

State of Vermont  
Department of Buildings & General Services

NEW HEATING SYSTEM  
BRIDGE SHOP / STOCK BUILDING

St. Johnsbury, Vermont

AGENCY OF ADMINISTRATION  
DEPT. OF BUILDINGS & GENERAL SERVICES  
2 GOVERNOR AIKEN AVENUE  
MONTPELIER, VERMONT 05633-5801  
R. TASHA WALLIS, COMMISSIONER

AGENCY OF TRANSPORTATION  
NATIONAL LIFE BUILDING  
MONTPELIER, VERMONT 05633-5001  
DAWN TERRILL, SECRETARY



James Douglas  
Governor

February 2006

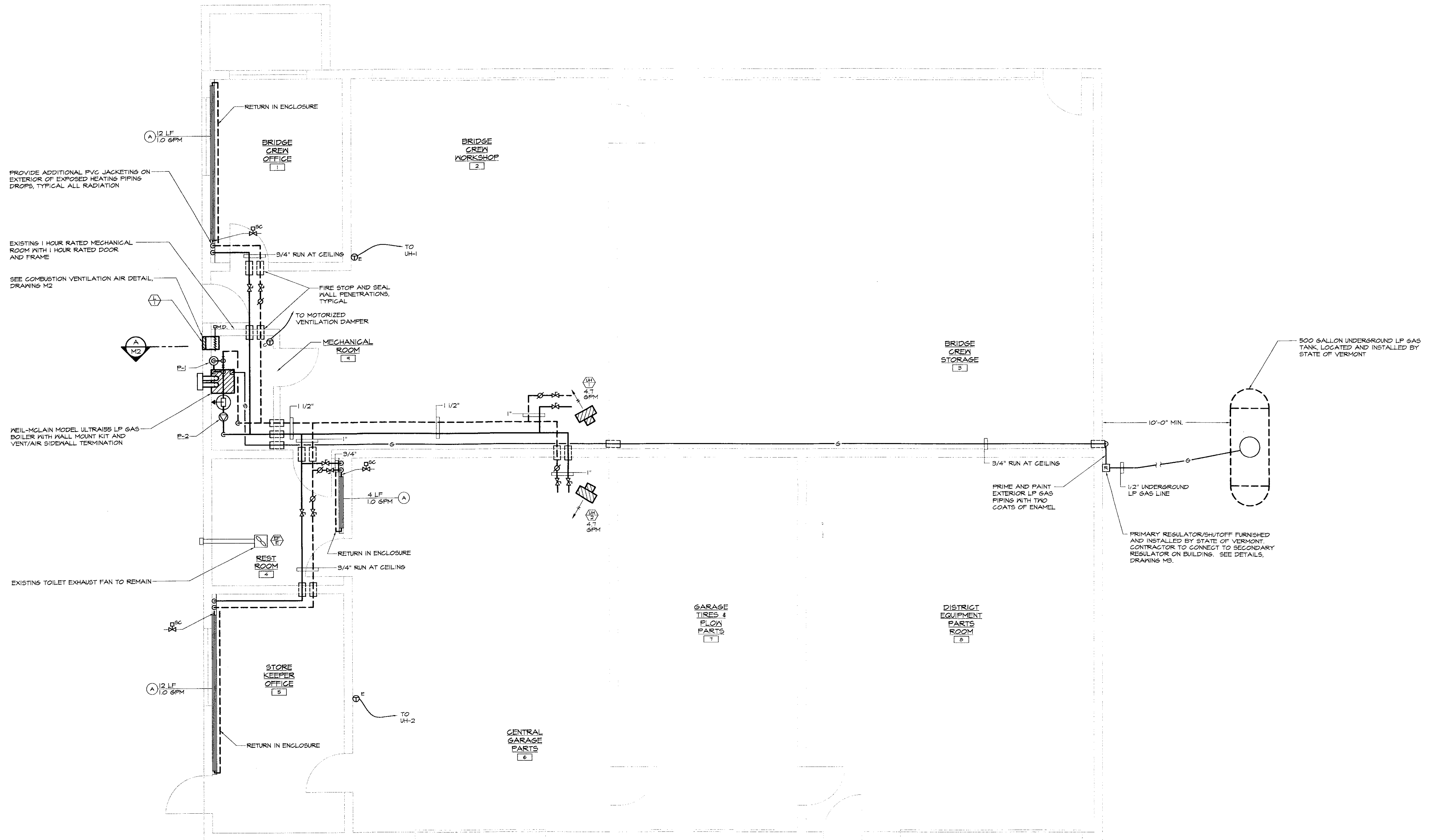
INDEX OF SHEETS

M1 FLOOR PLAN – MECHANICAL  
M2 MECHANICAL DETAILS, SCHEDULES AND LEGEND  
M3 MECHANICAL DETAILS  
M4 MECHANICAL MATERIAL SPECIFICATIONS

MECHANICAL ENGINEER:

LANE ASSOCIATES CONSULTING ENGINEERS  
51 KILLINGTON AVENUE  
RUTLAND, VERMONT 05701

SET # 4  
DO NOT COPY



PROVIDE ADDITIONAL PVC JACKETING ON EXTERIOR OF EXPOSED HEATING PIPING DROPS, TYPICAL ALL RADIATION

EXISTING 1 HOUR RATED MECHANICAL ROOM WITH 1 HOUR RATED DOOR AND FRAME

SEE COMBUSTION VENTILATION AIR DETAIL, DRAWING M2

WEIL-McLAIN MODEL ULTRA155 LP GAS BOILER WITH WALL MOUNT KIT AND VENT/AIR SIDEWALL TERMINATION

EXISTING TOILET EXHAUST FAN TO REMAIN

500 GALLON UNDERGROUND LP GAS TANK, LOCATED AND INSTALLED BY STATE OF VERMONT

PRIMARY REGULATOR/SHUTOFF FURNISHED AND INSTALLED BY STATE OF VERMONT CONTRACTOR TO CONNECT TO SECONDARY REGULATOR ON BUILDING. SEE DETAILS, DRAWING M5.

**FLOOR PLAN - MECHANICAL**  
SCALE: 1/4"=1'-0"

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	2	REVISED FOR BIDDING	12/21/2005
	1	BIDDING	10/20/2005
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HEATING, VENTILATION, & AIR CONDITIONING,  
PLUMBING, FIRE PROTECTION, & ELECTRICAL

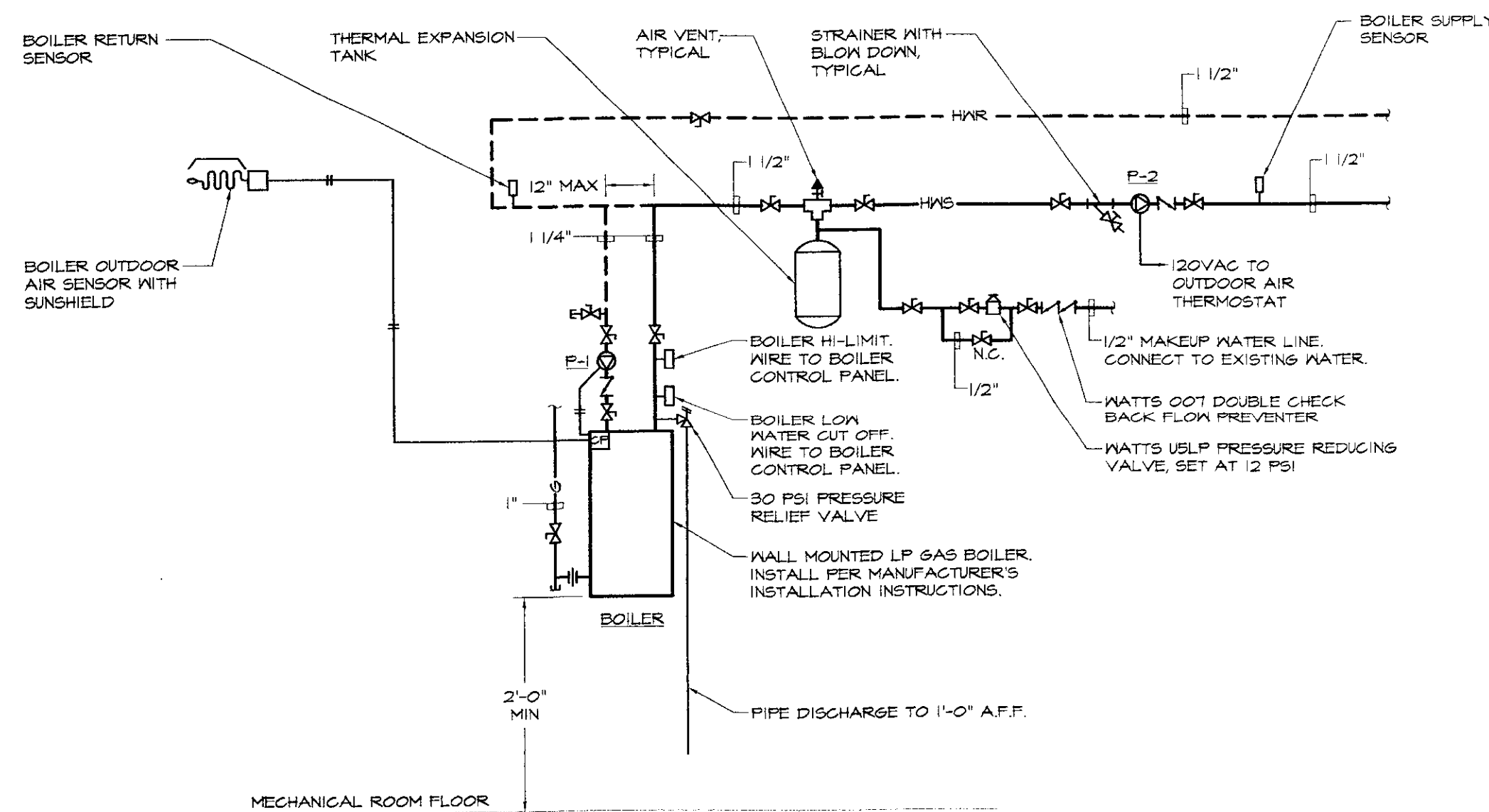
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<b>FLOOR PLAN - MECHANICAL</b>				<b>M 1</b>			
<b>NEW HEATING SYSTEM BRIDGE SHOP/STOCK BUILDING ST. JOHNSBURY AOT ST. JOHNSBURY, VT</b>							
APPR:	DVD	DRAWN:	DVD/GJT	SCALE:	AS NOTED	PROJ. NO.:	0312-26

**MECHANICAL LEGEND & ABBREVIATIONS**

- BALL VALVE
- CHECK VALVE
- BALANCING VALVE
- BACKFLOW PREVENTER
- SELF-CONTAINED RADIATION CONTROL VALVE
- DRAIN VALVE WITH CAP AND CHAIN
- AIR VENT
- PRESSURE GAUGE
- TEMPERATURE GAUGE
- HOT WATER SUPPLY
- HOT WATER RETURN
- PIPE RISER
- PIPE DROP
- PIPE GAP
- PIPE UNION
- PIPE SLEEVE
- UNIT HEATER
- BASEBOARD RADIATION
- THERMOSTAT  
SUBSCRIPTS: E = 120VAC, C = COOLING
- ACCESS PANEL
- ABOVE FINISHED FLOOR
- BACK DRAFT DAMPER
- MECHANICAL CONTRACTOR
- PLUMBING CONTRACTOR
- ELECTRICAL CONTRACTOR
- GENERAL CONTRACTOR
- NORMALLY CLOSED
- NORMALLY OPEN
- EQUIPMENT TYPE  
E=EXISTING
- BASEBOARD RADIATION TAG
- UNIT HEATER
- UNIT HEATER
- SECTION NUMBER  
DRAWING NUMBER
- LP GAS PIPING
- LP GAS REGULATOR
- PUMP TAG
- MOTORIZED DAMPER
- LOUVER TAG



**BOILER/SYSTEM PIPING SCHEMATIC**  
NOT TO SCALE

CIRCULATOR PUMP SCHEDULE										PLAN SYMBOL	P-1
No.	MANUFACTURER	SERIES	MODEL	MIN. GPM	HEAD (FT. HD.)	MOTOR				REMARKS	
						HP	VOLT	PH	RPM		
P-1	TACO	00	0011	15.0	10	1/8	115	1	3250	BOILER PUMP	
P-2	TACO	00	0011	12.4	20	1/8	115	1	3250	SYSTEM PUMP	

NOTES:  
1) PUMP PROVIDED WITH BOILER AND SHIPPED LOOSE FOR FIELD INSTALLATION.

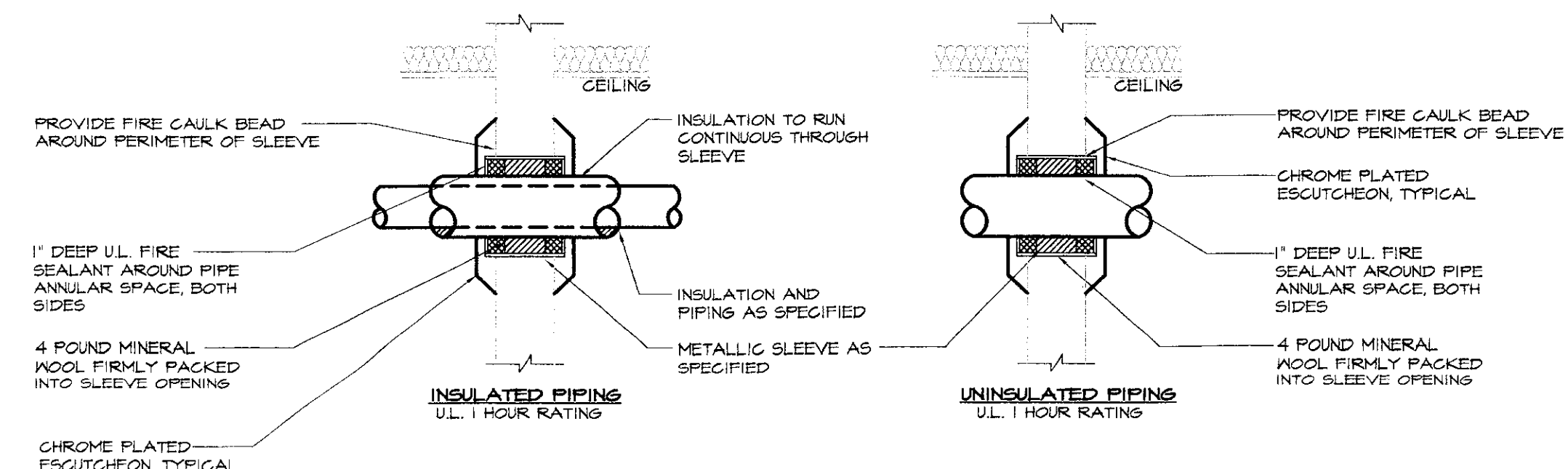
UNIT HEATER SCHEDULE											PLAN SYMBOL	UH
No.	MANUFACTURER	MODEL	SIZE	BTUH	E.W.T. (°F)	GPM	CFM	MOTOR			REMARKS	
								HP	VOLT	PH		
UH-1	VULCAN	HV-72	-	47,000	180	4.7	950	1/20	115	1	SOUND CLASS 1, FAN, 900 RPM MAX	
UH-2	VULCAN	HV-72	-	47,000	180	4.7	950	1/20	115	1	SOUND CLASS 1, FAN, 900 RPM MAX	

BASEBOARD RADIATION SCHEDULE										PLAN SYMBOL	○
TYPE	MANUFACTURER	MODEL	ENCLOSURE HEIGHT	MOUNTING HEIGHT	TIER	BTU/FT.	ELEMENT	A.W.T. (°F)	FINISH	REMARKS	
A	STERLING HYD.	SENGR	9 13/16"	9 13/16"	1	740	2 3/4" X 2 1/2", 55 FINS/LF	180	W.E.		

NOTES:  
1) PROVIDE REMOVABLE END ACCESS PANELS.

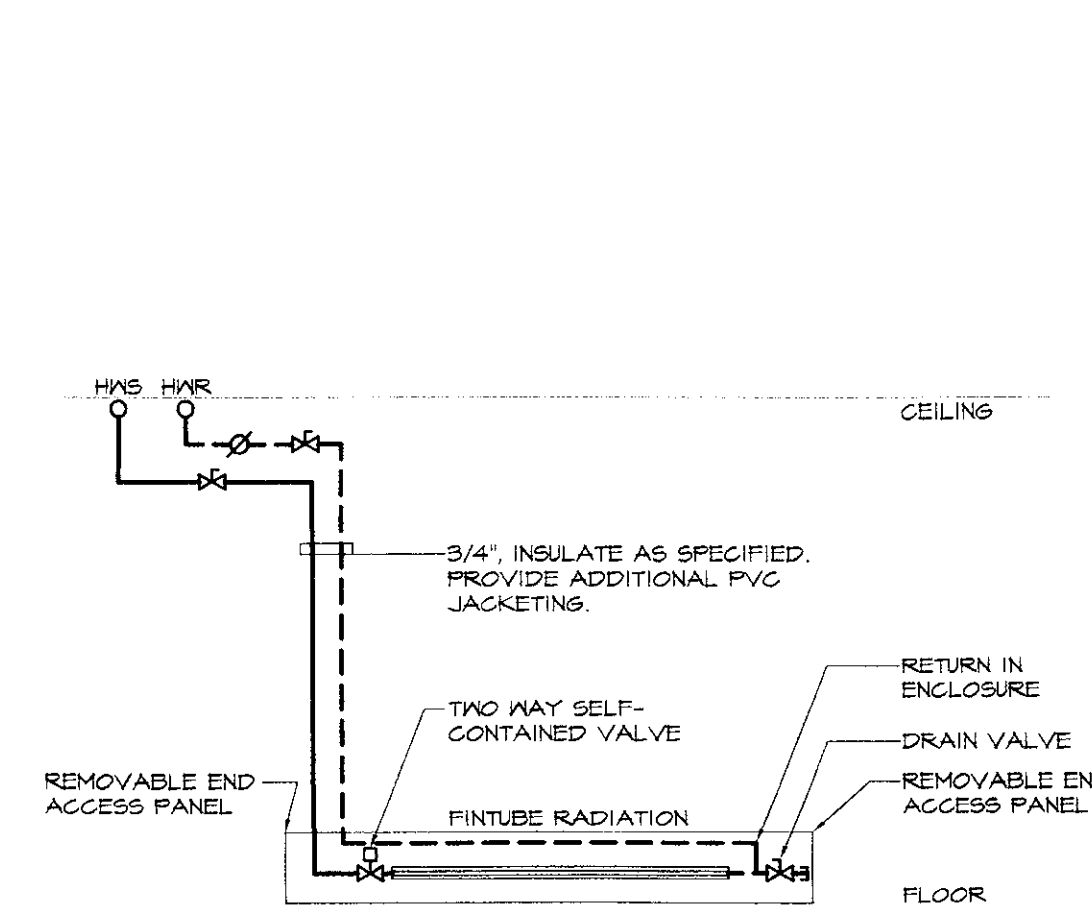
LOUVER SCHEDULE									PLAN SYMBOL	⬆
No.	MANUFACTURER	SERIES	MODEL	SIZE	AIR PATTERN	DAMPER	FINISH	REMARKS		
L-1	RUSKIN	ELF	ELF9TBDX	12" X 12"	FIXED	-	B.E.	NOTE 1		

NOTES:  
1) PROVIDE BAKED ENAMEL FINISH. COLOR TO BE SELECTED BY OWNER. PROVIDE GALVANIZED BIRDSCREEN.

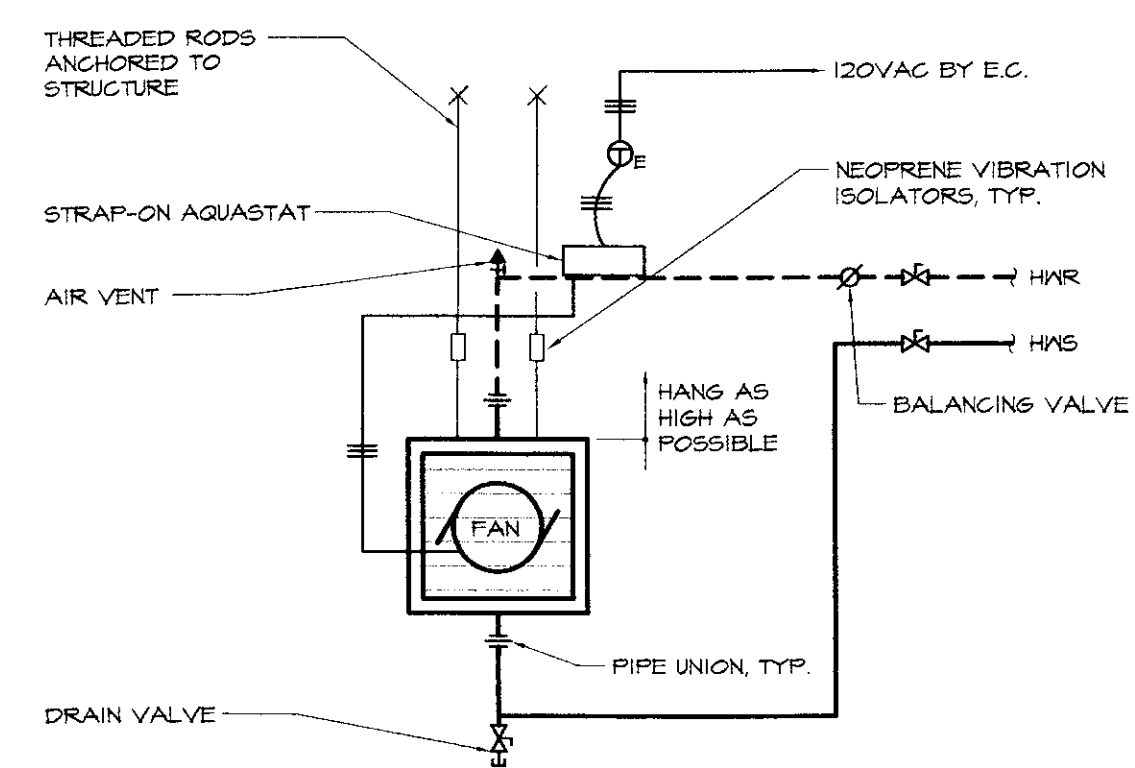


**WALL PIPE PENETRATION DETAILS**  
NOT TO SCALE

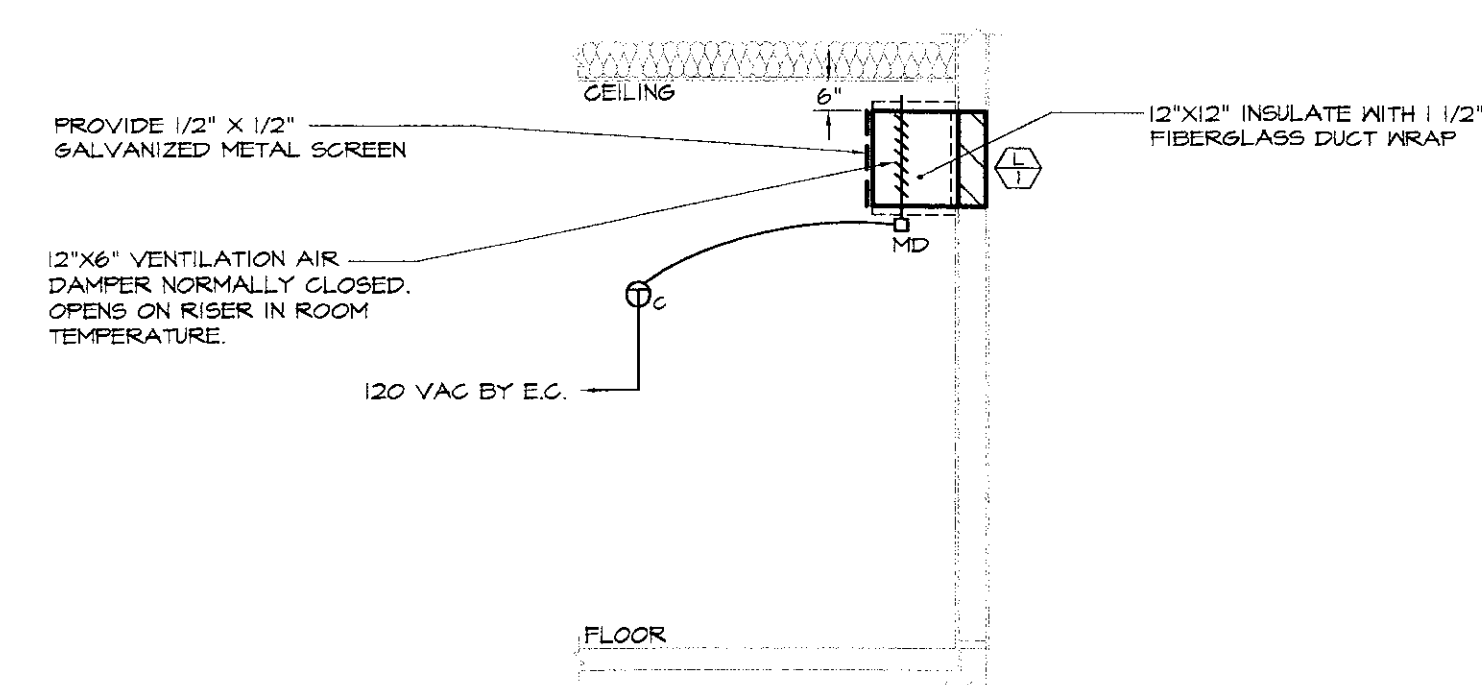
NOTE:  
1) FOLLOW FIRE SEALANT MANUFACTURER'S WRITTEN INSTALLATION INSTRUCTIONS IN CONJUNCTION WITH REQUIREMENTS AS DETAILED.  
2) ALL WALL PIPE PENETRATIONS SHALL BE INSTALLED PER THIS DETAIL.  
3) DETAIL BASED ON STI "SPEC-SEAL" FIRE STOPPING PRODUCTS. ALTERNATE MANUFACTURER'S INSTALLATION REQUIREMENTS MAY VARY.



**RADIATION PIPING DETAIL**  
NO SCALE



**UNIT HEATER PIPING DETAIL**  
NO SCALE



**MECHANICAL ROOM VENTILATION AIR DETAIL**  
NOT TO SCALE

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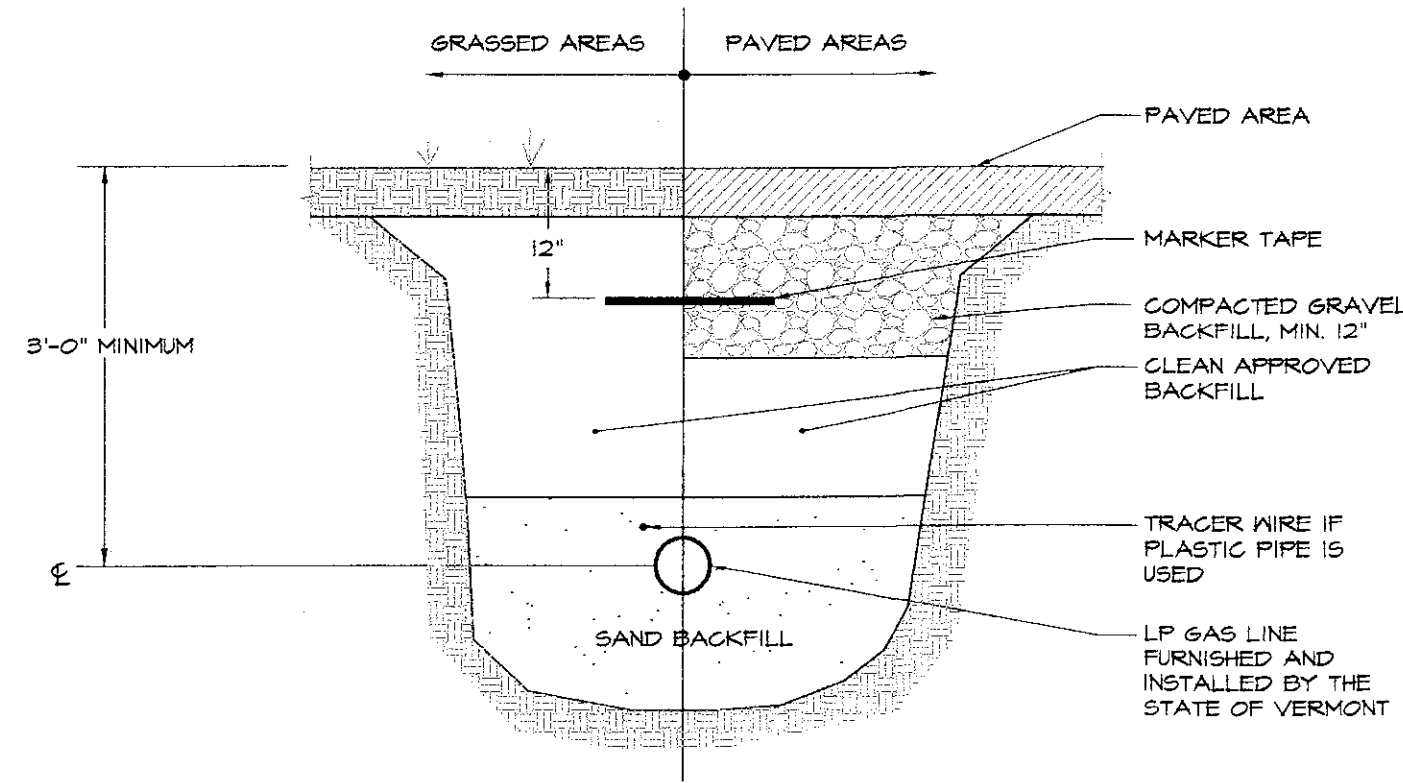


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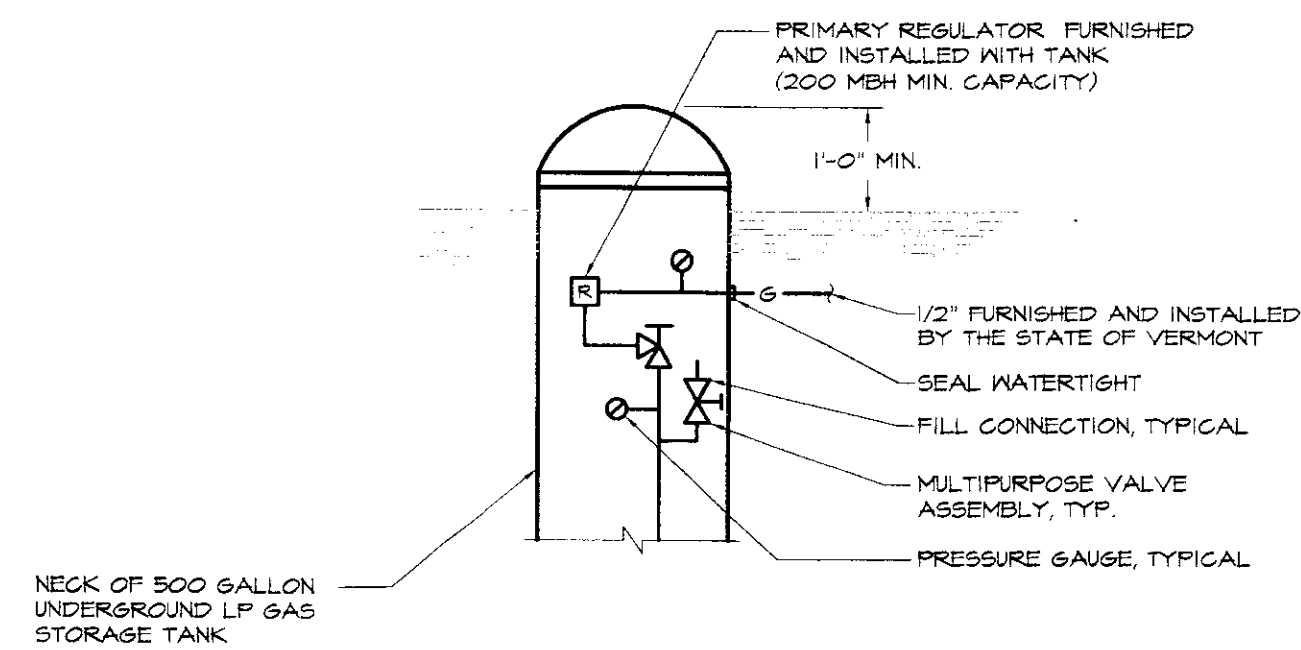
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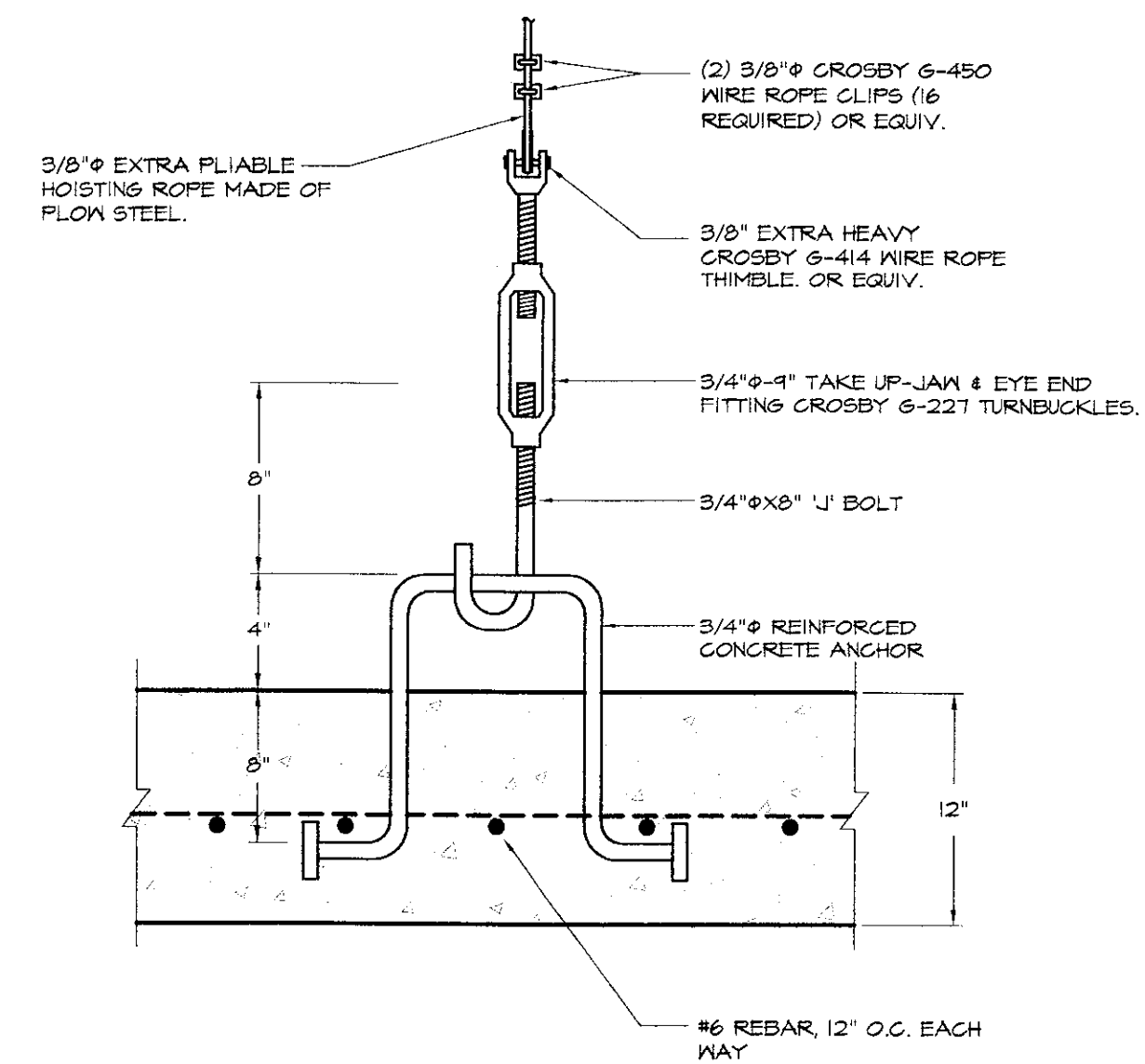
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APPR:	DWD	DRAWN:	DWD/GJT	SCALE:	AS NOTED	PROJ. NO.:	0312-26



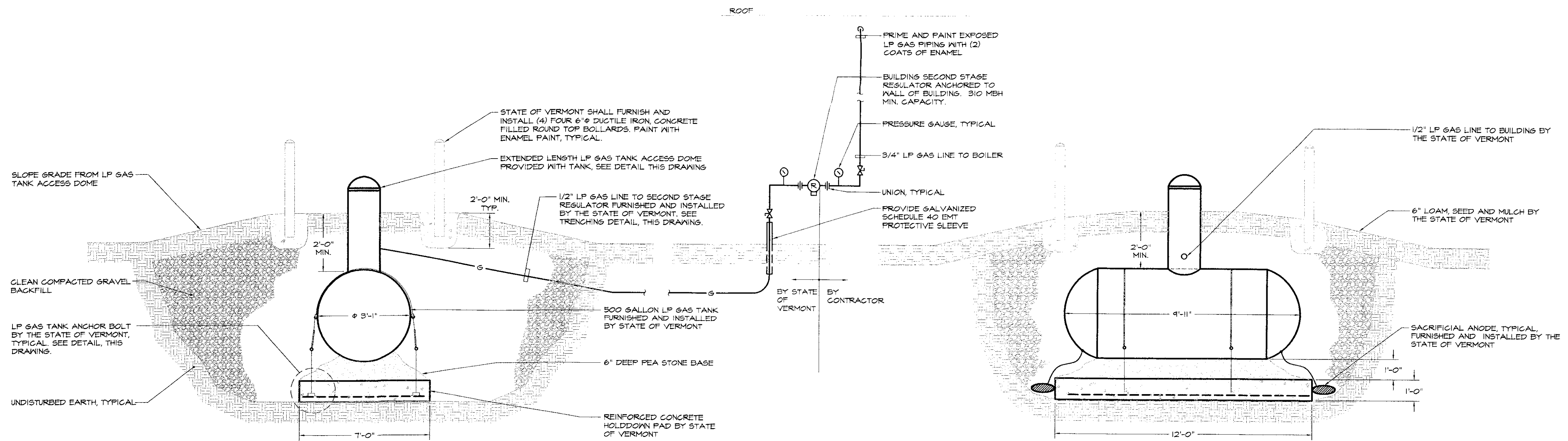
**LP GAS SUPPLY PIPE TRENCHING DETAIL**  
NOT TO SCALE



**LP GAS SUPPLY PIPING DETAIL**  
NOT TO SCALE



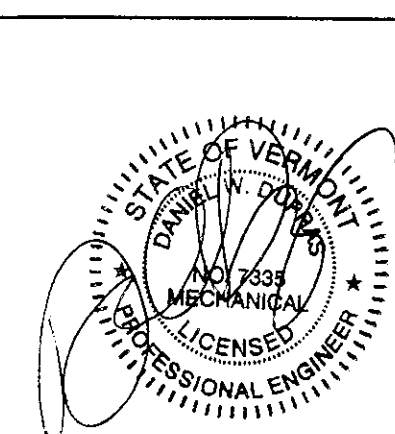
**TANK ANCHOR BOLT DETAIL**  
NOT TO SCALE



**UNDERGROUND LP GAS TANK DETAILS**  
NOT TO SCALE

NOTE:  
TANK REGULATORS, PIPING AND ACCESSORIES, INCLUDING FIRST AND SECOND STAGE REGULATORS, TO BE FURNISHED AND INSTALLED BY STATE OF VERMONT.

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MECHANICAL DETAILS				M 3
NEW HEATING SYSTEM BRIDGE SHOP/STOCK BUILDING ST. JOHNSBURY AOT ST. JOHNSBURY, VT				
APPR:	DWD	DRAWN:	DWD/GJT	SCALE: AS NOTED
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**MECHANICAL MATERIAL SPECIFICATIONS**

**GENERAL REQUIREMENTS**

CONTRACTORS SHALL PROVIDE ALL LABOR, MATERIALS, EQUIPMENT AND INCIDENTALS NECESSARY AND REQUIRED FOR THE COMPLETION OF THE PROJECT.

**PERMITS AND CODES**

THIS CONTRACTOR SHALL OBTAIN AND PAY FOR ALL LICENSES AND PERMITS AND SHALL PAY FOR ALL FEES AND CHARGES FOR THE CONNECTION TO OUTSIDE SERVICES AND USE OF PROPERTY OTHER THAN THE SITE OF THE WORK FOR STORAGE OF MATERIALS OR OTHER PURPOSES.

WORK UNDER THIS CONTRACT SHALL BE INSTALLED TO COMPLY STRICTLY WITH LATEST APPLICABLE EDITIONS OF 2003 INTERNATIONAL BUILDING CODE, INCLUDING SUPPLEMENTS THERETO, UNDERWRITER'S LABORATORIES REGULATIONS, NATIONAL FIRE PROTECTION ASSOCIATION, ASHRAE GUIDE, SMACNA, NATIONAL ELECTRIC CODE, AND ALL CODES, REGULATIONS AND REQUIREMENTS OF ALL MUNICIPAL, STATE, FEDERAL AND OTHER PUBLIC OR PRIVATE AUTHORITIES WHICH HAVE JURISDICTION. IN EACH CASE, CODES ARE MINIMUM REQUIREMENTS.

**WORKMANSHIP**

ALL WORK SHALL BE EXECUTED IN A WORKMANLIKE MANNER, PRESENTING A NEAT, MECHANICAL APPEARANCE WHEN COMPLETED.

**CERTIFICATES, DOCUMENTS AND INSTRUCTIONS**

SUBMIT THE FOLLOWING FOR APPROVAL BY THE ENGINEER:

- 1) ALL TEST DATA.
- 2) OPERATING AND MAINTENANCE INSTRUCTIONS FOR MECHANICAL AND PLUMBING SYSTEMS.
- 3) ALL APPROVED SHOP DRAWINGS.
- 4) CERTIFICATE OF APPROVAL OF ENTIRE PLUMBING SYSTEM BY LOCAL PLUMBING INSPECTOR.
- 5) SUBMIT COMPLETE AND DIMENSIONED "AS-BUILT" PLANS FOR ALL TRADES INDICATING ACTUAL INSTALLED CONDITIONS. PLANS SHALL BE ENTIRELY NEAT, LEGIBLE AND ACCURATE.

**SHOP DRAWINGS**

SUBMIT SHOP DRAWINGS ON ALL ITEMS OF EQUIPMENT AND MATERIALS TO THE ENGINEER FOR APPROVAL. MANUFACTURING OR FABRICATING OF ANY MATERIAL OR THE PERFORMING OF ANY WORK PRIOR TO APPROVAL OF SHOP DRAWINGS WILL BE ENTIRELY AT THE RISK OF THE CONTRACTOR. SEE GENERAL CONDITIONS FOR SHOP DRAWING SUBMITTAL PROCEDURE. SHOP DRAWINGS SHALL BE SUBMITTED WITHIN THIRTY (30) DAYS AFTER AWARD OF CONTRACT.

**MISCELLANEOUS STEEL SUPPORTS**

SEE DRAWINGS AND SCHEDULES FOR ITEMS INCLUDED IN THIS SECTION THAT NEED TO BE FASTENED TO AND/OR SUPPORTED BY THE STRUCTURE. THIS CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY ANCHOR BOLTS, INSERTS, STEEL BEAMS, BARS, BEARING AND LEVELING PLATES AND INCIDENTAL ITEMS AS MAY BE NEEDED TO INSTALL THE WORK. ITEMS TO BE BUILT INTO MASONRY AND CONCRETE MUST BE FURNISHED TO THE RESPECTIVE TRADE AT THE PROPER TIME TO BE BUILT-IN AND SHALL INCLUDE INSTRUCTIONS AND TEMPLATES FOR THEIR INSTALLATION, UNLESS IT IS EXPLICITLY SHOWN OR SPECIFIED OTHERWISE.

**PIPE HANGERS AND SUPPORTS**

GENERAL: ALL PIPING SHALL BE RIGIDLY SUPPORTED FROM THE BUILDING STRUCTURE BY MEANS OF APPROVED HANGERS AND SUPPORTS. THIS CONTRACTOR SHALL FURNISH AND INSTALL ALL NECESSARY INTERMEDIATE GALVANIZED SUPPORT STEEL AND THE PROPER HANGING OF ALL PIPING AND EQUIPMENT. CHAINS, STRAP, PERFORATED BAR OR WIRE HANGERS SHALL NOT BE PERMITTED. HANGERS FOR INSULATED STEEL PIPING SHALL BE INSTALLED OUTSIDE OF INSULATION AND PROVIDED WITH INSULATION PROTECTION SADDLES. SADDLE SHALL BE 1/2" LONG, 1/2 THE CIRCUMFERENCE IN WIDTH AND 1/8 GAUGE.

FURNISH AND INSTALL SUFFICIENT HANGERS, SUPPORTS AND MOUNTING DEVICES TO SUPPORT ALL PIPING INSTALLED UNDER THIS CONTRACT WITHOUT SAGGING, WITHOUT INTERFERENCE, WITH COMPLETE DRAINAGE AND SO LOCATED AND ARRANGED AS TO PERMIT FREE EXPANSION AND CONTRACTION OF PIPING.

ALL SUPPORT COMPONENTS SHALL CONFORM TO MANUFACTURER'S STANDARDIZATION SOCIETY SPECIFICATION SP-58. THE HANGERS SHALL ADEQUATELY SUPPORT THE PIPING SYSTEMS.

HANGERS SHALL BE CONSTRUCTED OF GALVANIZED STEEL. HANGERS SUPPORTING COPPER PIPE SHALL BE COPPER-PLATED.

**PIPE SLEEVES AND FIRE STOPPING**

FURNISH AND SET SLEEVES TO ACCOMMODATE PIPES PASSING THROUGH FOUNDATIONS, WALLS, FLOORS, FURRINGS AND CEILINGS. COOPERATE WITH GENERAL CONTRACTOR IN SETTING ALL SLEEVES. SLEEVES SHALL BE FULL THICKNESS OF CONSTRUCTION, PROVIDE UL LISTED FIRE STOPPING FOR ALL PENETRATIONS OF FLOORS, WALLS, CEILINGS, ETC.

**FLOOR, WALL AND CEILING ESCUTCHEONS**

PROVIDE CHROME PLATED ESCUTCHEON PLATES ON ALL EXPOSED PIPE PASSING THROUGH WALLS, FLOORS OR CEILINGS.

**SYSTEMS TESTING**

UPON COMPLETION OF FABRICATION AND BEFORE ENCLOSING, INSULATING OR CONCEALING IN ANY WAY, ALL PIPING, MAINS AND JOINTS SHALL BE TESTED FOR LEAKS AT ONE AND ONE-HALF THEIR NORMAL WORKING PRESSURES.

TEST THE PIPING SYSTEMS AS FOLLOWS:

WATER PIPING SYSTEMS SHALL BE TESTED HYDRAULICALLY AT 150 PSI AT THE FLOOR LEVEL, BEFORE FIXTURES ARE CONNECTED. MAINTAIN TEST FOR FOUR (4) HOURS WITH NO APPRECIABLE DROP IN PRESSURE.

TEST NEW HYDRONIC HEATING PIPING SYSTEMS HYDRAULICALLY AT 75 PSI TEST PRESSURE. OBSERVE EACH TEST FOR LEAKAGE AT END OF TEST PERIOD. TEST FAILS IF LEAKAGE IS OBSERVED OR IF PRESSURE DROP EXCEEDS 5% OF TEST PRESSURE. MINIMUM TEST PERIOD FOUR (4) HOURS.

TEST ALL GAS PIPING IN ACCORDANCE WITH NFPA 54 AND 58.

**WATER BALANCING**

MEASURE AND ADJUST ALL AIR AND WATER FLOWS TO THOSE SHOWN ON THE DRAWINGS OR TO ALTERNATE QUANTITIES AS DIRECTED BY THE ENGINEER.

SUBMIT A FINAL WATER BALANCE REPORT WITH THE FOLLOWING INFORMATION:

WATER FLOW FOR ALL PUMPS AND TERMINAL HEATERS, INCLUDING FINAL BALANCED POSITION FOR ALL BALANCING VALVES.

**LP GAS TANK, PIPING AND ACCESSORIES**

THE OWNER SHALL FURNISH AND INSTALL (1) 500 GALLON UNDERGROUND LP GAS TANK, FIRST AND SECOND STAGE REGULATORS AND PIPING FROM TANK TO BUILDING.

**LP GAS PIPING**

ABOVE GRADE: SHALL BE SCHEDULE 40 BLACK STEEL, ASTM A53, FITTINGS TO BE MALLEABLE IRON THREADED AND SHALL COMPLY WITH ANSI/ASME B1.20.2. PROVIDE GAS COCK, DIRT LEG, FLEXIBLE CONNECTOR, AND UNION AT GAS EQUIPMENT.

PROVIDE GAS COCK, DIRT LEG, FLEXIBLE CONNECTOR, AND UNION AT BOILER.

ALL PIPING AND ACCESSORIES: SHALL BE INSTALLED AND TESTED TO COMPLY WITH NFPA 54 AND 58. GAS PIPING SHALL BE TESTED IN ACCORDANCE WITH NATIONAL FIRE GAS CODE NFPA-54, MINIMUM TEST PRESSURE IS 15 PSI FOR 2 HOURS. PERFORM LEAKAGE TEST PRIOR TO TURNING ON GAS SUPPLY.

**PIPING AND FITTINGS**

GENERAL: PROVIDE PIPE AND FITTINGS OF THE TYPE, GRADE, SIZE AND WEIGHT INDICATED FOR EACH PIPING SYSTEM AS SHOWN ON THE DRAWINGS AND SPECIFIED HERE INHEREIN.

**PIPE AND TUBING**

HYDRONIC HEATING SYSTEM PIPING SHALL BE TYPE "L" HARD COPPER TUBING WITH WROUGHT COPPER FITTINGS FOR SOLDER FITTING ASSEMBLY.

CONDENSATE DRAIN PIPING FOR BOILER SHALL BE SCHEDULE 40 PVC WITH SOLVENT WELDED FITTINGS.

COLD WATER DISTRIBUTION PIPING: SHALL BE TYPE "L" HARD TEMPER COPPER TUBING, ASTM B-88. FITTINGS SHALL BE WROUGHT COPPER SOLDER JOINT TYPE. USE LEAD FREE SOLDER WITH SUITABLE FLUX FOR JOINING PIPE AND FITTINGS.

**LP GAS HOT WATER BOILER**

FURNISH AND INSTALL A PACKAGED, MODULATING, SEALED COMBUSTION, POWER-VENTED, HIGH EFFICIENCY GAS-FIRED BOILER WITH CAST ALUMINUM HEAT EXCHANGERS THAT USE OUTSIDE AIR FOR COMBUSTION. INSTALL PACKAGED BOILER UNIT ACCORDING TO MANUFACTURER'S INSTALLATION INSTRUCTIONS. BOILER SHALL BE VULCAN ULTRA-155.

BOILER SHALL BE CAPABLE OF FULL MODULATION FIRING WITH A TURN DOWN OF UP TO 5 TO 1. PROVIDE COMPLETE SUBMITTAL INCLUDING LITERATURE, MANUALS, AND WIRING DIAGRAMS, FUEL PIPING DIAGRAMS, AND LIST OF SIMILAR INSTALLATIONS.

BOILER CONSTRUCTION: BOILER HEAT EXCHANGER SHALL BE CAST ALUMINUM MONO BLOCK HEAT EXCHANGER.

BOILER MAIN COMPONENTS: THE COMBUSTION CHAMBER WILL BE SEALED AND LOCATED AT THE TOP OF THE MONO BLOCK CASTINGS WHICH WILL BE OF CENTER FLOW DESIGN, TO ASSURE THAT SEDIMENT AND ANY LIME THAT MIGHT FORM WILL FALL TO THE BOTTOM, AWAY FROM THE CROWN SHEET AREA. BOILER SHALL BE SUPPLIED WITH A GAS VALVE DESIGNED WITH NEGATIVE PRESSURE REGULATION (FAN SUCTION "PULLS" GAS THROUGH VALVE RATHER THAN GAS PRESSURE "PUSHING" GAS THROUGH VALVE), THIS SHALL ENABLE THE BOILER TO OPERATE IN A SAFE CONDITION AT A DE-RATED OUTPUT, EVEN IF THE INLET GAS PRESSURE SHOULD DROP TO AS LOW AS 4 INCHES W.C. THE INLET GAS PRESSURE TO THE BOILER GAS VALVE SHALL BE A MINIMUM OF 4" W.C. AND A MAXIMUM OF 15" W.C. THE BURNER SHALL BE PREMIX COMBUSTION TYPE, MADE WITH STAINLESS STEEL AND A MOVEN METAL FIBER OUTER COVERING PROVIDING MODULATION FIRING. THE BOILER SHALL BE EQUIPPED WITH A VARIABLE SPEED BLOWER SYSTEM, CAPABLE OF MODULATING THE BOILER FIRING RATE. THE BOILER SHALL BE EQUIPPED WITH A DEVICE CAPABLE OF CONTROLLING THE AIR/FUEL RATIO THROUGH A 5 TO 1 TURNDOWN RATIO.

THE CONTROL SYSTEM SHALL HAVE AN ELECTRONIC DISPLAY FOR BOILER SET-UP, BOILER STATUS, AND BOILER DIAGNOSTICS. PROVIDE FACTORY OUTDOOR AIR SENSOR FOR RESET CONTROL OF HOT WATER SUPPLY TEMPERATURE AND BOILER CIRCULATOR PUMP RELAY, DOMESTIC HOT WATER PUMP OUTPUT CONTROL.

VENTING AND COMBUSTION AIR: BOILER MUST BE CAPABLE OF USING OUTSIDE AIR PIPED DIRECTLY TO BOILER FOR COMBUSTION, INLET AND TERMINATION OF THESE PIPES MUST BE CONNECTED TO THROUGH THE WALL USING A FACTORY SUPPLIED VENT TERMINATION KIT. VENT AND COMBUSTION AIR PIPING SHALL BE SCHEDULE 40 PVC PIPING.

BOILER TRIM ALL ELECTRICAL COMPONENTS TO BEAR UL LABEL. WATER BOILER CONTROLS FURNISHED HIGH LIMIT TEMPERATURE CONTROL (NO DEGREES F MAXIMUM ALLOWABLE BOILER WATER TEMPERATURE, COMBINATION PRESSURE-TEMPERATURE GAUGE, GAUGE DIAL CLEARLY MARKED AND EASY TO READ, ASME CERTIFIED PRESSURE RELIEF VALVE, SET TO RELIEVE AT 50 PSIG, FLEE GAS, OUTLET WATER TEMPERATURE AND RETURN WATER TEMPERATURE SENSORS, LOW WATER PROTECTION, BUILT-IN FREEZE PROTECTION AND BOILER CIRCULATOR, TACO MODEL 0011. PROVIDE MANUAL RESET FROSE TYPE LOW WATER CUT-OFF.

**UNIT HEATERS**

FURNISH AND INSTALL, WHERE SHOWN ON DRAWINGS, UNIT HEATERS AS MANUFACTURED BY VULCAN, STERLING, TRANE OR EQUAL. HEATER SHALL BE EQUAL TO VULCAN AS SCHEDULED ON THE DRAWINGS. CASING SHALL BE OF NOT LESS THAN 20 GAUGE STEEL PHOSPHATIZED AND FINISHED WITH A BAKED ENAMEL FINISH. MOTOR AND FAN SHALL BE DESIGNED FOR UNIT HEATER SERVICE AND SHALL BE TESTED FOR CONTINUOUS DUTY. THE ENTIRE ASSEMBLY SHALL BE RESILIENT MOUNTED. HEATER DESIGN SHALL INCORPORATE MEANS OF ADEQUATELY COOLING THE MOTOR WHEN THE WATER IS ON AND FAN IS NOT OPERATING. COIL SHALL BE CONSTRUCTED OF COPPER TUBES, ALUMINUM FINS, AND STEEL HEADERS. THE COMPLETE ASSEMBLY SHALL BE TESTED AT 250 LBS. HYDROSTATIC PRESSURE. UNIT SHALL BE FURNISHED WITH INDIVIDUALLY ADJUSTABLE LOUVERS AND FAN SPEED CONTROL MOUNTED AT CEILING ABOVE UNIT FOR FINAL FAN SPEED CONTROL. UNITS SHALL BE VULCAN MODEL HV-72, 900 RPM, 450 CFM, 1/20 HP, 115 VAC, 1 PHASE, RATED AT 44.8 MBTUH AT 180 DEG. F. AWI.

**BASEBOARD RADIATION**

FURNISH AND INSTALL STERLING SENIOR MODEL 98-9/4-55, 3/4" TUBE, RATED AT 740 BTU/H/1' AT 180 DEG. F. AVERAGE WATER TEMPERATURE. ELEMENTS SHALL BE COPPER TUBE WITH ALUMINUM FINS. ENCLOSURES SHALL BE AS SCHEDULED, MANUFACTURED OF GAUGE GOLD ROLLED STEEL AND SHALL BE FURNISHED WITH FULL BACK PLATE, SLIDE ACTION FIN CRADLES, AND WHITE BAKED ENAMEL FINISH SUPPORT BRACKETS SHALL BE DIE-FORMED FOR RIGIDITY AND MUST BE DESIGNED TO SUPPORT THE ELEMENTS, PIPING, AND ENCLOSURES. EXPANSION SLIDE CRADLES SHALL BE PROVIDED FOR MOVEMENT OF ELEMENTS AND PIPING DURING EXPANSION AND CONTRACTION. SUPPORTING BRACKETS WITH CRADLES SHALL BE FURNISHED AND INSTALLED AT A MAXIMUM OF 3'-0" ON CENTERS. PROVIDE END COVERS, ACCESS PANELS, INSIDE/OUTSIDE CORNERS, COLUMNS, SPLICE PLATES, AND TRIM PIECES AT EACH WALL.

**IN-LINE CIRCULATING PUMPS**

FURNISH AND INSTALL HOT WATER CIRCULATING PUMP OF SIZE, TYPE AND CAPACITY AS SHOWN ON THE DRAWINGS. ARRANGE AND LOCATE AS INDICATED.

ALL PUMPS SHALL BE AS MANUFACTURED BY TACO OR BELL & GOSSETT, IRON BODY, STEEL SHAFT, SLEEVE BEARINGS, OIL LUBRICATED, MECHANICAL SEALS, AND 125 PSI WORKING PRESSURE. REFER TO SCHEDULE ON THE DRAWINGS. USE SAME MANUFACTURER FOR ALL PUMPS.

**HOT WATER SPECIALTIES**

HOT WATER SPECIALTIES SHALL BE AS INDICATED ON CONTRACT DRAWINGS AS MANUFACTURED BY BELL & GOSSETT, TAGO OR SPIROVENT.

**VALVES**

FURNISH AND INSTALL ALL CONTROL, DRAIN, GATE, CHECK, BYPASS AND OTHER VALVES SPECIFIED OR SHOWN ON THE DRAWINGS.

BALL VALVES: BALL VALVES FOR HEATING AND WATER SERVICE SHALL BE EQUAL TO WATTS NO. B-6000, BRONZE BODIES, 600 LB. W.O.G., CHROME BALL AND STEM, EXTENDED HANDLE. FTTE SEAT AND SEALS, SCREWED ENDS OR B-6001 SWEAT ENDS. BALL VALVES USED FOR GAS SERVICE SHALL BE GAS RATED.

CHECK VALVES: WATTS SERIES CV5, SOLDER ENDS, SERIES CV SCREWED ENDS, BRONZE BODY, 200 LB. W.O.G.

DRAIN VALVES: WATTS NO. B-6000, SCREWED ENDS, NO. B-6001 SWEAT ENDS. PROVIDE GAP AND CHAIN, WITH 1/2" I.P.S. TO 3/4" HOSE.

BALANCING VALVES: PIPING MAINS AND TERMINAL UNIT BRANCH PIPING BALANCING VALVES SHALL BE TOUR & ANDERSON MODEL STAS WITH TEMPERATURE/PRESSURE READOUT PORTS. VALVE TO BE SIZED BASED ON FLOW RATE REQUIRED. HANDLE WHEEL SHALL BE LOCKABLE WITH MEMORY STOP.

**SHEET METAL WORK**

FURNISH AND INSTALL DUCTS ALL SHEET METAL WORK FOR BOILER ROOM VENTILATION SYSTEM.

FABRICATE RECTANGULAR DUCTWORK FROM GALVANIZED SHEET STEEL COMPLYING WITH ANSI/ASTM A527, LOCK FORMING QUALITY, WITH ANSI/ASTM A525, 640 ZINC COATING, MILL PHOSPHATIZED FOR EXPOSED LOCATIONS.

GAUGES AND DETAILS OF CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF ASHRAE GUIDE AND SMACNA FOR 1" PRESSURE CLASS DUCTING.

PROVIDE HOT-DIPPED GALVANIZED STEEL FASTENERS, ANCHORS, ROD STRAPS, TRIM AND ANGLES FOR SUPPORT OF DUCTWORK. DUCTING SHALL BE SUPPORTED ON MAXIMUM 6 FOOT ON CENTERS.

ALL DUCTWORK SHALL BE SEALED WITH DUCT SEALANT, NON-HARDENING, NON-MIGRATING MASTIC OR LIQUID ELASTIC SEALANT AS CONFORMANCE AND RECOMMENDED BY THE MANUFACTURER SPECIFICALLY FOR SEALING JOINTS AND SEAMS IN DUCTWORK.

**LOUVERS**

WALL LOUVERS SHALL COMPLY WITH NATIONAL FIRE PROTECTION ASSOCIATION STANDARD NO. 90A, AS APPLICABLE TO LOUVER CONSTRUCTION.

PROVIDE WALL LOUVER WHERE INDICATED. MATERIAL SHALL BE ALUMINUM CHANNEL BOX FRAME AND BLADES WITH 1/2" MESH NO. 18 GAUGE WIRE BIRD SCREEN, DUCT COLLARS AND STAINLESS STEEL SCREWS. SCREEN SHALL BE PRE-COATED. LOUVERS SHALL BE EQUAL TO RUSKIN WITH MODEL AS SCHEDULED. ALL LOUVERS TO BE PROVIDED WITH BAKED ENAMEL FINISH, COLOR TO BE SELECTED BY OWNER.

**INSULATION**

PROVIDE THERMAL INSULATION FOR EXTERIOR SURFACES OF PIPING.

ALL HEATING PIPING SHALL BE INSULATED WITH 1" THICK OWENS-CORNING PRE-FORMED HEAVY DENSITY AJS/J55 FIBERGLASS WITH FULL OUTER JACKET SELF SEALING LAPS. JOINTS SHALL BE TIGHTLY BUTTED AND SEALED WITH LAGGING ADHESIVE. FITTINGS SHALL BE COVERED WITH ZEPHON COVERS AND SHALL BE INSULATED WITH AN EQUAL THICKNESS OF INSULATION. COVER ALL PIPING WITH ADDITIONAL HIGH IMPACT PVC JACKETING. DOMESTIC WATER PIPING TO BE INSULATED WITH 1/2" THICK INSULATION AS SPECIFIED ABOVE.

**TEMPERATURE CONTROLS**

GENERAL: PROVIDE ELECTRIC CONTROL PRODUCTS IN SIZES AND CAPACITIES INDICATED, CONSISTING OF VALVES, DAMPERS, THERMOSTATS, SENSORS, CONTROLLERS, RELAYS AND OTHER COMPONENTS AS REQUIRED FOR COMPLETE INSTALLATION. EXCEPT AS OTHERWISE INDICATED, PROVIDE MANUFACTURER'S STANDARD CONTROL SYSTEM COMPONENTS AS INDICATED BY PUBLISHED PRODUCT INFORMATION, DESIGNED AND CONSTRUCTED AS RECOMMENDED BY MANUFACTURER. PROVIDE ELECTRIC CONTROL SYSTEMS WITH THE FOLLOWING FUNCTIONAL AND CONSTRUCTION FEATURES AS INDICATED.

RELAYS: PROVIDE SWITCHING RELAY FOR CIRCULATOR PUMP CONTROL, HONEYWELL NO. RA89A, 24V. CONTROL, 120V. SWITCHING, 10A. RATINGS.

DAMPERS: PROVIDE AUTOMATIC CONTROL DAMPERS AS SPECIFIED ON THE DRAWINGS.

CONTROL POWER TRANSFORMERS: FURNISH AND INSTALL NEMA STANDARD D220-1442, 120VAC/24VAC TRANSFORMERS AS REQUIRED FOR CONTROL POWER.

**SEQUENCE OF OPERATION**

GENERAL: PROVIDE ELECTRIC AUTOMATIC CONTROLS TO ACCOMPLISH THE FOLLOWING CONTROL SEQUENCES. PROVIDE CONTROLS FOR BOILER, UNIT HEATERS, PUMPS AND INTAKE DAMPERS.

BOILER UNIT: THE BOILER UNIT SHALL BE PROVIDED WITH FACTORY HOT WATER RESET AND BOILER CIRCULATOR PUMP CONTROLS. PROVIDE OUTDOOR AIR SENSOR TO ACTIVATE BOILER AND CONTROLS WHEN OUTDOOR AIR TEMPERATURE IS BELOW 65 DEG. F. ADJUSTABLE. CONTRACTOR SHALL FURNISH, INSTALL AND WIRE OUTDOOR AIR SENSOR. BOILER INJECTION PUMP CONTROLS. THE BOILER IS EQUIPPED WITH MICROPROCESSOR ELECTRONIC CONTROLS. THIS CONTROLLER SHALL UTILIZE SUPPLY WATER TEMPERATURE, RETURN WATER TEMPERATURE, OUTDOOR AIR TEMPERATURE TO REGULATE BOILER ON/OFF OPERATION AND MODULATION OF FIRING RATE. THE BOILER SHALL BE PROGRAMMED FOR OUTDOOR RESET OF BOILER WATER TEMPERATURE.

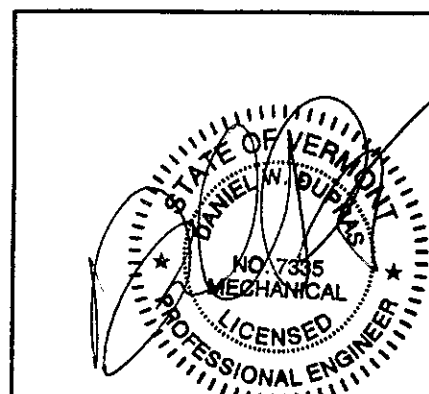
PUMP P-1: THIS PUMP SHALL BE CONTROLLED BY THE BOILER MICROPROCESSOR AND SHALL SERVE AS THE INJECTION PUMP FROM THE BOILER TO THE PRIMARY HEATING LOOP. THIS PUMP SHALL INJECT HOT WATER FROM THE BOILER TO THE PRIMARY LOOP TO MAINTAIN THE REQUIRED HOT WATER LOOP TEMPERATURE.

PUMP P-2: THIS PUMP SHALL START WHEN THE OUTDOOR AIR TEMPERATURE IS LESS THAN 60 DEG. F.

RADIATION CONTROLS: A NON-ELECTRIC MAGON ENTZ SELF-CONTAINED RADIATION CONTROL VALVE SHALL CONTROL HEAT TO RADIATION.

UNIT HEATER CONTROLS: A THERMOSTAT SHALL CYCLE FANS TO MAINTAIN SETPOINT. PROVIDE A STRAP-ON AQUASTAT INSTALLED IN THE BOILER ROOM TO PREVENT FAN FROM OPERATING WHEN WATER TEMPERATURE IS BELOW 100 DEG. F.

BOILER ROOM VENTILATION: PROVIDE A 120VAC COOLING THERMOSTAT TO OPEN VENTILATION AIR DAMPER IF ROOM TEMPERATURE EXCEEDS 80 DEG. F. (ADJUSTABLE). DAMPER SHALL CLOSE WHEN ROOM TEMPERATURE IS BELOW SETPOINT.



NO.	ISSUED FOR	DATE
2	REVISED FOR BIDDING	12/21/2005
1	BIDDING	10/20/2005



HEATING, VENTILATION, & AIR CONDITIONING, PLUMBING, FIRE PROTECTION, & ELECTRICAL

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**MECHANICAL MATERIAL SPECIFICATIONS**

**NEW HEATING SYSTEM  
BRIDGE SHOP/STOCK BUILDING  
ST. JOHNSBURY AOT  
ST. JOHNSBURY, VT**

**M  
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