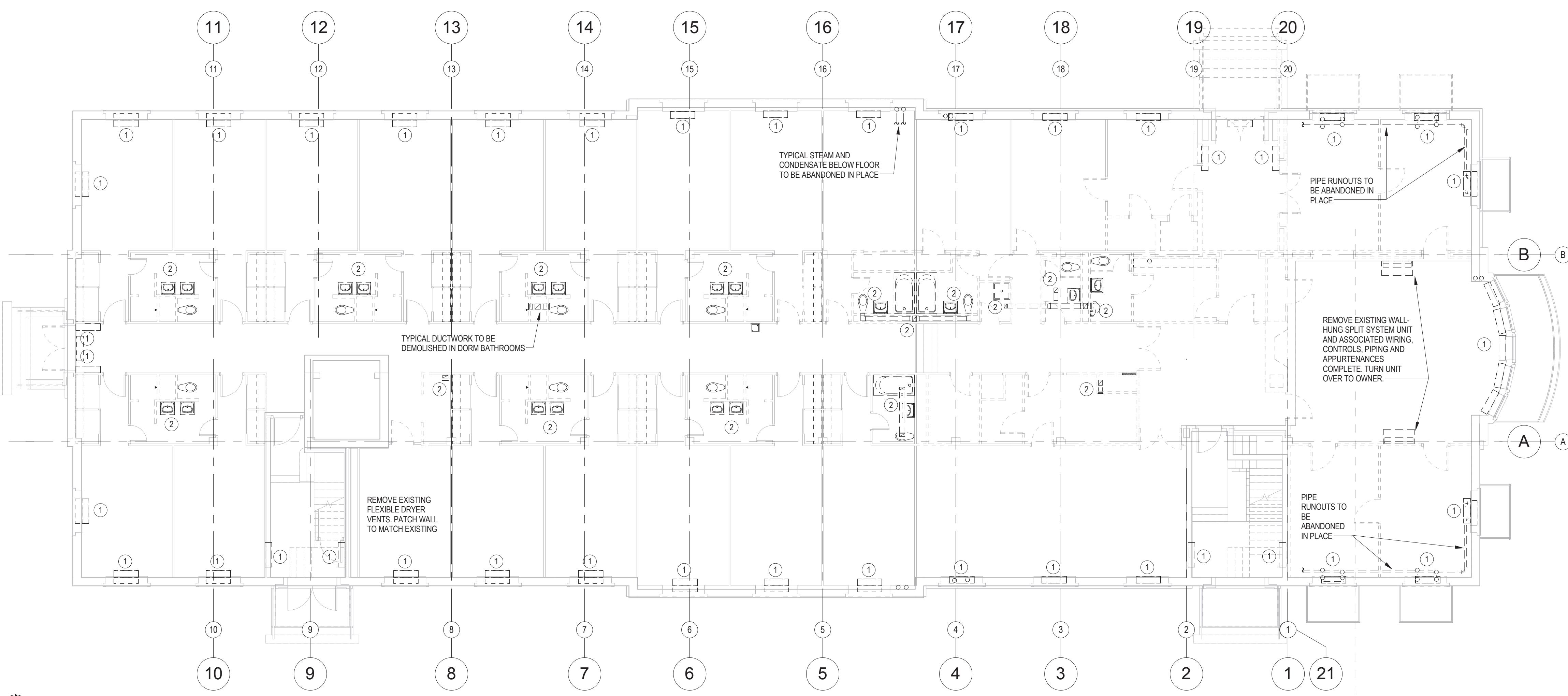


**RENOVATION OF THREE RESIDENCE HALLS
DRAPER HALL**
RADFORD UNIVERSITY
RADFORD, VIRGINIAProject Code
VMDO Project Number217-17565-002
1115**FIRST FLOOR DEMOLITION NOTES:**

(NOT ALL NOTES MAY APPLY TO THIS SHEET)

1. REMOVE EXISTING STEAM CONVECTOR AND ASSOCIATE CONTROLS AND APPURTENANCES COMPLETE. WHERE CONVECTORS ARE REMOVED FROM THE WALL, REMOVE DUCTWORK AND EXISTING PIPE RUNOUTS TO FINISH WHERE CEILINGS BELOW TO REMAIN. PIPE RUNOUTS TO CONVECTORS SHALL BE ABANDONED IN PLACE. OTHERWISE, REMOVE PIPE RUNOUTS. VERTICAL PIPES IN WALLS TO REMAIN SHALL BE ABANDONED IN PLACE. PIPES IN WALLS TO BE DEMOLISHED SHALL BE REMOVED.
2. REMOVE ALL VERTICAL AND HORIZONTAL DUCTWORK AND ASSOCIATED GRILLES, REGISTERS, DAMPERS, SUPPORTS AND APPURTENANCES COMPLETE. PATCH WALLS, WALLS AND FLOORS TO MATCH EXISTING.


FIRST FLOOR PLAN - HVAC DEMOLITION
SCALE: 1/8" = 1'-0"

Note: Asbestos containing materials shall not be used on the project.

Asbestos Disclosure Statement

An asbestos inspection was performed and ACM is suspected as noted in the specification. The asbestos inspection report is included as an appendix to the project specification. Asbestos-containing building material shall not be disturbed in this work except where it is required for demolition or removal. If asbestos is disturbed, the contractor shall have the ACM removed by a licensed asbestos contractor using approved procedures as specified. The ACM that is to remain and the new non asbestos-containing material shall be labeled according to the asbestos statement contained in the specification. Areas where asbestos was abated, areas where asbestos was left in place, areas where asbestos was encapsulated, and areas where ACM exist but were left in place. The General Contractor shall review and certify the locations where ACM was abated, areas where ACM was encapsulated and areas where ACM was left in place as marked on the record drawings and will provide the drawings to the General Contractor.

Lead Material Disclosure

An inspection to identify lead containing or coated building components has been conducted and can be found in the project specifications. This report is provided for the contractor's use and may not be all inclusive. It is the contractor's responsibility to comply with all Virginia Occupational Safety and Health (VOSH) regulations as they pertain to employee exposures to lead. All lead and lead-coated building components shall be recycled to the extent possible.

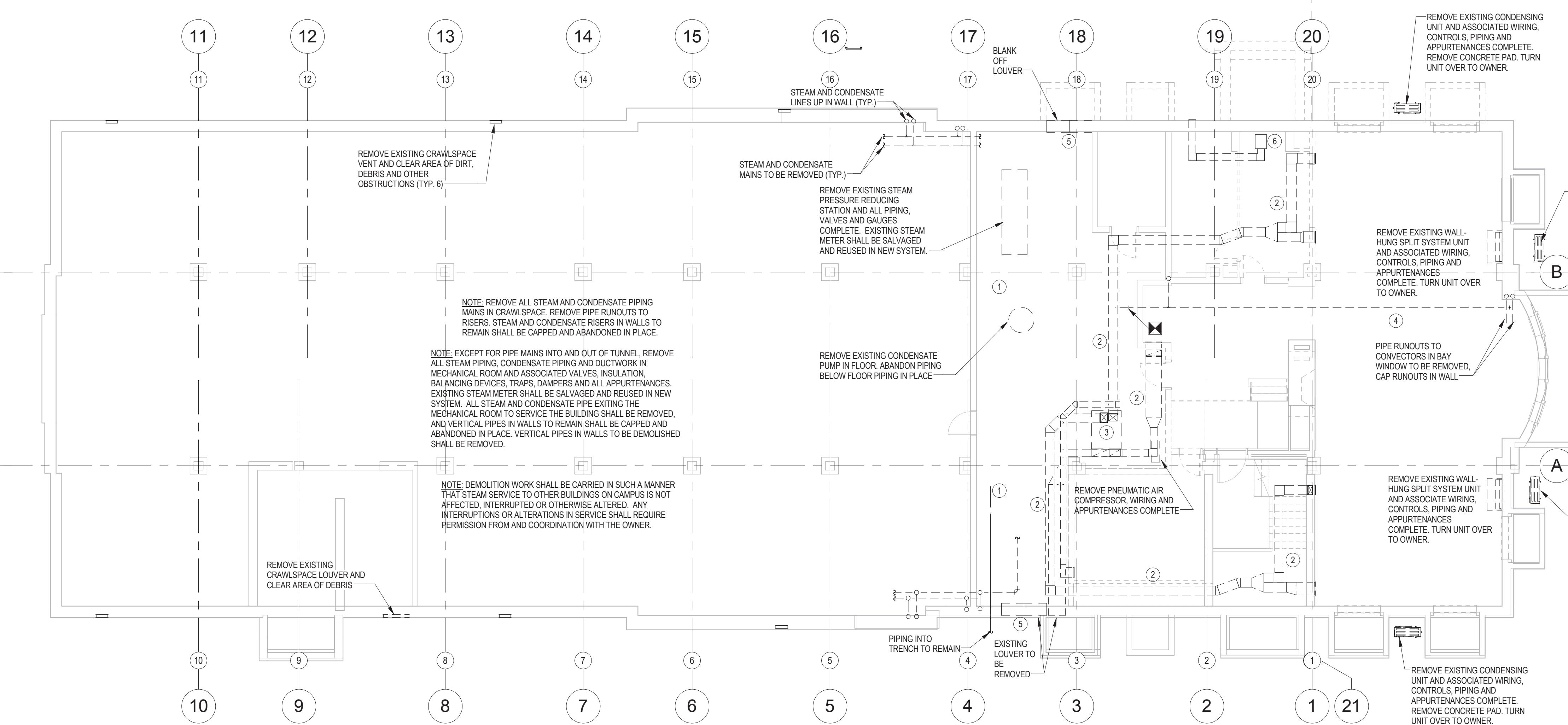
Checked By
RCHDrawn By
PLH

Note: Modifications to the bid documents that were issued by addenda have been incorporated into these drawings for the convenience of the Contractor. In the event of discrepancies between the originally issued addenda and changes depicted on these drawings, the originally issued addenda shall take precedence.

BASEMENT FLOOR DEMOLITION NOTES:

(NOT ALL NOTES MAY APPLY TO THIS SHEET)

1. EXISTING STEAM AND STEAM CONDENSATE LINES REMAIN. REINSULATE STEAM AND CONDENSATE LINES.
2. REMOVE DUCTWORK AND ASSOCIATED GRILLES, REGISTERS, DAMPERS, SUPPORTS AND APPURTENANCES COMPLETE. PATCH WALL PENETRATIONS TO MATCH NEW OR EXISTING TO REMAIN WALL FINISHES.
3. REMOVE EXISTING HEATING AND VENTILATING UNIT AND ASSOCIATED DUCTWORK, PIPING, CONTROLS, SUPPORTS AND APPURTENANCES COMPLETE.
4. STEAM AND CONDENSATE PIPING IN TRENCH TO BE REMOVED TO POINT OUTSIDE. IN TECHNICAL ROOM, VERTICAL PIPES IN WALLS TO BE REMOVED SHALL BE ABANDONED IN PLACE. VERTICAL PIPES IN WALLS TO BE DEMOLISHED SHALL BE REMOVED, AND RUNOUTS SHALL BE CAPPED BEHIND THE FLOOR.
5. REMOVE WALL-MOUNTED PROPELLER FANS AND ASSOCIATED WIRING, CONTROLS AND APPURTENANCES COMPLETE.
6. REMOVE EXISTING EXHAUST FAN AND ASSOCIATE DUCTWORK, WIRING, CONTROLS AND APPURTENANCES COMPLETE. REMOVE EXTERIOR WALL CAP AND PATCH WALL TO MATCH NEW OR EXISTING TO REMAIN FINISH.


BASEMENT FLOOR PLAN - HVAC DEMOLITION
SCALE: 1/8" = 1'-0"

ISSUES AND REVISIONS	NO. SUBMITTAL	DATE
	BID DOCUMENTS	05.19.14
1	Addendum 1	06.19.14
2	Addendum 2	06.24.14
3	Addendum 3	06.25.14
	CONSTRUCTION SET	05.01.15

BASEMENT AND FIRST FLOOR - MECHANICAL DEMOLITION

GRAPHIC SCALE

0 4' 8' 12'

MD101

RENOVATION OF THREE RESIDENCE HALLS DRAPER HALL

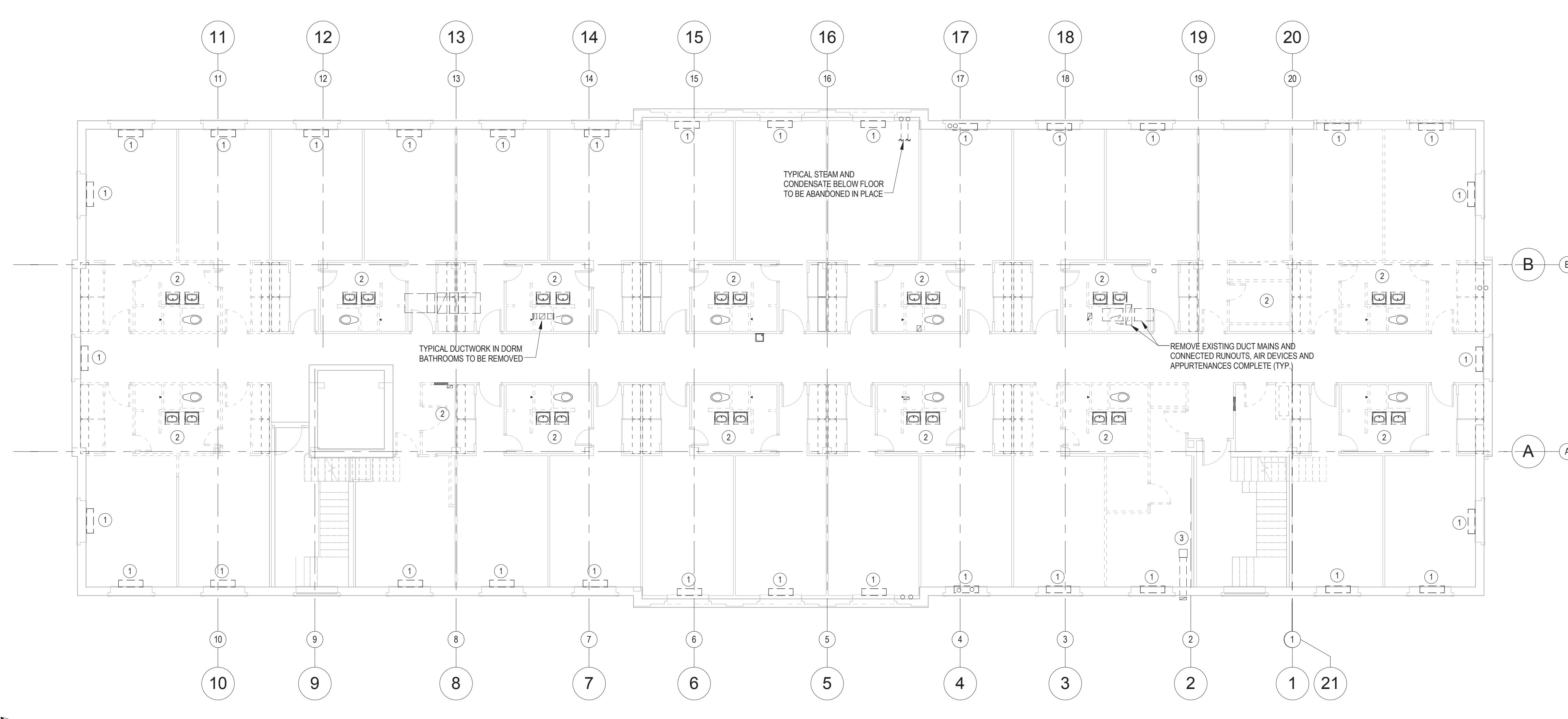
RADFORD UNIVERSITY
RADFORD, VIRGINIA

Project Code 217-17565-002
VMDO Project Number 1115

THIRD FLOOR DEMOLITION NOTES:

(NOT ALL NOTES MAY APPLY TO THIS SHEET)

1. REMOVE EXISTING STEAM CONVECTORS AND ASSOCIATED CONTROLS AND APPURTENANCES COMPLETE. WHERE CONVECTORS ARE RECESSED INTO THE WALL, PATCH WALL TO MATCH NEW OR EXISTING TOE-RAM FINISH. WHERE CEILINGS BELOW ARE TO REMAIN, PIPE RUNOUTS TO CONVECTORS SHALL BE ABANDONED IN PLACE. OTHERWISE, REMOVE PIPE RUNOUTS. VERTICAL PIPES IN WALLS TO REMAIN SHALL BE ABANDONED IN PLACE. PIPES IN WALLS TO BE DEMOLISHED SHALL BE REMOVED.
2. REMOVE ALL VERTICAL AND HORIZONTAL DUCTWORK AND ASSOCIATED GRILLES, REGISTERS, DAMPERS, SUPPORTS AND APPURTENANCES COMPLETE.
3. REMOVE EXISTING CEILING EXHAUST FAN DUCTWORK SHALL BE CAPPED ABOVE CEILING AND ABANDONED IN PLACE. PATCH CEILING TO MATCH EXISTING.



THIRD FLOOR PLAN - HVAC DEMOLITION



SCALE: 1/8" = 1'-0"

Note: Asbestos containing materials shall not be used on the project.

Asbestos Disposal

An asbestos inspection was performed and ACM is suspected as noted in the specifications. The asbestos inspection report is included as an append to the project specifications. Asbestos-containing building material shall not be disturbed in this work except where specifically required and required. Where such actions are required, the contractor shall have ACM removed by an asbestos abatement contractor using approved procedures as specified. The ACM that is to remain and the new non asbestos-containing material shall be labeled accordingly. The asbestos abatement contractor shall mark up the record drawings resulting from its work to include areas where ACM was disturbed and areas where ACM was removed. Areas where ACM exist but were left in place, the General Contractor shall review and certify the locations were ACM was asbestos areas where ACM was encapsulated and areas where ACM was left in place as marked on the record drawings and will provide the drawings to the Architect.

Lead Materials Disposal

An inspection to identify lead containing or coated building components has been conducted and can be found in the project specifications. This report is provided for the contractor's use and may not be all inclusive. It is the contractor's responsibility to comply with all Virginia Occupational Safety and Health (VOSH) regulations as they pertain to employee exposures to lead. All lead and lead-coated building components shall be recycled to the extent possible.

Checked By RCH

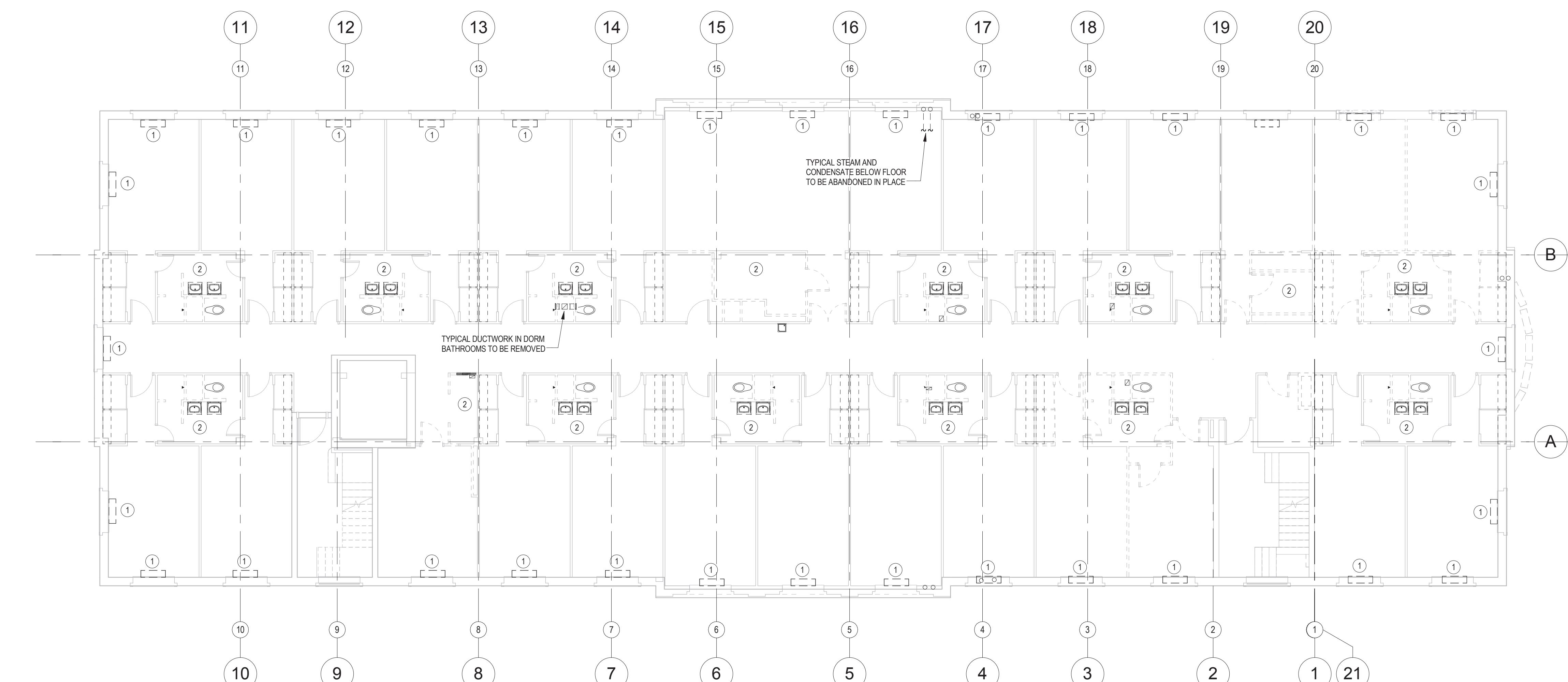
Drawn By PLH

Note: Modifications to the bid documents that were issued by addenda have been incorporated into these drawings for the convenience of the Contractor. In the event of discrepancies between the originally issued addenda and changes depicted on these drawings, the originally issued addenda shall take precedence.

SECOND FLOOR DEMOLITION NOTES:

(NOT ALL NOTES MAY APPLY TO THIS SHEET)

1. REMOVE EXISTING STEAM CONVECTOR AND ASSOCIATED CONTROLS AND APPURTENANCES COMPLETE. WHERE CONVECTORS ARE RECESSED INTO THE WALL, PATCH WALL TO MATCH NEW OR EXISTING TOE-RAM FINISH. WHERE CEILINGS BELOW ARE TO REMAIN, PIPE RUNOUTS TO CONVECTORS SHALL BE ABANDONED IN PLACE. OTHERWISE, REMOVE PIPE RUNOUTS. VERTICAL PIPES IN WALLS TO REMAIN SHALL BE ABANDONED IN PLACE. PIPES IN WALLS TO BE DEMOLISHED SHALL BE REMOVED.
2. REMOVE ALL VERTICAL AND HORIZONTAL DUCTWORK AND ASSOCIATED GRILLES, REGISTERS, DAMPERS, SUPPORTS AND APPURTENANCES COMPLETE.



SECOND FLOOR PLAN - HVAC DEMOLITION



SCALE: 1/8" = 1'-0"

ISSUES AND REVISIONS

NO. SUBMITTAL

BID DOCUMENTS

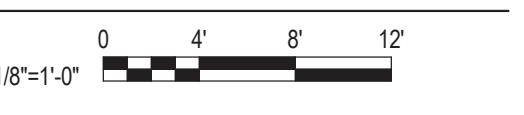
1	Addendum 1	05.19.14
2	Addendum 2	06.19.14
3	Addendum 3	06.24.14

CONSTRUCTION SET 06.25.14

DATE 05.01.15

SECOND AND THIRD FLOOR - MECHANICAL DEMOLITION

GRAPHIC SCALE



MD102



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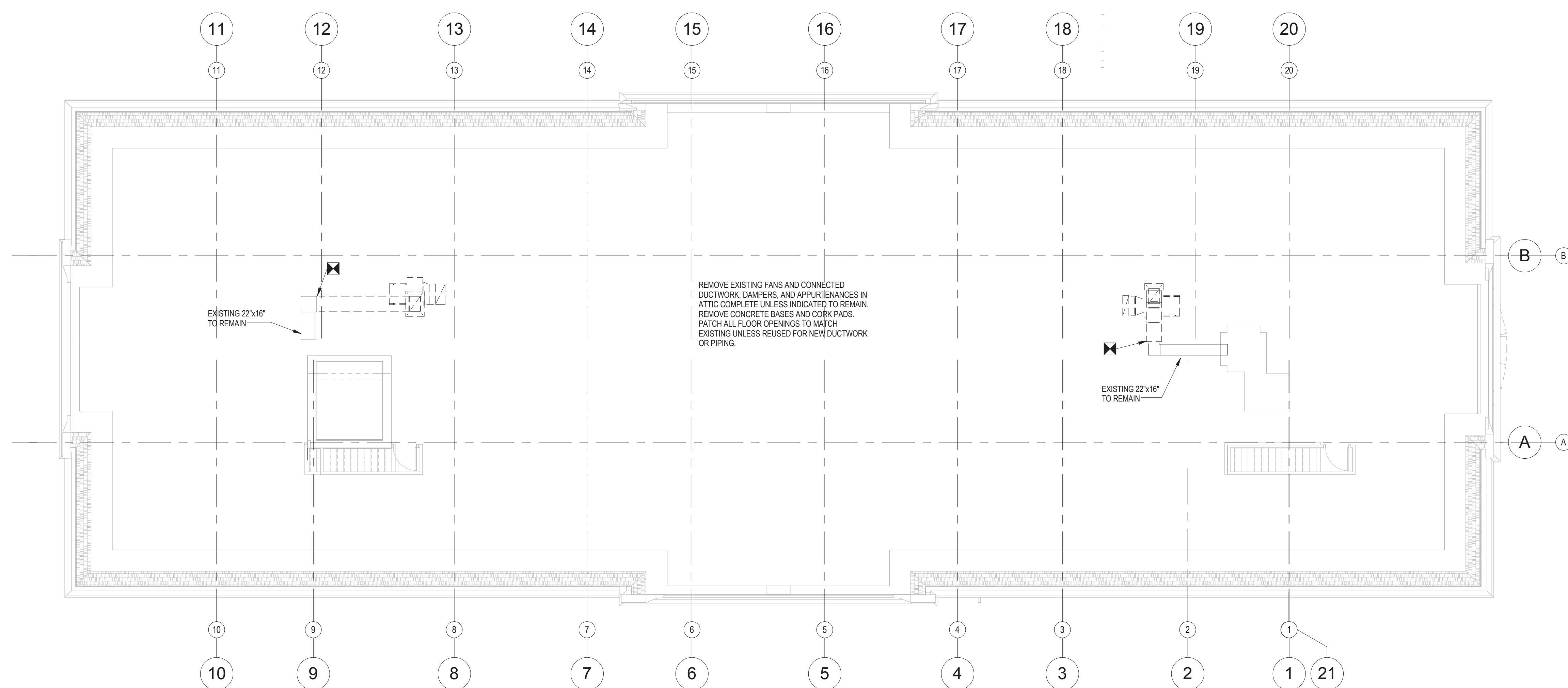
RU

RADFORD
UNIVERSITY

RENOVATION OF THREE
RESIDENCE HALLS
DRAPER HALL

RADFORD UNIVERSITY
RADFORD, VIRGINIA

Project Code 217-17565-002
VMDO Project Number 1115



ATTIC FLOOR PLAN - HVAC DEMOLITION
SCALE: 1/8" = 1'-0"

Checked By RCH
Drawn by PLH

Note: Asbestos containing materials shall not be used on the project.
Asbestos Disclosure Statement
An asbestos inspection was performed and ACM is suspected as noted in the specifications. The asbestos inspection report is included as an appendice to the project specifications. All asbestos containing building material shall not be disturbed in this work except where specifically indicated and required. Where such actions are required, the contractor shall have the ACM removed by a licensed asbestos contractor using approved procedures as specified. The ACM that is to remain and the new non-asbestos-containing building material shall be installed by the General Contractor. The General Contractor shall mark up the record drawings resulting from its work to include areas where asbestos was abated, areas where asbestos was encapsulated, and areas where ACM exist but were left in place. The General Contractor shall review and certify the location of ACM was abated, areas where ACM was encapsulated and areas where ACM was left in place as marked on the record drawings and will provide the drawings to the Architect.

Note: Modifications to the bid documents that were issued by addenda have been incorporated into these drawings for the convenience of the Contractor. In the event of discrepancies between the originally issued addenda and changes depicted on these drawings, the originally issued addenda shall take precedence.



GRAPHIC SCALE - 1/32" = 1'-0"
0 32'-0" 64'-0" 96'-0"

ISSUES AND REVISIONS		
NO.	SUBMITTAL	DATE
1	BID DOCUMENTS Addendum 1	05.19.14 06.19.14
2	Addendum 2	06.24.14
3	Addendum 3	06.25.14
	CONSTRUCTION SET	05.01.15

ATTIC FLOOR PLAN -
MECHANICAL
DEMOLITION

GRAPHIC SCALE
1/8" = 1'-0"
0 4' 8' 12'

MD103



LAWRENCE PERRY & ASSOCIATES
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RENOVATION OF THREE RESIDENCE HALLS DRAPER HALL

RADFORD UNIVERSITY
RADFORD, VIRGINIA

Project Code 217-17565-002
VMDO Project Number 1115

Checked By RCH
Drawn By PLH

Note: Modifications to the bid documents that were issued by addenda have been incorporated into these drawings for the convenience of the Contractor. In the event of discrepancies between the originally issued addenda and changes depicted on these drawings, the originally issued addenda shall take precedence.



GRAPHIC SCALE - 1/32" = 1'-0"
0 32' - 0" 64' - 0" 96' - 0"

HVAC LEGEND	
ABOVE	ABU
ABOVE FINISHED FLOOR	AFF
AIR HANDLING UNIT	AHU
AIR SEPARATOR	AS
ANCHOR	X
BALANCING VALVE	
BELOW	
BELT	BEL
BETWEEN	BET
BOTTOM GRILLE	BG
BOTTOM REGISTER	BR
BUCKET TRAP	[B]
CABINET HEATER	CHE
CAPACITY	CAP
CEILING	CLG
CEILING DIFFUSER	CD
CEILING GRILLE	CG
CEILING REGISTER	CR
CHECK VALVE	
CHILLED WATER PUMP	CWP
CHILLED WATER RETURN PIPE	CWR
CHILLED WATER SUPPLY PIPE	CWS
CIRCUIT SETTER	CS(GPM)
CLEANOUT	CO
CO2 SENSOR	CO2
COMMON	C
CONNECT TO EXISTING	
CUBING COIL CONDENSATE DRAIN PIPE	CCCD
CUBIC FEET PER MINUTE	CFM
DEGREES FAHRENHEIT	°F
DAMPER	DIA
DIRECTION OF FLOW	
DIRECTION OF SLOPE DOWN	
DOMESTIC COLD WATER PIPE	CW
DOWN	DN
DRAIN PIPE	
DRIP STATION	DS
DRY BULB	DB
DUCT SLOPE DOWN	
DUCT SLOPE UP	
EACH	
ENTERING AIR TEMPERATURE	EA
ENTERING WATER TEMPERATURE	EAT
EXPANSION TANK	EWT
FEET	FT
FEET PER MINUTE	FPM
FIRE DAMPER	FD
FIRESMOKE DAMPER	FSO
FLASH	FS
FLAME	
FLEXIBLE DUCT CONNECTION	
FLEXIBLE PIPE CONNECTION	
FLOAT & THERMOSTATIC TRAP	
FLOOR	FL
FROM	FR
GALLONS	GAJ
GALLONS PER MINUTE	GPM
GLOBE VALVE	GRV
HEATING WATER PUMP	HWP
HEATING WATER SUPPLY PIPE	HWR
HEATING WATER RETURN PIPE	HWS
HIGH PRESSURE CONDENSATE RETURN PIPE	HPS
HIGH PRESSURE STEAM SUPPLY PIPE	HPS
HIGH SIDEWALL GRILLE	HSWG
HIGH SIDEWALL REGISTER	HSR
HORIZONTAL PAN-COIL UNIT	HPC
HORIZONTAL UNIT HEATER	HUH
HORSEPOWER	HP
HOUR	HR
HUMIDISTAT	
INDOOR	IN
INLINE EXHAUST FAN	IEF
KILOWATT	KW
LEAVING AIR TEMPERATURE	LAT
LEAVING WATER TEMPERATURE	LWT
LOW PRESSURE CONDENSATE PIPE	LPC
LOW PRESSURE STEAM SUPPLY PIPE	LPS
LOUVER	LVR
MAKE-UP AIR ENERGY RECOVERY UNIT	MAU
MANUAL AIR VENT	MAV
MANUAL DAMPER	MD
MOTOR OPERATED DAMPER	MOD
NORMALLY CLOSED	NC
NORMALLY OPEN	NO
OUTDOOR AIR	OA
PIPING ORIENTATION WITH RESPECT	
TO FLOW	
BOTTOM TAKEOFF	
SIDE CONNECTION	
TOP TAKEOFF	
TURN UP OR FROM BELOW	
TURN UP OR DOWN	
TURN UP OR FROM ABOVE	
POUNDS	LBS
POUNDS PER SQUARE INCH GAGE	PSIG
PRESSURE DROP	PD
PRESSURE GAUGE	
PRESSURE REDUCING VALVE	
PRESSURE RELIEF VALVE	
PUMPED CONDENSATE RETURN PIPE	PCR
REFRIGERANT PIPING	R
REMOVE FROM THIS POINT	
RETURN AIR	RA
REVOLVING DOOR	RPM
REVOLVING REVOLVING DOOR	
ROTARY VALVE	
SMOKE DAMPER	SMD
STATIC PRESSURE	SP
STRAINER	
SUPPLY AIR	SA
THERMOMETER	
THERMOSTAT OR TEMPERATURE SENSOR	TSTAT
THOUSAND BTU PER HOUR	MBH
THREE-SPEED FAN SWITCH	(S)
THREE-WAY CONTROL VALVE	
TOP GRILLE	TG
TOP REGISTER	TR
TWO-WAY CONTROL VALVE	
UNION	
VENT PIPE	V
VERTICAL FAN-COIL UNIT	VFC
WET BULB	WB

BUILDING LOAD SUMMARY

COOLING	
SENSIBLE LOAD	= 58 TONS
LATENT LOAD	= 22 TONS
TOTAL LOAD	= 80 TONS
VENTILATION LOAD	= 16 TONS
INSTALLED COOLING CAPACITY (INCLUDES SPLIT SYSTEMS AND SUM OF CHILLED WATER COIL CAPACITIES)	= 102 TONS

HEATING	
BUILDING (TRANSMISSION + INFILTRATION)	= 564 MBH
VENTILATION	= 312 MBH
DOMESTIC HOT WATER	= 2135 MBH
TOTAL	= 3011 MBH
INSTALLED STEAM SYSTEM CAPACITY (5100 LBSHR)	= 4857 MBH
NOTE: BUILDING TRANSMISSION LOAD THROUGH WALLS FOR HEATING (CALCULATED USING U-VALUE OF WALL AND 70 DEG. F DELTA T (0 F TO 70 F). VENTILATION HEATING LOAD WAS CALCULATED WITH NO ENERGY RECOVERY AND A 70 DEG. DELTA T.	

HVAC LEGEND AND NOTES

HVAC DEMOLITION NOTES:

- THE CONTRACTOR SHALL REMOVE OR ALTER AS NECESSARY ALL EXISTING PIPING, EQUIPMENT, EQUIPMENT FOUNDATIONS, DUCTWORK AND APPURTENANCES THAT ARE NOT REQUIRED FOR THE NEW SYSTEM. CONTRACTOR SHALL VISIT THE SITE TO DETERMINE THE SCOPE OF THIS WORK AND VERIFY EXISTING CONDITIONS PRIOR TO SUBMITTING BIDS. REPORT ANY DISCREPANCIES BETWEEN PLANS AND ACTUAL FIELD CONDITIONS TO THE OWNER AND ENGINEER PRIOR TO THE COMMENCEMENT OF DEMOLITION WORK.
- THE PURPOSE OF THE DEMOLITION DRAWINGS IS TO GENERALLY SHOW THE EXISTING SYSTEMS AND EQUIPMENT TO BE REMOVED. CONSEQUENTLY, NOT ALL PIPING, EQUIPMENT, DUCTWORK, SUPPORTS AND APPURTENANCES TO BE REMOVED HAVE BEEN SHOWN ON THE DRAWINGS.
- EXISTING EQUIPMENT SHALL BE TURNED OVER TO THE OWNER, UNLESS DIRECTED OTHERWISE AND LOCATED AS DIRECTED BY THE OWNER. ALL OTHER ITEMS TO BE REMOVED SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND REMOVED FROM THE PREMISES.
- INSULATION ON EXISTING PIPING THAT IS DAMAGED OR REMOVED DUE TO THE DEMOLITION WORK SHALL BE REPLACED AND SEALED AS REQUIRED.
- EXISTING STEAM AND STEAM CONDENSATE MAINS IN MECHANICAL ROOM TO/FROM THE STEAM TUNNELS SHALL REMAIN AND BE REINSULATED.
- CONTRACTOR SHALL TAKE PRECAUTIONS DURING DEMOLITION WORK TO ENSURE THAT THE MODIFICATION OF ANY EXISTING STEAM OR CONDENSATE PIPING DOES NOT INTERRUPT OR IN ANY WAY AFFECT STEAM SERVICE TO OTHER PORTIONS OF CAMPUS WITHOUT PRIOR COORDINATION WITH OTHER TRADES THAT ARE SERVING FROM THE MAINS THAT SERVE OTHER BUILDINGS ON CAMPUS SHALL NOT BE REMOVED OR MODIFIED.
- WHERE EXISTING PIPING, DUCT OR WIRING PENETRATING WALLS AND/OR FLOORS IS REMOVED, WALL AND/OR FLOOR SHALL BE REPAVED AND INFILLED TO MATCH ADJACENT AREAS.

COORDINATION NOTES:

- CAREFULLY COORDINATE ALL DUCTWORK, PIPING AND APPURTENANCES IN CHASES WITH NEW AND EXISTING PLUMBING PIPING, SPRINKLER PIPING, ELECTRICAL, STRUCTURE AND OTHER TRADES.

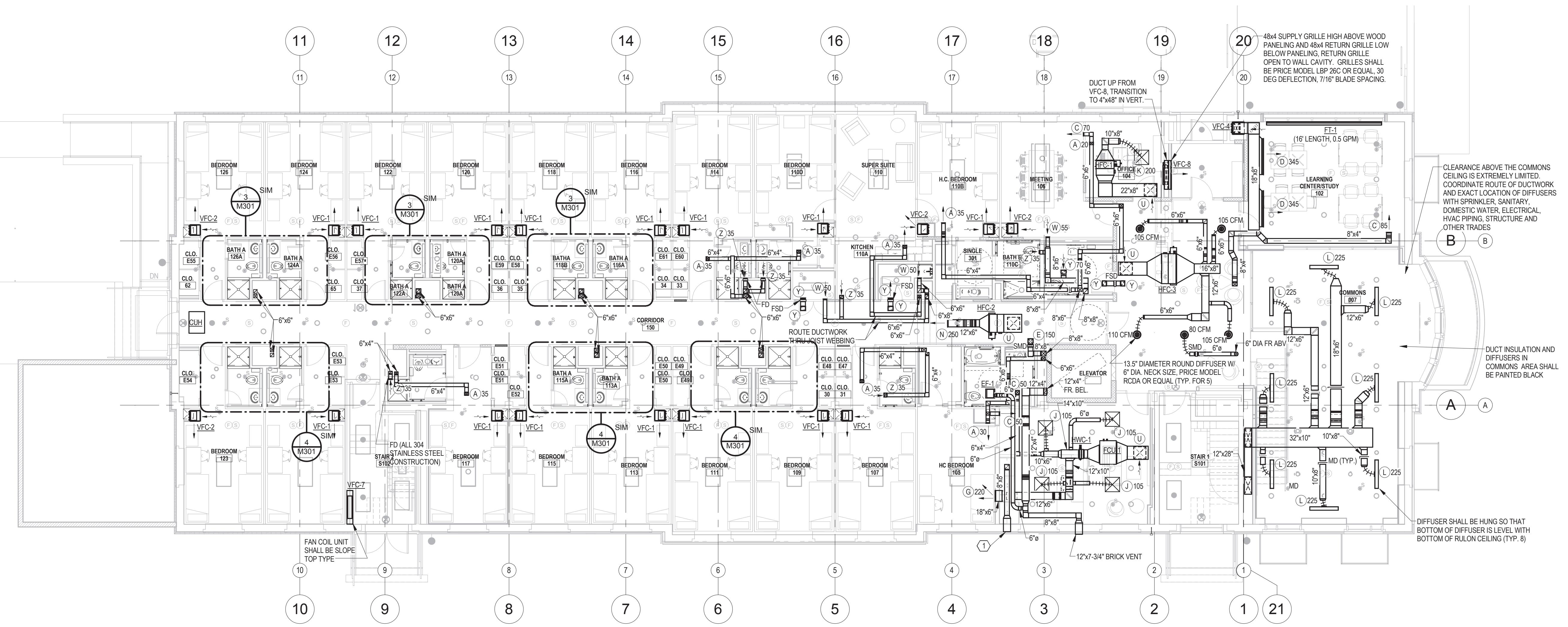
- CLEARANCE ABOVE CEILINGS IN MANY AREAS IS LIMITED, PARTICULARLY IN AREAS WITH THE 1-HOUR FIRE-RATED ASSEMBLY ABOVE THE CEILING. CAREFULLY COORDINATE LOCATIONS OF MECHANICAL EQUIPMENT, DUCTWORK, GRILLES, PIPES AND DIFFUSERS WITH PLUMBING, STRUCTURAL, ELECTRICAL AND OTHER TRADES.

- THE MECHANICAL CONTRACTOR IS HEREBY ADVISED THAT THE FIRST FLOOR LEARNING AREA (ROOM 102) EXTERIOR WALL DEMOLITION WILL PRESENT A LIMITED TIME FRAME TO MOVE LARGE MECHANICAL EQUIPMENT INTO THE BUILDING AND DOWN TO THE BASEMENT LEVEL. THE LENGTH OF TIME WILL BE APPROXIMATELY ONE DAY. THE CONTRACTOR SHALL INCLUDE A CONTINGENCY FACTOR FOR ALL ITEMS TO BE MOVED AND LOCATED PROPERLY. CONTRACTOR SHALL COORDINATE WITH ALL DISCIPLINES FOR DELIVERY, MOVING AND STORING ALL EQUIPMENT AND SUPPLIES.

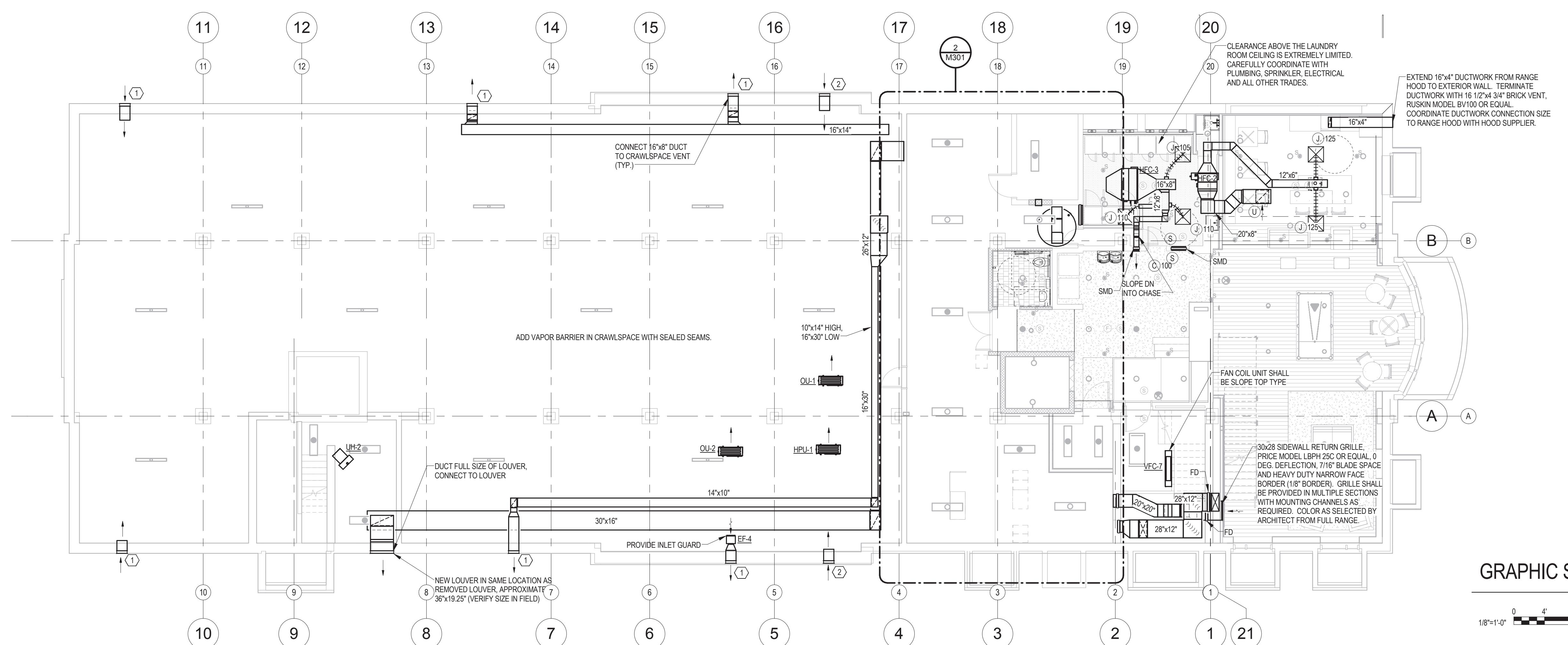
- HEIGHT AND OVERALL SPACE IN MECHANICAL ROOMS IS LIMITED. CONTRACTOR SHALL COORDINATE WITH PLUMBING, SPRINKLER, SANITARY, ELECTRICAL AND ALL OTHER TRADES TO MAINTAIN REQUIRED HEAD SPACE AND EQUIPMENT CLEARANCES.

SEISMIC NOTE:

- ALL MECHANICAL SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF IBC AND ASCE-7 SEISMIC DESIGN CATEGORY B.

RU
RADFORD
UNIVERSITYRENOVATION OF THREE
RESIDENCE HALLS
DRAPER HALLRADFORD UNIVERSITY
RADFORD, VIRGINIAProject Code
VMDO Project Number
217-17565-002
1115FIRST FLOOR PLAN - DUCTWORK
SCALE: 1/8" = 1'-0"Checked By RCH
Drawn by PLH

Note: Modifications to the bid documents that were issued by addenda have been incorporated into these drawings for the convenience of the Contractor. In the event of discrepancies between the originally issued addenda and changes depicted on these drawings, the originally issued addenda shall take precedence.



NO.	SUBMITTAL	DATE
1	BID DOCUMENTS Addendum 1	05.19.14
2	Addendum 2	06.19.14
3	Addendum 3	06.24.14
	CONSTRUCTION SET	05.01.15

BASEMENT AND FIRST
FLOOR DUCTWORKBASEMENT FLOOR PLAN - DUCTWORK
SCALE: 1/8" = 1'-0"

M101

Radford University

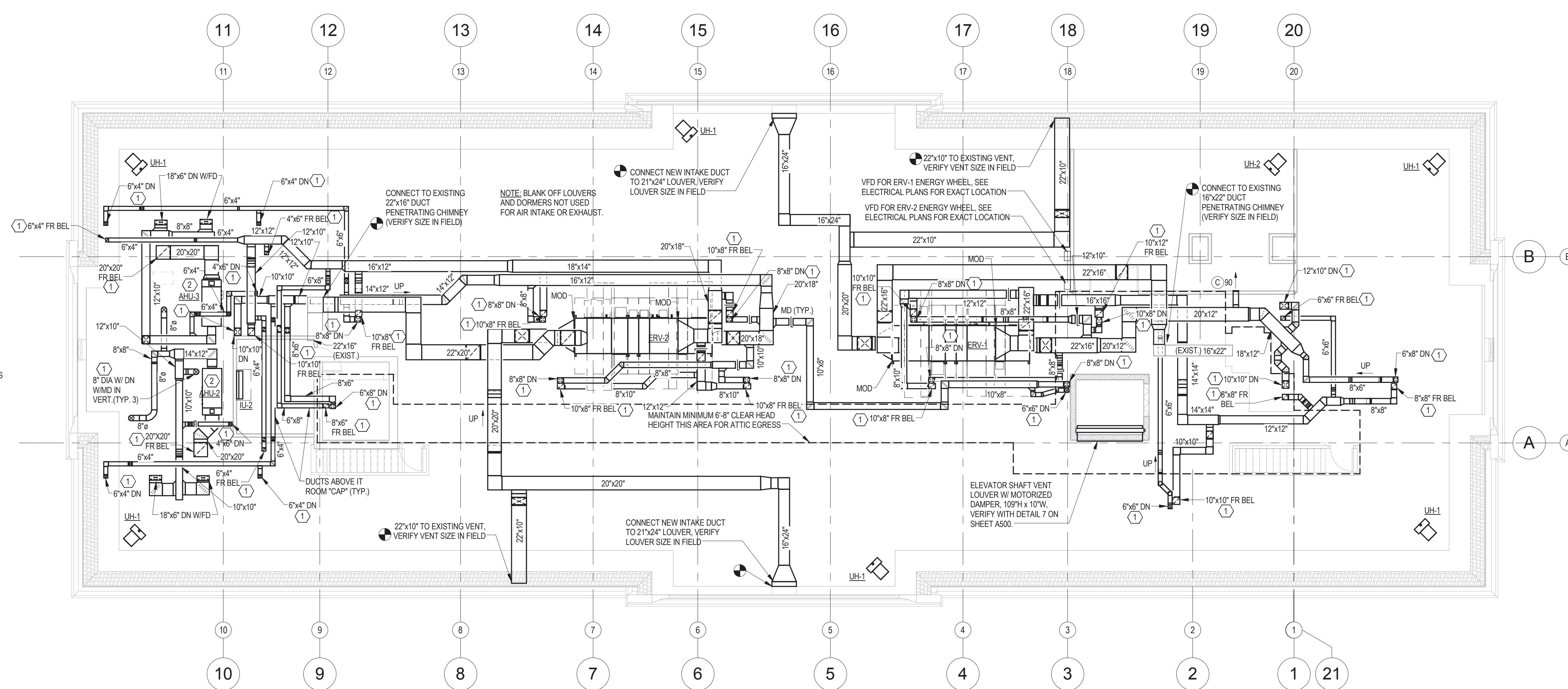
RENOVATION OF THREE RESIDENCE HALLS DRAPER HALL

RADFORD UNIVERSITY
RADFORD, VIRGINIA

217-17565-002
1115

PLAN NOTES:

1. PROVIDE FIRE DAMPER AT FLOOR PENETRATION.
 2. PROVIDE AIR HANDLER WITH LEFT HAND COIL CONNECTIONS
(REFERENCED FROM LOOKING IN THE DIRECTION OF
AIRFLOW).





ATTIC FLOOR PLAN - DUCTWORK

SCALE: 1/8" = 1'-0"

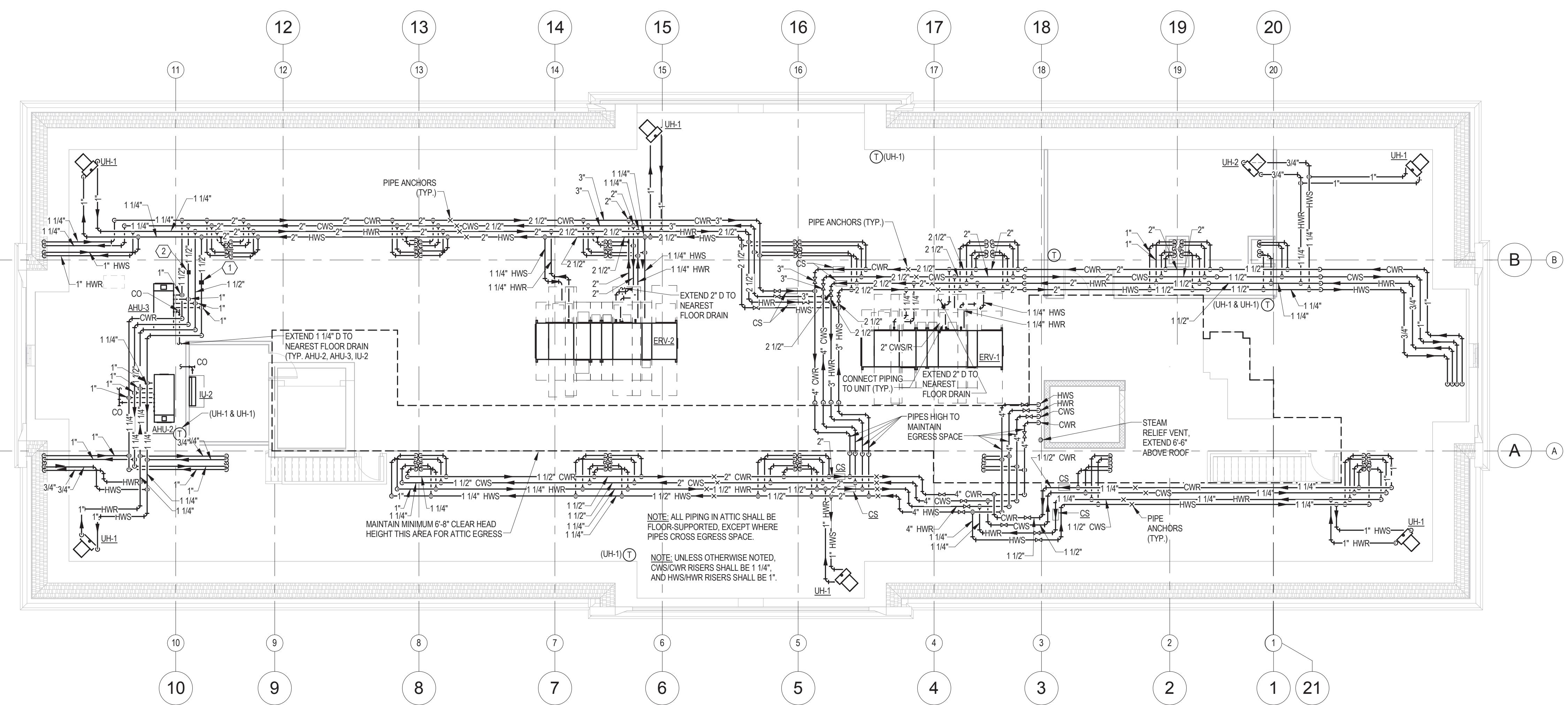
Checked By

RIH

Note: Modifications to the bid documents that were issued by addenda have been incorporated into these drawings for the convenience of the contractor. In the event of discrepancies between the originally issued addenda and changes depicted on these drawings, the originally issued addenda shall take precedence.

PLAN NOTES:

1. HEATING WATER PRESSURE SENSOR LOCATION FOR FLOW CONTROL OF HWP-1 AND HWP-2.
 2. CHILLED WATER PRESSURE SENSOR LOCATION FOR FLOW





ATTIC FLOOR PLAN - HVAC PIPING

SCALE: 1/8" = 1'-0"

SCALE: 1/8" = 1'-0"

ISSUES AND REVISIONS

NO. SUBMITTAL

BID DOCUMENTS

Addendum 1

Addendum 2

Addendum 3

DATE
05.19.14
06.19.14
06.24.14
06.25.14

ATTIC FLOOR PLANS - DUCTWORK - DRAPER

GRAPHIC SCALE

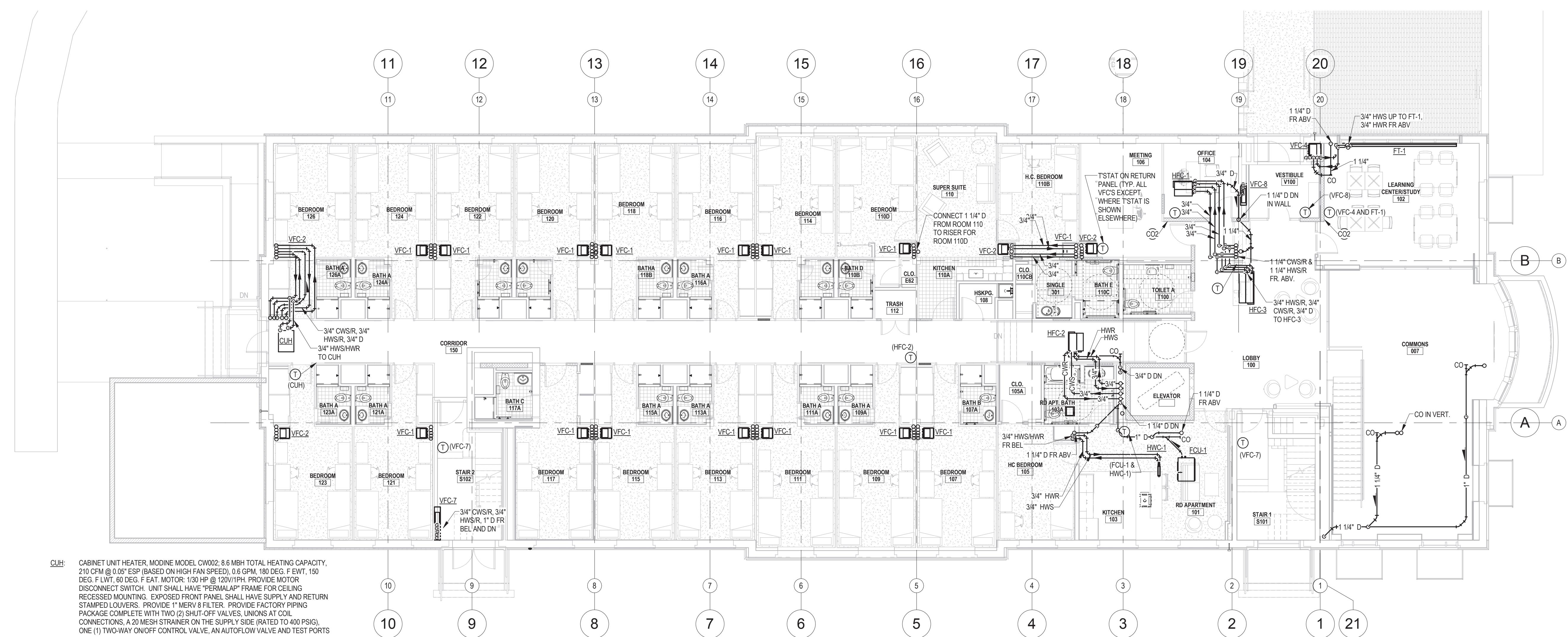
M103



RENOVATION OF THREE RESIDENCE HALLS DRAPER HALL

RADFORD UNIVERSITY
RADFORD, VIRGINIA

Project Code 217-17565-002
VMDO Project Number 1115

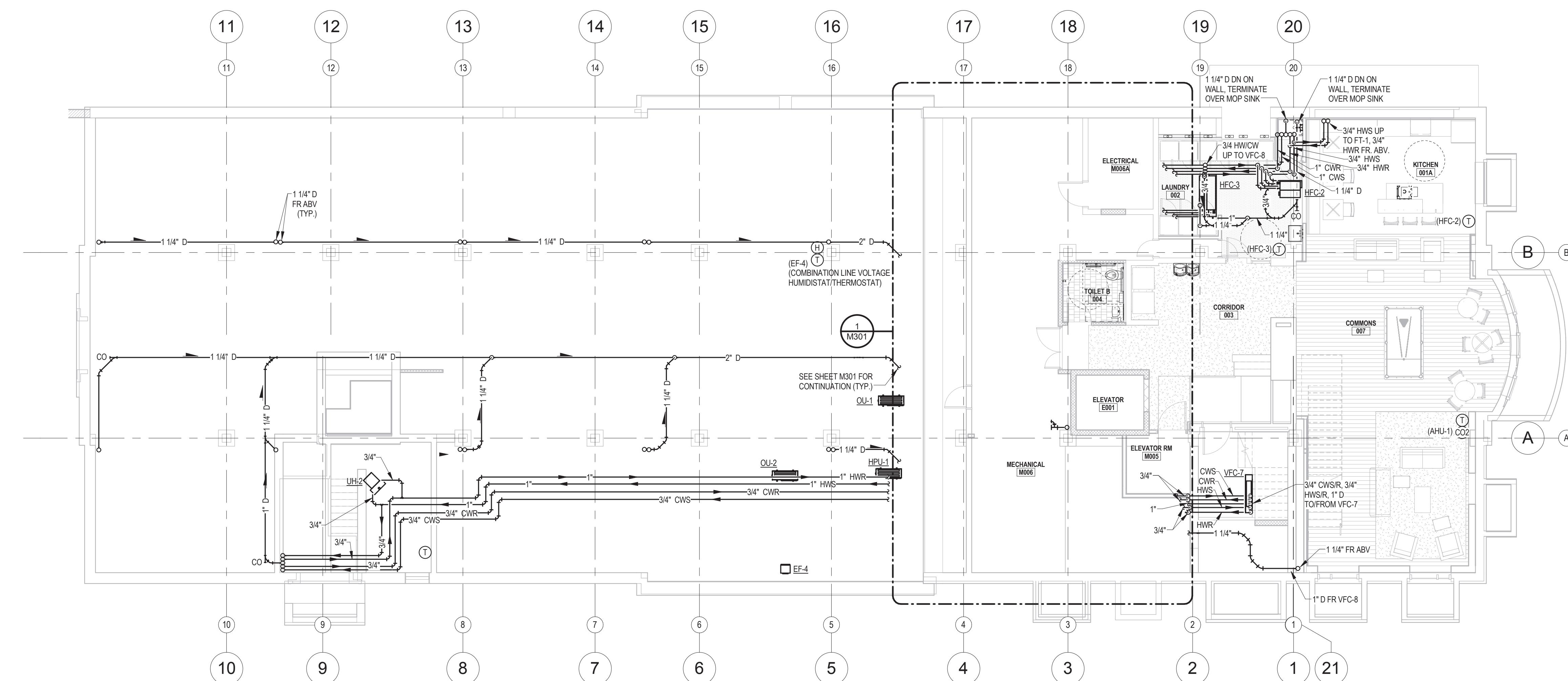


FIRST FLOOR PLAN - HVAC PIPING

SCALE: 1/8" = 1'-0"

Checked By RCH
Drawn by PLH

Note: Modifications to the bid documents that were issued by addenda have been incorporated into these drawings for the convenience of the Contractor. In the event of discrepancies between the originally issued addenda and changes depicted on these drawings, the originally issued addenda shall take precedence.



BASEMENT FLOOR PLAN - HVAC PIPING

SCALE: 1/8" = 1'-0"

ISSUES AND REVISIONS		DATE
BID DOCUMENTS		05.19.14
1 Addendum 1		06.19.14
2 Addendum 2		06.24.14
3 Addendum 3		06.25.14
CONSTRUCTION SET		05.01.15

BASEMENT AND FIRST FLOOR PLAN - HVAC PIPING

GRAPHIC SCALE

18'-0" 4' 8' 12'

M201

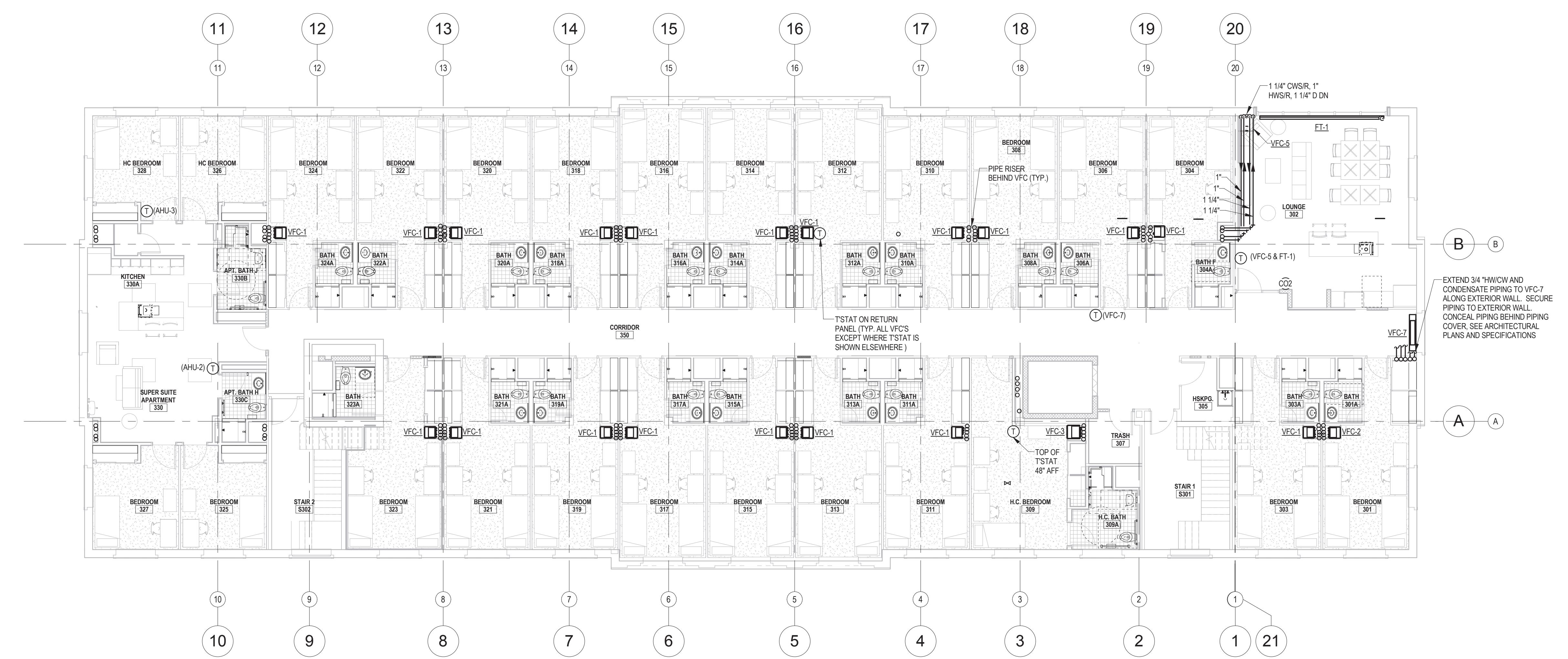
RENOVATION OF THREE RESIDENCE HALLS DRAPER HALL

RADFORD UNIVERSITY
RADFORD, VIRGINIA

Project Code 217-17565-002
VMDO Project Number 1115

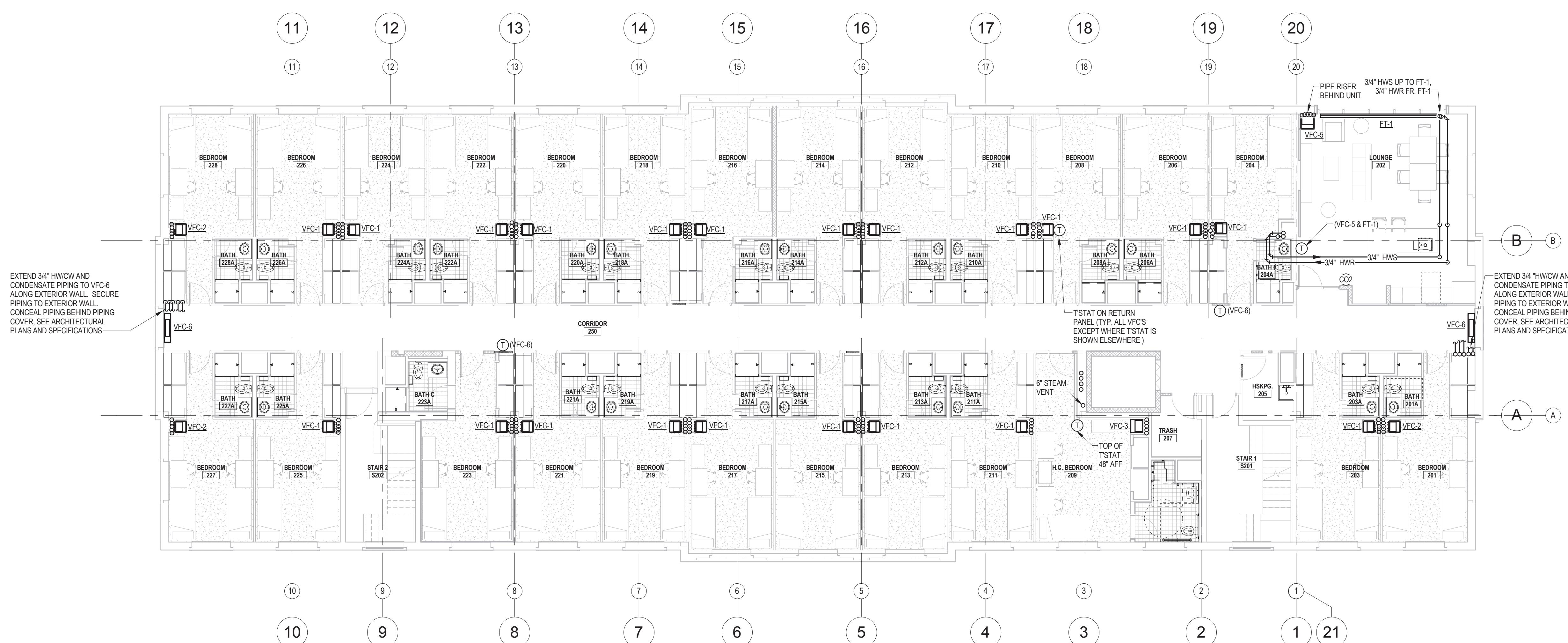
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Drawn By PLH

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THIRD FLOOR PLAN - HVAC PIPING

SCALE: 1/8" = 1'-0"



SECOND AND THIRD FLOOR PLANS - HVAC PIPING

GRAPHIC SCALE - 1/32" = 1'-0"

0 32' - 0" 64' - 0" 96' - 0"

SECOND FLOOR PLAN - HVAC PIPING

SCALE: 1/8" = 1'-0"

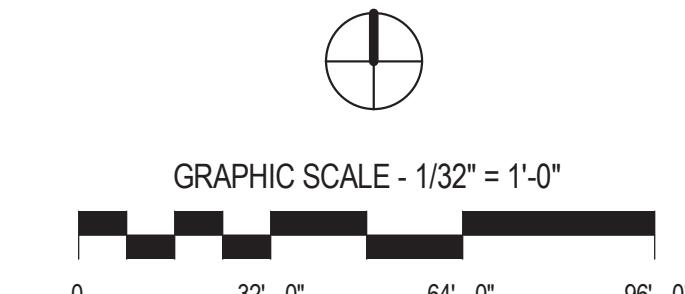
GRAPHIC SCALE

0 4' 8' 12'

M202

RENOVATION OF THREE
RESIDENCE HALLS
DRAPER HALLRADFORD UNIVERSITY
RADFORD, VIRGINIAProject Code 217-17565-002
VMDO Project Number 1115Checked By RCH
Drawn By PLH

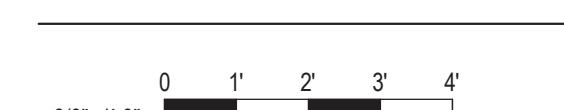
Note: Modifications to the bid documents that were issued by addenda have been incorporated into these drawings for the convenience of the Contractor. In the event of discrepancies between the originally issued addenda and changes depicted on these drawings, the originally issued addenda shall take precedence.



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3 Addendum 3	06.24.14
	06.25.14
	05.01.15

PARTIAL FLOOR PLANS -
HVAC

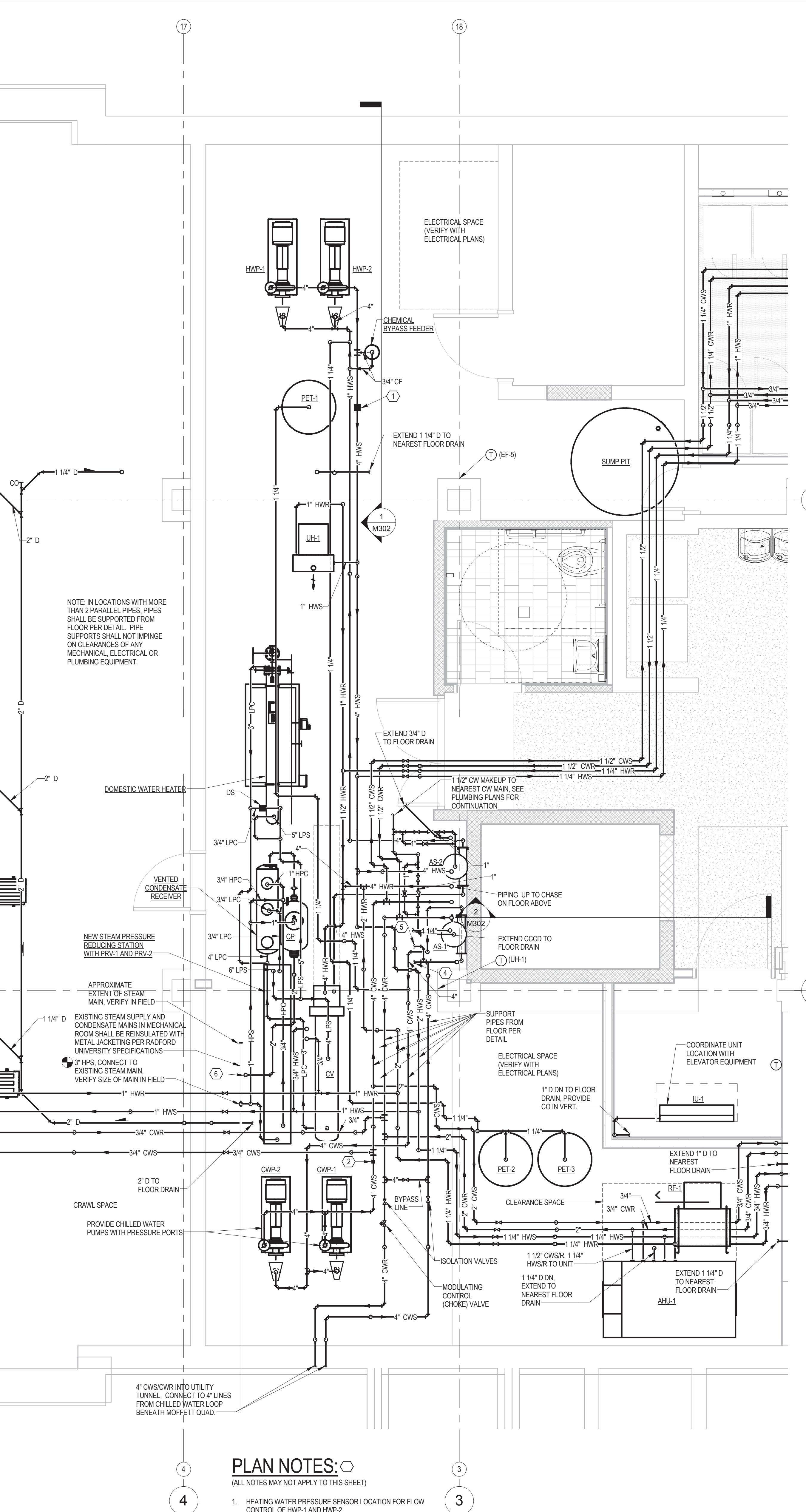
GRAPHIC SCALE



GRAPHIC SCALE

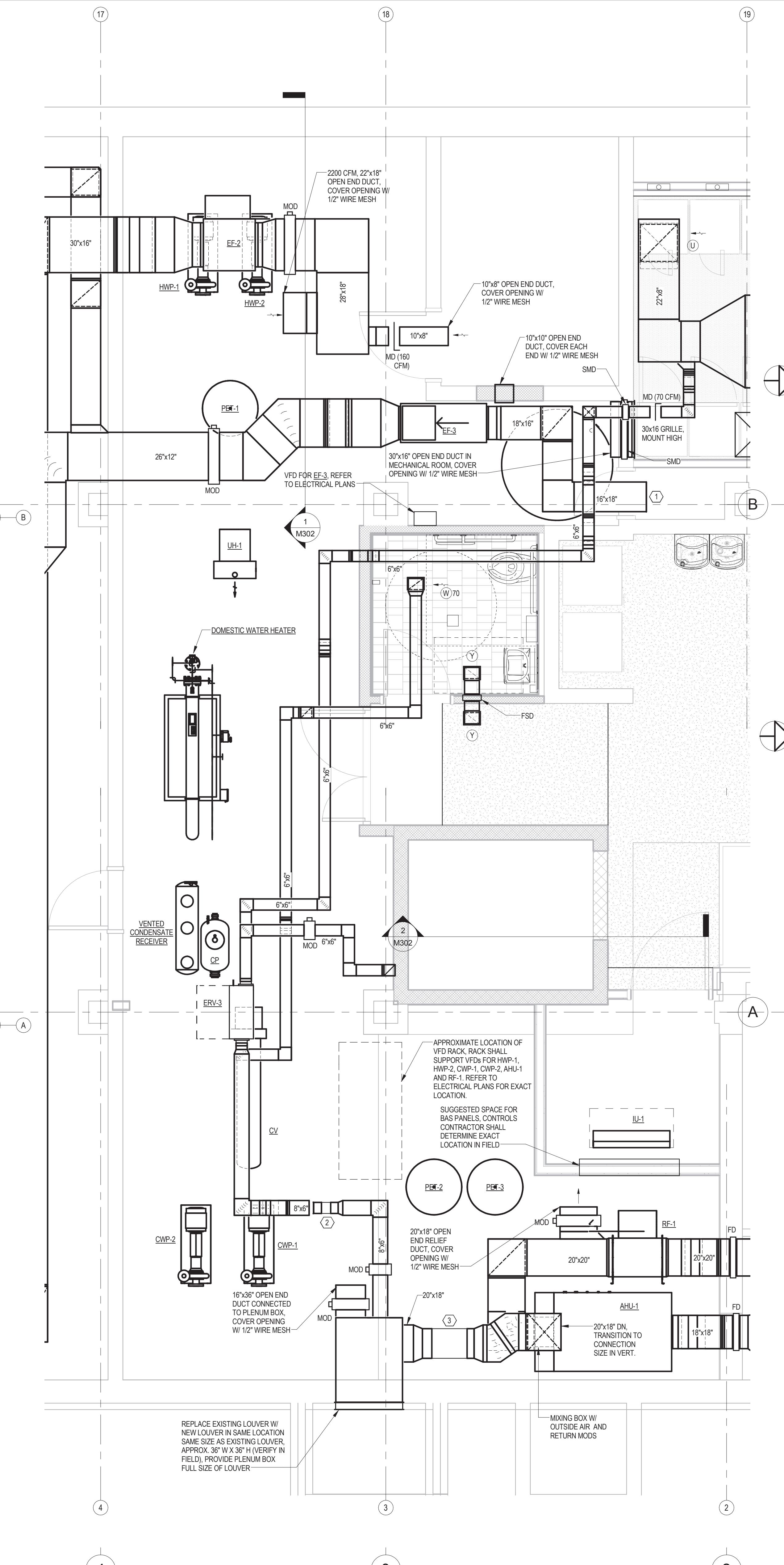


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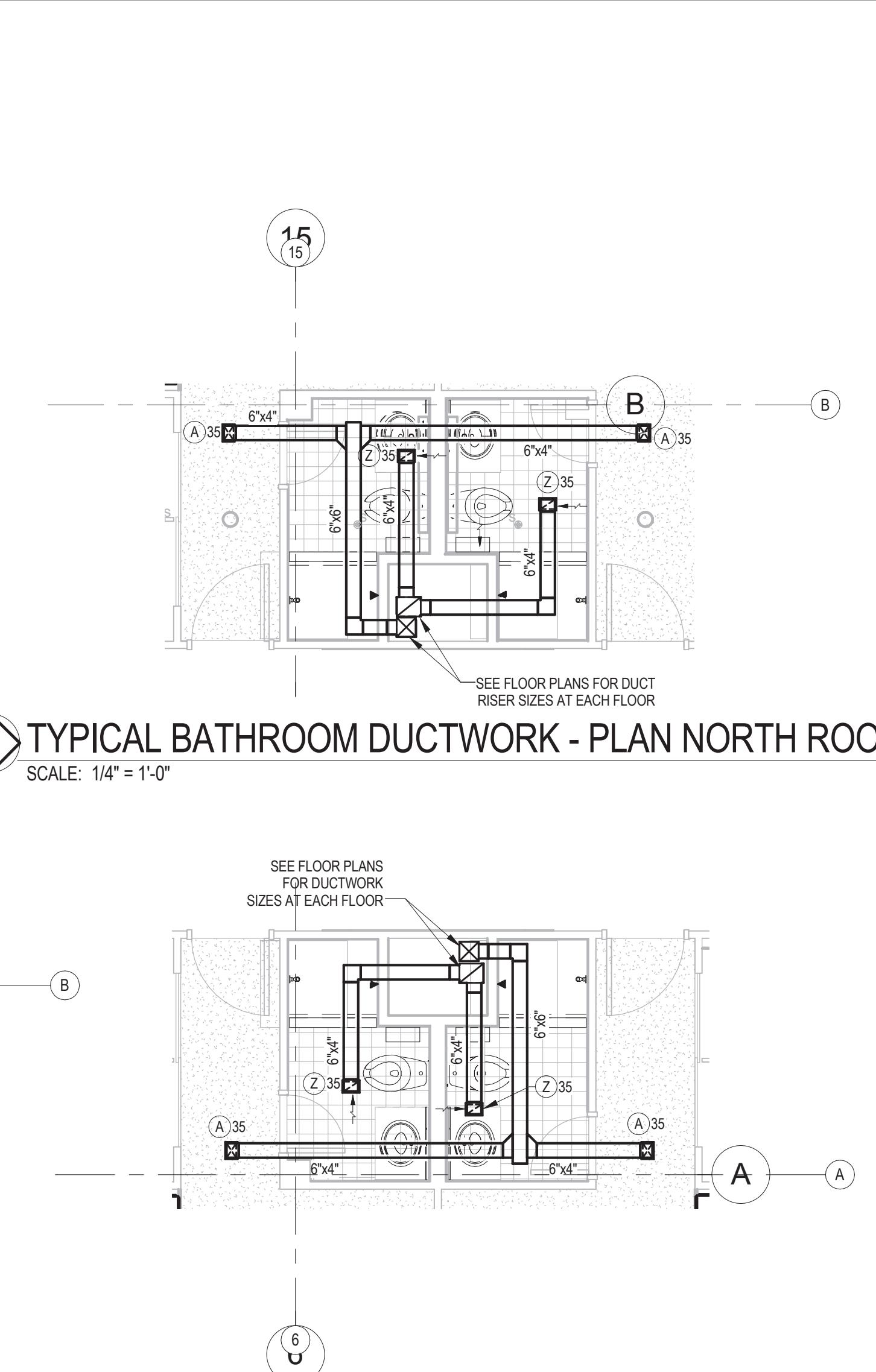
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3/8" = 1'-0"



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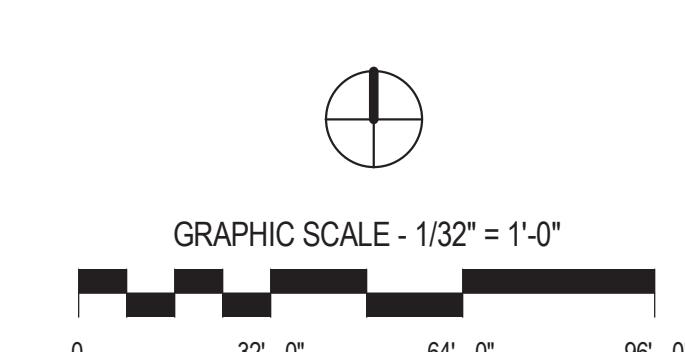
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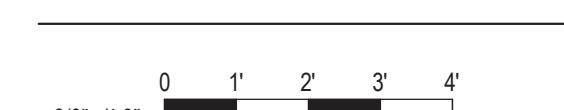
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GRAPHIC SCALE



GRAPHIC SCALE





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Comm. No.: 13111
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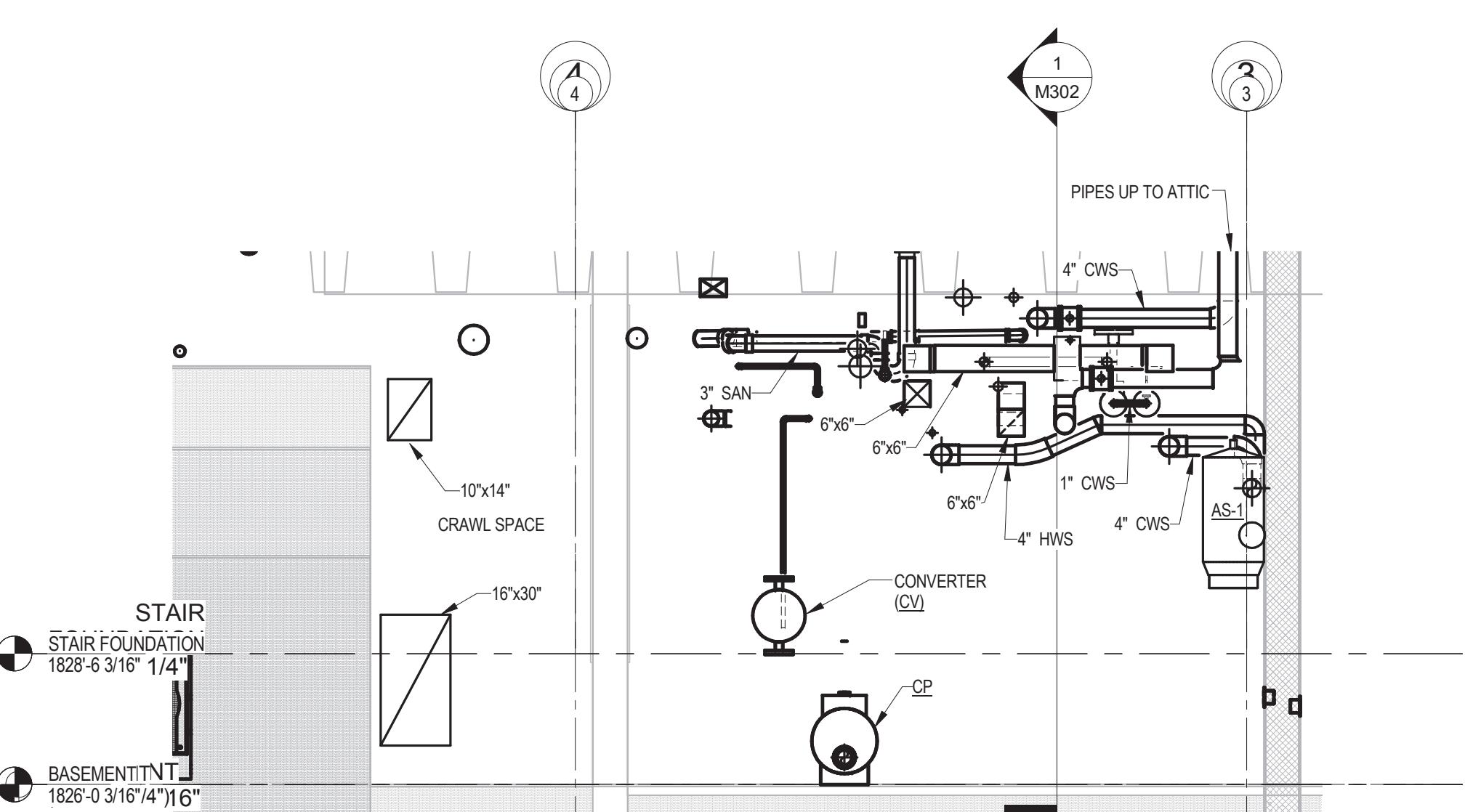
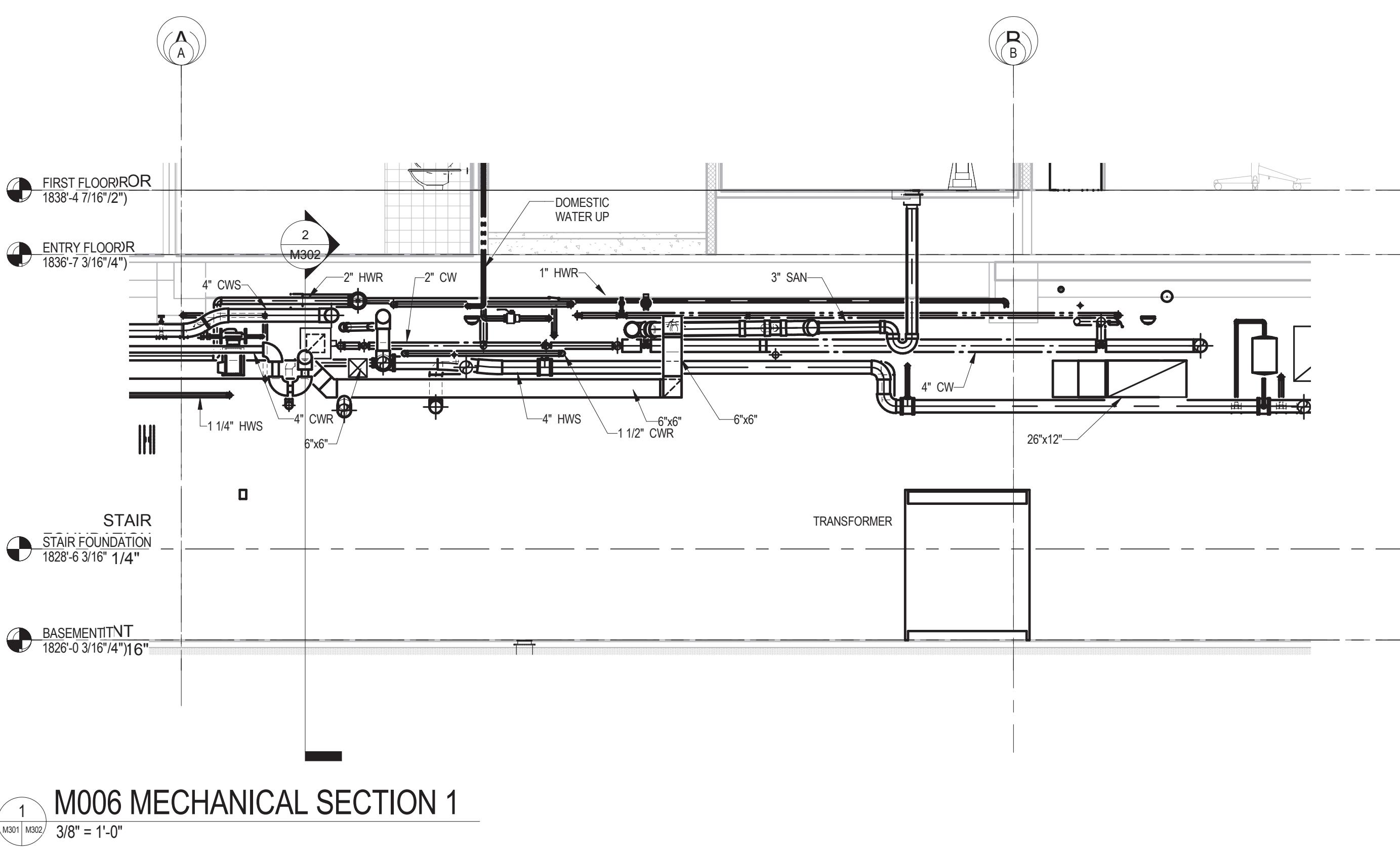
RU

RADFORD
UNIVERSITY

RENOVATION OF THREE
RESIDENCE HALLS
DRAPER HALL

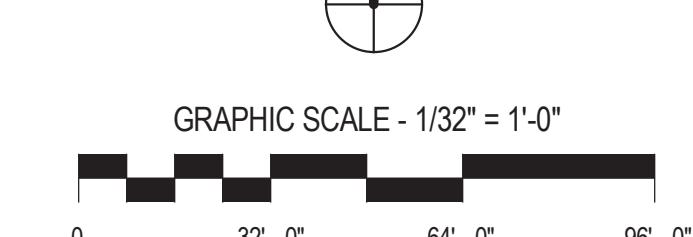
RADFORD UNIVERSITY
RADFORD, VIRGINIA

Project Code 217-17565-002
VMDO Project Number 1115



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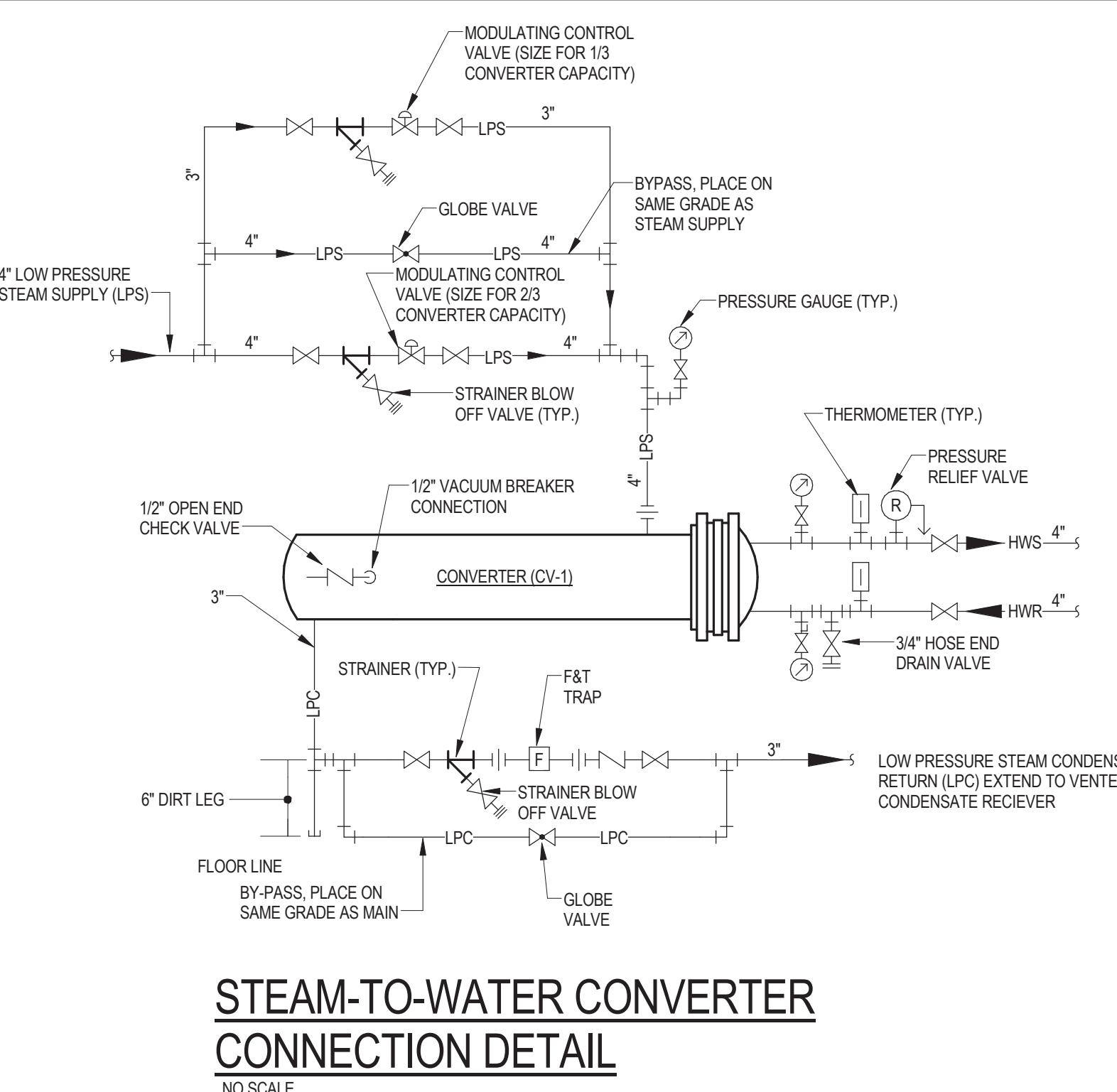


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HVAC SECTION VIEWS

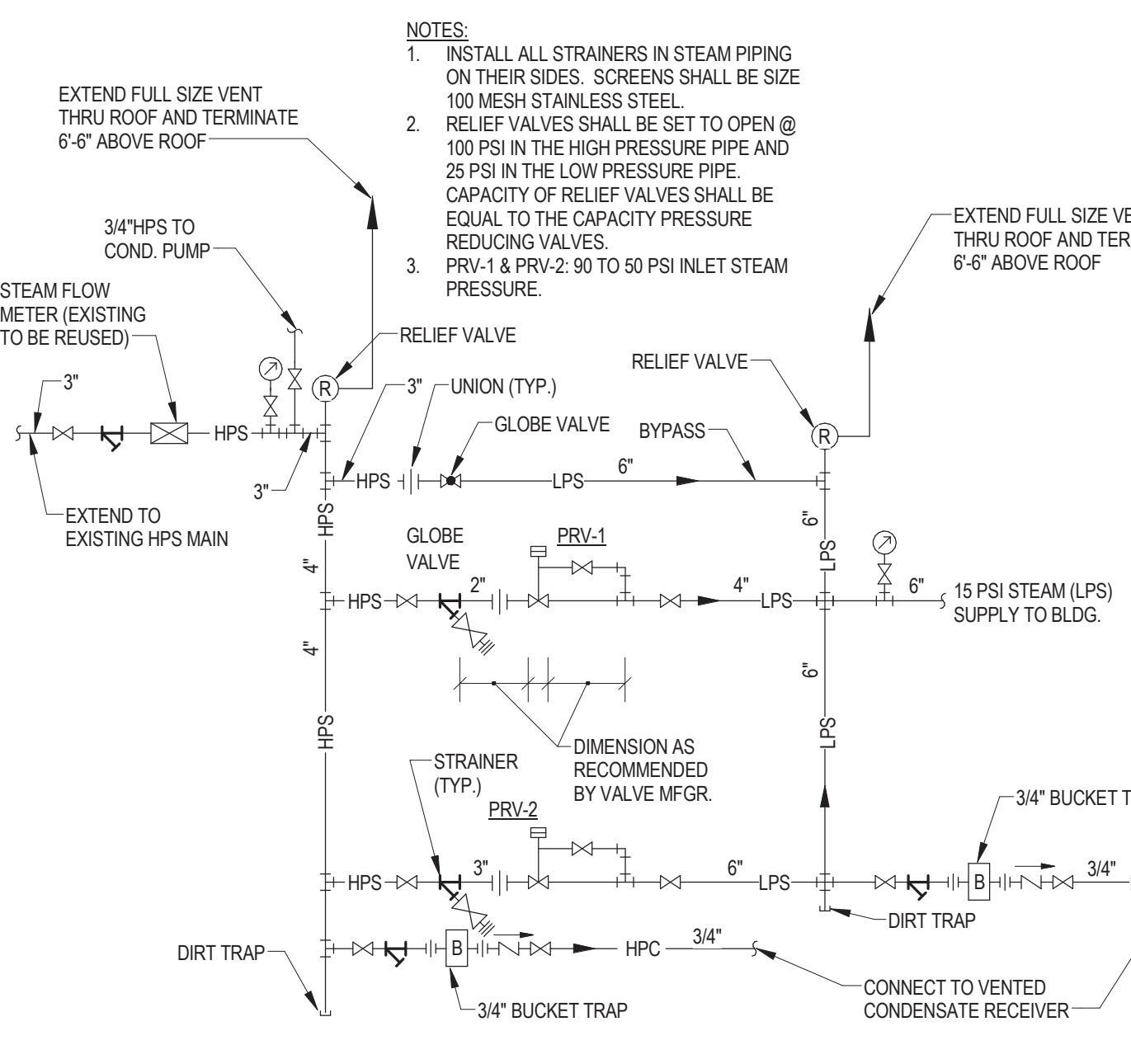


M302



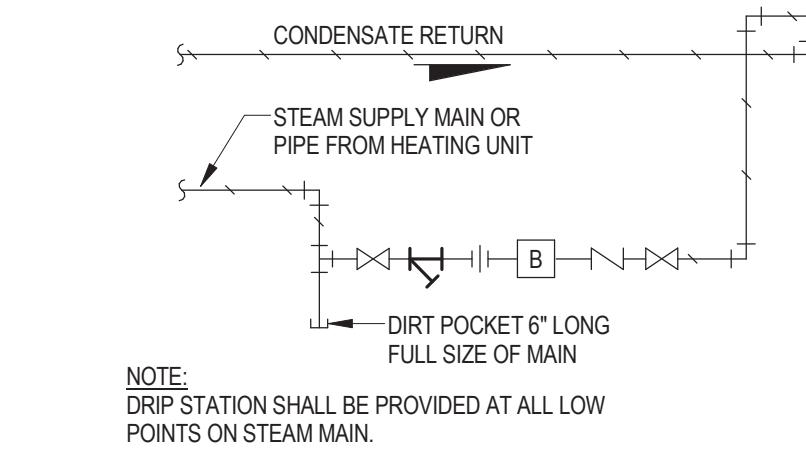
STEAM-TO-WATER CONVERTER CONNECTION DETAIL

NO SCALE



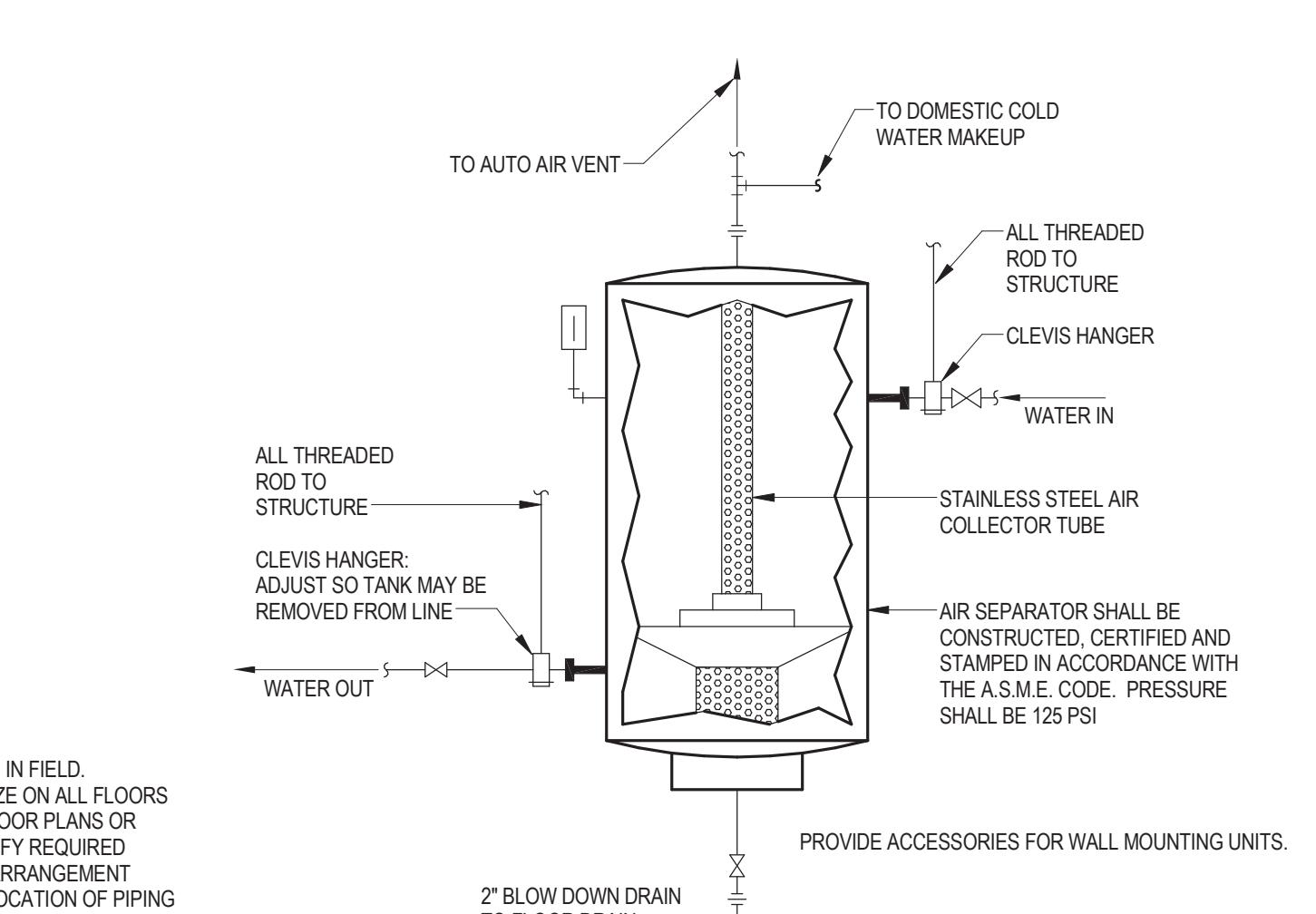
STEAM PRESSURE REDUCING STATION

NO SCALE



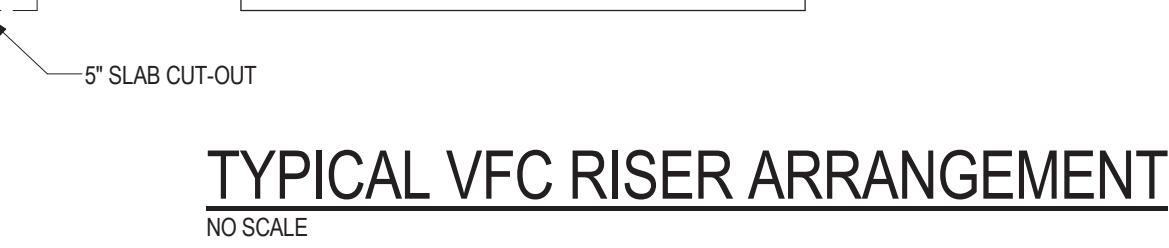
Drip Station Detail

NO SCALE



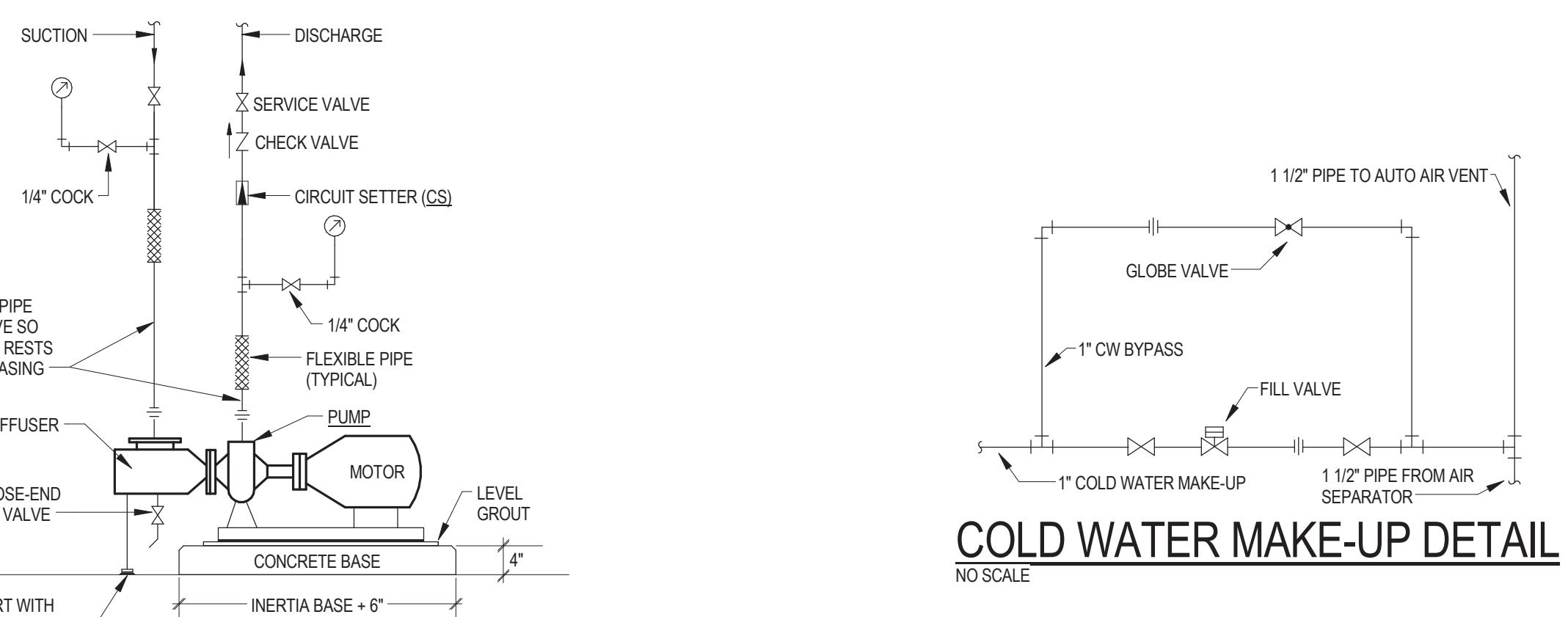
AIR SEPARATOR DETAIL

NO SCALE



TYPICAL VFC RISER ARRANGEMENT

NO SCALE



COLD WATER MAKE-UP DETAIL

NO SCALE



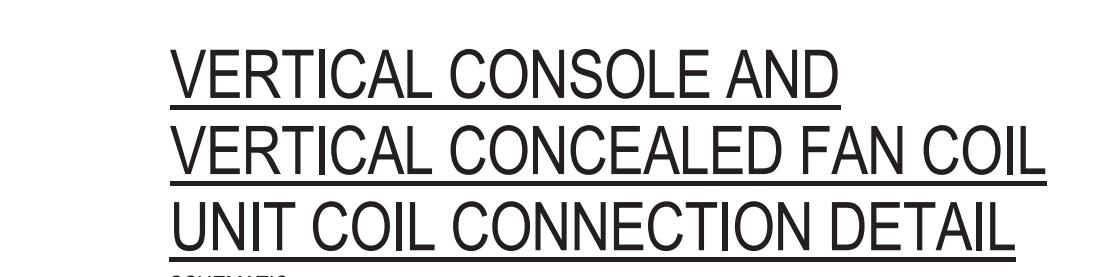
BYPASS CHEMICAL FEEDER

NO SCALE

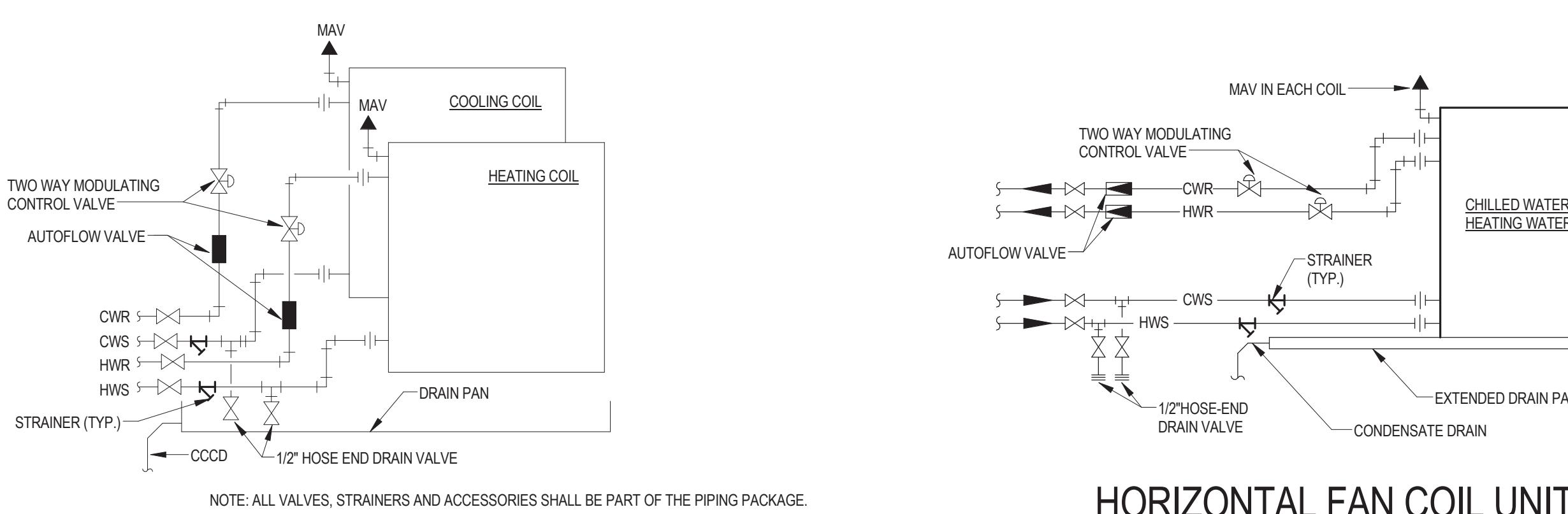


BASE MOUNTED PUMP DETAIL

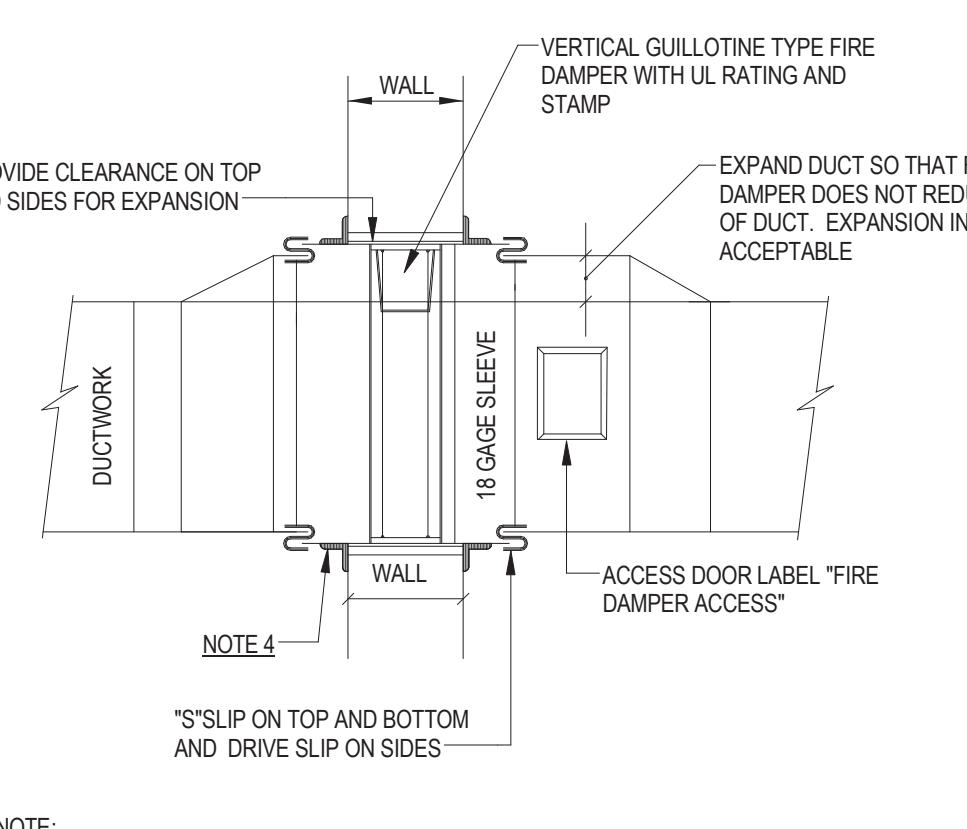
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VERTICAL CONSOLE AND
VERTICAL CONCEALED FAN COIL
UNIT COIL CONNECTION DETAIL

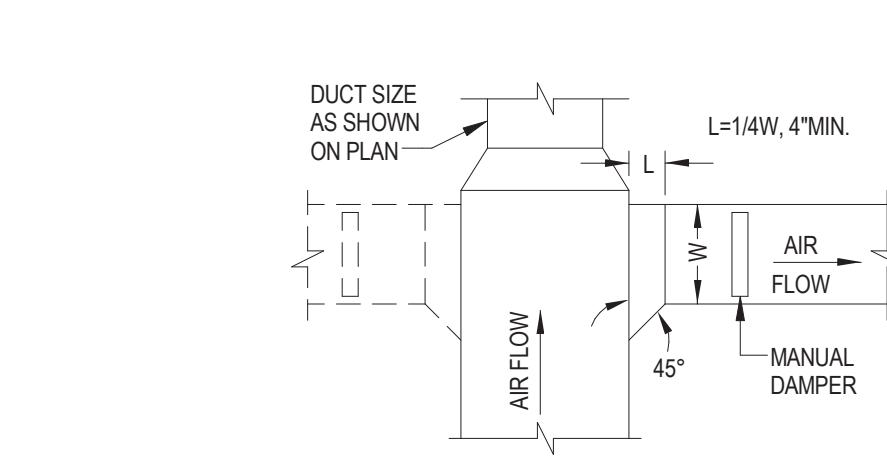
SCHEMATIC

VERTICAL HI-RISE STACK FAN COIL
UNIT COIL CONNECTION DETAIL

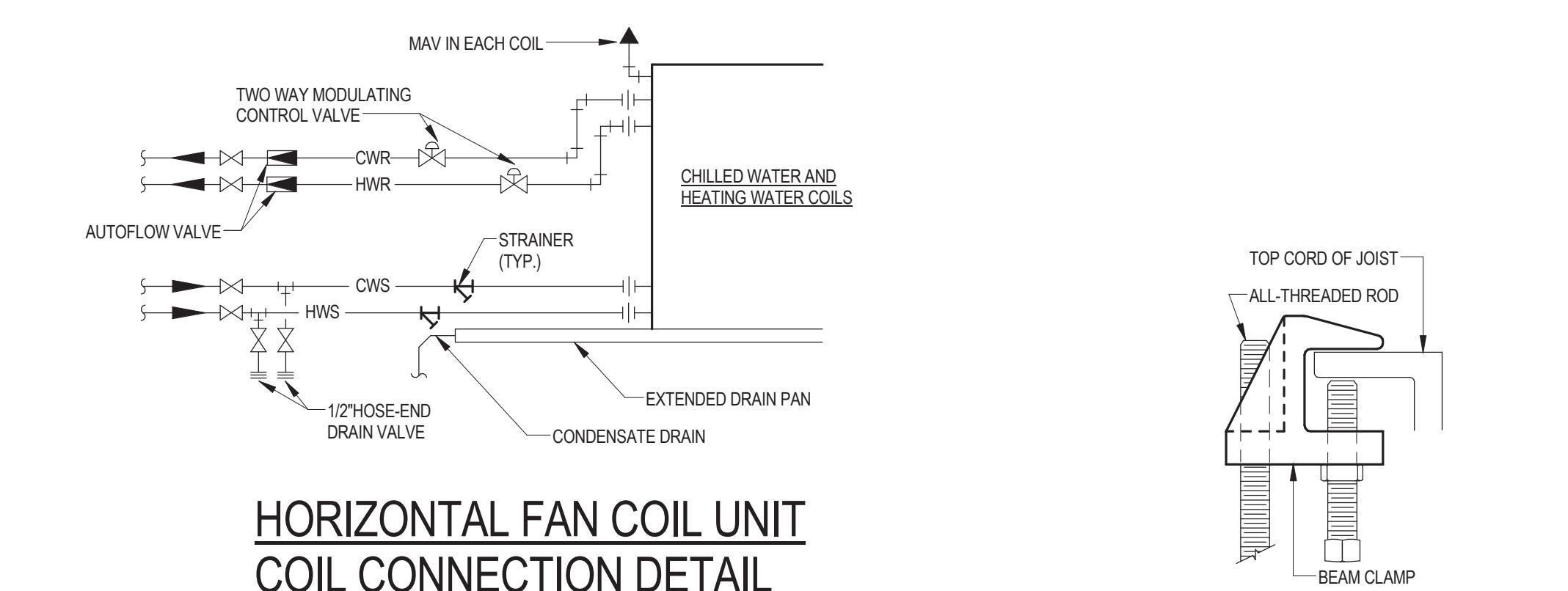
SCHEMATIC

FIRE DAMPER AT FIRE
RATED WALL DETAIL

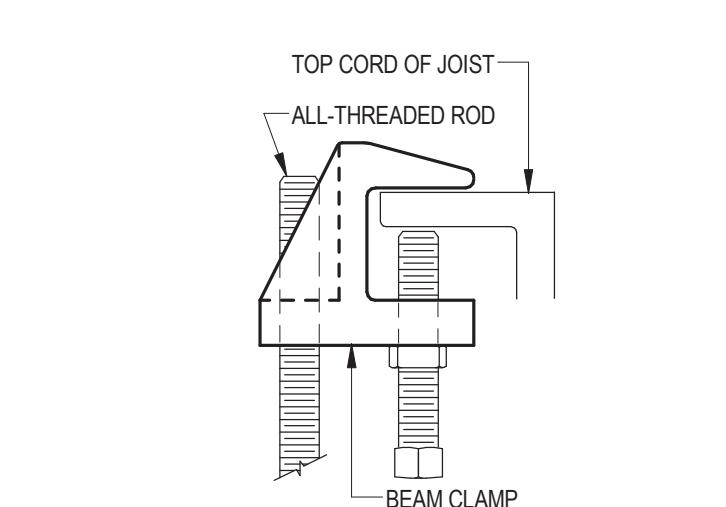
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LATERAL BRANCH DUCT
DETAIL

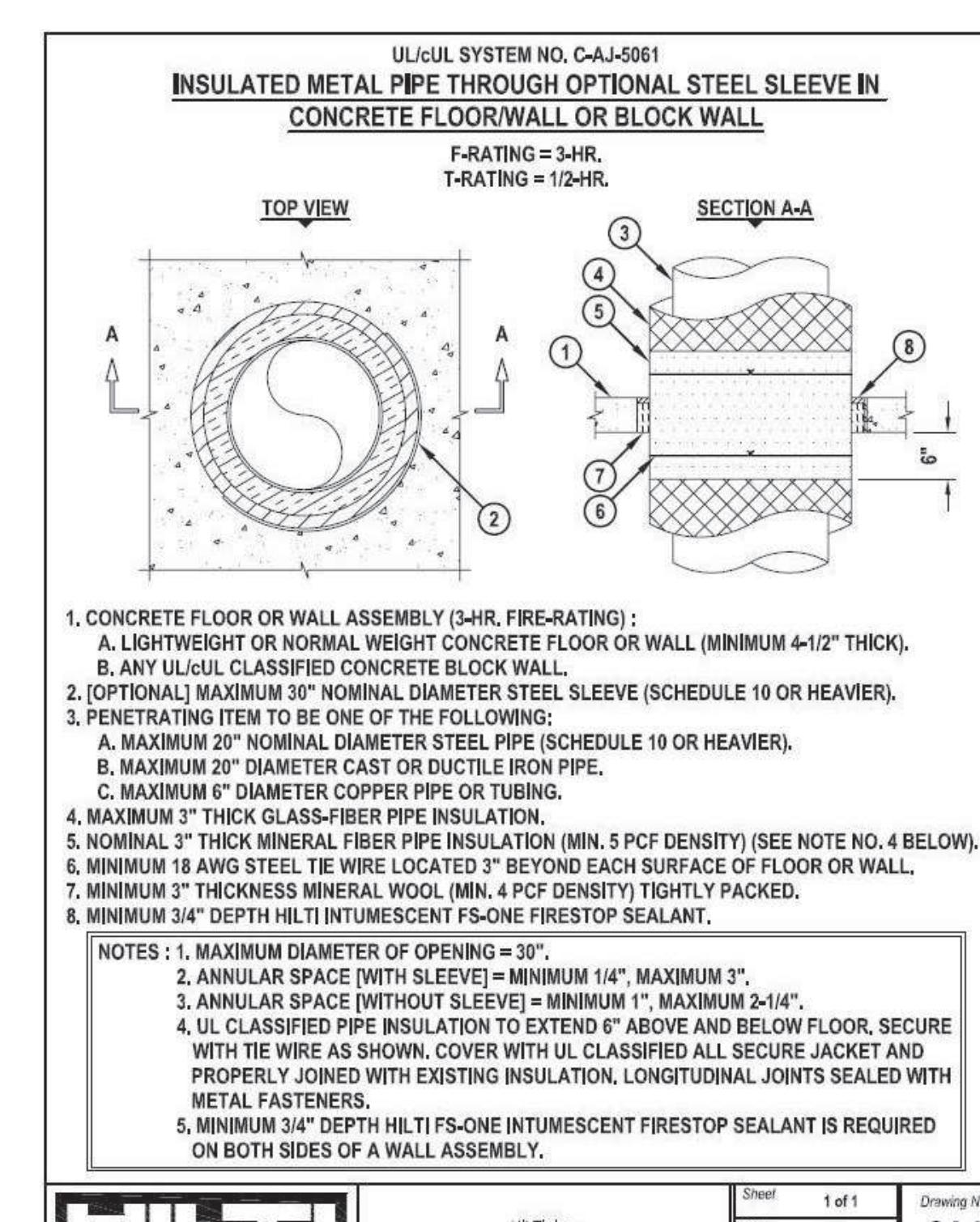
SCHEMATIC

HORIZONTAL FAN COIL UNIT
COIL CONNECTION DETAIL

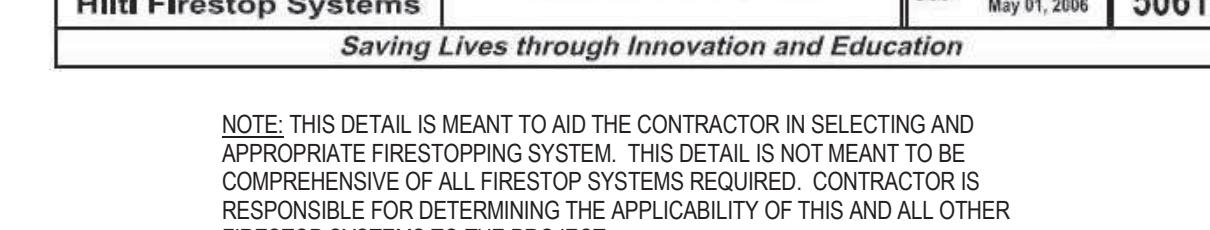
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PIPE SUPPORT
ATTACHMENT DETAIL

NO SCALE

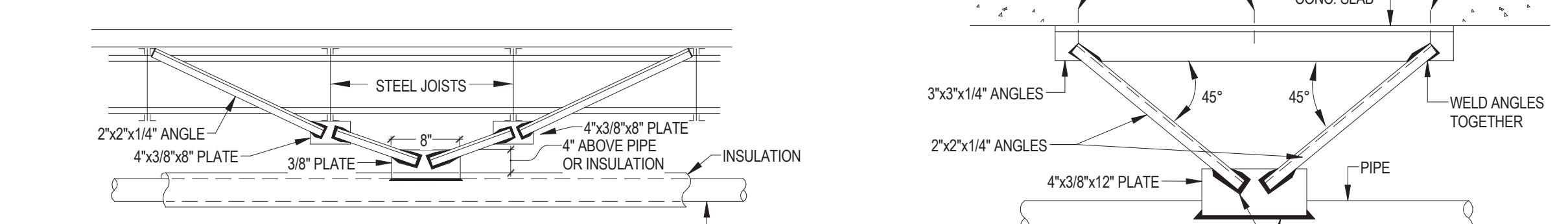


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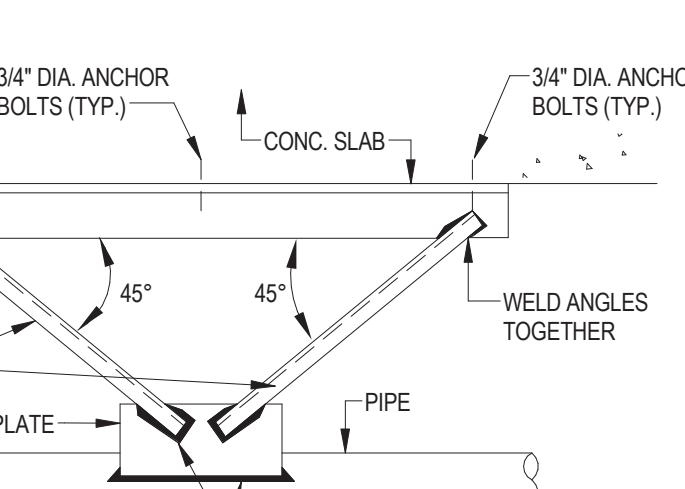


Graphic Scale - 1/32" = 1'-0"

0 32'-0" 64'-0" 96'-0"

PIPE ANCHOR WITH JOISTS & PIPE
PERPENDICULAR DETAIL

SCHEMATIC

PIPE ANCHOR TO CONCRETE
SLAB DETAIL

SCHEMATIC

NOTE: THIS DETAIL IS MEANT TO AID THE CONTRACTOR IN SELECTING AND APPROPRIATE FIRESTOPPING SYSTEM. THIS DETAIL IS NOT MEANT TO BE COMPREHENSIVE OF ALL FIRESTOP SYSTEMS REQUIRED. CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE APPLICABILITY OF THIS AND ALL OTHER FIRESTOP SYSTEMS TO THE PROJECT.

Sheet 1 of 1 Drawing No. CAJ 5061f

Scale 1/16" = 1"

Date May 01, 2004

HVAC DETAILS

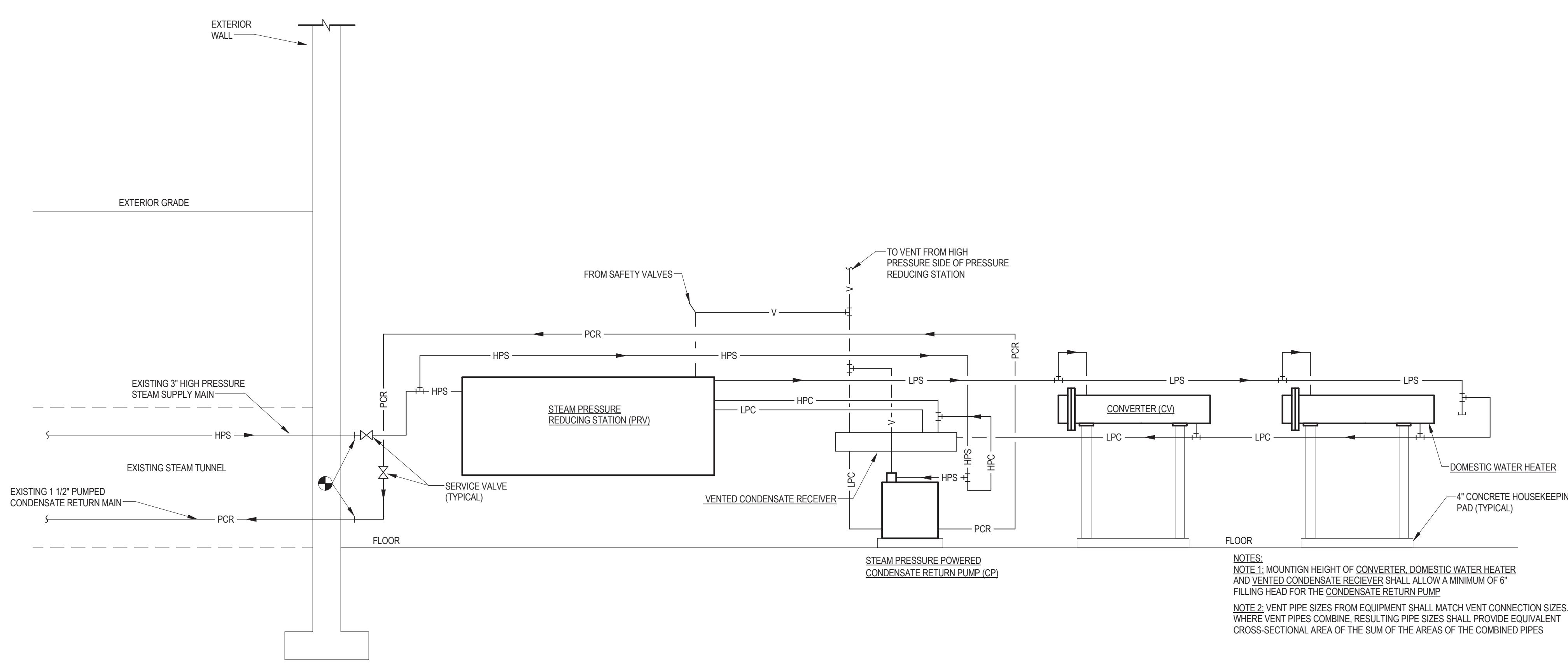
NOTE: THIS DETAIL IS MEANT TO AID THE CONTRACTOR IN SELECTING AND APPROPRIATE FIRESTOPPING SYSTEM. THIS DETAIL IS NOT MEANT TO BE COMPREHENSIVE OF ALL FIRESTOP SYSTEMS REQUIRED. CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE APPLICABILITY OF THIS AND ALL OTHER FIRESTOP SYSTEMS TO THE PROJECT.

Sheet 1 of 1 Drawing No. CAJ 5061f

Scale 1/16" = 1"

Date May 01, 2004

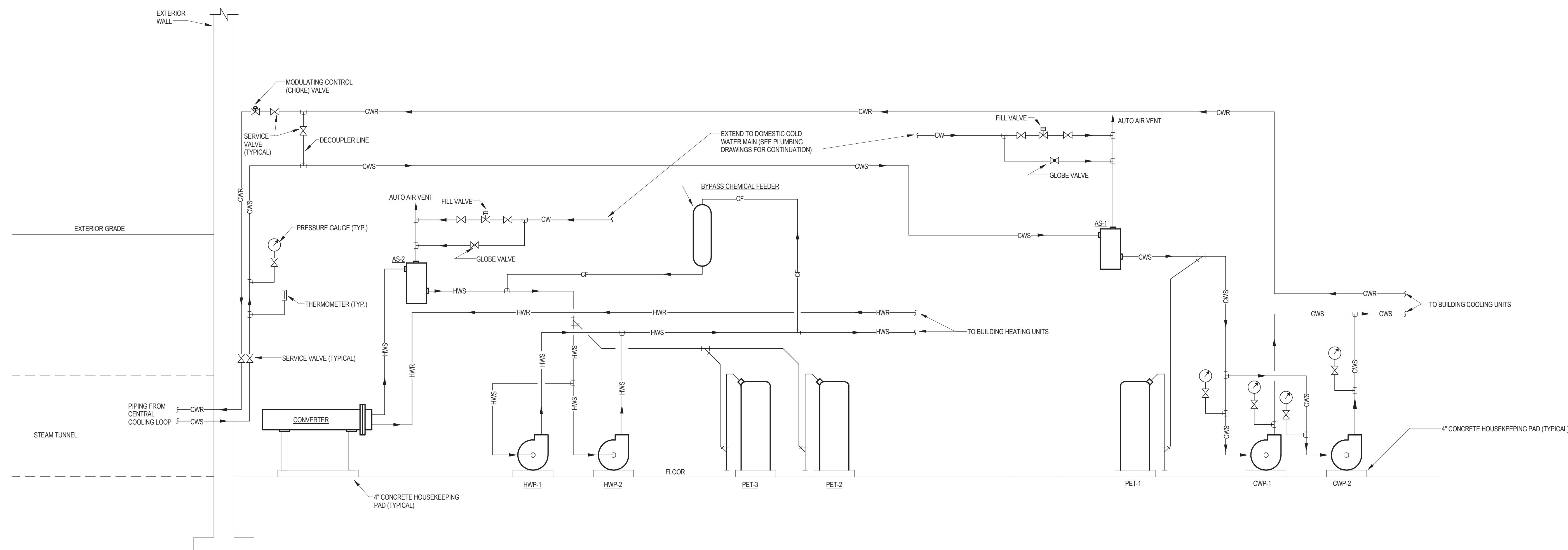
Page 1 of 1



STEAM SUPPLY AND STEAM CONDENSATE RETURN SCHEMATIC FLOW DIAGRAM

NO SCALE (PROVIDE ALL VALVES AND PIPING SPECIALTIES SHOWN ON THIS DIAGRAM. SEE DETAIL SHEETS FOR ADDITIONAL VALVES AND PIPING SPECIALTIES REQUIRED)

NOTES:
NOTE 1: MOUNTING HEIGHT OF CONVERTER, DOMESTIC WATER HEATER
AND VENTED CONDENSATE RECEIVER SHALL BE A MINIMUM OF 6'
FLOOR TO CENTER OF EQUIPMENT MOUNTING PLATE.
NOTE 2: VENT PIPE SIZES FROM EQUIPMENT SHALL MATCH VENT CONNECTION SIZES.
WHERE VENT PIPES COMBINE, RESULTING PIPE SIZES SHALL PROVIDE EQUIVALENT
CROSS-SECTIONAL AREA OF THE SUM OF THE AREAS OF THE COMBINED PIPES.

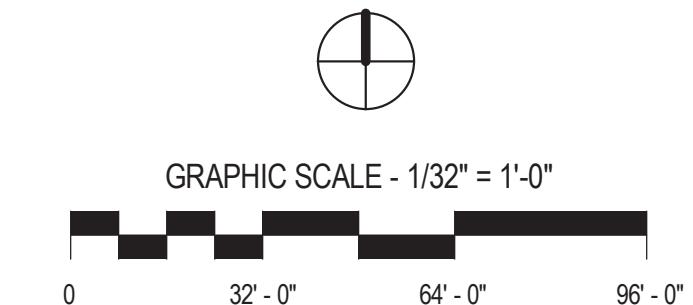


CHILLED WATER AND HEATING WATER SCHEMATIC FLOW DIAGRAM

NO SCALE (PROVIDE ALL VALVES AND PIPING SPECIALTIES SHOWN ON THIS DIAGRAM. SEE DETAIL SHEETS FOR ADDITIONAL VALVES AND PIPING SPECIALTIES REQUIRED)

Checked By RCH
Drawn by PLH

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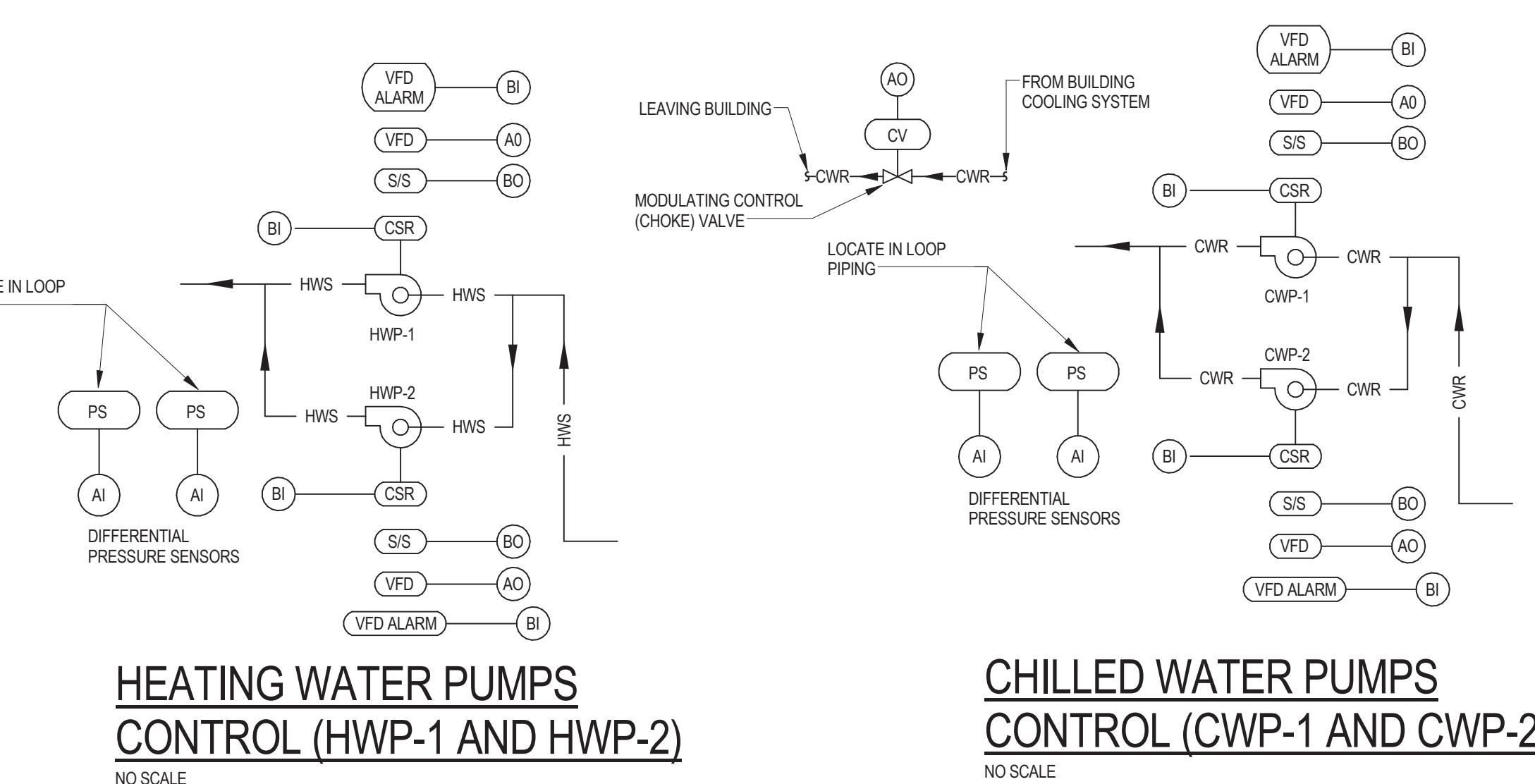
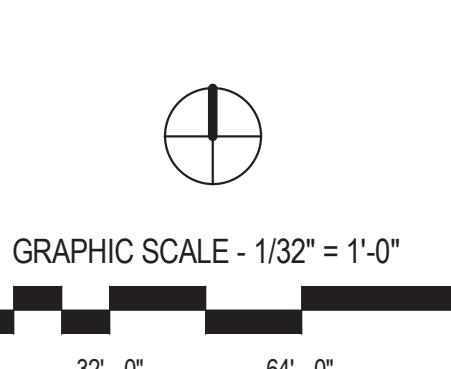
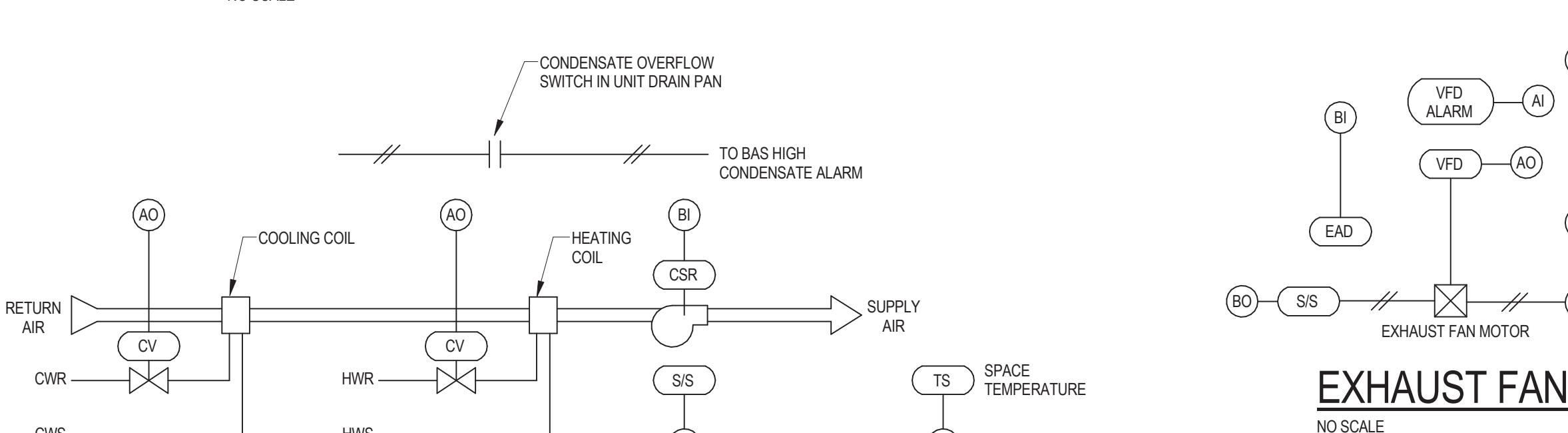
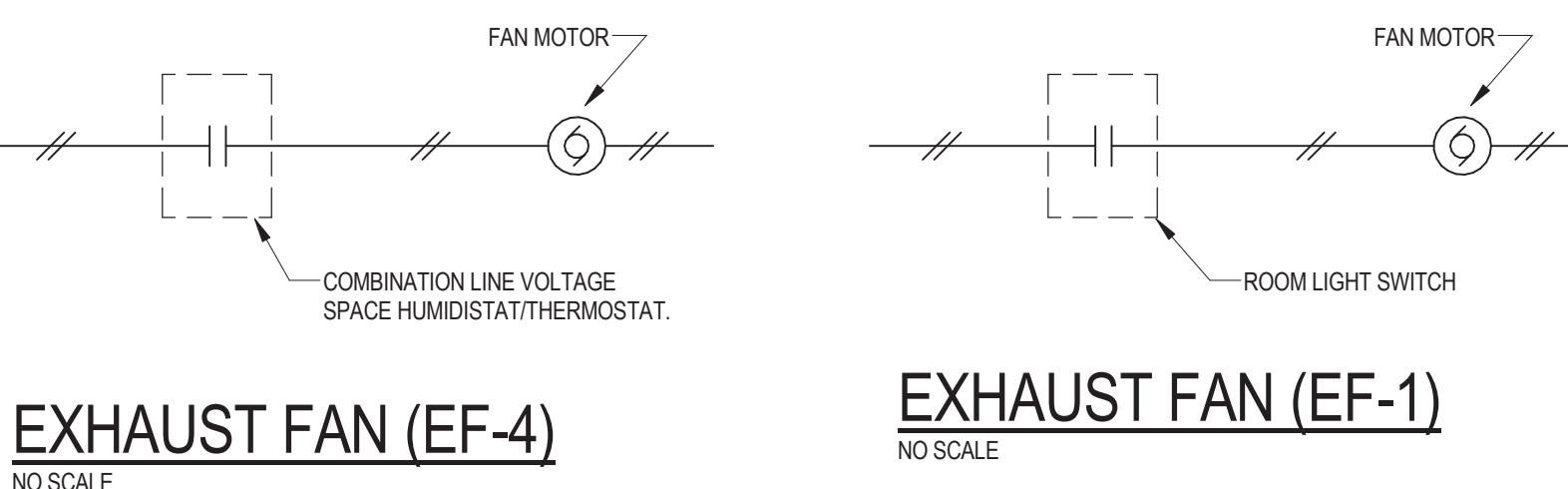
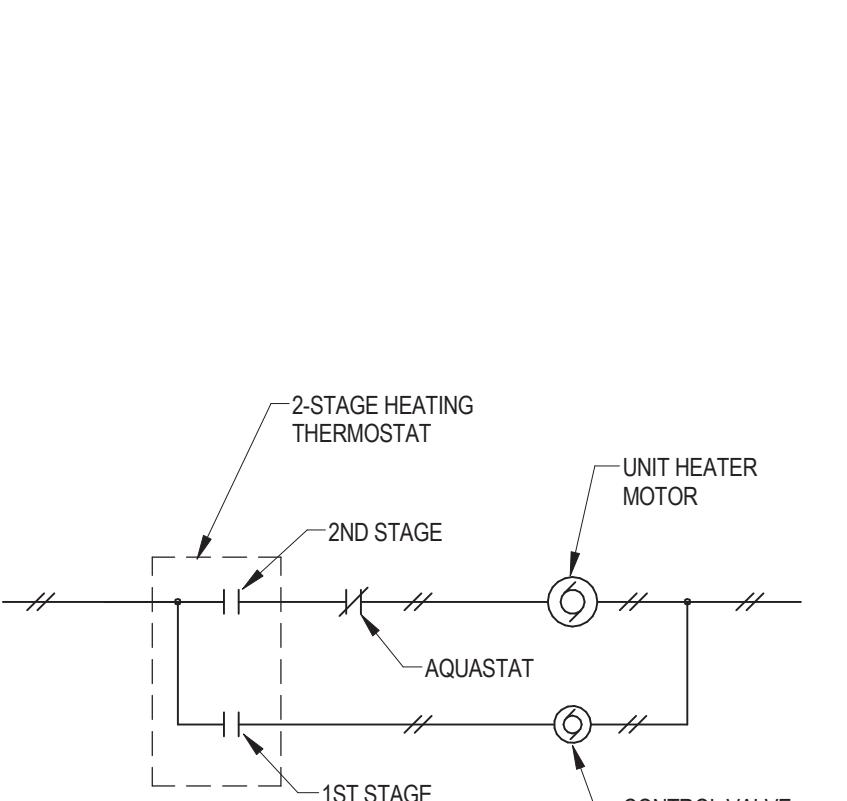


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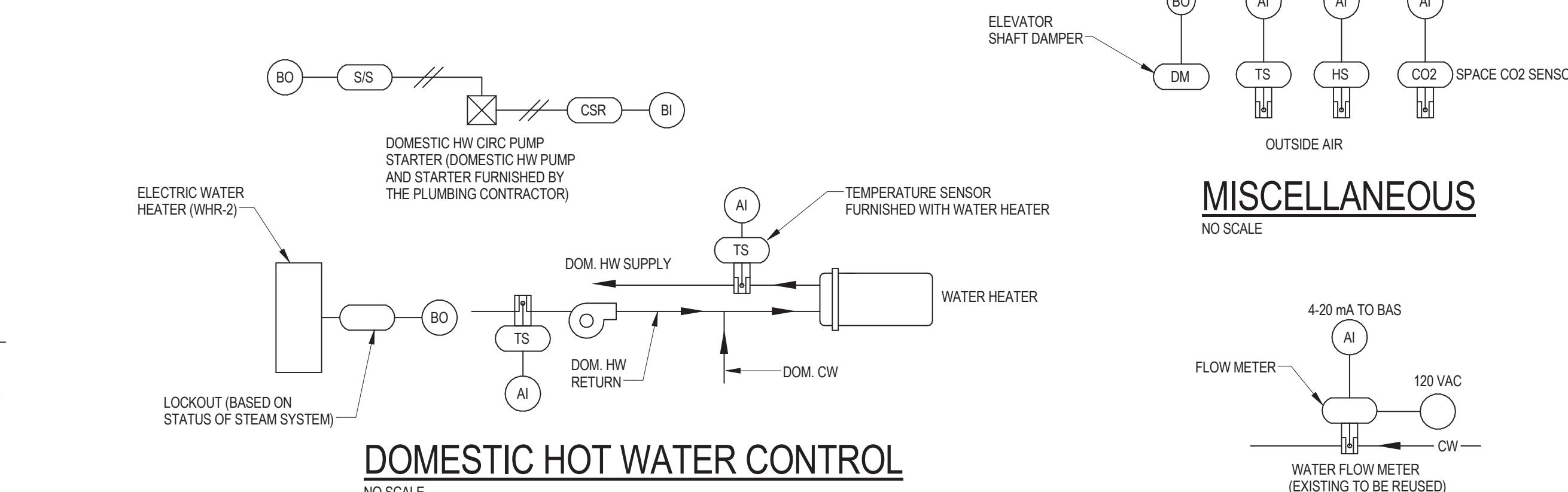
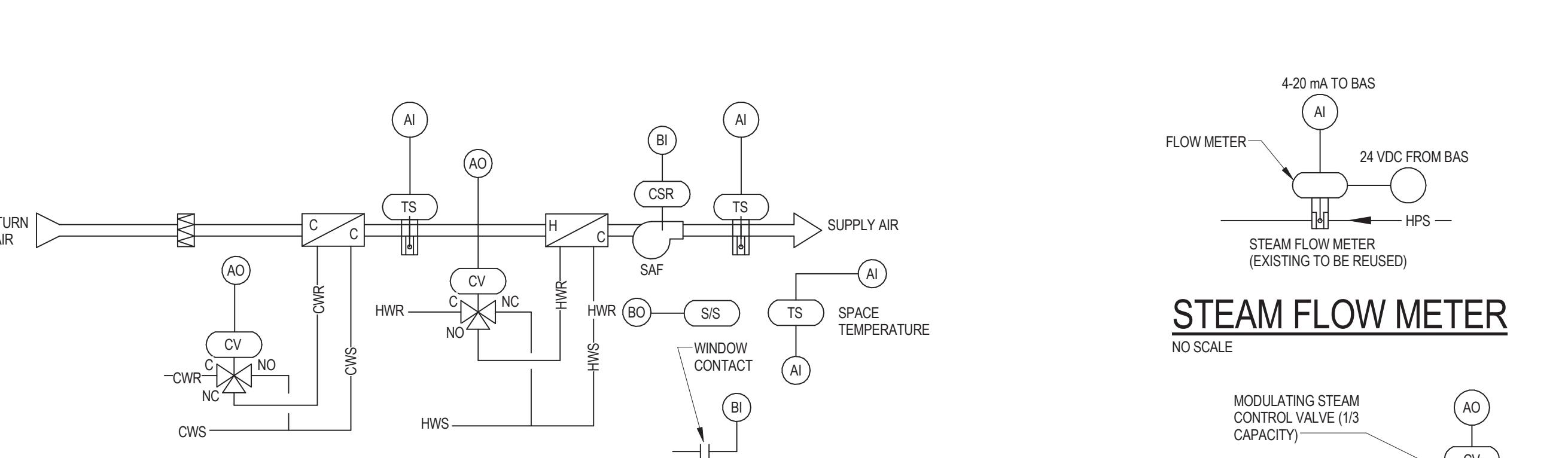
RENOVATION OF THREE
RESIDENCE HALLS
DRAPER HALLRADFORD UNIVERSITY
RADFORD, VIRGINIAProject Code 217-17565-002
VMDO Project Number 1115

Checked By _____
Drawn By _____

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**CHILLED WATER PUMPS CONTROL (CWP-1 AND CWP-2)**
NO SCALE**HORIZONTAL CONCEALED, VERTICAL CONSOLE AND VERTICAL CONCEALED FAN COIL UNIT CONTROL**
NO SCALE**EXHAUST FAN (EF-1)**
NO SCALE

CONTROL LEGEND	
CV	CONTROL VALVE ACTUATOR
CSR	CURRENT SENSING RELAY
SAF	SUPPLY AIR FAN
RAF	RETURN AIR FAN
VFD	VARIABLE SPEED DRIVE
TS	TEMPERATURE SENSOR
PS	PRESSURE SENSOR
DPS	DIFFERENTIAL PRESSURE SENSOR
FZ	FROZEN STAT
DM	DAMPER MOTOR
SD	SMOKE DETECTOR
AO	ANALOG OUTPUT
AI	ANALOG INPUT
BO	BINARY OUTPUT
BI	BINARY INPUT
S/S	START/STOP
HS	HUMIDITY SENSOR
OAD	OUTDOOR AIR DAMPER
EAD	EXHAUST AIR DAMPER
RDR	RETURN AIR DAMPER
ES	EXHAUST END SWITCH
EAF	EXHAUST AIR FAN
CO2	CO2 SENSOR

MISCELLANEOUS
NO SCALE**DOMESTIC WATER FLOW METER**
NO SCALE**AIR HANDLING UNIT CONTROL (AHU-2, AHU-3)**
NO SCALE**KW METER**
NO SCALE**DUCTLESS SPLIT AIR CONDITIONING UNIT**
NO SCALE**HVAC CONTROL DIAGRAMS**



RENOVATION OF THREE RESIDENCE HALLS DRAPER HALL

RADFORD UNIVERSITY
RADFORD, VIRGINIA

Project Code 217-17565-002
VMDO Project Number 1115

217-17565-002
1115

Checked By RCH
Drawn By PLH

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GRAPHIC SCALE - 1/32" = 1'-0"

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	CONSTRUCTION SET	05.01.15

SEQUENCES OF OPERATION

SEQUENCES OF OPERATION

A. Converter Heating System: The converter shall be controlled based on the outside air temperature and heating water supply temperature. On a fall in outside air temperature below an adjustable setpoint (determined by the Owner), the converter system shall be energized. The active heating water pump (HWP - 1 or 2) shall be energized. The smaller control valve (1/3 capacity) and associated active pump shall be energized and the control valve shall modulate to satisfy the supply water temperature setpoint. If the supply water temperature setpoint cannot be achieved, then the larger control valve (2/3 capacity) shall be energized and modulated as required. As the supply water temperature rises, the control valves shall modulate toward the closed position in reverse order. The supply water temperature shall be automatically reset with outdoor air temperature according to a reset schedule determined by the Owner. The BAS shall monitor the supply and return water temperature.

B. Heating Water Pumps (HWP-1 and 2): Only one heating water pump shall operate at a time. The active pump shall operate in conjunction with the converter heating system. An adjustable frequency drive (VFD) shall vary the speed for the active pump to maintain heating water pressure and flow to the heating system. Two pressure sensors located within the heating water piping system shall control the speed of the variable frequency drive (VFD) of the active pump. The BAS shall control to the lowest DP reading, but shall monitor and adjust pump speed to prevent high DP setting from exceeding setpoint by +5 ps (adjustable). In the event that the active pump will not operate, then the standby pump shall be energized through the adjustable frequency drive (VFD). The active and standby pump shall alternate on a weekly basis.

C. Chilled Water Pumps (CWP-1 and CWP-2): On a call for cooling as signaled by the BAS, the active chilled water pump shall be energized. Only one chilled water pump shall operate at a time. The active pump shall operate as a variable water volume system pump as controlled by the BAS. One pump shall be designated as standby when the other pump is enabled. Upon pump failure, the BAS shall be alarmed, and the standby pump shall be energized. The BAS shall interpret with the variable frequency drive controllers (VFD) to accomplish start/stop, pump rotation, and pump failure sequencing. Two pressure sensors located within the chilled water system shall control the speed of the variable frequency drive (VFD) for CWP-1 and CWP-2 to meet flow demand. The BAS shall control to the lowest DP reading, but shall monitor and adjust pump speed to prevent high DP setting from exceeding setpoint by +5 ps (adjustable). Each pump shall be designated on a rotating basis as either standby or enabled pump.

D. Energy Recovery Ventilation Units (ERV-1 and ERV-2):

1. The BAS shall determine the schedule of operation for the air units. When the units are energized, the BAS shall open air dampers and exhaust air dampers. When damper open and switches are made, the supply and exhaust air fans shall start and the total energy recovery wheel VFD shall rotate the wheel. If dampers do not open, an alarm shall be sent to the Building Automation System (BAS). If either fan status or the total energy recovery wheel status does not match the command point, an alarm shall be sent to the BAS. A temperature sensor located in the discharge air stream downstream of the total energy recovery wheel shall signal the BAS to control the preheat coil, cooling coil and reheat coil modulating control valves to satisfy the discharge air temperature setpoint. In cooling mode, the cooling coil modulating control valve shall maintain leaving air temperature (setpoint 70°F adjustable). In heating mode, the reheat coil modulating control valve shall maintain leaving air temperature setpoint (70°F adjustable). If discharge air temperature varies from setpoint by +5 degrees F, the BAS shall interpret with the variable frequency drive controllers (VFD) to accomplish start/stop, pump rotation, and pump failure sequencing. Two pressure sensors located within the air stream on the face of the wheel shall indicate the discharge air temperature. The BAS shall provide defrost control based on the failure of a heating water pump to operate based on a current relay feedback, an alarm message shall be transmitted to the BAS.

E. Air Handling Unit (Variable Volume; AHU-1):

1. Occupied Mode: The supply air fan and return air fan (RF-1) shall operate continuously. The fans shall be energized through their respective VFDs.

a. Cooling: On a call for cooling, the BAS shall modulate open the outside air damper to maintain space temperature setpoint per an enthalpy economizer. On a continued call for cooling, the BAS shall modulate the cooling coil fully open. With the cooling coil fully open, the supply air fan variable speed drive (VFD) shall modulate to reduce supply air flow if the space temperature falls below setpoint. The minimum supply air quantity shall be 60% of the listed supply air quantity. If space temperature continues to fall, the cooling coil shall modulate from fully open toward the closed position. An enthalpy economizer shall compare indoor and outdoor enthalpy and modulate the unit outside air damper, return air damper and relief air damper and energize the unit exhaust fan during the cooling cycle to provide up to 100% outdoor air for free cooling. The supply air shall be limited to 55 Deg. F. (adjustable).

b. Dehumidification: During occupied mode, space humidity may be controlled by a return air damper and a supply air damper. The supply air damper shall be controlled by a call for dehumidification (setpoint adjustable), the supply air variable frequency drive (VFD) shall decrease the supply airflow to 50% of total flow, and the cooling coil discharge air temperature may be lowered (50°F F. or below). The unit heat coil control valve shall modulate and provide relief to prevent over-cooling of the space.

c. Heating: The BAS shall control to a constant space temperature during the heating mode with a constant air flow (70 percent of full air flow - adjustable). On a call for heating, the BAS shall modulate the outside air damper to maintain discharge air temperature setpoint. If heat is required during dehumidification, the VFD on the supply fan shall reduce supply airflow to 50% of maximum.

d. Outdoor Air: The outdoor air damper shall remain in the minimum position, except to modulate open in the economizer cycle. The outdoor air damper shall also modulate according to the space CO2 level. The outdoor air damper shall modulate the minimum outside air setting. The outdoor air damper shall also modulate according to the CO2 sensor in the space. The duct-mounted airflow measuring station in the outside air ductwork shall report outside air quantities to the BAS. The airflow measuring station shall control the outside air damper to an absolute minimum of 150 cfm and shall allow the building static pressure to drop below setpoint. The airflow measuring station shall alarm the BAS if outside air quantities differ by 10% or more from the design quantities, an alarm shall be sent to the BAS.

e. VAV: The return air fan (RF-1) shall operate as required to maintain static pressure setpoint. A differential pressure controller shall compare the indoor air pressure with the outdoor ambient atmospheric pressure. The return air fan variable speed drive (VFD) shall modulate to control the building pressure within adjustable setpoints. The return air damper shall modulate to relieve air into the mechanical room. The BAS controller shall modulate the variable speed drive of the supply fan motor as previously described in paragraph "d" above.

2. Unoccupied Mode: When the unit is in the unoccupied mode, the supply air fan shall cycle and outdoor air damper and relief air dampers shall be closed. The return air damper shall be open. The unit shall maintain setback/setup space temperatures as determined by the Owner through the BAS. On a manual call for override from the temperature sensor override button, the system shall return to the occupied mode of operation for a set period of time.

3. Manual Warm-up/Cool Down Mode: The BAS shall optimally start the unit and modulate the heating or cooling coil valves to reach occupied setpoint by scheduled occupied time. The outside air damper and relief air dampers shall be closed.

4. Temperature Sensor: Two temperature sensors located in the space shall have an adjustment for occupant comfort which shall change the setpoint by 2 Deg. F. (adjustable through BAS only).

5. Safety: A low limit sensor (freezing point) located across the face of the chilled water coil shall energize the unit supply fan and return fan (RF-1) and close the outside air and relief air dampers in the event a low limit (38 Deg. F) is reached on the leaving side of the chilled water coil. If the air temperature upstream of the chilled water coils is 38 deg. F. or below, the chilled water control valve shall fully open to the coil. If the air temperature downstream of the reheat coil is 38 deg. F. or below, the heating water control valve shall be fully open to the coil. If space CO2 levels rise above setpoint (adjustably) by 10% or more, an alarm shall be sent to the BAS.

F. Air Handling Unit (Constant Volume; AHU-2, AHU-3):

1. Occupied Mode: The supply air fan shall operate continuously.

a. Cooling: On a call for cooling, the BAS shall modulate the cooling coil control valve to maintain space temperature setpoint.
b. Heating: On a call for heating, the BAS shall modulate the heating (reheat) coil control valve to maintain space temperature setpoint.

2. Unoccupied Mode: When the unit is in the unoccupied mode, the supply air fan shall cycle. The unit shall maintain setback/setup space temperatures as determined by the Owner through the BAS. On a manual call for override from the temperature sensor override button, the system shall return to the occupied mode of operation for a set period of time.

3. The temperature sensor located in the space shall have an adjustment for occupant comfort which shall change the setpoint by 2 Deg. F. (adjustable through BAS only).

4. Window Contact: Provide a control switch with a normally closed contact in each operable window. The contact shall be wired in the unit fan control circuit to allow normal operation of the unit fan when the window is open. If multiple windows are in a room then they shall all be wired in series so if one window is open in any room served by the air handling unit then the unit fan is de-energized.

G. Horizontal, Concealed, Vertical Console and Vertical Concealed Fan Coil Units (HFC-1 thru HFC-3, VFC-6 thru VFC-8 with ERV-3):

1. General: Each fan coil unit shall be controlled by a temperature sensor located in each space through the BAS.

2. The temperature sensor in each space shall have an adjustment for occupant comfort which shall change setpoint within the controller by 3 Deg. F. (adjustable through BAS only). The controller shall modulate two-way heating/cooling control valves as needed to maintain the setpoint within the room. The two-way modulating control valves shall be furnished by the BAS Contractor to the fan coil unit manufacturer for factory installation. The controller shall cycle the supply fan on/off as needed to maintain the setpoint within the room. The two-way modulating control valves shall be furnished by the BAS Contractor to the fan coil unit manufacturer for factory installation.

3. The condensate overflow valve shall shut off for the coil unit. If the chilled water valve fails and alarm the BAS if the high condensate level trips the switch.

4. Ventilation unit ERV-3 shall operate during occupied hours. When energized, the outdoor air and exhaust air dampers shall open and the unit supply and exhaust air fans shall be energized. The duct-mounted airflow measuring station in the outside air ductwork shall report outside air quantities to the BAS. The airflow measuring station shall alarm the BAS if outside air quantities differ by 10% or more from design.

H. Ductless Split Air Conditioning Units (IU-1/IU-2 and IU-2/OU-2):

1. Unit shall be controlled by a wall-mounted thermostat/sensor with programmable setpoints that shall be provided with the unit. The supply fan shall operate continuously. On a call for cooling, the controls shall stage on the DX cooling to maintain setpoint.

2. Safety: The BAS shall monitor unit status and room temperature.

I. Split System Air Conditioning Unit and Hot Water Unit (FCU-1/HPU-1 and HWC-5):

1. Unit shall be controlled by a space-mounted thermostat/sensor wired to a controller. The thermostat/sensor and controller shall be furnished with the unit. The thermostat/sensor and controller shall operate as a complete system with the BAS to provide heating (through HWC-1), cooling, occupied/unoccupied operation, supply air fan speed control and adjustable temperature range at the space (through the BAS).

2. Occupied Mode: Indoor fan and unit supply air fan shall operate continuously.

a. System controller shall be indexed to occupied time schedule and temperature setpoints from the BAS.

b. Cooling: On a call for cooling, the controller shall energize the condensing unit and stage the compressor and indoor unit coil to maintain space cooling setpoint.

c. Heating: On a call for heating, the two-way heating water control valve for HWC-1 shall modulate to maintain space temperature setpoint.

3. Unoccupied Mode: System controller shall be indexed to unoccupied time schedule and temperature setpoints from the BAS. Indoor unit supply fan shall cycle and the compressor (cooling) or hot water coil (heating) shall modulate to maintain unoccupied setback temperature. Controller shall operate with input from space thermostat/sensor to maintain BAS-determined unoccupied heating and cooling and heating setpoint (adjustable). On a manual call for override from the temperature sensor override button, the system shall return to the occupied mode of operation for a set period of time (adjustable).

4. Safety: The condensate overflow drain switch shall energize the unit and alarm the BAS if the drain line becomes clogged on the indoor unit. If the condensate pump fails, an alarm shall be sent to the BAS.

5. Window Contact: Provide a control switch with a normally closed contact in each operable window. The contact shall be wired in the unit fan control circuit to allow normal operation of the unit fan when the window is open. If multiple windows are in a room, then they shall all be wired in series so if one window is open then the unit fan is de-energized.

J. Horizontal Unit Heaters (UH-1 and UH-2): Unit shall be controlled by a wall-mounted thermostat. The thermostat shall cycle the unit fan and open/close the heating water control valve to maintain the thermostat setpoint. An aquastat shall be provided to stop the fan if the heating water temperature falls below 60 Deg. F.

K. Vertical Stack Fan Coil Units (VFC-1 thru VFC-5):

1. General: Each fan coil unit shall be controlled and monitored as directed by the BAS. Unit controllers shall be furnished by the BAS Contractor to the fan coil unit manufacturer for factory installation.

2. The vertical fan coil unit shall consist of:

a. Chilled water coil with a 2-way modulating control valve (furnished by the BAS Contractor to the fan coil unit manufacturer for factory installation)

b. Supply air fan

c. Hot water coil with a 2-way modulating control valve (furnished by the BAS Contractor to the fan coil unit manufacturer for factory installation)

3. The BAS shall perform the following fan coil control strategies, provide points listed on the list and provide the specified monitoring and diagnostics.

a. Fan Operation: The supply fan shall cycle on/off as needed to maintain setpoint within the room. Units shall be equipped with a current sensing relay to indicate an alarm at the BAS if the supply air fan motor fails.

b. Occupancy Setpoint Adjustment: The temperature sensor located in each space shall have an adjustment for occupant comfort which shall change the setpoint by 3 Deg. F. (adjustable through BAS only).

c. Four Pipe Valve Control: In heating mode, heating coil and coil control valves shall be modulated to maintain the heating setpoint. In cooling mode, cooling coil control valve shall be modulated to maintain the cooling setpoint and the heating coil control valve shall be fully closed. In either mode, the discharge air temperature setpoint shall be limited to an adjustable low (usually 50 Deg. F.) and high (usually 90 Deg. F.) to prevent extremely cold or hot air from blowing into the space.

d. Unoccupied Operation: In the Unoccupied Mode, the heating and cooling operation shall be the same as Occupied Mode, except that the adjustable setpoints shall be adjusted as directed by the Owner.

e. Each zone shall have a thermostatic element to measure the actual zone temperature. The setpoint shall be determined by the BAS set.

f. A condensate overflow switch for each vertical fan coil unit shall shut off the fan coil unit to close the chilled water valve and alarm the BAS if the high condensate level trips the switch.

4. Window Contact: Provide a control switch with a normally closed contact in each operable window in bedrooms and living room areas. The contact shall be wired in the unit fan control circuit to allow normal operation of the unit fan when the window is closed. But de-energize the unit fan when the window is open. If multiple windows are in a room then they shall all be wired in series so if one window is open then the unit fan is de-energized.

L. Electric Wall Heaters (CUH-1 and CUH-2): Units shall be controlled by the unit-mounted thermostats. Upon a call heating, the fan shall energize and the electric heating coil shall modulate to maintain space temperature setpoint.

M. Exhaust Fans:

1. Exhaust fan EF-1 shall be controlled by the room light switch.

2. Mechanical room exhaust fan EF-2 shall be controlled by a single stage cooling thermostat. Upon an increase in space temperature above setpoint (adjustable), the exhaust motorized damper and outside air motorized damper shall open and the fan shall be energized.

3. Dryer exhaust fan EF-3 shall be controlled by a pressure sensor in the exhaust duct on the suction side of the exhaust fan. Upon an increase in pressure above setpoint, the exhaust fan VFD shall energize the motor and ramp the speed up and down as required to maintain static pressure setpoint, and the outside air damper shall modulate to maintain building static pressure.

4. Exhaust fan EF-4 shall be controlled by a combination space humidity/temperature sensor in the crawlspace. Upon an increase in either space relative humidity above setpoint (adjustable) or space temperature above setpoint (adjustable), the fan shall energize.

N. Steam Condensate Pump (CP): The steam condensate pump is controlled by a float switch located inside the pump receiver. When the level of steam condensate return in the pump rises above the float switch setting, the pump allows high pressure steam to push the steam condensate out of the pump to the steam condensate return manifolds and to the central heating plant.

O. Fin-Tube Radiators (FT-1): Each unit shall be controlled by a wall-mounted temperature sensor located in the space served by the fin-tube units and vertical stack fan coil units. The fin-tube unit two-way modulating control valve shall be operated to maintain the space temperature setpoint, in spaces with both fin-tube radiators and vertical stack fan coil units, the fin-tube radiators shall be the first stage of heat. If the fin-tube radiators are unable to maintain space heating setpoint, the vertical stack fan coil units shall provide secondary heating. The BAS shall control the fin-tube radiators and vertical stack fan coil units within each space in unison to prevent simultaneous heating and cooling.

P. Domestic Hot Water System Control:

1. Pump Control: The BAS shall start and stop the circulator pumps according to the operator entered occupancy schedule. In the occupied mode, the pump shall run continuously. In the unoccupied mode, the pump shall be off. If pump does not operate when selected to run, an alarm shall be sent to the operator through a motor current sensor.