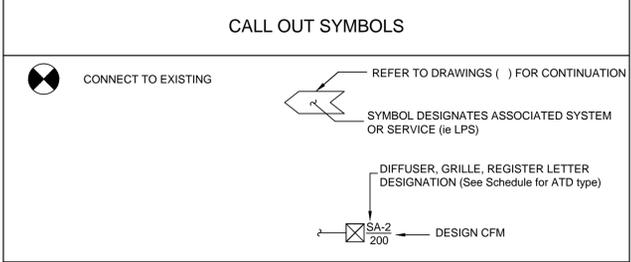
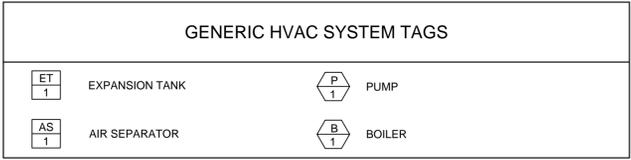
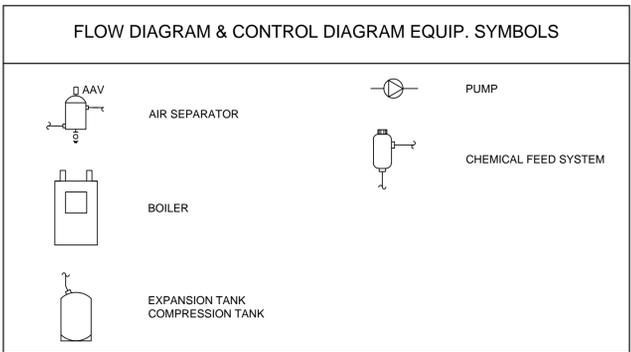
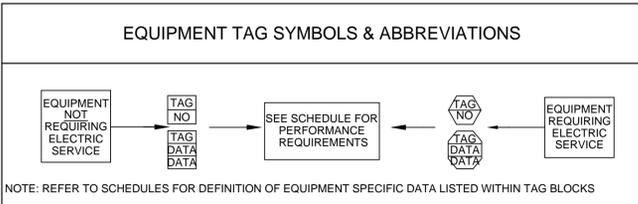


PIPING LEGEND	
	BALL VALVE
	BALL VALVE WITH MEMORY STOP (BALANCING VALVE)
	BUTTERFLY VALVE
	BUTTERFLY VALVE WITH MEMORY STOP (BALANCING VALVE)
	PLUG VALVE
	PRESSURE REDUCING VALVE
	CHECK VALVE
	STRAINER W/BALL VALVE, HOSE BIBB & CAP (GATE VALVE FOR STEAM)
	SOLENOID VALVE
	AUTOMATIC CONTROL VALVE, MODULATING ACTUATOR
	AUTOMATIC CONTROL VALVE TWO POSITION ACTUATOR
	THREE WAY AUTOMATIC CONTROL VALVE, TWO POSITION ACTUATOR
	AUTOMATIC FLOW CONTROL VALVE (PRESSURE INDEPENDENT)
	COMBINATION FLOWMETER/SHUT OFF/BALANCING VALVE (CIRCUIT SETTER)
	FLOW MEASURING DEVICE
	UNION OR FLANGE (AS INDICATED BY PIPE SIZE - SEE SPEC.)
	BLIND FLANGE
	END CAP
	PRESSURE GAUGE WITH GAUGE CLOCK
	THERMOMETER
	PRESSURE/TEMPERATURE WELL
	AUTOMATIC AIR VENT WITH ISOLATION VALVE
	FLEXIBLE CONNECTION
	RISE (SINGLE LINE - PLAN VIEW)
	DROP (SINGLE LINE - PLAN VIEW)
	TOP TAKEOFF
	BOTTOM TAKEOFF
	PIPE BREAK (SINGLE LINE)
	DIRT LEG
	CLEAN-OUT FOR CONDENSATE DRAIN
	DIRECTION OF FLOW IN PIPE
	PITCH PIPE UP IN DIRECTION OF FLOW
	PITCH PIPE DOWN IN DIRECTION OF FLOW

HYDRONIC SYSTEM SPECIFIC ABBREVIATIONS			
AS	AIR SEPARATOR	ET	EXPANSION TANK
AAV	AUTOMATIC AIR VENT	EWT	ENTERING WATER TEMPERATURE
CH	CHILLER	HB	HOSE BIBB CONN W/CHAINED CAP
CHEM	CHEMICAL FEED	LWT	LEAVING WATER TEMPERATURE
CHW	CHILLED WATER	MAV	MANUAL AIR VENT
CHWR	CHILLED WATER RETURN	NPSH	NET POSITIVE SUCTION HEAD
CHWS	CHILLED WATER SUPPLY	OS&Y	OUTSIDE STEM AND YOKE
CT	COOLING TOWER	PU	PUMP
CTK	COMPRESSION TANK	TDH	TOTAL DYNAMIC HEAD
DDV	DRAIN OFF VALVE		

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



- 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 AND CONTROL SYSTEMS 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.
 - 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 DUCTS 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.

SCHEDULE OF DRAWINGS	
DWG#	DESCRIPTION
H1.0	HVAC LEGEND
HD2.0	HVAC DEMO FLOOR PLAN
H2.0	HVAC FLOOR PLAN
H3.0	HVAC DETAILS AND CONTROLS
H4.0	HVAC SCHEDULES
H5.0	HVAC SPECIFICATIONS

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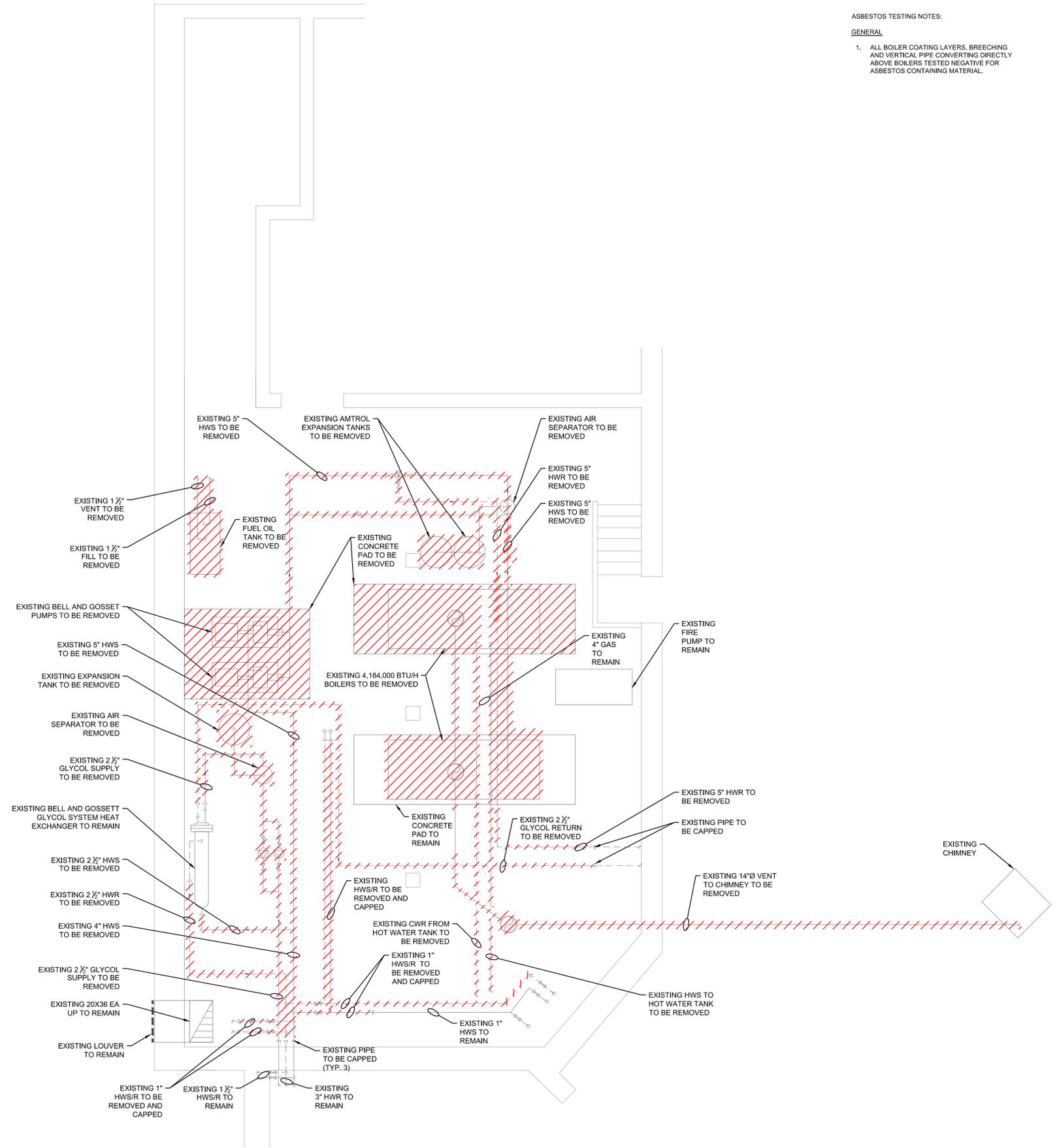
BID SET 6-30-15

CSI Project Number: 2014-525
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 Drawn By: JC
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 Date: 6-29-15

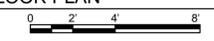
HVAC LEGEND

Chappuis, July 14, 2015 - 10:10am - 2014-525 H1.0 HVAC Legend.dwg

ASBESTOS TESTING NOTES:
 GENERAL
 1. ALL BOILER COATING LAYERS, BREECING AND VERTICAL PIPE CONVERTING DIRECTLY ABOVE BOILERS TESTED NEGATIVE FOR ASBESTOS CONTAINING MATERIAL.



HVAC DEMO FLOOR PLAN
 SCALE: 1/4"=1'-0"



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HVAC DEMO
 FLOOR PLAN

HD2.0
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07/14/2015 10:10am - 2014-525 HD2.0 HVAC Demo Floor Plan.dwg



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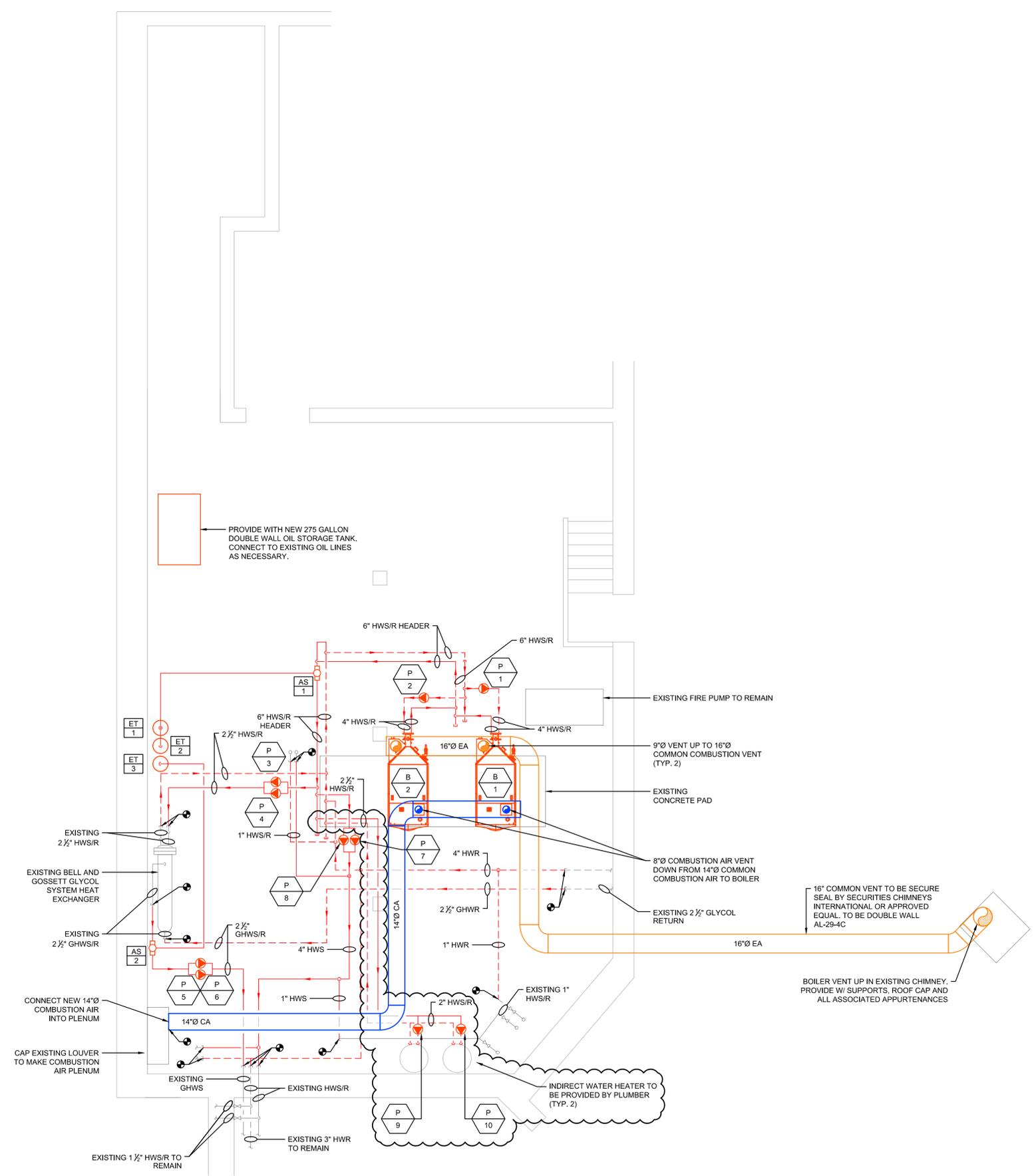
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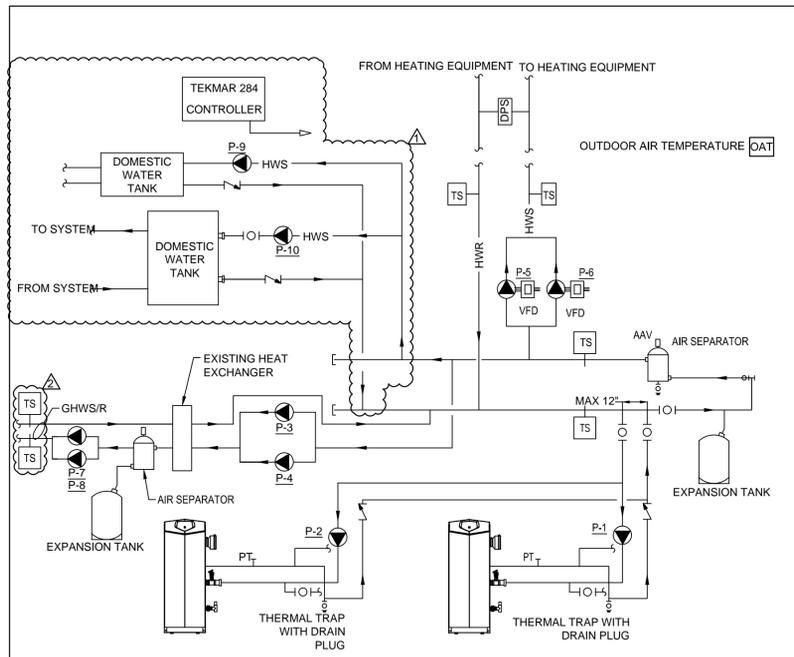
CSI Project Number: 2014-525
Scale: 1/4"=1'-0"
Drawn By: JC
Checked By: DM
Date: 6-29-15

HVAC FLOOR PLAN



HVAC FLOOR PLAN
SCALE: 1/4"=1'-0"
0 2' 4' 8'

chappell, July 14, 2015 - 10:10am - 2014-525 H2.0 HVAC Floor Plan.dwg



THE BOILERS AND PUMPS FOR THE HEATING SYSTEM ARE CONTROLLED AND MONITORED BY THE TEKMAR 284 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, THE DUTY/STANDBY CONTROL ON THE SECONDARY PUMPS P-3, P-4, P-5, P-6, P-7 AND P-8 THE DWH PUMP P-9 AND P-10, AND TOTALIZES THE RUN TIME OF EACH BOILER AND EACH SECONDARY PUMP.

BOILERS AND ASSOCIATED PRIMARY PUMPS ARE ENERGIZED AND DE-ENERGIZED BY THE TEKMAR 284 TO MAINTAIN A PRIMARY HEATING HOT WATER SUPPLY TEMPERATURE (SEE CHART BELOW). WHEN A BOILER IS ENERGIZED THE ASSOCIATED PRIMARY PUMP IS ENERGIZED FIRST, THEN THE BOILER IS FIRED. THE BOILERS WILL MAINTAIN A SECONDARY LOOP RESET TEMPERATURE PER THE FOLLOWING SCHEDULE:

OUTDOOR AIR TEMPERATURE	HOT WATER SECONDARY LOOP SUPPLY TEMP. SETPOINT
LESS THAN 20°F	180°F
20°F ≤ T ≤ 30°F	170°F
30°F ≤ T ≤ 40°F	160°F
40°F ≤ T ≤ 50°F	150°F
50°F ≤ T ≤ 65°F	140°F
65°F < T	HEATING SYSTEM OFF

WHEN OAT SENSOR IS BELOW 65°F (ADJ) THE DUTY SECONDARY PUMP SHALL OPERATE CONTINUOUSLY. ARE CONTROLLED WITH AN INTEGRAL VFD. AS THE PRESSURE INCREASES SENSED BY THE DPS THE PUMP SPEED IS REDUCED. AS THE SYSTEM'S PRESSURE DECREASES THE PUMP SPEED IS INCREASED TO MAINTAIN THE SYSTEMS PRESSURE.

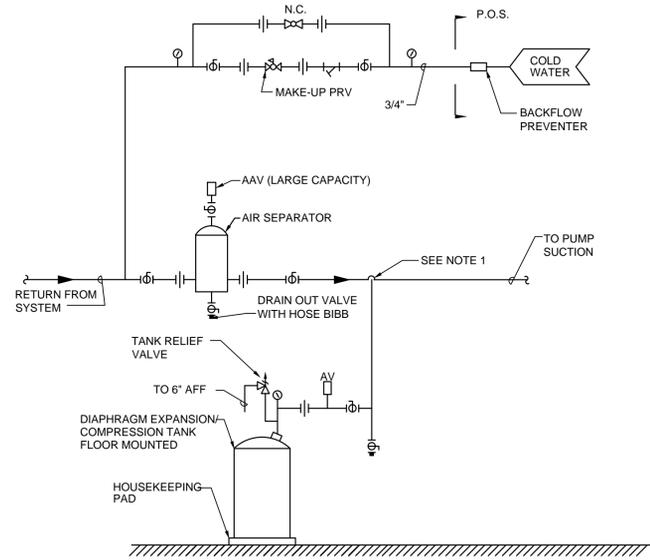
TEKMAR 284 CONTROL PANEL WILL TURN ON THE MOST BOILERS POSSIBLE TO MEET THE LOAD. THE CONTROL WILL BRING ON THE FIRST PUMP AND BOILER AT MINIMUM MODULATION AND DOES NOT INCREASE ITS MODULATION. IF MORE BOILER OUTPUT IS REQUIRED, THE SECOND PUMP AND BOILER WILL TURN ON AT MINIMUM MODULATION AND DOES NOT INCREASE ITS MODULATION. IF STILL MORE BOILER OUTPUT IS REQUIRED, ALL BOILERS ARE MODULATED UP IN PARALLEL UNTIL THEY REACH THEIR MAXIMUM. REVERSE SHALL OCCUR ONCE LOAD IS SATISFIED.

MODULATION SETTINGS 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 TEKMAR 284 CONTROL PANEL ALLOWS FOR SELECTION OF LEAD BOILER AND SECONDARY DUTY PUMP BY EITHER MANUALLY (BY OPERATOR) OR AUTOMATICALLY (EVERY TWO WEEKS BOILERS AND PUMPS ROTATE POSITIONS).

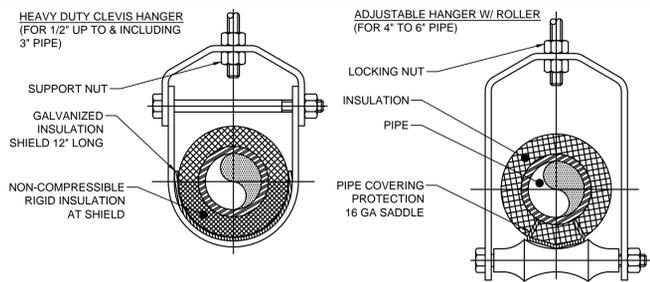
ON A CALL FOR DHW REGARDLESS OF OUTDOOR TEMPERATURE THE TEKMAR 284 WILL INCREASE THE WATER TEMPERATURE TO 180°F. THE DHW DEMAND OVERRIDES THE BOILER RESET TARGET TEMPERATURE. REGARDLESS OF DHW SETTINGS AND REQUESTED TARGETS, THE BOILERS WILL MAINTAIN A SUPPLY TEMPERATURE NO HIGHER THAN THE BOIL MAX SETTING. CONTROLS TO BE TIED INTO EXISTING TRIDIUM NIAGARA SYSTEM.

HEATING HOT WATER BOILERS AND ASSOCIATED PUMPS CONTROL SEQUENCE AND PIPING DIAGRAM

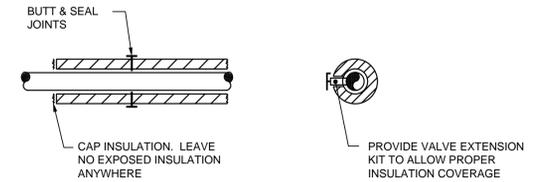


NOTES:
1. CONNECT TO SIDE OF MAIN TO PREVENT AIR OR DEBRIS FROM ENTERING PIPE TO TANK. TOP OR BOTTOM CONNECTION NOT PERMITTED.

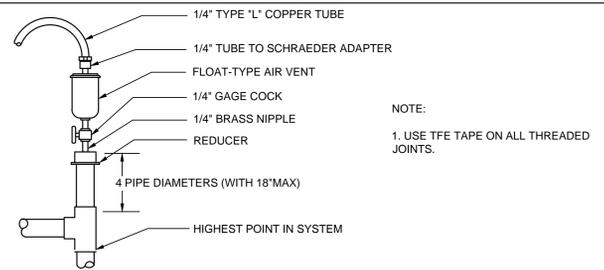
HYDRONIC SPECIALTIES FOR CLOSED LOOP WATER SYSTEMS



PIPE HANGER SUPPORT

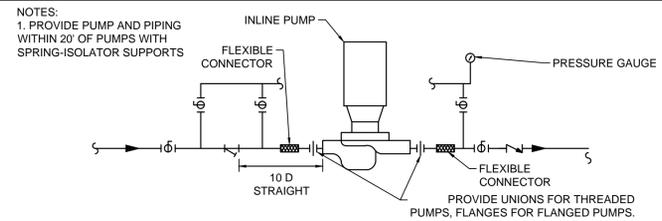


TYPICAL PIPE INSULATION & VALVE HANDLE EXTENSION

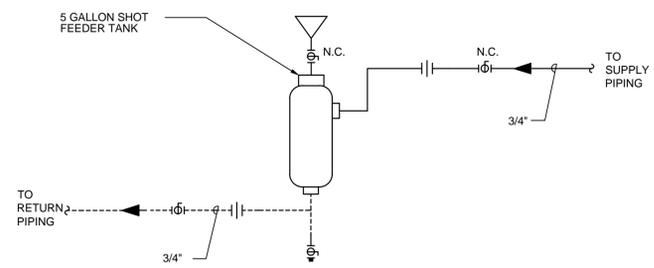


NOTE:
1. USE TFE TAPE ON ALL THREADED JOINTS.

AUTOMATIC AIR VENT ASSEMBLY



INLINE PUMP PIPING



CHEMICAL FEED (SHOT FEEDER)



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REVISIONS:

Date	Description
6-29-15	Add/Alternate
7-14-15	Controls Addendum

BID SET 6-30-15

CSI Project Number: 2014-525
Scale: NTS
Drawn By: JC
Checked By: DM
Date: 6-29-15

HVAC DETAILS AND CONTROLS



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**LOWELL
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REPLACEMENT**

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Date	Description
6-29-15	Add/Alternate

**BID SET
6-30-15**

CSI Project Number: 2014-525
Scale: NTS
Drawn By: JC
Checked By: DM
Date: 6-29-15

**HVAC
SCHEDULES**

HVAC BOILER SCHEDULE (GAS FIRED)															
TAG No.	LOCATION	INPUT (MBH)	OUTPUT (MBH)	MAX. OPER. PRESS. (PSIG)	WATER				FUEL INLET PRESSURE (IN.WG)	BURNER				MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
					ENT(°F)	LVG(°F)	GPM	PD (FT)		TURN DOWN	BLOWER				
									AMPS		V	PH			
B-1	MECH ROOM	2500	2300	160	160	180	230	4.6	4-14	20:1	10.2	120	1	LOCHINVAR FB-2500	
B-2	MECH ROOM	2500	2300	160	160	180	230	4.6	4-14	20:1	10.2	120	1	LOCHINVAR FB-2500	

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 BACNET CAPABILITY

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	W	HP	V	PH		
P-1	B-1 PRIMARY PUMP	MECH ROOM	INLINE	WATER	180	230	15	50	3513	2050	-	208	3	GRUNDFOS UPS 80-160	1,3
P-2	B-2 PRIMARY PUMP	MECH ROOM	INLINE	WATER	180	230	15	50	3513	2050	-	208	3	GRUNDFOS UPS 80-160	1,3
P-3	HWS TO HX	MECH ROOM	INLINE	WATER	180	100	40	50	3513	-	-	115	1	GRUNDFOS UPS 80-160	1,3
P-4	HWS TO HX	MECH ROOM	INLINE	WATER	180	100	40	50	3513	-	-	115	1	GRUNDFOS UPS 80-160	1,3
P-5	GHWS TO HX	MECH ROOM	INLINE	30% GLYCOL	170	70	65				3	208	3	GRUNDFOS VLSE-4P-3HP	2,3
P-6	GHWS TO HX	MECH ROOM	INLINE	30% GLYCOL	170	70	65				3	208	3	GRUNDFOS VLSE-4P-3HP	2,3
P-7	HWS TO HX	MECH ROOM	INLINE	WATER	180	240	95	130	3500	-	10	208	3	GRUNDFOS VLC 25709-10HP	2,3
P-8	HWS TO HX	MECH ROOM	INLINE	WATER	180	240	75	130	3500	-	10	208	3	GRUNDFOS VLC 25709-10HP	2,3
P-9	DHW	MECH ROOM	INLINE	WATER	180	24	22	45	-	370	-	115	1	GRUNDFOS UPS 26-150	1,3
P-10	DHW	MECH ROOM	INLINE	WATER	180	24	22	45	-	370	-	115	1	GRUNDFOS UPS 26-150	1,3

NOTES: 1. PROVIDE THREE SPEED PUMP. 2. PROVIDE PUMP WITH VFD MOTOR AND BUILT IN DIFFERENTIAL PRESSURE SENSOR. 3. PROVIDE WITH BACNET CAPABILITY

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	MECHANICAL	DIA	132	61	WATER	24 X 89	TACO CAX500	
ET-2	HWS	MECHANICAL	DIA	132	61	WATER	24 X 89	TACO CAX500	
ET-3	GHWS	MECHANICAL	DIA	11	5	30% GLYCOL	14 X 33	TACO CAX42	

NOTES: 1. EXPANSION TANK BY TACO OR EQUAL. 2. EXPANSION TANK TO BE ASME.

HVAC AIR & DIRT SEPARATOR SCHEDULE							
TAG NO.	SERVICE	LOCATION	SIZE (IN)	GPM	MAX P.D. (FT HEAD)	MANUFACTURER AND MODEL NUMBER (AS STANDARD)	REMARKS
AS-1	HWS	MECH ROOM	6"	340	1.0	SPIROTHERM VDT 600	
AS-2	GHWS	MECH ROOM	2-1/2"	70	1.0	SPIROTHERM VDT 250	

NOTES: 1. AIR SEPARATOR BY SPIROTHERM. 2. PROVIDE WITH FLANGE.

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 COINCIDE 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 INTERNATIONAL BUILDING CODE, 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 FOR THE WORK OF THIS SECTION. STRUCTURAL ELEMENTS SHALL NOT BE CUT, FILLED AND PATCH ALL OPENINGS DAMAGED AND 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 (OR PEX "A" PIPING UP TO 4"), 2" AND SMALLER SHALL BE SREWED SCHEDULE 40 STEEL, 95/5 SOLDERED TYPE L COPPER OR PEX "A" PIPING. CONDENSATE DRAIN PIPING SHALL BE COPPER OR PEX "A" PIPING. 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 IN STRICT 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, HEAT EXCHANGERS, 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.
6. VIBRATION ISOLATION: PROVIDE VIBRATION ISOLATION FOR EACH PIECE OF ROTATING OR PISTON DRIVEN HVAC EQUIPMENT SHOWN ON THE DRAWINGS. ISOLATION MAY BE INTERNAL OR EXTERNAL TO THE EQUIPMENT AND SHALL PROVIDE AT LEAST 90% ISOLATION EFFICIENCY. ISOLATE THE FIRST FOUR PIPE HANGER LOCATIONS FROM EQUIPMENT WITH 1" DEFLECTION COMBINATION SPRING AND NEOPRENE. INSTALLATION PRACTICES SHALL BE IN STRICT ACCORDANCE WITH THE RECOMMENDATIONS OF THE VIBRATION ISOLATION MANUFACTURER.
7. CENTRIFUGAL PUMPS: PROVIDE WHERE SHOWN ON DRAWINGS, CENTRIFUGAL PUMPS, OF CAPACITIES, TYPES, AND CONFIGURATIONS SHOWN ON SCHEDULES. PROVIDE PREMIUM EFFICIENCY VFD COMPATIBLE MOTORS THAT ARE NON-OVERLOADING THROUGHOUT PUMP CURVE. ACCEPTABLE MANUFACTURERS SHALL BE: GRUNDFOS, PACO AND BELL AND GOSSETT. PROVIDE A NON-REDUCING SUCTION DIFFUSERS ON PUMP INLETS.
8. HYDRONIC SPECIALTIES: PROVIDE 125 PSI RATED (ASME) AIR SEPARATORS AND DIAPHRAGM EXPANSION TANKS AS SHOWN ON DRAWINGS. PROVIDE WITH AUTOMATIC AIR VENT AND DRAIN VALVES. SPECIALTIES SHALL BE AS MANUFACTURED BY SPROVENT, AMTROR OR BELL AND GOSSETT.
9. CLOSED WATER TREATMENT: PROVIDE CLOSED LOOP SYSTEMS WITH WATER TREATMENT CONSISTING OF 5 GALLON BY-PASS SHOT FEEDER TO FEED CHEMICAL SOLUTION INTO EACH PIPING SYSTEM. FLUSH AND CLEAN ALL SYSTEMS AFTER INSTALLATION. SUBMIT WRITTEN REPORT INDICATING THAT SYSTEMS HAVE BEEN THOROUGHLY CLEANED AND CHARGED WITH CORROSION INHIBITOR. EFFLUENT FROM SYSTEMS DISCHARGED TO SEWER SHALL MEET REQUIREMENTS OF APPLICABLE LOCAL, STATE, AND NATIONAL WATER QUALITY STANDARDS. PROVIDE ONE-YEAR SERVICE INCLUDING MAINTAINING CHEMICALS AS WELL AS ANALYZING WATER SAMPLE
10. GAS FIRED BOILERS: THE BOILERS SHALL BE A LOCHINVAR KNIGHT MODEL FB OR APPROVED EQUAL AND SHALL BE OPERATED ON NATURAL GAS. THE BOILER SHALL BE CAPABLE OF FULL MODULATION, FIRING DOWN TO 20% OF RATED INPUT WITH A TURNDOWN RATIO OF 5:1. THE BOILER SHALL BE OF A FIRE TUBE DESIGN AND SHALL BE VERTICALLY DOWN FIRED. THE BOILER SHALL BEAR THE ASME "H" STAMP FOR 80 PSI WORKING PRESSURE AND SHALL BE NATIONAL BOARD LISTED. THE HEAT EXCHANGER ASSEMBLY SHALL BE FULLY WELDED THROUGH AN AUTOMATED PROCESS TO ENSURE WELD INTEGRITY. THE 439 STAINLESS STEEL COMBUSTION CHAMBER AND TUBES SHALL BE SELF CLEANING AND DESIGNED TO DRAIN CONDENSATION TO THE BOTTOM OF THE HEAT EXCHANGER ASSEMBLY. A BUILT-IN STAINLESS STEEL FLUE COLLECTOR SHALL ALLOW CONDENSATION TO DRAIN FROM THE HEAT EXCHANGER ASSEMBLY AND INTO THE EXTERNAL CONDENSATE TRAP. THE COMPLETE HEAT EXCHANGER ASSEMBLY SHALL CARRY A TWELVE (12) YEAR LIMITED WARRANTY. THE BOILER SHALL BE CERTIFIED AND LISTED BY C.S.A. INTERNATIONAL UNDER THE LATEST EDITION OF THE HARMONIZED ANSI Z21.13/CSA 4.9 TEST STANDARD FOR THE U.S. AND CANAD. THE BOILER SHALL COMPLY WITH THE ENERGY EFFICIENCY REQUIREMENTS OF THE LATEST EDITION OF THE ASHRAE 90.1 STANDARD AND THE MINIMUM EFFICIENCY REQUIREMENTS OF THE LATEST EDITION OF THE ASHRAE 103 STANDARD. THE BOILER SHALL MEET U.S. ENVIRONMENTAL PROTECTION AGENCY AND DEPARTMENT OF ENERGY GUIDELINES FOR "ENERGY STAR". THE BOILER SHALL BE CERTIFIED FOR INDOOR INSTALLATION. THE BOILER'S EFFICIENCY RATINGS SHALL BE VERIFIED THROUGH THIRD PARTY TESTING BY THE HYDRONICS INSTITUTE DIVISION OF AHRI AND LISTED IN THE AHRI CERTIFICATION DIRECTORY. THE BOILER SHALL BE CONSTRUCTED WITH A HEAVY GAUGE STEEL JACKET ASSEMBLY, PRIMED AND PRE-PAINTED ON BOTH SIDES. THE COMBUSTION CHAMBER SHALL BE SEALED AND COMPLETELY ENCLOSED, INDEPENDENT OF THE OUTER JACKET ASSEMBLY, SO THAT INTEGRITY OF THE OUTER JACKET DOES NOT AFFECT A PROPER SEAL. A BURNER FLAME OBSERVATION PORT SHALL BE PROVIDED. THE BURNER SHALL BE A PREMIX DESIGN AND CONSTRUCTED OF HIGH TEMPERATURE STAINLESS STEEL WITH A WOVEN METAL FIBER OUTER COVERING TO PROVIDE MODULATING FIRING RATES. THE BOILER SHALL BE SUPPLIED WITH A GAS VALVE DESIGNED WITH NEGATIVE PRESSURE REGULATION AND BE EQUIPPED WITH A VARIABLE SPEED BLOWER SYSTEM, TO PRECISELY CONTROL THE FUEL/AIR MIXTURE TO PROVIDE MODULATING BOILER FIRING RATES FOR MAXIMUM EFFICIENCY. THE BOILER SHALL OPERATE IN A SAFE CONDITION AT A DERATED OUTPUT WITH GAS SUPPLY PRESSURES AS LOW AS 4 INCHES OF WATER COLUMN. THE BOILER SHALL UTILIZE A 24 VAC CONTROL CIRCUIT AND COMPONENTS. THE CONTROL SYSTEM SHALL HAVE AN ELECTRONIC DISPLAY FOR BOILER SET-UP, BOILER STATUS, AND BOILER DIAGNOSTICS. ALL COMPONENTS SHALL BE EASILY ACCESSED AND SERVICEABLE FROM THE FRONT AND TOP OF THE JACKET. THE BOILER SHALL BE EQUIPPED WITH: A TEMPERATURE/PRESSURE GAUGE, HIGH LIMIT TEMPERATURE CONTROL CERTIFIED TO UL353, ASME CERTIFIED PRESSURE RELIEF VALVE, OUTLET WATER TEMPERATURE SENSOR, RETURN WATER TEMPERATURE SENSOR, A UL 353 CERTIFIED FLUE TEMPERATURE SENSOR, OUTDOOR AIR SENSOR, LOW WATER FLOW PROTECTION AND BUILT-IN ADJUSTABLE FREEZE PROTECTION. THE BOILER SHALL FEATURE THE "SMART SYSTEM" CONTROL WITH A MULTI-COLORED GRAPHIC LCD DISPLAY WITH NAVIGATION DIAL AND SOFT KEYS FOR, PASSWORD SECURITY, THREE LOOP TEMPERATURE SETPOINTS WITH INDIVIDUAL OUTDOOR AIR RESET CURVES, PUMP DELAY WITH ADJUSTABLE FREEZE PROTECTION, PUMP EXERCISE, DOMESTIC HOT WATER PRIORITIZATION WITH DHW MODULATION LIMITING AND USB PC PORT CONNECTION. THE BOILER SHALL BE CAPABLE OF CONTROLLING A VARIABLE SPEED BOILER PUMP TO KEEP A CONSTANT DELTA T AT ALL MODULATION RATES. THE BOILER SHALL HAVE THE CAPABILITY TO ACCEPT A 0-10 VDC INPUT CONNECTION FOR BMS CONTROL OF MODULATION OR SETPOINT, ENABLE/DISABLE OF THE BOILER, VARIABLE SYSTEM PUMP SIGNAL AND A 0-10VDC OUTPUT OF BOILER MODULATION RATE. THE BOILER SHALL HAVE A BUILT-IN "CASCADE" WITH SEQUENCING OPTIONS FOR "LEAD LAG" OR "EFFICIENCY OPTIMIZED" MODULATION LOGIC, WITH BOTH CAPABLE OF ROTATION WHILE MAINTAINING MODULATION OF UP TO EIGHT BOILERS WITHOUT UTILIZATION OF AN EXTERNAL CONTROLLER. SUPPLY VOLTAGE SHALL BE 120 VOLT / 60 HERTZ / SINGLE PHASE. THE BOILER SHALL BE EQUIPPED WITH TWO TERMINAL STRIPS FOR ELECTRICAL CONNECTION. A LOW VOLTAGE CONNECTION BOARD WITH 42 DATA POINTS FOR SAFETY AND OPERATING CONTROLS, I.E., AUXILIARY RELAY, AUXILIARY PROVING SWITCH, ALARM CONTACTS, MANUAL RESET LOW WATER CUTOFF, FLOW SWITCH, HIGH AND LOW GAS PRESSURE SWITCHES, TANK THERMOSTAT, THREE WALL THERMOSTAT/ZONE CONTROLS, SYSTEM SUPPLY SENSOR, OUTDOOR SENSOR, BUILDING MANAGEMENT SYSTEM SIGNAL, MODBUS CONTROL CONTACTS AND CASCADE CONTROL CIRCUIT. A HIGH VOLTAGE TERMINAL STRIP SHALL BE PROVIDED FOR SUPPLY VOLTAGE. THE HIGH VOLTAGE TERMINAL STRIP PLUS INTEGRAL RELAYS ARE PROVIDED FOR INDEPENDENT PUMP CONTROL OF THE SYSTEM PUMP, THE BOILER PUMP AND THE DOMESTIC HOT WATER PUMP. THE BOILER SHALL BE INSTALLED AND VENTED WITH A DIRECT VENT TERMINATION OF BOTH THE VENT AND COMBUSTION AIR. THE FLUE SHALL BE PVC, CPVC OR STAINLESS STEEL SEALED VENT MATERIAL TERMINATING AT THE SIDEWALL WITH THE MANUFACTURER'S SPECIFIED VENT TERMINATION. A SEPARATE PIPE SHALL SUPPLY COMBUSTION AIR DIRECTLY TO THE BOILER FROM THE OUTSIDE. THE AIR INLET PIPE MAY BE PVC, CPVC, ABS, GALVANIZED, DRYER VENT, OR STAINLESS STEEL SEALED PIPE. THE AIR INLET MUST TERMINATE ON THE SAME SIDEWALL WITH THE MANUFACTURER'S SPECIFIED AIR INLET CAP. THE BOILER'S TOTAL COMBINED AIR INTAKE LENGTH SHALL NOT EXCEED 100 EQUIVALENT FEET. THE BOILER'S TOTAL COMBINED EXHAUST VENTING LENGTH SHALL NOT EXCEED 100 EQUIVALENT FEET. FOAM CORE PIPE IS NOT AN APPROVED MATERIAL FOR EXHAUST PIPING. THE BOILER SHALL HAVE AN INDEPENDENT LABORATORY RATING FOR OXIDES OF NITROGEN (NOX) OF 20 PPM OR LESS CORRECTED TO 3% O2. THE MANUFACTURER SHALL VERIFY PROPER OPERATION OF THE BURNER, ALL CONTROLS AND THE HEAT EXCHANGER BY CONNECTION TO WATER AND VENTING FOR A FACTORY FIRE TEST PRIOR TO SHIPPING.

C. EXECUTION

1. DEMOLITION: THE EXISTING FACILITY WILL CONTINUE TO OPERATE DURING ALL PHASES OF THE DEMOLITION WORK AND SUBSEQUENT CONSTRUCTION. NO INTERRUPTION OF THE SYSTEMS WILL BE PERMITTED WITHOUT PRIOR APPROVAL OF THE OWNER'S REPRESENTATIVE. SUBMIT PROPOSED METHODS AND SEQUENCE OF OPERATIONS FOR THE SELECTIVE DEMOLITION WORK TO THE OWNER'S REPRESENTATIVE FOR REVIEW PRIOR TO THE START OF THE WORK. ANY DEMOLITION SHALL BE COORDINATED WITH OWNER, AND CM/GC. PERFORM ALL DEMOLITION WHILE ENSURING MINIMUM INTERFERENCE WITH ADJACENT OCCUPIED AREAS.
2. START UP, TESTING AND BALANCING: PROVIDE QUALIFIED PERSONNEL, EQUIPMENT, APPARATUS, AND SERVICES FOR START-UP, TESTING AND BALANCING OF THE MECHANICAL SYSTEMS TO PERFORMANCE DATA SHOWN IN SCHEDULES AND ON DRAWINGS. AIR AND WATER FLOWS SHALL BE BALANCED TO +/- 5% OF DESIGN. LEAKS, DAMAGE, AND DEFECTS DISCOVERED OR RESULTING FROM START-UP AND BALANCING SHALL BE REPAIRED OR REPLACED TO LIKE-NEW CONDITION WITH ACCEPTABLE MATERIALS. TESTING SHALL CONTINUE UNTIL SYSTEM OPERATES WITHOUT ADJUSTMENTS OR REPAIRS. REPORT DATA ON INDUSTRY STANDARD NEBB OR AABC REPORTING FORMS. THE TAB CONTRACTOR WILL PRODUCE A TAB REPORT THAT HAS THE FOLLOWING: THE REPORT SHALL BE APPROPRIATELY BOUND, A COVER PAGE, A TABLE OF CONTENTS, THE CONTRACTOR'S CERTIFICATION INFORMATION, THE CONTRACTOR'S EQUIPMENT CALIBRATION INFORMATION, FLOW DIAGRAMS OF THE SYSTEM WITH MINIMUM, MAXIMUM AND DESIGN FLOWS AND PRESSURE DATA, FAN CURVES WITH DESIGN AND MAXIMUM PRESSURES PLOTTED, A PAGE FOR EACH PUMP WITH ALL THE INFORMATION FILLED IN (ACTUAL AND DESIGN), PUMP CURVES WITH DESIGN AND MAXIMUM PRESSURES PLOTTED, A PAGE FOR EACH BOILER WITH ALL THE INFORMATION FILLED IN (ACTUAL AND DESIGN). THIS REPORT SHALL HELP THE OWNER DIAGNOSE ANY ISSUE WITH THE SYSTEMS SHOULD ANY ARISE IN THE FUTURE. SUBMIT COPIES OF START-UP AND BALANCING REPORTS FOR APPROVAL.
3. INSTALL ALL EQUIPMENT ACCORDING TO THE MANUFACTURER'S REQUIREMENTS, SHOP DRAWINGS, AND DETAILS AS SHOWN ON THE DRAWINGS AND AS SPECIFIED. INSTALL ALL WORK SO THAT PARTS REQUIRING INSPECTION, REPLACEMENT, MAINTENANCE AND REPAIR SHALL BE READILY ACCESSIBLE. SMALL DEVIATIONS FROM THE DRAWINGS MAY BE MADE TO ACCOMPLISH THIS, BUT ANY SUBSTANTIAL CHANGE SHALL NOT BE MADE WITHOUT PRIOR WRITTEN OWNER APPROVAL.
4. ALL EQUIPMENT, PIPING, VALVES, AND DUCTWORK PROVIDED UNDER THIS SECTION OF THE SPECIFICATIONS SHALL BE MARKED FOR EASE OF IDENTIFICATION PER OWNER'S OR INDUSTRY STANDARDS.
5. PROVIDE QUALIFIED PERSONNEL, EQUIPMENT, APPARATUS, AND SERVICES FOR TESTING AND INSPECTION OF MECHANICAL SYSTEMS. WATER PIPING SHALL BE HYDROSTATICALLY TESTED AT 130% OF DESIGN PRESSURE AT A MINIMUM OF 120 PSIG. STEAM AND STEAM CONDENSATE PIPING SHALL BE TESTED AT 130% OF DESIGN PRESSURE AT A MINIMUM OF 45 PSIG. TESTS SHALL BE FOR A FIVE-HOUR DURATION, DURING WHICH TIME PIPING SHALL SHOW NO LEAKS AND NO SEALING OF LEAKS SHALL BE PERMITTED. ANY EQUIPMENT NOT CAPABLE OF WITHSTANDING TEST PRESSURES SHALL BE ISOLATED FROM THE TEST. LEAKS, DAMAGE, AND DEFECTS DISCOVERED OR RESULTING FROM TESTING SHALL BE REPAIRED OR REPLACED TO LIKE-NEW CONDITION WITH ACCEPTABLE MATERIALS. TESTS SHALL BE CONTINUED UNTIL SYSTEMS OPERATE WITHOUT LEAKS OR REPAIRS. SUBMIT COPIES OF TESTING REPORTS FOR APPROVAL. DO NOT COVER OR CONCEAL WORK BEFORE TESTING AND INSPECTION.

D. AUTOMATIC TEMPERATURE CONTROLS:

1. DDC/BUILDING AUTOMATION SYSTEM INTERFACE: PROVIDE ALL NECESSARY COMPONENTS AND WIRING FOR INTERLOCK TO EXISTING DDC/BUILDING AUTOMATION SYSTEM. ALL COMPONENTS MUST BE COMPATIBLE WITH EXISTING OUTPUT DEVICES. PROVIDE TO OWNER FULL OPERATING AND MAINTENANCE INSTRUCTIONS FOR USE AND/OR ALTERATION OF DDC SYSTEMS.
2. AUTOMATIC TEMPERATURE CONTROLS: CONTROL SYSTEM SHALL BE CAPABLE OF PERFORMING ALL SEQUENCES OF OPERATION SHOWN ON THE DRAWINGS. INDIVIDUAL CONTROL COMPONENTS MAY NOT BE SHOWN ON CONTRACT DOCUMENTS, BUT ATC CONTRACTOR SHALL SUPPLY ALL COMPONENTS, CONTROL WIRING (INCLUDING POWER WIRING TO ALL PANELS, CONTROLLERS, TRANSFORMERS, ACTUATORS, ETC.), NECESSARY FOR A COMPLETE OPERABLE SYSTEM. COORDINATE WITH ELECTRICAL CONTRACTOR FOR LOCATION OF LINE VOLTAGE JUNCTION BOX IN EACH MECHANICAL AREA. ATC CONTRACTOR SHALL EXTEND WIRING FROM THESE BOX(ES) TO ALL CONTROL COMPONENTS AND SHALL BE RESPONSIBLE FOR ALL SYSTEM COMPONENTS. ALL WIRING SHALL COMPLY WITH THE REQUIREMENTS OF THE ELECTRICAL SECTION OF THESE SPECIFICATIONS. WIRING BETWEEN FIRE ALARM SYSTEM AND TEMPERATURE CONTROL SYSTEM, EXCEPT FOR DUCT MOUNTED SMOKE DETECTORS, FURNISHED BY THE ELECTRICAL CONTRACTOR, SHALL BE BY THE ATC CONTRACTOR.
3. ALL CONTROL WIRING SHALL COMPLY WITH THE REQUIREMENTS OF THE ELECTRICAL SECTION OF THESE CONTRACT DOCUMENTS.
4. PROVIDE TO OWNER FULL OPERATING AND MAINTENANCE INSTRUCTIONS FOR NEW AND/OR ALTERATION OF DDC SYSTEMS.



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STAMP

LOWELL AUDITORIUM BOILER REPLACEMENT

REVISIONS:

Date	Description
6-29-15	Add/Alternate
7-14-15	Controls Addendum

BID SET 6-30-15

CSI Project Number: 2014-525
Scale: NTS
Drawn By: JC
Checked By: DM
Date: 6-29-15

HVAC SPECIFICATIONS

H5.0

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