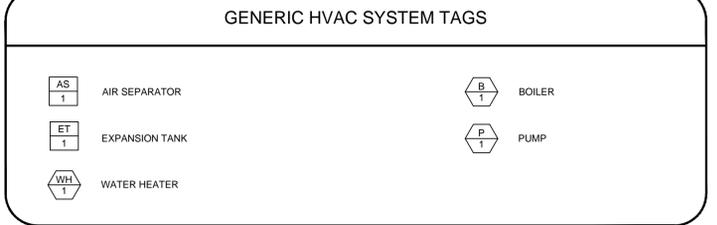
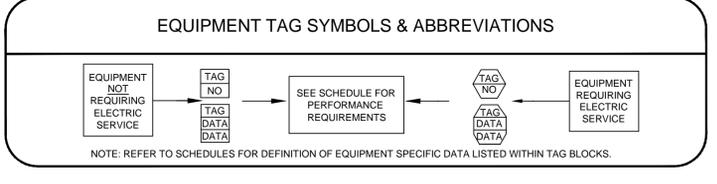
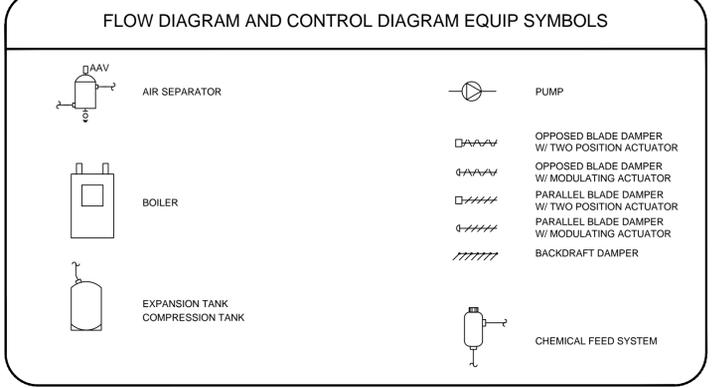


GENERIC ABBREVIATIONS

*F	DEGREES FAHRENHEIT	ID	INSIDE DIAMETER
°C	DEGREES CELSIUS	IN	INCHES
Ø	DIAMETER	INSUL	INSULATION
ACV	AUTOMATIC CONTROL VALVE	KILOVOLT	KILOVOLT
AD	ACCESS DOOR	KVA	KILOVOLT AMPERE
ADJ	ADJUSTABLE	LB	LENGTH
ADDL	ADDITIONAL	MB	MAXIMUM
AFF	ABOVE FINISHED FLOOR	LF	LINEAR FEET
AFG	ABOVE FINISHED GRADE	LVG	LEAVING
ALT	ALTERNATE	M	ONE THOUSAND
AP	ACCESS PANEL	MAX	MAXIMUM
ARCH	ARCHITECT	MBH	THOUSAND BRITISH THERMAL UNITS PER HOUR
ATC	AUTOMATIC TEMPERATURE CONTROL	MCA	MINIMUM CIRCUIT AMPS
ATV	ATMOSPHERIC VENT	MCC	MOTOR CONTROL CENTER
AS	AIR SEPARATOR	MECH	MECHANICAL
AVG	AVERAGE	MEZZ	MEZZANINE
BAS	BUILDING AUTOMATION SYSTEM	MFR	MANUFACTURER
BFF	BELOW FINISHED FLOOR	MIN	MINIMUM
BHP	BRAKE HORSEPOWER	MTD	MOUNTED
BLDG	BUILDING	MU	MAKEUP WATER
BLR	BOILER	N/A	NOT APPLICABLE
BOD	BOTTOM OF DUCT	NC	NORMALLY CLOSED
BOP	BOTTOM OF PIPE	NC	NORMALLY CLOSED
BSMT	BASEMENT	NTS	NOT IN CONTRACT
BTU	BRITISH THERMAL UNIT	NO	NORMALLY OPEN
BTUH	BRITISH THERMAL UNIT PER HOUR	NO	NUMBER
CONTR	CONTRACTOR	NOM	NOMINAL
CF	CEILING FAN	NTS	NOT TO SCALE
CL	CENTERLINE	OB	OCTAVE BAND
CLG	CEILING	OC	ON CENTER
CO	CLEAN-OUT	OD	OUTSIDE DIAMETER
COL	COLUMN	ODP	OPEN DRIP PROOF
COMP	COMPRESSOR	OFCI	OWNER FURNISHED CONTRACTOR INSTALLED
CONC	CONCRETE	OFI	OWNER FURNISHED OWNER INSTALLED
CONN	CONNECTION	OFV	OUTLET VELOCITY
CONTR	CONTRACTOR	PCF	POUNDS PER CUBIC FOOT
CORR	CORRIDOR	PD	PRESSURE DROP
CUF	CUBIC FEET	PH	PHASE
CUH	CABINET UNIT HEATER	PLBG	PLUMBING PROVIDED BY OTHER SECTION(S)
CYL	CYLINDER	POS	PRESSURE
D	DRAIN	PRIM	PRIMARY
DB	DRY BULB TEMPERATURE	PSIA	POUNDS PER SQUARE INCH ABSOLUTE
DDC	DIRECT DIGITAL CONTROL	PSID	POUNDS PER SQUARE INCH DIFFERENTIAL
DDCFP	DIRECT DIGITAL CONTROL FIELD PANEL	PSIG	POUNDS PER SQUARE INCH GAUGE
DIA	DIAMETER	PVC	POLYVINYL CHLORIDE
DM	DIMENSION	REP	REPRESENTATIVE
DN	DOWN	RET	RETURN
DWG	DRAWING	REQD	REQUIRED
EA	EACH	REQS	REQUIREMENTS
EAT	ENTERING AIR TEMPERATURE	RH	RELATIVE HUMIDITY
EFF	EFFICIENCY	RM	ROOM
ECUH	ELECTRIC CABINET UNIT HEATER	RPM	REVOLUTIONS PER MINUTE
ELEC	ELECTRICAL	SCH	SCHEDULE
ELEV	ELEVATION	SOV	SOLENOID OPERATED VALVE
EMER	EMERGENCY	SPECS	SPECIFICATIONS
ENT	ENTERING	SQ	SQUARE
EQUIP	EQUIPMENT	SQFT	SQUARE FEET
EXH	EXHAUST	SS	STAINLESS STEEL
EXP	EXPANSION	STD	STANDARD
FTR	FINNED TUBE RADIATION	STDBY	STANDBY
FCV	FLOW CONTROL VALVE	STL	STEEL
FG	FIBERGLASS	SUCT	SUCTION
FLEX	FLEXIBLE	SUP	SUPPLY
FLR	FLOOR	TA	THROW-AWAY
FLDR	FLOOR DRAIN	TAV	THERMOSTATIC AIR VENT
FP	FIRE PROTECTION	TEFC	TOTALLY ENCLOSED FAN COOLED
FPM	FEET PER MINUTE	TEL	TELEPHONE
FT	FEET	TEMP	TEMPERATURE
FT/SEC	FEET PER SECOND	TOP	TOP OF DUCT
FURN	FURNISHED	TOP	TOP OF PIPE
FVNR	FULL VOLTAGE NON-REVERSING	TYP	TYPICAL
GA	GAUGE	UH	UNIT HEATER
GAL	GALLONS	V	VENT
GALV	GALVANIZED	VEL	VELOCITY
GC	GENERAL CONTRACTOR	VERT	VERTICAL
GND	GROUND	VFD	VARIABLE FREQUENCY DRIVE
GPH	GALLONS PER HOUR	VTR	VENT THROUGH ROOF
GPM	GALLONS PER MINUTE	W	WIDTH
GRD	GRADE (GROUND LEVEL)	W	WITH
GWB	GYPNUM WALL BOARD	WO	WITHOUT
H	HEIGHT	WB	WET BULB TEMPERATURE
HD	HEAD	WF	WIDE FLANGE
HP	HORSEPOWER	WG	WATER GAUGE
HR	HOUR	WRT	WITH RESPECT TO
HZ	HERTZ		



- ### PLUMBING GENERAL NOTES
- PLUMBING WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST EDITION OF THE STATE PLUMBING AND GAS CODE INCLUDING ALL LOCAL AMENDMENTS.
 - OBTAIN ALL PERMITS AND PAY ALL FEES ASSOCIATED WITH THIS WORK PRIOR TO COMMENCEMENT.
 - THE DRAWINGS ARE DIAGRAMMATICAL ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT ROUTE OF ALL PIPING, IN FIELD AND IN CONJUNCTION WITH COORDINATION OF ALL EXISTING CONDITIONS, NEW CONSTRUCTION, AND COORDINATION WITH ALL OTHER TRADES TO INSURE THAT ALL THE PLUMBING SYSTEMS WILL FIT INTO THE SPACE.
 - IN ADDITION TO REVIEWING AND COORDINATING WITH THE OTHER TRADES (CIVIL, STRUCTURAL, ARCHITECTURAL, FIRE PROTECTION, HVAC, AND ELECTRICAL) THE CONTRACTOR SHALL VISIT THE SITE AND FAMILIARIZE HIMSELF WITH DETAILS OF CONSTRUCTION.
 - ALL EXISTING CONDITIONS SHOWN ARE APPROXIMATE ONLY. ALL EXISTING CONDITIONS SHALL BE VERIFIED IN THE FIELD.
 - ADDRESS QUESTIONS REGARDING DRAWINGS TO ARCHITECT IN WRITING BEFORE AWARD OF CONTRACT. OTHERWISE, ARCHITECT INTERPRETATION OF MEANING AND INTENT OF DRAWINGS SHALL BE FINAL.
 - VISIT SITE AND EXAMINE CONDITIONS UNDER WHICH WORK MUST BE PERFORMED. REPORT ADVERSE CONDITIONS IN WRITING TO ARCHITECT. COMMENCEMENT OF WORK SHALL BE CONSTRUED AS COMPLETE ACCEPTANCE OF EXISTING CONDITIONS INCLUDING PREPARATORY WORK DONE BY OTHERS.
 - GUARANTEE WORK IN WRITING FOR ONE YEAR FROM DATE OF FINAL ACCEPTANCE. REPAIR OR REPLACE DEFECTIVE MATERIALS OR INSTALLATION AT NO COST TO OWNER. CORRECT DAMAGE CAUSED IN MAKING NECESSARY REPAIRS AND REPLACEMENTS UNDER GUARANTEE AT NO COST TO OWNER.
 - CONTRACTOR MUST PROVIDE AND INSTALL ALL NECESSARY PIPING, FITTINGS, VALVES, EQUIPMENT SUPPORTS AND ANY EQUIPMENT NOT SHOWN ON DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS BUT NECESSARY TO CONFORM TO 248 CMR 10.00 AND PROVIDE A COMPLETE FUNCTIONING SYSTEM.
 - PROVIDE ACCESS TO ALL EQUIPMENT REQUIRING PERIODIC SERVICE AND MAINTENANCE.
 - FURNISH ACCESS PANELS TO THE GENERAL CONTRACTOR FOR INSTALLATION UNDER THE RELATED TRADES.
 - PIPING SHALL RUN CONCEALED IN ALL AREAS WITH THE EXCEPTION OF MECHANICAL ROOMS, AREAS WHERE NO CEILING EXISTS OR WHERE NOTED ON THE PLANS.
 - INSTALL DIELECTRIC COUPLINGS BETWEEN DISSIMILAR MATERIALS.
 - ALL PIPING RUNNING THROUGH BUILDING EXPANSION JOINTS SHALL BE EQUIPPED WITH EXPANSION FITTINGS.
 - INTERRUPTIONS TO EXISTING SERVICES AND SYSTEMS SHALL BE AS SHORT AS POSSIBLE AND AT A TIME AND DURATION APPROVED BY THE ARCHITECT OR OWNER. INCLUDE ALL PREMIUM TIME ASSOCIATED WITH INTERRUPTIONS.
 - ALL NEW SYSTEMS SHALL BE TESTED, BALANCED AND ADJUSTED TO INSURE PROPER OPERATION AND CODE COMPLIANT INSTALLATION. PIPING AND EQUIPMENT SHALL BE TESTED IN ACCORDANCE WITH THE STATE PLUMBING CODE.
 - INSTALL SHOCK ABSORBERS BY PRECISION PLUMBING PRODUCTS AT ENDS OF HOT AND COLD WATER PIPING RUNS BELOW THE LAST FIXTURE.
 - THE PLUMBING CONTRACTOR SHALL FURNISH AND INSTALL ALL TRAPS, ANGLE STOPS, WASTE ARMS, STRAINERS, TAIL PIECES, FIXTURE SUPPLIES AND ALL OTHER PLUMBING CONNECTIONS TO FIXTURES REQUIRING PLUMBING AND AS REQUIRED FOR A COMPLETE SYSTEM.
 - ALL WATER PIPING SHALL BE RUN ON THE WARM SIDE OF BUILDING INSULATION. NO WATER PIPING SHALL BE RUN IN EXTERIOR WALLS.
 - THE PLUMBING CONTRACTOR SHALL SUBMIT PROPER DOCUMENTATION FOR ALL BACK FLOW PREVENTERS TO THE LOCAL WATER AUTHORITY FOR APPROVAL. BACK FLOW PREVENTERS SHOULD NOT BE INSTALLED UNTIL APPROVAL HAS BEEN OBTAINED.

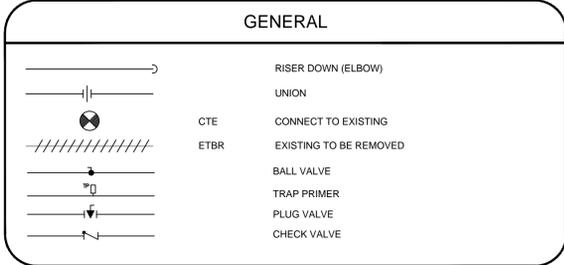
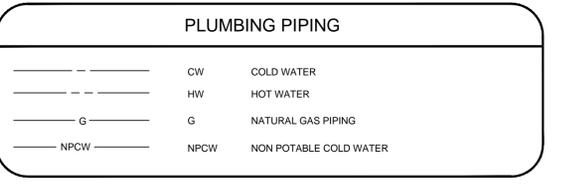
- ### DEMOLITION NOTES
- DISCONNECT AND DISMANTLE EXISTING PLUMBING SYSTEMS AND EQUIPMENT TO BE DEMOLISHED AND LEAVE DEBRIS AND DISCONNECTED EQUIPMENT IN DESIGNATED AREA FOR REMOVAL UNDER SECTION - SELECTIVE DEMOLITION.

- ### CONTRACTOR BIDDING NOTES
- THE DRAWINGS ARE DIAGRAMMATICAL ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT ROUTE OF ALL PIPING, IN FIELD AND IN CONJUNCTION WITH COORDINATION OF ALL EXISTING CONDITIONS, NEW CONSTRUCTION, AND COORDINATION WITH ALL OTHER TRADES TO INSURE THAT ALL THE PLUMBING SYSTEMS WILL FIT INTO THE SPACE.
 - IN ADDITION TO REVIEWING AND COORDINATING WITH THE OTHER TRADES (CIVIL, STRUCTURAL, ARCHITECTURAL, FIRE PROTECTION, HVAC, AND ELECTRICAL) THE CONTRACTOR SHALL VISIT THE SITE AND FAMILIARIZE HIMSELF WITH DETAILS OF CONSTRUCTION.
 - ALL EXISTING CONDITIONS SHOWN ARE APPROXIMATE ONLY. ALL EXISTING CONDITIONS SHALL BE VERIFIED IN THE FIELD.
 - ADDRESS QUESTIONS REGARDING DRAWINGS TO ENGINEER IN WRITING BEFORE AWARD OF CONTRACT. OTHERWISE, ENGINEER INTERPRETATION OF MEANING AND INTENT OF DRAWINGS SHALL BE FINAL.
 - VISIT SITE AND EXAMINE CONDITIONS UNDER WHICH WORK MUST BE PERFORMED. REPORT ADVERSE CONDITIONS IN WRITING TO ENGINEER. COMMENCEMENT OF WORK SHALL BE CONSTRUED AS COMPLETE ACCEPTANCE OF EXISTING CONDITIONS INCLUDING PREPARATORY WORK DONE BY OTHERS.
 - CONTRACTOR MUST PROVIDE AND INSTALL ALL NECESSARY PIPING, FITTINGS, VALVES, EQUIPMENT SUPPORTS AND ANY EQUIPMENT NOT SHOWN ON DRAWINGS OR CALLED FOR IN THE SPECIFICATIONS BUT NECESSARY TO CONFORM TO 248 CMR 10.00 AND PROVIDE A COMPLETE FUNCTIONING SYSTEM.

- ### HVAC GENERAL NOTES
- GENERAL NOTES APPLY TO ALL DRAWINGS.
 - THIS PROJECT INVOLVES CONSTRUCTION INSIDE AN EXISTING STRUCTURE. CONTRACTORS, BY SUBMITTING A BID, ARE DEEMED TO BE COMPLETELY FAMILIAR WITH THE EXISTING CONDITION OF THE BUILDING AS IT INFLUENCES THE WORK DESCRIBED. ABSOLUTELY NO CLAIMS FOR EXTRA COMPENSATION WILL BE CONSIDERED FOR EXISTING CONDITIONS VISIBLE OR REASONABLY INFERRABLE FROM A CAREFUL EXAMINATION OF THE EXISTING BUILDING.
 - THIS CONTRACTOR SHALL INSPECT THE EXISTING FIELD CONDITIONS AT THE SITE AND THE "AS-BUILT" BASE BUILDING CONTRACT DOCUMENTS PRIOR TO THE START OF ANY WORK TO DETERMINE WHAT EFFECT THE EXISTING CONDITIONS WILL HAVE ON HIS WORK. POTENTIAL PROBLEM AREAS SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT AND/OR ENGINEER IMMEDIATELY.
 - THIS CONTRACTOR SHALL CONNECT HIS WORK TO VARIOUS EXISTING PIPING IN THE BASE BUILDING. THE NEW WORK SHALL BE COMPATIBLE WITH THE EXISTING SYSTEMS. LOCATION OF EQUIPMENT OR THE ROUTING OF THE VARIOUS SYSTEMS AS WELL AS OPENINGS IN FLOOR SLABS OR WALLS SHALL BE GOVERNED BY THE EXISTING CONDITIONS AS THEY APPEAR IN THE FIELD OR ON THE "AS-BUILT" DRAWINGS.
 - CARE SHALL BE TAKEN DURING THE INSTALLATION TO NOT DAMAGE OR INTERRUPT BUILDING SYSTEMS AND SERVICES THAT ARE ALREADY INSTALLED. DAMAGE TO SUCH SYSTEMS OR EQUIPMENT CAUSED BY THIS CONTRACTOR DURING INSTALLATION SHALL BE REPAIRED AND/OR REPLACED AT THIS CONTRACTOR'S EXPENSE TO THE COMPLETE SATISFACTION OF THE BUILDING OWNER.
 - SHUTDOWN OF EXISTING SYSTEMS FOR CONNECTION TO EXISTING SERVICES SHALL BE COORDINATED WITH THE CONSTRUCTION MANAGER OR GENERAL CONTRACTOR AND BUILDING OWNER. THIS CONTRACTOR SHALL SUBMIT REQUESTS, WHERE THEY AFFECT THE OPERATION OF THE BUILDING SYSTEMS, AT LEAST ONE WEEK IN ADVANCE OF ANY REQUIRED SHUTDOWN. THE ACTUAL SHUTDOWN PERIOD SHALL BE AS SHORT AS POSSIBLE AND AT A TIME MUTUALLY AGREEABLE TO THE BUILDING OWNER AND THE CONSTRUCTION MANAGER/GENERAL CONTRACTOR.
 - CONTRACTOR SHALL BE RESPONSIBLE FOR TEMPORARY HEAT AND DOMESTIC HOT WATER SERVICE DURING SHUTDOWN PERIODS WHEN NECESSARY.
 - DRAWINGS ARE DIAGRAMMATIC, THEREFORE DETERMINE EXACT LOCATIONS OF SYSTEMS AND COMPONENTS IN FIELD.
 - ALL WORK SHALL BE COORDINATED WITH ALL TRADES INVOLVED. OFFSETS IN PIPING AND TRANSITIONS AROUND OBSTRUCTIONS SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.
 - VERIFY ALL EQUIPMENT CONNECTIONS WITH MANUFACTURER'S CERTIFIED DRAWINGS. VERIFY AND PROVIDE DUCT AND/OR PIPE TRANSITIONS TO FURNISHED EQUIPMENT. FIELD VERIFY AND COORDINATE ALL DIMENSIONS BEFORE FABRICATION.
 - ALL MATERIALS AND EQUIPMENT UNLESS SPECIFICALLY INDICATED AS REUSED, SHALL BE NEW.
 - WHEN SECTION OF PIPE IS NOT LABELED FOR SIZE, THE LARGER SIZE INDICATED ON THE CONNECTED PIPE SHALL PREVAIL.

HYDRONIC SYSTEM SPECIFIC ABBREVIATIONS

AS	AIR SEPARATOR	ET	EXPANSION TANK
AAV	AUTOMATIC AIR VENT	EWT	ENTERING WATER TEMPERATURE
CHEM	CHEMICAL FEED	LWT	LEAVING WATER TEMPERATURE
CTK	COMPRESSION TANK	MAN	MANUAL AIR VENT
DOV	DRAIN OFF VALVE	NPSH	NET POSITIVE SUCTION HEAD
		PU	PUMP
		TDH	TOTAL DYNAMIC HEAD



SCHEDULE OF DRAWINGS

DWG#	DESCRIPTION
M1.0	MECHANICAL LEGEND
MD2.0	MECHANICAL DEMO FLOOR PLAN-1ST BASE SIDE
MD2.1	MECHANICAL DEMO FLOOR PLAN-3RD BASE SIDE
M2.0	MECHANICAL FLOOR PLAN-1ST BASE SIDE
M2.0A	PLUMBING & VENTILATION 1ST BASE SIDE FLOOR PLAN
M2.1	MECHANICAL FLOOR PLAN-3RD BASE SIDE
M2.1A	PLUMBING & VENTILATION 3RD BASE SIDE FLOOR PLAN
M3.0	MECHANICAL DETAILS
M4.0	MECHANICAL SCHEDULES
M5.0	MECHANICAL SPECIFICATIONS



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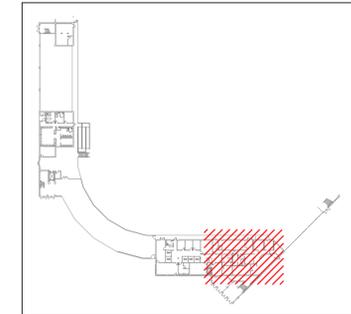
Date	Description

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04-11-2014

CSI Project Number: 2013-206
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Checked By: DM
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MECHANICAL LEGEND

M1.0
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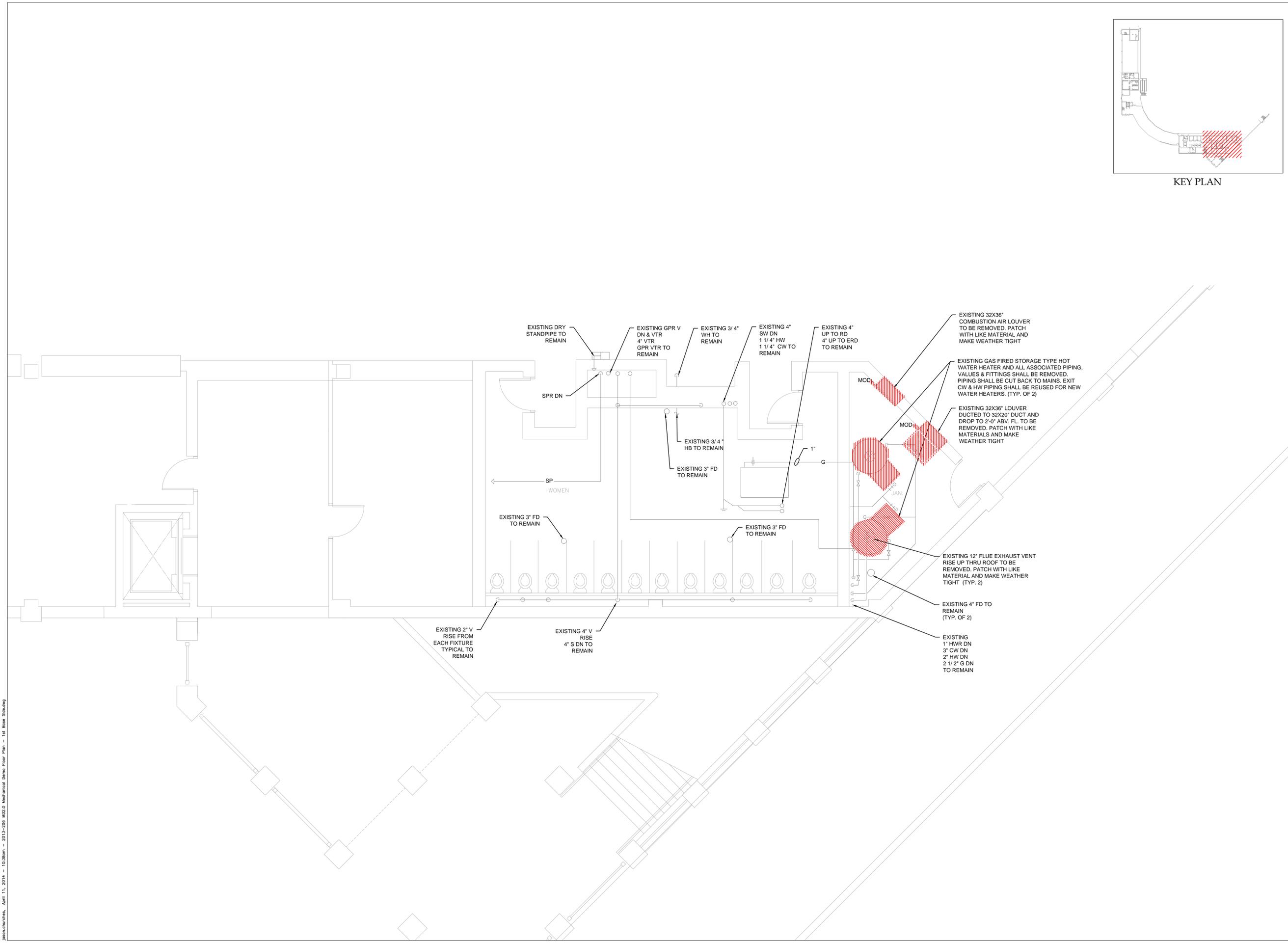
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MECHANICAL
1ST BASE SIDE
DEMO FLOOR PLAN

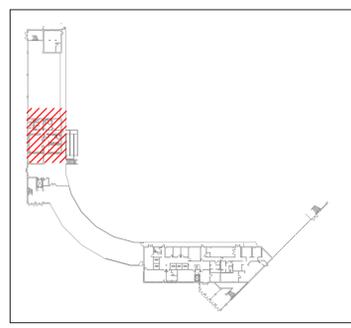
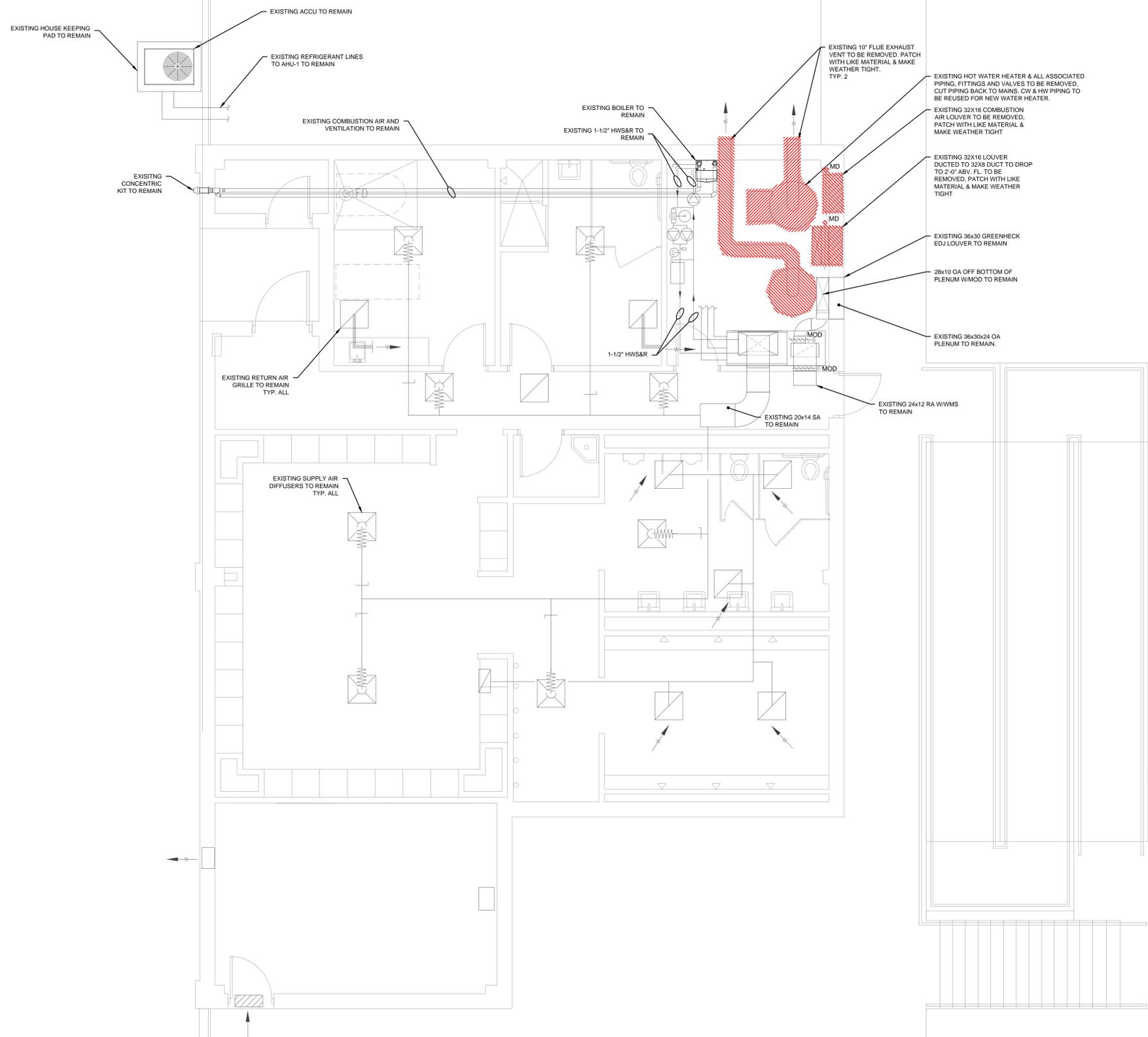
MD2.0

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John Churcher, April 11, 2014 - 10:36am - 2013-206 MD2.0 Mechanical Demo Floor Plan - 1st Base Side.dwg

2013-206 MD2.1 Mechanical Demo Floor Plan - 3rd Base Side
 2014 - 10:38am - April 11, 2014



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**LOWELL CIVIC
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 Checked By: DM
 Date: 04-11-14

MECHANICAL
 3RD BASE SIDE
 DEMO FLOOR PLAN

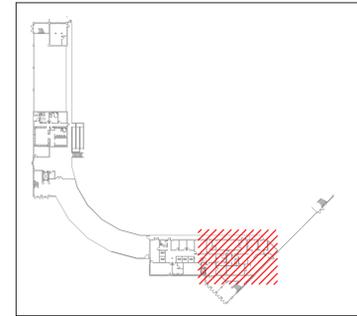
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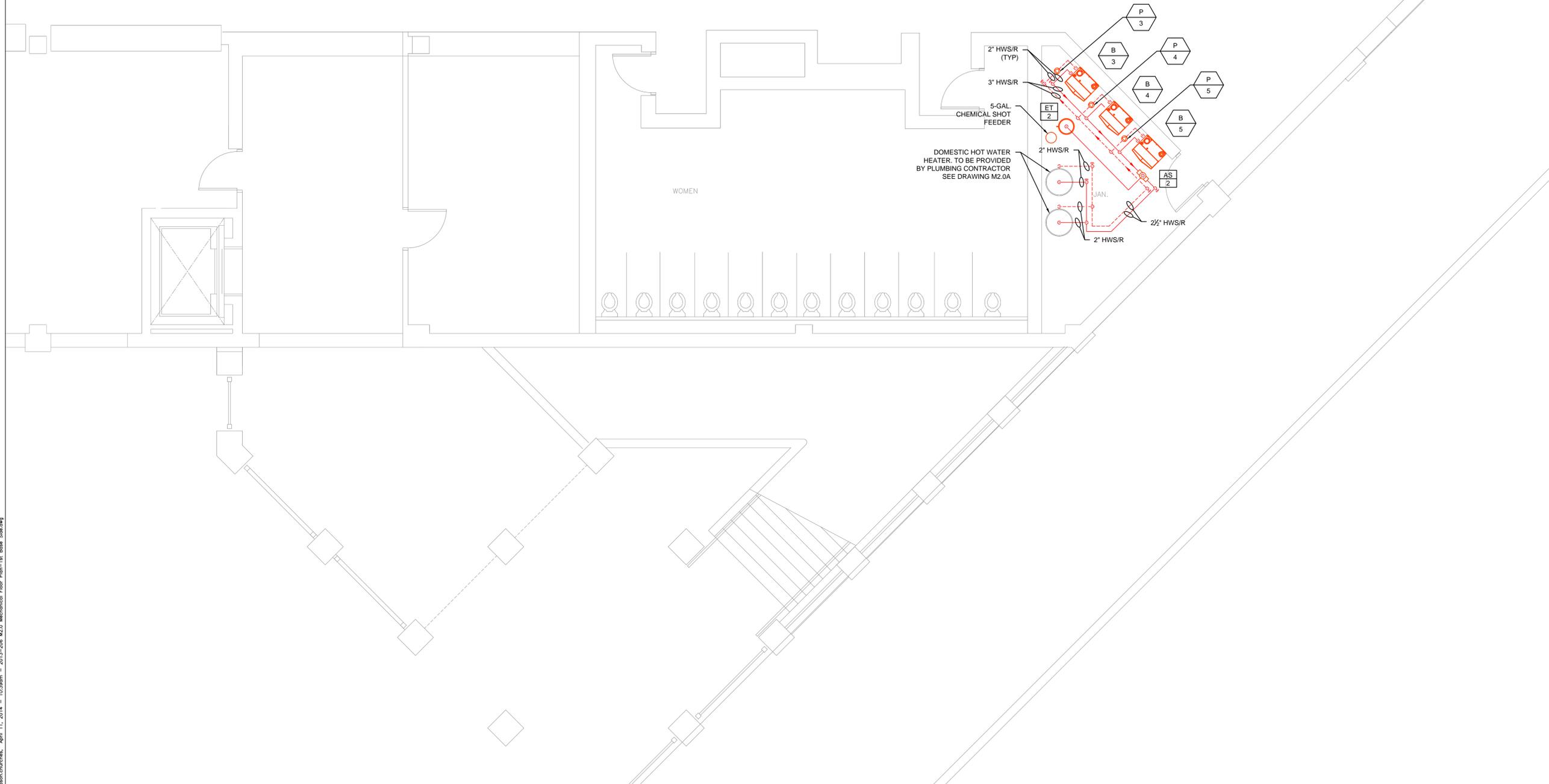
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Checked By: DM
Date: 04-11-14

MECHANICAL
1ST BASE SIDE
FLOOR PLAN
CONCOURSE LEVEL

M2.0
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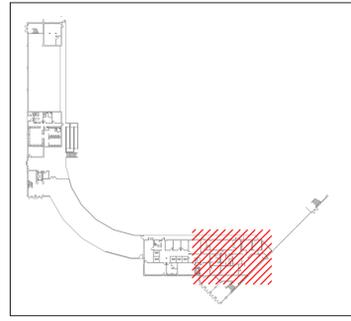
John.Churcher_April 11, 2014 - 10:39am - 2013-206 M2.0 Mechanical Floor Plan-1st Base Side.dwg



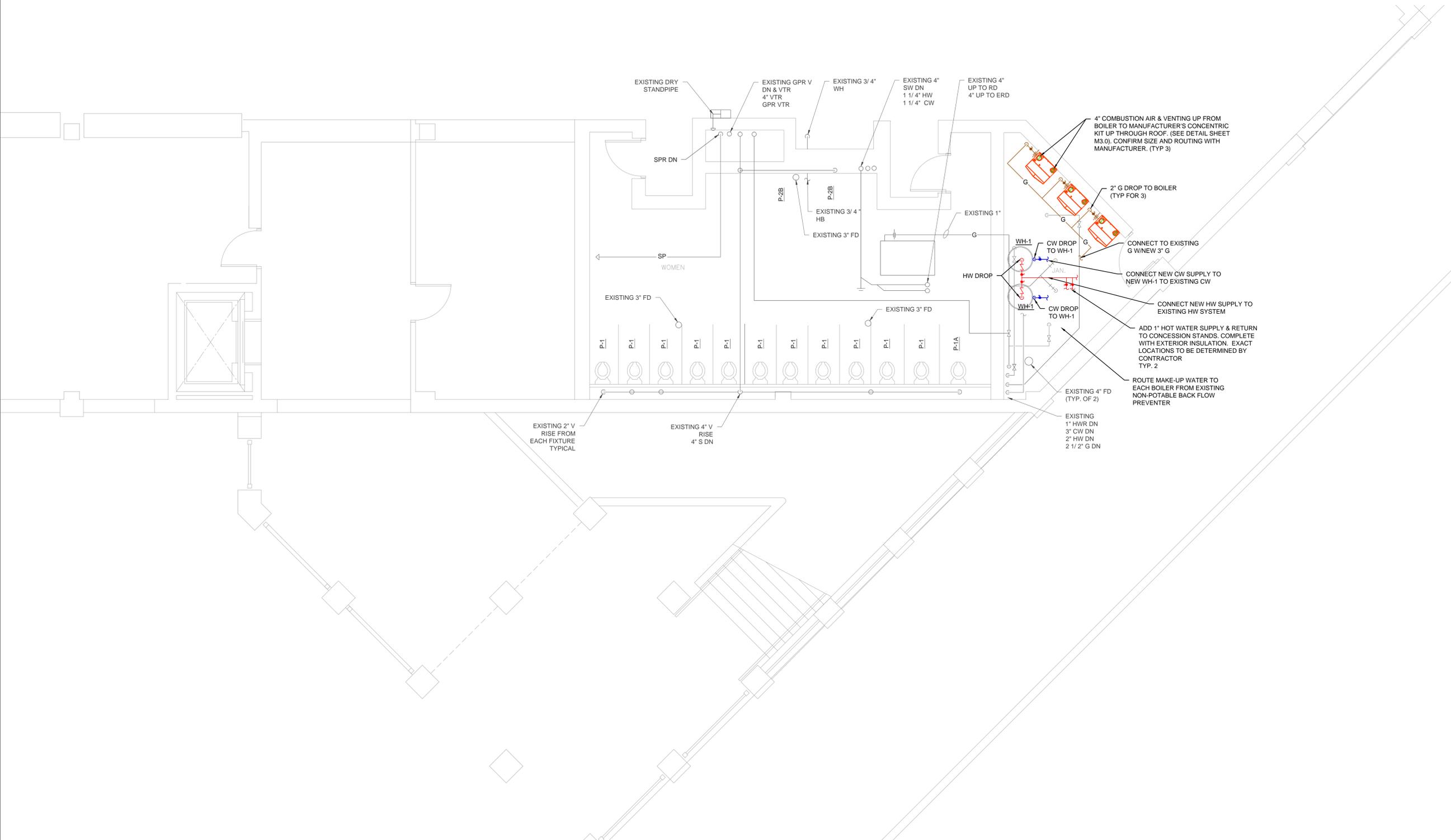
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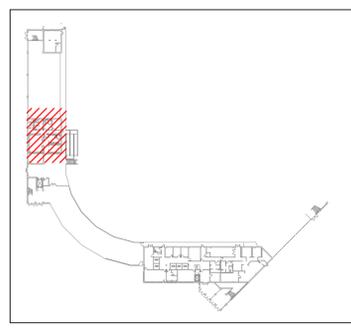
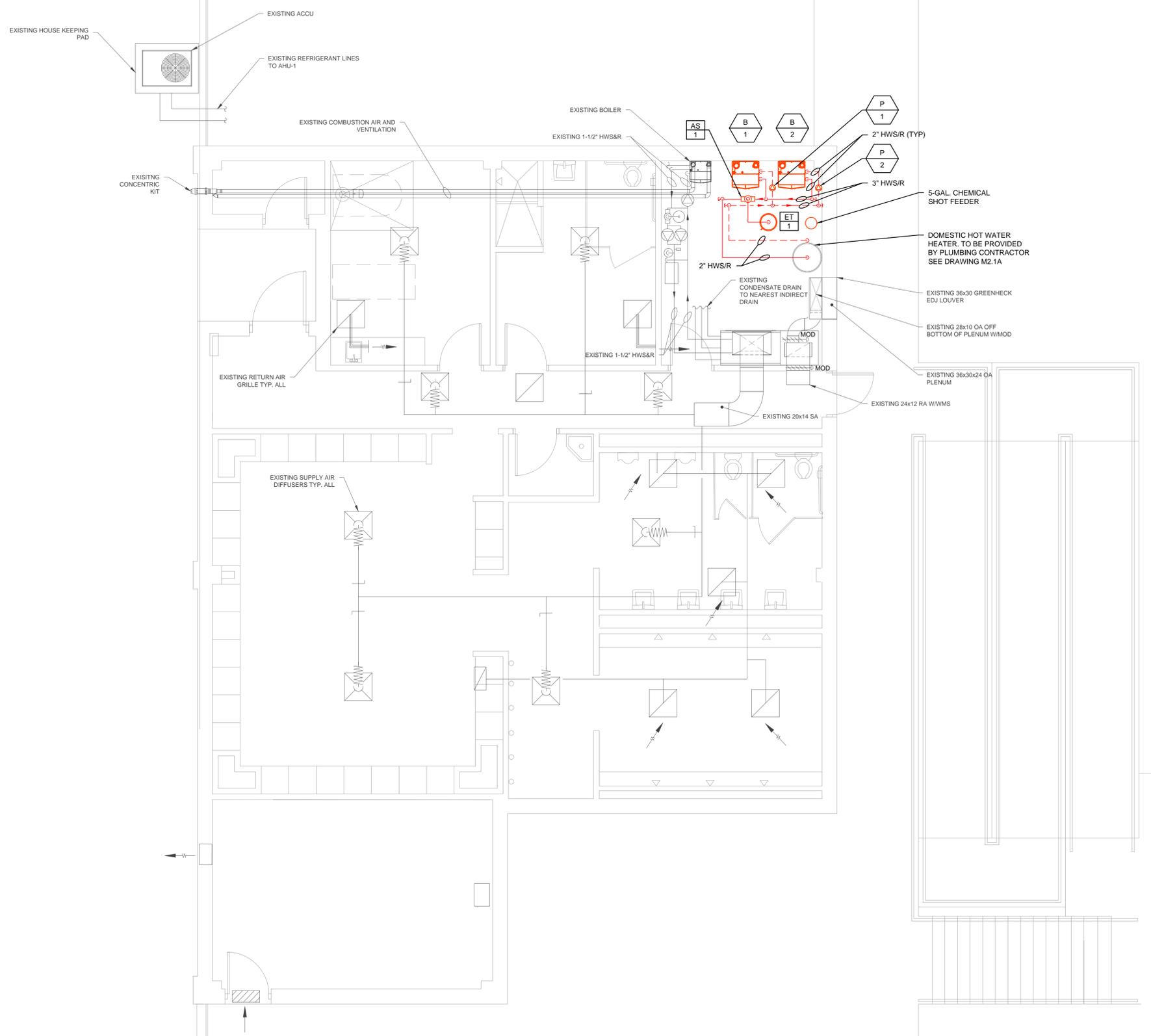
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Drawn By: AP
Checked By: KC
Date: 04-11-14

PLUMBING & VENTILATION
1ST BASE SIDE FLOOR PLAN

M2.0A

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Plan:Churches, April 11, 2014 - 10:39am - 2013-206 M2.0A Plumbing Floor Plan-1st Base Side.dwg



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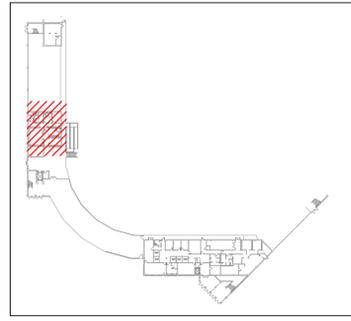
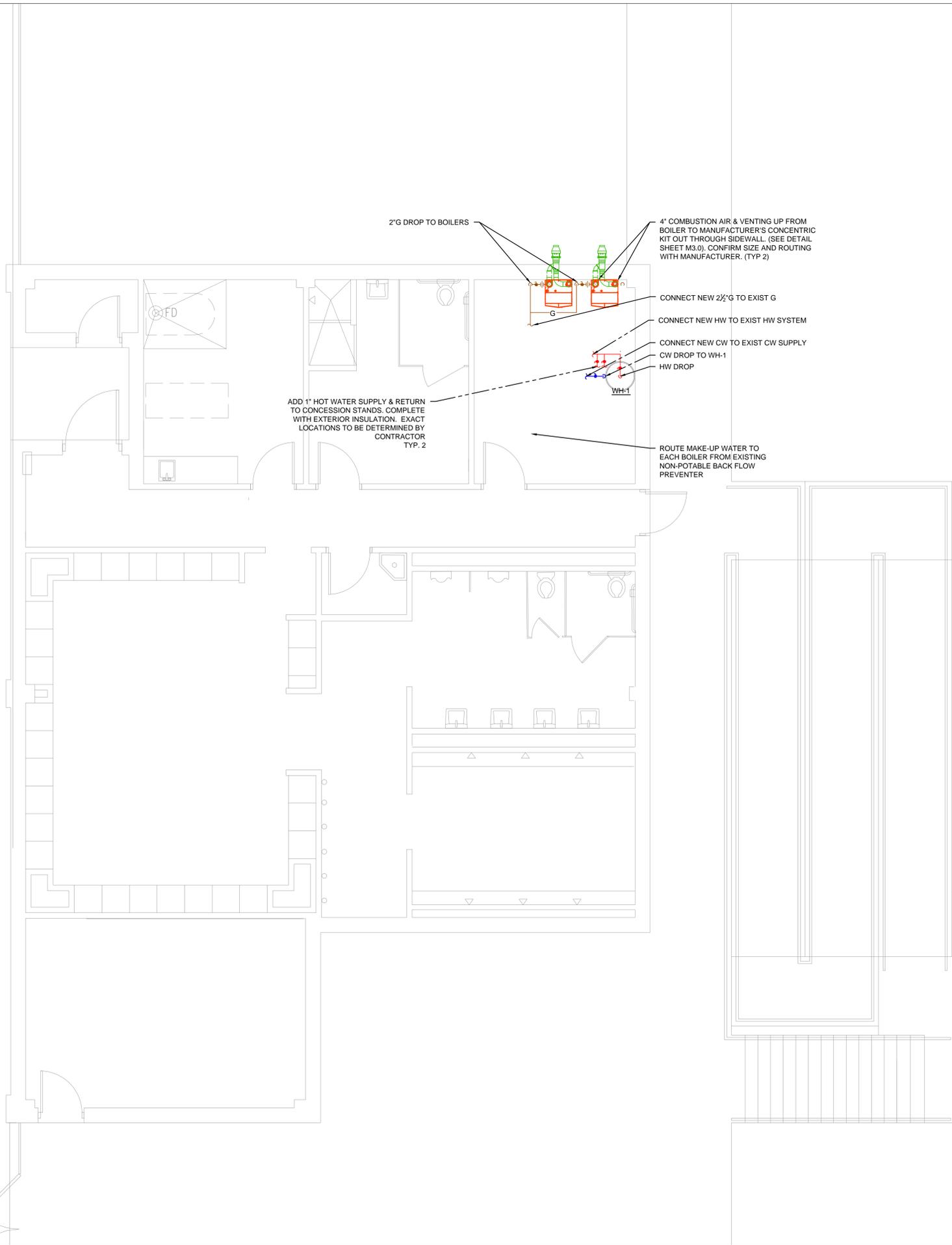
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MECHANICAL
3RD BASE SIDE
FLOOR PLAN

M2.1
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John Churcher, April 11, 2014 - 10:40am - 2013-206 M2.1 Mechanical Floor Plan - 3rd Base Side.dwg

PlanChurches April 11, 2014 10:40am 2013-206 M2.1A Plumbing and Ventilation Floor Plan - 3rd Base Side.dwg



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STAMP

LOWELL, MA

LOWELL CIVIC CENTER HOT WATER UPGRADE

REVISIONS:

Date	Description

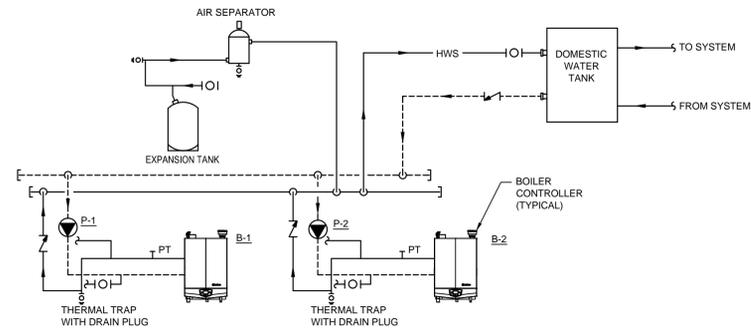
**PRICING SET
04-11-2014**

CSI Project Number: 2013-206
Scale: 1/4"=1'-0"
Drawn By: AP
Checked By: KC
Date: 04-11-14

PLUMBING & VENTILATION
3RD BASE SIDE
FLOOR PLAN

M2.1A

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THE BOILERS AND PUMPS FOR THE DOMESTIC HOT WATER SYSTEM ARE CONTROLLED AND MONITORED BY THE BOILER CONTROL PANEL. THIS SYSTEM SHALL BE CAPABLE OF PROVIDING THE SPECIFIED SEQUENCE OF OPERATION ALONG WITH THE HOT WATER RESET, LEAD/LAG CONTROL ON THE BOILERS B-1 AND B-2, THE CONTROL FOR THE PRIMARY PUMPS P-1 AND P-2, AND TOTALIZES THE RUN TIME OF EACH BOILER AND EACH PRIMARY PUMP.

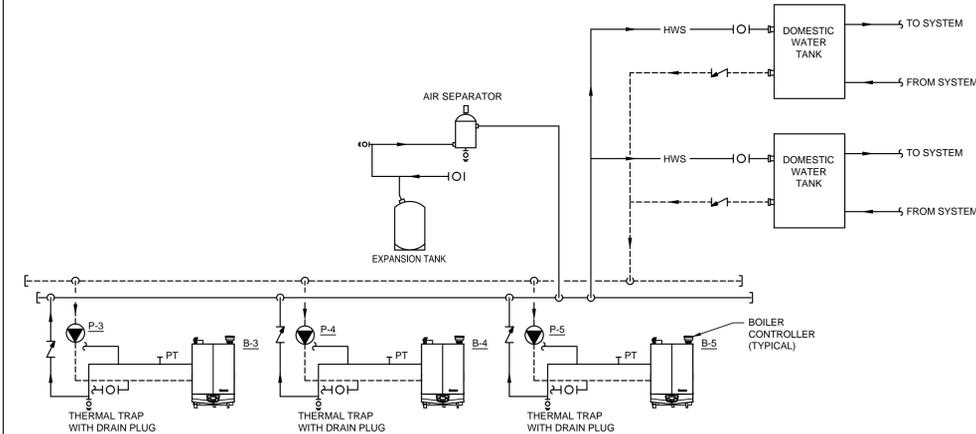
BOILER CONTROL PANEL WILL TURN ON THE MOST BOILERS POSSIBLE TO MEET THE LOAD. THE CONTROL WILL BRING ON THE FIRST PUMP AND BOILER AT MINIMUM MODULATION AND DOES NOT INCREASE ITS MODULATION. IF MORE BOILER OUTPUT IS REQUIRED, THE SECOND PUMP AND BOILER WILL TURN ON AT MINIMUM MODULATION AND DOES NOT INCREASE ITS MODULATION. IF STILL MORE BOILER OUTPUT IS REQUIRED, ALL BOILERS ARE MODULATED UP IN PARALLEL UNTIL THEY REACH THEIR MAXIMUM MODULATION SETTINGS. REVERSE SHALL OCCUR ONCE LOAD IS SATISFIED.

SECONDARY PUMP FAILURE ALARM SIGNALS TO THE BOILER CONTROL PANEL IF A NO FLOW CONDITION IS SENSED OR NO CURRENT IS SENSED AT THE DUTY PUMP. THE CONTROLLER PANEL SHALL THEN DISABLE THE DUTY PUMP AND ENABLE THE STANDBY PUMP.

THE BOILER CONTROL PANEL ALLOWS FOR SELECTION OF LEAD BOILER AND PRIMARY PUMP BY EITHER MANUALLY (BY OPERATOR) OR AUTOMATICALLY (EVERY TWO WEEKS BOILERS AND PUMPS ROTATE POSITIONS).

ON A CALL FOR DHW, THE BOILER CONTROL WILL SUPPLY 180°F WATER TO SYSTEM. THE BOILERS WILL MAINTAIN A SUPPLY TEMPERATURE NO HIGHER THAN THE BOIL MAX SETTING.

HOT WATER BOILERS AND ASSOCIATED PUMPS FOR 3RD BASE SIDE DOMESTIC HOT WATER CONTROL SEQUENCE AND PIPING DIAGRAM



THE BOILERS AND PUMPS FOR THE DOMESTIC HOT WATER SYSTEM ARE CONTROLLED AND MONITORED BY THE BOILER CONTROL PANEL. THIS SYSTEM SHALL BE CAPABLE OF PROVIDING THE SPECIFIED SEQUENCE OF OPERATION ALONG WITH THE HOT WATER RESET, LEAD/LAG CONTROL ON THE BOILERS B-3, B-4 AND B-5, THE CONTROL FOR THE PRIMARY PUMPS P-3, P-4 AND P-5, AND TOTALIZES THE RUN TIME OF EACH BOILER AND EACH PRIMARY PUMP.

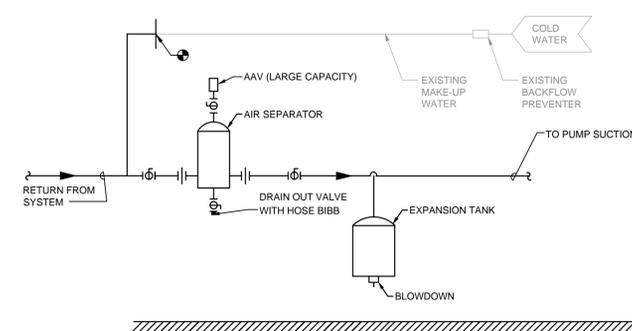
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SECONDARY PUMP FAILURE ALARM SIGNALS TO THE BOILER CONTROL PANEL IF A NO FLOW CONDITION IS SENSED OR NO CURRENT IS SENSED AT THE DUTY PUMP. THE CONTROLLER PANEL SHALL THEN DISABLE THE DUTY PUMP AND ENABLE THE STANDBY PUMP.

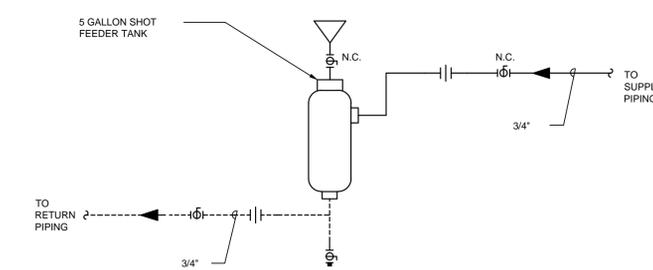
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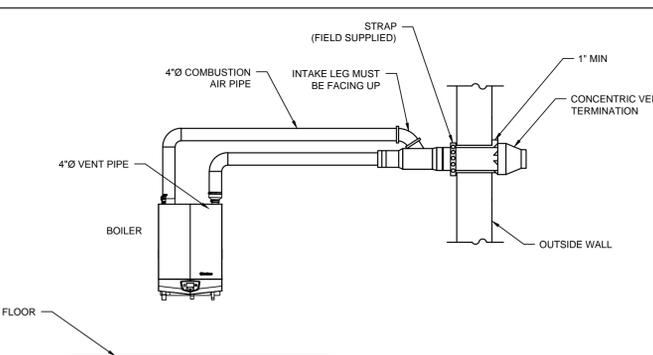
HOT WATER BOILERS AND ASSOCIATED PUMPS FOR 1ST BASE SIDE DOMESTIC HOT WATER CONTROL SEQUENCE AND PIPING DIAGRAM



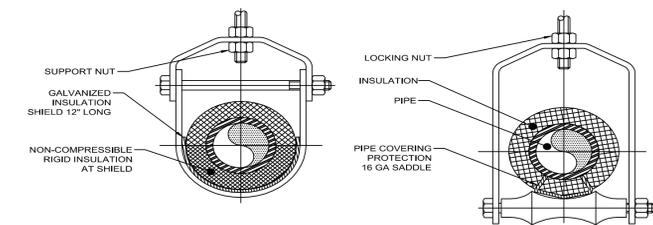
HYDRONIC SPECIALTIES FOR CLOSED LOOP WATER SYSTEMS



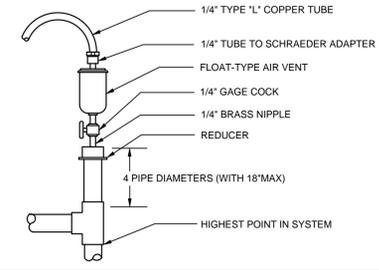
CHEMICAL FEED (SHOT FEEDER)



HORIZONTAL CONCENTRIC VENT DETAIL

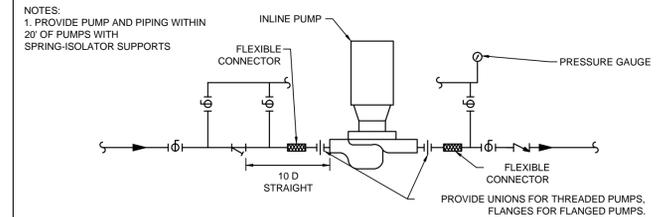


PIPE HANGER SUPPORT

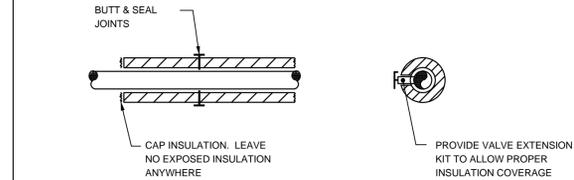


AUTOMATIC AIR VENT ASSEMBLY

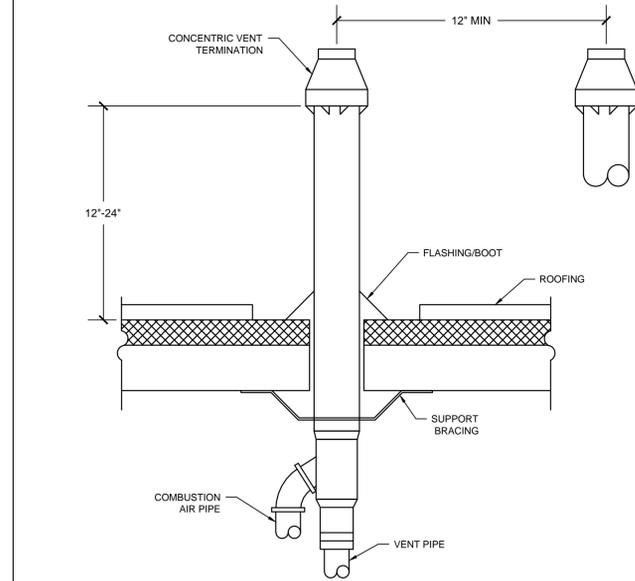
NOTE:
1. USE TFE TAPE ON ALL THREADED JOINTS.



INLINE PUMP PIPING



TYPICAL PIPE INSULATION & VALVE HANDLE EXTENSION



VERTICAL CONCENTRIC VENT DETAIL



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LOWELL, MA

LOWELL CIVIC CENTER HOT WATER UPGRADE

REVISIONS:

Date	Description

PRICING SET
04-11-2014

CSI Project Number: 2013-206
Scale: NTS
Drawn By: MR
Checked By: DM
Date: 04-11-14

MECHANICAL DETAILS & CONTROLS

M3.0

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MECHANICAL SCHEDULES

M4.0
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HVAC PUMP SCHEDULE

TAG NO.	SERVICE	LOCATION	CASING TYPE	FLUID		GPM	HEAD (FT.)	SHUT-OFF HEAD (FT.)	MOTOR				MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
				TYPE	TEMP (°F)				RPM	HP	V	PH		
P-1	B-1 PRIMARY PUMP	3RD BASE SIDE	INLINE	WATER	180	38	17.5	38.5	3400	1/2	208	1	GRUNDFOS MAGNA 40-120	1
P-2	B-2 PRIMARY PUMP	3RD BASE SIDE	INLINE	WATER	180	38	17.5	38.5	3400	1/2	208	1	GRUNDFOS MAGNA 40-120	1
P-3	B-3 PRIMARY PUMP	1ST BASE SIDE	INLINE	WATER	180	38	17.5	38.5	3400	1/2	208	1	GRUNDFOS MAGNA 40-120	1
P-4	B-4 PRIMARY PUMP	1ST BASE SIDE	INLINE	WATER	180	38	17.5	38.5	3400	1/2	208	1	GRUNDFOS MAGNA 40-120	1
P-5	B-5 PRIMARY PUMP	1ST BASE SIDE	INLINE	WATER	180	38	17.5	38.5	3400	1/2	208	1	GRUNDFOS MAGNA 40-120	1

NOTES: 1. PROVIDE THREE SPEED PUMP. 2. PROVIDE PUMP WITH VFD MOTOR AND BUILT IN DIFFERENTIAL PRESSURE SENSOR

HVAC BOILER SCHEDULE (GAS FIRED)

TAG No.	LOCATION	INPUT (MBH)	OUTPUT CAPACITY (NET I=B=R) MBH	MAX. OPER. PRESS. (PSIG)	WATER				FUEL INLET PRESSURE	BURNER	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS					
					ENT(°F)	LVG(°F)	GPM	PD (FT)					GAS (IN.WG)	TURN DOWN	BLOWER		
															AMPS	V	PH
B-1	3RD BASE SIDE	399	372	160	180	160	38	21	4-13	5:1	2.0	120	1	LOCHINVAR WH-399			
B-2	3RD BASE SIDE	399	372	160	180	160	38	21	4-13	5:1	2.0	120	1	LOCHINVAR WH-399			
B-3	1ST BASE SIDE	399	372	160	180	160	38	21	4-13	5:1	2.0	120	1	LOCHINVAR WH-399			
B-4	1ST BASE SIDE	399	372	160	180	160	38	21	4-13	5:1	2.0	120	1	LOCHINVAR WH-399			
B-5	1ST BASE SIDE	399	372	160	180	160	38	21	4-13	5:1	2.0	120	1	LOCHINVAR WH-399			

NOTES: 1. PROVIDE CONDENSATE NEUTRALIZING KIT. 2. PROVIDE WITH LOW WATER CUTOFF CONTROL. LOW WATER CUTOFF SHALL SHUT OFF BOILER WHEN THE WATER LEVEL REACHES THE LOWEST SAFE WATER LEVEL AS ESTABLISHED BY MANUFACTURER. 3. PROVIDE WITH CONCENTRIC VENT KIT. 4. PROVIDE WITH BOILER WALL MOUNT KIT & ASSOCIATED HARDWARE.

HVAC EXPANSION TANK SCHEDULE

TAG NO.	SERVICE	LOCATION	TYPE	CAPACITY (GAL.)	ACCEPTANCE VOLUME (GAL.)	FLUID	TANK SIZE (DIA x HEIGHT)	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
ET-1	HWS	3RD BASE SIDE	DIA	4.4	2.5	WATER	11x16	AMTROL EX-30	
ET-2	HWS	1ST BASE SIDE	DIA	4.4	2.5	WATER	11x16	AMTROL EX-30	

NOTES: EXPANSION TANK BY AMTROL

HVAC AIR & DIRT SEPARATOR SCHEDULE

TAG NO.	SERVICE	LOCATION	TYPE	GPM	MAX P.D. (FT HEAD)	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
AS-1	HWS	3RD BASE SIDE	DIA	76	1.0	SPIROTHERM VSR 300	
AS-2	HWS	1ST BASE SIDE	DIA	114	1.0	SPIROTHERM VSR 400	

NOTES: AIR SEPARATOR BY SPIROTHERM

INDIRECT FIRED WATER HEATER SCHEDULE

TAG NO.	TANK STORAGE (gal.)	INPUT (MBH)	RECOVERATE (GPH) AT 100° RISE	SETTING	REMARKS	MANUFACTURER AND MODEL NO.
WH-1	110	399	527	120	-	TURBOMAX 109A

NOTES:

HVAC SPECIFICATIONS

- A. GENERAL NOTES**
1. GENERAL PROVISIONS: DRAWINGS ARE DIAGRAMMATIC AND INDICATE GENERAL ARRANGEMENT OF WORK IN CONTRACT.
 2. THE CONTRACTOR SHALL PERFORM THE WORK AND PROVIDE NEW MATERIAL AND EQUIPMENT AS SHOWN ON DRAWINGS AND AS SPECIFIED IN THIS SECTION OF THE SPECIFICATIONS. PROVIDE ALL COMPONENTS AND MATERIALS, WHETHER SPECIFICALLY SHOWN OR NOT, THAT ARE NECESSARY TO MAKE THE SYSTEMS COMPLETE AND FULLY OPERATIONAL AS INTENDED IN THE CONSTRUCTION DOCUMENTS.
 3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL WORK INCLUDED UNDER THIS SECTION UNTIL THE COMPLETION AND FINAL ACCEPTANCE OF THIS PROJECT. PROTECT ALL EQUIPMENT AND MATERIALS FROM DAMAGE FROM ALL CAUSES. ALL MATERIALS AND EQUIPMENT DAMAGED OR STOLEN SHALL BE REPAIRED OR REPLACED WITH EQUAL MATERIAL OR EQUIPMENT AT NO ADDITIONAL COST TO THE OWNER. PROTECT ALL EQUIPMENT, OUTLETS AND OPENINGS, AND ROOF PENETRATIONS. PROTECT WORK AND MATERIALS OF OTHER TRADES FROM DAMAGE THAT MIGHT BE CAUSED BY WORK OR WORKMEN UNDER THIS SECTION. DAMAGED MATERIALS ARE TO BE REMOVED FROM THE SITE. NO SITE STORAGE OF DAMAGED MATERIALS WILL BE ALLOWED. ANY DAMAGE TO EXISTING SYSTEMS AND EQUIPMENT CAUSED BY THIS CONTRACTOR DURING INSTALLATION SHALL BE REPAIRED AND/OR REPLACED AT THIS CONTRACTOR'S EXPENSE TO THE COMPLETE SATISFACTION OF THE OWNER.
 4. WHERE DRAWINGS OR SPECIFICATIONS DO NOT CONCLUDE WITH MANUFACTURER'S RECOMMENDATIONS, ARE UNCLEAR AS TO INTENT AND/OR REQUIRED MATERIAL QUALITY, ADVISE CSI ENGINEERING IN WRITING BEFORE PROCEEDING WITH THE WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REWORK NECESSARY TO RESOLVE THESE DISCREPANCIES.
 5. THE CONTRACTOR SHALL CAREFULLY EXAMINE SITE TO IDENTIFY EXISTING CONDITIONS THAT MAY IMPACT THE WORK OF THIS SECTION BEFORE SUBMITTING BID. NO EXTRA PAYMENT SHALL BE ALLOWED FOR ADDITIONAL WORK CAUSED BY THE SITE CONDITIONS THAT ARE VISIBLE OR EASILY DISCERNED BY AN THE CONTRACTOR.
 6. THE FOLLOWING WORK IS NOT INCLUDED IN THIS SECTION AND WILL BE PROVIDED UNDER OTHER SECTIONS: TEMPORARY HEAT, TESTING, PAINTING, PATCHING, ELECTRICAL POWER WIRING TO ALL EQUIPMENT, AND DUCT MOUNTED SMOKE DETECTORS.
 7. ALL WORK WILL BE DESIGNED PER THE MASSACHUSETTS STATE BUILDING CODE, MASSACHUSETTS NATIONAL ELECTRICAL CODE, STATE GAS CODE, SMACNA, NFPA, ANSI/ASHRAE, ASME, UL, NEMA, OSHA, ARCHITECTURAL ACCESS BOARD, AND ALL OTHER APPLICABLE FEDERAL, STATE OR LOCAL CODES. THESE DRAWINGS AND SPECIFICATIONS ILLUSTRATE THE SCOPE REQUIRED FOR THIS PROJECT, WHICH MAY EXCEED MINIMUM CODE, LAW AND STANDARDS CRITERIA.
 8. THE CONTRACTOR SHALL PROVIDE SUBMITTALS THAT SPECIFY SPECIFIED ITEMS, EQUIPMENT AND THE MANUFACTURER'S PRODUCT DATA. DEVIATIONS TO SPECIFIED ITEMS SHALL BE AT THE SOLE RISK OF THE CONTRACTOR, WHO SHALL BE RESPONSIBLE FOR ALL ASSOCIATED CHANGES TO THIS AND OTHER TRADES. REVIEW OF THE SHOP DRAWINGS BY THE ENGINEER SHALL NOT ABSOLVE THE CONTRACTOR FROM MEETING THE FULL DESIGN INTENT OF THE ASSOCIATED SYSTEMS. THE CONTRACTOR SHALL HAVE PREVIOUSLY REVIEWED AND APPROVED THE SUBMITTALS BEFORE SUBMITTING TO CSI ENGINEERING.
 9. SUBMIT OPERATING AND MAINTENANCE MANUALS PRIOR TO THE COMPLETION OF THE PROJECT. PROVIDE ON-SITE DEMONSTRATION OF ALL SYSTEMS TO OWNER AFTER SYSTEMS ARE FULLY OPERATIONAL. O&M MANUALS SHALL INCLUDE ALL COMPONENTS AS WELL AS SYSTEM DESCRIPTIONS OF ALL SYSTEMS WITH FLOW DIAGRAMS, WIRING DIAGRAMS, WRITTEN WARRANTIES, RECOMMENDED SPARE PARTS AND ROUTINE MAINTENANCE REQUIREMENTS WITH RECOMMENDED INTERVALS FOR ALL MOVING EQUIPMENT AND CONTROLS.
 10. WARRANTY INSTALLATION IN WRITING FOR ONE YEAR FROM DATE OF OWNER'S ACCEPTANCE OF CERTIFICATE OF SUBSTANTIAL COMPLETION.
 11. COORDINATE WITH ALL OTHER TRADES RELATIVE TO LOCATION OF ALL APPARATUS AND EQUIPMENT TO BE INSTALLED AND SELECT LOCATIONS SO AS NOT TO CONFLICT WITH OR HINDER THE PROGRESS OF THE WORK OF OTHER SECTIONS. WORK INSTALLED THAT CREATES INTERFERENCE OR RESTRICTS ACCESS REQUIRED BY CODE OR TO CONDUCT MAINTENANCE AND/OR ADJUSTMENTS SHALL BE MODIFIED AT NO ADDITIONAL COST TO THE OWNER.
 12. INCLUDE ALL STRUCTURAL STEEL SUPPORTS, HANGER BRACKETS, ETC., REQUIRED FOR THE WORK IN THIS SECTION. HANGERS SHALL BE STEEL ANGLE IRON, CHANNEL OR STEEL ROD USED WITH APPROVED CLAMPS, INSERTS, ETC. ALL HANGERS SHALL BE GALVANIZED OR PAINTED WITH TWO COATS OF RUST PREVENTING PAINT BEFORE INSTALLATION. SUPPORTS INSTALLED IN EXTERIOR LOCATIONS SHALL BE GALVANIZED STEEL OR STAINLESS STEEL WITH STAINLESS STEEL HARDWARE.
 13. IF THE GENERAL CONTRACTOR IS NOT RESPONSIBLE FOR THE CUTTING AND PATCHING REQUIRED IN THIS SECTION THEN THE CONTRACTOR SHALL INCLUDE ALL CORING, CUTTING, PATCHING AND FIREPROOFING NECESSARY FOR THE WORK OF THIS SECTION. STRUCTURAL ELEMENTS SHALL NOT BE CUT. FILL AND PATCH ALL OPENINGS OR HOLES LEFT IN THE EXISTING STRUCTURES BY THE REMOVAL OF EXISTING EQUIPMENT. PATCH, SEAL AND MAKE AIR AND WATER TIGHT ALL EXISTING OPENINGS IN DUCTWORK AND PIPING NOT USED FOR THE NEW WORK.
 14. THE CONTRACTOR SHALL PROVIDE, SET-UP AND MAINTAIN THE HOISTING, CRANES, SCAFFOLDS, STAGING AND PLANKING AS REQUIRED FOR THE WORK FOR THIS SECTION.
 15. THE CONTRACTOR SHALL COMPLY WITH ALL OF THE SAFETY REQUIREMENTS OF THE OWNER AND OSHA THROUGHOUT THE COURSE OF THE PROJECT.
 16. THE CONTRACTOR SHALL PROVIDE A CERTIFICATE OF COMPLETION STATING THAT THE INSTALLATION IS IN COMPLIANCE WITH THE CONSTRUCTION DOCUMENTS AND ALL APPLICABLE CODES. ALL SUBMITTALS, AS-BUILTS, O&M MANUALS, COMPLETED PUNCH LIST ITEMS AND REPORTS ARE TO BE PROVIDED PRIOR TO REQUEST FOR COMPLETION CERTIFICATES. THE CONTRACTOR SHALL VERIFY THAT ALL SYSTEMS AND EQUIPMENT ARE WORKING PER THE CONTRACT DRAWINGS.
- B. PROJECT PRODUCTS**
1. WATER PIPING AND VALVES: PIPING 2-1/2" AND LARGER SHALL BE WELDED SCHEDULE 40 STEEL, 2" AND SMALLER SHALL BE SCREWED SCHEDULE 40 STEEL, 95/5 SOLDERED TYPE L COPPER. CONDENSATE DRAIN PIPING SHALL BE COPPER. PROVIDE FLEX CONNECTORS AT ALL CONNECTIONS TO ROTATING EQUIPMENT. PROVIDE DIELECTRIC FITTINGS TO CONNECT DIFFERENT PIPING MATERIALS. VALVES SHALL HAVE NAME OF MANUFACTURER AND GUARANTEED WORKING PRESSURE CAST OR STAMPED ON BODIES. VALVES AND STRAINERS SHALL BE AS MANUFACTURED BY NEXUS, DANFOSS OR APOLLO. BALL VALVES SHALL BE USED ON 2" AND SMALLER WATER PIPING, BUTTERFLY USED ON 2-1/2" AND LARGER WATER PIPING. PROVIDE DRAIN VALVES AT LOW POINTS IN PIPING AND VALVED VENTS AT HIGH POINTS. STRAINERS SHALL BE "Y" TYPE, FULL SIZE OF ENTERING PIPE SIZE AND HAVE A MAXIMUM CLEAN PRESSURE DROP OF 1 PSID. STRAINERS SHALL INCLUDE BLOW DOWN VALVE.
 2. PIPE INSULATION: INSULATION SHALL BE FIBROUS GLASS INSULATION WITH FACTORY-APPLIED FIRE RETARDANT VAPOR BARRIER JACKET WITH K FACTOR OF AT LEAST 0.23 AT 75 DEG. F MEAN TEMPERATURE BY CERTAIN-TEED, MANVILLE, OR KNAUF. ASTM E-84 FIRE HAZARD RATINGS SHALL BE 25 FLAME SPREAD, 50 SMOKE DEVELOPED AND 50 FUEL CONTRIBUTED. INSULATION THICKNESS SHALL BE 1-1/2" FOR HOT WATER.
 3. PIPE HANGERS AND SUPPORTS: PROVIDE PIPE STANDS, SUPPORTS, HANGERS, AND OTHER SUPPORTING APPLIANCES AS NECESSARY TO SUPPORT WORK REQUIRED BY CONTRACT DOCUMENTS. SPACING OF HANGERS SHALL BE INSTRUCTED IN ACCORDANCE WITH APPLICABLE BUILDING AND MECHANICAL CODES. SIZE OF HANGERS SHALL INCLUDE THE PIPE INSULATION WITH SHIELD. WHERE HANGERS ARE USED OUTDOORS, THEY SHALL BE STAINLESS STEEL OR PVC COATED GALVANIZED STEEL.
 4. INSULATION SHALL BE CERTAIN-TEED, MANVILLE OR OWENS CORNING AND SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. INSULATE THE FOLLOWING EQUIPMENT: AIR SEPARATORS, PUMPS, EXPANSION TANKS, ETC. INSULATION SHALL BE FORMED OR FABRICATED TO FIT EQUIPMENT AND HAVE REMOVABLE SECTIONS FOR SERVICING.
 5. MOTORS, STARTERS, AND WIRING: PROVIDE PREMIUM EFFICIENCY MOTORS. STARTERS AND/OR VFD'S SHALL BE PROVIDED BY DIVISION 16 UNLESS PART OF PACKAGED EQUIPMENT. PROVIDE CONTROL AND OTHER RELATED WIRING INCLUDING INTERLOCKS.



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CENTER HOT
WATER
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Date: 04-11-14

MECHANICAL
SPECIFICATIONS

M5.0
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PLUMBING SPECIFICATIONS

- A. GENERAL**
1. GENERAL: ALL WORK COVERED CONSISTS OF FURNISHING ALL MATERIALS, LABOR, EQUIPMENT AND SUPPLIES NECESSARY TO PROVIDE A COMPLETE WORKING SYSTEM REQUIRED PER THE DESIGN DRAWINGS AND MASSACHUSETTS STATE CODES.
 2. SHOP DRAWINGS: SHOP DRAWING SUBMITALS AND TESTING REPORTS OF ALL SPECIFIED FIXTURES, EQUIPMENT AND PIPING SHALL BE SUBMITTED TO THE ARCHITECT FOR APPROVAL.
 3. CODES: ALL EQUIPMENT AND MATERIALS FURNISHED UNDER THE PLUMBING SUB-CONTRACT, LABOR, AND TESTING PERFORMED HEREIN SHALL BE IN COMPLETE ACCORDANCE WITH THE MASSACHUSETTS STATE BUILDING CODE, INTERNATIONAL FUEL GAS CODE, STATE PLUMBING CODE, LOCAL ORDINANCES AND REGULATIONS OF THE CITY OR TOWN, NATIONAL FIRE PROTECTION ASSOCIATION AND INSURANCE REGULATIONS AND REQUIREMENTS GOVERNING SUCH WORK.
 4. PRIOR TO BID: THE PLUMBING SUBCONTRACTOR SHALL VISIT THE SITE AND FAMILIARIZE HIMSELF WITH ALL TRADE DRAWINGS AND ASPECTS OF THE SCOPE AND EXISTING CONDITIONS TO WHICH THE WORK WILL BE INSTALLED. ANY DISCREPANCIES BETWEEN THE SCOPE OF WORK SHOWN ON THE DRAWINGS AND ANY CONDITIONS SHALL BE SUBMITTED TO THE ARCHITECT IN WRITING. FAILURE OF THE CONTRACTOR TO DO SO SHALL NOT CONSTITUTE AN EXTRA TO THE CONTRACT.
 5. PERMITS: ALL PERMITS, FEES OR EXPENSES INCURRED THAT ARE REQUIRED FOR INSTALLATION OF ANY MATERIAL SHALL BE OBTAINED AS PART OF THE WORK OF THIS SPECIFICATION INCLUDING.
 6. INSTRUCTIONS: ALL INSTRUCTION SHALL BE PROVIDED AFTER COMPLETION OF PROJECT TO THE OWNER'S OPERATING PERSONNEL REGARDING ALL SYSTEMS AND EQUIPMENT OPERATION AND MAINTENANCE. OPERATION AND MAINTENANCE MANUALS SHALL BE PROVIDED TO THE OWNER.
 7. GUARANTEE: ALL MATERIALS, EQUIPMENT AND WORK FURNISHED UNDER THIS SECTION SHALL BE GUARANTEED AGAINST ALL DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE (1) YEAR COMMENCING WITH THE DATE OF THE SUBSTANTIAL COMPLETION.
 8. RECORD DRAWINGS: THE PLUMBING SUBCONTRACTOR SHALL MAINTAIN AT THE JOB, AT ALL TIMES, A COMPLETE AND SEPARATE SET OF BLACKLINE PRINTS OF THE PLUMBING DRAWINGS OF HIS TRADE ON WHICH HE SHALL MARK CLEARLY, NEATLY, ACCURATELY, AND PROMPTLY AS THE WORK PROGRESSES. TWO CADD DISKS, AUTOCAD RELEASE 2000 MINIMUM OR COMPATIBLE SYSTEM AS WELL AS MYLAR REPRODUCIBLE, AS-BUILTS, SHALL BE FURNISHED BY THE PLUMBING SUBCONTRACTOR AT THE JOB COMPLETION.
 9. COORDINATION: CONTRACTOR TO CAREFULLY COORDINATE ALL WORK INSTALLED WITH THAT OF ALL OTHER TRADES.
 10. PROTECTION OF PROPERTY: PROTECT ALL NEW AND EXISTING WORK BEFORE, DURING AND AFTER INSTALLATION.
 11. DISINFECTION: ALL DOMESTIC WATER SYSTEMS SHALL BE DISINFECTED IN ACCORDANCE WITH THE LOCAL PUBLIC HEALTH AND MASSACHUSETTS PLUMBING CODE REQUIREMENTS SECTION 10.14.
 12. TESTS: THE PLUMBING SUBCONTRACTOR SHALL PERFORM ALL TESTS AT THE COMPLETION OF THE WORK, AND THE RESULTS FURNISHED TO THE OWNER AND ARCHITECT IN WRITING.
 13. CERTIFICATES OF APPROVAL: UPON COMPLETION OF ALL WORK, THE PLUMBING SUBCONTRACTOR SHALL FURNISH, IN DUPLICATE, CERTIFICATES OF INSPECTIONS FROM ALL INSPECTORS AND AUTHORITIES HAVING JURISDICTION, NOTARIZED LETTERS FROM THE MANUFACTURERS STATING THAT AUTHORIZED FACTORY ENGINEERS HAVE INSPECTED AND TESTED THE INSTALLATION OF THEIR RESPECTIVE SYSTEMS AND FOUND SAME TO BE IN PERFECT OPERATING CONDITION.
 14. DRAWING INTERPRETATION: THE CONTRACT DRAWINGS ARE GENERALLY DIAGRAMMATIC AND INDICATE ONLY THE GENERAL ARRANGEMENTS OF WORK. IT IS NOT THE INTENT OF THESE DRAWINGS TO SHOW EVERY PIPE, RISE, DROP, ELBOW, ETC. ANY ADDITIONAL WORK NOT SHOWN AND REQUIRED TO INSTALL THE PLUMBING SYSTEMS SHALL BE INCLUDED AS PART OF THIS CONTRACT.
 15. DEMOLITION WORK: PARTICULAR CARE SHALL BE TAKEN TO AVOID CREATING HAZARDS ON THE SITE OR CAUSING DISRUPTION OF SERVICE IN THE BUILDING. ALL EXISTING EQUIPMENT TO BE REMOVED SHALL BE DONE IN A NEAT AND WORKMANLIKE MANNER. ALL EXISTING EQUIPMENT TO BE TURNED OVER TO THE OWNER SHALL BE PRESENTED TO THE OWNER IN GOOD CONDITION AT A LOCATION DESIGNATED BY THE OWNER. ALL OTHER EQUIPMENT SHALL BE REMOVED FROM THE PREMISES. REMOVE ALL ABANDONED PIPING AND EQUIPMENT NOT BUILT INTO BUILDING CONSTRUCTION, WHERE CEILING OR WALLS ARE REMOVED, ALL ABANDONED PIPING SHALL BE REMOVED AND ENDS OF LIVE SERVICES CAPPED. ABANDONED ELEMENTS BUILT INTO WALLS OR LOCATED ABOVE EXISTING INACCESSIBLE CEILINGS SHALL REMAIN AND ENDS CAPPED AND MARKED ABANDONED.
 16. CONTINUITY OF SERVICES: SERVICES SHALL NOT BE INTERRUPTED WITHOUT OWNER'S APPROVAL. WHEN AN INTERRUPTION OF SERVICE BECOMES NECESSARY, CONTRACTOR SHALL CONSULT WITH THE OWNER AND SCHEDULE THE PROPER TIME TO DO THE SHUT-DOWN. SCHEDULE MUST NOT DELAY NOR INTERFERE WITH THE PROGRESS OF THE PROJECT.
 17. SEISMIC RESTRAINTS: PROVIDE SEISMIC RESTRAINTS IN ACCORDANCE WITH THE SEISMIC REQUIREMENTS IDENTIFIED IN THE MASSACHUSETTS STATE BUILDING CODE, EIGHTH (8TH) EDITION.
- B. SCOPE**
1. THE WORK OF THIS SECTION CONSISTS OF ALL LABOR, MATERIALS AND EQUIPMENT REQUIRED TO PROVIDE ALL PLUMBING WORK COMPLETE, IN PLACE, AS SHOWN ON THE DRAWINGS, SPECIFIED HEREIN AND AS NECESSARY FOR A PROPER INSTALLATION.
 2. THE EXTENT OF THE PLUMBING WORK SHALL INCLUDE, BUT NOT BE LIMITED TO THE FOLLOWING:
 - a. DOMESTIC COLD WATER SYSTEM.
 - b. DOMESTIC HOT WATER SUPPLY AND HOT WATER RECIRCULATION SYSTEM.
 - c. CORE DRILLING.
 - d. INSULATION OF ALL EXISTING COLD WATER, HOT WATER, HOT WATER RECIRCULATION AND CONDUCTORS SYSTEMS PIPING, VALVES AND FITTINGS MADE BARE AS A RESULT OF ASBESTOS ABATEMENT, WHEN CONNECTING TO EXISTING INSULATED SYSTEM PROVIDE NEW INSULATION FOR THREE FEET ON EITHER SIDE OF THE NEW CONNECTION.
 - e. FURNISHING OF ACCESS PANELS.
- C. RELATED WORK**
1. THE FOLLOWING EQUIPMENT ITEMS AND WORK SHALL BE THE RESPONSIBILITY OF OTHERS:
 - a. CUTTING AND PATCHING
 - b. TEMPORARY WATER, HEAT, FIRE PROTECTION AND TOILET FACILITIES
 - c. TEMPORARY POWER AND LIGHTING
 - d. CONCRETE AND MASONRY SUPPORTS AND EQUIPMENT BASES
 - e. FLASHING AND CAULKING

- f. FINISH PAINTING
- g. HEATING, VENTILATING AND AIR CONDITIONING
- h. FIRE PROTECTION
- i. ELECTRICAL POWER AND WIRING
- j. FURNISHING OF TOILET ROOM ACCESSORIES
- k. INSTALLATION OF ACCESS PANELS

- D. PIPING MATERIALS & FITTINGS**
1. COLD & HOT WATER: TYPE K HARD DRAWN COPPER TUBING WITH WROUGHT COPPER SWEAT FITTINGS JOINED WITH APPROVED 95/5 LEAD FREE TIN ANTIMONY SOLDER.
 2. COLD & HOT WATER: TYPE L HARD DRAWN COPPER TUBING WITH WROUGHT COPPER SWEAT FITTINGS JOINED WITH APPROVED 95/5 LEAD FREE TIN ANTIMONY SOLDER.
 3. GAS 2" AND SMALLER: SCHEDULE 40 BLACK STEEL PIPE WITH STANDARD WEIGHT MALLEABLE IRON FITTINGS JOINED WITH THREADED CONNECTIONS.
 4. GAS LARGER THAN 2": SCHEDULE 40 BLACK STEEL PIPE WITH BEVELED ENDS WITH STANDARD WEIGHT CARBON STEEL BEVELED END FITTINGS JOINED BY WELDING IN ACCORDANCE WITH LOCAL CODES.
- E. INSULATION**
1. ALL DOMESTIC COLD AND HOT WATER SUPPLY AND RECIRCULATION PIPE, FITTINGS AND VALVES SHALL BE INSULATED WITH HEAVY DENSITY RIGID FIBERGLASS WITH A VAPOR BARRIER AND ALL PURPOSE JACKET WITH SELF-SEALING LAP JOINT. VALVES AND FITTINGS SHALL BE INSULATED WITH ZESTON H-LO INSULATION AND COVERED WITH 25/50 RATED PVC COVERS SECURED WITH VAPOR RETARDER MASTIC.
 2. INSULATION THICKNESS SHALL BE AS FOLLOWS:
 - COLD WATER = 1/2"
 - HOT WATER SUPPLY AND RECIRCULATION UP TO 4" = 1"
 - HOT WATER SUPPLY AND RECIRCULATION LARGER THAN 4" = 1-1/2"
- F. PIPE SLEEVES, HANGERS AND SUPPORTS**
1. ALL PIPING SHALL BE PROPERLY SUPPORTED FROM THE BUILDING STRUCTURE IN ACCORDANCE WITH LOCAL CODES AND MANUFACTURER'S RECOMMENDATIONS. HANGERS FOR INSULATED PIPING SHALL BE OVERSIZED AND FURNISHED WITH A SHEETMETAL INSULATION SHIELD TO ALLOW THE INSULATION TO PASS THROUGH UN CUT. PROVIDE SCHEDULE 40 PIPE SLEEVES, EXTEND 1 INCH ABOVE FLOOR, MAKE WATERTIGHT AND PACK WITH MATERIAL THAT SHALL MAINTAIN FIRE RATING. PROVIDE CORE DRILLING WHERE REQUIRED AND PROVIDE FIRE RATED LINK SEAL PENETRATION CLOSURES.
- G. VALVES**
1. SHUT OFF VALVES ON COLD WATER, HOT WATER, AND HOT WATER RECIRCULATION PIPING FROM UP TO AND INCLUDING 2 1/2" SHALL BE APOLLO SERIES 77C, THREADED OR SOLDER END, BRONZE BODY BALL VALVE, FULL PORT STAINLESS STEEL BALL AND STEM, 600 PSI WOG.
 2. SHUT OFF VALVES ON COLD WATER AND HOT WATER PIPING 3" AND LARGER SHALL BE APOLLO SERIES 143 BUTTERFLY VALVE, LUG TYPE DUCTILE IRON BODY, EPDM OR BUNA-N SEAT, 10 POSITION LEVER HANDLE.
 3. SHUT OFF VALVES ON COLD WATER AND HOT WATER PIPING UP TO 3" SHALL BE BRONZE BODY GATE VALVE WITH RISING STEM, SOLID WEDGE DESIGN, 300 PSI WOG WITH THREADED OR SOLDERED ENDS.
 4. ALL CHECK VALVES ON COLD WATER, HOT WATER AND HOT WATER RECIRCULATION PIPING THREE INCHES AND LESS IN SIZE SHALL BE APOLLO SERIES 61, BRONZE BODY, RTFE BALL CHECK, S.S. SPRING.
 5. ALL DRAIN VALVES SHALL BE 1/2 INCH APOLLO MODEL 78-103 WITH WATTS NO. 8A HOSE CONNECTION VACUUM BREAKER, CAP WITH CHAIN OF LENGTH AS REQUIRED.
 6. ALL BALANCING VALVES FOR HOT WATER RECIRCULATION SHALL BE THE SAME AS SPECIFIED FOR SHUT OFF VALVES AND SHALL BE MODIFIED TO INCLUDE BALANCING STOP PLATE.
 7. ALL SHUT-OFF VALVES ON NATURAL GAS SYSTEM 2 INCHES AND SMALLER SHALL BE APOLLO SERIES 80-100 SERIES MASSACHUSETTS APPROVED, THREADED END T HANDLE BRONZE BODY BALL VALVE, RATED FOR 250 PSIG.
 8. ALL SHUTOFF VALVES ON NATURAL GAS SYSTEMS 2-1/2 INCHES AND LARGER SHALL BE WALWORTH 1797F IRON BODY PLUG VALVE WITH FLANGED ENDS.
 9. ALL BALL VALVES FOR INSTALLATION IN INSULATED PIPING SHALL HAVE VALVE EXTENSIONS TO SUIT INSULATION THICKNESS.
- H. WATER HEATER:** SEE WATER HEATER SCHEDULE ON DRAWINGS FOR SPECIFICATION
- I. PIPE IDENTIFICATION AND VALVE TAGS:**
1. ALL PLUMBING SYSTEMS SHALL BE LABELED AT EACH VALVE, AT EACH BRANCH, AT EACH PIPE PASSAGE THROUGH WALL AND AT INTERVALS OF NOT MORE THAN 20 FEET WITH COLOR CODED SEMI-RIGID SETMARK PIPE MARKERS WITH ARROWS INDICATING THE DIRECTION OF FLOW. ALL VALVES SHALL BE TAGGED WITH 1-1/2 INCH DIAMETER BRASS TAGS AND NUMBERED IN SEQUENCE FROM POINT OF ORIGIN. VALVE CHARTS SHALL BE PLACED UNDER GLASS, FRAMED AND PRESENTED TO THE OWNER.