 (0.68 x 2.30) 19 x 51 (0.75 x 2.01)
101	85 (72)	26 (22)	5120645	Signal, Gantry TGPU to OC		FT-4	300	<30VDC	80	11 (0.440)	25	22	17 x 58 (0.68 x 2.30) 19 x 51 (0.75 x 2.01)
102	85 (72)	26 (22)	2373436-2	Signal (LAN), Gantry to OC			1900	<30VDC		6 (0.234)	8	24	15 (0.59) Dia
103	85 (76)	25 (23)	5125259	Fiber Optic, Gantry to OC			N/A	N/A			1	N/A	10 (0.39) Dia
104	-	-	n/a	Signal, Gantry to Table		FT-4	300		80	6 (0.234)	25	22	

Table 13-3 GE Healthcare Supplied Cables (Option Run) - UL Information

3.3 GE Healthcare Supplied (Cables of Options)

(Reference IEC 60601-1-2 6.8.3.201(IEC 60601-1 Edition 2 Scheme) / 5.2.2(IEC60601-1 Edition 3 Scheme))

OPTION	LENGTH, ACTUAL (USABLE)		PART #	DESCRIPTION	UL CABLE INFORMATION								PULL SIZE MM (INCHES)
	ft	m			UL Style	Flam. Rating	Voltage Rating	Voltage Actual	Temp. Rating (C)	Dia. mm (inch)	# of Cond	Size AWG	
Injector	100	30.5	5169456	GANTRY TO INJECTOR	1007	VW-1	300	<30VDC	80	1.57 (0.062)	3	22	45(1.78) Dia
	8..2	2.5	5317258	POWER CABLE INJECTOR TO CONSOLE	62	VW-1	300	120VAC	60	9.4 (0.37)	3	14	36(1.41) Dia
Cardiac	30	9.1	5198566	GANTRY TO EKG MONITOR	2919	UL1685 UL loading	30	<30VDC	80	6.45 (0.254)	6	24	37(1.45) Dia
Adv 4D Resp	100	30.5	5199717	GANTRY TO RPM UNIT	2464	FT4	300	<30VDC	80	6.6 (0.26)	4	22	37(1.45) Dia

Table 13-4 GEMS Supplied Cables for Options - UL Information

3.4 UPS Wiring Cables

(Reference IEC 60601-1-2 6.8.3.201(IEC 60601-1 Edition 2 Scheme) / 5.2.2(IEC60601-1 Edition 3 Scheme))

Run #	Length Actual (Usable) ft	Length Actual (Usable) m	Part #	Description	UL Cable Information: UL Style	Flam. Rating	Voltage Rating	Voltage Actual	Temp. Rating (C)	Dia. mm (inch)	# of Cond	Size AWG	Pull Size mm (inches)
060	19 (15)	4.6	2391751	POWER CABLE, NGPDU TO UPS	2587	FT4	600	208VAC	90	5.8 (0.228)	5	8	
061	19 (15)	4.6	2391751-3	POWER CABLE, UPS DISCONNECT PANEL TO NGPDU	2587	FT4	600	208VAC	90	5.8 (0.228)	4	8	
110	45 (40)	13.6	5169224	UPS CONTROL CABLE	2587	FT4	600	120VAC	90	10.3 (0.406)	5	18	

Table 13-5 UPS Wiring Cables

3.5 A1 UPS

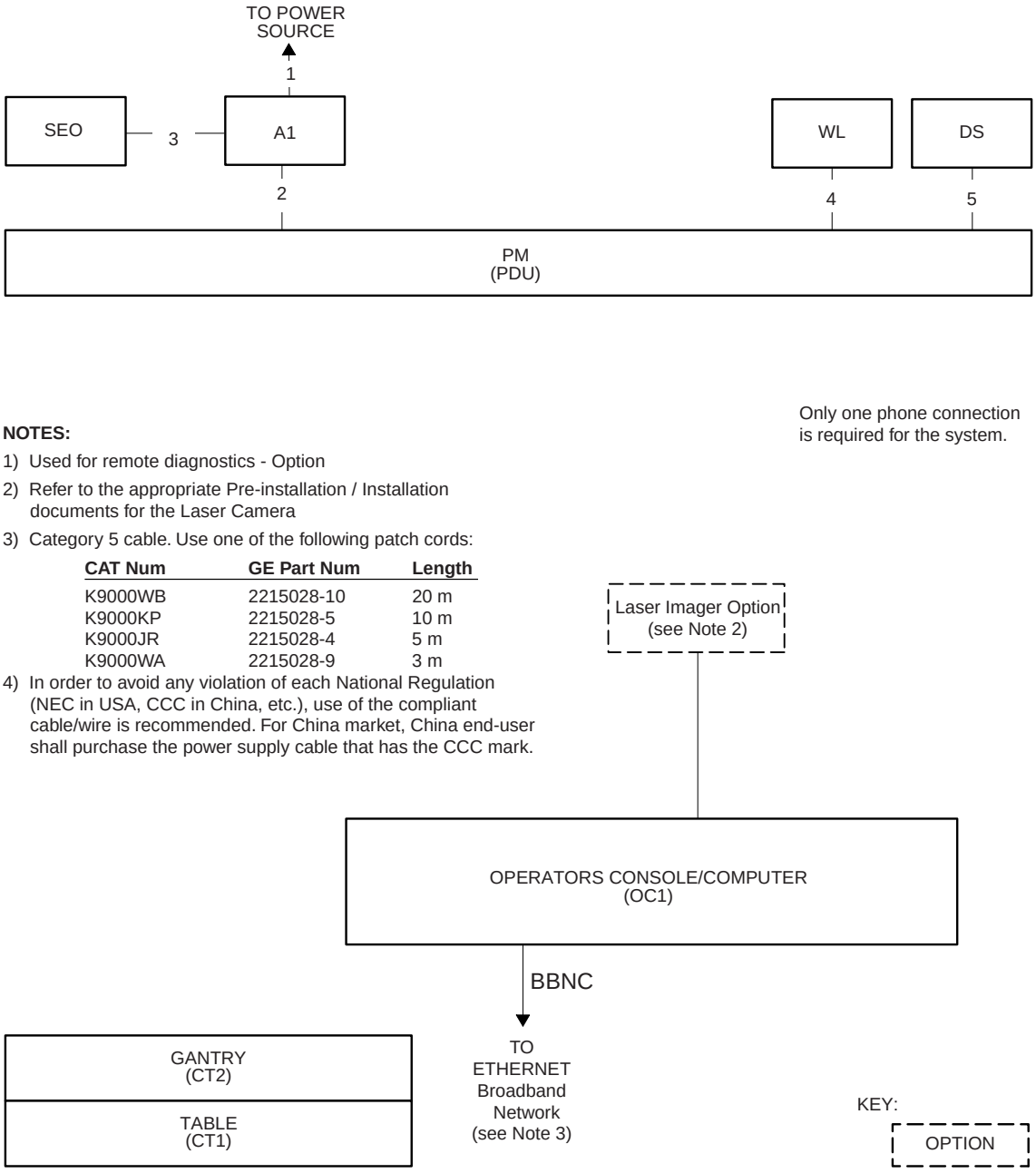
PDU Type & Model No.	Maximum Mom. kVA Rating	Required Main Disconnect (A1) Catalog No.		Optional Partial UPS Kit Catalog No.
		Europe & Asia (380-400V or 420V)	North America (440V or 460-480V)	
NGPDU-80 2326492-80	100kVA	**E4502AC** (110A) (incl. Auto Restart & Integrated UPS Control)	**E4502AB** (90A) (incl. Auto Restart & Integrated UPS Control)	**B7999ZA** (incl. 12.5KVA UPS&40A hardware kit) REQUIRES one of the A1 Panels shown at left

Table 13-6 A1 UPS

3.6 Contractor/Customer-Supplied

Customer Installed Wiring		Description	Cables Supplied			Plug Pulling Dimensions		Wire and Cable Pigtails ft. (M.)	
Qty	**Size AWG (MM^2)**		**Part No**	**LENGTH ft. (M.)**	**DIA. in (mm)**	**From**	**TO**	**From**	**To**
RUN NO. 1 FROM PRIMARY POWER SOURCE TO FACILITY DISCONNECT (POWER SOURCE - A1)									
Maximum Run Length *									
3	*	POWER						3 (1)	3(1)
1	1/0 (50)	GROUND						3 (1)	3 (1)
RUN NO. 2 FROM FACILITY DISCONNECT TO POWER DISTRIBUTION UNIT (A1 - PM)									
3	*	POWER						3 (1)	3(1)
1	1/0 (50)	GROUND						3 (1)	3 (1)
-	-	NEUTRAL -- Not Required						3 (1)	3 (1)
RUN N0. 3 FROM FACILITY DISCONNECT TO SYSTEM EMERGENCY OFF (A1 - SEO)									
2	14 (2)	POWER						6 (2)	6 (2)
1	14 (2)	GROUND						6 (2)	6 (2)
RUN NO. 4 POWER DISTRIBUTION UNIT TO WARNING LIGHT CONTROL (PDU - WL)									
2	14 (2)	WARNING LIGHT 24 VOLT CONTROL TS6 1, 2, 3, 4, 5, 6, 7, 8							
RUN NO. 5 POWER DISTRIBUTION UNIT TO SCAN ROOM DOOR INTERLOCK (PDU - DOOR SWITCH)									
2	14 (2)	SCAN ROOM DOOR INTER LOCK TS6 9, 10							
*	REFER TO Table 12-4 and Table 12-5 on page 115 FOR AWG (MM2) WIRE SIZES								
RUN NO. n/a BBNC									
1	customer determined	Hospital Broadband Network Connection (Wall Jack: Placed on the wall behind the console.)							

Table 13-7 Runs 1, 2, 3, 4 and 5 Connections



NOTES:

1) Used for remote diagnostics - Option
2) Refer to the appropriate Pre-installation / Installation documents for the Laser Camera
3) Category 5 cable. Use one of the following patch cords:

CAT Num	GE Part Num	Length
K9000WB	2215028-10	20 m
K9000KP	2215028-5	10 m
K9000JR	2215028-4	5 m
K9000WA	2215028-9	3 m

4) In order to avoid any violation of each National Regulation (NEC in USA, CCC in China, etc.), use of the compliant cable/wire is recommended. For China market, China end-user shall purchase the power supply cable that has the CCC mark.

Figure 13-1 Interconnection Runs

3.7 Fuse

ITEM	NUMBER	QTY	FRU	DESCRIPTION/NAME
1	5365852	2	Y	NGPDU-80 Input Fuse (160A 690VAC)
2	2364059	1	Y	GLASS FUSE (6.3A 250V)
3	46-170021P50	1	Y	FUSE 12 AMPS 250 VOLTS BUSSMAN MDA12 DUAL ELEMENT.
4	46-170021P15	1	Y	FUSE 8 AMPS 250 VOLTS REVIEWED TK, 7 91.
5	2336517-2	2	Y	FUSE 25 AMPS 700 VOLTS 2.5M SECONDS
6	46-170021P31	2	Y	One-HalfA, 250V SLO-BLO FUSE. TYPE 3AG, 1.25aprox. X 0.25aprox. GLASS BODY. REVIEWED TK, 7-91.
7	2379651	1	Y	FUSE - 700 V, 200 A, FAST SEMI
8	5327449	2	Y	PROTECTION FUSE, 3.2A, NA, FAST ACTION, 250V, HM FUSE 3.2A
9	5327448-2	1	Y	PROTECTION FUSE, 2A, NA, FAST ACTION, 250V, HM FUSE
10	5327448	2	Y	PROTECTION FUSE, 1A, NA, FAST ACTION, 250V, HM FUSE
11	2142415-9	1	Y	PROTECTION FUSE, 25A, TIME DELAY, 600VAC 250VDC, CHASSIS MOUNTED
12	2148403-3	1	Y	PROTECTION FUSE, 2A, FAST ACTION, 250V, 5X20MM
13	2142415-4	1	Y	PROTECTION FUSE, 5A, TIME DELAY, 600VAC 250VDC, BOARDS USE FUSE CLIPS
14	2142415-7	1	Y	PROTECTION FUSE, 15A, TIME DELAY, 600VAC 250VDC, BOARDS USE FUSE CLIPS
15	2142415-5	1	Y	PROTECTION FUSE, 8A, TIME DELAY, 600VAC 250VDC, BOARDS USE FUSE CLIPS
16	5118644	1	Y	FAST ACTION 15 AMPS 250 VOLTS 0.01 SECONDS U0028FF

Table 13-8 FUSE KIT Optima CT660 (5371451-2 BOM, rev x)

ITEM	NUMBER	QTY	FRU	DESCRIPTION/NAME
1	2142415-9	1.0	No	PROTECTION FUSE, 25A, TIME DELAY, 600VAC 250VDC, CHASSIS MOUNTED-- CURRENT RATING HIGHER THAN FOR TYPICAL WITH FUSE CLIPS
2	2364059	1.0	Yes	GLASS FUSE
3	46-170021P15	1.0	Yes	FUSE, TIME DELAY, 6.3X32MM, 8A, 250V, 400A INTERRUPT AT 250VAC, CERAMIC, UL
4	46-170021P50	1.0	Yes	FUSE, TIME DELAY, 6.3X32MM, 12A, 250V, 400A INTERRUPT AT 250VAC, CERAMIC, UL
5	5327449	1.0	Yes	PROTECTION FUSE, 3.2A, NA, FAST ACTION, 250V, HM FUSE
6	5365852	2.0	Yes	NGPDU-80 Input Fuse
7	5435503	1.0	Yes	fuse 10A 250V AC
8	5422971	3.0	Yes	FUSE 6X32 15A 250V 750A UL
9	5260728-3	2.0	No	PROTECTION FUSE, 7A, TIME DELAY, 125V, WITH INTEGRAL CLIPS, Not Preferred Part
10	5336513	2.0	Yes	Fuse holder for drive power and brake resistor

Table 13-9 Cj M40 Fuse Kit (5371451-5 BOM, rev 4)

Section 4.0: Contractor Supplied Components

REFERENCE	ASSOCIATED EQUIPMENT	MATERIAL/LABOR SUPPLIED BY CUSTOMER CONTRACTOR	USA VENDOR / CAT NO. GE CATALOG
A1 380 - 480V 50/60 Hz	Fusible Disconnect and Magnetic Contactor	3 Pole, 380V - 480V, Combination breaker with magnetic contactor. Includes control transformer, optional UPS interface, On/Off controls and auto-restart feature.	Recommend*: • E4502AC (110A) • E4502AB (90A)
BBNC (required)	Broad-Band Network Connection	Broad-Band network connection wall jack, located within 1m (39inches) of Operator Console location, for internal hospital networking and InSite Broad-Band connectivity. Cabling to conform to facility's IT standards.	
	System Components	Reference the system installation drawings supplied by Installation Support Services within your geographic area.	

*Refer to Table 13-7 on page 126

Table 13-10 Contractor-Supplied Components

Section 5.0: Scan Room Warning Light and Door Interlock

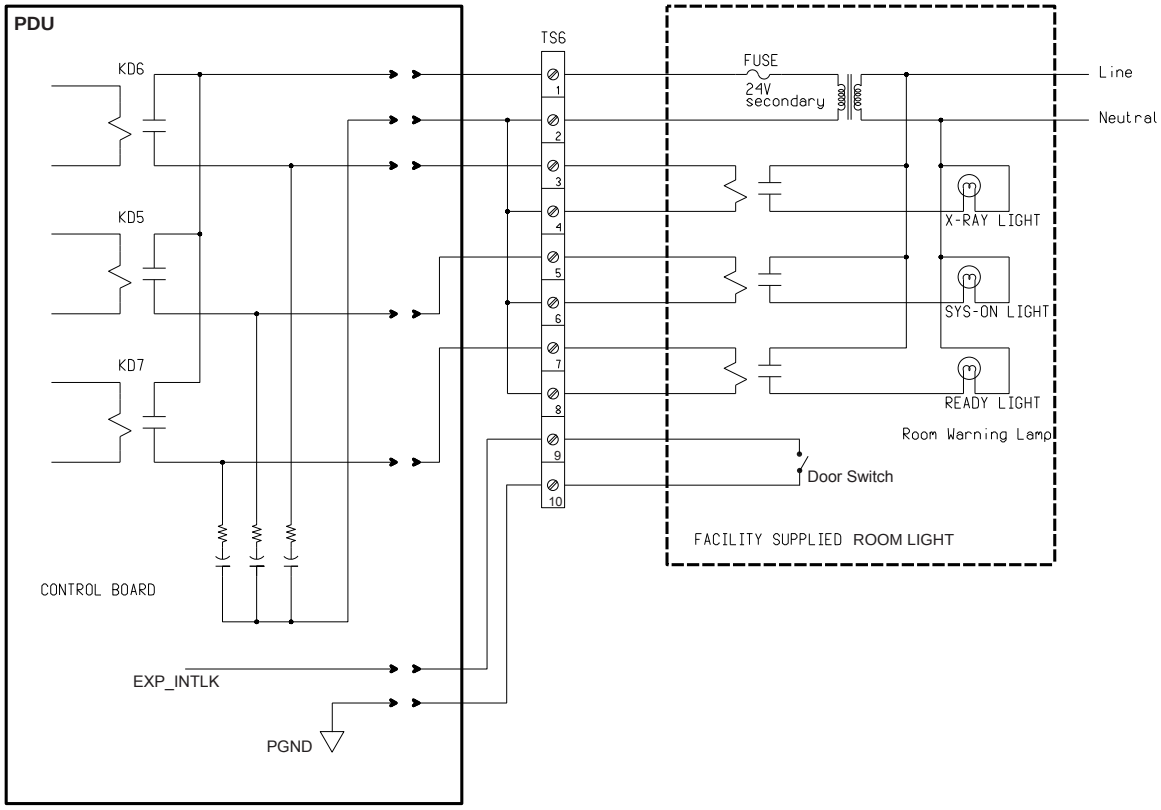
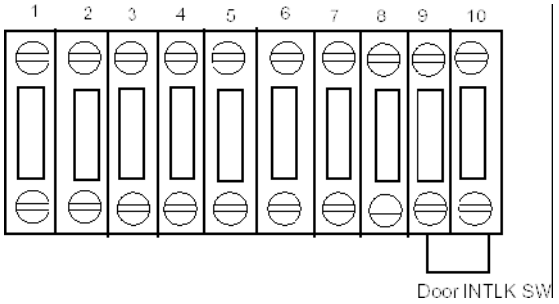
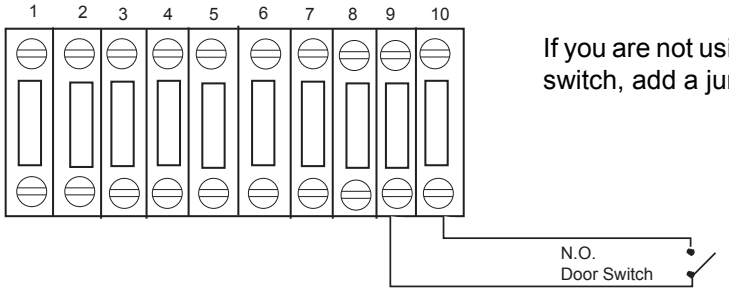


Figure 13-2 TS6 X-Ray Warning Light Connections



Without the jumper in place, ecposures do not occur. Check this jumper if you get scan interlock errors.

Figure 13-3 TS6 Room Door Interlock Connections - Without a Door Interlock



If you are not using a door switch, add a jumper.

Figure 13-4 TS6 Room Door Interlock Connections - With a Door Interlock

Chapter 14
Delivery and Storage Requirements

This chapter provides information necessary for planning a safe and successful delivery of the system from GE Healthcare to the receiving area of the installation site, and from the receiving area of that facility to the scan suite.

Section 1.0: Delivery to the Facility

Your Project Manager of Installation will determine the most appropriate means of transporting the system to your facility. However, the type of receiving area at the facility where the installation will occur determines, to a large extent, the method used to transport the system to that facility. When planning for delivery, facilities fall into two general categories: those with a loading dock, and those without a loading dock.

1.1 Loading Dock Deliveries

Facilities with a loading dock in their receiving area can generally accommodate delivery of the system by van. This is the preferred method of transporting the system to the installation site, as dock-to-dock shipment by van minimizes the possibility of dropping the gantry. Also, packing the CT system for van shipment involves minimum tear-down of components. This system is shipped Lean packed on pallets and dollies with approximately 10 units.

1.2 Ground (Non-Loading Dock) Deliveries

Facilities without a loading dock usually require ground delivery by either liftgate or tiltbed truck. Such deliveries require unloading the system components from the truck and then rolling them across smooth sidewalks or other paved surfaces into the facility.

1.2.1 Liftgate Truck

Delivery of the system by liftgate truck requires an appropriate capacity truck with a liftgate capable of lifting 3 tons. If using a rollback truck, the Project Manager of Installation should be on-site at the time of delivery to supervise this operation in person.

1.2.2 Tiltbed Truck

Delivery of the system by tiltbed truck also requires an appropriate capacity truck, capable of lifting 3 tons. Safe transport of the system by tiltbed truck requires securing the components to the truck to prevent damage during transportation. To avoid damage to the gantry or dolly when removing the gantry from a tiltbed truck, the Project Manager of Installation should direct the driver to attach straps to the lowest possible point on the dolly and lower the gantry at the slowest reasonable rate.

1.2.3 Forklift Truck

A forklift can be used to unload the gantry, provided that the lifting option is ordered and delivered. The system will arrive with a lifting skid attached to the gantry and table. This option cannot be added later as an on-site addition.

Section 2.0: Delivery to the Scan Suite

Once at the installation site, conveyance of the system into the scan suite may involve special considerations, such as vertical lifting, or transportation though stairwells, which involves additional planning by the Project Manager of Installation.

2.1 Lifting

Both vertical and horizontal lifting require professional riggers. The PMI should always notify CT engineering before attempting either lifting procedure and should make sure that the order includes the necessary lifting fixtures, as both vertical and horizontal fixtures must appear on the order for them to ship with the system.

If delivery requires vertical lifting, the PMI adds the appropriate identifier to the order. The gantry ships in a vertical lifting crate with lifting instructions for riggers.

If delivery requires horizontal lifting, the PMI adds the corresponding identifier to the order. The gantry ships in a horizontal lifting crate with lifting instructions for riggers.

2.1.1 Stairway Deliveries

Stairways with angles at or less than 45 degrees can accommodate delivery of system components. If the site requires delivery through stairwells, the PMI adds the appropriate identifier to the order to ensure proper packaging of the system, and notifies CT engineering before attempting the procedure. The components ship attached to special lifting skids with lifting instruction for riggers.

2.2 Floor Protection

GE recommends floor protection along the delivery path from the dock/receiving area to scan room.

2.3 Un-loading and un-packing the System

Retain the packaging surrounding the following components:

- Console-Shipped on a shock resistant skid. Do not remove the skid.
- UPS-Shipped on a shock resistant skid. Do not remove the skid.

Section 3.0: Dollies

3.1 Installations within the United States

Typically, domestic shipments (shipments within the United States) involve the use of dollies for moving the gantry, table, and console. After completing installation, return the dollies to GE using the shipping document found in Box #1.

3.2 Zero Clearance Dollies

Deliveries involving small elevators with a depth of at least 2692 mm (106 in.) require zero clearance dollies. Zero clearance dollies allow movement of the gantry in tight areas; avoid using them for normal dock or van deliveries. To order zero clearance dollies, go to: http://www.umi-dollyshop.com.

3.3 Tilting Table Dollies

Deliveries involving small elevators with a depth of at least 2438 mm (96 in.) require tilting table dollies. If storing the system prior to installation, do not order tilt dollies. If you are unable to obtain tilt dollies for delivery, substitute riggers in their place. A limited number of tilt dollies exist for U.S. deliveries. To order tilt dollies, go to: http://www.umi-dollyshop.com.

3.4 Installations Outside of the United States

Customers may purchase dollies (B7850LD) for shipments outside of the United States. After removing the system from the crates, DO NOT return dollies shipped outside of the US to GE Healthcare in Milwaukee, WI, USA. Instead, forward them to the local GE office or warehouse.

Zero Clearance and Tilting Table dollies can be purchased through UMI, To buy tilt dollies, go to: http://www.umi-dollyshop.com.

Section 4.0: Gantry Delivery Considerations

4.1 Gantry Shipping State

The gantry ships with most covers installed, and the assembly mounted between two dollies (see Figure 14-1). Two side rails, bolted to the dollies, stabilize the dollies and protect the gantry. Use the dolly elevating casters to lift the gantry off its base and roll it into position.

Figure 14-1 Gantry with Shipping Dollies and Side Rails

4.2 Door Openings

Unobstructed door openings, for moving equipment into the building, must measure 1067 mm X 2083 mm (42 in. X 82 in.) minimum. Corridors with a width of 2439 mm (8 ft.) also prove helpful.

4.3 Elevator Requirements

When moving the gantry from the receiving location to the scanning room, pay special attention to elevator size and capacity. Removing side rails and one dolly after placing the gantry in the elevator reduces the gantry width/length and elevator depth requirements.

Due to gantry component weight differences all weights listed below are averages. This change can measure ±18.14 kg (±40 lb). Contact the elevator manufacturer if the gantry weight exceeds elevator capacity (see Table 14-1).

Configuration	Length	Width	Height	Weight
Dollies On, Side Rails On	2810 mm (111 in.)	1290 mm (51 in.)	2000 mm (79 in.)	2050 kg (4520 lb)
Dollies On, Side Rails Removed	2810 mm (111 in.)	1039 mm (40.9 in.)	2000 mm (79 in.)	2022 kg (4458 lb)
Dollies Off, Covers Off	1970 mm (77 in.)	860 mm (34 in.)	1850 mm (73 in.)	1671 kg (3684 lb)

Table 14-1 Size of Gantry & Dollies, with and without Side Rails

The minimum hallway and door size for a gantry with covers and dollies attached but side rails removed, is 1016 mm (40 in.). For alternative lifting arrangements and instructions, contact GE Installation Support Services.

Section 5.0: Table Delivery Considerations

Table Delivery Considerations

GT1700V / VT2000:

The table is shipped without side covers installed. Covers are shipped in separate boxes. The table is mounted with two dollies.

Lite Table:

The whole Lite table is shipped in one box. The side and base covers are disassembled and put on the table. The table is mounted between two dollies.

For the table dimensions with dollies, refer to Table 14-2, Table Dimensions with dollies..

	Length		Width		Height		Weight	
	mm	in	mm	in	mm	in	kg	lb
VT2000	2997	118	762	30	1143	45	632	1390
GT1700V	2489	98	762	30	1143	45	576	1270
Lite Table	2244	89	820	32	1143	45	372	821

Table 14-2 Table Dimensions with dollies

Section 6.0: Console Delivery Considerations

The console is shipped without covers installed. The covers are delivered in the Product Grade Collector.

The dimensions of the console alone (as shipped) measure 832 mm (33 in.) deep, 470 mm (19 in.) wide, and 656 mm (26 in.) high.

Section 7.0: Storage Requirements

NOTICE Failure to adhere to storage requirements can result in equipment damage.

7.1 Short-term Storage (Less than Six Months)

If storing the CT system before installation for less than six months, store it in a temperature- and humidity-controlled warehouse. Protect it from weather, dirt, and dust.Meeting the following requirements prevents rust and corrosion from forming on bearing surfaces due to condensation:

- Storage temperature should not exceed 4º to 27º C (40º to 80º F).
- Maintain relative humidity (non-condensing) between 30% and 60%.
- Maximum rate of relative humidity change measures 5%/hr.
- Maximum rate of temperature change measures 3º C/hr. (5º F/hr.)
- Storage longer than 6 months is not recommended

NOTICE Between delivery qualifies as short-term storage. Van storage must meet the same specifications listed above.

7.2 Construction-Site Storage

When storing the CT system at a construction site be sure to adhere to the following storage requirements:

- Do not damage or puncture the shipping crate.
- Do not remove packaging until all construction is completed at the site and all dust created by the construction is removed.
- Maintain a storage temperature within the range of 10º to 32º C (50º to 90º F).
- Maintain a relative humidity (non-condensing) between 20% and 70%.

Section 8.0: Extreme Temperature Delivery and Storage

NOTICE Failure to adhere to extreme temperature requirements during delivery and storage can result in equipment damage.

Avoid extreme temperatures during system transportation and delivery.

Extreme temperatures consist of temperatures below -18º C (0º F), or above 49º C (120º F), without humidity control.

When transporting the CT system, prevent extended exposure of the system to temperatures or humidity outside of the following specifications:

- Temperature: -40º to +70º C (-40º to +158o F)
- Humidity: 5% to 95%

NOTICE Component freezing occurs when exposing the CT system to temperatures below -18º C (0o F) for a period longer than two (2) days. Allow a minimum of 12 hours for the CT system to adjust to ambient room temperature prior to installation.

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Chapter 15
Handling Requirements

Communicate the information in this chapter to any personnel who will transport, move, or otherwise handle the system components during transportation and delivery of the system.

Section 1.0: Transportation

To avoid dropping the gantry, it is recommended that the system is transported from GE Healthcare to the facility of the installation site, shipping dock-to-dock in a van. However, facilities without a loading dock may transport the system using liftgate or flatbed trucks, provided that no dropping or mis-handling of the system occurs. These methods involve unloading system components from the truck and then rolling them across SMOOTH sidewalks or other paved surfaces.

Section 2.0: Handling Requirements

The design of the system does not tolerate dropping, shock, vibration, tipping, or hoisting. Be sure to communicate these handling requirements to all parties involved in transporting, moving, and handling system components.

2.1 Avoid Dropping

Never drop the gantry, console, table, or PDU. A drop from a height greater than 13 mm (0.5 in.) may cause structural damage to the frame or other major components. Damage resulting from a drop (e.g., bent frame, misalignment) may not become apparent until after the system is installed

2.2 Avoid Shocks and Vibrations

The design of the system, including the gantry, console, table, and PDU, does not tolerate excessive shock or vibration, which may occur during unloading. For example, rolling the console across a "washboard" style ramp may vibrate components, causing loose or broken connections. Damage resulting from shock or vibration (e.g., monitor, CD-ROM, hard-drive, or console failure) may not become evident until after the system is installed.

2.3 Avoid Tipping

All system components must remain upright at all times; avoid tipping them. Move the gantry by rolling it on its dollies ONLY, do NOT hoist it. Avoid tipping or lifting the gantry when moving it through hallways, doorways, elevators, etc.

⚠ **NOTICE** **Never lift the gantry with a forklift. Lifting the gantry requires engineering approval for each occurrence. Your GE PMI should contact CT Engineering for all special lifting requirements, as unauthorized gantry lifting can cause gantry bearing damage.**

2.4 Inclines and Flat-bed Truck Removal

Inclines and Flat-bed Truck Removalwrecker, attach the straps to the LOWEST possible point on the dolly, and lower the gantry at the SLOWEST reasonable rate, (see Figure 15-1).

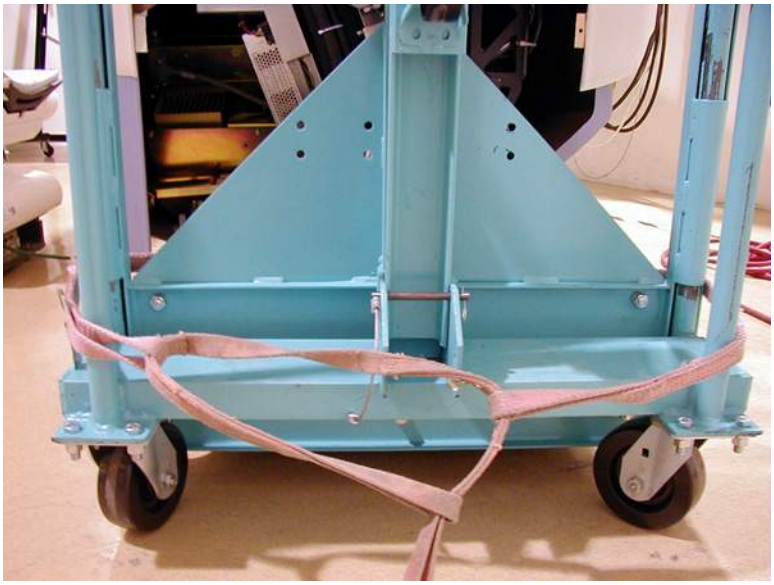


Figure 15-1 Proper Gantry Strap Location

⚠ **WARNING SOME ASSEMBLIES MAY BE TOP-HEAVY. BE CAREFUL NOT TO TIP!**

Appendix A
Alternate Cover Removal Options

Section 1.0 Alternate Cover Removal Options

1.1 Overview

The room dimensions and clearance dimensions shown in this manual assume a room configuration in which the front and rear gantry covers are removed and stored straight back/ forward from the gantry. However, not all room configurations are the same, meaning covers can be stored in other available spaces. For example, some rooms are long and skinny, while other rooms are short and wide. Some rooms may have a support column in the way, while other rooms have an adjacent room to store the gantry covers. For this reason, some alternative cover removal options for different room configurations are presented in this appendix.

1.2 Front Cover Removal

Rather than storing the front cover straight forward from the gantry at the foot of the table, the cover can be moved and stored on the right or left side of the table if there is space available while still maintaining service access to the table. Additionally, the cover can be moved out of the scan room to a temporary storage location.

The standard procedure for removing the front cover is with the table all the way down. A second method for front cover removal is with the table partially raised and the IMS moved into the bore of the gantry by table service switch. Under this method, the minimum length of the room can be reduced.

NOTICE

A room size that utilizes the table-up cover removal method has severe limitations in space for patient care and work flow. The map and dimensions shown in this manual depict the required clearances for proper equipment operation and service only. The customer/purchaser is responsible for federal, state and/or local codes regarding facility egress and related facility requirements.

1.3 Rear Cover Removal

Rather than storing the rear cover straight back from the gantry, the cover can be moved and stored on the right or left side or angled if there is space available while still maintaining service access to the gantry. Additionally, the cover can be moved to the side of the table or out of the scan room to a temporary storage location.

For rooms with a surface floor duct (without ramps) behind the gantry, the rear cover cannot be moved to the side of the gantry. Due to the weight of the gantry cover, lifting it over a surface floor duct without ramps is prohibited.

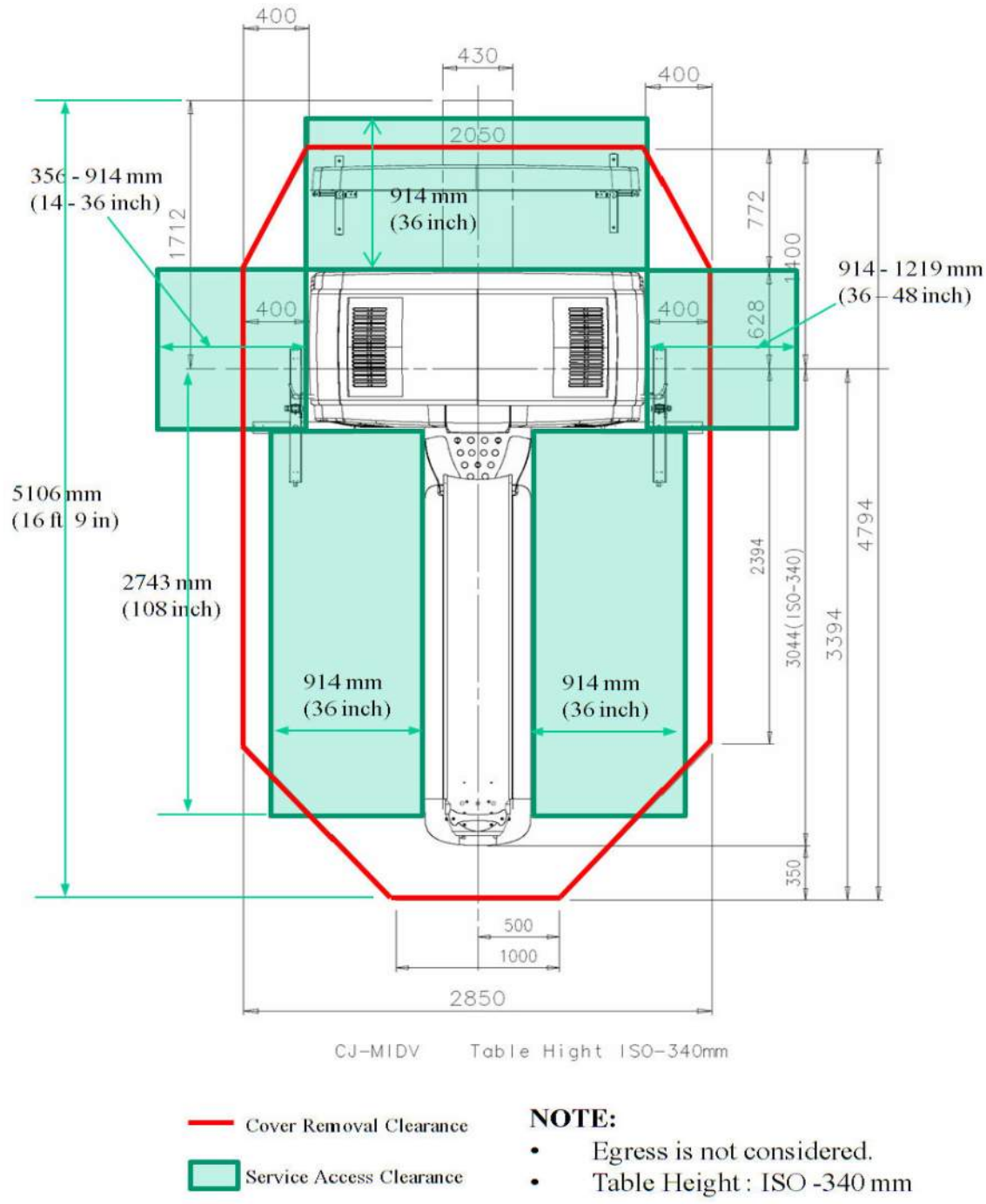


Figure A-1 Standard Service Access (GT1700V)

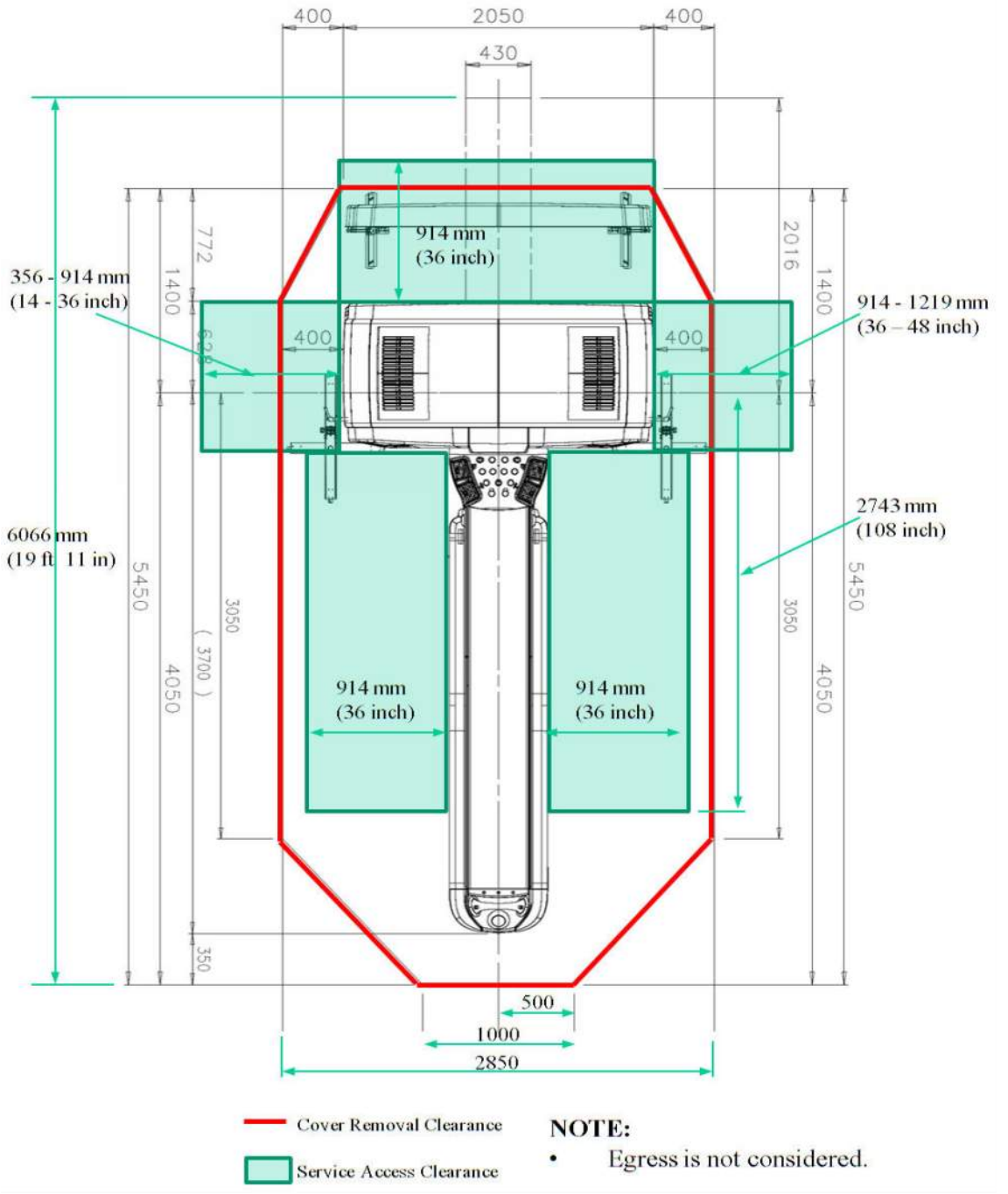


Figure A-2 Standard Service Access (GT2000V)

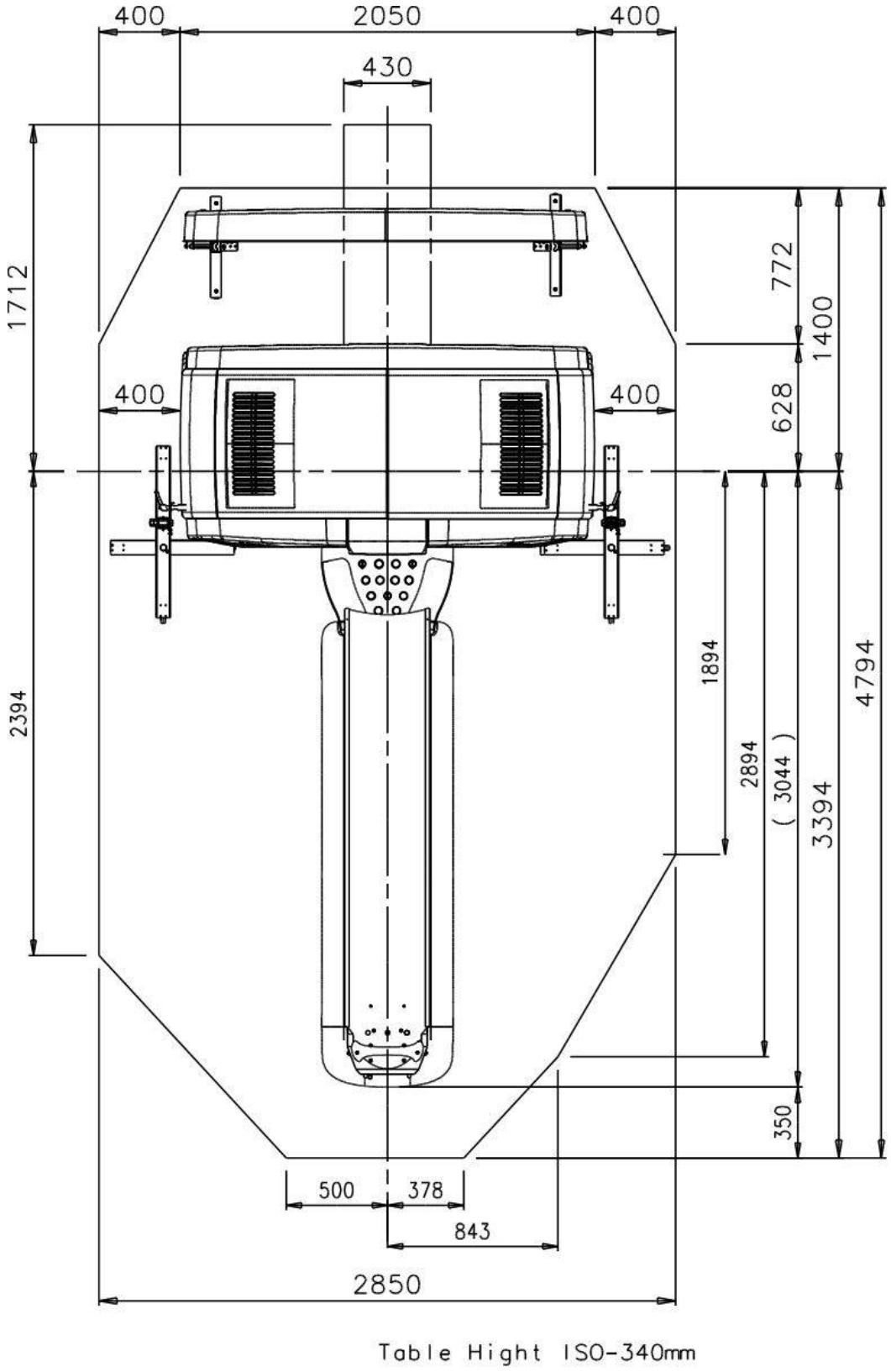


Figure A-3 Cover Removal Clearance (GT1700V - Gantry Front Cover Removal and Storage to Left Side)

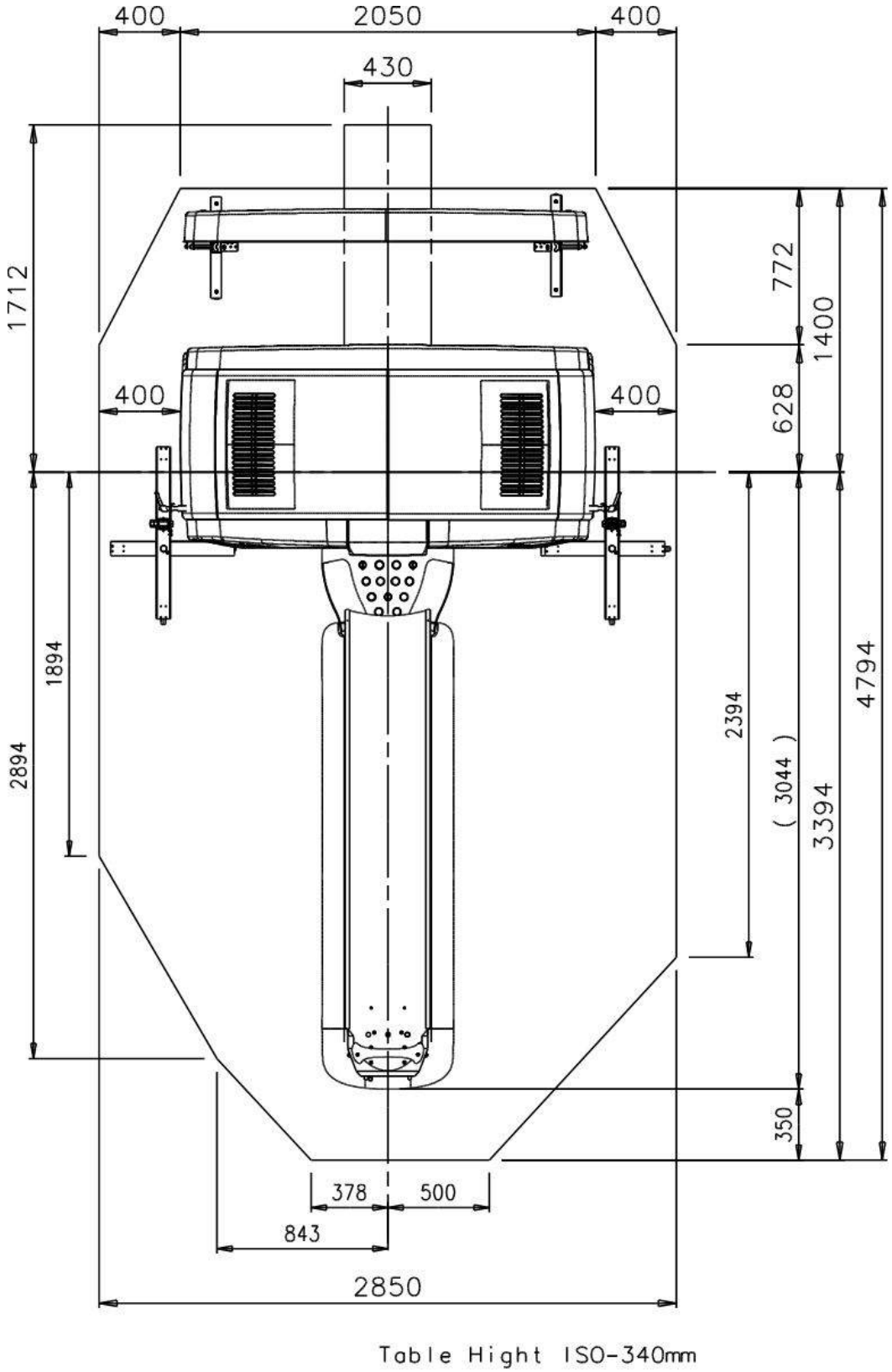


Figure A-4 Cover Removal Clearance (GT1700V - Gantry Front Cover Removal and Storage to Right Side)

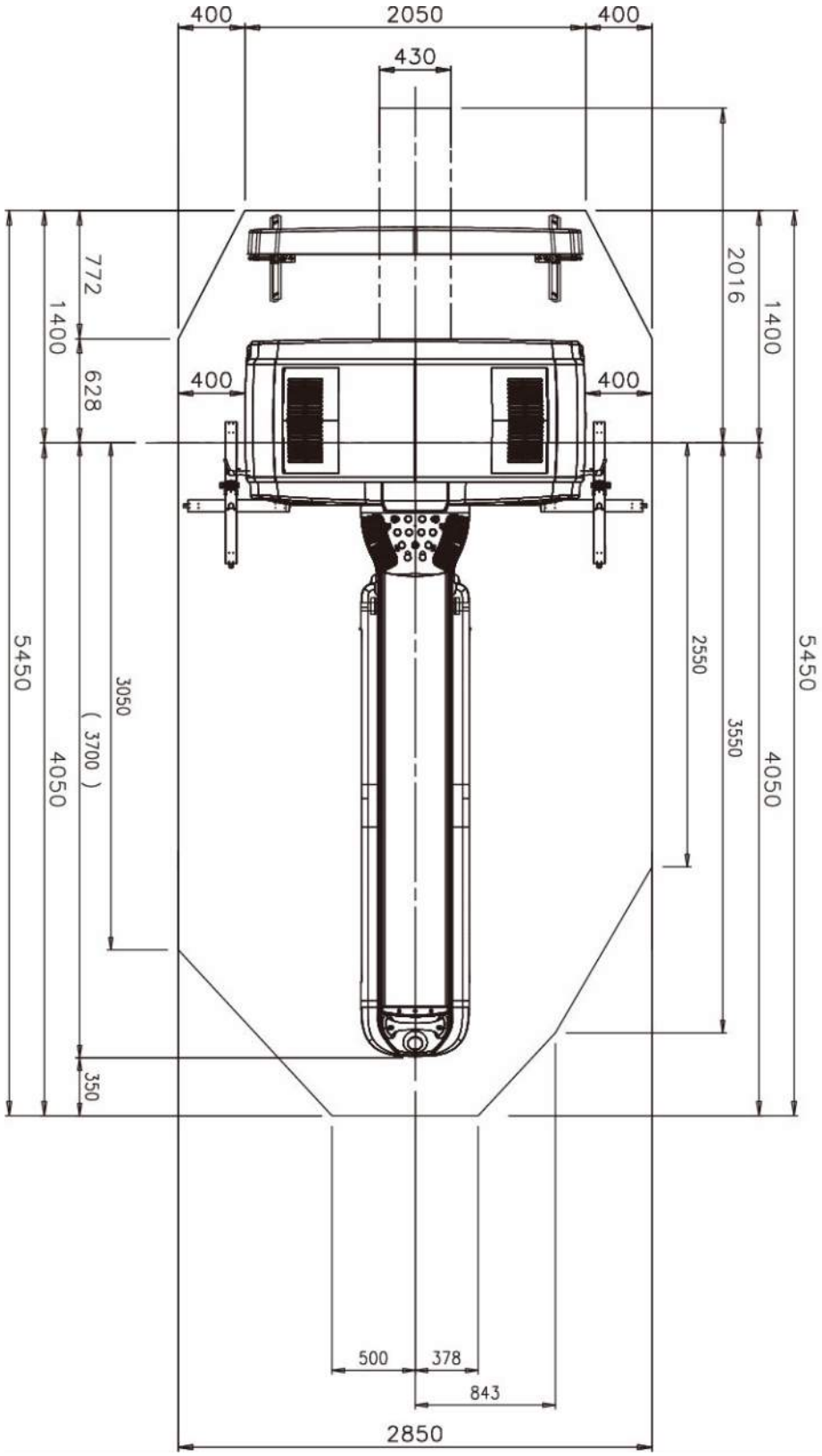


Figure A-5 Cover Removal Clearance (GT2000V - Gantry Front Cover Removal and Storage to Left Side)

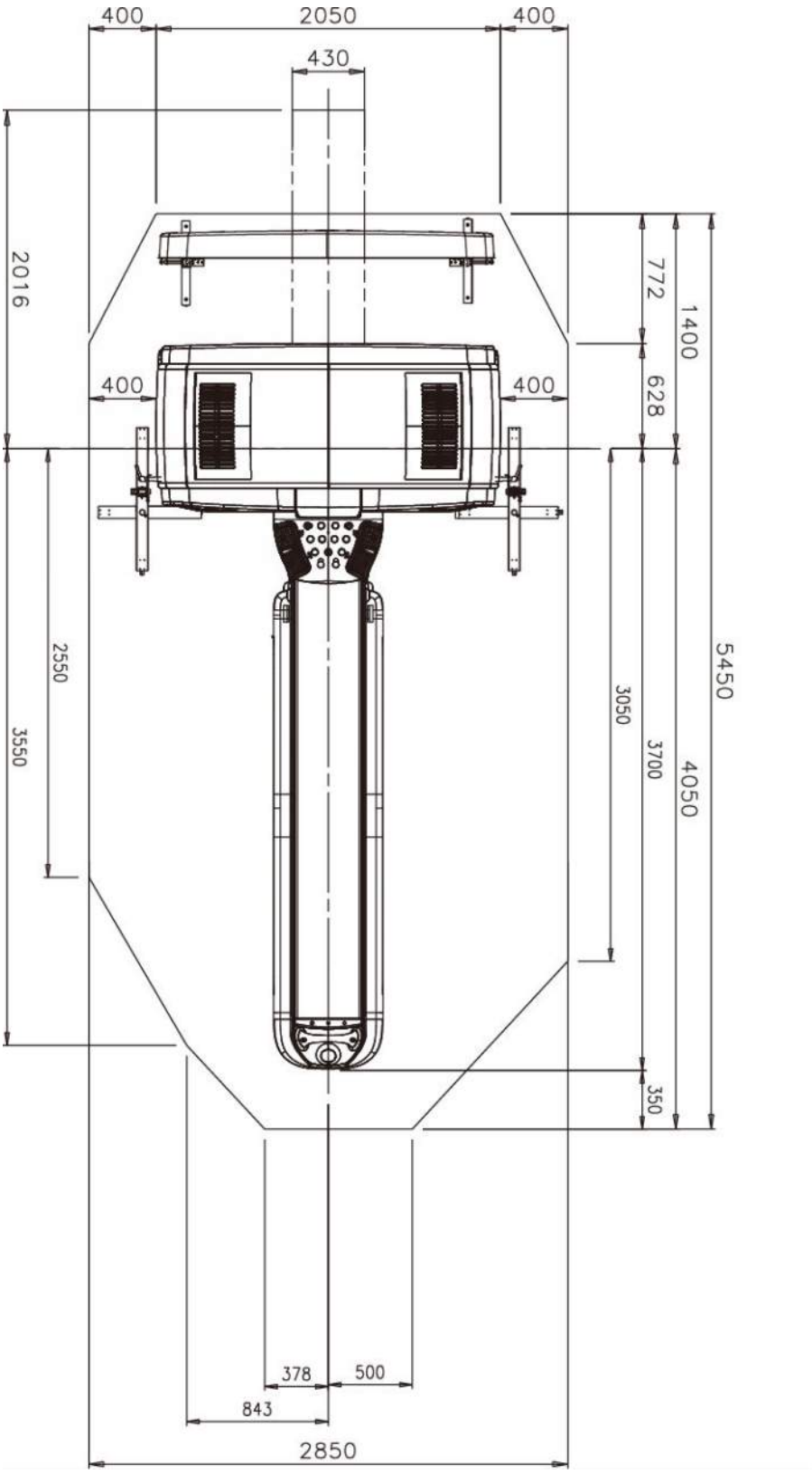
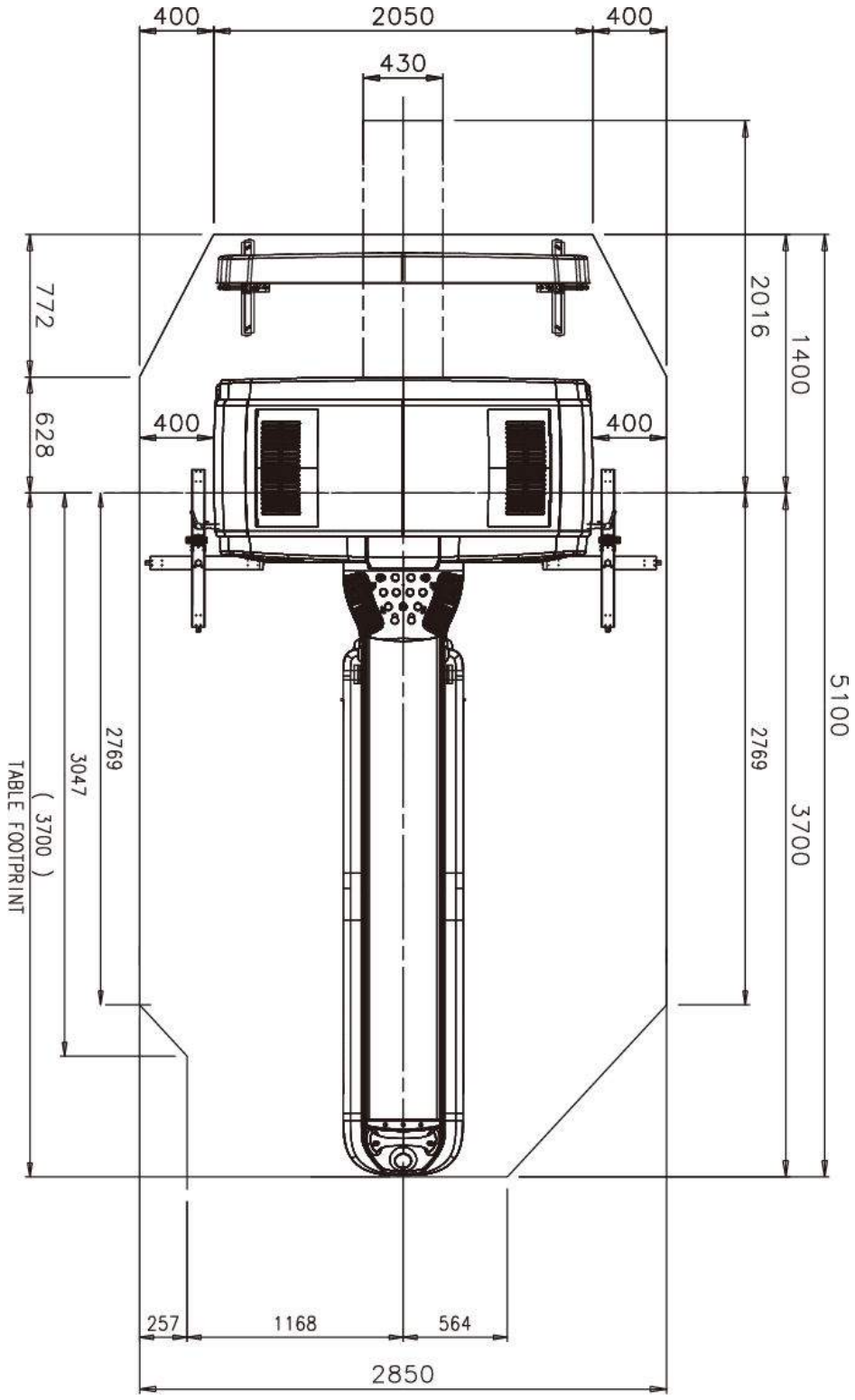
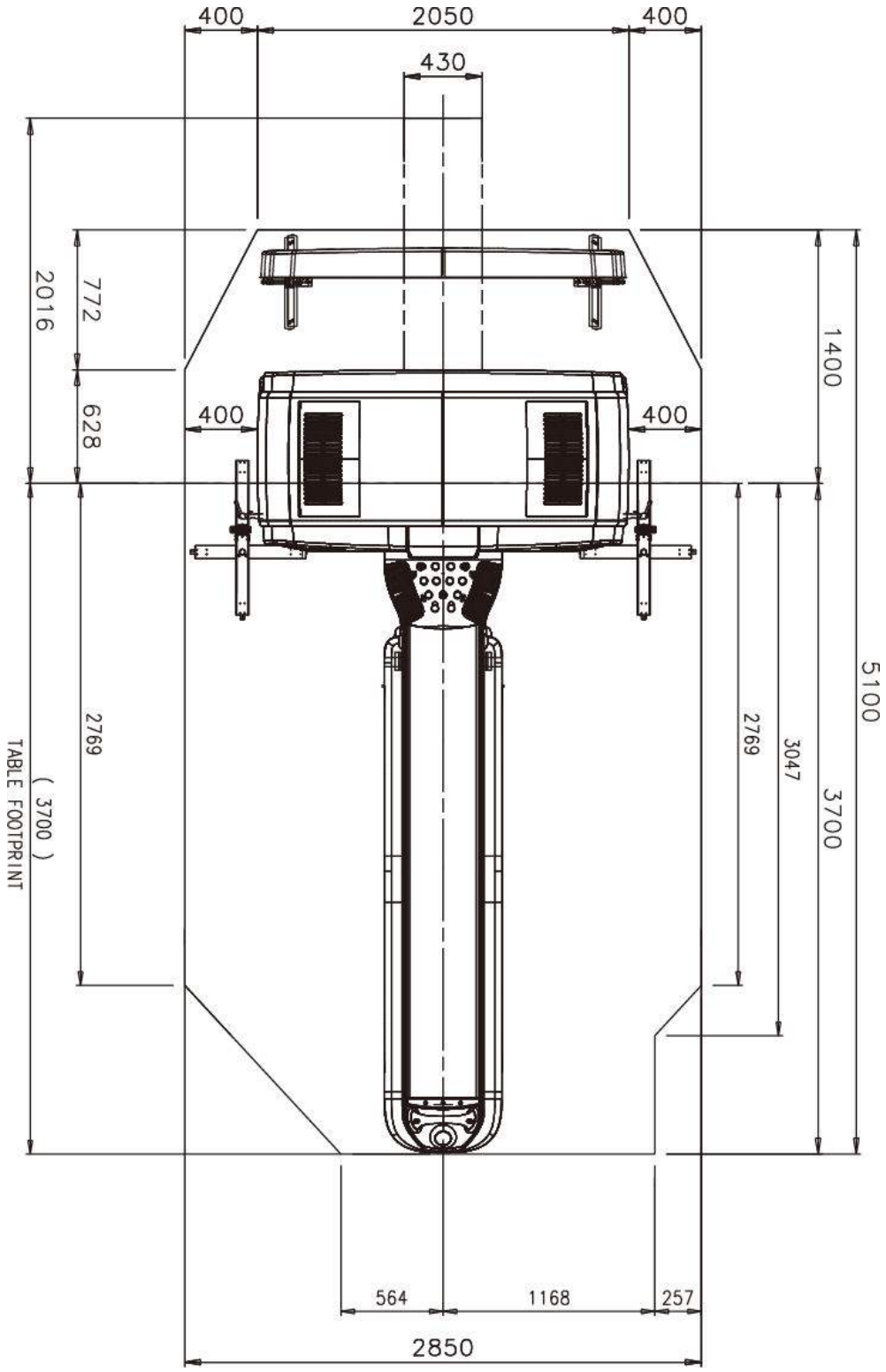


Figure A-6 Cover Removal Clearance (GT2000V - Gantry Front Cover Removal and Storage to Right Side)



Note:GT2000 IMS can moves 4000mm at IST-340.
So if IMS is moved 4000mm In-direction by sevice switch, Gantry cover can be removed.

Figure A-7 Cover Removal Clearance (GT2000V - Gantry Front Cover Removal and Storage to Left Side with IMS Manually Moved In)



Note:GT2000 IMS can moves 4000mm at IST-340.
So if IMS is moved 4000mm In-direction by sevice switch, Gantry cover can be removed.

Figure A-8 Cover Removal Clearance (GT2000V - Gantry Front Cover Removal and Storage to Right Side with IMS Manually Moved In)

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SECTION 07 2119 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Open-cell spray polyurethane foam insulation.
2. Accessories.

B. Related Requirements:

1.2 ACTION SUBMITTALS

A. Product Data:

1. Open-cell spray polyurethane foam insulation.
2. Accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by qualified testing agency.

PART 2 - PRODUCTS

2.1 OPEN-CELL SPRAY POLYURETHANE FOAM INSULATION

A. Open-Cell Spray Polyurethane Foam: Spray-applied polyurethane foam using water as a blowing agent. Minimum density of 0.4 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 3.4 deg F x h x sq. ft./Btu at 75 deg F.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Carlisle Spray Foam Insulation.
b. Gaco; a brand of Firestone Building Products.
c. Henry Company.
d. Huntsman Building Solutions.
e. Johns Manville; a Berkshire Hathaway company.
f. Master Builders Solutions.

g. NCFI Polyurethanes; a division of Barnhardt Manufacturing Company.
h. SES Foam LLC.
i. SWD Urethane Company.

2. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

3. Fire Propagation Characteristics: Passes NFPA 285 and NFPA 276 testing as part of an approved assembly.

2.2 ACCESSORIES

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.

E. Cavity Walls: Install into cavities to thickness indicated on Drawings.

F. Miscellaneous Voids: Apply according to manufacturer's written instructions.

3.3 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.

END OF SECTION 07 2119

SECTION 07 4213.23 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal composite material (MCM) panels.

1.2 DEFINITIONS

A. DBVC: Drained and back-ventilated cavity rainscreen system designed to drain and dry water entering cavity through drainage channels, weeps, and air ventilation.

B. MCM: Metal composite material; cladding material formed by joining two thin metal skins to polyethylene or fire-retardant core and bonded under precise temperature, pressure, and tension.

C. PER: Pressure-equalized rainscreen system designed for no water intrusion, with equal pressure within air cavity and outside cladding barrier.

1.3 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel, system, and accessory.

1. Metal composite material (MCM) panels.

B. Shop Drawings:

1. Include fabrication and installation layouts of MCM system; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, accessories, and special details.
2. Accessories: Include details of flashing, trim, and anchorage, at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Initial Selection: For each type of MCM panel indicated, with factory-applied color finishes.

1. Size: Manufacturers' standard size.
2. Include Samples of trim and accessories involving color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For MCM panels.

B. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, MCM panels, and other manufactured items so as not to be damaged or deformed. Package MCM panels for protection during transportation and handling.

B. Unload, store, and erect MCM panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack MCM panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store MCM panels to ensure dryness, with positive slope for drainage of water. Do not store MCM panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on MCM panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.7 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of MCM panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.8 COORDINATION

A. Coordinate MCM panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Panel Integrity Warranty: Manufacturer agrees to repair or replace components of MCM panels that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Panel Finish Warranty: Manufacturer agrees to repair finish or replace MCM panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: MCM systems to withstand the effects of the following loads, based on testing in accordance with ASTM E330/E330M:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

C. Fire-Resistance Ratings: Comply with ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.

D. Fire Propagation Characteristics: MCM system passes NFPA 285 testing.

2.2 METAL COMPOSITE MATERIAL (MCM) WALL PANELS

A. Metal Composite Material (MCM) Wall Panels: Provide MCM panels fabricated from two metal facings bonded to a solid, extruded thermoplastic core.

1. Basis of Design Product: Subject to compliance with requirements, provide Alucobond; 3A Composites USA, Inc.; Alucobond Plus or comparable product by another manufacturer.
2. Panel Thickness: 0.157 inch.
3. Bond Strength: 22.5 in-lb/in. when tested for bond integrity in accordance with ASTM D1781.
4. Fire Performance: Flame-spread index less than 25 and smoke-developed index less than 450, in accordance with ASTM E84 or UL 723.

B. MCM Panel Materials:

1. Aluminum-Faced Panels : ASTM B209/B209M alloy as standard with manufacturer, temper as required to suit finish and forming operations with 0.020-inch- thick, aluminum sheet facings.

a. Exterior Finish: Two-coat fluoropolymer .

1) Color: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

A. Metal Subframing and Furring: ASTM C955 cold-formed, metallic-coated steel sheet ASTM A653/A653M, G90 hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of MCM system.

B. System Accessories: Provide components required for a complete, weathertight wall system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of MCM panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as MCM panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent MCM panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Use gasketed or approved coated fasteners between dissimilar metals.

1. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.

2.4 FABRICATION

A. Fabricate and finish MCM panels at the factory, by panel manufacturer's standard procedures and processes, as necessary to fulfill indicated panel performance requirements demonstrated by laboratory testing.

B. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's written instructions and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal manufacturer for application, but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Coil-Coated Metal Finish:

1. PVDF Fluoropolymer: AAMA 2605, two-coat fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, MCM system supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by MCM system manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by MCM system manufacturer.

a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and assemblies penetrating MCM system to verify actual locations of penetrations relative to seam locations of MCM panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION TOLERANCES

A. Shim and align MCM panels within installed tolerance of 1/4 inch in 20 ft., non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.3 CLEANING

A. Remove temporary protective coverings and strippable films as MCM panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, clean finished surfaces as recommended by MCM panel manufacturer. Maintain in a clean condition during construction.

B. After installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

3.4 PROTECTION

A. Replace MCM panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 4213.23

SECTION 08 4113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed entrance and storefront systems.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Aluminum-framed entrance and storefront systems.

B. Product Data Submittals: For each product.

1. Construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Operating characteristics, electrical characteristics, and furnished accessories.

C. Shop Drawings:

1. Plans, elevations, sections, full-size details, and attachments to other work.
2. Details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
3. Full-size isometric details of each type of vertical-to-horizontal intersection of aluminum-framed entrance and storefront systems, showing the following:

    a. Joinery, including concealed welds.
    b. Anchorage.
    c. Expansion provisions.
    d. Glazing.
    e. Flashing and drainage.

4. Connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
5. Point-to-point wiring diagrams showing the following:

    a. Power requirements for each electrically operated door hardware.
    b. Location and types of switches, signal device, conduit sizes, and number and size of wires.

D. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

E. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

F. Delegated Design Submittals: For aluminum-framed entrances and storefront systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For aluminum-framed entrance and storefront systems, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront system.

B. Delegated Design Engineer Qualifications: For aluminum-framed entrance and storefront systems.

C. Sample Warranties: For aluminum-framed entrance and storefront systems.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For aluminum-framed entrance and storefront systems.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

D. Structural-Sealant Glazing: Comply with ASTM C1401 for design and installation of storefront systems that include structural glazing.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Submit to structural glazing sealant manufacturer, for testing indicated below, Samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that is in close proximity to or is touching the structural or nonstructural sealants of a structural glazed system.

1. Compatibility: Test materials or components using ASTM C1087.
2. Adhesion: Test for adhesion or lack of adhesion of a structural sealant to the surface of another material or component using ASTM C1135.
3. Submit no fewer than eight pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, obtain sealant manufacturer's written instructions for corrective measures, including the use of specially formulated primers.
6. Testing will not be required if data based on previous testing of current sealant products match those submitted.

1.7 WARRANTY

A. Special Warranty: Manufacturer and Installer agree to repair or replace components of aluminum-framed entrance and storefront systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures, including but not limited to, excessive deflection.
    b. Faulty operation of operating components.
    c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
    d. Adhesive or cohesive sealant failures.
    e. Water leakage through fixed glazing and framing areas.

2. Warranty Period: 10 years from date of Substantial Completion.

B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 20 years from date of Substantial Completion.

C. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Delta E units when tested in accordance with ASTM D 2244.
    b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D 4214.
    c. Cracking, peeling, or chipping.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain all components of aluminum-framed entrance and storefront system, including framing venting windows and accessories, from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 4000 "Quality Requirements," to design aluminum-framed entrance and storefront systems.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrance and storefront systems representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrance and storefront systems to withstand movements of supporting structure, including, but not limited to, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

    a. Thermal stresses transferring to building structure.

b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members Supporting Glass: At design wind load, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans of up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.

a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

E. Structural: Test in accordance with ASTM E330/E330M as follows:

1. When tested at positive and negative wind-load design pressures, storefront assemblies, including entrance doors, do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, storefront assemblies, including entrance doors and anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Water Penetration under Static Pressure: Test in accordance with ASTM E331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas, including entrance doors, when tested in accordance with a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than [6.24 lbf/sq. ft.] [10 lbf/sq. ft.] [15 lbf/sq. ft.] <Insert value>.

G. Water Penetration under Dynamic Pressure: Test in accordance with AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft..
2. Maximum Water Leakage: In accordance with AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

H. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor):

    a. Fixed Glazing and Framing Areas: U-factor for the system of not more than 0.41 Btu/sq. ft. x h x deg F as determined in accordance with NFRC 100.

2. Air Leakage:

    a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested in accordance with ASTM E283.

3. Condensation Resistance Factor (CRF):

    a. Fixed Glazing and Framing Areas: CRF for the system of not less than 70 as determined in accordance with AAMA 1503.

I. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested in accordance with AAMA 501.5.

    a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
    b. Low Exterior Ambient-Air Temperature: 0 deg F.
    c. Interior Ambient-Air Temperature: 75 deg F.

J. Structural-Sealant Joints:

1. Designed to carry gravity loads of glazing.

K. Structural Sealant: ASTM C1184. Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed, aluminum-framed entrance and storefront systems without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant to occur before adhesive failure.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate, because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.3 ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Kawneer Company, Inc.; Arconic Corporation.
2. OldCastle BuildingEnvelope (OBE).

B. Basis of Design Products

1. Window Wall Product

a. Product: Subject to compliance with requirements, provide Oldcastle Building Envelope Reliance Window Wall or comparable product by another manufacturer.

1) System Depth: 5 inches.
2) Captured/Non-Captured: Captured System
3) Sight Line: 2-1/4 inches

2. Storefront System

a. Product: Subject to compliance with requirements, provide Oldcastle Building Envelope ThermaStack Storefront or comparable product by another manufacturer.

C. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Exterior Framing Construction: Thermally broken .
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Finish: Clear anodic finish .
5. Fabrication Method: Field-fabricated stick system.
6. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
7. Steel Reinforcement: As required by manufacturer.

D. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

E. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

F. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

    a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.

2. Door Design: Medium stile; 3-1/2-inch nominal width.

    a. Accessible Doors: Smooth surface for width of door in area within 10 inches above finished floor or ground surface.

3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

4. Finish: Match adjacent storefront framing finish.

2.4 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 08 7100 "Door Hardware."

B. Continuous-Gear Hinges: BHMA A156.26.

C. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.

D. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing in accordance with UL 305.

E. Cylinders:

1. As specified in Section 08 7100 "Door Hardware."

F. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

G. Operating Trim: BHMA A156.6.

H. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.

I. Concealed Overhead Holders and Stops: BHMA A156.8, Grade 1.

J. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.

K. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D2000 molded neoprene or ASTM D2287 molded PVC.

L. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

2.5 GLAZING

A. Glazing: Comply with Section 08 8000 "Glazing."

2.6 MATERIALS

A. Sheet and Plate: ASTM B209.

B. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

C. Structural Profiles: ASTM B308/B308M.

D. Steel Reinforcement:

1. Structural Shapes, Plates, and Bars: ASTM A36/A36M.
2. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.
3. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

E. Steel Reinforcement Primer: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods in accordance with recommendations in SSPC-SP COM, and prepare surfaces in accordance with applicable SSPC standard.

2.7 ACCESSORIES

A. Partition Gap CLosures

1. Basis of Design Product: Subject to compliance with requirements, provide Gordon Architectural +Engineered Solutions, Mullion Mate Series 40 abd Mullion Mate End Cap or comparable product by another manufacturer.
2. Materials: Aluminum extrusions; 6063-T5 or T6 temper, tensile strength 31 KSI (ASTM B221, ASTM B221M.)
3. Length: As required to extend from base of wall to top of wall in single piece.

4. Gap Infill: As required to fill between wall and storefront system mullion or glass. Min. 3 inches/ Max. 13-1/2 inches.

B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

C. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123/A123M or ASTM A153/A153M requirements.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

E. Bituminous Paint: Cold-applied asphalt-mastic paint containing no asbestos, formulated for 30-mil thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from [exterior] [interior] [interior for vision glass and exterior for spandrel glazing or metal panels].
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. Storefront Framing: Fabricate components for assembly using screw-spline system.

G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At interior and exterior doors, provide compression weather stripping at fixed stops.

H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

I. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

J. After fabrication, clearly mark components to identify their locations in Project in accordance with Shop Drawings.

2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF ALUMINUM-FRAMED ENTRANCE AND STOREFRONT SYSTEMS

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure nonmovement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Seal perimeter and other joints watertight unless otherwise indicated.

G. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

H. Set continuous sill members and flashing in full sealant bed, as specified in Section 07 9200 "Joint Sealants," to produce weathertight installation.

I. Install joint filler behind sealant as recommended by sealant manufacturer.

J. Install components plumb and true in alignment with established lines and grades.

K. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

L. Install entrance doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware in accordance with entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

M. Install glazing as specified in Section 08 8000 "Glazing."

N. Install structural glazing as follows:

1. Prepare surfaces that will contact structural sealant in accordance with sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.
2. Set glazing into framing in accordance with sealant manufacturer and framing manufacturer's written instructions and standard practice. Use a spacer or backer as recommended by manufacturer.
3. Set glazing with proper orientation so that coatings face exterior or interior as specified.
4. Hold glazing in place using temporary retainers of type and spacing recommended by manufacturer, until structural sealant joint has cured.
5. Apply structural sealant to completely fill cavity, in accordance with sealant manufacturer and framing manufacturer's written instructions and in compliance with local codes.
6. Apply structural sealant at temperatures indicated by sealant manufacturer for type of sealant.
7. Allow structural sealant to cure in accordance with manufacturer's written instructions.

8. Clean and protect glass as indicated in Section 08 8000 "Glazing."
9. After structural sealant has completely cured, remove temporary retainers and insert backer rod between lites of glass as recommended by sealant manufacturer.
10. Install weatherseal sealant to completely fill cavity, in accordance with sealant manufacturer's written instructions, to produce weatherproof joints.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed entrance and storefront systems to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:

    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
    b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
    c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

END OF SECTION 08 4113

SECTION 13 4900 - RADIATION PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Lead sheet, strip, and plate.
2. Lead-lined gypsum board.
3. Lead glass.
4. Lead-lined hollow-metal doors.
5. Lead-lined hollow-metal frames.
6. Lead-lined flush wood doors.
7. Informational signs.

1.2 DEFINITIONS

A. Lead Equivalence: The thickness of lead that provides the same attenuation (reduction of radiation passing through) as the material in question under the specified conditions.

1. Lead equivalence specified for materials used in diagnostic x-ray rooms is as measured at 100 kV unless otherwise indicated.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to radiation protection, including, but not limited to, the following:

a. Sequence and schedule of radiation protection work in relation to other work.
b. Supplementary lead shielding at duct, pipe, and conduit penetrations of radiation protection.
c. Methods of attaching other construction and equipment to lead-lined finishes.
d. Notification procedures for work that requires modifying radiation protection.
e. Requirements for field quality control.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Lead sheet, strip, and plate.

2. Lead-lined gypsum board.
3. Lead glass.
4. Lead-lined hollow-metal doors.
5. Lead-lined hollow-metal frames.
6. Lead-lined flush wood doors.
7. Informational signs.

B. Product Data Submittals:

1. Doors and Frames: Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

C. Shop Drawings: Show layout of radiation-protected areas, indicating lead thickness or lead equivalence of components. Show components and installation conditions not fully dimensioned or detailed in product data.

1. Show ducts, pipes, conduit, and other objects that penetrate radiation protection; include details of penetrations.
2. Show details of joints between radiation protection materials.
3. Include door details, including elevations, frame dimensions and profile, glazed light, and clearances and undercuts.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For assemblies with radiation protection materials, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Items penetrating radiation protection materials, including the following:

a. Electrical services.
b. Air outlets and inlets.
c. Sprinklers.
d. Access panels.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Lead-Lined Gypsum Panels and Plywood: Store inside under cover, and keep dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

B. Lead-Lined, Hollow-Metal Doors and Frames: Comply with requirements in Section 08 1113 "Hollow Metal Doors and Frames" for delivery, storage, and handling.

C. Lead-Lined Wood Doors: Comply with requirements in Section 08 1416 "Flush Wood Doors" for delivery, storage, and handling.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install radiation protection until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

A. Warranty for Lead-Lined Wood Doors: Comply with requirements in Section 08 1416 "Flush Wood Doors."

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of radiation protection product from single source from single manufacturer unless otherwise indicated.

2.2 PERFORMANCE REQUIREMENTS

A. Provide materials and workmanship, including joints and fasteners, that maintain continuity of radiation protection at all points and in all directions equivalent to materials specified in thicknesses and locations indicated.

B. Materials, thicknesses, and configuration of radiation protection shall be as indicated by the radiation protection design reports prepared by Owner's radiation health physicist. The design report(s) are appended following this section.

1. Diagnostic Radiology Installation Shielding Analysis and Specification; Room: CT; Dated 8/4/2023.
2. Diagnostic Radiology Installation Shielding Analysis and Specification; Room: X-Ray Room 135; Dated 8/3/2023.
3. Diagnostic Radiology Installation Shielding Analysis and Specification; Room: X-Ray Room 239; Dated 8/3/2023.
4. Diagnostic Radiology Installation Shielding Analysis and Specification; Room: OR Large 3 - 245; Dated 8/5/2023.
5. Diagnostic Radiology Installation Shielding Analysis and Specification; Room: OR Surg 5 - 242; Dated 8/5/2023.

C. Lead-Lined Assemblies: Unless otherwise indicated, provide lead thickness in lead-lined assemblies of not less than lead thickness indicated for assemblies in which they are installed.

D. Lead Glazing: Unless otherwise indicated, provide lead equivalence of not less than that indicated for assembly in which glazing is installed.

E. Fire-Rated and Smoke-Control Door and Frame Assemblies: Comply with Section 08 1113 "Hollow Metal Doors and Frames" and Section 08 1416 "Flush Wood Doors".

2.3 LEAD SHEET, STRIP, AND PLATE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. A&L Shielding Inc.
2. ABM Lead Corporation.
3. El Dorado Metals, Inc.
4. MarShield Custom Radiation Shielding Products, a division of Mars Metal Company.
5. Mayco Industries.
6. MediRay.
7. NELCO Worldwide.
8. New Shield, Inc.
9. Pitts Little Corporation.
10. Radiation Protection Products, Inc.
11. Ray-Bar Engineering Corp.
12. Ultraray Radiation Protection.

B. Lead Sheet, Strip, and Plate: ASTM B749, Alloy UNS No. L51121 (chemical-copper lead).

2.4 LEAD-LINED GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. A&L Shielding Inc.

2. ABM Lead Corporation.
3. Accurate Radiation Shielding, Inc.
4. El Dorado Metals, Inc.
5. Global Partners in Shielding, Inc.
6. MarShield Custom Radiation Shielding Products, a division of Mars Metal Company.
7. Mayco Industries.
8. NELCO Worldwide.
9. New Shield, Inc.
10. Pitts Little Corporation.
11. Radiation Protection Products, Inc.
12. Ray-Bar Engineering Corp.
13. Ultraray Radiation Protection.

B. Lead-Lined Gypsum Board: 5/8-inch- thick gypsum board complying with Section 09 2900 "Gypsum Board," of width and length required for support spacing and to prevent cracking during handling, and with a single sheet of lead laminated to the back of the board.

1. Lead Sheet Lining: Full width and length of board. Extend lead sheet lining 1 inch beyond one vertical edge of board.
2. Furnish 2-inch- wide lead strips for backing joints.
3. Furnish finishing materials, accessories, and trim for lead-lined gypsum board complying with Section 09 2900 "Gypsum Board."

2.5 LEAD GLASS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. A&L Shielding Inc.
2. ABM Lead Corporation.
3. Accurate Radiation Shielding, Inc.
4. Amerope Enterprises, Inc.
5. El Dorado Metals, Inc.
6. Global Partners in Shielding, Inc.
7. Hot Cell Services Corporation.
8. MarShield Custom Radiation Shielding Products, a division of Mars Metal Company.
9. Mayco Industries.
10. McGrory Glass, Inc.
11. NELCO Worldwide.
12. New Shield, Inc.
13. Pitts Little Corporation.
14. Radiation Protection Products, Inc.
15. Ray-Bar Engineering Corp.
16. Schott North America, Inc.
17. Ultraray Radiation Protection.

B. Lead Glass: Lead-barium, polished glass containing not less than 60 percent heavy metal oxides, including not less than 48 percent lead oxide by weight.

1. Tempered Safety Glass: ASTM C1048, Kind FT (fully tempered), lead glass with thickness as needed to provide lead equivalence indicated.

2.6 LEAD-LINED HOLLOW-METAL DOORS

A. Lead-Lined Hollow-Metal Doors: Steel doors complying with NAAMM-HMMA 861, except as indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. A&L Shielding Inc.
   b. Accurate Radiation Shielding, Inc.
   c. DCI Hollow Metal on Demand.
   d. Deronde Products.
   e. El Dorado Metals, Inc.
   f. Global Partners in Shielding, Inc.
   g. Karpen Steel Custom Doors & Frames.
   h. MarShield Custom Radiation Shielding Products, a division of Mars Metal Company.
   i. NELCO Worldwide.
   j. New Shield, Inc.
   k. Pitts Little Corporation.
   l. Ray-Bar Engineering Corp.
   m. Republic Doors and Frames; a Allegion brand.
   n. Security Metal Products; a brand of ASSA ABLOY.
   o. Ultraray Radiation Protection.

2. Provide single continuous sheet of lead of thickness not less than that required for partition in which door is installed extending from top to bottom and edge to edge, supported by hat-channel stiffeners. Do not weld stiffeners through lead lining.
3. Line-inverted channels at top and bottom of doors with lead sheet of same thickness used in door and close with filler channels to provide flush top and bottom edges.
4. Shield cutouts for locksets with lead sheet of same thickness used in door. Overlap lining of cutouts with lining of door by 1 inch.
5. Prepare doors to receive glazed lights; Factory cut and trim openings through doors. Furnish removable stops for glazed openings.
6. Furnish lead-lined astragals for pairs of doors.
7. Factory fit doors to suit frame-opening sizes indicated with 1/16-inch clearance at heads and jambs and minimum clearance at bottom.
8. Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

B. Metal Frames for Glazed Lights: Lead-lined frame formed of 0.048-inch- thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated.

2.7 LEAD-LINED HOLLOW-METAL FRAMES

A. Hollow-Metal Frames: Steel frames complying with NAAMM-HMMA 861, except as indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. A&L Shielding Inc.
    b. ABM Lead Corporation.
    c. Accurate Radiation Shielding, Inc.
    d. DCI Hollow Metal on Demand.
    e. Deronde Products.
    f. El Dorado Metals, Inc.
    g. Global Partners in Shielding, Inc.
    h. Karpen Steel Custom Doors & Frames.
    i. MarShield Custom Radiation Shielding Products, a division of Mars Metal Company.
    j. NELCO Worldwide.
    k. New Shield, Inc.
    l. Pioneer Industries; AADG, Inc.; ASSA ABLOY.
    m. Pitts Little Corporation.
    n. Radiation Protection Products, Inc.
    o. Ray-Bar Engineering Corp.
    p. Republic Doors and Frames; a Allegion brand.
    q. Security Metal Products; a brand of ASSA ABLOY.
    r. Ultraray Radiation Protection.

2. Provide knocked down frames where indicated.
3. Provide door frames from steel sheet with minimum thickness of 0.0667 inch.
4. Furnish with additional reinforcements and internal supports to adequately carry the weight of lead-lined doors. Install reinforcements and supports before installing lead lining.
5. Line frame with lead sheet of thickness not less than that required for doors and walls where frames are used. Form lead sheet to match frame contour, continuous in each jamb and across the head, lapping the stops. Form lead shields around areas prepared to receive hardware. Fabricate lead lining wide enough to maintain an effective lap with lead of adjacent shielding.
6. Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

2.8 LEAD-LINED FLUSH WOOD DOORS

A. Lead-Lined Flush Wood Doors: Solid-core wood doors with lead sheet laminated to each side of core, with faces applied over lead lining.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. A&L Shielding Inc.
    b. Accurate Radiation Shielding, Inc.
    c. General Veneer Manufacturing Co.
    d. Lambton Doors.
    e. MarShield Custom Radiation Shielding Products, a division of Mars Metal Company.
    f. Masonite Architectural.
    g. Oshkosh Door Company.
    h. Poncraft Door Company.
    i. Ray-Bar Engineering Corp.
    j. Ultraray Radiation Protection.
    k. VT Industries, Inc.
    l. Vancouver Door Company.

2. Construction: Hot pressed, bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before applying lead lining and faces.
3. Core: Mineral.
4. Lead Lining: Continuous sheets of lead extending from top to bottom and edge to edge; with total lead thickness not less than that required for partition in which door is installed.
5. Wood Veneer Faces: Wood veneer applied to crossbands over core.

    a. Comply with Section 08 1416 "Flush Wood Doors" for veneer species, grade, and matching; finishing; and other requirements unless otherwise indicated.

6. ANSI/WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

B. Prepare doors to receive glazed lights; factory cut and trim openings through doors.

C. Metal Frames for Glazed Lights: Lead-lined frame formed of 0.048-inch- thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated.

D. Shield cutouts for locksets with lead sheet of same thickness used in door. Lap lining of cutouts with door lining.

E. Furnish lead-lined astragals for pairs of doors.

F. Factory fit doors to suit frame openings indicated with 1/16-inch clearance at heads and jambs and minimum clearance at bottom. Factory machine doors for hardware not surface applied.

2.9 DOOR AND DOOR FRAME FABRICATION

A. Hardware Preparation: Factory prepare doors and frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with door hardware schedule and templates furnished, as specified in Section 08 7100 "Door Hardware."

2.10 MISCELLANEOUS MATERIALS

A. Glazing Compounds, Gaskets, and Accessories: Comply with requirements in Section 08 8000 "Glazing."

B. Accessories and Fasteners: Manufacturer's standard fasteners and accessories as required for installation, maintaining same lead equivalence as rest of system.

C. Asphalt Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

D. Asphalt Felt: ASTM D226/D226M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates with Installer present for compliance with requirements, installation tolerances, and other conditions affecting performance of radiation protection.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF LEAD-LINED GYPSUM BOARD

A. Install and finish lead-lined gypsum board in accordance with Section 09 2900 "Gypsum Board."

B. Install lead-lined gypsum board panels with long edge parallel to supports and lead lining facing supports. Provide blocking at end joints. Install using construction adhesive and supplementary fasteners.

C. Install lead-lined gypsum board panels in sequence, so lead lining that extends beyond edge of gypsum board is covered by next panel installed.

D. At joints where lead lining does not extend beyond edge of gypsum board panels, install lead strips 2 inches wide and same thickness as lead lining to face of framing and blocking. Secure lead strips with construction adhesive.

E. Provide shims at face of supports and blocking, where lead lining does not overlap, to provide a uniform plane across panel surfaces.

F. Fasten lead-lined gypsum board to framing, with steel drill screws spaced as recommended in writing by lead-lined gypsum board manufacturer.

G. Openings: Extend lead-lined gypsum board into frames of openings, lapping lead lining with lead frames or frame linings at least 1 inch. Arrange board around openings, so neither horizontal nor vertical joints occur at corners of openings.

H. Install control and expansion joints where indicated, with appropriate trim accessories. Install lead strip on face of framing, extending across joint, and lap with lead lining of gypsum board.

3.3 INSTALLATION OF LEAD-LINED DOORS AND DOOR FRAMES

A. Install lead-lined steel doors and door frames in accordance with Section 08 1113 "Hollow Metal Doors and Frames."

1. Apply a coat of asphalt mastic or paint to lead lining in door frames where lead comes in contact with masonry or concrete.

B. Install lead-lined wood doors in accordance with Section 08 1416 "Flush Wood Doors."

C. Lead-Lined Hollow-Metal Door Frames: Comply with ANSI/NAAMM-HMMA 840 unless otherwise indicated. Except for frames located in existing walls or partitions, place frames before constructing walls. Set frames accurately in position, plumb, and brace securely until permanent anchors are set.

1. Provide three anchors per jamb, located adjacent to hinge on hinge jamb and at corresponding heights on strike jamb.
2. In masonry construction, use wire or T-strap anchors, and apply a coat of asphalt mastic or paint to lead lining where lead comes in contact with masonry or grout.
3. In metal stud construction, use wall anchors attached to studs with screws.

D. Lap lead lining of frames over lining in walls at least 1 inch.

E. Lead Lining of Frames: Line inside of frames with lead of thickness of not less than that required in doors and walls where frames are used. Form lead to match frame contour, continuous in each jamb and across the head, lapping the stops. Form lead shields around areas prepared to receive hardware. Lap lining over lining in walls at least 1 inch.

F. Install leaded side of frame on radiation side of wall. Lap lead lining of frames over lining in walls at least 1 inch.

G. Lead Glazing: Comply with installation requirements in Section 08 8000 "Glazing" and with manufacturer's written instructions.

H. Line astragals with lead sheet.

I. Hardware: Line covers, escutcheons, and plates to provide effective shielding at cutouts and penetrations of frames and doors. See Section 08 7100 "Door Hardware" for other installation requirements.

3.4 INSTALLATION OF PENETRATING ITEMS

A. At penetrations of lead linings, provide lead shields to maintain continuity of protection.

B. Provide lead linings, sleeves, shields, and other protection in thickness of not less than that required in assembly being penetrated.

C. Secure shields at penetrations using adhesive or wire ties but not penetrating fasteners unless indicated on Drawings.

D. Outlet Boxes and Conduit: Cover or line with lead sheet lapped over adjacent lead lining at least 1 inch. Wrap conduit with lead sheet for a distance of not less than 10 inches from box.

E. Duct Openings: Unless otherwise indicated, line or wrap ducts with lead sheet for distance from partition/ceiling equal to 3 times the largest opening dimension. Lap lead sheet with adjacent lead lining at least 1 inch.

F. Piping: Unless otherwise indicated, wrap piping with lead sheet for a distance of not less than 10 inches from point of penetration.

3.5 PROTECTION

A. Lock radiation-protected rooms once doors and locks are installed, and limit access to only those persons performing work in the rooms.

END OF SECTION 13 4900

Petrone Associates, LLC.
728 Castleton Avenue
Staten Island, NY 10310
(718) 815-6807

Diagnostic Radiology Installation
Shielding Analysis and Specification

Date: 8/4/2023

Facility: National Veterinary Associates
Eastern Carolina Veterinary
5051 New Centre Dr
Wilmington, NC 28403
Room: CT

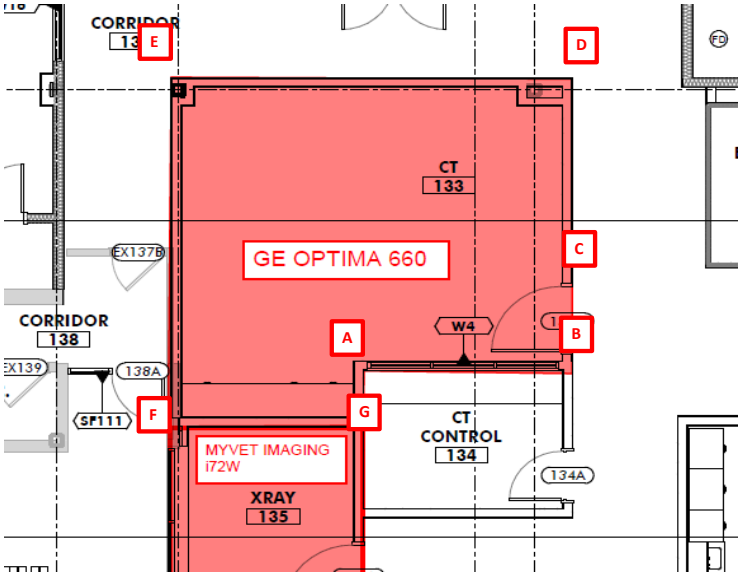
The following analysis and specification for shielding of a diagnostic radiographic installation has been performed according to the principles outlined in Report #147 of the National Council on Radiation Protection and Measurements (NCRP). The amount of supplemental shielding specified for each barrier is necessary to reduce radiation levels in adjacent areas to acceptable levels.

When assumptions were necessary, such as workload, use factors, and occupancy, they were made according to the above mentioned reference and are considered reasonable with regard to the resultant exposure values.

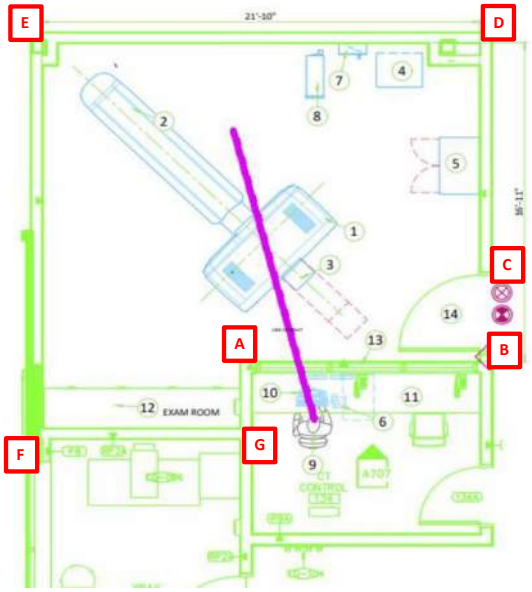
Specification regarding sheet lead and concrete assume a physical density of 11.36 g/cm3 and 2.35 g/cm3, respectively. All shielding is to be provided to a minimum height of 7 feet above the floor unless otherwise specified. All joints should be sealed in such a way as to not produce voids at the union.

When a barrier contains a door it should provide the same lead equivalence as specified for that barrier. All viewing windows should possess the same lead equivalence as the barrier with which they are associated.

Room Diagram with barrier labels



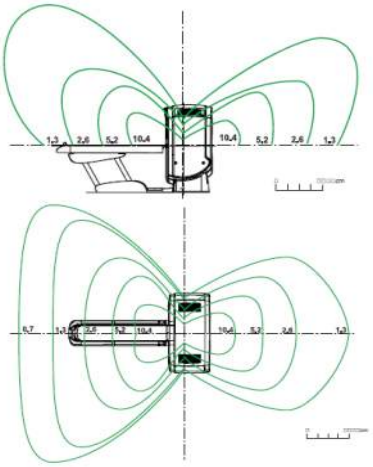
Room Diagram depicting CT Layout



GE Optima 660 Isodose Plot

Typical Scatter Survey (Large Filter (Body) - Phantom 32cm CTDI)

Figure 12-21 ISO- Contour 1.3, 2.6, 5.2, and 10.4 µGray/scan Technique 140 kV, 100 mA, 1 second, 40 mm)



GE Optima 660 Typical Scatter Survey

Table 12-28 Typical Scatter Survey (Large Filter (Body) - Phantom 32cm CTDI)

µGray/scan Parallel to Rotational Axis (m)														
Perpendicular to Rotational Axis (cm)	**-3.0**	**-2.5**	**-2.0**	**-1.5**	**-1.0**	**-0.5**	**0**	**0.5**	**1.0**	**1.5**	**2.0**	**2.5**	**3.0**	
	0.9	1.2	1.3	1.6	1.5	1.5	1.5	1.5	1.5	1.6	1.3	1.2	1.0	**F3.0**
	1.3	1.4	1.8	1.9	2.4	2.2	2.1	2.2	2.4	1.9	1.8	1.4	1.3	**F2.5**
	0.9	2.0	2.2	3.0	3.2	3.5	4.3	3.5	3.2	3.0	2.2	1.9	0.9	**F2.0**
	0.7	1.2	2.8	4.0	5.8	6.4	7.3	6.4	5.8	4.0	2.8	1.2	0.7	**F1.5**
	0.3	0.5	1.5	4.7	9.1	14.0	16.9	14.0	9.1	4.7	1.5	0.5	0.3	**F1.0**
	0.2	0.2	0.5	0.7	6.2	39.2	65.4	39.2	6.2	0.7	0.5	0.2	0.2	**F0.5**
	0.1	0.1	0.2	0.2	-	-	ISO	-	-	0.2	0.2	0.1	0.1	**0**
	0.1	0.1	0.1	0.2	-	-	67.3	-	-	0.2	0.1	0.1	0.1	**R0.5**
	0.1	0.1	0.2	0.3	3.4	16.7	19.1	16.7	3.4	0.3	0.2	0.1	0.1	**R1.0**
	0.1	0.2	0.3	1.6	6.3	7.6	8.5	7.6	6.3	1.6	0.3	0.2	0.1	**R1.5**
	0.2	0.3	0.9	2.7	3.8	4.5	4.6	4.5	3.8	2.7	0.9	0.3	0.2	**R2.0**
	0.3	0.6	1.4	2.3	2.7	2.9	2.9	2.9	2.7	2.3	1.4	0.6	0.3	**R2.5**
	0.5	0.9	1.5	1.7	1.9	2.0	2.0	2.0	1.9	1.7	1.5	0.9	0.5	**R3.0**

Diagnostic Shielding Recommendations

Date: 8/4/2023

Facility: National Veterinary Associates
Eastern Carolina Veterinary
5051 New Centre Dr

Room: CT

Workload: 30.0 Procedures per week
Reference Drawing: See Attached

	Area/Barrier	Shielding Goal (mGy/week)	Shielding Materia	ccupancy Factor (	Distance to barrier (meters)	Minimum Shielding Requirement
A <-> B	Control Room (Operator including window)	0.1	Lead	1	1	1/16 inch Lead
B <-> C	Corridor Door	0.02	Lead	1/8	1	1/16 inch Lead
C <-> D	Corridor	0.02	Lead	1/5	1	1/16 inch Lead
D <-> E	Corridor	0.02	Lead	1/5	1	1/16 inch Lead
E <-> F	Corridor	0.02	Lead	1/5	1	1/16 inch Lead
F <-> G	X-Ray Room	0.02	Lead	1/2	1	1/16 inch Lead
G <-> A	Control Room	0.1	Lead	1	1	1/16 inch Lead
(Option 1)	Second Floor (Clinical)	0.02	Lead	1/5	1	1/16 inch Lead
(Option 2)	Second Floor (Clinical)	0.02	Concrete	1/5	1	4 inches of Concrete
Below	Slab	0.02	Concrete	0	1	None

Notes: If the existing x-ray shielding in the walls meets the Minimum Shielding Requirements, then no additional shielding is necessary.

Calculations assume dimensions are as in the diagram attached. If there are any discrepancies, shielding requirements must be recalculated.

Calculations are based on the local dose distribution map provided by the manufacturer.

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Diagnostic Radiology Installation
Shielding Analysis and Specification

Date: 8/3/2023

Facility: National Veterinary Associates
Eastern Carolina Veterinary
5051 New Centre Dr
Wilmington, NC 28403
Room: X-Ray Room 135

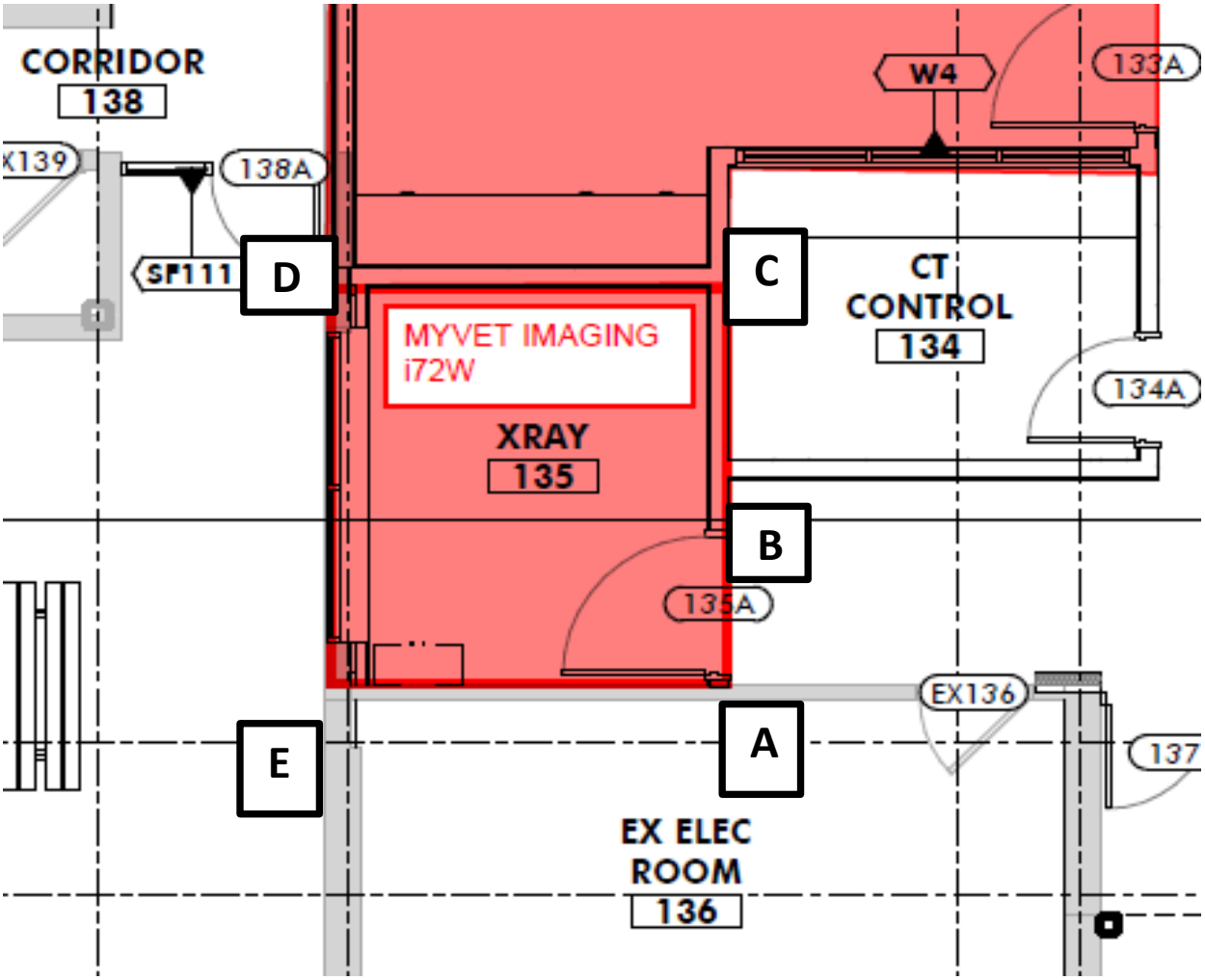
The following analysis and specification for shielding of a diagnostic radiographic installation has been performed according to the principles outlined in Report #147 of the National Council on Radiation Protection and Measurements (NCRP). The amount of supplemental shielding specified for each barrier is necessary to reduce radiation levels in adjacent areas to acceptable levels.

When assumptions were necessary, such as workload, use factors, and occupancy, they were made according to the above mentioned reference and are considered reasonable with regard to the resultant exposure values.

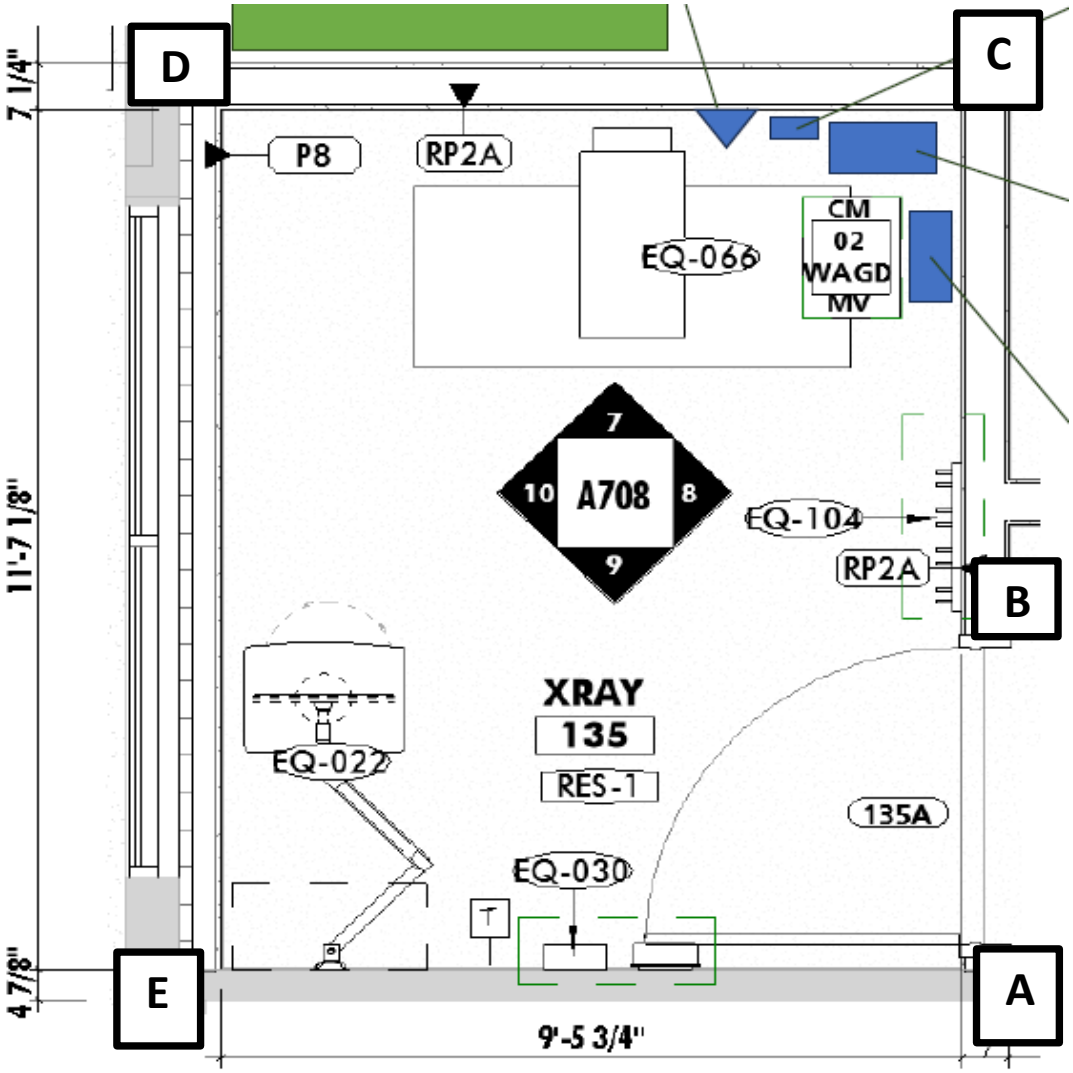
Specification regarding sheet lead and concrete assume a physical density of 11.36 g/cm^3 and 2.35 g/cm^3, respectively. All shielding is to be provided to a minimum height of 7 feet above the floor unless otherwise specified. All joints should be sealed in such a way as to not produce voids at the union.

When a barrier contains a door it should provide the same lead equivalence as specified for that barrier. All viewing windows should possess the same lead equivalence as the barrier with which they are associated.

Room Diagram with Barrier Labels



Room Diagram depicting X-Ray Layout



Diagnostic Shielding Recommendations

Date: 8/3/2023

Facility: National Veterinary Associates
Eastern Carolina Veterinary
5051 New Centre Dr

Room: X-Ray Room 135

Workload: 160 patients per week
Reference Drawing: See Attached

	Area/Barrier	Type of Barrier	Use Factor (U	Occupancy (T	Distance (m)	Shielding Material	Recommended Shielding
A <-> B	Room Door (Operator)	S	1	1	2.0	Lead	1/32 inch lead door
B <-> C	CT Control Room	S	1	1	1.3	Lead	1/32 inch lead
C <-> D	CT Exam Room	S	1	1/5	1.0	Lead	1/32 inch lead
D <-> E	Corridor	S	1	1/5	1.5	Lead	1 /32 inch lead
E <-> A	Electrical Room	S	1	1/10	2.9	Lead	1/32 inch lead
-	Above (Option 1)	S	1	1	2.0	Concrete	3 inches of concrete
-	Above (Option 2)	S	1	1	2.0	Lead	1/32 inch Lead
-	Below	P	1	0	-0.5	Concrete	None

Notes: If the existing ceiling materials meet the standards from option 1 or option 2, no further shielding is required.

Calculations assume dimensions are as in the diagram attached. If there are any discrepancies, shielding requirements must be recalculated.

Calculations assume that there are no existing significant shielding materials present unless specifically noted. If existing shielding is present, this will reduce the requirements above by that amount.

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Diagnostic Radiology Installation
Shielding Analysis and Specification

Date: 8/3/2023

Facility: National Veterinary Associates
Eastern Carolina Veterinary
5051 New Centre Dr
Wilmington, NC 28403
Room: X-ray Room 239

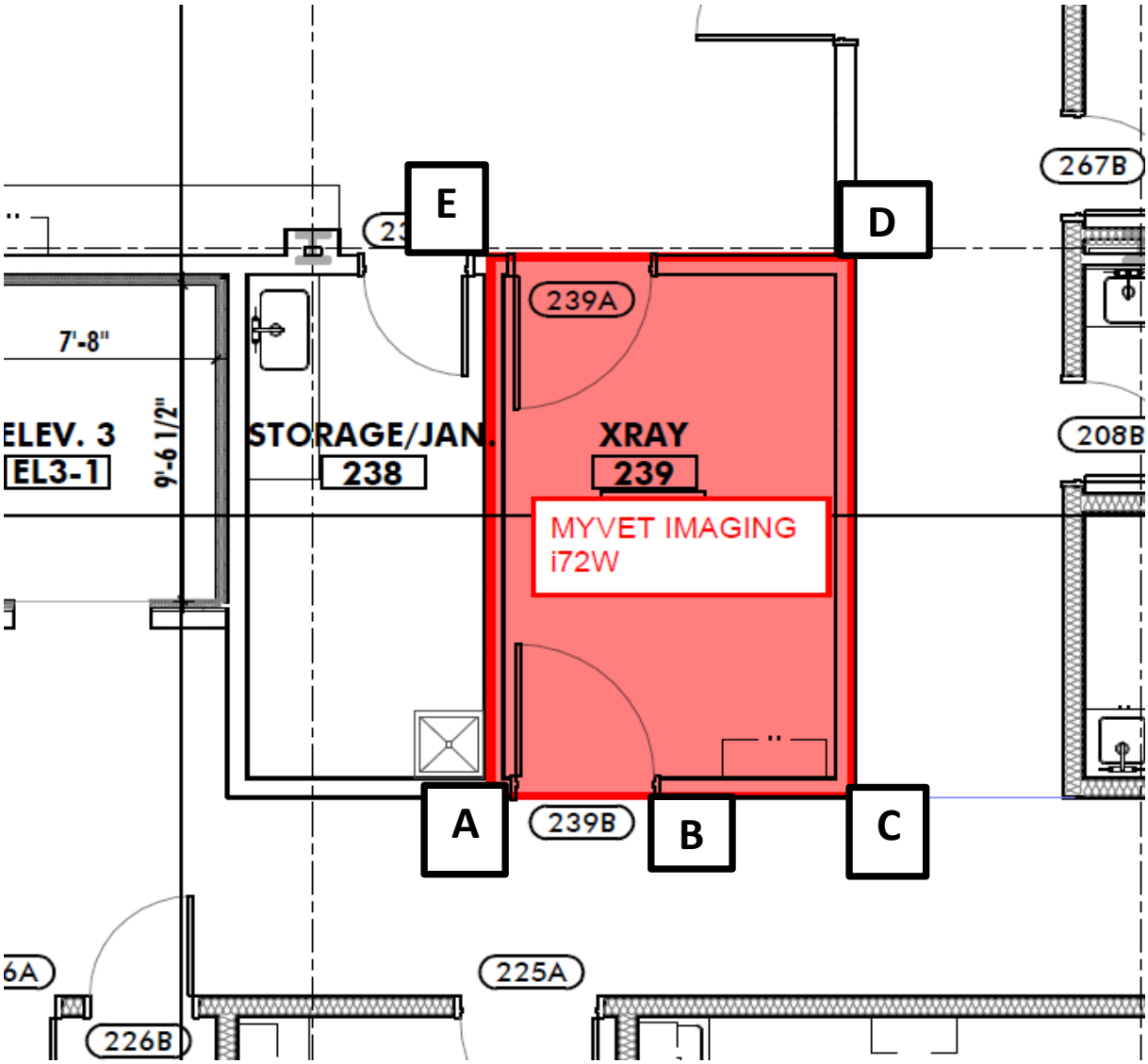
The following analysis and specification for shielding of a diagnostic radiographic installation has been performed according to the principles outlined in Report #147 of the National Council on Radiation Protection and Measurements (NCRP). The amount of supplemental shielding specified for each barrier is necessary to reduce radiation levels in adjacent areas to acceptable levels.

When assumptions were necessary, such as workload, use factors, and occupancy, they were made according to the above mentioned reference and are considered reasonable with regard to the resultant exposure values.

Specification regarding sheet lead and concrete assume a physical density of 11.36 g/cm^3 and 2.35 g/cm^3, respectively. All shielding is to be provided to a minimum height of 7 feet above the floor unless otherwise specified. All joints should be sealed in such a way as to not produce voids at the union.

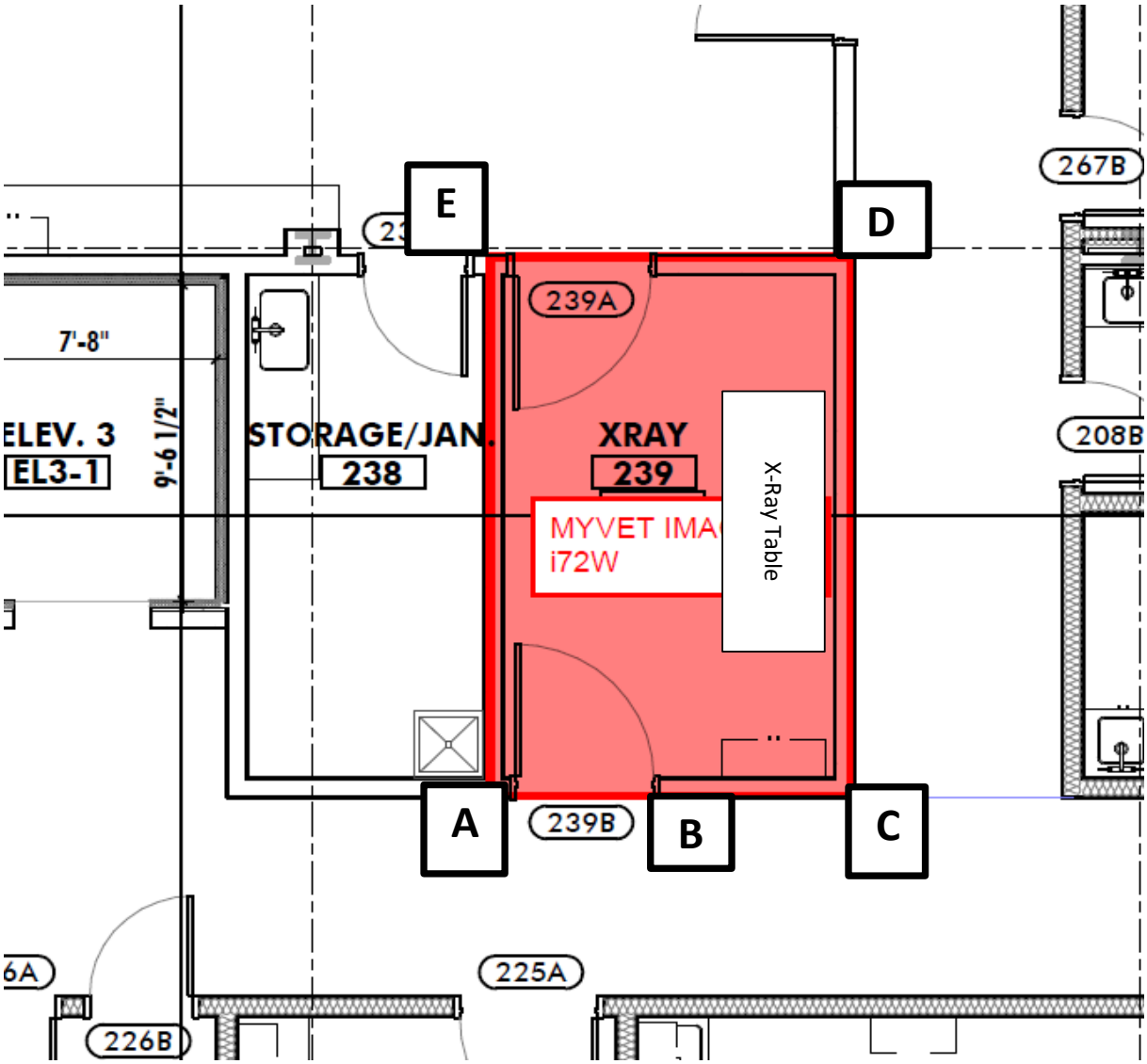
When a barrier contains a door it should provide the same lead equivalence as specified for that barrier. All viewing windows should possess the same lead equivalence as the barrier with which they are associated.

Room Diagram with Barrier Labels



Room Diagram depicting assumed X-Ray Layout

Note: The X-Ray equipment position in the diagram below is the assumed layout used for this calculation. Conservative distances were applied to each barrier to calculate the appropriate shielding. If the final layout deviates from this layout, please contact our office so that these calculations/report can be updated appropriately.



Diagnostic Shielding Recommendations

Date: 8/3/2023

Facility: National Veterinary Associates
Eastern Carolina Veterinary
5051 New Centre Dr

Room: X-ray Room 239

Workload: 160 patients per week
Reference Drawing: See Attached

	Area/Barrier	Type of Barrier	Use Factor (U)	Occupancy (T)	Distance (m)	Shielding Material	Recommended Shielding
A <-> B	Corridor Door (Operator)	S	1	1	1.8	Lead	1/32 in lead
B <-> C	Corridor	S	1	1/5	1.8	Lead	1/32 in lead
C <-> D	Corridor	S	1	1/5	0.8	Lead	1/32 in lead
D <-> E	Surgical Prep	S	1	1	1.8	Lead	1/32 in lead
E <-> A	Storage	S	1	1/20	1.8	Lead	1/32 in lead
-	Roof	S	1	1/40	2.0	Lead	None
-	Below (Option 1)	P	0.89	1	2.0	Lead	1/16 inch Lead
-	Below (Option 2)	P	0.89	1	2.0	Concrete	3 inches Concrete

Notes: If the existing floor material meets the standards of option 1 or option 2, no further shielding is required.

Calculations assume dimensions are as in the diagram attached. If there are any discrepancies, shielding requirements must be recalculated.

Calculations assume that there are no existing significant shielding materials present unless specifically noted. If existing shielding is present, this will reduce the requirements above by that amount.

Christopher C. Smitherman, M.S., DABR

Site:	National Veterinary Associates	# patients (N) per week	Ceiling Height (ft)	9
Room:	X-ray Room 239	160	Ceiling Height (m)	2.74
Unit:	Radiographic			

	Barrier Type(Custom - except Above and Below use exact terms)	Primary / Secondary	Transmission Curve	Material	P	T	Distance Past Barrier	Distance to Barrier	Total Distance	U	K1	B	alpha	beta	gamma	Shielding thickness without Preshielding (mm)	Shielding Thickness with Preshiedling (mm)	Shielding
A <-> B	Corridor Door (Operator)	S	Rad Room (all barriers)	Lead	0.1	1	0.3	1.50	1.80	1	4.90E-02	4.13E-02	2.30E+00	1.74E+01	6.19E-01	0.38	0.38	1/32 in lead
B <-> C	Corridor	S	Rad Room (all barriers)	Lead	0.02	1/5	0.3	1.50	1.80	1	4.90E-02	4.13E-02	2.30E+00	1.74E+01	6.19E-01	0.38	0.38	1/32 in lead
C <-> D	Corridor	S	Rad Room (all barriers)	Lead	0.02	1/5	0.3	0.50	0.80	1	4.90E-02	8.16E-03	2.30E+00	1.74E+01	6.19E-01	0.81	0.81	1/32 in lead
D <-> E	Surgical Prep	S	Rad Room (all barriers)	Lead	0.02	1	0.3	1.50	1.80	1	4.90E-02	8.27E-03	2.30E+00	1.74E+01	6.19E-01	0.81	0.81	1/32 in lead
E <-> A	Storage	S	Rad Room (all barriers)	Lead	0.02	1/20	0.3	1.50	1.80	1	4.90E-02	1.65E-01	2.30E+00	1.74E+01	6.19E-01	0.15	0.15	1/32 in lead
-	Roof	S	Rad Room (all barriers)	Lead	0.02	1/40	0.3	1.70	2.00	1	4.90E-02	4.08E-01	2.30E+00	1.74E+01	6.19E-01	0.06	0.06	None
-	Below (Option 1)	P	Rad Room (floor or other barriers)	Lead	0.02	1	1	1.00	2.00	0.89	5.20E+00	1.08E-04	2.65E+00	1.66E+01	4.59E-01	1.89	1.04	1/16 inch Lead
-	Below (Option 2)	P	Rad Room (floor or other barriers)	Concrete	0.02	1	1	1.00	2.00	0.89	5.20E+00	1.08E-04	3.99E-02	1.45E-01	4.23E-01	142.37	70.37	3 inches Concrete

TABLE 4.5—*Unshielded primary air kerma per patient [K_p^1 (in mGy patient^{-1})] for the indicated workload [W_{norm} (mA min patient^{-1})] and workload distribution, normalized to primary beam distance d_p = 1 m.*

Workload Distribution[a]	W_{norm} (mA min patient^{-1})[b,c]	K_p^1 (mGy patient^{-1})[d]
Rad Room (chest bucky)	0.6	2.3
Rad Room (floor or other barriers)	1.9	5.2
Rad Tube (R&F Room)	1.5	5.9
Chest Room	0.22	1.2

TABLE 4.6—*Equivalent thickness of primary beam preshielding (x_{pre}) (Dixon, 1994).*[a,b]

Application	x_{pre} (in mm)		
	Lead	Concrete	Steel
Image receptor in radiographic table or wall-mounted cassette holder (attenuation by grid, cassette, and image-receptor supporting structures)	0.85	72	7
Cross-table lateral (attenuation by grid and cassette only)	0.3	30	2

TABLE 4.1—*Suggested occupancy factors[a] (for use as a guide in planning shielding where other occupancy data are not available).*

Location	Occupancy Factor (T)
Administrative or clerical offices; laboratories, pharmacies and other work areas fully occupied by an individual; receptionist areas, attended waiting rooms, children's indoor play areas, adjacent x-ray rooms, film reading areas, nurse's stations, x-ray control rooms	1
Rooms used for patient examinations and treatments	1/2
Corridors, patient rooms, employee lounges, staff rest rooms	1/5
Corridor doors[b]	1/8
Public toilets, unattended vending areas, storage rooms, outdoor areas with seating, unattended waiting rooms, patient holding areas	1/20
Outdoor areas with only transient pedestrian or vehicular traffic, unattended parking lots, vehicular drop off areas (unattended), attics, stairways, unattended elevators, janitor's closets	1/40

TABLE 4.7—*Unshielded leakage, scattered and total secondary air kermas (in mGy patient^{-1}) for the indicated workload distributions at $d_s = d_L = 1$ m. The workload distributions and total workloads per patient (W_{norm}) for the indicated clinical sites are the average per patient surveyed by AAPM TG9 (Simpkin, 1996a), listed in Table 4.2. The primary field size F (in cm^2) is known at primary distance d_p. Side-scattered radiation is calculated for 90 degree scatter. Forward- and backscattered radiations are calculated for 135 degree scatter.[a] Leakage radiation technique factors are 150 kVp at 3.3 mA to achieve 0.876 mGy h^{-1} (100 mR h^{-1}) for all tubes except mammography, which assumes leakage radiation technique factors of 50 kVp at 5 mA.*

Workload Distribution	W_{norm} (mA min patient^{-1})	F (cm^2) at d_p (m)	Unshielded Air Kerma (mGy patient^{-1}) at 1 m				
			Leakage	Side-Scatter	Leakage and Side-Scatter (K_{sc}^1)[b]	Forward/ Backscatter	Leakage and Forward/ Backscatter (K_{sc}^1)[c]
Rad Room (all barriers)	2.5	1,000	1.00	5.3×10^{-4}	3.4×10^{-2}	3.4×10^{-2}	4.8×10^{-2}	4.9×10^{-2}
Rad Room (chest bucky)	0.60	1,535[d]	1.83	3.9×10^{-4}	4.9×10^{-3}	5.3×10^{-3}	6.9×10^{-3}	7.3×10^{-3}
Rad Room (floor or other barriers)	1.9	1,000	1.00	1.4×10^{-4}	2.3×10^{-2}	2.3×10^{-2}	3.3×10^{-2}	3.3×10^{-2}
Fluoroscopy Tube (R&F room)	13	730[e]	0.80	1.2×10^{-2}	3.1×10^{-1}	3.2×10^{-1}	4.4×10^{-1}	4.6×10^{-1}
Rad Tube (R&F room)	1.5	1,000	1.00	9.4×10^{-4}	2.8×10^{-2}	2.9×10^{-2}	3.9×10^{-2}	4.0×10^{-2}
Chest Room	0.22	1,535[d]	2.00	3.8×10^{-4}	2.3×10^{-2}	2.7×10^{-2}	3.2×10^{-2}	3.6×10^{-2}
Mammography Room[f]	6.7	720[g]	0.58	1.1×10^{-6}	1.1×10^{-2}	1.1×10^{-2}	4.9×10^{-2}	4.9×10^{-2}
Cardiac Angiography	160	730[e]	0.90	8.8×10^{-3}	2.6	2.7	3.7	3.8
Peripheral Angiography[h]	64	730[e]	0.90	3.4×10^{-3}	6.6×10^{-1}	6.6×10^{-1}	9.5×10^{-1}	9.5×10^{-1}

TABLE 4.3—*Estimated total workloads in various medical x-ray imaging installations in clinics and hospitals. The total workload values are for general guidance and are to be used only if the actual workloads are not available.*

Room Type	Total Workload per Patient[a] (W_{norm})[b] (mA min patient^{-1})	Typical Number of Patients (N) (per 40 h week)		Total Workload per Week (W_{tot}) (mA min week^{-1})	
		Average	Busy	Average	Busy
Rad Room (chest bucky)	0.6	120	160	75	100
Rad Room (floor or other barriers)	1.9	120	160	240	320
Chest Room	0.22	200	400	50	100
Fluoroscopy Tube (R&F room)	13	20	30	260	400
Rad Tube (R&F room)	1.5	25	40	40	60
Mammography Room	6.7	80	160	550	1,075
Cardiac Angiography	160	20	30	3,200	4,800
Peripheral Angiography[b]	64	20	30	1,300	2,000

[a]As discussed in Section 4.1.4, values of W_{norm} given in this table can be modified by use of a multiplier term W_{site}/W_{norm} if necessary to account for different workloads per patient at a particular site.
[b]The data in this Table for *Peripheral Angiography* also apply to *Neuroangiography*.

	α (mm^{-1})	β (mm^{-2})	γ	α (mm^{-1})	β (mm^{-1})	γ	α (mm^{-1})	β (mm^{-1})	γ
Rad Room (all barriers)	2.163×10^{-1}	3.101	5.745×10^{-1}	3.907×10^{-2}	1.069×10^{-1}	5.940×10^{-1}	7.616×10^{-3}	7.670×10^{-4}	1.027
Rad Room (chest bucky)	2.179×10^{-1}	2.677	7.209×10^{-1}	2.762×10^{-2}	9.751×10^{-2}	7.867×10^{-1}	7.142×10^{-3}	3.080×10^{-4}	1.617
Rad Room (floor or other barriers)	2.535×10^{-1}	2.740	4.297×10^{-1}	4.361×10^{-2}	1.062×10^{-1}	5.463×10^{-1}	7.915×10^{-3}	8.800×10^{-4}	9.790×10^{-1}
Fluoroscopy Tube (R&F room)	2.325×10^{-1}	2.190	6.509×10^{-1}	3.901×10^{-2}	8.588×10^{-2}	8.081×10^{-1}	7.089×10^{-3}	4.740×10^{-4}	1.560
Rad Tube (R&F room)	2.126×10^{-1}	2.568	6.788×10^{-1}	3.778×10^{-2}	9.365×10^{-2}	7.482×10^{-1}	7.162×10^{-3}	4.119×10^{-4}	1.541
Chest Room	2.500×10^{-1}	1.989	7.721×10^{-1}	3.868×10^{-2}	7.721×10^{-2}	9.843×10^{-1}	7.030×10^{-3}	-8.800×10^{-4}	8.083×10^{-2}
Mammography Room	5.998	4.291×10^{1}	3.927×10^{-1}	2.467×10^{-1}	1.054	3.694×10^{-1}	1.914×10^{-2}	4.198×10^{-2}	2.858×10^{-3}
Cardiac Angiography	2.531×10^{-1}	2.461	6.243×10^{-1}	4.025×10^{-2}	9.482×10^{-2}	7.523×10^{-1}	7.393×10^{-3}	7.220×10^{-4}	1.204
Peripheral Angiography[c]	3.679×10^{-1}	3.289	5.036×10^{-1}	4.642×10^{-2}	1.203×10^{-1}	5.763×10^{-1}	8.193×10^{-3}	8.440×10^{-4}	9.754×10^{-1}

TABLE C.1—*Fitting parameters of the broad-beam secondary transmission to Equation A.2 (thickness x is input in millimeters).*[a]

Workload Distribution[b]	Lead			Concrete[c]			Gypsum Wallboard		
	α (mm^{-1})	β (mm^{-1})	γ	α (mm^{-1})	β (mm^{-1})	γ	α (mm^{-1})	β (mm^{-1})	γ
30 kVp	3.879×10^{3}	1.800×10^{2}	3.560×10^{-1}	3.174×10^{-1}	1.725	3.705×10^{-1}	1.198×10^{-1}	7.137×10^{-3}	3.703×10^{-2}
50 kVp	8.801	2.728×10^{2}	2.957×10^{-1}	9.030×10^{-2}	1.712×10^{-1}	2.324×10^{-1}	3.880×10^{-2}	8.750×10^{-2}	5.105×10^{-1}
70 kVp	5.369	2.549×10^{1}	5.863×10^{-1}	5.090×10^{-2}	1.697×10^{-1}	3.649×10^{-1}	2.300×10^{-2}	7.160×10^{-2}	7.300×10^{-1}
100 kVp	2.507	1.533×10^{1}	9.124×10^{-1}	3.950×10^{-2}	8.440×10^{-2}	5.191×10^{-1}	1.470×10^{-2}	4.000×10^{-2}	9.752×10^{-1}
125 kVp	2.233	7.888	7.295×10^{-1}	3.510×10^{-2}	6.600×10^{-2}	7.832×10^{-1}	1.200×10^{-2}	2.676×10^{-2}	1.079
150 kVp	1.791	5.478	5.678×10^{-1}	3.240×10^{-2}	7.150×10^{-2}	1.566	1.040×10^{-2}	2.020×10^{-2}	1.135
Rad Room (all barriers)	2.298	1.738×10^{1}	6.193×10^{-1}	3.610×10^{-2}	1.433×10^{-1}	5.600×10^{-1}	1.380×10^{-2}	5.700×10^{-2}	7.937×10^{-1}
Rad Room (chest bucky)	2.256	1.380×10^{1}	6.837×10^{-1}	3.560×10^{-2}	1.079×10^{-1}	7.705×10^{-1}	1.270×10^{-2}	4.450×10^{-2}	1.049
Rad Room (floor or other barriers)	2.513	1.734×10^{1}	4.994×10^{-1}	3.920×10^{-2}	1.464×10^{-1}	4.486×10^{-1}	1.640×10^{-2}	6.060×10^{-2}	7.472×10^{-1}
Fluoroscopy Tube (R&F room)	2.322	1.291×10^{1}	7.575×10^{-1}	3.630×10^{-2}	9.360×10^{-2}	5.955×10^{-1}	1.330×10^{-2}	4.190×10^{-2}	9.566×10^{-1}
Rad Tube (R&F room)	2.272	1.360×10^{1}	7.164×10^{-1}	3.560×10^{-2}	1.114×10^{-1}	6.020×10^{-1}	1.290×10^{-2}	4.570×10^{-2}	9.355×10^{-1}
Chest Room	2.286	9.848	1.054	3.640×10^{-2}	6.590×10^{-2}	7.543×10^{-1}	1.300×10^{-2}	2.970×10^{-2}	1.195
Mammography Room	2.991×10^{1}	1.844×10^{2}	3.550×10^{-1}	2.539×10^{-1}	1.8411	3.924×10^{-1}	8.830×10^{-2}	7.526×10^{-1}	3.790×10^{-1}
Cardiac Angiography	3.354	1.494×10^{1}	7.481×10^{-1}	3.710×10^{-2}	1.067×10^{-1}	5.733×10^{-1}	1.390×10^{-2}	4.640×10^{-2}	9.185×10^{-1}
Peripheral Angiography[d]	2.661	1.954×10^{1}	5.094×10^{-1}	4.219×10^{-2}	1.559×10^{-1}	4.472×10^{-1}	1.747×10^{-2}	6.422×10^{-2}	7.299×10^{-1}

Workload Distribution[a]	Steel			Plate Glass			Wood[b]		
	α (mm^{-1})	β (mm^{-1})	γ	α (mm^{-1})	β (mm^{-1})	γ	α (mm^{-1})	β (mm^{-1})	γ
30 kVp	7.498	4.249×10^{1}	4.001×10^{-1}	3.060×10^{-1}	1.620	3.793×10^{-1}	2.159×10^{-2}	3.971×10^{-2}	2.852×10^{-1}
50 kVp	1.817	4.840	4.021×10^{-1}	9.721×10^{-2}	1.799×10^{-1}	4.912×10^{-1}	1.076×10^{-2}	1.862×10^{-2}	1.170
70 kVp	7.149×10^{-1}	3.798	5.381×10^{-1}	5.791×10^{-2}	1.357×10^{-1}	5.968×10^{-1}	8.550×10^{-3}	5.390×10^{-4}	1.194
100 kVp	3.424×10^{-1}	2.456	9.388×10^{-1}	4.279×10^{-2}	8.948×10^{-2}	1.029	7.230×10^{-3}	9.940×10^{-4}	1.316
125 kVp	2.138×10^{-1}	1.690	1.086	3.654×10^{-2}	5.790×10^{-2}	1.093	6.587×10^{-3}	-1.140×10^{-3}	1.172
150 kVp	1.511×10^{-1}	1.124	1.151	3.267×10^{-2}	4.074×10^{-2}	1.134	6.027×10^{-3}	-1.630×10^{-3}	1.440
Rad Room (all barriers)	2.191×10^{-1}	3.490	7.358×10^{-1}	3.873×10^{-2}	1.054×10^{-1}	6.397×10^{-1}	7.552×10^{-3}	7.370×10^{-4}	1.044
Rad Room (chest bucky)	2.211×10^{-1}	2.850	1.123	3.749×10^{-2}	8.710×10^{-2}	9.086×10^{-1}	7.058×10^{-3}	2.290×10^{-4}	1.875
Rad Room (floor or other barriers)	2.440×10^{-1}	3.012	5.019×10^{-1}	4.299×10^{-2}	1.070×10^{-1}	5.538×10^{-1}	7.887×10^{-3}	8.770×10^{-4}	9.800×10^{-1}
Fluoroscopy Tube (R&F room)	2.331×10^{-1}	2.213	8.051×10^{-1}	3.886×10^{-2}	8.091×10^{-2}	8.520×10^{-1}	7.057×10^{-3}	4.220×10^{-4}	1.664
Rad Tube (R&F room)	2.149×10^{-1}	2.695	8.768×10^{-1}	3.762×10^{-2}	8.857×10^{-2}	8.087×10^{-1}	7.102×10^{-3}	3.450×10^{-4}	1.698
Chest Room	2.518×10^{-1}	1.829	1.273	3.866×10^{-2}	6.270×10^{-2}	1.128	7.485×10^{-3}	-8.100×10^{-4}	9.459×10^{-2}
Mammography Room	5.799	4.412×10^{2}	4.124×10^{-2}	2.464×10^{-1}	1.709	3.918×10^{-1}	1.868×10^{-2}	4.172×10^{-2}	2.903×10^{-1}
Cardiac Angiography	2.530×10^{-1}	2.592	7.999×10^{-1}	4.001×10^{-2}	9.030×10^{-2}	8.019×10^{-1}	7.266×10^{-3}	6.740×10^{-4}	1.235
Peripheral Angiography[d]	3.579×10^{-1}	3.466	5.600×10^{-1}	4.612×10^{-2}	1.198×10^{-1}	5.907×10^{-1}	8.079×10^{-3}	8.470×10^{-4}	9.742×10^{-1}

TABLE B.1—*Fitting parameters for transmission of broad primary x-ray beams to Equation A.2 (thickness x is input in millimeters).*

Workload Distribution[a]	Lead			Concrete[b]			Gypsum Wallboard		
	α (mm^{-1})	β (mm^{-1})	γ	α (mm^{-1})	β (mm^{-1})	γ	α (mm^{-1})	β (mm^{-1})	γ
Rad Room (all barriers)	2.346	1.590×10^{1}	4.992×10^{-1}	3.626×10^{-2}	1.429×10^{-1}	4.932×10^{-1}	1.420×10^{-2}	3.781×10^{-2}	7.445×10^{-1}
Rad Room (chest bucky)	2.264	1.368×10^{1}	5.600×10^{-1}	3.552×10^{-2}	1.177×10^{-1}	6.007×10^{-1}	1.278×10^{-2}	4.848×10^{-2}	8.609×10^{-1}
Rad Room (floor or other barriers)	2.851	1.836×10^{1}	4.385×10^{-1}	3.984×10^{-2}	1.448×10^{-1}	4.231×10^{-1}	1.679×10^{-2}	6.124×10^{-2}	7.356×10^{-1}
Fluoroscopy Tube (R&F room)	2.347	1.287×10^{1}	6.149×10^{-1}	3.616×10^{-2}	8.721×10^{-2}	5.186×10^{-1}	1.340×10^{-2}	4.293×10^{-2}	8.796×10^{-1}
Rad Tube (R&F room)	2.295	1.360×10^{1}	5.573×10^{-1}	3.548×10^{-2}	1.164×10^{-1}	5.774×10^{-1}	1.300×10^{-2}	4.778×10^{-2}	8.485×10^{-1}
Chest Room	2.293	1.074×10^{1}	6.370×10^{-1}	3.622×10^{-2}	7.766×10^{-2}	5.404×10^{-1}	1.286×10^{-2}	3.505×10^{-2}	8.356×10^{-1}
Mammography Room	3.993×10^{1}	1.776×10^{2}	3.398×10^{-1}	2.577×10^{-1}	1.765	3.644×10^{-1}	9.148×10^{-2}	7.090×10^{-1}	3.439×10^{-1}
Cardiac Angiography	2.389	1.426×10^{1}	5.948×10^{-1}	3.717×10^{-2}	1.067×10^{-1}	4.879×10^{-1}	1.409×10^{-2}	4.814×10^{-2}	8.419×10^{-1}
Peripheral Angiography[c]	2.728	1.852×10^{1}	4.614×10^{-1}	4.292×10^{-2}	1.558×10^{-1}	4.236×10^{-1}	1.774×10^{-2}	6.449×10^{-2}	7.158×10^{-1}

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Staten Island, NY 10310
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Diagnostic Radiology Installation
Shielding Analysis and Specification

Date: 8/5/2023

Facility: National Veterinary Associates
Eastern Carolina Veterinary
5051 New Centre Dr
Wilmington, NC 28403
Room: OR Large 3 - 245

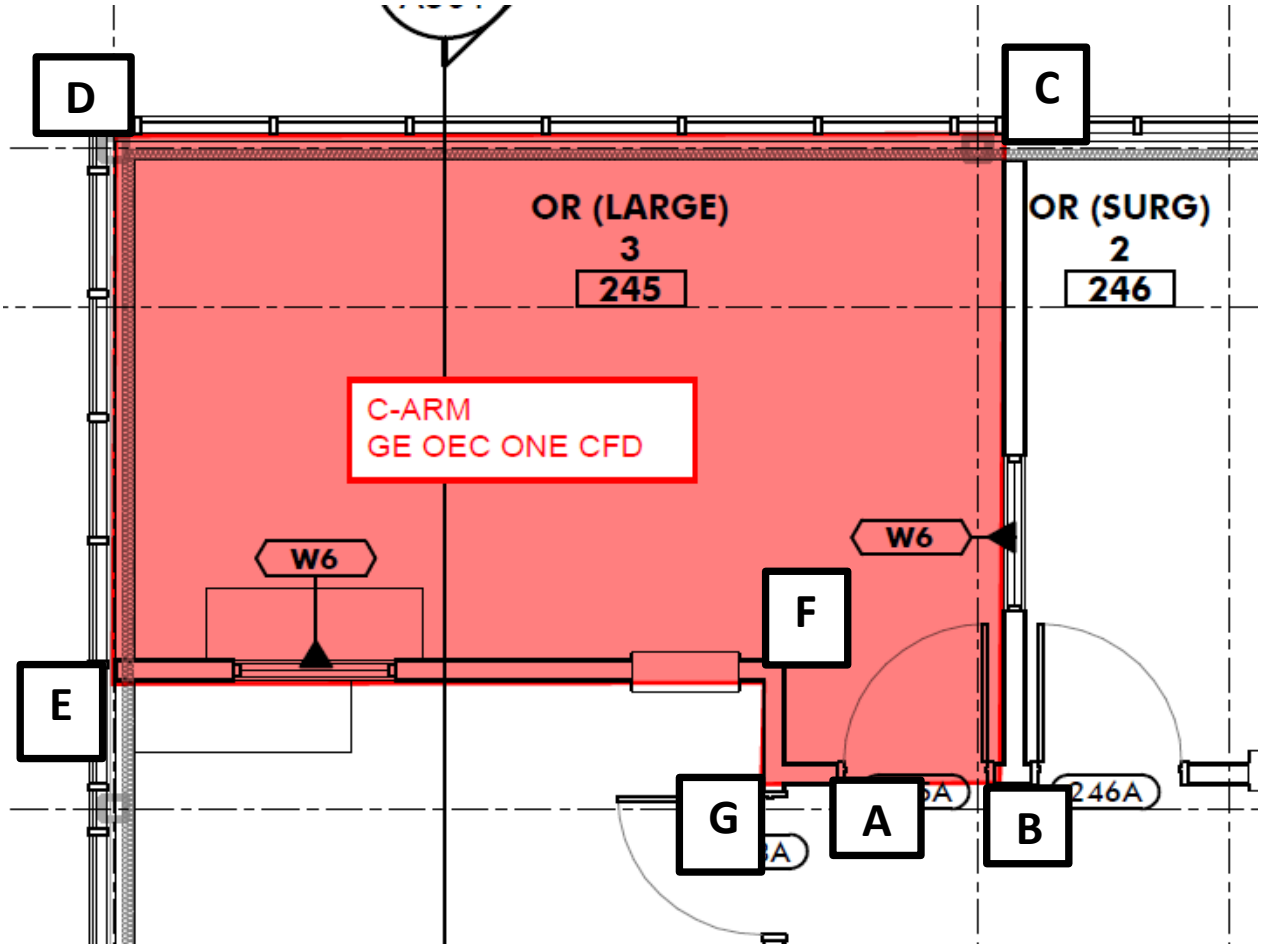
The following analysis and specification for shielding of a diagnostic radiographic installation has been performed according to the principles outlined in Report #147 of the National Council on Radiation Protection and Measurements (NCRP). The amount of supplemental shielding specified for each barrier is necessary to reduce radiation levels in adjacent areas to acceptable levels.

When assumptions were necessary, such as workload, use factors, and occupancy, they were made according to the above mentioned reference and are considered reasonable with regard to the resultant exposure values.

Specification regarding sheet lead and concrete assume a physical density of 11.36 g/cm^3 and 2.35 g/cm^3, respectively. All shielding is to be provided to a minimum height of 7 feet above the floor unless otherwise specified. All joints should be sealed in such a way as to not produce voids at the union.

When a barrier contains a door it should provide the same lead equivalence as specified for that barrier. All viewing windows should possess the same lead equivalence as the barrier with which they are associated.

Room Diagram with Barrier Labels



The c-arm setup was assumed to be approximately in the center of the exam room for the shielding design calculations. It is suggested that the c-arm be positioned as close to the exterior walls as possible without disrupting clinical practice to further reduce the scatter exposure in the adjacent clinical areas.

Diagnostic Shielding Recommendations

Date: 8/5/2023

Facility: National Veterinary Associates
Eastern Carolina Veterinary
5051 New Centre Dr

Room: OR Large 3 - 245

Workload: 20 patients per week
Reference Drawing: See Attached

	Area/Barrier	Type of Barrier	Use Factor (U)	Occupancy (T)	Distance (m)	Shielding Material	Recommended Shielding
A <-> B	Corridor Door	S	1	1/8	2.3	Lead	1/32 inch Lead
B <-> C	Exam Room (Surgery)	S	1	1	2.8	Lead	1/32 inch Lead
C <-> D	Exterior (2nd Floor)	S	1	0	1.8	Lead	None
D <-> E	Exterior (2nd Floor)	S	1	0	2.3	Lead	None
E <-> F	Exam Room (Surgery)	S	1	1	1.8	Lead	1/32 inch Lead
F <-> G	Exam Room (Surgery)	S	1	1	2.3	Lead	1/32 inch Lead
G.	Above (Roof)	S	1	1/40	2.2	Lead	None
H.	Below (Option 1)	S	1	1	2.0	Concrete	3 inches Concrete
H.	Below (Option 2)	S	1	1	2.0	Lead	1/16 inch Lead

Notes: If the existing floor meet the standards listed in option 1 then no additional sheilding is required.

All personnel in surgery rooms should wear personnel dosimetry monitors to monitor occupational radiation exposure.

Calculations assume dimensions are as in the diagram attached. If there are any discrepancies, shielding requirements must be recalculated.

Calculations assume that there are no existing significant shielding materials present unless specifically noted. If existing shielding is present, this will reduce the requirements above by that amount.

Christopher C. Smitherman, M.S., DABR

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728 Castleton Avenue
Staten Island, NY 10310
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Diagnostic Radiology Installation
Shielding Analysis and Specification

Date: 8/5/2023

Facility: National Veterinary Associates
Eastern Carolina Veterinary
5051 New Centre Dr
Wilmington, NC 28403
Room: OR Surg 5 - 242

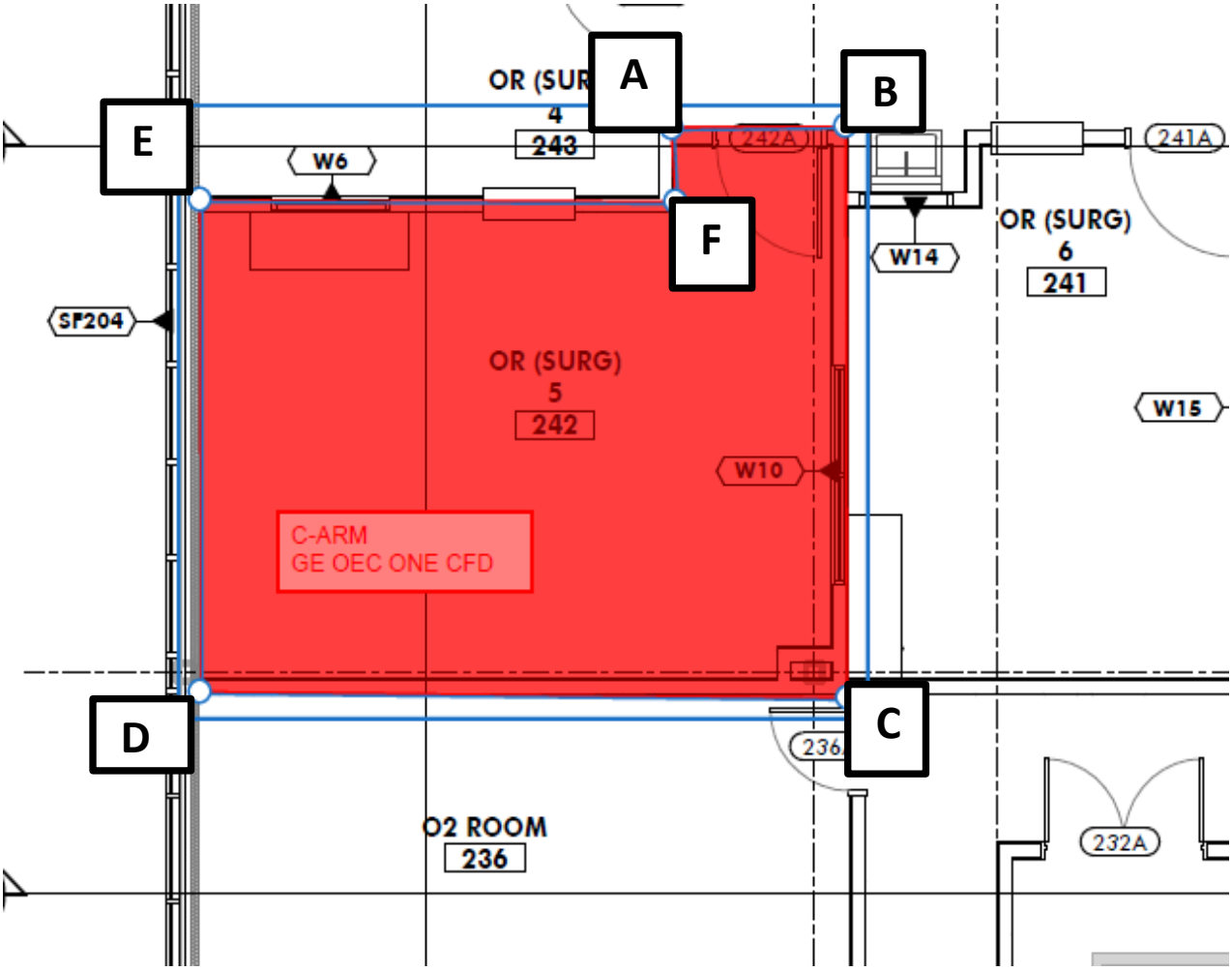
The following analysis and specification for shielding of a diagnostic radiographic installation has been performed according to the principles outlined in Report #147 of the National Council on Radiation Protection and Measurements (NCRP). The amount of supplemental shielding specified for each barrier is necessary to reduce radiation levels in adjacent areas to acceptable levels.

When assumptions were necessary, such as workload, use factors, and occupancy, they were made according to the above mentioned reference and are considered reasonable with regard to the resultant exposure values.

Specification regarding sheet lead and concrete assume a physical density of 11.36 g/cm^3 and 2.35 g/cm^3, respectively. All shielding is to be provided to a minimum height of 7 feet above the floor unless otherwise specified. All joints should be sealed in such a way as to not produce voids at the union.

When a barrier contains a door it should provide the same lead equivalence as specified for that barrier. All viewing windows should possess the same lead equivalence as the barrier with which they are associated.

Room Diagram with Barrier Labels



The c-arm setup was assumed to be approximately in the center of the exam room for the shielding design calculations. It is suggested that the c-arm be positioned as close to the exterior wall as possible without disrupting clinical practice to further reduce the scatter exposure in the adjacent clinical areas.

Diagnostic Shielding Recommendations

Date: 8/5/2023

Facility: National Veterinary Associates
Eastern Carolina Veterinary
5051 New Centre Dr

Room: OR Surg 5 - 242

Workload: 20 patients per week
Reference Drawing: See Attached

	Area/Barrier	Type of Barrier	Use Factor (U)	Occupancy (T)	Distance (m)	Shielding Material	Recommended Shielding
A <-> B	Corridor Door	S	1	1/5	2.3	Lead	1/32 inch Lead
B <-> C	Exam Room	S	1	1/2	2.8	Lead	1/32 inch Lead
C <-> D	Exam Room	S	1	1/2	2.1	Lead	1/32 inch Lead
D <-> E	2nf Floor Exterior Wall	S	1	0	2.1	Lead	None
E <-> F	Exam Room	S	1	1/2	2.1	Lead	1/32 inch Lead
F <-> A	Exam Room	S	1	1/2	2.1	Lead	1/32 inch Lead
-	Above	S	1	1/40	2.2	Lead	None
-	Below (Option 2)	S	1	1	2.0	Lead	1/16 inch Lead

Notes: If the existing floor meet the standards listed in option 1 then no additional sheilding is required.

All personnel in surgery rooms should wear personnel dosimetry monitors to monitor occupational radiation exposure.

Calculations assume dimensions are as in the diagram attached. If there are any discrepancies, shielding requirements must be recalculated.

Calculations assume that there are no existing significant shielding materials present unless specifically noted. If existing shielding is present, this will reduce the requirements above by that amount.

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