MEP GENERAL REMOVAL NOTES

1. ALL EXISTING UTILITIES SHOWN ON THE DRAWINGS ARE SHOWN IN A SCHEMATIC, DIAGRAMMATIC, NATURE. THE DOCUMENTS DO NOT SHOW EVERY OFFSET, FITTING OR EVERY LENGTH OF PIPE OR CONDUIT. DO NOT SCALE THE DRAWINGS.
2. OTHER AREAS WITHIN BUILDING WILL BE OCCUPIED, AND IN OPERATION, DURING NEW CONSTRUCTION AND DEMOLITION WORK. SCHEDULE WORK TO MINIMIZE DISRUPTIONS TO BUILDING SERVICES. COOPERATE WITH OWNER TO MINIMIZE CONFLICTS, AND TO FACILITATE OWNER'S OPERATIONS. SCHEDULE THE WORK TO ACCOMMODATE THIS REQUIREMENT.
3. IT IS THE INTENT OF THESE DOCUMENTS THAT THE EXISTING UTILITIES (HVAC, PLUMBING, SPRINKLER AND ELECTRICAL EQUIPMENT, PIPING, SUPPORTS, ETC.), WITHIN THE DEMOLITION WORK AREA (EXCEPT AS NOTED OTHERWISE), ARE TO BE REMOVED AND PROPERLY DISPOSED. SEE ARCHITECTURAL DRAWINGS FOR EXTENT OF DEMOLITION WORK.
4. IF REMOVAL OF ANY EXISTING UTILITY WILL REQUIRE A SHUTDOWN, PROVIDE A MINIMUM OF 5 DAYS WRITTEN NOTICE TO THE OWNER AND EXISTING TENANTS PRIOR TO ANY DISRUPTIONS IN BUILDING SERVICES (PLUMBING / SPRINKLER SYSTEMS, HVAC SYSTEM, ELECTRICAL POWER, PHONE, DATA AND OR ALARM SYSTEMS ETC.). DO NOT DISCONNECT OR INTERRUPT ANY BUILDING SERVICE WITHOUT EXPLICIT PERMISSION FROM THE OWNER.
5. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REVIEW THE DEMOLITION PLANS, AND INCLUDE, AS WORK OF THEIR CONTRACT, ALL TEMPORARY CONNECTIONS AND CONSTRUCTION AS REQUIRED TO MAINTAIN THE INTEGRITY OF SERVICES TO THE OCCUPIED PORTIONS OF THE BUILDING.
6. THE PROJECT WILL REQUIRE MULTIPLE SHUT-DOWNS OF MEP SYSTEMS AS WELL AS MULTIPLE TEMPORARY CONNECTIONS DURING DIFFERENT TIMES/PHASES IN ORDER TO MAINTAIN OPERATION OF THE SYSTEMS TO ALL ADJACENT AND OCCUPIED AREAS AND TO PERMIT CONSTRUCTION OF THE PROPOSED WORK.

HVAC REMOVAL WORK NOTES:

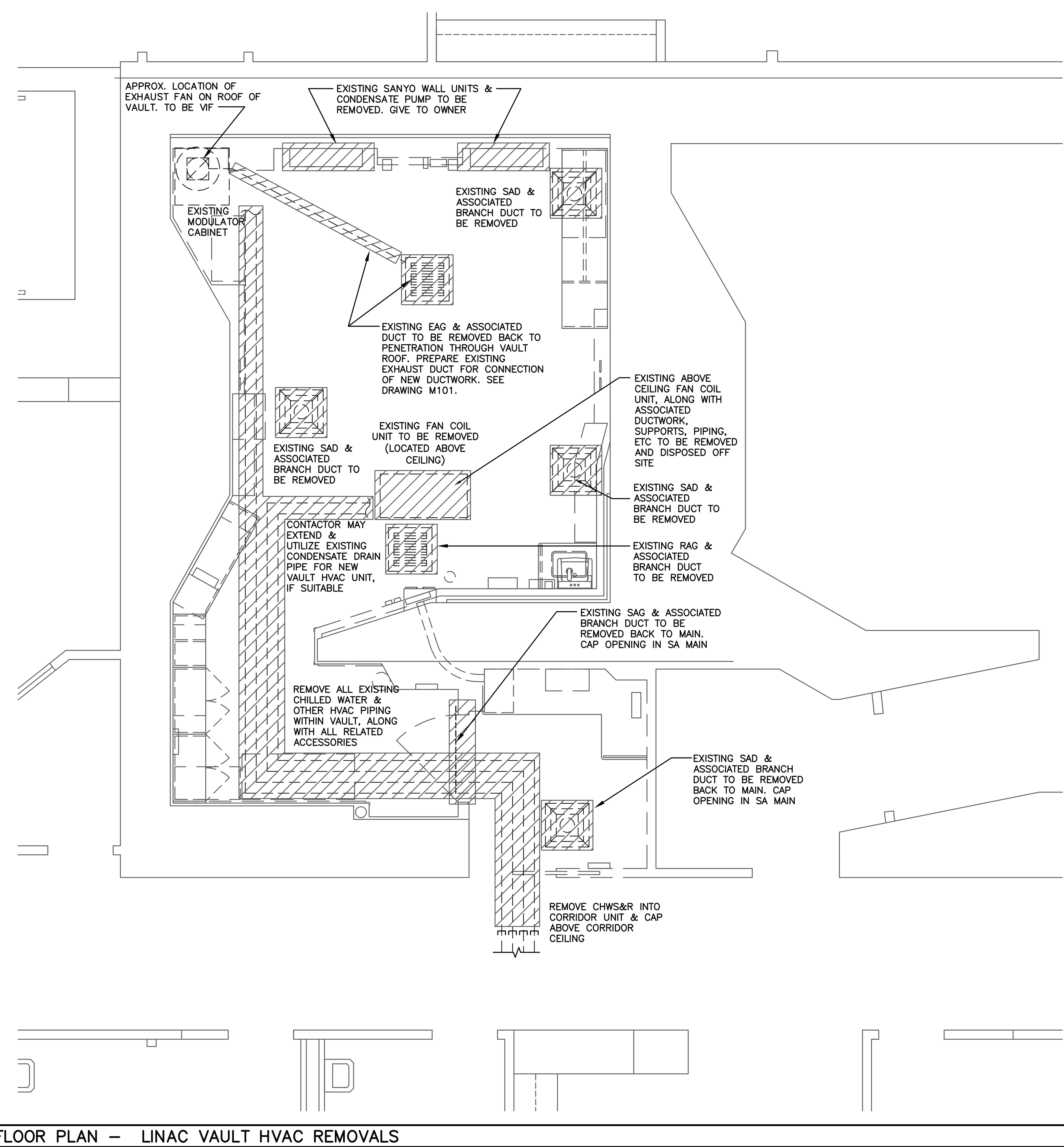
1. BEFORE SUBMITTING A BID THE MECHANICAL CONTRACTOR SHALL VISIT THE PROJECT SITE AND SHALL BECOME THOROUGHLY FAMILIAR WITH THE OBSERVABLE EXISTING CONDITIONS WHICH AFFECT WORK OF THIS CONTRACT. NO ADDITIONAL COMPENSATION WILL BE GRANTED DUE TO EXTRA WORK MADE NECESSARY BY THE CONTRACTOR'S FAILURE TO INVESTIGATE EXISTING CONDITIONS AND NOT BECOMING FAMILIAR WITH THE NATURE OF THE PROJECT.
2. ALL EXISTING HVAC EQUIPMENT, DUCTWORK, GRILLES, DIFFUSERS, CONTROLS AND HANGERS AND THEIR ASSOCIATED ACCESSORIES WITHIN THE LINAC VAULT ARE TO BE REMOVED. (UNLESS NOTED OTHERWISE). COORDINATE REMOVALS WITH ARCHITECTURAL DRAWINGS AND NEW HVAC DRAWINGS.
3. ALL OPENINGS CREATED IN THE EXISTING CONSTRUCTION SHALL BE CLOSED, PATCHED, SEALED AND FINISHED TO MATCH NEW BUILDING FINISHES AND OR SMOKE / FIRE RATINGS.

ALL EXISTING, AND NEW, DUCTWORK, DIFFUSERS, REGISTERS, GRILLES, ETC SHOWN ON THE DRAWINGS ARE SHOWN IN A SCHEMATIC, DIAGRAMMATIC, NATURE. THE DOCUMENTS DO NOT SHOW EVERY OFFSET, FITTING OR EVERY LENGTH OF DUCT. THE ACTUAL LOCATIONS MAY DIFFER FROM THOSE SHOWN. THE CONTRACTOR SHALL VERIFY LOCATIONS OF EXISTING DUCTWORK, DIFFUSERS, REGISTERS, GRILLES, ETC AND MAKE ADJUSTMENTS IN THE LAYOUT OF NEW PIPING AS NECESSARY TO ACCOMODATE EXISTING CONDITIONS.

INSTALLATION OF NEW DUCTWORK, DIFFUSERS, REGISTERS, GRILLES, ETC, SHALL BE BASED UPON ACTUAL CONDITIONS AND REQUIREMENTS OF THE NEW DESIGN. REVIEW ARCHITECTURAL NEW WORK DRAWINGS FOR SPACES AVAILABLE AND FOR BUILDING CONSTRUCTION DETAILS BEFORE INSTALLING PIPING AND EQUIPMENT. MAKE SUCH OFFSETS AND DEVIATIONS FROM WORK SHOWN ON THE DRAWINGS AS MAY BECOME NECESSARY TO FIT EXISTING CONDITIONS.

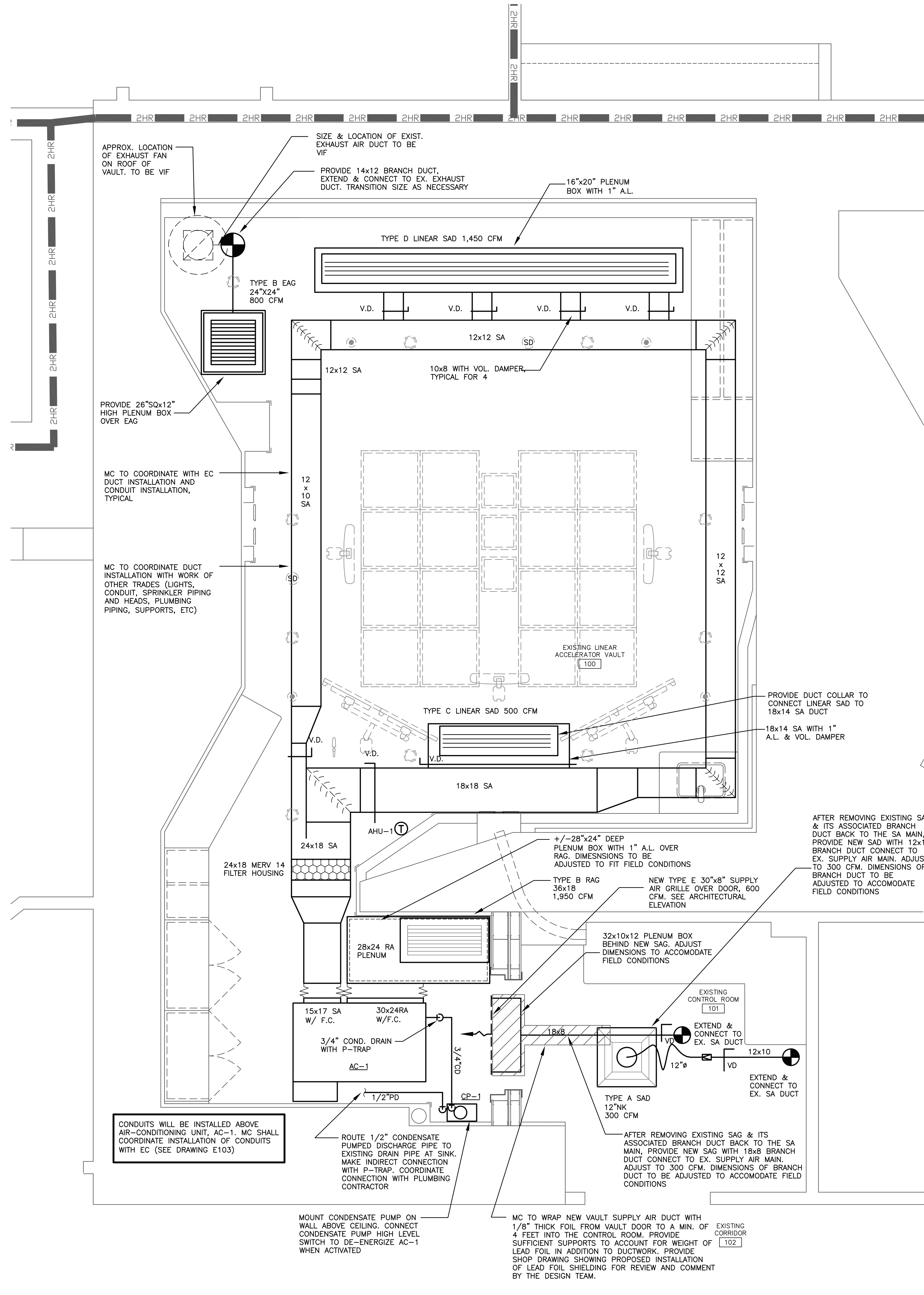
ABOVE CEILING COORDINATION DRAWING

THE HVAC CONTRACTOR, PLUMBING CONTRACTOR, SPRINKLER SYSTEM CONTRACTOR, ELECTRICAL CONTRACTOR AND OTHER CONTRACTORS ARE REQUIRED TO PREPARE A COORDINATION DRAWING SHOWING INSTALLATION OF ALL EQUIPMENT, PIPING, DUCTWORK, CONDUIT, VALVES, ACCESSORIES AND OTHER ITEMS THAT WILL BE INSTALLED ABOVE THE CEILING. IF CONFLICTS (INCLUDING, BUT NOT LIMITED TO, LOCATION, CLEARANCES FOR MAINTENANCE AND/OR REPAIR, CODE REQUIRED CLEARANCES FOR EQUIPMENT, ETC.) ARE IDENTIFIED, THEY SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT AND ENGINEER, AND SHALL BE RESOLVED BEFORE INSTALLATION OF THE CONFLICTING ITEMS. IF THE COORDINATION DRAWING INDICATES CONFLICTS BETWEEN EQUIPMENT OF DIFFERING TRADES, OWNER'S EQUIPMENT, BUILDING ELEMENTS, OR ANY OTHER ITEM, AND THESE CONFLICTS ARE NOT NOTED, IDENTIFIED OR OTHERWISE BROUGHT TO THE ATTENTION OF THE ARCHITECT AND ENGINEER, OR IF THEY ARE IDENTIFIED AND INSTALLED BEFORE BEING RESOLVED, ALL COSTS INVOLVED WITH CORRECTING THE CONFLICTS, TO THE SATISFACTION OF THE ARCHITECT AND ENGINEER, SHALL BE PAID BY THE AFFECTED TRADES. ADDITIONALLY, IF THERE ARE CONFLICTS BETWEEN INSTALLED ITEMS, BUILDING ELEMENTS, ETC., AND THEY ARE READILY APPARENT BY CASUAL OBSERVATION OF THE AREAS IN WHICH THE EQUIPMENT IS TO BE INSTALLED, AND/OR BY REVIEWING EQUIPMENT MANUFACTURER'S INSTALLATION REQUIREMENTS AND RECOMMENDATIONS, ALL COSTS INVOLVED WITH CORRECTING THE CONFLICTS, TO THE SATISFACTION OF THE ARCHITECT AND ENGINEER, SHALL BE PAID BY THE AFFECTED TRADES.



APPROX. LOCATION OF EXHAUST FAN ON ROOF OF VAULT. TO BE VIF
EXISTING SANYO WALL UNITS & CONDENSATE PUMP TO BE REMOVED. GIVE TO OWNER
EXISTING MODULATOR CABINET
EXISTING SAD & ASSOCIATED BRANCH DUCT TO BE REMOVED
EXISTING EAG & ASSOCIATED DUCT TO BE REMOVED BACK TO PENETRATION THROUGH VAULT ROOF. PREPARE EXISTING EXHAUST DUCT FOR CONNECTION OF NEW DUCTWORK. SEE DRAWING M101.
EXISTING ABOVE CEILING FAN COIL UNIT, ALONG WITH ASSOCIATED DUCTWORK, SUPPORTS, PIPING, ETC TO BE REMOVED AND DISPOSED OFF SITE
EXISTING FAN COIL UNIT TO BE REMOVED (LOCATED ABOVE CEILING)
EXISTING SAD & ASSOCIATED BRANCH DUCT TO BE REMOVED
CONTACTOR MAY EXTEND & UTILIZE EXISTING CONDENSATE DRAIN PIPE FOR NEW VAULT HVAC UNIT, IF SUITABLE
EXISTING RAG & ASSOCIATED BRANCH DUCT TO BE REMOVED
EXISTING SAG & ASSOCIATED BRANCH DUCT TO BE REMOVED BACK TO MAIN. CAP OPENING IN SA MAIN
REMOVE ALL EXISTING CHILLED WATER & OTHER HVAC PIPING WITHIN VAULT, ALONG WITH ALL RELATED ACCESSORIES
EXISTING SAD & ASSOCIATED BRANCH DUCT TO BE REMOVED BACK TO MAIN. CAP OPENING IN SA MAIN
REMOVE CHWS&R INTO CORRIDOR UNIT & CAP ABOVE CORRIDOR CEILING

2 PARTIAL SECOND FLOOR PLAN – LINAC VAULT HVAC REMOVALS
1/4" = 1'-0"



APPROX. LOCATION OF EXHAUST FAN ON ROOF OF VAULT. TO BE VIF
SIZE & LOCATION OF EXIST. EXHAUST AIR DUCT TO BE VIF
PROVIDE 14x12 BRANCH DUCT, EXTEND & CONNECT TO EX. EXHAUST DUCT. TRANSITION SIZE AS NECESSARY
16"x20" PLENUM BOX WITH 1" A.L.
TYPE D LINEAR SAD 1,450 CFM
TYPE B EAG 24"X24" 800 CFM
12x12 SA
10x8 WITH VOL. DAMPER, TYPICAL FOR 4
PROVIDE 26"SQx12" HIGH PLENUM BOX OVER EAG
MC TO COORDINATE WITH EC DUCT INSTALLATION AND CONDUIT INSTALLATION, TYPICAL
12 x 10 SA
MC TO COORDINATE DUCT INSTALLATION WITH WORK OF OTHER TRADES (LIGHTS, CONDUIT, SPRINKLER PIPING AND HEADS, PLUMBING PIPING, SUPPORTS, ETC)
12 x 12 SA
EXISTING LINEAR ACCELERATOR VAULT 100
TYPE C LINEAR SAD 500 CFM
PROVIDE DUCT COLLAR TO CONNECT LINEAR SAD TO 18x14 SA DUCT
18x14 SA WITH 1" A.L. & VOL. DAMPER
18x18 SA
24x18 SA
AHU-1
24x18 MERV 14 FILTER HOUSING
+/-28"x24" DEEP PLENUM BOX WITH 1" A.L. OVER RAG. DIMENSIONS TO BE ADJUSTED TO FIT FIELD CONDITIONS
TYPE B RAG 36x18 1,950 CFM
NEW TYPE E 30"x8" SUPPLY AIR GRILLE OVER DOOR, 600 CFM. SEE ARCHITECTURAL ELEVATION
AFTER REMOVING EXISTING SAD & ITS ASSOCIATED BRANCH DUCT BACK TO THE SA MAIN, PROVIDE NEW SAD WITH 12x10 BRANCH DUCT CONNECT TO EX. SUPPLY AIR MAIN. ADJUST TO 300 CFM. DIMENSIONS OF BRANCH DUCT TO BE ADJUSTED TO ACCOMODATE FIELD CONDITIONS
28x24 RA PLENUM
32x10x12 PLENUM BOX BEHIND NEW SAG. ADJUST DIMENSIONS TO ACCOMODATE FIELD CONDITIONS
EXISTING CONTROL ROOM 101
15x17 SA W/ F.C.
30x24RA W/F.C.
3/4" COND. DRAIN WITH P-TRAP
AC-1
CP-1
18x8
EXTEND & CONNECT TO EX. SA DUCT
12x10
TYPE A SAD 12"NK 300 CFM
CONDUITS WILL BE INSTALLED ABOVE AIR-CONDITIONING UNIT, AC-1. MC SHALL COORDINATE INSTALLATION OF CONDUITS WITH EC (SEE DRAWING E103)
ROUTE 1/2" CONDENSATE PUMPED DISCHARGE PIPE TO EXISTING DRAIN PIPE AT SINK. MAKE INDIRECT CONNECTION WITH P-TRAP. COORDINATE CONNECTION WITH PLUMBING CONTRACTOR
AFTER REMOVING EXISTING SAG & ITS ASSOCIATED BRANCH DUCT BACK TO THE SA MAIN, PROVIDE NEW SAG WITH 18x8 BRANCH DUCT CONNECT TO EX. SUPPLY AIR MAIN. ADJUST TO 300 CFM. DIMENSIONS OF BRANCH DUCT TO BE ADJUSTED TO ACCOMODATE FIELD CONDITIONS
MOUNT CONDENSATE PUMP ON WALL ABOVE CEILING. CONNECT CONDENSATE PUMP HIGH LEVEL SWITCH TO DE-ENERGIZE AC-1 WHEN ACTIVATED
MC TO WRAP NEW VAULT SUPPLY AIR DUCT WITH 1/8" THICK FOIL FROM VAULT DOOR TO A MIN. OF 4 FEET INTO THE CONTROL ROOM. PROVIDE SUFFICIENT SUPPORTS TO ACCOUNT FOR WEIGHT OF LEAD FOIL IN ADDITION TO DUCTWORK. PROVIDE SHOP DRAWING SHOWING PROPOSED INSTALLATION OF LEAD FOIL SHIELDING FOR REVIEW AND COMMENT BY THE DESIGN TEAM.
EXISTING CORRIDOR 102

1 PARTIAL SECOND FLOOR PLAN – PROPOSED HVAC NEW WORK PLAN
1/2" = 1'-0"

M.E.P. ENGINEER
SJM Associates Consulting Engineers
58 Brookside Drive
West Shokan, New York 12494
Ph. (845) 657-2072 Fax (845) 657-2073

optimus ARCHITECTURE
187 E. Market Street
Suite 180
Rhinebeck NY 12572
845 876 8202 phone
845 876 8112 fax

SCALE	DATE	DRAWN BY:	CHKED. BY:
AS NOTED	12/03/20	SJM	SJM

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PROJECT — PROJECT #: 2023
Linear Accelerator Replacement for:
VASSAR BROTHERS MEDICAL CENTER
45 READE PLACE
POUGHKEEPSIE, NEW YORK 12601

DRAWING TITLE
PARTIAL SECOND FLOOR PLAN – HVAC REMOVALS & NEW LINAC VAULT HVAC PLAN

DRAWING NUMBER:
M100

LINAC CHILLED WATER NOTES

PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO FURNISH AND INSTALL SERVICES AND CONNECTIONS TO ALL OWNER PROVIDED EQUIPMENT (INCLUDING, BUT NOT LIMITED TO, LINAC, LINAC CHILLER ALONG WITH ASSOCIATED EQUIPMENT AND SYSTEMS): ALL EQUIPMENT, DEVICES, SUPPORTS, PIPNG, VALVES, AUTOMATIC AIR VENTS (WITH SHUTOFF VALVE), DRAIN VALVES, FITTINGS, FILTERS, PRESSURE GAUGES, THERMOMETERS, FLOW METERS, ADAPTERS, INSTALLATION OF PIPING AND HOSES SUPPLIED BY THE LINAC MANUFACTURER, CONNECTIONS, ETC REQUIRED BY LINAC MANUFACTURER TO BE PROVIDED BY THE MECHANICAL CONTRACTOR ARE TO BE FURNISHED AND INSTALLED AS PART OF THIS CONTRACT. IT IS A REQUIREMENT OF THE BIDDING AND CONSTRUCTION DOCUMENTS THAT CONTRACTORS REQUEST & OBTAIN ALL AVAILABLE INSTALLATION DOCUMENTS FOR THE LINAC AND OTHER OWNER PROVIDED EQUIPMENT. THE CONTRACTOR SHALL REVIEW MANUFACTURER'S INSTALLATION DOCUMENTS (INCLUDING, BUT NOT LIMITED TO, PRODUCT PLANNING GUIDE, DRAWINGS, DETAILS, SITE PREPARATION MANUAL, INSTALLATION REQUIREMENTS, ETC.) AND PROVIDE ALL REQUIRED MECHANICAL WORK DESCRIBED OR REQUIRED FOR COMPLETE AND FUNCTIONAL INSTALLATIONS IN ACCORDANCE WITH THE EQUIPMENT MANUFACTURERS RECOMMENDATIONS AND REQUIREMENTS.

A. DOCUMENTS (MEP DRAWINGS, PRODUCT PLANNING GUIDE, MANUFACTURERS INSTALLATION INSTRUCTIONS, ETC) ARE COMPLIMENTARY TO EACH OTHER AND APPLICABLE INSTALLATION REQUIREMENTS OF ALL DOCUMENTS ARE TO BE INCLUDED AS PART OF THE CONTRACT REQUIREMENTS AND BID PRICE.

B. PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO RECEIVE, SET CHILLER AND RIG AND INSTALL LINAC CHILLER TO ITS LOCATION ON THE ROOF.

C. PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO RECEIVE, MOUNT AND INSTALL LINAC CHILLED WATER AUTOMATIC BYPASS PANEL IN THE 1ST FLOOR MECHANICAL EQUIPMENT ROOM.

D. FURNISH AND INSTALL CHILLED WATER SUPPLY AND RETURN PIPING, VALVES, FLEXIBLE CONNECTIONS, STRAINERS, DRAINS, VENTS, GUAGES, THERMOMETERS, ETC REQUIRED BY VARIAN FOR THE LINAC CHILLED WATER SYSTEM. PROVIDE ALL LABOR, MATERIALS, EQUIPMENT AND WORK DESCRIBED AND/OR SHOWN IN THE MECHANICAL DRAWINGS, VARIAN DOCUMENTS, AND IN ACCORDANCE WITH THE CHILLER MANUFACTURER'S REQUIREMENTS REQUIRED TO BE PROVIDED BY THE MECHANICAL CONTRACTOR.

E. ALL CHILLED WATER PIPING MUST BE INSULATED AND PROVIDED WITH PIPE LABELS AND FLOW DIRECTION ARROWS.

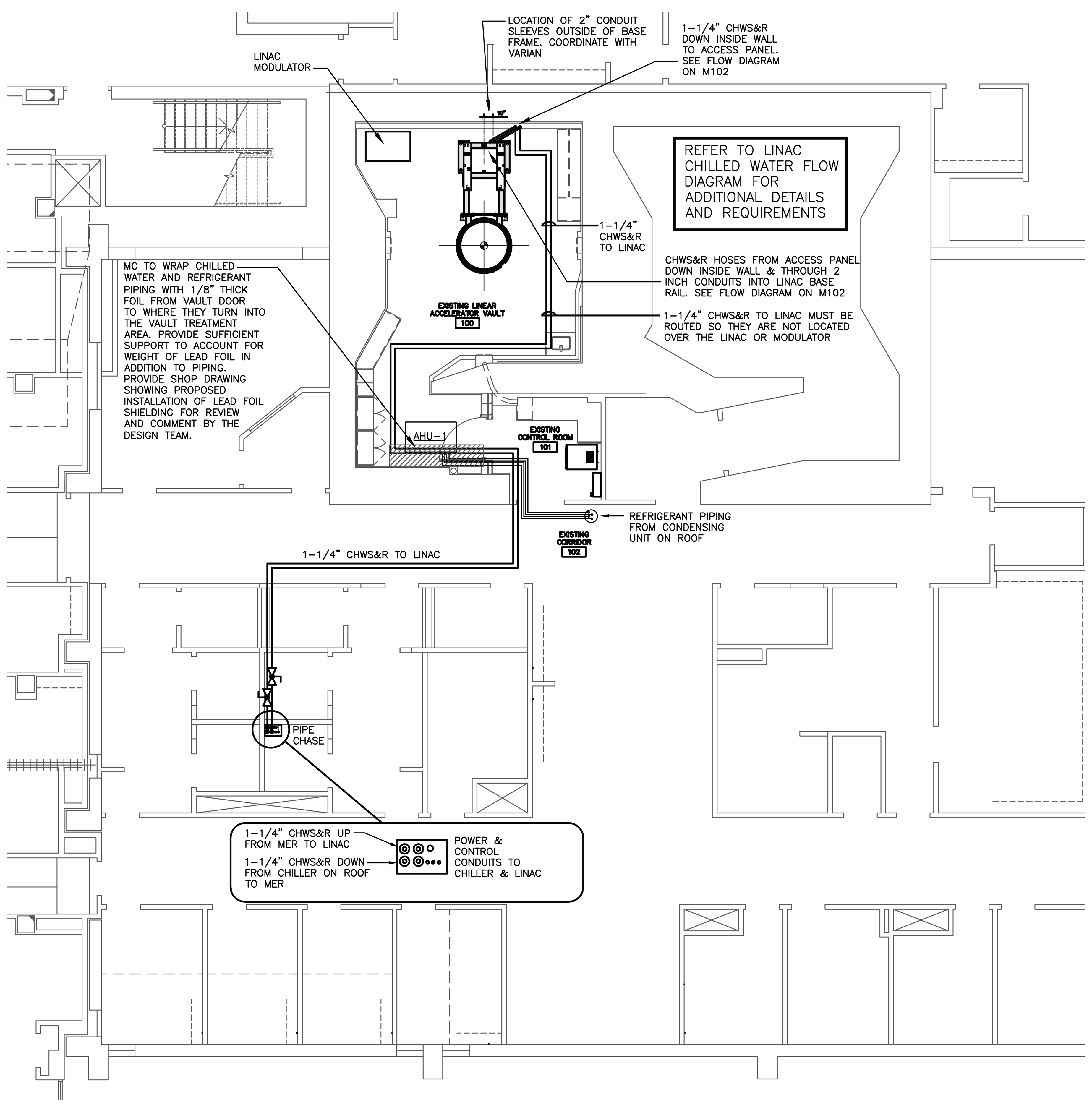
F. FURNISH AND INSTALL UP TO 95 GALLONS OF DEMINERILIZED WATER (TAP WATER IS NOT PERMITTED) AND SUFFICIENT PROPYLENE GLYCOL TO TO FILL MRI CHILLED WATER SYSTEM WITH A 50% PG/WATER SOLUTION. CONFIRM THAT WATER QUALITY IS IN ACCORDANCE WITH VARIAN'S REQUIREMENTS (REFER TO VARIAN PRODUCT PLANNING GUIDE FOR WATER CHEMISTRY REQUIREMENTS).

G. PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO FILL CHILLED WATER CIRCUITS WITH ANTI-FREEZE SOLUTION.

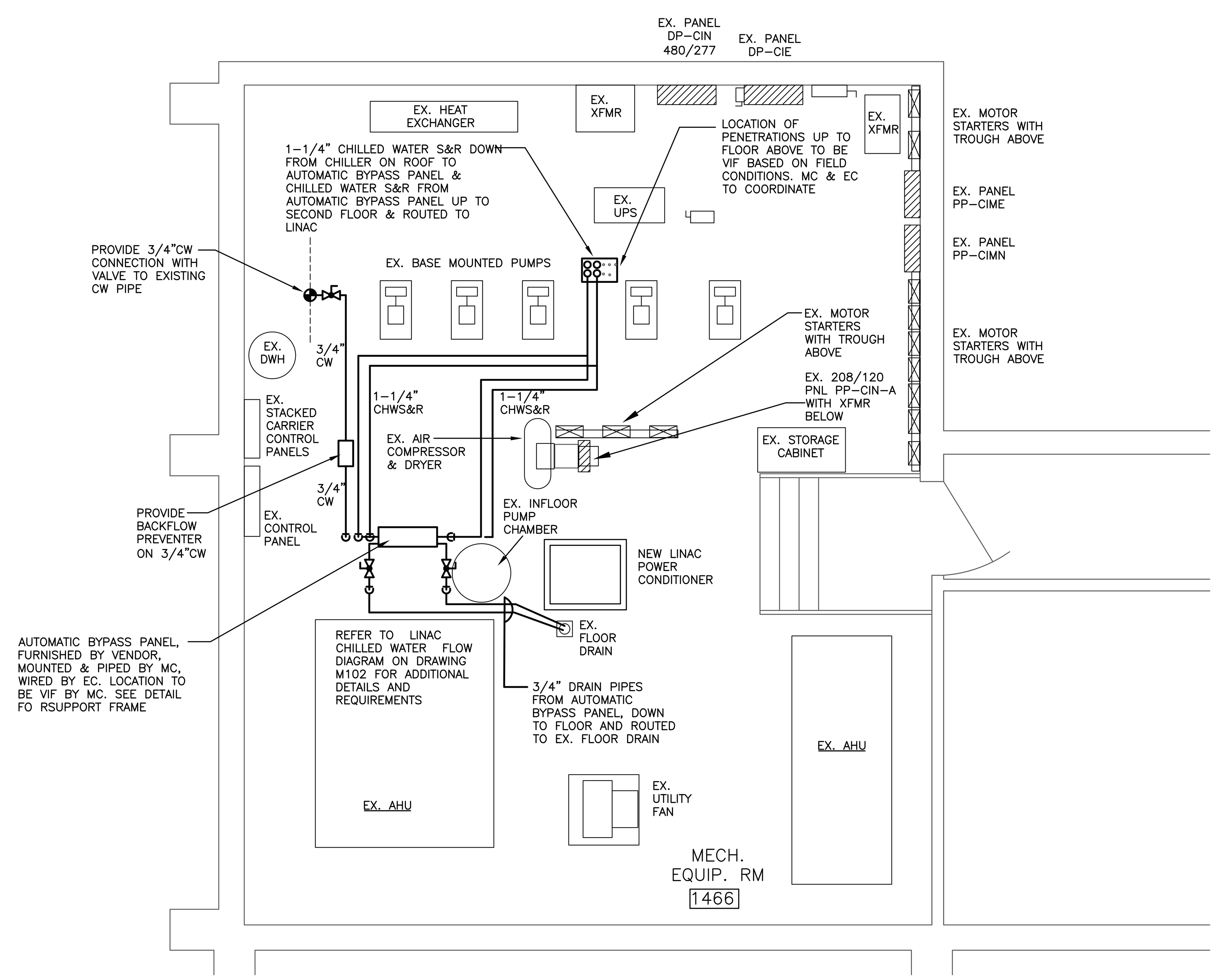
LINEAR ACCELERATOR EQUIPMENT INSTALLATION NOTES

PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO FURNISH AND INSTALL MECHANICAL WORK REQUIRED FOR THE LINEAR ACCELERATOR. THIS INCLUDES, BUT IS NOT LIMITED TO RECEIVING, RIGGING AND INSTALLING THE LINEAR ACCELERATOR CHILLER ON THE ROOF, FURNISHING AND INSTALLING CHILLED WATER PIPING, ALONG WITH REQUIRED ACCESSORIES, FROM THE CHILLER DOWN TO THE AUTOMATIC BYPASS PANEL, RECEIVING, MOUNTING AND PIPING THE AUTOMATIC BYPASS PANEL, RUNNNG CHILLED WATER PIPING FROM TH EAUTOMATIC BYPASS PANEL INTO THE LINEAR ACCELERATOR VAULT AS SHOWN IN THE DRAWINGS AND AS REQUIRED BY THE VARIAN PRODUCT PLANNING GUIDE.

IT IS A REQUIREMENT OF THE BIDDING AND CONSTRUCTION DOCUMENTS THAT THE MECHANICAL CONTRACTOR REQUEST AND OBTAIN ALL AVAILABLE INSTALLATION DOCUMENTS FOR THE LINEAR ACCELERATOR SYSTEM, CHILLER, AUTOMATIC BYPASS PANEL AND ASSOCIATED PERIPHERAL EQUIPMENT. THE CONTRACTOR SHALL REVIEW MANUFACTURER'S INSTALLATION DOCUMENTS (INCLUDING, BUT NOT LIMITED TO, PRODUCT PLANNING GUIDE, DRAWINGS, DETAILS, INSTALLATION MANUAL, SITE PREPARATION CHECKLIST, INSTALLATION REQUIREMENTS, ETC.) AND PROVIDE ALL REQUIRED MECHAICAL WORK AND MATERIALS DESCRIBED OR REQUIRED FOR A COMPLETE AND FUNCTIONAL INSTALLATION IN ACCORDANCE WITH THE EQUIPMENT MANUFACTURERS RECOMMENDATIONS AND REQUIREMENTS AS WELL AS APPLICABLE CODES, RULES AND REGULATIONS.



2 PARTIAL SECOND FLOOR PLAN – NEW LINAC CHILLED WATER PIPING PLAN
1/8" = 1'-0"



1 PARTIAL FIRST FLOOR PLAN – MECHANICAL ROOM HVAC PLAN
1/4" = 1'-0"

M.E.P. ENGINEER
SJM Associates Consulting Engineers
58 Brookside Drive
West Shokan, New York 12494
Ph. (845) 657-2072 Fax (845) 657-2073

187 E. Market Street
Suite 180
Rhinebeck NY 12572
845 876 8202 phone
845 876 8112 fax
optimus
ARCHITECTURE

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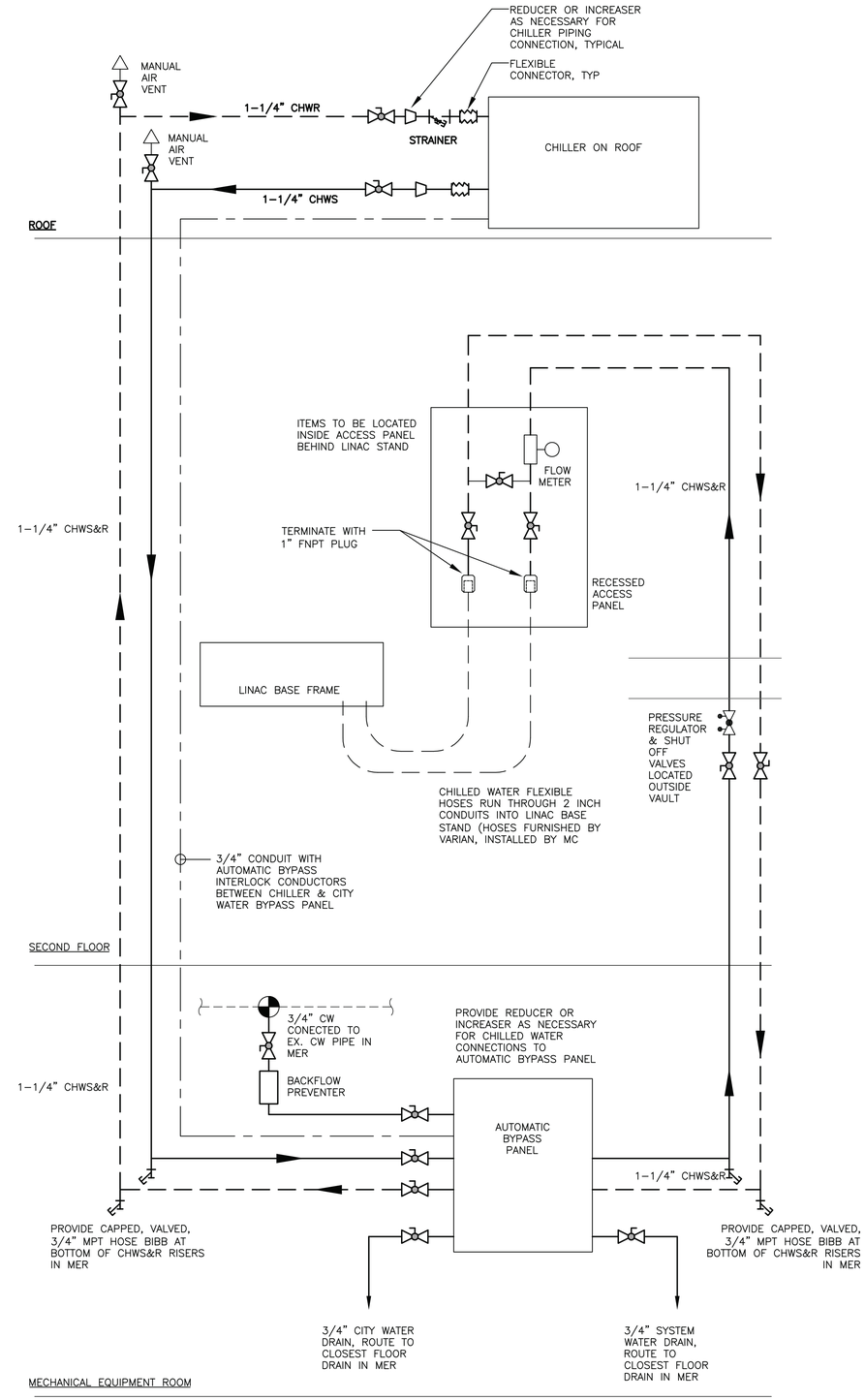
PROJECT #: 2023

PROJECT
Linear Accelerator Replacement for:
VASSAR BROTHERS MEDICAL CENTER
45 READE PLACE
POUGHKEEPSIE, NEW YORK 12601

DRAWING TITLE
PARTIAL SECOND FLOOR PLAN – NEW LINAC CHILLED WATER PIPING & FIRST FLOOR MER RM

DRAWING NUMBER:
M101



2 LINAC CHILLED WATER FLOW DIAGRAM
NOT TO SCALE

RIGGING OF EQUIPMENT

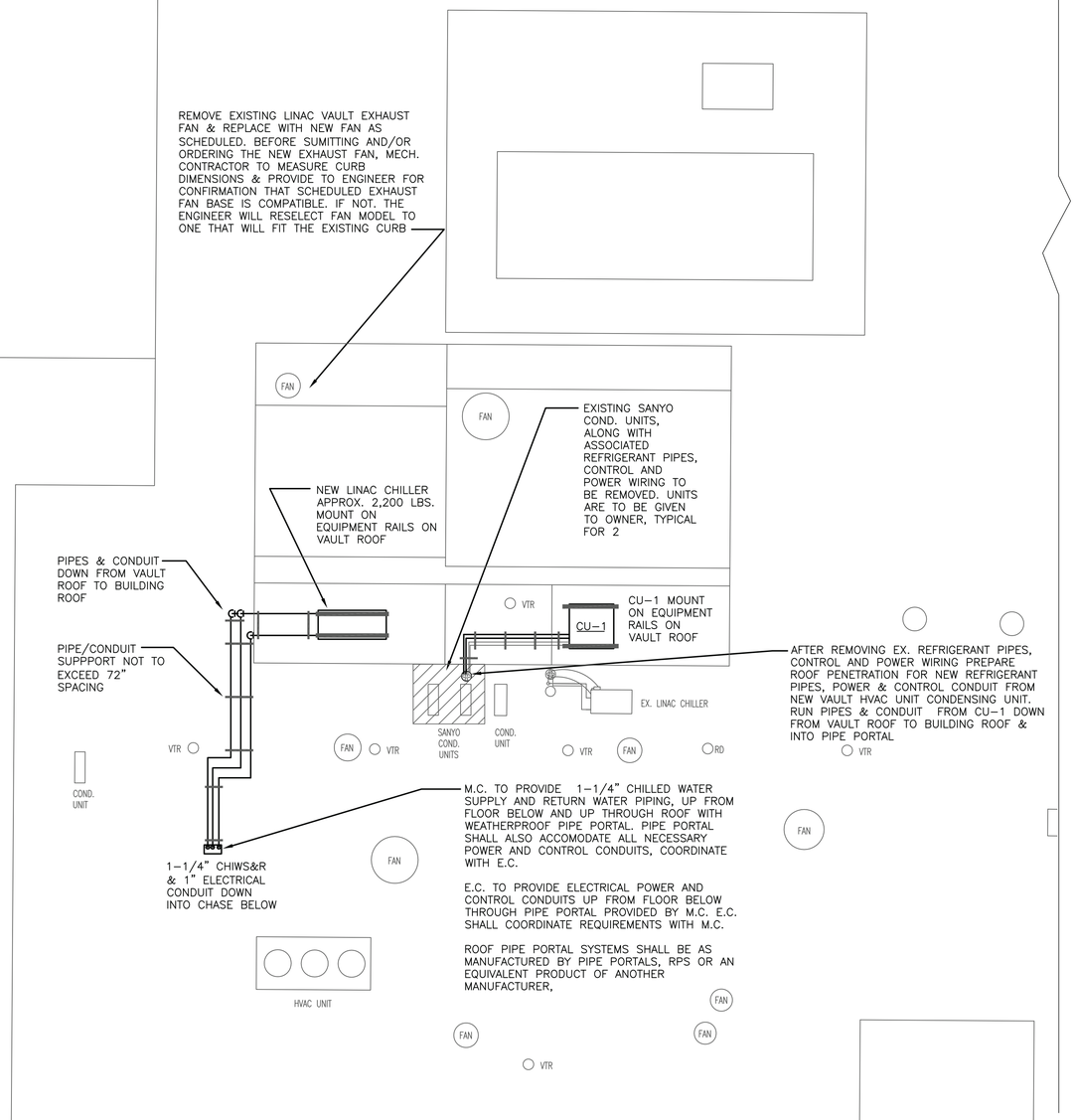
A. THE NEW CHILLER FOR THE LINAC IS PURCHASED BY THE OWNER AND WILL BE DELIVERED TO VBMC. THE MECHANICAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL LABOR, MATERIALS AND EQUIPMENT, REQUIRED FOR RECEIVING, MOVING, RIGGING, LIFTING AND SETTING THE CHILLER FROM THE TRUCK UP ONTO THE ROOF AND MOUNTING ON THE EQUIPMENT RAILS PROVIDED BY THE MECHANICAL CONTRACTOR.

B. PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT, REQUIRED FOR REMOVING, RIGGING, LIFTING AND DISPOSING OF THE EXISTING LINAC CHILLER OFF SITE.

C. ADDITIONALLY PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT, REQUIRED FOR MOVING, RIGGING, LIFTING AND SETTING ALL EQUIPMENT PROVIDED UNDER THIS CONTRACT, INCLUDING, BUT NOT LIMITED TO ROOF MOUNTED CONDENSING UNIT AND EXHAUST FAN.

D. THIS WORK SHALL BE PERFORMED IN SUCH A MANNER THAT IT DOES NOT DISTURB EXISTING TRAFFIC PATTERNS AROUND THE HOSPITAL AND DOES NOT CREATE A HAZARD FOR PATIENTS, VISITORS, STAFF OR ANYONE ELSE. DEPENDING UPON DELIVERY AND PROJECT SCHEDULE, REMOVING THE UNIT FROM THE DELIVERY TRUCK AND SETTING ON THE GROUND (IN A LOCATION APPROVED BY THE OWNER) AND THEN LIFTING THE CHILLER TO ROOF MAY BE NECESSARY AND MAY REQUIRE SEPARATE LIFTS ON DIFFERENT DAYS.

E. SCHEDULING, AND SETUP, OF RIGGING AND MOVING EQUIPMENT SHALL BE APPROVED BY THE OWNER BEFORE PROCEEDING WITH THE WORK.



1 PARTIAL ROOF PLAN – PROPOSED HVAC WORK
1/8" = 1'-0"

M.E.P. ENGINEER
SJM Associates Consulting Engineers
58 Brookside Drive
West Shokan, New York 12494
Ph. (845) 657-2072 Fax (845) 657-2073

187 E. Market Street
Suite 180
Rhinebeck NY 12572
845 876 8202 phone
845 876 8112 fax

optimus ARCHITECTURE

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SJM	SJM

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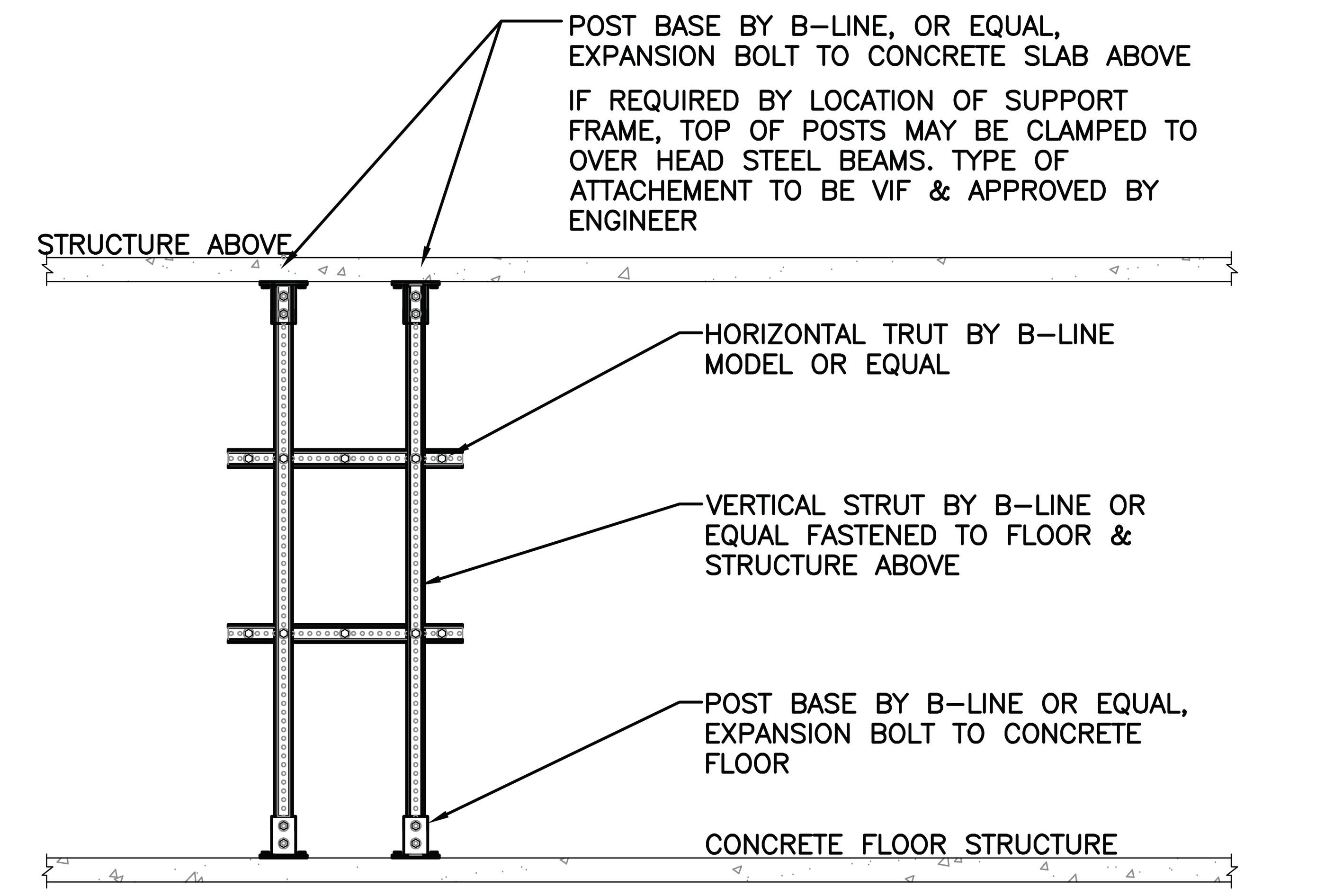
SCALE AS NOTED
DATE 12/03/20

PROJECT #: 2023

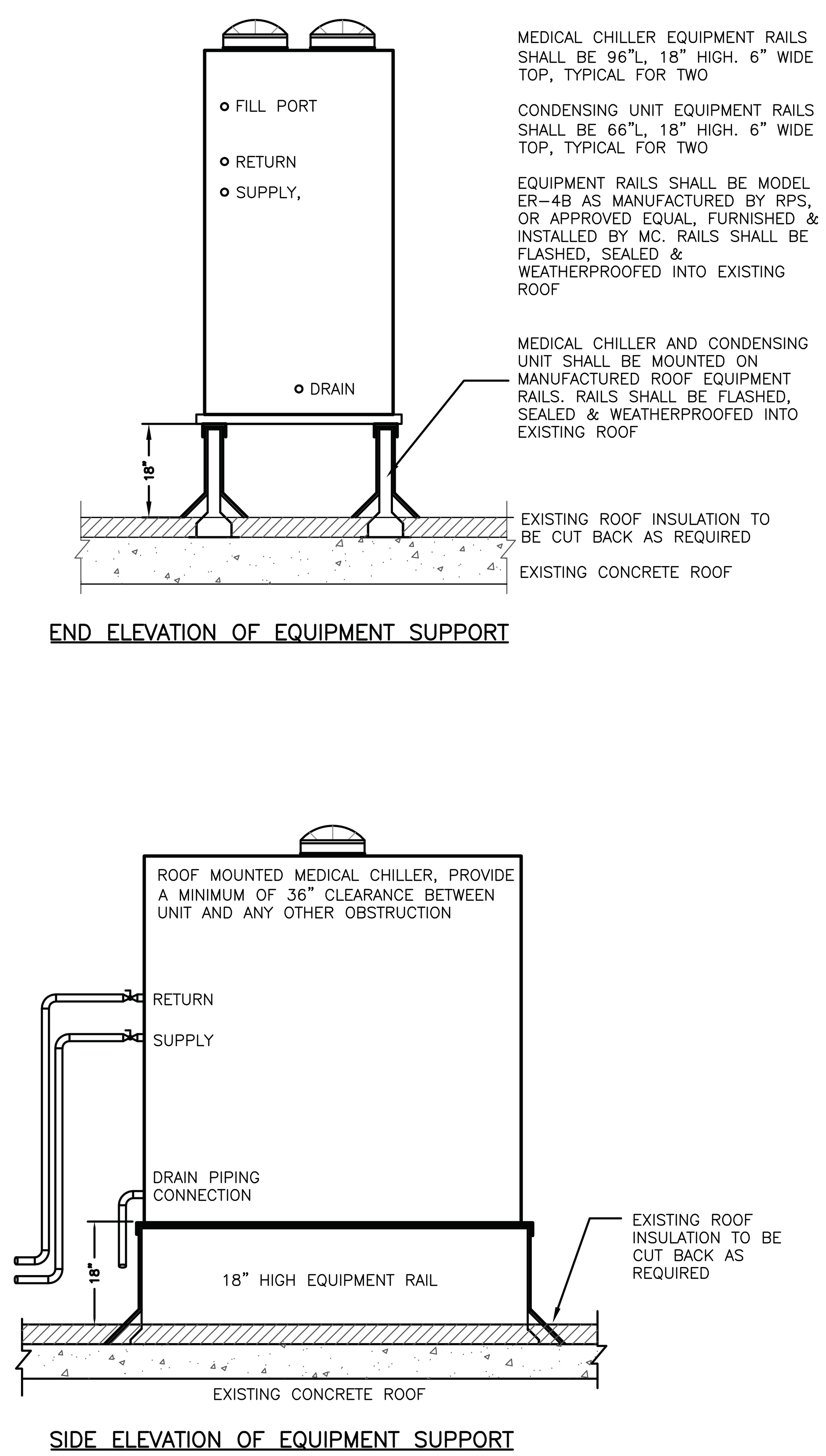
PROJECT
Linear Accelerator Replacement for:
VASSAR BROTHERS MEDICAL CENTER
45 READE PLACE
POUGHKEEPSIE, NEW YORK 12601

DRAWING TITLE
PARTIAL HVAC ROOF PLAN & LINAC
CHILLED WATER FLOW DIAGRAM

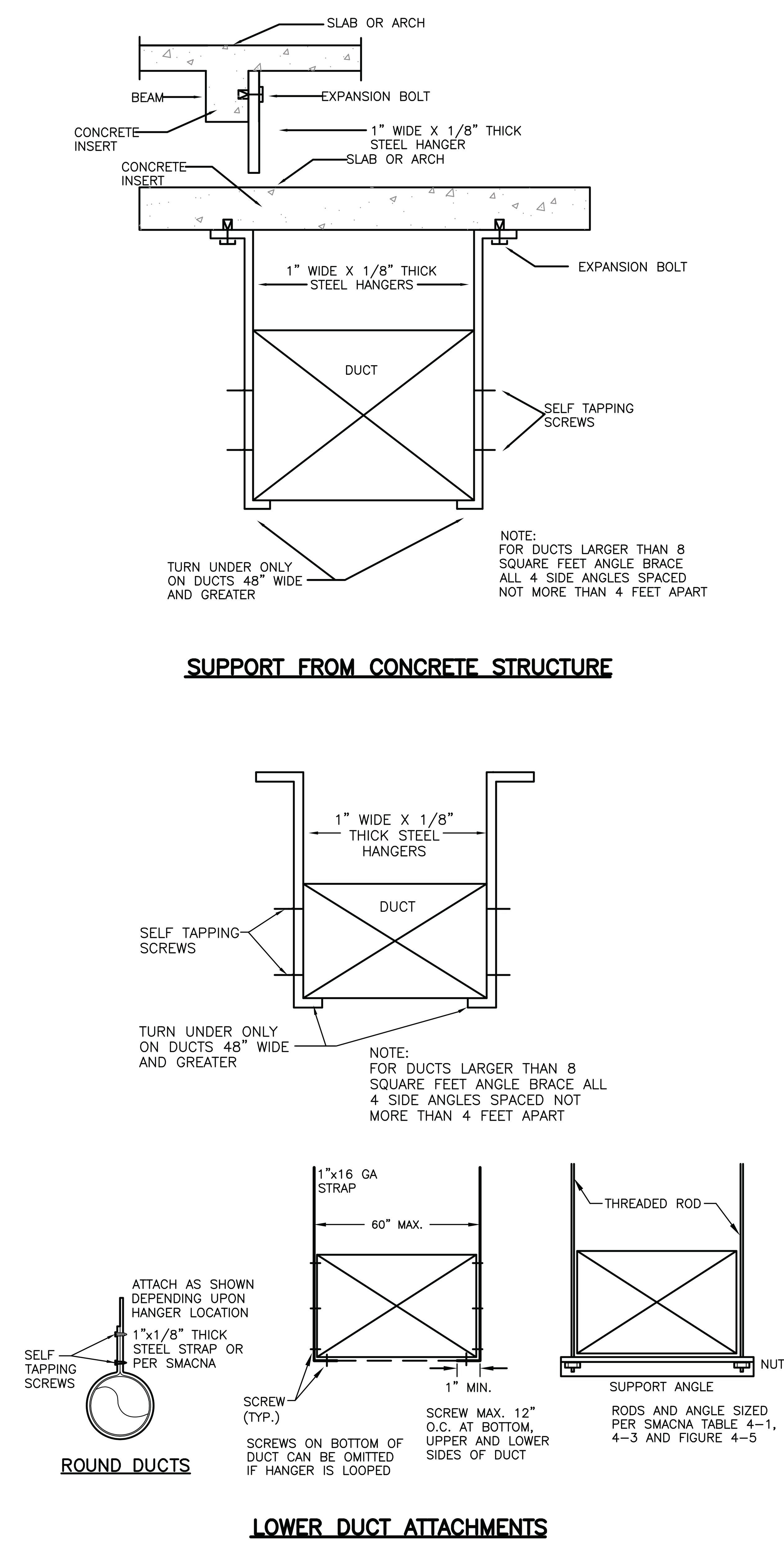
DRAWING NUMBER:
M102



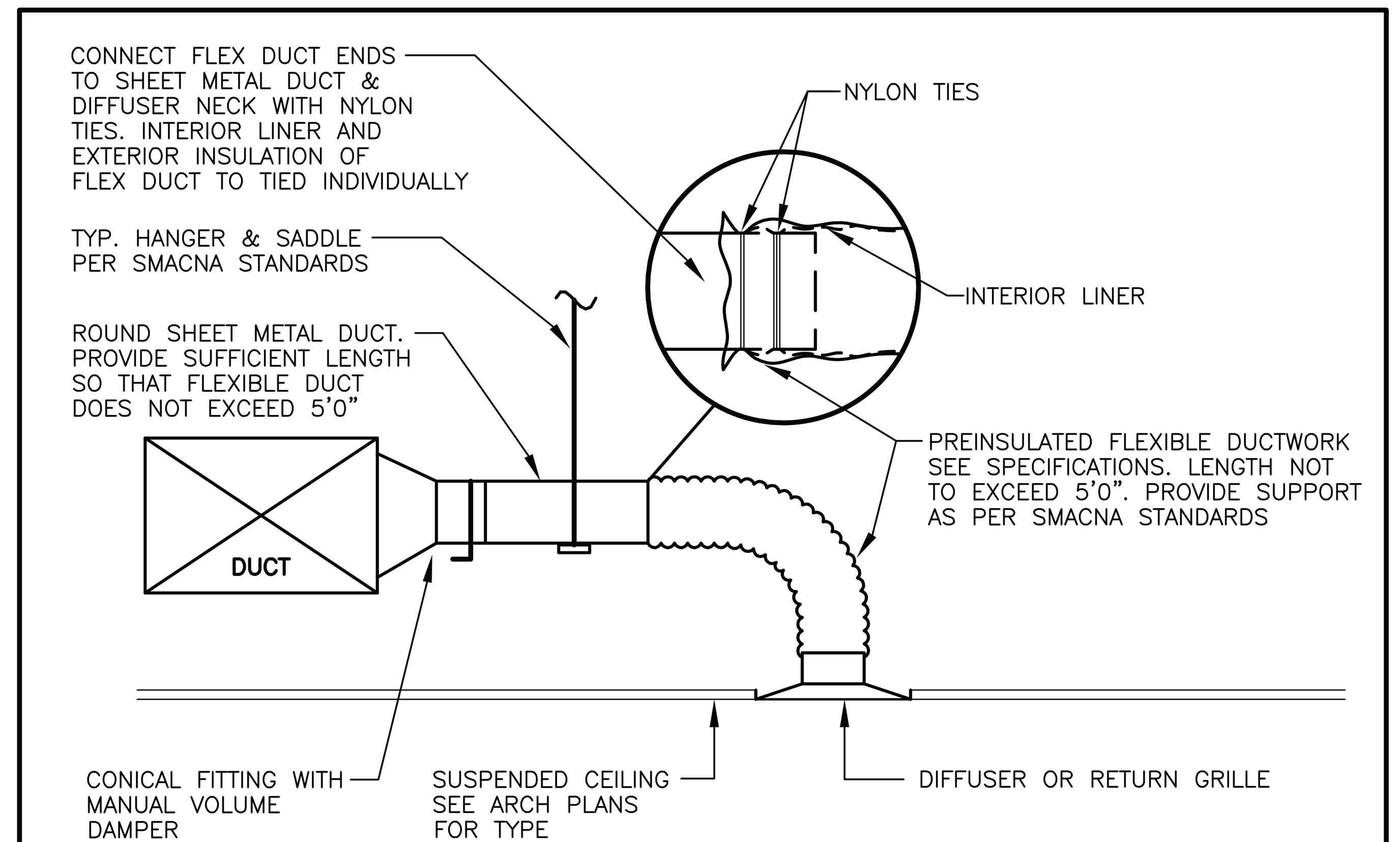
6 SUPPORT FRAME FOR AUTOMATIC BYPASS PANEL
NOT TO SCALE



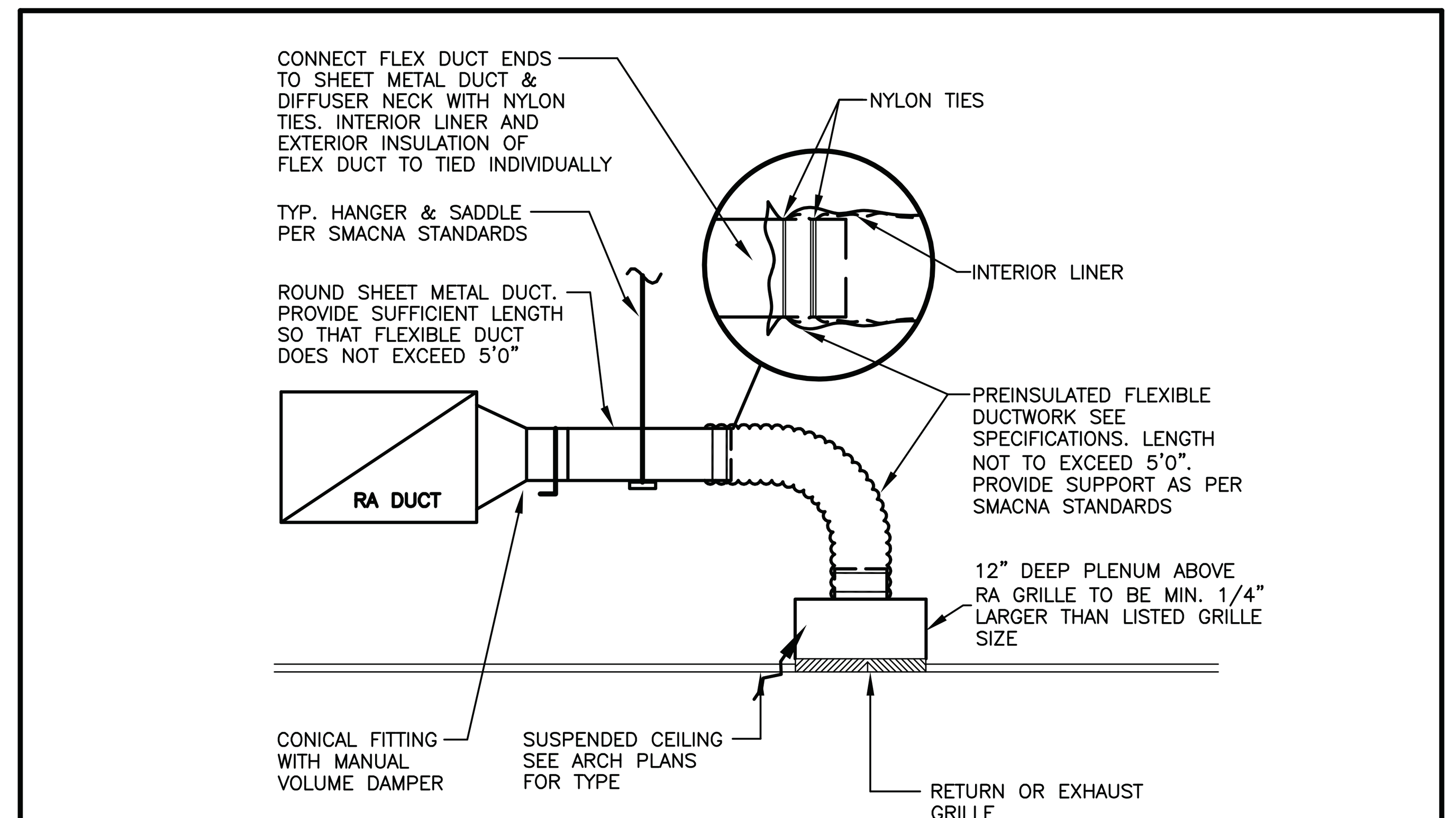
5 MEDICAL CHILLER AND CONDENSING UNIT SUPPORT DETAIL
SCALE: N.T.S.



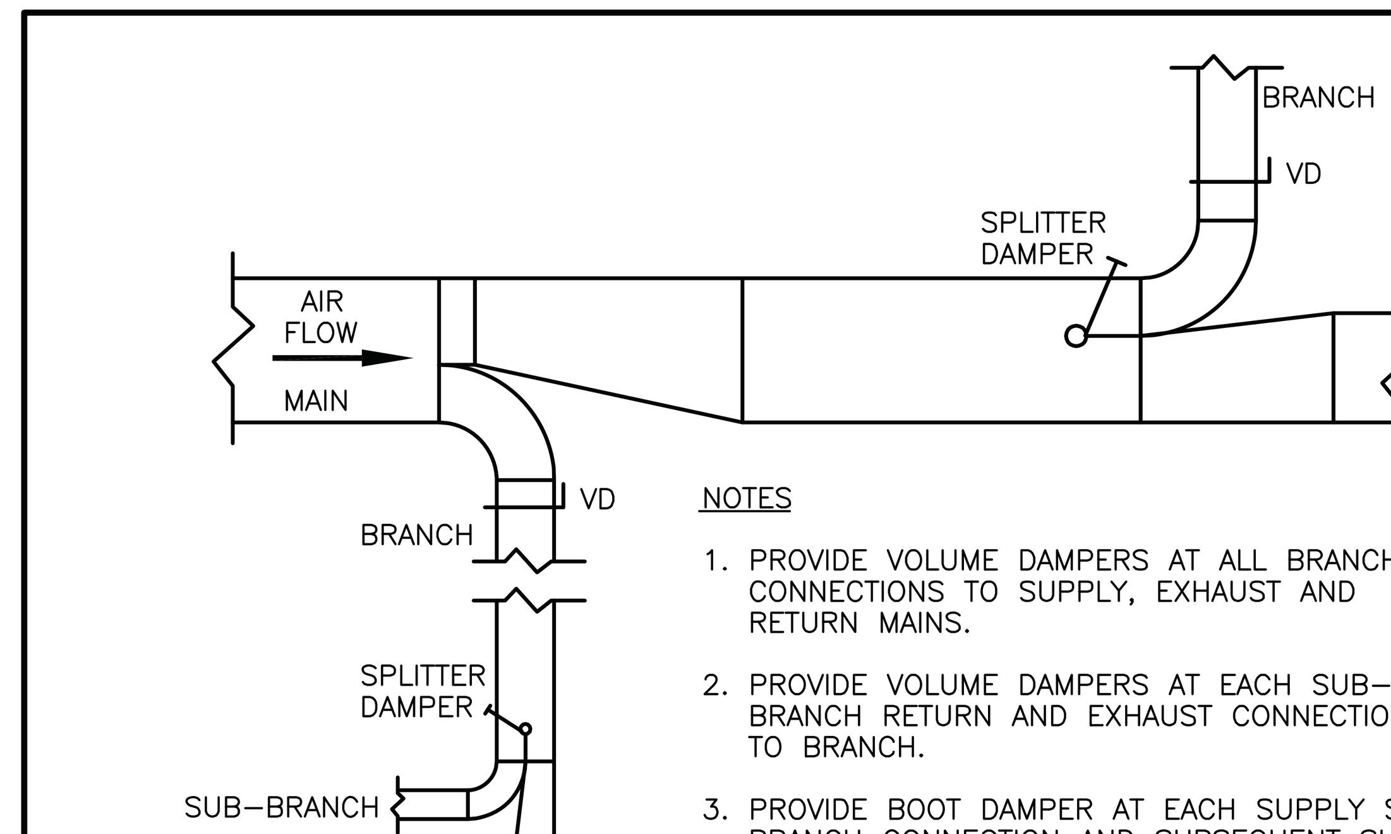
4 DUCT HANGING DETAILS
SCALE: N.T.S.



3 TYPICAL FLEXIBLE DUCT TAKE–OFF
SCALE: N.T.S.



2 TYPICAL FLEXIBLE RA / EXH. DUCT TAKE–OFF
NOT TO SCALE



NOTES

1. PROVIDE VOLUME DAMPERS AT ALL BRANCH CONNECTIONS TO SUPPLY, EXHAUST AND RETURN MAINS.
2. PROVIDE VOLUME DAMPERS AT EACH SUB–BRANCH RETURN AND EXHAUST CONNECTION TO BRANCH.
3. PROVIDE BOOT DAMPER AT EACH SUPPLY SUB–BRANCH CONNECTION AND SUBSEQUENT SUB–BRANCH CONNECTIONS.

1 BRANCH AND SUB–BRANCH DUCT CONNECTIONS
SCALE: N.T.S.

M.E.P. ENGINEER
SJM Associates Consulting Engineers
58 Brookside Drive
West Shokan, New York 12494
Ph. (845) 657-2072 Fax (845) 657-2073

187 E. Market Street
Suite 180
Rhinebeck NY 12572
845 876 8202 phone
845 876 8112 fax
optimus ARCHITECTURE

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PROJECT PROJECT #: 2023
Linear Accelerator Replacement for:
VASSAR BROTHERS MEDICAL CENTER
45 READE PLACE
POUGHKEEPSIE, NEW YORK 12601

DRAWING TITLE
HVAC DETAILS

DRAWING NUMBER:
M200

LEGEND & SYMBOL LIST

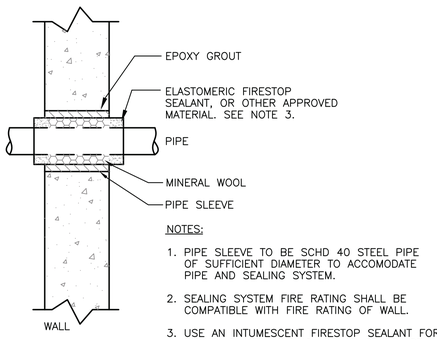
	SUPPLY AIR DUCT
	RETURN AIR DUCT
	ELBOW WITH TURNING VANES
	DUCT RADIUS ELBOW
	RETURN AIR DUCT DOWN
	SUPPLY AIR DUCT DOWN
	BALANCING VALVE
	BUTTERFLY VALVE
	BALL VALVE
	CHECK VALVE
	GATE VALVE
	ELBOW DOWN
	TEE UP
	UNION
FAI	FRESH AIR INTAKE
TD	TRANSFER DUCT
SD	SPLITTER DAMPER
FD	FIRE DAMPER
AD	ACCESS DOOR
A.L.	ACOUSTIC DUCT LINING
SAD	SUPPLY AIR DIFFUSER
RAG	RETURN AIR GRILLE
EXH.	EXHAUST

	SUPPLY AIR DIFFUSER
	RETURN/EXHAUST GRILLE
6"ø	FLEX ABLE DUCT CONNECTION
VD	VOLUME DAMPER
FD	FIRE DAMPER
MD	RETURN/SUPPLY AIR GRILLE
	WALL LOUVER
	FLEXIBLE DUCT CONNECTION
T	THERMOSTAT

CHWS	CHILLED WATER SUPPLY
CHWR	CHILLED WATER RETURN
COND DRAIN	CONDENSATION DRAIN

MECHANICAL WORK GENERAL NOTES

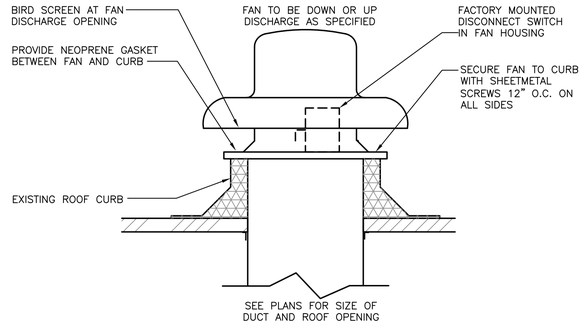
1. ALL OPENINGS THROUGH SOUND AND FIRE RATED WALLS, FLOORS AND CEILINGS FOR PIPING, WIRING, DUCTWORK, AND ASSOCIATED HANGING/MOUNTING HARDWARE MUST BE SEALED FIRE AND SMOKE TIGHT WITH FIRESTOPPING MATERIAL AND/OR SYSTEM MANUFACTURED BY HILTI.
2. FULLY COORDINATE ALL PIPE, DUCT, CONDUIT AND CONTROL WIRING RUNS AND INSTALLATIONS BEFORE FABRICATION AND INSTALLATION. NO EXTRA PAYMENTS WILL BE AUTHORIZED FOR REROUTING OR REMOVAL OF INSTALLED WORK DUE TO LACK OF COORDINATION WITH THE BUILDING STRUCTURE, WORK OF OTHER TRADES OR BUILDING COMPONENTS. DUCTWORK AND PIPING PLANS ARE TWO DIMENSIONAL AND ALL DUCTWORK AND PIPING RUNS DO NOT SHOW ALL NECESSARY CHANGES IN ELEVATION OR OFFSETS REQUIRED FOR A COMPLETE INSTALLATION. PROVIDE DUCT AND PIPE OFFSETS AS NECESSARY FOR INSTALLATION OF DUCT AND PIPE RUNS.
3. OFFSET EXPOSED PIPING, DRAINS, DUCTWORK AND WIRING AS REQUIRED SO THAT THEY DO NOT RUN ACROSS LIGHTS, SPEAKERS, FIRE ALARM COMPONENTS AND OTHER CEILING OR EXPOSED STRUCTURE MOUNTED DEVICES.
4. COORDINATE ELECTRICAL CHARACTERISTICS AND REQUIREMENTS OF ALL MECHANICAL EQUIPMENT WITH ELECTRICAL DRAWINGS AND PROVIDE EQUIPMENT WIRE AND DESIGN FOR THE VOLTAGES SHOWN THEREIN.
5. STARTERS, TRANSFORMERS, CONTROLS AND CONTROL WIRING REQUIRED FOR ALL MECHANICAL EQUIPMENT SHALL BE FURNISHED BY THE MECHANICAL CONTRACTOR.
6. ALL CONTROL WIRING SHALL BE INCLUDED AS PART OF THE MECHANICAL WORK.
7. ALL MECHANICAL EQUIPMENT REQUIRING ELECTRICAL POWER SHALL BE INSTALLED WITH DISCONNECT SWITCHES OR COMBINATION STARTERS AS REQUIRED, AT EACH PIECE OF EQUIPMENT. COORDINATE SWITCH TYPE (FUSED OR NON-FUSED) WITH EQUIPMENT CHARACTERISTICS AND ELECTRICAL DRAWINGS.
8. SUPPLY AND RETURN AIR DUCTWORK SHALL BE INSULATED. SEE SPECIFICATIONS FOR REQUIREMENTS.
9. EXHAUST AIR DUCTWORK SHALL NOT BE INSULATED, UNLESS NOTED OTHERWISE.
10. ALL DUCTWORK SHALL BE SUPPORTED FROM THE BUILDING STRUCTURE AND SHALL NOT REST ON CEILING TILES, OR CEILING STRUCTURE.
11. FLEXIBLE DUCTWORK SHALL BE FLEXMASTER TYPE 4, OR APPROVED EQUAL, SAME SIZE AS DIFFUSER NECKS. MAXIMUM LENGTH 5FT.
12. LOCATIONS OF GRILLES, REGISTERS, AND DIFFUSERS ARE APPROXIMATE. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR LOCATIONS.
13. ALL SQUARE DUCTWORK ELBOWS SHALL BE PROVIDED WITH DOUBLE DEFLECTION TURNING VANES.
14. PROVIDE FLEXIBLE SUPPLY AND RETURN DUCT CONNECTIONS AT EACH AIR HANDLER UNIT.
15. ALL DUCT DIMENSIONS ARE CLEAR, INSIDE DIMENSIONS



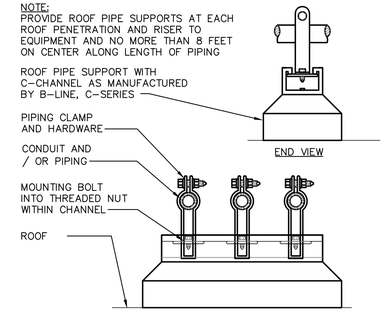
NOTES:

1. PIPE SLEEVE TO BE SCHD 40 STEEL PIPE OF SUFFICIENT DIAMETER TO ACCOMODATE PIPE AND SEALING SYSTEM.
2. SEALING SYSTEM FIRE RATING SHALL BE COMPATIBLE WITH FIRE RATING OF WALL.
3. USE AN INTUMESCENT FIRESTOP SEALANT FOR PIPING, PLASTIC PIPING, OR AS OTHERWISE SPECIFIED.

6 PIPE THROUGH FIRE RATED WALL
SCALE: N.T.S.



3 ROOF EXHAUST FAN DETAIL
NOT TO SCALE



5 ROOF PIPE SUPPORT
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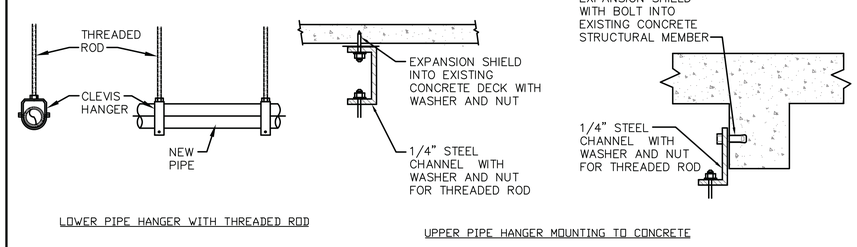

2 PIPE HANGING DETAILS
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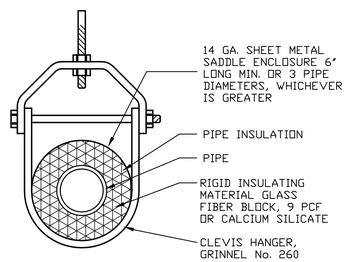
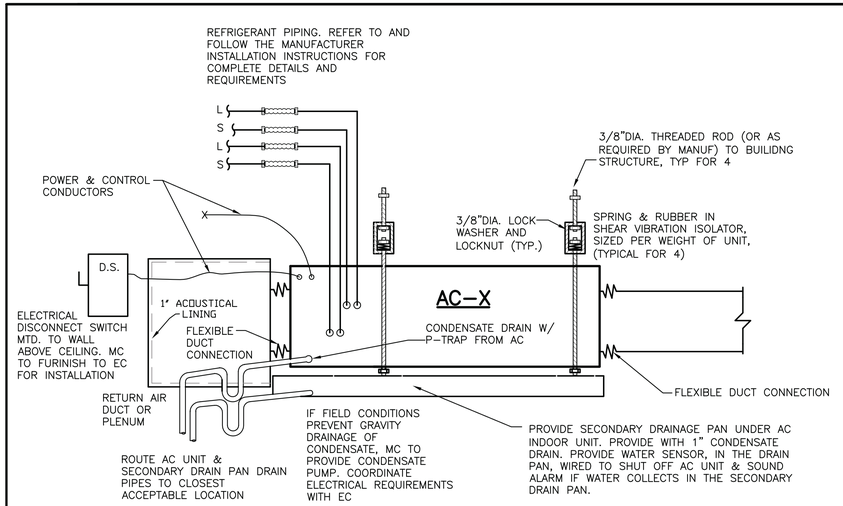


STEEL SADDLES FOR USE WITH COLD PIPING INSULATION

4 PIPE AND DUCT HANGING DETAILS
SCALE: N.T.S.



1 INDOOR HVAC UNIT DETAIL
SCALE: N.T.S.

M.E.P. ENGINEER
SJM Associates Consulting Engineers
58 Brookside Drive
West Shokan, New York 12494
Ph. (845) 657-2072 Fax (845) 657-2073

187 E. Market Street
Suite 180
Rhinebeck NY 12572
845 876 8202 phone
845 876 8112 fax

optimus ARCHITECTURE

SCALE	DATE	DRAWN BY:	CHKED. BY:
AS NOTED	12/03/20	SJM	SJM

#	DATE	REVISIONS
	12/03/20	ISSUED FOR BID, PERMIT AND CONSTRUCTION

PROJECT #: 2023

PROJECT
Linear Accelerator Replacement for:
VASSAR BROTHERS MEDICAL CENTER
45 READE PLACE
POUGHKEEPSIE, NEW YORK 12601

DRAWING TITLE
HVAC DETAILS, NOTES AND LEGEND

DRAWING NUMBER:

M201

DIFFUSER & REGISTER SCHEDULE

DESIG.	MANUF.	MODEL	TYPE	DUTY	FLOW PATTERN	SIZE	NECK	DAMPER	FINISH	MAT'L	REMARKS
A	TITUS	PMC	PERFORATED FACE	SUPPLY	ADJUSTABLE	24"x24"	SEE DWG	NO	NOTE 10	STEEL	NOTES 1, 2
B	TITUS	355FL	RCT GRILLE	RTN/EXH	N/A	SEE DWG'S	NONE	NO	NOTE 10	ALUMINUM	NOTES 1, 2, 3, 4, 5, 8
C	TITUS	LL1-11-3/4"	LINEAR DIFFUSER	SUPPLY	ONE WAY	4 FEET	SEE DWG	NO	NOTE 10	ALUMINUM	NOTES 1, 2, 3, 6, 7
D	TITUS	LL1-11-3/4"	LINEAR DIFFUSER	SUPPLY	ONE WAY	12 FEET	SEE DWG	NO	NOTE 10	ALUMINUM	NOTES 1, 2, 3, 6, 7
E	TITUS	271FS	RCT GRILLE	SUPPLY	N/A	SEE DWG'S	NONE	NO	NOTE 10	ALUMINUM	NOTES 1, 2, 9

NOTES:

1. SEE DRAWINGS FOR SIZES
2. PROVIDE DAMPER IN BRANCH DUCT TO DIFFUSER
3. PROVIDE T-BAR CEILING MARGIN
4. PROVIDE RECTANGULAR TO ROUND ADAPTER AS REQUIRED FOR CONNECTION OF DUCT
5. PROVIDE DAMPER IN EXHAUST BRANCH DUCTWORK
6. PROVIDE PLENUM SIZED PER DRAWING WITH ACOUSTICAL LINING
7. PROVIDE WITH ALL NECESSARY MOUNTING AND SUPPORT ACCESSORIES REQUIRED FOR INSTALLATION IN A LAY-IN CEILING. BORDERS SHALL HAVE MITERED CORNERS, PROVIDE TRIM AS REQUIRED FOR MULTIPLE SECTIONS
8. FLEXIBLE DUCT CONNECTION
9. PROVIDE WITH ALL NECESSARY MOUNTING AND SUPPORT ACCESSORIES REQUIRED FOR INSTALLATION IN A SHEETROCK WALL
10. COLOR TO BE SELECTED ON SUBMITTAL

EXHAUST FAN SCHEDULE

UNIT #	AREA SERVED	MANUF.	MOUNTING	MODEL No.	CFM	EXTERNAL S.P.	SONES	ELEC. VOLT.	MOTOR	DRIVE	LBS.	REMARKS
EF-1	LINAC VAULT	GREENHECK	ROOF	C-103-VG	800	0.75"	7.4	120	1/2 HP	DIRECT	55	

EXHAUST FAN NOTES:

PROVIDE EXHAUST FANS WITH INDICATED ACCESSORIES:

1. MANUAL MOTOR STARTER
2. GRAVITY BACKDRAFT DAMPER (LOW LEAKAGE TIGHT CLOSING)
3. ECM MOTOR WITH INTEGRAL SPEED CONTROL
4. ELECTRICAL DISCONNECT SWITCH
5. FLEX CONNECTION FROM FAN TO DUCT
6. SPRING & RUBBER VIBRATION ISOLATOR'S WITH HANGING RODS, AND MOUNTING HARDWARE

LINAC VAULT AC-1 SCHEDULE

PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT NECESSARY TO FURNISH AND INSTALL A COMPLETE AIR-CONDITIONING SYSTEM FOR THE LINAC TREATMENT VAULT, INCLUDING, BUT NOT LIMITED TO, INDOOR, ABOVE CEILING MOUNTED, EVAPORATOR, ROOF MOUNTED OUTDOOR CONDENSING UNIT, ALL INTERCONNECTING REFRIGERANT PIPING, CONDENSATE DRAIN PIPING, CONTROLS, CONTROL WIRING, POWER WIRING, NECESSARY SUPPORTS AND ACCESSORIES, ETC. THE WORK SHALL PROVIDE A FULLY FUNCTIONING AIR-CONDITIONING SYSTEM.

AC-1 SHALL BE ABOVE-AIR TECHNOLOGIES "PRECISION COOL" MODEL HK WITH A ROOF MOUNTED DUAL CIRCUIT CONDENSING UNIT, OR AN EQUIVALENT PRODUCT OF ANOTHER MANUFACTURER

NOMINAL SYSTEM COOLING CAPACITY: 6 TONS
COOLING CAPACITIESS AT 72F DB/60 F WB AT EVAPORATOR EAT:
TOTAL COOLING CAPACITY: 75.5 MBH
SENSIBLE COOLING CAPACITY: 67.0 MBH
AIRFLOW: 2,400 CFM
ESP: 1.25" WC

SYSTEM SHALL BE PROVIDED WITH THE FOLLOWING:

INDOOR UNIT

1. SAME SIDE SUPPLY AND RETURN AIR
2. ELECTRIC REHEAT (11 KW), SCR CONTROL
3. MC-2000 CONTROLLER WITH BACNET INTERFACE (CONFIRM WITH VBMC IT DEPT)
4. CONDENSATE PUMP
5. SMOKE DETECTOR
6. WATER LEAK DETECTOR
7. SPRING HANGING ISOLATORS
8. DISCONNECT SWITCH
9. MERV 8 FILTER WITH FILTER RACK
10. 460/3/60, 27.4A MCA

OUTDOOR UNIT

1. DUAL SCROLL COMPRESSORS, DUAL REFRIGERATION CIRCUIT CONDENSING UNIT (ROOF MOUNTED)
2. HOT GAS BYPASS ON EACH CIRCUIT
3. SUCTION LINE ACCUMULATORS
4. MINUS 20F LOW AMBIENT OPERATION
5. DISCONNECT SWITCH
6. 460/3/60, 17.4A MCA

INSTALLATION

A. GENERAL: INSTALL AIR-CONDITIONING SYSTEM IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS. INSTALL UNITS PLUMB AND LEVEL, FIRMLY ANCHORED IN LOCATIONS INDICATED, AND MAINTAIN MANUFACTURER'S RECOMMENDED CLEARANCES.

B. INSTALL INDOOR AND OUTDOOR UNIT IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, REQUIREMENTS AND RECOMMENDATIONS.

C. FURNISH AND INSTALL CONDENSATE DRAIN PIPING (INCLUDING CONDENSATE PUMP AND DISCHARGE PIPING) FROM INDOOR UNIT AS REQUIRED BY THE MANUFACTURER AND SHOWN ON THE DRAWINGS.

D. INSTALL ALL REFRIGERANT PIPING, INSULATION, AND RELATED ACCESSORIES, IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS. PURGE REFRIGERANT PIPING IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

E. PROTECT REFRIGERANT PIPING DURING CONSTRUCTION AGAINST ENTRANCE OF FOREIGN MATTER, DIRT AND MOISTURE; HAVE OPEN ENDS OF PIPING AND CONNECTIONS TO COMPRESSORS, CONDENSERS, EVAPORATORS AND OTHER EQUIPMENT TIGHTLY CAPPED UNTIL ASSEMBLY.

F. INSULATE REFRIGERANT PIPING IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. PROVIDE WEATHER RESISTANT JACKET TO ALL INSULATION EXPOSED TO OUTDOOR CONDITIONS.

G. INSTALL ALL ITEMS SHIPPED LOOSE BY THE MANUFACTURER FOR FIELD INSTALLATION.

H. PROVIDE R410A REFRIGERANT AS NECESSARY TO FULLY CHARGE SYSTEMS IN ACCORDANCE WITH MANUFACTURER'S REQUIREMENTS.

I. PROVIDE ALL REQUIRED CONTROL AND POWER WIRING REQUIRED TO FURNISH AND INSTALL A COMPLETELY FUNCTIONAL SYSTEM IN ACCORDANCE WITH THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.

J. ELECTRICAL: INSTALL AND CONNECT ELECTRICAL DEVICES SUPPLIED BY MANUFACTURER BUT NOT SPECIFIED TO BE FACTORY MOUNTED.

K. FURNISH COPY OF MANUFACTURER'S ELECTRICAL CONNECTION DIAGRAM SUBMITTAL TO ELECTRICAL CONTRACTOR.

L. FURNISH AND INSTALL POWER AND CONTROL CONDUITS AND CONDUCTORS ALONG WITH RELATED INTERCONNECTIONS IN ACCORDANCE WITH HVAC UNITS MANUFACTURER'S REQUIREMENTS AND RECOMMENDATIONS.

M. FIELD QUALITY CONTROL: START UP SYSTEM IN ACCORDANCE WITH MANUFACTURER'S START UP INSTRUCTIONS. TEST EQUIPEMNT AS WELL AS CONTROLS AND DEMONSTRATE COMPLIANCE WITH REQUIREMENTS.

M.E.P. ENGINEER

SJM Associates Consulting Engineers
58 Brookside Drive
West Shokan, New York 12494
Ph. (845) 657-2072 Fax (845) 657-2073

187 E. Market Street
Suite 180
Rhinebeck NY 12572
845 876 8202 phone
845 876 8112 fax

optimus ARCHITECTURE

DRAWN BY: SJM | CHKED. BY: SJM

#	DATE	REVISIONS
	12/03/20	ISSUED FOR BID, PERMIT AND CONSTRUCTION

SCALE AS NOTED

DATE 12/03/20

PROJECT # 2023

PROJECT
Linear Accelerator Replacement for:
VASSAR BROTHERS MEDICAL CENTER
45 READE PLACE
POUGHKEEPSIE, NEW YORK 12601

DRAWING TITLE
HVAC SCHEDULES

DRAWING NUMBER:

M202

MECHANICAL WORK SPECIFICATIONS

1. SCOPE OF WORK

THE INTENT OF THE DRAWINGS AND SPECIFICATIONS IS THAT THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, TOOLS, EQUIPMENT, AND TRANSPORTATION NECESSARY FOR THE PROPER EXECUTION OF THE WORK OF THIS PROJECT, IN ACCORDANCE WITH THE CONTRACT DOCUMENTS AND ALL INCIDENTAL WORK NECESSARY TO COMPLETE THE PROJECT IN AN ACCEPTABLE MANNER, READY FOR USE, OCCUPANCY OR OPERATION BY THE OWNER.

IN CASE OF CONFLICT BETWEEN THE DRAWINGS AND SPECIFICATIONS, THE SPECIFICATIONS SHALL GOVERN. FIGURE DIMENSIONS ON DRAWINGS SHALL GOVERN OVER SCALE DIMENSIONS AND DETAILED DRAWINGS SHALL GOVERN OVER GENERAL DRAWINGS.

ANY ADDITIONAL WORK OR COSTS INCURRED DUE TO DISCREPANCIES FOUND BETWEEN THE DRAWINGS AND SPECIFICATIONS AND SITE CONDITIONS OR ANY INCONSISTENCIES OR AMBIGUITIES, SHALL BE DONE AT THE CONTACTORS' RISK, UNLESS THE ENGINEER IS NOTIFIED IN WRITING.

2. CODES & STANDARDS

ALL WORK SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF FEDERAL, STATE AND LOCAL AGENCIES; PUBLIC UTILITY COMPANIES AND SHALL COMPLY WITH LOCAL CODES. WHERE A CONFLICT IN CODE REQUIREMENTS IS ENCOUNTERED, THE MOST STRINGENT SHALL APPLY. A SAMPLE OF THE MORE EXPLICIT CODES AND STANDARDS:

- UNDERWRITER'S LABORATORIES
- NATIONAL ELECTRICAL CODE, LATEST EDITION
- N.Y.S. ENERGY CONSERVATION CONSTRUCTION CODE (NYSECCC)
- NEW YORK STATE BUILDING CODE
- OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

3. PERMITS

THE CONTRACTOR SHALL OBTAIN AND PAY FOR ALL PERMITS REQUIRED FOR WORK OF THIS CONTRACT.

4. GUARANTEES

WRITTEN GUARANTEE: THE CONTRACTOR SHALL SUBMIT A WRITTEN GUARANTEE IN TRIPLICATE TO INCLUDE ALL SYSTEMS, MATERIALS, AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE BY THE OWNER.

GUARANTEE PERIOD: THE OPERATION OF THE EQUIPMENT BY THE OWNER DOES NOT CONSTITUTE AN ACCEPTANCE OF THE WORK. THE WORK WILL BE ACCEPTED ONLY AFTER THE CONTRACTOR HAS PROPERLY ADJUSTED HIS EQUIPMENT, DEMONSTRATED THAT IT FULFILLS THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS, OPERATED IT SATISFACTORILY FOR A SUFFICIENT PERIOD OF TIME, AND HAS FURNISHED ALL THE REQUIRED CERTIFICATES.

THE GUARANTEE PERIOD WILL BEGIN ON THE DATE THE CONTRACTOR RECEIVES WRITTEN NOTICE OF ACCEPTANCE BY THE OWNER AND/OR ENGINEER.

GUARANTEE RESPONSIBILITY: UPON NOTICE OF THE OWNER OF FAILURE OF ANY PART OF THE GUARANTEED EQUIPMENT OR SYSTEMS DURING THE GUARANTEE PERIOD, THE AFFECTED PART OR PARTS AND DAMAGES RESULTING THEREFROM SHALL BE REPLACED OR REPAIRED PROMPTLY BY AND AT THE EXPENSE OF THE CONTRACTOR AND AT THE CONVENIENCE OF THE OWNER.

5. WORK & MATERIALS

PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT AS USUALLY PROVIDED, AND AS REQUIRED FOR THE DELIVERY, THE ERECTION, THE PROPER WORKING, AND THE COMPLETE FINISH OF THE WORK OF THIS CONTRACT.

6. SUBMITTALS

PROVIDE SHOP DRAWINGS OF ALL SYSTEMS AND EQUIPMENT, UNLESS OTHERWISE SPECIFIED. THE TERM "SHOP DRAWINGS," AS USED HEREIN, SHALL MEAN ALL MANUFACTURER'S BROCHURES, CATALOG CUTS, WIRING DIAGRAMS, INSTALLATION MANUALS, SHOP FABRICATION DRAWINGS, OR ANY SUCH MATERIALS USED TO DESCRIBE THE SYSTEM OR EQUIPMENT BEING SUBMITTED FOR APPROVAL.

ALL DRAWINGS SHALL BE SUBMITTED SUFFICIENTLY IN ADVANCE OF FIELD REQUIREMENTS TO ALLOW REASONABLE TIME FOR CHECKING; AND NO CLAIM FOR EXTENSION OF THE CONTRACT TIME WILL BE GRANTED BY REASON OF FAILURE IN THIS RESPECT. ALL SUBMITTALS SHALL BE COMPLETE; AND SHALL CONTAIN ALL REQUIRED AND DETAILED INFORMATION.

SHOP DRAWINGS SHALL BE SUBMITTED ELECTRONICALLY TO THE GREATEST EXTENT POSSIBLE. IF NOT, THEN SUBMIT FIVE COPIES OF SHOP DRAWINGS TO THE ARCHITECT. THE ARCHITECT, ENGINEER AND OWNER WILL KEEP ONE COPY EACH AND TWO COPIES WILL BE RETURNED TO THE CONTRACTOR.

B. RECORD DRAWINGS: INCLUDE A COPY OF AS-BUILT DRAWINGS IN EACH COPY OF THE OPERATION AND MAINTENANCE MANUAL DESCRIBED IN THESE SPECIFICATIONS.

C. UPON COMPLETION OF THIS PROJECT, AND AS A CONDITION OF ACCEPTANCE, DELIVER TO THE ENGINEER, THREE COPIES OF THE OPERATIONS AND MAINTENANCE MANUAL.

7. RECORD DRAWINGS

DURING THE PROGRESS OF WORK, A CAREFUL RECORD WILL BE KEPT OF ALL CHANGES WHERE THE ACTUAL INSTALLATION DIFFERS FROM THAT SHOWN ON THE DESIGN DRAWINGS.

ON COMPLETION OF THE JOB, THE CONTRACTOR SHALL FURNISH TO THE OWNER HIS ORIGINAL TRACINGS OR REPRODUCIBLE TRANSPARENCIES OF ALL SHOP DRAWINGS. HE SHALL NOTE CHANGES FROM THE DESIGN DRAWINGS ON THE RECORD DRAWINGS. WHERE SHOP DRAWINGS ARE NOT AVAILABLE, THE CONTRACTOR SHALL PRODUCE RECORD DRAWINGS. RECORD DRAWINGS SHALL BE SUBMITTED TO THE PROJECT ENGINEER FOR APPROVAL. AFTER APPROVAL, THEY SHALL BECOME THE PROPERTY OF THE OWNER.

8. INSTRUCTION MANUALS

INSTRUCTION MANUALS WILL CONTAIN ALL PERTINENT DATA SPECIFIC TO THE WORK. THE MANUAL SHALL BE HARD-BOUND, THREE-RING TYPE OF SUFFICIENT SIZE TO CONTAIN ALL REQUIRED DATA OR SHALL BE MULTIPLE BINDERS CONTAINING ASSOCIATED PORTIONS OF THE DATA AND LABELED ACCORDINGLY.

LABEL OUTSIDE FRONT COVER AND HEEL COVER WITH FILLED EMBOSSED LETTERS HAVING A CONTRASTING COLOR. LABEL SHALL STATE "PROJECT NAME – HEATING AND VENTILATING SYSTEMS". FURNISH THREE COPIES OF THE MANUAL TO THE ENGINEER.

THE INSTRUCTION MANUAL SHALL CONTAIN:

- INSTALLATION, MAINTENANCE, OPERATING INSTRUCTIONS AND FULL CATALOG DESCRIPTION INCLUDING EXPLODED PARTS DRAWINGS OF ALL EQUIPMENT.
- ALL WIRING DIAGRAMS.
- AS-BUILT DRAWINGS
- CONTROL DESCRIPTION AND DIAGRAMS.
- EMERGENCY PHONE NUMBERS FOR SERVICE FOR ALL EQUIPMENT.
- LIST OF ALL SUPPLIERS AND SUBCONTRACTORS INCLUDING ADDRESSES, RESPONSIBLE PERSONNEL AND PHONE NUMBERS.
- ALL GUARANTEES.

9. TRAINING

AFTER RECEIPT OF THE INSTRUCTION MANUALS BY THE OWNER, A TRAINING PERIOD WILL BE PROVIDED FOR THE OPERATING PERSONNEL. THE TRAINING PERIOD WILL PROVIDE SUFFICIENT TIME FOR THE CONTRACTOR TO DEMONSTRATE THE VARIOUS SYSTEMS OPERATIONS.

10. COORDINATION OF WORK

COORDINATE REQUIREMENTS FOR INSTALLATION OF MECHANICAL WORK WHICH IS INDICATED DIAGRAMMATICALLY ON DRAWINGS. FOLLOW ROUTING SHOWN FOR DUCTS, AS CLOSELY AS PRACTICABLE; PLACE RUNS PARALLEL WITH LINE OF BUILDING. UTILIZE SPACES EFFICIENTLY TO MAXIMIZE ACCESSIBILITY FOR OTHER INSTALLATIONS, FOR MAINTENANCE, AND FOR REPAIRS.

11. CUTTING, PATCHING & PAINTING

ALL CUTTING AND PATCHING REQUIRED TO PERFORM WORK OF THIS CONTRACT (INCLUDING, BUT NOT LIMITED TO CORE DRILLING AND SAWCUTTING OF CONCRETE) SHALL BE PROVIDED BY THE MECHANICAL CONTRACTOR. ALL SURFACES AND FINISHES IN AREAS DISTURBED BY WORK OF THIS CONTRACT, EITHER INTENTIONALLY OR ACCIDENTALLY, SHALL BE RESTORED TO A CONDITION EQUAL OR BETTER THAN FOUND. PREPARE SURFACE AND REMOVE SURFACE FINISHES TO PROVIDE FOR PROPER INSTALLATION OF FINISHES. ALL SAWCUTTING AND/OR CORE DRILLING OF CONCRETE MUST HAVE PRIOR APPROVAL FROM THE OWNER AND DESIGN TEAM. ALL CUTTING, COREDRILLING, SAW CUTTING, ETC MUST BE SCHEDULED WITH THE OWNER TO MINIIMIZE DISTURBANCES TO OPERATION OF THE FACILITY AND ITS OCCUPANTS.

12. CLEAN UP

THE CONTRACTOR SHALL BE RESPONSIBLE FOR CLEANING UP THE DEBRIS, RUBBISH, ETC., GENERATED BY HIS OWN OPERATION. HE SHALL CLEAN UP THE PROJECT SITE PERIODICALLY AND AS DIRECTED BY THE ENGINEER.

13. INSERTS & SUPPORTS

IT SHALL BE THE RESPONSIBILITY OF THE INSTALLER OF A PARTICULAR PIECE OF EQUIPMENT TO PROVIDE THE PROPER MEANS OF ANCHORING AND SUPPORT.

14. SLEEVES & PLATES

SLEEVES SHALL BE PROVIDED AT ALL FLOOR, ROOF, AND WALL PENETRATIONS FOR PIPING AND CONDUIT. SLEEVES THROUGH STRUCTURAL MEMBERS ARE NOT ALLOWED WITHOUT PRIOR APPROVAL FROM THE ENGINEER. SLEEVES SHALL BE OF ADEQUATE SIZE TO ACCOMMODATE SERVICE AND PACKING.

SLEEVES SHALL BE OF SIMILAR MATERIAL TO ADJACENT CONDUIT, ETC., BUT NOT LESS THAN 18 US GAUGE METAL. SLEEVES THROUGH FLOOR SLABS, COLUMNS OR BEAMS SHALL BE STANDARD WEIGHT STEEL PIPE.

SLEEVES FOR CONDUIT AND EQUIPMENT THROUGH FIRE RATED AND FIRE RESISTIVE FLOORS AND WALLS SHALL BE PREFABRICATED FIRE RATED SLEEVES INCLUDING SEALS, UL LISTED AND BEARING THE UL LABEL.

15. FIRESTOPPING

PROVIDE FIRESTOPPING IN ALL SPACES AROUND PENETRATIONS AND OTHER OPENINGS IN FIRE RATED PARTITIONS, FLOORS, WALLS AND CEILINGS. WHERE DUCTWORK, WIRING, CABLE, PIPE, CONDUIT OR OTHER EQUIPMENT PENETRATES FIRERATED FLOOR, CEILING, OR WALL CONSTRUCTION. CLOSE OFF SPACE BETWEEN DUCTWORK, CONDUIT OR EQUIPMENT AND ADJACENT WORK WITH FIRE STOPPING INSULATION AND CAULK.

16. DUCTWORK

A. GENERAL: THE CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS AND EQUIPMENT REQUIRED FOR INSTALLATION OF DUCTWORK AND ACCESSORIES REQUIRED FOR THIS PROJECT. ALL DUCTWORK SYSTEMS SHALL BE DESIGNED AND INSTALLED IN ACCORDANCE WITH SMACNA HVAC DUCT INSTALLATION STANDARDS. SEAL ALL DUCT SEAMS TIGHT. DUCTS WITH ANY DIMENSION LARGER THAN 14" SHALL UTILIZE "DUCTMATE" FLANGES AND SEAL, OR AN EQUIVALENT PRODUCT.

B. DUCTWORK ACCESSORIES:

1. ACCEPTABLE MANUFACTURERS: TITUS, AERO DYNE, DURO DYNE.

2. AIR TURNING DEVICES/EXTRACTORS
   a. MULTI-BLADE DEVICE WITH BLADES ALIGNED IN SHORT DIMENSION; STEEL CONSTRUCTION; WITH INDIVIDUALLY ADJUSTABLE BLADES, MOUNTING STRAPS. SIMILAR TO TITUS MODELS AG-45 OR AG225.
   b. MANUFACTURED TURNING VANES: PROVIDE TURNING VANES CONSTRUCTED OF 1-1/2" WIDE CURVED BLADES SET AT 3/4" O.C., SUPPORTED WITH BARS PERPENDICULAR TO THE BLADES SET 2" O.C. AND SET INTO SIDE STRIPS SUITABLE FOR MOUNTING IN DUCTWORK.
   c. MANUFACTURED ACOUSTIC TURNING VANES: PROVIDE ACOUSTIC TURNING VANES CONSTRUCTED OF AIRFOIL SHAPED ALUMINUM EXTRUSIONS WITH PERFORATED FACES AND FIBERGLASS FILL.

3. BACKDRAFT DAMPERS.
   a. GRAVITY BACKDRAFT DAMPERS, SIZE 18 X 18 INCHES OR SMALLER, SHALL BE FURNISHED WITH AIR MOVING EQUIPMENT: AIR MOVING EQUIPMENT MANUFACTURERS STANDARD CONSTRUCTION.
   b. MULTI-BLADE, PARALLEL ACTION GRAVITY BALANCED BACKDRAFT DAMPERS: FRAME SHALL BE CONSTRUCTED OF 12 GAUGE GALVANIZED STEEL, DAMPER BLADES OF 16GAUGE STEEL WITH REINFORCEMENT AND EDGE SEALS. BLADES SHALL BE INTERNALLY LINKED AND ATTACHED TO ADJUSTABLE, EXTERNAL COUNTERWEIGHTS TO PERMIT SETTING FOR VARYING DIFFERENTIAL STATIC PRESSURES. MODEL 3200 AS MANUFACTURED BY VENT PRODUCTS INC.

4. VOLUME CONTROL DAMPERS
   a. FABRICATE IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE, AND AS INDICATED.
   b. SPLITTER DAMPERS:
      1. MATERIAL: SAME GAGE AS DUCT TO 24 INCHES SIZE IN EITHER DIRECTION, AND TWO GAGES HEAVIER FOR SIZES OVER 24 INCHES.
      2. BLADE: FABRICATE OF DOUBLE THICKNESS SHEET METAL TO STREAMLINE SHAPE, SECURED WITH CONTINUOUS HINGE OR ROD.
      3. OPERATOR: MINIMUM 1/4 INCH DIAMETER ROD IN SELF ALIGNING, UNIVERSAL JOINT ACTION, FLANGED BUSHING WITH SET SCREW.
   c. SINGLE BLADE DAMPERS: FABRICATE FOR DUCT SIZES UP TO 6 X 30 INCH.
   d. MULTI-BLADE DAMPER: FABRICATE OF OPPOSED BLADE PATTERN WITH MAXIMUM BLADE SIZES 8 X 72 INCH. ASSEMBLE CENTER AND EDGE CRIMPED BLADES IN PRIME COATED OR GALVANIZED CHANNEL FRAME WITH SUITABLE HARDWARE.
   e. END BEARINGS: EXCEPT IN ROUND DUCTWORK 12 INCHES AND SMALLER, PROVIDE END BEARINGS. ON MULTIPLE BLADE DAMPERS, PROVIDE OIL-IMPREGNATED NYLON OR SINTERED BRONZE BEARINGS.
   f. QUADRANTS:
      1. PROVIDE LOCKING, INDICATING QUADRANT REGULATORS ON SINGLE AND MULTI-BLADE DAMPERS.
      2. ON INSULATED DUCTS MOUNT QUADRANT REGULATORS ON STAND-OFF MOUNTING BRACKETS, BASES, OR ADAPTERS.
      3. WHERE ROD LENGTHS EXCEED 30 INCHES PROVIDE REGULATOR AT BOTH ENDS.

C. DUCTWORK FABRICATION:

1. CONSTRUCT T'S, BENDS, AND ELBOWS WITH RADIUS OF NOT LESS THAN 1-1/2 TIMES WIDTH OF DUCT ON CENTERLINE. WHERE NOT POSSIBLE AND WHERE RECTANGULAR ELBOWS ARE USED, PROVIDE AIR-OIL TURNING VANES. PROVIDE ACOUSTICAL AIR-FOIL TURNING VANES WHERE INDICATED ON DRAWINGS.

2. INCREASE DUCT SIZES GRADUALLY, NOT EXCEEDING 15 DEGREES DIVERGENCE WHEREVER POSSIBLE; MAXIMUM 30 DEGREES DIVERGENCE UPSTREAM OF EQUIPMENT AND 45 DEGREES CONVERGENCE DOWNSTREAM.

3. PROVIDE STANDARD 45 DEGREE LATERAL WYE TAKEOFFS UNLESS OTHERWISE INDICATED WHERE 90 DEGREE CONICAL TEE CONNECTIONS MAY BE USED.

4. LONGITUDINAL SEAMS FOR RECTANGULAR DUCTWORK SHALL BE SUITABLY SELECTED FOR THE MATERIAL, PRESSURE CLASSIFICATION AND OTHER CONSTRUCTION DETAILS APPLICABLE FOR THE SERVICE. SEAMS SHALL BE FORMED AND ASSEMBLED WITH PROPER DIMENSION AND PROPORTION FOR TIGHT AND SECURE FITUP. SOLDER FOR WATERTIGHT SEAM CLOSURE SHALL CONFORM TO ASTM STANDARD B32.

5. ON ROUND DUCTWORK USE 5-PIECE ELBOWS UP TO 12" DIAMETER, AND 7-PIECE ELBOWS ON LARGER DUCTS. USE SMACNA TYPES RL-1, 4 OR 5 ON LONGITUDINAL SEAMS AND TYPES RT-1 OR 2 ON TRANSVERSE JOINTS.

6. DUCTWORK SHALL BE GALVANIZED STEEL EXCEPT FOR TOILET EXHAUST WHICH SHALL BE ALUMINUM.

7. DUCTWORK SYSTEM SHALL BE DESIGNED FOR A MAXIMUM VELOCITY OF 500 FEET PER MINUTE IN BRANCH DUCTS AND 800 FEET PER MINUTE IN MAIN DUCTS.

8. ALL EXTERIOR DUCTWORK SHALL BE MIN. 18 GUAGE GALVANIZED STEEL WITH DUCTMATE "45" SYSTEM CONNECTIONS BETWEEN SECTIONS.

9. ALL DUCTWORK SHALL BE CONSTRUCTED AND SEALED TO SMANCA STANDARDS FOR MIN. 3" WC POSITIVE AND NEGATIVE.

10. DUCT SEAMS SHALL BE SEALED WITH AN ACCEPTABLE DUCT SEALANT. SUCH AS DUCTMATE "EZ SEAL" OR EQUIVALENT.

D. DUCTWORK INSTALLATION:

1. INSTALL AND SEAL DUCTS IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE. DUCTWORK SHALL BE DESIGNED, CONSTRUCTED, SEALED AND REINFORCED AS PER SMACNA REQUIREMENTS FOR DUCTS OPERATING BETWEEN 3" W.G. AND 4" W.G. PRESSURE.

2. PROVIDE OPENINGS IN DUCTWORK WHERE REQUIRED TO ACCOMMODATE THERMOMETERS AND CONTROLLERS. PROVIDE PILOT TUBE OPENINGS WHERE REQUIRED FOR TESTING OF SYSTEMS, COMPLETE WITH METAL CAN WITH SPRING DEVICE OR SCREW TO ENSURE AGAINST AIR LEAKAGE. WHERE OPENINGS ARE PROVIDED IN INSULATED DUCTWORK, INSTALL INSULATION MATERIAL INSIDE A METAL RING.

3. DUCTS SHALL BE SUPPORTED FROM THE BUILDING STRUCTURE BY THE USE OF INSERTS, BEAM CLAMPS, EXPANSION BOLTS AS APPROPRIATE. DUCTS SHALL HAVE HANGERS AT EACH JOINT. CARE SHALL BE TAKEN TO COOPERATE WITH OTHER TRADES SO AS TO UTILIZE SPACE CONDITIONS IN AS EFFICIENT A MANNER AS POSSIBLE.

4. FOR DUCTS NOT EXCEEDING TWO (2) SQUARE FEET IN CROSS-SECTIONAL AREA, HANGERS SHALL BE METAL NOT LESS THAN ONE SIXTEENTH (1/16") INCH IN THICKNESS. FOR LARGER DUCTS, HANGERS SHALL BE METAL NOT LESS THAN ONE INCH WIDE BY ONE-EIGHTH INCH THICK, OR THE EQUIVALENT AREA. HANGERS SHALL BE FASTENED TO THE SIDES OF THE DUCTS. FOR DUCTS OVER 48 INCHES WIDE, THE HANGERS SHALL BE BROUGHT DOWN THE SIDES AND TURNED UNDER AND FASTENED TO BOTTOM AS WELL (REFER TO APPLICABLE SMACNA STANDARDS).

5. WHERE VIBRATION OCCURS IN DUCTWORK WHILE THE SYSTEM IS IN OPERATION, THE CONTRACTOR SHALL PROVIDE SUCH ADDITIONAL STIFFENING MEMBERS AS ARE NECESSARY TO OVERCOME THE VIBRATION. ALL DUCTWORK WHERE VIBRATIONS OCCUR SHALL BE ISOLATED AT POINTS OF CONTACT WITH THE BUILDING BY FELT PADS NEATLY AND SECURELY HELD IN PLACE.

6. LIGHTING FIXTURES, CONDUIT, PIPING, CEILING CONSTRUCTION OR ANY WORK INSTALLED BY OTHER TRADES IS NOT TO BE SUSPENDED OR HUNG FROM DUCTWORK.

7. PROVIDE FLEXIBLE CONNECTIONS AT THE DISCHARGE AND INLET OF EACH FAN AND WHEREVER ELSE INDICATED. THE FLEXIBLE CONNECTION SHALL BE INSTALLED SLACK AND SHALL NOT BE PAINTED. ALIGN DUCTWORK AND FANS TO EACH OTHER AND TO THE PLUMB PRIOR TO START-UP.

8. THE THROAT RADIUS OF ALL ELBOWS, OFFSETS, ETC. SHALL BE EQUAL TO THE FULL WIDTH OF THE DUCT IN THE TURNING PLANE. WHERE IT IS IMPOSSIBLE TO MAINTAIN THE FULL RADIUS DUE TO SPACE LIMITATIONS, SPLITTERS SHALL BE INSTALLED IN THE ELBOW OR OFFSET. SPLITTERS SHALL BE OF SUCH DESIGN AND NUMBER TO MAINTAIN THE SAME PRESSURE LOSS AT THE ELBOW OR OFFSET AS WOULD BE IN THE CASE WHERE IT HAS A FULL RADIUS. SPLITTERS SHALL BE OF THE SAME MATERIAL AS THE DUCT IN WHICH IT IS INSTALLED.

9. WHERE CONDITIONS PROHIBIT THE USE OF A THROAT RADIUS OF AT LEAST 4", THE ELBOW OR OFFSET SHALL HAVE A SQUARE THROAT AND HEEL. PROVIDE TURNING VANES IN ALL SQUARE THROAT ELBOWS OR OFFSETS. ALL TURNING VANES SHALL BE DOUBLE THICKNESS, AREA EQUALIZING TYPE AND SHALL BE OF THE SAME MATERIAL AS THE DUCT IN WHICH IT IS INSTALLED.

10. LOCATE DUCTS WITH SUFFICIENT SPACE AROUND EQUIPMENT TO ALLOW NORMAL OPERATING AND MAINTENANCE ACTIVITIES.

11. USE DOUBLE NUTS AND LOCK WASHERS ON THREADED ROD SUPPORTS. CONNECT FLEXIBLE DUCTS TO METAL DUCTS WITH DRAW BANDS. PLASTIC DRAW BANDS USED IN CEILING PLENUM SPACES SHALL BE LISTED, AND APPROVED BY THE ENGINEER, FOR SUCH USE.

12. DURING CONSTRUCTION PROVIDE TEMPORARY CLOSURES OF METAL OR TAPED POLYETHYLENE ON OPEN DUCTWORK TO PREVENT CONSTRUCTION DUST FROM ENTERING DUCTWORK SYSTEM.

13. ALUMINUM DUCTWORK SHALL BE USED IN TOILET ROOM. SLOPE DUCT TOWARDS REGISTER.

E. DUCT ACCESSORIES INSTALLATION

1. INSTALL ACCESSORIES IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS, NFPA 90A, AND FOLLOW SMACNA HVAC DUCT CONSTRUCTION STANDARDS – METAL AND FLEXIBLE.

2. PROVIDE BACKDRAFT DAMPERS ON EXHAUST FANS OR EXHAUST DUCTS NEAREST TO OUTSIDE AND WHERE INDICATED.

3. PROVIDE DUCT ACCESS DOORS FOR INSPECTION AND CLEANING BEFORE AND AFTER FILTERS, COILS, FANS, AUTOMATIC DAMPERS, AT FIRE DAMPERS, COMBINATION FIRE AND SMOKE DAMPERS, AND ELSEWHERE AS INDICATED. PROVIDE MINIMUM 8 X 8 INCH SIZE FOR HAND ACCESS, 18 X 18 INCH SIZE FOR SHOULDER ACCESS, AND AS INDICATED. REVIEW LOCATIONS PRIOR TO FABRICATION.

4. PROVIDE DUCT TEST HOLES WHERE INDICATED AND REQUIRED FOR TESTING AND BALANCING PURPOSES.

5. PROVIDE FIRE DAMPERS AT LOCATIONS INDICATED, WHERE DUCTS AND OUTLETS PASS THROUGH FIRE RATED COMPONENTS, AND WHERE REQUIRED BY AUTHORITIES HAVING JURISDICTION. INSTALL WITH REQUIRED PERIMETER MOUNTING ANGLES, SLEEVES, BREAKAWAY DUCT CONNECTIONS, CORROSION RESISTANT SPRINGS, BEARINGS, BUSHINGS AND HINGES. PROVIDE ACCESS DOORS ON BOTH SIDES OF EACH FIRE DAMPER.

6. DEMONSTRATE RE-SETTING OF FIRE DAMPERS TO OWNER'S REPRESENTATIVE.

7.PROVIDE FLEXIBLE CONNECTIONS IMMEDIATELY ADJACENT TO EQUIPMENT IN DUCTS ASSOCIATED WITH FANS AND MOTORIZED EQUIPMENT AND SUPPORTED BY VIBRATION ISOLATORS.

8.PROVIDE BALANCING DAMPERS AT POINTS ON SUPPLY, RETURN, AND EXHAUST SYSTEMS WHERE BRANCHES ARE TAKEN FROM LARGER DUCTS AS REQUIRED FOR AIR BALANCING. INSTALL MINIMUM 2 DUCT WIDTHS FROM DUCT TAKE-OFF.

9.USE SPLITTER DAMPERS WHERE INDICATED OR REQUIRED DUE TO DUCT LAYOUT.

10. PROVIDE BALANCING DAMPERS ON DUCT TAKE-OFF TO DIFFUSERS, GRILLES, AND REGISTERS, REGARDLESS OF WHETHER DAMPERS ARE SPECIFIED AS PART OF THE DIFFUSER, GRILLE, OR REGISTER ASSEMBLY.

17. DUCT INSULATION

A. THERMAL INSULATION: FLEXIBLE BLANKET TYPE DUCT INSULATION WITH A FACTORY APPLIED ALUMINUM FOIL FACING REINFORCED WITH FIBERGLASS SCRIM LAMINATED TO A UL LISTED KRAFT PAPER. APPLY TO DUCTWORK WITH A 3"-4" OVERLAP, AND SECURE OVERLAP TIGHTLY WITH OUTWARD CLINCHING STAPLES. CARE SHOULD BE TAKEN TO MINIMIZE COMPRESSION DURING INSTALLATION. TEARS AND BREAKS IN FACING SHALL BE SEALED WITH A FOIL-SCRIM-DRAFT FSK BARRIER TAPE. INSULATION ON DUCTWORK MORE THAN 24" WIDE SHALL BE ADDITIONALLY SECURED ON THE BOTTOM WITH MECHANICAL FASTENERS SPACED APPROXIMATELY 18" ON CENTER. SEAL PIN PENETRATIONS WITH VAPOR BARRIER TAPE AS ABOVE. DENSITY: 1.0 LB/CUFT, "K" VALUE OF 0.27 AT 75 DEGREES F, THICKNESS: 1-1/2". MANVILLE "MICROLITE" TYPE 100, WITH FSK FACING. VSK VAPOR BARRIER TAPE. PERMTAPE BY COMPACT CORPORATION, FSK PRODUCT NO. 110-7.

18. DIFFUSERS AND REGISTERS

A. PROVIDE MANUFACTURERS STANDARD DIFFUSERS, REGISTERS AND GRILLES OF SIZE, SHAPE, MATERIALS AND PERFORMANCE AS REQUIRED BY THE APPLICABLE SERVICE AND INSTALLATION CONDITIONS. PROVIDE DIFFUSER, REGISTER, AND GRILLE STYLES THAT ARE COMPATIBLE WITH FLOOR, CEILING AND/OR WALL CONSTRUCTION. PAINT DUCTWORK VISIBLE BEHIND REGISTERS AND GRILLES MATTE BLACK. DIFFUSERS, REGISTERS AND GRILLES SHALL BE AS MANUFACTURED BY TUTTLE AND BAILEY, CARNES, TITUS.

19. BALANCING AND TESTING

A. CONTRACTOR SHALL SUBMIT A DRAFT COPY OF THE TESTING AND BALANCING REPORT FOR ENGINEERS REVIEW AND COPMMENT.

B. UPON COMPLETION AND BEFORE FINAL ACCEPTANCE OF WORK, TEST EACH SYSTEM IN SERVICE TO DEMONSTRATE COMPLIANCE WITH THE CONTRACT REQUIREMENTS. ADJUST CONTROLS AND BALANCE SYSTEMS PRIOR TO FINAL ACCEPTANCE OF COMPLETED SYSTEMS. TEST CONTROLS THROUGH EVERY CYCLE OF OPERATION.

C. TESTING AND BALANCING: SUBMIT TYPED REPORT CONTAINING THE FOLLOWING INFORMATION.

1. AIR DISTRIBUTION TEST SHEET:
A. AIR TERMINAL NUMBER
B. ROOM NUMBER/LOCATION
C. TERMINAL TYPE
D. TERMINAL SIZE
E. AREA FACTOR
F. DESIGN MINIMUM AND MAXIUMUM VELOCITY
G. DESIGN AIR FLOW
H. TEST (FINAL) MINIMUM AND MAXIUMUM VELOCITY
I. TEST (FINAL) MINIMUM AND MAXIMUM AIR FLOW
J. PERCENT OF DESIGN AIR FLOW @ MAXIUMUM

2. NOTICE OF TESTS: NOTIFY THE ENGINEER IN WRITING AT LEAST FIFTEEN (15) CALENDAR DAYS PRIOR TO THE TESTING. WITHIN THIRTY (30) CALENDAR DAYS AFTER ACCEPTABLE COMPLETION OF TESTING, SUBMIT EACH TEST REPORT FOR REVIEW AND APPROVAL.

3. REPORT FORMS: TYPE ALL DATA ENTRIES AND WRITING ON THE TEST REPORT FORMS. COMPLETED TEST REPORT FORMS FOR EACH ITEM OF EQUIPMENT SHALL BE REVIEWED, APPROVED, AND SIGNED BY THE CONTRACTOR. THE MANUFACTURER'S FIELD TEST REPRESENTATIVE SHALL ALSO REVIEW, APPROVE, AND SIGN THE REPORT OF THE MANUFACTURER'S RECOMMENDED TEST. SIGNATURES SHALL BE ACCOMPANIED BY THE PERSON'S TYPED NAME.

4. DEFICIENCY RESOLUTION: THE TEST REQUIREMENTS ARE ACCEPTABLY MET, DEFICIENCIES IDENTIFIED DURING THE TESTS CORRECTED TO COMPLY WITH THE MANUFACTURER'S RECOMMENDATIONS, AND CORRECTIONS RETESTED IN ORDER TO VERIFY COMPLIANCE.

5. AIR SYSTEM PROCEDURE

A. TEST AND ADJUST FAN RPM TO DESIGN REQUIREMENTS.

B. TEST AND RECORD MOTOR FULL LOAD NAMEPLATE RATING AND ACTUAL AMPERE DRAW.

C. TEST AND RECORD SYSTEM STATIC PRESSURES, FAN SUCTION AND DISCHARGE.

D. ADJUST ALL MAIN SUPPLY AND RETURN AIR DUCT TO PROPER DESIGN CFM.

E. TEST AND ADJUST EACH DIFFUSER, GRILLE AND REGISTER. READING AND TESTS OF DIFFUSERS, GRILLES AND REGISTERS SHALL INCLUDE DESIGN VELOCITY (FPM) AND AS ADJUSTED VELOCITY, DESIGN CFM AND ADJUSTED CFM.

F. TEST AND ADJUST AIR DISTRIBUTION SYSTEMS TO PROVIDE REQUIRED OR DESIGN SUPPLY, RETURN, OUTSIDE AND EXHAUST AIR QUANTITIES.

G. MAKE AIR QUANTITY MEASUREMENTS IN DUCTS BY PITOT TUBE TRAVERSE OF ENTIRE CROSS SECTIONAL AREA OF DUCT.

H. MEASURE AIR QUANTITIES AT AIR INLETS AND OUTLETS.

I. ADJUST DISTRIBUTION SYSTEM TO OBTAIN UNIFORM SPACE TEMPERATURES FREE FROM OBJECTIONABLE DRAFTS AND NOISE.

J. USE VOLUME CONTROL DEVICES TO REGULATE AIR QUANTITIES ONLY TO EXTEND THAT ADJUSTMENTS DO NOT CREATE OBJECTIONABLE AIR MOTION OR SOUND LEVELS. EFFECT VOLUME CONTROL BY DUCT INTERNAL DEVICES SUCH AS DAMPERS AND SPLITTERS.

K. ADJUST SYSTEM TO PROVIDE THE SPECIFIED PRESSURE DIFFERENTIALS AND MINIMUM AIR CHANGES.

L. PROVIDE SYSTEM SCHEMATIC WITH REQUIRED AND ACTUAL AIR QUANTITIES AND PRESSURE DIFFERENTRIALS RECORDED AT EACH OUTLET, INLET, ROOM, ETC.

6. WATER SYSTEM PROCEDURE

A. PREPARE ITEMIZED EQUIPMENT SCHEDULES, LISTING ALL HEATING AND/OR COOLING ELEMENTS AND EQUIPMENT IN THE SYSTEMS TO BE BALANCED. LIST IN ORDER ON EQUIPMENT SCHEDULES, BY PUMP OR ZONE ACCORDING TO THE DESIGN, ALL HEATING OR COOLING ELEMENTS AND ALL ZONE BALANCING VALVES OR BALANCING DEVICES. BREAK DOWN SCHEDULES INTO ZONES OR CIRCUITS, STARTING WITH THE ZONE AND ENDING WITH THE LAST ITEMS OF EQUIPMENT OR TRANSFER ELEMENT IN THE RESPECTIVE ZONE OR CIRCUIT. INCLUDE ON SCHEDULE SHEETS COLUMN TITLES LISTING THE LOCATION, TYPE OF ELEMENT OR APPARATUS, DESIGN CONDITIONS AND MEASURED CONDITIONS. PREPARE INDIVIDUAL REPORT SHEETS FOR EACH ZONE OR CIRCUIT.

B. ADJUST WATER SYSTEMS TO PROVIDE REQUIRED OR DESIGN QUANTITIES.

C. USE CALIBRATED VENTURI TUBES, ORIFICES, OR OTHER METERED FITTINGS AND PRESSURE GAGES TO DETERMINE FLOW RATES FOR SYSTEM BALANCE. WHERE FLOW METERING DEVICES ARE NOT INSTALLED, BASE FLOW BALANCE ON TEMPERATURE DIFFERENCE ACROSS VARIOUS HEAT TRANSFER ELEMENTS IN THE SYSTEM.

D. ADJUST SYSTEMS TO PROVIDE SPECIFIED PRESSURE DROPS AND FLOWS THROUGH HEAT TRANSFER ELEMENTS PRIOR TO THERMAL TESTING. PERFORM BALANCING BY MEASUREMENT OF TEMPERATURE DIFFERENTIAL IN CONJUNCTION WITH AIR BALANCING.

E. EFFECT SYSTEM BALANCE WITH AUTOMATIC CONTROL VALVES FULLY OPEN TO HEAT TRANSFER ELEMENTS.

F. EFFECT ADJUSTMENT OF WATER DISTRIBUTION SYSTEMS BY MEANS OF BALANCING COCKS, VALVES, AND FITTINGS. DO NOT USE SERVICE OR SHUT-OFF VALVES FOR BALANCING UNLESS INDEXED FOR BALANCE POINT.

G. CONFIRM REQUIRED CHILLED WATER FLOW RATE WITH THE LINAC MANUFACTURER.

REPORTS TO BE SUBMITTED

A. REPORT FORMS

1. TITLE PAGE:
   A. NAME OF TESTING, ADJUSTING, AND BALANCING AGENCY
   B. ADDRESS OF TESTING, ADJUSTING, AND BALANCING AGENCY
   C. TELEPHONE NUMBER OF TESTING, ADJUSTING, AND BALANCING AGENCY
   D. PROJECT NAME
   E. PROJECT LOCATION
   F. PROJECT ARCHITECT
   G. PROJECT ENGINEER
   H. PROJECT CONTRACTOR
   I. PROJECT ALTITUDE
   J. REPORT DATE

2. SUMMARY COMMENTS:
A. DESIGN VERSUS FINAL PERFORMANCE
B. NOTABLE CHARACTERISTICS OF SYSTEM
C. DESCRIPTION OF SYSTEMS OPERATION SEQUENCE
D. SUMMARY OF OUTDOOR AND EXHAUST FLOWS TO INDICATE AMOUNT OF BUILDING PRESSURIZATION
E. NOMENCLATURE USED THROUGHOUT REPORT
F. TEST CONDITIONS

3. INSTRUMENT LIST:
A. INSTRUMENT
B. MANUFACTURER
C. MODEL NUMBER
D. SERIAL NUMBER
E. RANGE
F. CALIBRATION DATE

4. ELECTRIC MOTORS:
A. MANUFACTURER
B. MODEL/FRAME
C. HP/BHP
D. PHASE, VOLTAGE, AMPERAGE; NAMEPLATE, ACTUAL, NO LOAD
E. RPM
F. SERVICE FACTOR
G. STARTER SIZE, RATING, HEATER ELEMENTS
H. SHEAVE MAKE/SIZE/BORE

5. V BELT DRIVE:
A. IDENTIFICATION/LOCATION
B. REQUIRED DRIVEN RPM
C. DRIVEN SHEAVE, DIAMETER AND RPM
D. BELT, SIZE AND QUANTITY
E. MOTOR SHEAVE DIAMETER AND RPM
F. CENTER TO CENTER DISTANCE, MAXIMUM, MINIMUM, AND ACTUAL

6. DX UNIT DATA:
A. IDENTIFICATION/NUMBER
B. LOCATION
C. SERVICE
D. MANUFACTURER
E. AIR FLOW, DESIGN AND ACTUAL
F. ENTERING DRY BULB AND WET AIR TEMPERATURES, DESIGN AND ACTUAL
G. LEAVING AIR DRY BULB AND WET BULB TEMPERATURES, DESIGN AND ACTUAL
H. AIR PRESSURE DROP, DESIGN AND ACTUAL

7. AIR MOVING EQUIPMENT:
A. LOCATION
B. MANUFACTURER
C. MODEL NUMBER
D. SERIAL NUMBER
E. ARRANGEMENT/CLASS/DISCHARGE
F. SUPPLY AIR FLOW, SPECIFIED AND ACTUAL
G. RETURN AIR FLOW, SPECIFIED AND ACTUAL
H. TOTAL STATIC PRESSURE, SPECIFIED AND ACTUAL
I. EXTERNAL STATIC PRESSURE, SPECIFIED AND ACTUAL
J. SHEAVE MAKE/SIZE/BORE
K. NUMBER OF BELTS/MAKE/SIZE
L. FAN RPM

8. EXHAUST FAN DATA:
A. LOCATION
B. MANUFACTURER
C. MODEL NUMBER
D. SERIAL NUMBER
E. AIR FLOW, SPECIFIED AND ACTUAL
F. TOTAL STATIC PRESSURE (TOTAL EXTERNAL), SPECIFIED AND ACTUAL
G. INLET PRESSURE
H. DISCHARGE PRESSURE
I. SHEAVE MAKE/SIZE/BORE
J. NUMBER OF BELTS/MAKE/SIZE
K. FAN RPM

9. DUCT TRAVERSE:
A. SYSTEM ZONE/BRANCH
B. DUCT SIZE
C. AREA
D. DESIGN VELOCITY
E. DESIGN AIR FLOW
F. TEST VELOCITY
G. TEST AIR FLOW
H. DUCT STATIC PRESSURE
I. AIR TEMPERATURE
J. AIR CORRECTION FACTOR

10. AIR DISTRIBUTION TEST SHEET:
A. AIR TERMINAL NUMBER
B. ROOM NUMBER/LOCATION
C. TERMINAL TYPE
D. TERMINAL SIZE
E. AREA FACTOR
F. DESIGN VELOCITY
G. DESIGN AIR FLOW
H. TEST (FINAL) VELOCITY
I. TEST (FINAL) AIR FLOW
J. PERCENT OF DESIGN AIR FLOW

11. PRESSURE DIFFERENTIAL TEST SHEET:

A. <u>VAULT TO CONTROL ROOM</u>: -0.015"WC

12. CHILLED WATER FOR LINAC
A. IDENTIFICATION/NUMBER
B. LOCATION
C. SERVICE
D. CHILLER MANUFACTURER AND MODEL NUMBER, VOLTAGE
E. CHILLED WATER FLOW, DESIGN AND ACTUAL AT CHILLER
F. CHILLED WATER FLOW, DESIGN AND ACTUAL AT LINAC
G. CHILLED WATER PRESSURE DROP, DESIGN AND ACTUAL
H. ENTERING WATER TEMPERATURE, DESIGN AND ACTUAL
I. LEAVING WATER TEMPERATURE, DESIGN AND ACTUAL

M.E.P. ENGINEER
SJM Associates Consulting Engineers
58 Brookside Drive
West Shokan, New York 12494
Ph. (845) 657-2072 Fax (845) 657-2073

optimus ARCHITECTURE
187 E. Market Street
Suite 180
Rhinebeck NY 12572
845 876 8202 phone
845 876 8112 fax

SCALE	DATE	DRAWN BY:	CHKED. BY:
AS NOTED	12/03/20	SJM	SJM

#	DATE	REVISIONS
	12/03/20	ISSUED FOR BID, PERMIT AND CONSTRUCTION

PROJECT PROJECT #: 2023
Linear Accelerator Replacement for:
VASSAR BROTHERS MEDICAL CENTER
45 READE PLACE
POUGHKEEPSIE, NEW YORK 12601

DRAWING TITLE
HVAC SPECIFICATIONS

DRAWING NUMBER:
M500

BASIC PIPING MATERIALS

A. GENERAL: BASIC PIPING MATERIALS, ASSEMBLIES AND FACTORY FABRICATED PIPING PRODUCTS OF SIZES, TYPES, PRESSURE RATINGS, AND CAPACITIES AS REQUIRED PROVIDE PROPER SELECTION AS DETERMINED BY INSTALLER TO COMPLY WITH INSTALLATION REQUIREMENTS. PROVIDE FITTINGS OF MATERIALS WHICH ARE COMPATIBLE WITH THEIR ASSOCIATED PIPING AND CONNECTIONS.

B. PIPE FITTINGS:
1. ALL FITTINGS SHALL COMPLY WITH LATEST EDITION OF ANSI STANDARDS.
2. STEEL FLANGES/FITTINGS: ANSI B16.5
3. CAST IRON THREADED FITTINGS: ANSI B16.4

C. JOINTS:
1. AMERICAN STANDARD TAPERED THREADS, FULL CUT. LUBRICANT FOR MALE THREADS OF SCREWED PIPE SHALL BE TEFLON TAPE OR NON–TOXIC THREAD SEALANT COMPOUND. THE USE OF COTTON WICKING OR CAULKING SHALL BE PROHIBITED. PIPE ENDS SHALL BE DEBURRED AND REAMED TO FULL SIZE.

C. UNIONS AND FLANGES:
1. UNIONS ON STEEL PIPE: GALVANIZED, MALLEABLE, BRASS SEAT UNIONS FOR GALVANIZED PIPING AND BLACK, MALLEABLE, BRASS SEAT UNIONS FOR BLACK AND COPPER NICKEL ALLOY STEEL PIPING. RATED AT 150 PSIG OR GREATER AS REQUIRED BY PRESSURE RATING OF THE SYSTEM AND OTHER FITTINGS USED IN THE SYSTEM.
2. UNIONS FOR COPPER PIPE: BRONZE WITH SOLDERED JOINTS.
3. DIELECTRIC UNIONS: AT EACH JOINT BETWEEN STEEL OR GALVANIZED (ZINC) AND COPPER PIPING SYSTEMS. FOR FLANGE TYPE, PROVIDE INSULATING SPACERS AND WASHERS.
4. FLANGES FOR PIPE OVER 2 INCHES: FERROUS PIPING: 150 PSIG FORGED STEEL, SLIP–ON. COPPER PIPING: BRONZE.

E. SOLDERING MATERIALS:
1. ALL SOLDERS SHALL MEET FEDERAL REQUIREMENTS FOR LEAD FREE SOLDERS AS PER THE FEDERAL SAFE DRINKING WATER ACT AMENDMENTS OF 1986 (PUBLIC LAW 99–339).
2. ALL SOLDERS SHALL COMPLY WITH SECTION 905.5 OF THE NEW YORK STATE EXECUTIVE VOLUME OF CODES, RULES AND REGULATIONS (NEW YORK STATE BUILDING CODE).
3. SOLDER SHALL BE TIN–ANTIMONY (ASTM B–32 GRADE 95 TA) OR OF OTHER LEAD FREE TYPE SUCH AS SILVABRITE 100 (AS MANUFACTURED BY ENGELHARD CORP.), STAY–SAFE 50 (AS MANUFACTURED BY J.W. HARRIS CO.) OR EQUAL.

15.3 PIPING

A. CHILLED WATER PIPING (WITHIN BUILDING, ABOVE GRADE)
1. COPPER TUBING: ASTM B88, TYPE L, HARD DRAWN.
2. FITTINGS: ASME B16.18, CAST BRONZE, OR ASME B16.22, WROUGHT COPPER AND BRONZE.
3. JOINTS: ASTM B32, SOLDER, GRADE 95TA.

B. LOW PRESSURE STEAM PIPING (15 PSIG MAXIMUM)

1. STEEL PIPE: ASTM A53, SCHEDULE 40, BLACK.
   a. FITTINGS: 1/2" THROUGH 2" THREADED ASTM B16.3 MALLEABLE IRON CLASS 125, 2–1/2" THROUGH 6" ASTM A234 FORGED STEEL CLASS 125.
   b. JOINTS: 1/2" THROUGH 2" THREADED, 2–1/2" THROUGH 6", WELDED.

2. DIELECTRIC CONNECTIONS: UNION WITH GALVANIZED OR PLATED STEEL THREADED END, COPPER SOLDER END, WATER IMPERVIOUS ISOLATION BARRIER.

15.4 VALVES

A. GENERAL: VALVES AND VALVE CONSTRUCTION SHALL BE SUITABLE FOR THE PRESSURE, TEMPERATURE, AND WATER QUALITY OF THE SERVICE. ALL VALVES SHALL CONFORM TO ANSI STANDARDS. COMPLY WITH ASME B31.9 FOR BUILDING SERVICES PIPING AND ASME B31.1 FOR POWER PIPING.
B. VALVES:
1. PIPE SIZE 2" AND UNDER: BRONZE BODY AND TRIM WITH SCREWED ENDS.
2. TUBE SIZE 2" AND UNDER: SOLDERED JOINT VALVES.
C. OPERATORS: PROVIDE HANDWHEELS, FASTENED TO VALVE STEM, FOR VALVES OTHER THAN QUARTER–TURN. PROVIDE LEVER HANDLE FOR QUARTER–TURN VALVES, 6" AND SMALLER, OTHER THAN PLUG VALVES. PROVIDE ONE WRENCH FOR EVERY TEN (10) PLUG VALVES.
D. GATE VALVES (SHUT–OFF VALVE): SCREWED – NIBCO #T–111, OR APPROVED EQUAL.
E. TWO INCH AND SMALLER WITH RISING STEM, SCREWED BONNET AND INSIDE SCREW. ALL VALVES SHALL BE BACK SEATING WITH ADJUSTABLE PACKING NUT AND CAPABLE OF BEING REPACKED UNDER PRESSURE.
F. BALL VALVES (SHUT–OFF VALVE 2" AND SMALLER): SCREWED – NIBCO #T–595–Y, OR APPROVED EQUAL.
1. 2" AND SMALLER THREE PIECE, BRONZE TRIM, WITH BOTTOM LOADED PRESSURE RETAINING STEMS, TEFLON SEATS, REINFORCED STEM PACKING SEALS, ADJUSTABLE STEM PACKING GLAND AND QUARTER TURN OPEN–CLOSE LEVER.

G. CHECK VALVES: SCREWED – NIBCO #T–413, OR APPROVED EQUAL.
1. 2" AND SMALLER WITH RENEWABLE TEFLON OR BRONZE DISC AND BRONZE ARM SWINGING ON A BRONZE HINGE PIN.
H. DRAIN VALVES AND MANUAL VENT VALVES:
1. 1/2" – 75 PSIG WORKING PRESSURE AND BELOW, 150 DEGREES F WORKING TEMPERATURE AND BELOW. CAST BRASS BODY AND HANDWHEEL WITH 3/4" HOSE CONNECTION AND INTEGRAL VACUUM BREAKER. WATTS #HB–1, OR APPROVED EQUAL.
2. OVER 1/2" – 75 PSIG WORKING PRESSURE AND ABOVE, 150 DEGREES F WORKING TEMPERATURE AND ABOVE. USE GATE VALVE. NIBCO #T–113–HC, OR APPROVED EQUAL.

I. ACCEPTABLE MANUFACTURERS FOR ALL VALVES SPECIFIED ABOVE CONTINGENT UPON COMPLIANCE WITH SPECIFICATIONS: CRANE, DEZURIK, FAIRBANKS, OR OTHER APPROVED EQUAL.

15.5 PIPE INSULATION

A. ACCEPTABLE MANUFACTURERS: MANVILLE CORP., OWENS–CORNING, CERTAIN–TEED OR OTHER MANUFACTURER PROVIDING EQUIVALENT PRODUCTS.
B. INSULATION TYPE FS: INSULATION: FLEXIBLE, UNICELLULAR ELASTOMERIC SHEET INSULATION. FIELD FABRICATE FOR A SECURE, TIGHT FIT. SECURE WITH PROPER CONTACT CEMENT, MAKING SURE ALL JOINTS AND POSSIBLE VAPOR BARRIER LEAKS ARE ALSO SEALED. APPLY MANUFACTURER'S RECOMMENDED PAINT FOR U.V. PROTECTION FOR EXTERIOR APPLICATIONS. MANVILLE "RUBATEX", OR APPROVED EQUAL.
C. INSULATION TYPE GF: RIGID FIBERGLASS ONE PIECE PIPE INSULATION, WITH A FACTORY INSTALLED ALL PURPOSE VAPOR BARRIER JACKET OF WHITE KRAFT BONDED TO ALUMINUM FOIL, REINFORCED WITH FIBERGLASS YARN. JACKET SHALL BE FURNISHED WITH A PRESSURE SENSITIVE TAPE LAP SEALING SYSTEM, WITH MATCHING PRESSURE SENSITIVE TAPE BUTT STRIPS. "K" VALUE OF 0.24 AT 75 DEGREES F. OWENS–CORNING ASJ/SSL–II OR EQUAL.
D. INSULATION JACKETS:

ONE PIECE MOLDED PVC VALVE AND FITTING COVERS AND SHEET MATERIAL, WHITE COLOR. MANVILLE ZESTON 2000, OR APPROVED EQUAL.
1. MINIMUM SERVICE TEMPERATURE: 0 DEGREES F.
2. MAXIMUM SERVICE TEMPERATURE: 150 DEGREES F.
3. MAXIMUM FLAME SPREAD: 25 OR LESS.
4. MAXIMUM SMOKE DEVELOPED: 50 OR LESS.
5. THICKNESS: 20 MIL.
6. CONNECTIONS: BRUSH ON WELDING ADHESIVE.

STAINLESS STEEL: TYPE 304 (USE OUTDOORS).
1. THICKNESS: 0.018" SHEET, WITH MOISTURE BARRIER.
2. FINISH: EMBOSSED.
3. JOINING: LONGITUDINAL SLIP JOINTS AND 2 INCH LAPS.
4. FITTINGS: 0.016 INCH THICK DIE SHAPED FITTING COVERS WITH FACTORY ATTACHED PROTECTIVE LINER.
5. METAL JACKET BANDS: 3/8 INCH WIDE; 0.010 INCH THICK STAINLESS STEEL.

E. INSULATION IS TO BE PROVIDED ON ALL CONDENSATE DRAIN AND CHILLED WATER PIPING. INSULATION COMPONENTS (INSULATION, JACKETS, ADHESIVES, CEMENTS, COATINGS, ETC.) SHALL HAVE A COMPOSITE FIRE AND SMOKE HAZARD RATING NOT TO EXCEED 25 FOR FLAME SPREAD, 50 FOR SMOKE DEVELOPED.

F. FOR EXTERIOR APPLICATIONS, PROVIDE VAPOR BARRIER JACKET. INSULATE FITTINGS, JOINTS, AND VALVES WITH INSULATION OF LIKE MATERIAL AND THICKNESS AS ADJOINING PIPE, AND FINISH WITH GLASS MESH REINFORCED VAPOR BARRIER CEMENT. MINIMUM INSULATION THICKNESS FOR EXTERIOR PIPING SHALL BE 2 INCHES. COVER WITH STAINLESS STEEL JACKET WITH SEAMS LOCATED ON BOTTOM SIDE OF HORIZONTAL PIPING.
1. BUTT STRIPS LINED WITH SEALING COMPOUND SHALL PROVIDE THE CIRCUMFERENTIAL, WEATHERPROOF JOINT SEAL. SNAP STRAPS SHALL BE SECURED WITH A 3/8" WIDE STAINLESS STEEL BAND APPLIED WITH A BONDING AGENT.
2. PRIOR TO APPLYING THE STAINLESS STEEL JACKET, THE PIPING INSULATION SHALL BE WATERPROOFED BY COMPLETELY COATING IT WITH A PRODUCT SUCH AS "INSULKOTE" AS MANUFACTURED BY SCHULLER, OR APPROVED EQUAL. BEFORE APPLYING THE COATING, INSULKOTE PRIMER, OR OTHER PRIMER RECOMMENDED BY THE MANUFACTURER, MUST BE APPLIED. ADDITIONALLY, AN OPEN MESH GLASS CLOTH, TIGHTLY STRETCHED, SHALL BE INSTALLED OVER THE INSULATION PRIOR TO APPLYING THE COATING. APPLY THE COATING TO A TOTAL THICKNESS OF 1/4", IN TWO COATS. THE FIRST COAT SHALL BE 1/8" THICK, OR SLIGHTLY LESS, BUT SHALL COMPLETELY COVER THE MESH. THE FINAL COAT MUST BE APPLIED WHILE THE FIRST COAT IS STILL TACKY AND SLIGHTLY WET TO THE TOUCH. WHEN FINISHED, ALL MESH MUST BE COMPLETELY COVERED. FOLLOW MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS FOR APPLICATION AND INSTALLATION OF THE WEATHER PROTECTIVE COATING SYSTEM.

PIPE HANGERS AND SUPPORTS

FURNISH AND INSTALL ALL HANGERS, GUIDES AND SUPPORTS TO PROPERLY SUPPORT AND RETAIN PIPING TO CONTROL EXPANSION, CONTRACTION, ANCHORAGE, DRAINAGE AND TO PREVENT SWAY AND VIBRATION. PIPING SHALL BE SUPPORTED AS TO NOT PLACE A STRAIN ON VALVES AND EQUIPMENT.

SUSPENDED PIPING SHALL BE SUPPORTED BY ADJUSTABLE CLEVIS TYPE HANGERS. PIPING 2" IN SIZE AND SMALLER MAY BE SUPPORTED USING ADJUSTABLE BANK OR SWIVEL RING HANGERS. NO PERFORATED STRAP HANGERS WILL BE PERMITTED.

TRAPEZE HANGERS MAY BE USED FOR MULTIPLE RUNS OF PIPING AND SHALL CONSIST OF A CHANNEL WITH ADJUSTABLE HANGER RODS. ALL PIPE THUS SUPPORTED SHALL HAVE INDIVIDUAL ROLLER SUPPORT. HANGER SPACING SHALL BE DETERMINED BY THE SMALLEST PIPE SUPPORTED.

PIPE SIZE INCHES	MAX. SUPPORT SPACING FEET	DIAMETER INCHES
1/2 TO 1–1/4	6	3/8
1–1/2 TO 2	10	3/8
2–1/2 TO 3	10	1/2
4 TO 6	12	5/8

FOR HORIZONTAL ROOF MOUNTED PIPING, PROVIDE SUPPORTS A BOTH SIDES OF EACH ELEBOW AND WHERE PIPE CHANGES DIRECTION FROM HORIZONTAL TO VERTTICAL. THESE ARE IN ADDITION TO SUPPORTS SPACED AS DESCRIBED ABOVE.

19. MISCELLANEOUS HYDRONIC SPECIALTIES

a. THERMOMETERS: THERMOMETER SHALL BE ADJUSTABLE ANGLE, WITH RED APPEARING MERCURY, LENS FRONT TUBE, CAST ALUMINUM CASE WITH ENAMEL FINISH, CAST ALUMINUM ADJUSTABLE JOINT WITH POSITIVE LOCKING DEVICE AS MANUFACTURED BY TAYLOR OR APPROVED EQUAL.
b. STRAINERS: STRAINER TO BE SAME SIZE AS PIPING, WITH SCREWED BRASS OR IRON BODY FOR 175 PSIG WORKING PRESSURE, Y PATTERN WITH 1/32 INCH STAINLESS STEEL PERFORATED SCREEN AND VALVED BLOWOFF (CAP END OF BLOWOFF PIPE). STRAINER SHALL BE AS MANUFACTURED BY SARCO, OR EQUAL.
c. AUTOMATIC AIR VENTS: PROVIDE AUTOMATIC AIR VENTS AT HIGH POINTS IN PIPING SYSTEM AND IN OTHER LOCATIONS AS INDICATED ON THE DRAWINGS, OR REQUIRED FOR PROPER OPERATION. AUTOMATIC AIR VENTS SHALL BE #67, AS MANUFACTURED BY BELL & GOSSETT, OR APPROVED EQUAL.
d. FLOW METER SHALL BE DWYER MODEL HF, OR AN EQUIVALENT PRODUCT OF ANOTHER MANUFACTURER, WITH A FLOW RANGE OF 2–15 GPM. MODEL SHALL BE SELECTED FOR COMAPTIBILTY WITH WATER/PROPYLENE GLYCOL MIXTURE. PROVIDE PIPE SIZE REDUCER/INCREASER AS NECESSARY FOR INSTALLATION.

20. AUTOMATIC TEMPERATURE CONTROL

DESCRIPTION OF WORK

A. PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, AND SERVICES NECESSARY FOR, AND INCIDENTAL TO, THE FURNISHING AND INSTALLATION OF AUTOMATIC TEMPERATURE CONTROL SYSTEM COMPONENTS AND ACCESSORIES NECESSARY AND/OR REQUIRED FOR THE COMPLETE EXECUTION OF WORK FOR THIS PROJECT, AS REQUIRED BY THE SCHEDULES, DRAWINGS, OPERATING SEQUENCES AND/OR AS SPECIFIED HEREIN.

B. THE AUTOMATIC TEMPERATURE CONTROL SYSTEM AND ITS ASSOCIATED COMPONENTS SHALL BE FULLY COMPATIBLE WITH THE EXISTING CARRIER BUILDING MANAGEMENT SYSTEM.

C. INCLUDE AS PART OF WORK OF THIS PROJECT ALL LABOR, MATERIALS AND EQUIPMENT REQUIRED FOR FURNISHING AND INSTALLING CONNECTIONS TO, AND INTEGRATING WITH, THE EXISTING BUILDING MANAGEMENT SYSTEM, AC–1 (LINAC VAULT AC UNIT) AND EF–1 LINAC VAULT EXHAUST FAN. THIS INCLUDES, BUT IS NOT LIMITED TO, FURNISHING AND INSTALLING POWER SUPPLIES, EXPANSION CARDS, EXPANSION PANELS, WIRING, PROGRAMMING, CONTROLS, SENSORS, CONTROLLERS, CALIBRATING AND COMMISSIONING OF CONTROLS ALONG WITH OTHER ITEMS REQUIRED TO ACCOMPLISH THIS TASK

D. THE BMS CONTRACTOR IS RESPONSIBLE FOR FURNISHING AND INSTALLATION OF ALL AUTOMATIC TEMPERATURE CONTROL SYSTEM COMPONENTS AND ACCESSORIES REQUIRED TO PROVIDE THE SPECIFIED OPERATING SEQUENCES. WORK INCLUDES PROVIDING LABOR, MATERIAL AND EQUIPMENT FOR INSTALLATION OF ALL POWER AND CONTROL WIRING, SENSORS, TRANSMITTERS, THERMOSTATS, CONTROLLERS, OPERATORS, CONTROL DEVICES, SWITCHES, PANELS AND ALL OTHER ITEMS REQUIRED TO PROVIDE THE CONDITIONS, LIMITS, SAFETY CONTROLS, CYCLES AND OPERATING SEQUENCES SPECIFIED.

E. THE DRAWINGS AND SPECIFICATIONS ARE COMPLEMENTARY TO ONE ANOTHER, MEANING THAT WHAT IS CALLED FOR ON ONE IS TO BE CONSIDERED CALLED FOR IN BOTH. WHERE CONFLICTS EXIST BETWEEN THE SPECIFICATIONS AND/OR DRAWINGS, THE MORE STRINGENT REQUIREMENT SHALL APPLY.

F. THE BMS CONTRACTOR SHALL BE RESPONSIBLE FOR FIELD VERIFICATION OF SITE CONDITIONS AND FOR GATHERING ALL NECESSARY FIELD DATA FOR ALL ITEMS TO BE PROVIDED UNDER THIS CONTRACT PRIOR TO SUBMITTING HIS BID.

G. WHERE WORK SPECIFIED UNDER OTHER SECTIONS OF THESE SPECIFICATIONS CONNECTS TO EQUIPMENT OR SYSTEMS, WHICH IS A PART OF THIS SECTION, PROVIDE PROPER CONNECTION(S) TO SUCH EQUIPMENT INCLUDING TRADE COORDINATION.

H. ADDITIONAL REQUIREMENTS. WORK UNDER THIS CONTRACT SHALL ALSO INCLUDE:

1. PROVIDING ACCESS DOORS OR OTHER APPROVED MEANS OF ACCESS THROUGH DUCTS AND/BUILDING CONSTRUCTION FOR SERVICING OF CONTROL EQUIPMENT.
2. PROVIDING ALL REQUIRED RELAYS ALONG WITH RELATED CONTROLS AND OTHER DEVICES REQUIRED TO INTERFACE EQUIPMENT WITH FIRE ALARM SYSTEM TO PROVIDE SHUTDOWN OF , ALL ROOFTOP HVAC UNITS AND EXHAUST FANS. A DRY CONTACT CLOSURE SIGNAL WILL BE PROVIDED TO INITIATE SHUTDOWN.
3. CONTROL AND POWER WIRING AS REQUIRED AND AS FOLLOWS:
   a) ALL CIRCUITS WHICH ARE ACTIVATED OR DEACTIVATED BY A TEMPERATURE CONTROL SYSTEM COMPONENT, SUCH AS, BUT NOT LIMITED TO, SAFETY AND/OR PROTECTIVE DEVICES, PRESSURE–ELECTRIC SWITCHES, ELECTRIC–PRESSURE SWITCHES, EQUIPMENT INTERLOCKS, ETC.
   b) ALL CIRCUITS WHICH ACTIVATE OR DEACTIVATE TEMPERATURE CONTROL COMPONENTS.
   c) ALL TEMPERATURE CONTROL PANEL WIRING TO TERMINAL STRIPS AND FROM TERMINAL STRIPS TO ALL DEVICES AND EQUIPMENT.
   d) ALL CONTROL WIRING TO MOTOR STARTERS OF UNITS BEING CONTROLLED BY THE AUTOMATIC TEMPERATURE CONTROL SYSTEM.
   e) WIRING OF ALL ELECTRO–MECHANICAL AND ELECTRONIC DEVICES REQUIRED TO PROVIDE THE REQUIRED OPERATING SEQUENCE OR FUNCTION.
   f) WIRING OF ALL DEVICES ASSOCIATED WITH THE AUTOMATIC TEMPERATURE CONTROL SYSTEM, UNLESS OTHERWISE NOTED.
   g) 120 VAC POWER WIRING TO CONTROL CIRCUITS. THE ATC CONTRACTOR SHALL UTILIZE A LICENSED ELECTRICIAN TO PERFORM ALL 120 VAC WIRING.

INSTALLATION

WIRING

A. UNLESS NOTED OTHERWISE, ALL ELECTRICAL WIRING (INCLUDIG, BUT NOT LIMITED TO, POWER, CONTROL, DATA AND INTERLOCK WIIRNG) REQUIRED TO OPERATE. MONITOR, INTERCONNECT THE COMPONENTS OF THE CONTROL SYSTEM SHALL BE FURNISHED AND INSTALLED BY THE ATC CONTRACTOR. PERFORM ALL WIRING IN ACCORDANCE WITH THE REQUIREMENTS LISTED BELOW, APPLICABLE CODE REQUIREMENTS AND THE NEC.
B. POWER WIRING REQUIRED FOR CONTROLLERS AND CONTROL PANELS SHALL BE FURNISHED AND INSTALLED BY THE ATC CONTRACTOR. POWER FOR THESE COMPONENTS SHALL BE DEDICATED POWER CIRCUITS FOR THE EXPRESS USE OF THE INDIVIDUAL CONTROLLER OR CONTROL PANEL. PROVIDE ALL CIRCUIT BREAKERS AND OTHER ELECTRICAL COMPONENTS REQUIRED FOR THIS DEDICATED CIRCUIT.
C. ALL LINE VOLTAGE WIRING SHALL BE INSTALLED WITHIN EMT CONDUIT. CONDUIT SHALL BE ADEQUATELY SUPPORTED IN ACCORDANCE WITH LOCAL CODES AND DIVISION 16.
D. ALL LOW VOLTAGE WIRING SHALL BE INSTALLED WITHIN EMT CONDUIT, EXCEPT WHEN RAN IN CEILING SPACES. LOW VOLTAGE WIRING INSTALLED IN CEILING SPACES MUST BE PLENUM RATED WIRING IN ACCORDANCE WITH LOCAL CODES. ALL WIRING IN CEILING SPACES MUST BE PROPERLY SUPPORTED TO THE BUILDING SO AS NOT TO DROOP. INSTALL WIRING AS CLOSE TO THE DECK AS POSSIBLE TO AVOID DAMAGE FROM OTHER TRADES OR MATERIALS.
E. ALL CONDUIT AND WIRING SHALL BE INSTALLED IN PARALLEL LINES TO THE BUILDING STRUCTURE, CORRIDORS, AND HALLWAYS.
F. COMMUNICATION WIRING SHALL BE INSTALLED USING SHIELDED CABLE. THE COMMUNICATION NETWORK WIRING SHALL BE CLEARLY MARKED WITH A SPECIFIC COLOR CODE. COMMUNICATION WIRING SHALL NOT BE INSTALLED NEAR NOISE PRODUCING EQUIPMENT, SUCH AS BALLASTS, MAGNETIC STARTERS, ETC.
G. ALL ANALOG INPUTS AND ANALOG OUTPUTS SHALL BE WIRED USING SHIELDED CABLE.
H. ALL DIGITAL OUTPUTS SHALL BE WIRED USING 18 GAUGE STRANDED WIRE.
I. ALL WIRING IN MECHANICAL ROOMS, WALLS SHALL BE INSTALLED IN EMT CONDUIT. CONCEALED CONDUIT AND WIRING IS REQUIRED IN ALL FINISHED SPACES.

EQUIPMENT

A. ALL COMPONENTS SHALL BE INSTALLED IN PROTECTIVE ENCLOSURES. ALL WIRING WITHIN THE DDC ENCLOSURE SHALL BE EITHER NUMBER CODED OR COLOR CODED. BOTH THE ENCLOSURE AND THE CONTROLLER SHALL BE PROPERLY GROUNDED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATION. DOCUMENTATION SHALL BE FIRMLY ATTACHED TO THE ENCLOSURE WITHIN A PLASTIC ENVELOPE. DOCUMENTATION SHALL STATE POINT–TO–POINT TERMINATIONS DETAIL, DESCRIPTION OF EACH INDIVIDUAL POINT, LOCATION OF POWER SOURCE FOR THE CONTROLLER AND ID NUMBER OR ADDRESS WITHIN THE NETWORK.
B. ALL DDC CONTROLLERS SHALL BE MOUNTED ON WALLS WITHIN EQUIPMENT ROOMS, CUSTODIAL CLOSETS OR ELECTRICAL ROOMS. ONLY APPLICATION–SPECIFIC CONTROLLERS (ASCS) FOR VAV BOXES, HEAT PUMPS, UNIT VENTILATORS, ROOFTOP UNITS OR PACKAGE UNITS MAY BE MOUNTED ON THE EQUIPMENT.

SENSING DEVICE INSTALLATION

A. SPACE SENSORS/TRANSMITTERS: PROVIDE AS REQUIRED BY THE SEQUENCES AND SHOWN ON THE DRAWINGS. MOUNT AT 60 INCHES ABOVE FINISHED FLOOR. WIRE TO RESPECTIVE PUC OR ASC TO PROVIDE STAND–ALONE CONTROL.
B. DUCT MOUNTED SENSORS/TRANSMITTERS: PROVIDE AS REQUIRED BY TILE SEQUENCES. AVERAGING TYPE SENSORS SHALL BE SUPPLIED FOR ALL MIXED AIR AND DISCHARGE AIR LOCATIONS. SERPENTINE ACROSS THE DUCT OPENING AT EVEN INCREMENTS AND PROVIDE PROPER FASTENING.

CONTROLLED DEVICES

A. DAMPERS: DAMPERS SHALL BE INSTALLED BY THE HVAC CONTRACTOR, AND ANY LINKAGE ASSEMBLY SHALL BE PERFORMED BY THE ATC CONTRACTOR. DAMPERS SHALL OPERATE SMOOTHLY THROUGHOUT THEIR ENTIRE STROKE.
B. ACTUATORS: ALL ACTUATORS SHALL BE INSTALLED BY THE ATC CONTRACTOR, UNLESS SPECIFIED OTHERWISE. ALL POWER WIRING SHALL BE THE RESPONSIBILITY OF THE CONTROLS CONTRACTOR.

OPERATING SEQUENCES

PROVIDE ALL LABOR, MATERIALS, EQUIPMENT, AND SERVICES NECESSARY FOR, AND INCIDENTAL TO, THE FURNISHING AND INSTALLATION OF AUTOMATIC TEMPERATURE CONTROL SYSTEM COMPONENTS AND ACCESSORIES NECESSARY AND/OR REQUIRED FOR THE COMPLETE EXECUTION OF WORK FOR THIS PROJECT, AS REQUIRED BY THE SCHEDULES, DRAWINGS, OPERATING SEQUENCES AND/OR AS SPECIFIED HEREIN.

HVAC–1 SEQUENCE OF OPERATION

THE VAULT HVAC SYSTEM SHALL OPERATE, UNDER ITS OWN CONTROLS TO MAINTAIN THE REQUIRED SPACE TEMPERATURE (70 DEGREES F, ADJUSTABLE) IN THE LINAC VAULT. HOWEVER THE AC UNITS CONTROLS SHALL BE CONNECTED TO THE BMS IN ORDER TO ADJUST SPACE TEMPERATURE, MONITOR AND PROVIDE ALARMS FOR TEMEPERATURE EXCURSIONS. PROVIDE TEMPERATURE SENSORS, ALONG WITH ALLL RELATED ACCESSORIES, IN THE LINAC VAULT AS NECESSSARY TO CONTROL AND MONITOR SPACE CONDITIONS, AS WELL AS ISSUE HIGH AND LOW TEMPERATURE ALARMS TO THE BMS.

SMOKE DETECTOR

PROVIDE DUCT MOUNTED SMOKE DETECTOR IN THE RETURN DUCT OF AC–1 WHEN SMOKE DETECTOR IS ACTIVATED, IT SHALL STOP HVAC–1 AND SEND AN ALARM THROUGH THE FIRE ALARM SYSTEM.

EXHAUST FAN CONTROL:

FAN SHALL OPERATE CONTINUOUSLY. EXHAUST FAN OPERATION SHALL BE MONITORED THROUGH THE BMS. IF A FAN IS SCHEDULED TO OPERATE AND FAILS TO START, OR RUN, AN ALARM SHALL BE SENT THROUGH THE BMS.

RTU–1 OPERATING SEQUENCE

1. THE AC SYSTEM SHALL OPERATE CONTINUOUSLY TO MAINTAIN REQUIRED TEMPERATURE WITHIN THE LINAC VAULT.

2. SPACE TEMPERATURE SHALL BE CONTROLLED THROUGH THE UNITS INTERNAL CONTROLS AND THE WALL MOUNTED CONTROLLER FURNISHED WITH THE SYSTEM. IN ADDITION VAULT SPACE TEMPERATURE SHALL BE MONITORED AND CONTROLLED THROUH THE BMS.

3. ALARM CONDITION AS REPORTED BY THE WALL MOUNTED CONTROLLER SHALL BE REPORTED TO THE BMS.

M.E.P. ENGINEER
SJM Associates Consulting Engineers
58 Brookside Drive
West Shokan, New York 12494
Ph. (845) 657-2072 Fax (845) 657-2073

optimus ARCHITECTURE
187 E. Market Street
Suite 180
Rhinebeck NY 12572
845 876 8202 phone
845 876 8112 fax

SCALE	DATE	DRAWN BY:	CHKED. BY:
AS NOTED	12/03/20	SJM	SJM

#	DATE	REVISIONS
	12/03/20	ISSUED FOR BID, PERMIT AND CONSTRUCTION

PROJECT PROJECT #: 2023
Linear Accelerator Replacement for:
VASSAR BROTHERS MEDICAL CENTER
45 READE PLACE
POUGHKEEPSIE, NEW YORK 12601

DRAWING TITLE
HVAC SPECIFICATIONS

DRAWING NUMBER:
M501