PIPING SPECIFICATIONS

PIPING SYSTEM	SIZE	MATERIAL	JOINTS	INSULATION
NATURAL GAS (G)	< 3"	SCH. 40 C.S.	T & C	N/A
	< 3"	COPPER	BRAZED	N/A
	~~≥ 3"~~	~~SCH. 40 C.S.~~	~~WELDED~~	~~N/A~~

1. 6" DIRT LEG SHALL BE INSTALLED AT ALL GAS EQUIPMENT.
2. A GAS REGULATOR SHALL BE INSTALLED AT GAS EQUIPMENT WHERE APPLICABLE.
3. ALL GAS PIPING EXPOSED TO THE ELEMENTS SHALL BE PAINTED WITH "RUSTOLEUM" PAINT.
4. ALL GAS PIPING SHALL BE INSTALLED PER NFPA 54.

PIPING SYSTEM	SIZE	MATERIAL	JOINTS	INSULATION
REFRIGERANT (RL, RS, RG)	~~ALL~~	~~TYPE ACR COPPER~~	~~BRAZED~~	~~1/2" ELASTOMERIC~~

1. ALL ELBOWS TO BE LONG RADIUS.
2. SUCTION TRAPS MAY BE PRE-FORMED OR MADE WITH 45s AND 90s.
3. SUCTION PIPING SHALL BE SLOPED IN DIRECTION OF FLOW.
3. SYSTEM SHALL BE EVACUATED AND CHARGED PRIOR TO START UP.

PIPING SYSTEM	SIZE	MATERIAL	JOINTS	INSULATION
CONDENSATE DRAIN (CD)	< 3"	SCH. 40 PVC	GLUED	N/A
	< 3"	TYPE "M" COPPER	BRAZED	1/2" ELASTOMERIC
	~~≥ 3"~~	~~SCH. 40 C.S.~~	~~T & C~~	~~1/2" ELASTOMERIC~~

1. PVC SHALL NOT BE USED IN RETURN AIR PLENUMS.
2. PROVIDE DRAIN TRAP AT ALL DRAW-THROUGH EQUIPMENT.
3. HORIZONTAL PIPING SHALL BE SLOPED IN DIRECTION OF FLOW.
4. CONDENSATE SHALL NOT DISCHARGE INTO STREET, ALLEY, OR ANY OTHER AREA THAT MAY CAUSE A NUISANCE.
5. A SECONDARY DRAIN OR AUXILIARY DRAIN PAN SHALL BE REQUIRED WHERE DAMAGE TO ANY BUILDING COMPONENTS WILL OCCUR AS A RESULT OF OVERFLOW FROM THE EQUIPMENT DRAIN PAN.

PIPING SYSTEM	SIZE	MATERIAL	JOINTS	INSULATION
FLUE PIPE	3' - 6'	SCH. 40 PVC	GLUE	NONE
LOW PRESS. STEAM (LPS)	~~< 1-1/2"~~	~~SCH. 40 C.S.~~	~~T & C~~	~~1-1/2" FIBERGLASS~~
	~~1-1/2" - 2-1/2"~~	~~SCH. 40 C.S.~~	~~T & C~~	~~2" FIBERGLASS~~
	~~≥ 2-1/2"~~	~~SCH. 40 C.S.~~	~~WELDED~~	~~2" FIBERGLASS~~
LOW PRESS. CONDENSATE RETURN (CR)	~~< 1-1/2"~~	~~SCH. 80 C.S.~~	~~T & C~~	~~1-1/2" FIBERGLASS~~
	~~1-1/2" - 2-1/2"~~	~~SCH. 80 C.S.~~	~~T & C~~	~~2" FIBERGLASS~~
	~~≥ 2-1/2"~~	~~SCH. 80 C.S.~~	~~WELDED~~	~~2" FIBERGLASS~~
FILL	ALL	COPPER/PVC	BRAZED/GLUED	N/A
HEAT PUMP 40-100 DEG. (CHWS/CHWR)	< 1-1/2"	COPPER/PVC	BRAZED	3/4" FIBERGLASS
	1-1/2" - 3"	SCH. 40 C.S./PVC	T & C	1" FIBERGLASS
	≥ 4"	SCH. 40 C.S./PVC	WELDED	2" FIBERGLASS

1. PROVIDE AIR VENTS AT HIGH POINTS OF SYSTEM.
2. PROVIDE HOSE END DRAIN VALVES AT LOW POINTS OF SYSTEM.

PIPING SYSTEM	SIZE	MATERIAL	JOINTS	INSULATION
HW/BOILER 80 - 120 DEG. (HWS/HWR)	< 1-1/2"	COPPER/PVC	BRAZED	3/4" FIBERGLASS
	1-1/2" - 3"	SCH. 40 C.S./PVC	T & C	1" FIBERGLASS
	≥ 4"	SCH. 40 C.S./PVC	WELDED	2" FIBERGLASS

1. PROVIDE AIR VENTS AT HIGH POINTS OF SYSTEM.
2. PROVIDE HOSE END DRAIN VALVES AT LOW POINTS OF SYSTEM.

MAX SPACING BETWEEN SUPPORTS (FT)	MATERIAL				
NOMINAL PIPE SIZE (IN)	COPPER TUBING	STAINLESS STEEL AND MONEL	CARBON STEEL	GLASS FIBER	CPVC PVC
1/2	4	4.5	5	–	4.5
3/4	6	4.5	6	–	4.5
1	6	6.5	7	–	5
1-1/2	6	7	9	5.5	6
2	10	8.5	10	6	6.5
3	10	10	12	6.5	7.5
4	10	11	15	8.5	–
6	–	13	17	9	–
8	–	14	19	10	–
10	–	15	22	12	–
12	–	16	23	13	–
14	–	16.5	25	8	–
16	–	17	27	8.5	–
18	–	17.5	28	9	–
20	–	18	30	9'-5"	–
24	–	–	32	10'-5"	–

DUCT INSULATION SCHEDULE

DUCT SYSTEM	LOCATION: OUTSIDE ENVELOPE	NON-CONDITIONED ATTIC SPACE	PLENUM SPACE	INT. WALL CAVITY OR CHASE	EXT. WALL CAVITY OR DUCTED RETURN	GRADE BELOW SLAB
SUPPLY	R=8.0	R=8.0	R=6.0	R=6.0	R=6.0	R=8.0
RETURN	R=8.0	R=8.0	NONE	NONE	R=6.0	R=8.0
EXHAUST	NONE	R=8.0	NONE	NONE	NONE	R=8.0
OUTSIDE AIR	NONE	R=8.0	R=6.0	R=6.0	R=6.0	R=8.0

1. DIMENSIONS SHOWN ON PLAN OR FREE SPACE. ADD INSULATION THICKNESS TO DETERMINE OVERALL DUCT DIMENSIONS.
2. ALL LOW PRESSURE SUPPLY FLEXIBLE AIR DUCTS SHALL HAVE FIBERGLASS INSULATION AND VAPOR BARRIER.
3. ALL EXHAUST AIR FLEXIBLE DUCTS SHALL BE NON-INSULATED.
4. MAXIMUM LENGTH OF FLEXIBLE DUCTS SHALL NOT EXCEED 10'-0"
5. FIRE DAMPERS SHALL BE INSTALLED PER SMACNA 15D FIRE DAMPER GUIDE OR APPROVED UL LISTING.
6. PROVIDE FLEXIBLE CANVAS CONNECTIONS AT ALL DUCT CONNECTIONS TO VIBRATING EQUIPMENT.
7. SUPPLY DUCT INSULATION TO BE FIBERGLASS WITH FOIL FACE AND VAPOR BARRIER.
8. KITCHEN HOOD EXHAUST DUCTS TO HAVE WELDED JOINTS AND COMPLY WITH NFPA 96.
9. LOW PRESSURE AND MEDIUM PRESSURE DUCT: R=5.0 INTERIOR, R=8.0 EXTERIOR.
10. KOOLDUCT/THERMADUCT LOW PRESSURE AND MEDIUM PRESSURE DUCT:
KOOLDUCT: R=6.0, R=8.1, R=12.0 INTERIOR
THERMADUCT: R=8.1, R=12, R=16.2, R=20.1,R24 EXTERIOR.

DUCT INSULATION LEGEND

- INTERNALLY LINED DUCTWORK
- EXTERNALLY WRAPPED DUCTWORK
- STAINLESS STEEL DUCT
- BLACK IRON WELDED KITCHEN HOOD EXHAUST DUCT

INSULATION SPECIFICATIONS

1.01 INSULATION MATERIALS USED SHALL HAVE COMPOSITE (INSULATION, JACKET ORFACING AND ADHESIVE USED) FIRE AND SMOKE HAZARD RATING AS TESTED BY PROCEDURE ASTM E-84, NFPA 255, AND UL 723 NOT EXCEEDING FLAME SPREAD OF 25, AND SMOKE DEVELOPED OF 50.

1.02 INSULATION MATERIAL AND THICKNESS SHALL MEET THE REQUIREMENTS OF ASHRAE STANDARD 90.1-1999

A. INSULATION SHALL BE APPLIED IN STRICT ACCORDANCE WITH INSULATION MANUFACTURER'S INSTRUCTIONS.

B. REMOVABLE INSULATION SHALL BE USED FOR EQUIPMENT AND PIPING COMPONENTS THAT REQUIRE ROUTINE SERVICE.

2.01 PIPE INSULATION MATERIALS

A. FIBERGLASS INSULATION: PROVIDE INSULATION COMPOSED OF INORGANIC GLASS FIBERS BONDED WITH A THERMOSETTING RESIN. THE MAXIMUM THERMAL CONDUCTIVITY IN ACCORDANCE ASTM C 335 SHALL BE AS FOLLOWS:

MAXIMUM THERMAL CONDUCTIVITY (BTU IN/HR SQ. FT. DEG. F)	MEAN RATING TEMPERATURE (DEG. F)
0.34	250
0.31	200
0.30	150
0.28	100

1. PREFORMED PIPE INSULATION: COMPLY WITH ASTM C 547, TYPE 1 WITH FACTORY APPLIED JACKET.

B. CELLULAR GLASS INSULATION: PROVIDE INSULATION COMPOSED OF 8.0 PCF, INCOMBUSTIBLE, INORGANIC, ANNEALED, FOAMED, OR CELLULATED GLASS WITH HERMETICALLY SEALED CELLS. COMPLY WITH ASTM 552, TYPE 11, CLASS 2.

C. FLEXIBLE ELASTOMERIC INSULATION: PROVIDE INSULATION COMPOSED OF CLOSED CELL, SELF-SEALING, EXPANDED RUBBER MATERIAL. COMPLY WITH ASTM C 534, TYPE-1 TUBULAR MATERIAL, AND TYPE 11 FOR SHEET MATERIALS. POLYOLEFIN INSULATION MATERIALS ARE NOT ACCEPTED.

1. INSULATION SHALL BE JACKETED. UNLESS OTHERWISE SPECIFIED, JACKETING MATERIALS FOR FIBERGLASS PIPING INSULATION SHALL BE REINFORCED, ALL SERVICE, VAPOR RETARDER JACKET WITH SELF-SEALING LAP JOINT SUITABLE FOR DIRECT APPLICATION OF FINISH WITHOUT SURFACE PREPARATIONS.

D. KOOLDUCT/THERMADUCT: PANELS COMPRISED OF FIBER FREE THERMOSET PHENOLIC INSULATED FACED ON BOTH SIDES. MEETS UL 723 FLAME SPREAD /SMOKE DEVELOPED <25/50. MEETS ASHRAE 90.1 IECC R-VALUE AND IMC/IBC CLASS 1 DUCT MATERIAL

PROJECT DESIGN CONDITIONS

OUTDOOR CONDITIONS	LOCATION		SUMMER (DB/WB)			WINTER			
	ST. LOUIS, MO		95°/78°			0°			
ENVELOPE DESIGN	AREA	WALL U-VALUE	ROOF U-VALUE	GLASS U-VALUE	GLASS S.C.	PARTITION U-VALUE			
	ALL	0.0875	0.0650	0.50	0.55	0.25			
AREA/ROOM	O.A. (CFM/PERSON)	O.A. (CFM/SF)	ZONE AIR DISTR. EFFECT.	TOTAL CFM	COOLING (°F/RH)	HEATING (°F/RH)	PEOPLE	LIGHTING (W/SF)	EQUIP. (W/SF)
DWELLING	5	0.06	0.8	–	–	–	–	–	–

GENERAL NOTES

1. DESIGN AND INSTALLATION IN ACCORDANCE WITH 2009 INTERNATIONAL MECHANICAL AND 2009 INTERNATIONAL BUILDING CODES.
2. SEISMIC RESTRAINTS BASED ON SEISMIC DESIGN CATEGORY "D".
3. SMOKE DETECTORS SHALL BE INSTALLED IN RETURN AIR SYSTEMS WITH A DESIGN CAPACITY GREATER THAN OR EQUAL TO 2,000 CFM, IN THE RETURN AIR DUCT OR PLENUM UPSTREAM OF ANY FILTERS, EXHAUST AIR CONNECTIONS OR DECONTAMINATION EQUIPMENT AND APPLIANCES.
4. MATERIALS EXPOSED IN PLENUMS SHALL BE NON COMBUSTIBLE OR HAVE A FLAME SPREAD OF NOT MORE THAN 25 AND A SMOKE-DEVELOPED INDEX OF NOT MORE THAN 50 WHEN TESTED IN ACCORDANCE WITH ASTM E 84.
5. ALL LINTELS, FRAMING, FURRING, PATCHING, AND PAINTING REQUIRED WILL BE PROVIDED BY THE GENERAL CONTRACTOR.
6. THE GENERAL CONTRACTOR SHALL PROVIDE A UNIFORM LEVEL SUPPORT INCLUDING FRAMING FOR ALL ROOF MOUNTED EQUIPMENT.
7. ALL POWER WIRING, DISCONNECT SWITCHES, AND MOTOR STARTERS SHALL BE FURNISHED AND INSTALLED BY ELECTRICAL CONTRACTOR. ALL AUXILIARY HEATING EQUIPMENT (I.E. ELECTRIC WALL HEATERS) SHALL BE FURNISHED BY MECHANICAL CONTRACTOR AND INSTALLED BY ELECTRICAL CONTRACTOR.

SMACNA SEALING REQUIREMENTS

DUCT TYPE	DUCT PRESSURE CLASS	SEALING PRESSURE CLASS	LEAKAGE CLASS
RECTANGULAR	4" W.G. AND ABOVE (+OR-)	A	24
ROUND	4" W.G. AND ABOVE (+OR-)	A	12
RECTANGULAR	3" W.G. (+OR-)	B	12
ROUND	3" W.G. (+OR-)	B	6
RECTANGULAR	2" W.G. (+OR-)	C	6
ROUND	2" W.G. (+OR-)	C	3
RECTANGULAR	1" W.G. AND BELOW (+OR-)	NONE	NONE
ROUND	1" W.G. AND BELOW (+OR-)	NONE	NONE

1. SEAL CLASS A: TRAVERSE AND LONGITUDINAL JOINTS AND DUCT WALL PENETRATIONS TO BE SEALED.
2. SEAL CLASS B: TRAVERSE AND LONGITUDINAL JOINTS TO BE SEALED.
3. SEAL CLASS C: TRAVERSE JOINTS ONLY TO BE SEALED.
4. ALL EXTERIOR DUCT TO BE SEAL CLASS A REGARDLESS OF PRESSURE CLASS.
5. ALL DUCTWORK CARRYING HAZARDOUS FUMES (CLASS 3 OR 4), NOT REQUIRING LIQUID TIGHT JOINTS AND SEAMS, REGARDLESS OF PRESSURE CLASS SHALL BE SMACNA SEAL CLASS A.
6. ALL DUCTWORK SERVING COMMERCIAL KITCHEN HOODS, DISHWASHERS, OR WHERE SPECIFIED, SHALL HAVE WELDED, LIQUID TIGHT JOINTS AND SEAMS. USE APPROPRIATE GASKETS AND SEALANTS WHERE WELDING IS NOT POSSIBLE.
7. KOOLDUCT MAX. 4" W.G. SMACNA CLASS 3 W/4 BOLT COUPLING SYSTEM THERMADUCT MAX. 10 W.G. SMACNA CLASS 1 W/THERMADUCT CONNECTION SYSTEM.

SPECIALTY DUCT	LOCATION	PRESSURE CLASS	MATERIAL	INSULATION THICKNESS
LABORATORY EXHAUST	~~MEDIUM PRESSURE~~	~~4" W.G.~~	~~GALVANIZED~~	~~N/A~~
	~~LOW PRESSURE~~	~~2" W.G.~~	~~GALVANIZED~~	~~N/A~~
	~~FUME HOOD~~	~~2" W.G.~~	~~304 S.S.~~	~~N/A~~
~~KICHEN HOOD EXHAUST~~	~~ALL~~	~~2" W.G.~~	~~16 GA. B.I.~~	~~2 HR~~

SYMBOLS AND ABBREVIATIONS

DUCTWORK & FITTINGS

- 24x12 — RECTANGULAR DUCT
- FLEXIBLE DUCT CONNECTION
- VD — VOLUME DAMPER
- DUCT RISE UP
- DUCT DROP DOWN
- 12"ø — ROUND/SPIRAL DUCT
- FLEX SHOWN AS SINGLE-LINE, 12"ø — FLEX DUCT
- VD, 24x12 — ROUND SPIN-IN TAP WITH VOLUME DAMPER
- 24x12 — DUCT REDUCER FITTING
- 24x12 — DUCT SQUARE TO ROUND REDUCER FITTING
- 24x12 UP — DUCT CHANGE IN ELEVATION UP
- 24x12 DN — DUCT CHANGE IN ELEVATION DOWN
- 24x12 — RECTANGULAR ELBOW WITH TURNING VANES
- RECTANGULAR TEE WITH TURNING VANES

AIR DEVICES

- CEILING SUPPLY DIFFUSER
- CEILING RETURN GRILLE
- CEILING EXHAUST GRILLE
- SURFACE MOUNTED SUPPLY GRILLE (DOUBLE DEFLECTION)
- SURFACE MOUNTED SUPPLY GRILLE (SINGLE DEFLECTION)
- SURFACE MOUNTED RETURN/EXHAUST GRILLE

HVAC CONTROLS

- S — SENSOR
- T — THERMOSTAT
- H — HUMIDISTAT
- P — ROOM PRESSURE SENSOR
- CONTROL WIRING
- FIRE DAMPER (FD) MOUNTED IN VERTICAL POSITION (WALL)
- FIRE DAMPER (FD) MOUNTED IN HORIZONTAL POSITION (FLOOR)
- FIRE/SMOKE DAMPER (F/SD)
- DD — DUCT MOUNTED SMOKE DETECTOR

PIPING AND FITTINGS

- CHWS — CHILLED WATER SUPPLY
- CHWR — CHILLED WATER RETURN
- CWS — CONDENSER WATER SUPPLY
- CWR — CONDENSER WATER RETURN
- HWS — HEATING HOT WATER SUPPLY
- HWR — HEATING HOT WATER RETURN
- CD — CONDENSATE DRAIN
- G — NATURAL GAS
- RL — REFRIGERATION LIQUID
- RS — REFRIGERATION SUCTION
- FLOW DIRECTION
- ISOLATION VALVE
- CHECK VALVE
- BUTTERFLY VALVE
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- PIPE RISE
- PIPE DROP
- CONTROL VALVE (2-WAY)
- CONTROL VALVE (3-WAY)
- UNION
- PRESSURE GAUGE
- THERMOMETER
- CIRCUIT SETTER (CS, 15 — GPM)
- STRAINER
- BACKFLOW PREVENTER

MISC. SYMBOLS

- KEYED NOTE
- DIFFUSER TAG CFM
- EQUIPMENT TYPE NUMBER
- CONNECT TO EXISTING
- DETAIL NUMBER / SHEET NUMBER

ABREVIATIONS

A.F.F.	ABOVE FINISHED FLOOR
B.O.D.	BOTTOM OF DUCT
DN	DOWN
E.C.	ELECTRICAL CONTRACTOR
G.C.	GENERAL CONTRACTOR
M.C.	MECHANICAL CONTRACTOR
M.D.	MOTORIZED DAMPER
N.T.S.	NOT TO SCALE
U.T.R.	UP THRU ROOF
V.D.	MANUAL VOLUME DAMPER

SEISMIC CODE BLOCK FOR MECHANICAL SYSTEMS EQUIPMENT AND COMPONENT ANCHORAGE EARTHQUAKE LOAD RESISTANCE

OCCUPANCY CATEGORY II — SEISMIC DESIGN CATEGORY "D"

ITEM	IMPORTANCE FACTOR (Ip)	SEISMIC ANCHORAGE TO FLOORS, ROOFS, ETC.: NOT PROVIDED FOR PROJECT	SEISMIC ANCHORAGE: PROVIDED FOR PROJECT	SEISMIC SWAY BRACING: NOT PROVIDED FOR PROJECT	SEISMIC SWAY BRACING: PROVIDED FOR PROJECT	LOCATION OF SEALED DETAILS – ON CONSTRUCTION DOCUMENTS: DRAWING NO. OR SPECIFICATION SECTION	SUBSEQUENT SUBMITTAL: SHOP DRAWINGS	SUBSEQUENT SUBMITTAL: SEPARATE PERMITS & PLANS	OTHER PROVISIONS (SEE NOTES)	COMMENTS: IBC SECTION THAT EXEMPTS SEISMIC REQUIRE-MENTS	COMMENTS: ST. LOUIS COUNTY REFERENCE THAT EXEMPTS SEISMIC REQUIREMENTS
PAD/ROOF-MOUNTED EQUIPMENT > 400 LBS (FC-2)	1.0		X	X		M2					1
PAD/ROOF-MOUNTED EQUIPMENT ≤ 400 LBS (B-1, B-2)	1.5		X	X		M2					2
SUSPENDED EQUIPMENT ≤ 20 LBS (P-3, P-4)	1.0	X		X							3
MECHANICAL PIPING ≤ 3" DIAMETER	1.0	X		X							6,7
GAS PIPING ≤ 1" DIAMETER	1.5		X	X							6,7,8,9

1. COMPONENTS SHALL BE POSITIVELY ATTACHED WITH MECHANICAL FASTENERS.
2. TABLE 4.4, ITEM 1, GENERAL EXEMPTIONS, PART "A" - EQUIPMENT MOUNTED 4 FEET OR LESS ABOVE THE FLOOR LEVEL & WEIGHING 400 LBS OR LESS DOES NOT REQUIRE SEISMIC BRACING.
3. TABLE 4.4, ITEM 1, GENERAL EXEMPTIONS, PART "B" - EQUIPMENT WEIGHING 20 LBS OR LESS DOES NOT REQUIRE SEISMIC BRACING.
4. TABLE 4.4, ITEM 3, DUCT EXEMPTIONS, PART "A" - DUCT SUSPENDED FROM HANGERS 12 INCHES OR LESS IN LENGTH WHICH ARE DETAILED TO AVOID SIGNIFICANT BENDING OF THE HANGERS & THEIR ATTACHMENT DOES NOT REQUIRE SEISMIC BRACING
5. TABLE 4.4, ITEM 3, DUCT EXEMPTIONS, PART "B" - DUCT HAVING A CROSS-SECTIONAL AREA OF LESS THAN 6 SQUARE FEET DOES NOT REQUIRE SEISMIC BRACING. SEE PLAN DRAWINGS FOR DUCT SIZES.
6. TABLE 4.4, ITEM 4, PIPING SYSTEM EXEMPTIONS - PIPING IS SUPPORTED BY ROD HANGERS; HANGERS IN THE PIPE RUN ARE 12 INCHES OR LESS IN LENGTH FROM THE TOP OF THE PIPE TO THE SUPPORTING STRUCTURE; HANGERS ARE DETAILED TO AVOID BENDING OF THE HANGERS AND THEIR ATTACHMENTS; AND PROVISIONS ARE MADE FOR PIPING TO ACCOMMODATE EXPECTED DEFLECTIONS. PIPING MEETING ALL CRITERIA IS EXEMPT FROM SEISMIC BRACING REQUIREMENTS
7. TABLE 4.4, ITEM 4, PIPING SYSTEM EXEMPTIONS - HIGH-DEFORMABILITY PIPING (STEEL & COPPER PIPING AND TUBING JOINED BY WELDING, BRAZING/SOLDERING OR BY BOLTED STEEL FLANGES) IS USED; PROVISIONS ARE MADE TO AVOID IMPACT
8. TABLE 4.4, ITEM 5, GAS PIPING SYSTEM EXEMPTIONS, PART "A" - EXTERIOR GAS PIPING INSTALLED ON ROOFS WHICH SUPPLIES NO MORE THAN 2 PSI AND IS PROTECTED BY AN APPROVED SEISMIC SHUT-OFF VALVE WITHIN 5 FEET OF THE
9. TABLE 4.4, ITEM 5, GAS PIPING SYSTEM EXEMPTIONS, PART "B" - EXTERIOR GAS PIPING INSTALLED ON ROOFS WHICH SUPPLIES NO MORE THAN 2 PSI AND IS PROTECTED BY APPROVED FLEXIBLE PIPING NO LESS THAN 3 FEET IN LENGTH IS
10. EXEMPT EXISTING EQUIPMENT/DUCT/PIPE.

FLUID COOLER SCHEDULE

PLAN MARK	MANUFACTURER & MODEL NO.	NO. OF CELLS	CELL AIR FLOW CFM	TOWER PUMP BHP	PROCESS WATER GPM	ENT. WATER °F	LVG. WATER °F	DESIGN WET BULB °F	FLUID COIL P.D. PSI	TOTAL HEAT REJECTION BTUH	MAX. OP. WEIGHT (LBS)	BASIN HEATER KW/CELL	ELECTRICAL DATA VOLTS / PH / HZ	REMARKS
FC-2	BAC VF1-018-43	1		0.50	120	100	85	78	18	600,000	3200		200/3/60	1,2,3

REMARKS:
1. (2) 4" DIA. CONNS. FOR PROCESS WATER INLET & (2) 4" DIA. CONNS. FOR PROCESS WATER OUTLET
2. FULL FACE AIR INLET SCREENS
3. 4" DIA. DRAIN & OVERFLOW CONN. PER CELL
4. -

BOILER SCHEDULE

PLAN MARK	MANUFACTURER & MODEL NO.	TYPE	FUEL NG (PSI)	HEATING INPUT BTUH	OUTPUT BTUH	ELEC. VOLT/PH	OPERATING PRESSURE	PVC INTAKE/ FLUE Φ	GAS CONN. SIZE	WEIGHT (LBS)	REMARKS
B-1	LOCHINVAR WHB285N	HIGH EFF	2	280	270,000	120/1	LOW	3"/3"	1/2"	184	1,2,4
B-2	LOCHINVAR WHB285N	HIGH EFF	2	280	270,000	120/1	LOW	3"/3"	1/2"	184	1,2,4

REMARKS:
1. SYSTEM SENSOR
2. CONDENSATE NEUTRALIZER
3. U.L. 353 COMPLIANT LOW WATER CUT-OFF INTERFACE KIT WITH MANUAL RESET
4. COMMUNICATION PACKAGE

PUMP SCHEDULE

PLAN MARK	MANUFACTURER & MODEL NO.	GPM	HEAD/FT	RPM	HP	IMPELLER SIZE (IN)	IN / OUT SIZE (IN)	ELECTRIC VOLTS / PH / HZ	WEIGHT (LBS)	REMARKS
P-3	TACO	25	10	1720	FRACTION	TBD	1 1/4"	110/1/60	10	1,2,3
P-4	TACO	25	10	1720	FRACTION	TBD	1 1/4"	110/1/60	10	1,2,3

REMARKS:
1. IN LINE
2. INTERLOCKED & CONTROLLED BY BOILER
3. PIPING SPECIALTIES

SEAL:
STATE OF MISSOURI — PATRICK A. OBRIEN — NUMBER EN-025069 — REGISTERED PROFESSIONAL ENGINEER

Patrick OBrien
Digitally signed by Patrick OBrien
Date: 2021.10.27 13:54:14 -05'00'

MISSOURI CERTIFICATE OF AUTHORITY #: E-2011001315
PROFESSIONAL ENGINEER #: MO-25069

PETERS-EICHLER HEATING COMPANY
3115 SUTTON AVENUE
ST. LOUIS, MO 63043
PHONE: (314) 647-4023

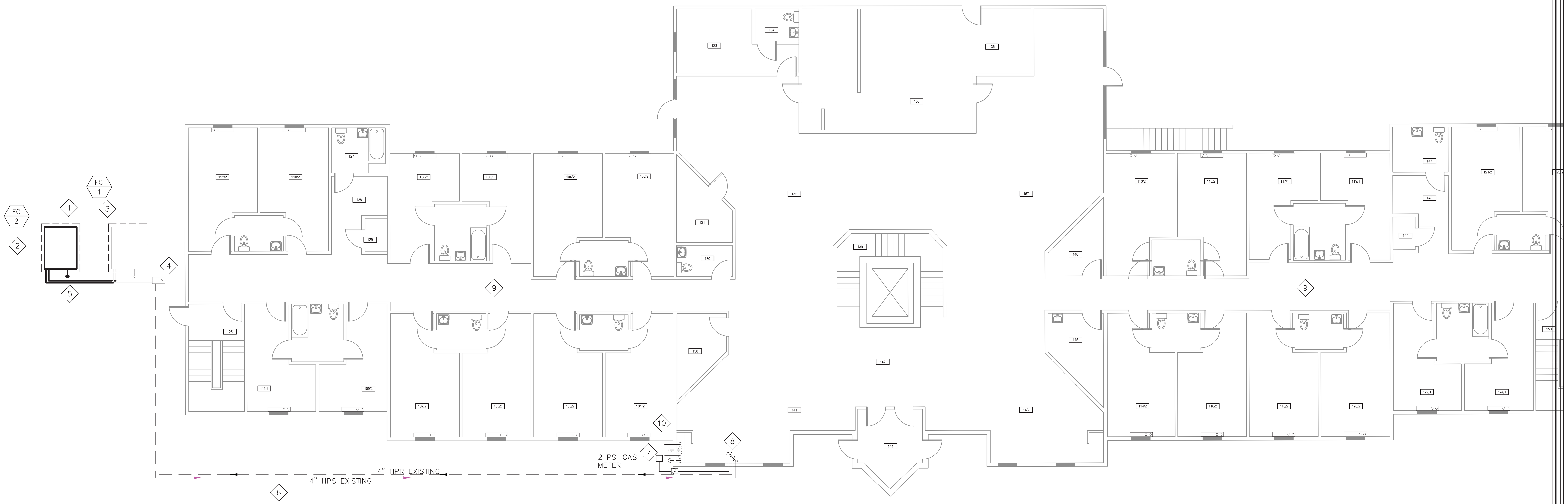
Dynamic ENGINEERED SYSTEMS, INC.
797 WEST TERRA LN.
O'FALLON, MO 63366-2432
PH: 636-385-6800
WWW.DYNAMICENGINEEREDSYSTEMS.COM

NEW MECHANCIAL EQUIPMENT FOR
MARY RIDER HOME
4361 OLIVE ST
SAINT LOUIS, MO 63108

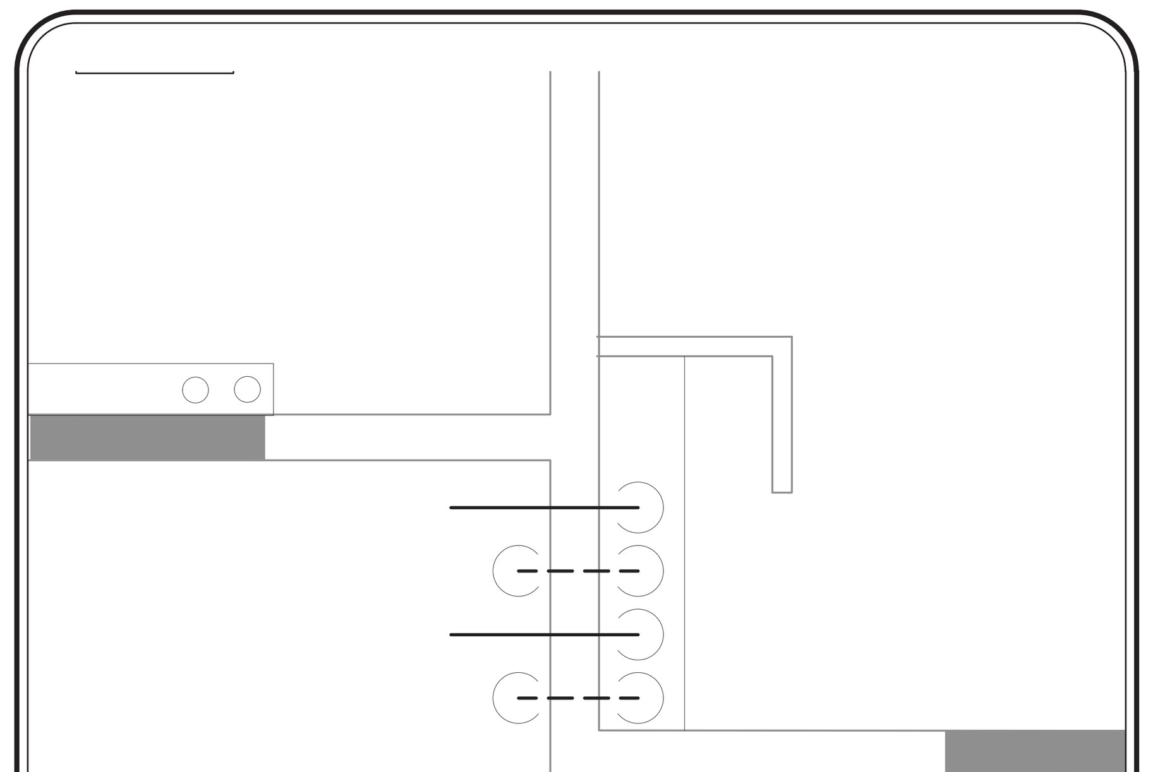
REVISIONS:

TAG	DESCRIPTION
0	PERMIT SET 10/27/21

PROJECT #:	PET-21-026
DATE:	3/15/21
DRAWN BY:	BM
DESIGNED BY:	POB
CHECKED BY:	POB
SHEET:	M1.0

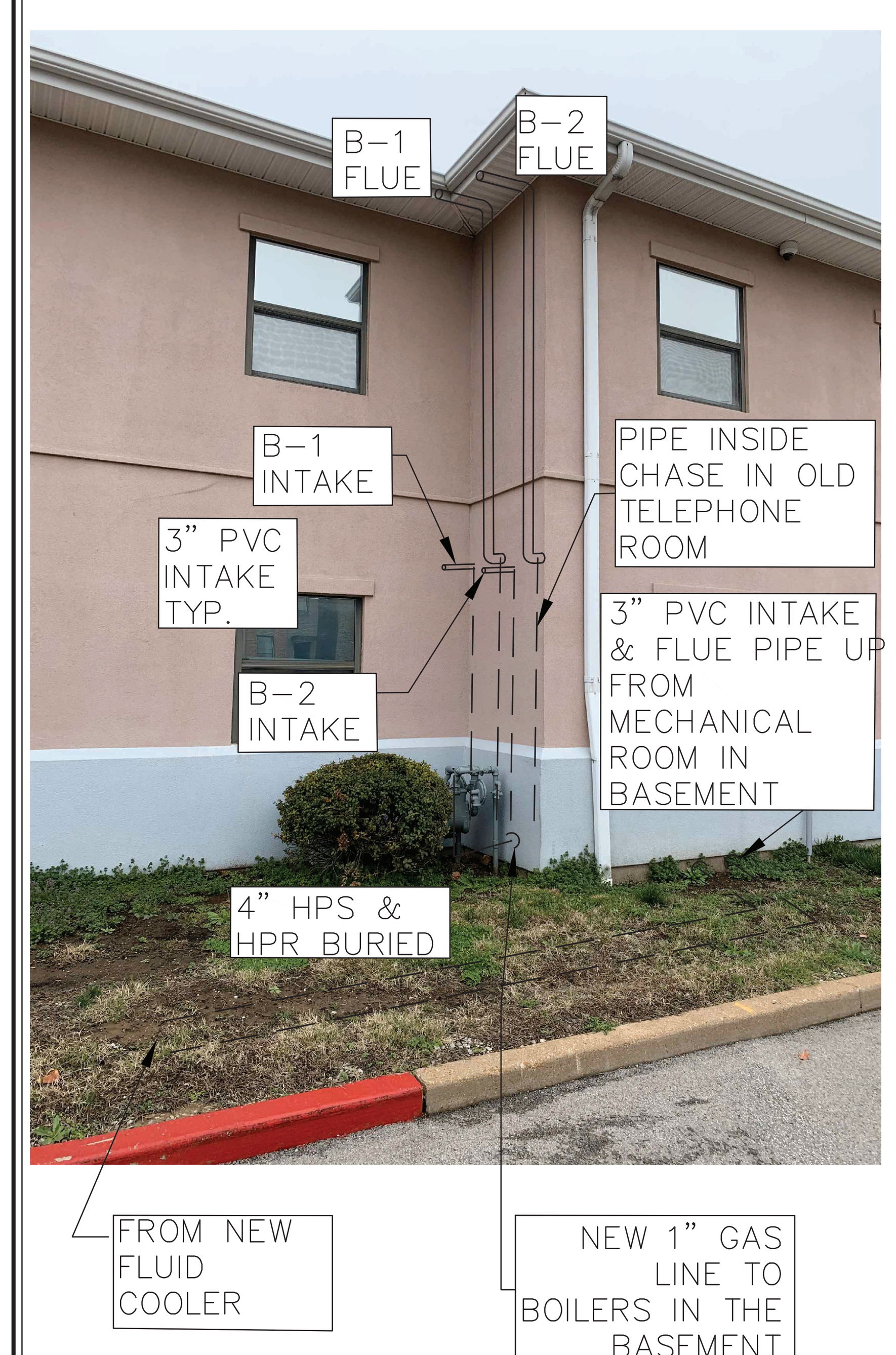


1 M1.1 FIRST STORY FLOOR PLAN
SCALE: 1/4" = 1' - 0"



4 M1.1 BOILER PIPES ENLARGED PLAN
SCALE: 1/4" = 1' - 0"

3 M1.1 FLUID COOLER DETAIL
SCALE: NO SCALE

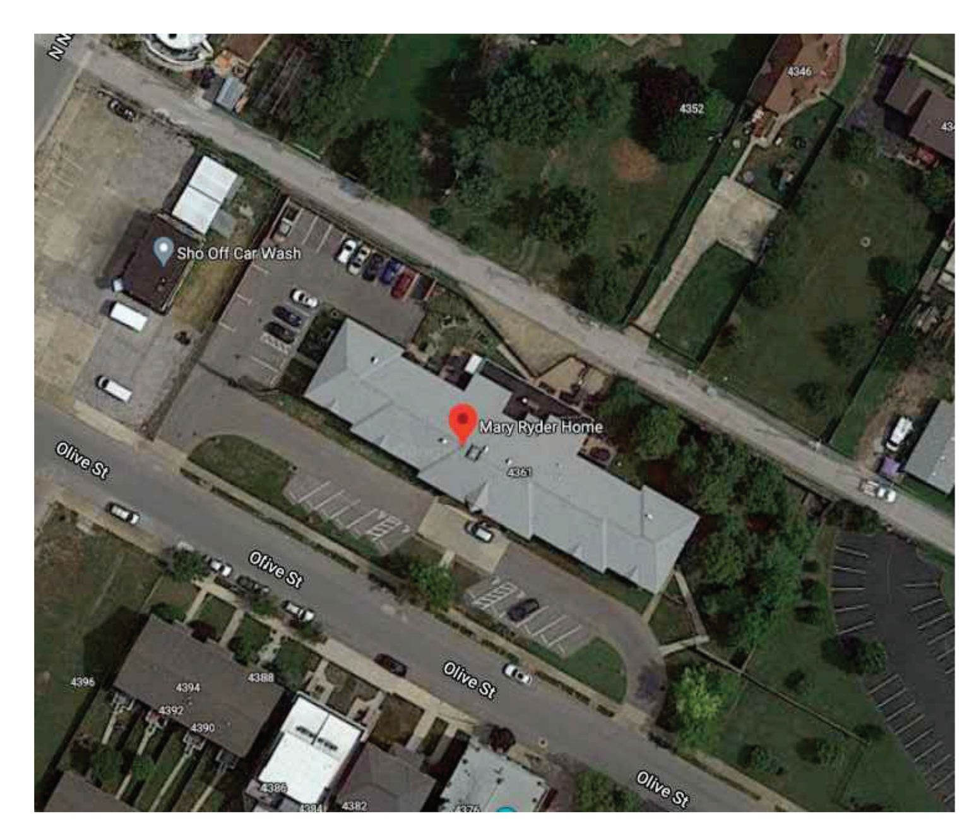


2 M1.1 BOILER FLUE DETAIL
SCALE: NO SCALE

GENERAL NOTES

1. THESE DRAWINGS (PLANS, DETAILS AND SCHEMATICS) ARE SOMEWHAT DIAGRAMMATIC IN NATURE AND INDICATE GENERAL LOCATION AND ARRANGEMENT OF NEW AND EXISTING MAJOR EQUIPMENT AND DUCT & PIPING SYSTEMS. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING EXACT LOCATIONS AND DIMENSIONS OF ALL EQUIPMENT, NEW AND TEMPORARY DUCT & PIPING COMPONENTS INCLUDING FINAL TIE-IN POINT LOCATIONS BETWEEN NEW AND EXISTING PIPING & DUCT SYSTEMS AND EQUIPMENT. NOTIFY ENGINEER OF ANY MAJOR DISCREPANCIES.
2. COORDINATE AND SCHEDULE ALL SHUTDOWNS AND TIE-INS WITH OWNER.
3. CONTRACTOR TO PROVIDE A COMPLETE AND WORKING SYSTEM.

KEY PLAN



KEYED NOTES

1. EXISTING FLUID COOLER TO REMAIN & BE USED.
2. NEW FLUID COOLER TO BE PLACED ON A NEW PAD. SEE ANCHORING DETAIL.
3. NEW ¾" FILL LINE TO CONNECT TO EXISTING FILL. ROUTE UNDER GROUND. ALLOW FOR WINTER CONDITIONS (INSULATE, HEAT TRACE, OR DRAIN).
4. EXTEND EXISTING PIPING TO NEW UNIT. ROUTE HEAT PUMP LOOP, POWER CONTROLS & FILL THRU MAINTENANCE BOX.
5. NEW HEAT PUMP LOOP TO TOWER. HEAT TRACE & INSULATE TO MATCH EXISTING.
6. REUSE EXISTING HEAT PUMP LINES UNDER GROUND & TIE INTO EXISTING SYSTEM. SEE PID.
7. 2 PSI GAS METER. EXTEND FROM EXISTING GAS METER A NEW 1" GAS LINE & ROUTE TO NEW BOILERS LOCATED IN LOWER LEVEL.
8. REPIPE EXISTING HEAT PUMP SUPPLY, RETURN, & GAS PIPE INTO LOWER LEVEL MECHANICAL ROOM.
9. NO WORK IN THIS AREA. THIS IS PROVIDED FOR AS-BUILT MARK-UP PURPOSE ONLY.
10. PVC INTAKE & FLUE UP FROM BOILER ROOM BELOW. PROVIDE NEW ENCLOSURE COVER. ROUTE INTAKE LOW AT 8'-0" AFF LEVEL. ROUTE FLUE UP TO JUST BELOW OVERHANG. SEE DETAIL 3 ON M1.1.

SEAL:

MISSOURI CERTIFICATE OF AUTHORITY #: E-2011001315
PROFESSIONAL ENGINEER #: MO-25069

PETERS-EICHLER HEATING COMPANY
3115 SUTTON AVENUE
ST. LOUIS, MO 63043
PHONE: (314) 647-4023

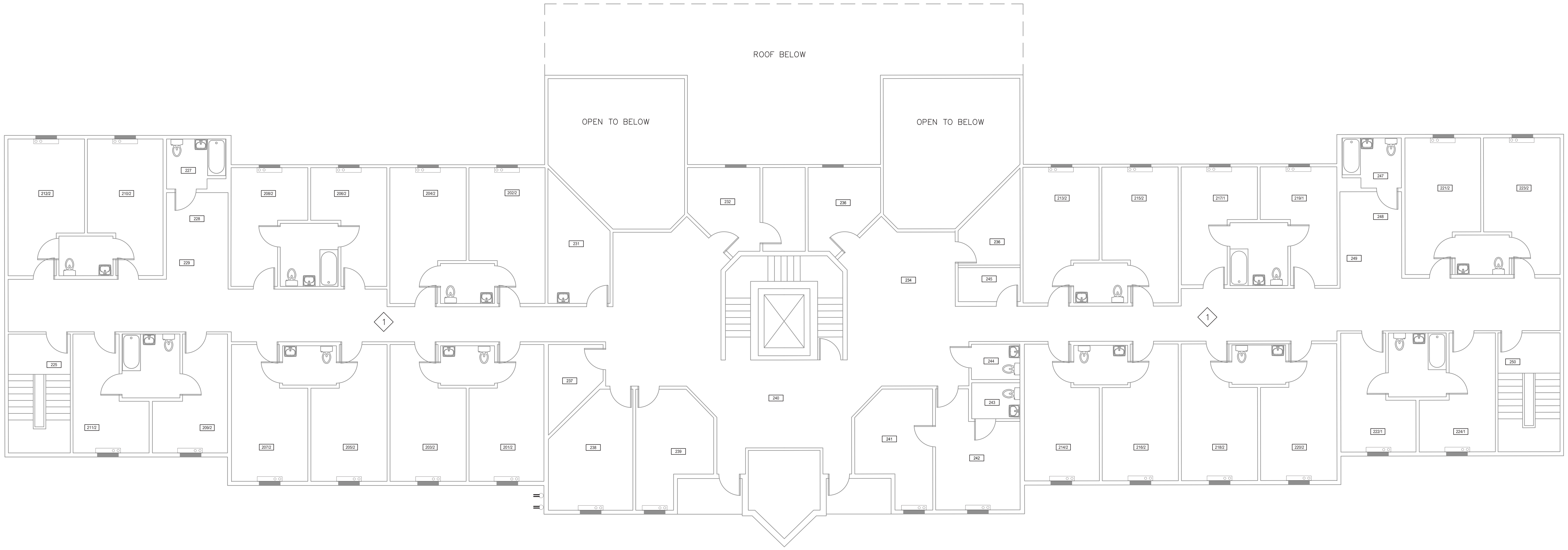
Dynamic ENGINEERED SYSTEMS, INC.
WWW.DYNAMICENGINEEREDSYSTEMS.COM

NEW MECHANICAL EQUIPMENT FOR
MARY RIDER HOME
4361 OLIVE ST
SAINT LOUIS, MO 63108

REVISIONS:

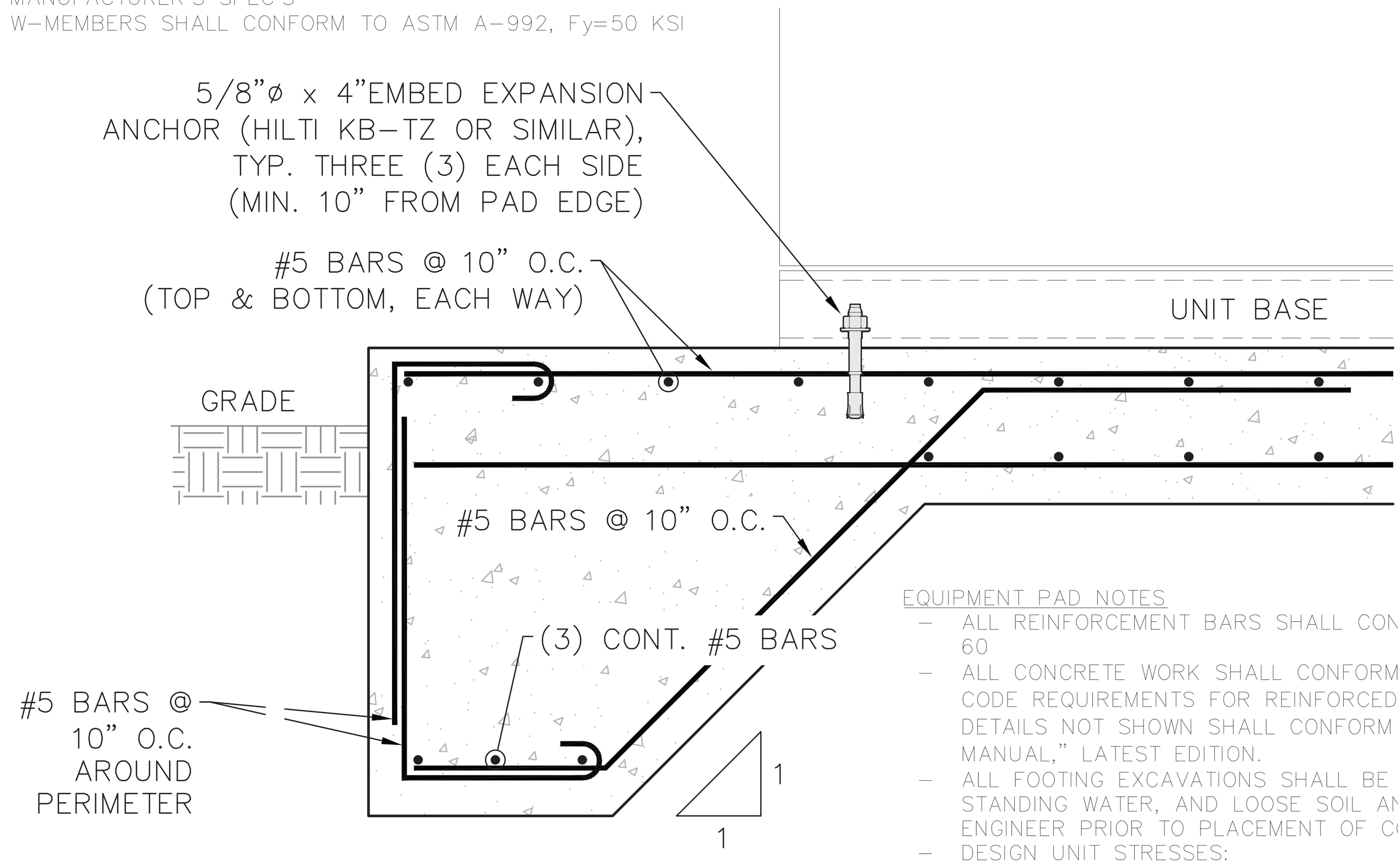
TAG	DESCRIPTION
0	PERMIT SET 10/27/21

PROJECT #:	PET-21-026
DATE:	3/15/21
DRAWN BY:	BM
DESIGNED BY:	POB
CHECKED BY:	POB
SHEET:	M1.1



1 SECOND STORY FLOOR PLAN
M1.2
SCALE: 1/4" = 1' – 0"

SUPPORT STEEL & FASTENERS NOTES
- ALL COMPONENTS EXPOSED TO ELEMENTS SHALL BE STAINLESS STEEL / HOT–DIPPED GALV. / OTHER APPROVED CORROSIVE–RESISTANT MATERIAL
- DISSIMILAR METALS SHALL BE KEPT SEPARATE WITH NEOPRENE ELEMENTS
- CONCRETE ANCHOR HOLES SHALL BE DRILLED W/HAMMER DRILL USING CARBIDE BIT, CLEAN HOLES PER ANCHOR MANUFACTURER'S SPEC'S
- W–MEMBERS SHALL CONFORM TO ASTM A–992, Fy=50 KSI

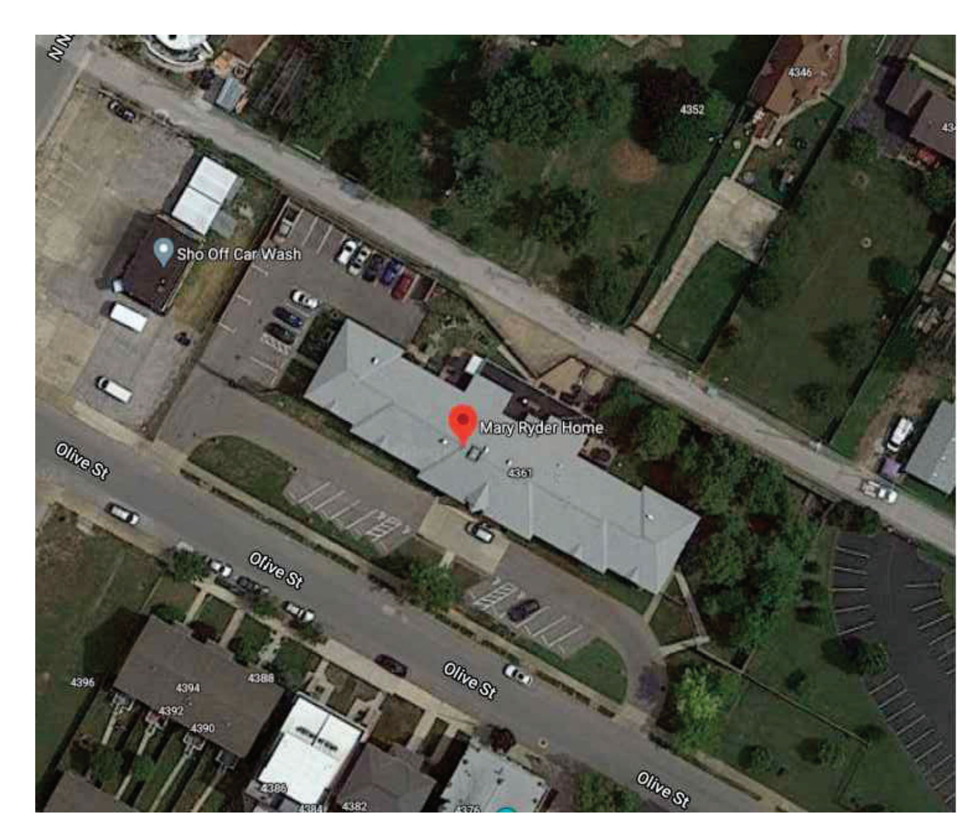


EQUIPMENT PAD NOTES
- ALL REINFORCEMENT BARS SHALL CONFORM TO ASTM–A615, GRADE 60
- ALL CONCRETE WORK SHALL CONFORM TO ACI 318–05 "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE." ALL REINFORCING DETAILS NOT SHOWN SHALL CONFORM TO ACI 315 "DETAILING MANUAL," LATEST EDITION.
- ALL FOOTING EXCAVATIONS SHALL BE CLEAN AND FREE OF DEBRIS, STANDING WATER, AND LOOSE SOIL AND SHALL BE INSPECTED THE ENGINEER PRIOR TO PLACEMENT OF CONCRETE
- DESIGN UNIT STRESSES:
  -- CONCRETE: F'_C=3,000 PSI
  -- REINFORCING STEEL: F_Y=60,000 PSI

2 STRUCTURAL PAD & FC ANCHORAGE DETAIL
M1.2
SCALE: NO SCALE

1. THESE DRAWINGS (PLANS, DETAILS AND SCHEMATICS) ARE SOMEWHAT DIAGRAMMATIC IN NATURE AND INDICATE GENERAL LOCATION AND ARRANGEMENT OF NEW AND EXISTING MAJOR EQUIPMENT AND DUCT & PIPING SYSTEMS. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING EXACT LOCATIONS AND DIMENSIONS OF ALL EQUIPMENT, NEW AND TEMPORARY DUCT & PIPING COMPONENTS INCLUDING FINAL TIE–IN POINT LOCATIONS BETWEEN NEW AND EXISTING PIPING & DUCT SYSTEMS AND EQUIPMENT. NOTIFY ENGINEER OF ANY MAJOR DISCREPANCIES.
2. COORDINATE AND SCHEDULE ALL SHUTDOWNS AND TIE–INS WITH OWNER.
3. CONTRACTOR TO PROVIDE A COMPLETE AND WORKING SYSTEM.

GENERAL NOTES



KEY PLAN

1. NO WORK IN THIS AREA. THIS SHEET PROVIDED FOR AS–BUILT MARK–UP PURPOSE ONLY.
2. EXTEND FLUE UP TO JUST BELOW ROOF OVERHAND SOFFIT. ROUTE HORIZONTALLY 24". SLOPE ALL PIPE BACK TO BOILER TO PREVENT CONDENSATE DRIP. CUT ANGLE AT 45 TO REDUCE RAIN ENTERING THE SYSTEM.

KEYED NOTES

SEAL:

STATE OF MISSOURI
PATRICK A. O'BRIEN
NUMBER EN-025069
REGISTERED PROFESSIONAL ENGINEER

MISSOURI CERTIFICATE OF AUTHORITY #: E–2011001315

PROFESSIONAL ENGINEER #: MO–25069

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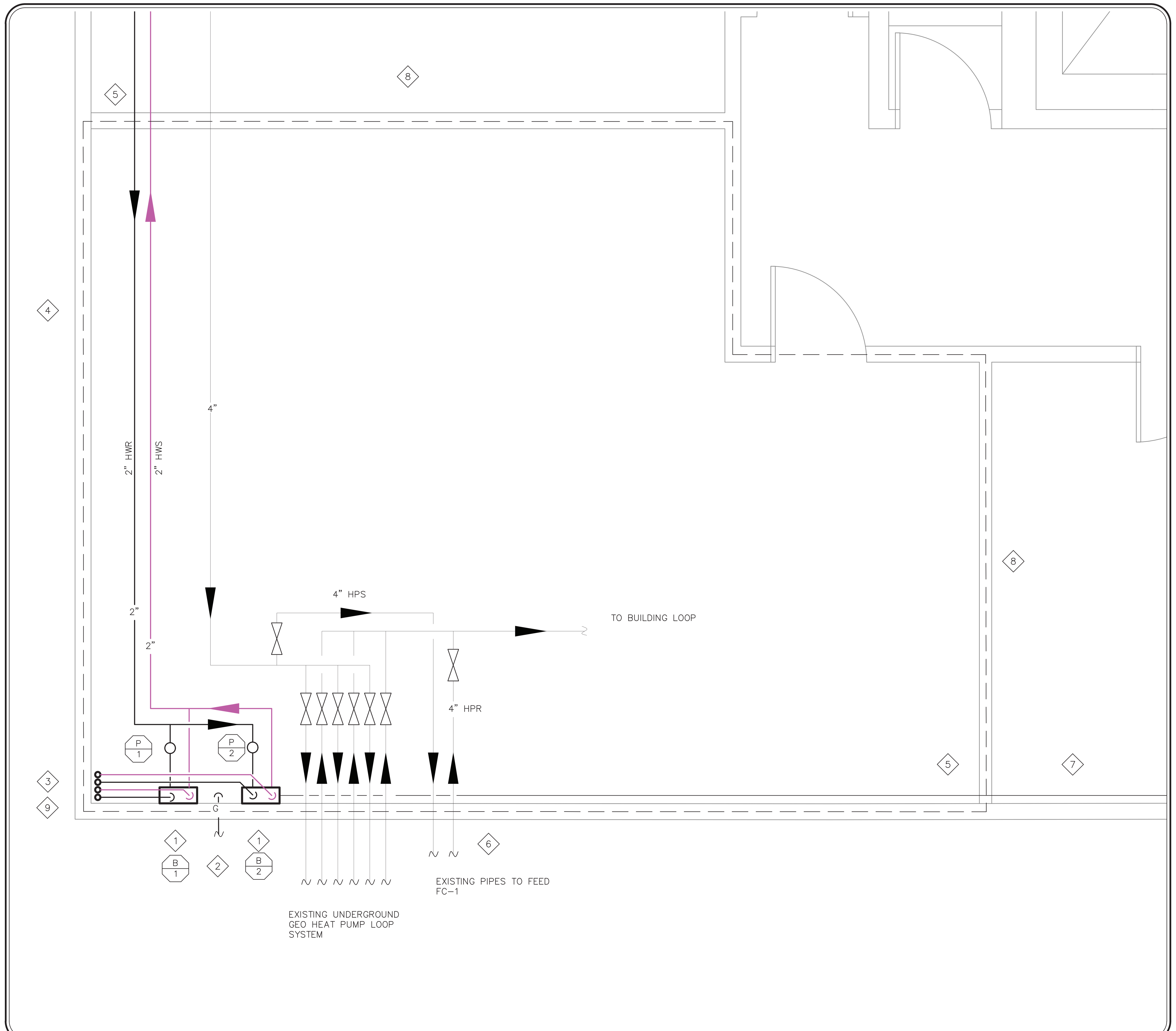

1 BASEMENT FLOOR PLAN

M1.3

SCALE: 1/4" = 1' - 0"

1. THESE DRAWINGS (PLANS, DETAILS AND SCHEMATICS) ARE SOMEWHAT DIAGRAMMATIC IN NATURE AND INDICATE GENERAL LOCATION AND ARRANGEMENT OF NEW AND EXISTING MAJOR EQUIPMENT AND DUCT & PIPING SYSTEMS. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING EXACT LOCATIONS AND DIMENSIONS OF ALL EQUIPMENT, NEW AND TEMPORARY DUCT & PIPING COMPONENTS INCLUDING FINAL TIE-IN POINT LOCATIONS BETWEEN NEW AND EXISTING PIPING & DUCT SYSTEMS AND EQUIPMENT. NOTIFY ENGINEER OF ANY MAJOR DISCREPANCIES.
2. COORDINATE AND SCHEDULE ALL SHUTDOWNS AND TIE-INS WITH OWNER.
3. CONTRACTOR TO PROVIDE A COMPLETE AND WORKING SYSTEM.

GENERAL NOTES

1. MOUNT NEW BOILERS TO WALL. ANCHOR PER MANUFACTURERS INSTRUCTIONS.
2. ROUTE NEW 1" GAS LINE FROM EXISTING METER TO NEW BOILERS. SEE PID. SEAL PENETRATION WATER TIGHT.
3. ROUTE NEW 3" PVC INTAKE &FLUE UP THRU FIRST FLOOR & OUT SIDE OF BUILDING. SEE DETAIL.
4. NEW 2" HWS & HWR. TAP NEW PIPING UP STREAM OF PUMP. PROVIDE PUMP FOR EACH BOILER. INSULATE TO MATCH EXISTING.
5. FIRE STOP ALL PIPING AT FIRE WALL PENETRATION. MIN 1 HR RATING.
6. EXISTING 4" FLUID COOLER PIPING. SEAL PENETRATION WATER TIGHT. CONNECT INTO EXISTING HEAT PUMP LOOP. PARALLEL EXISTING GEO LOOPS. PROVIDE SHUT OFF VALVES FOR MAINTENANCE.
7. ROUTE BOILER DRAIN FROM NEUTRALIZATION TANK TO NEAREST FLOOR DRAIN. SLOPE IN DIRECTION OF FLOW AT $\frac{1}{8}$" PER FOOT.
8. BOILERS TO BE LOCATED IN EXISTING FIRE RATED ROOM.
9. FIRE STOP. PVC INTAKE & FLUE AT FLOOR TO SPACE ABOVE USE 3M FIRE BARRIER PLASTIC PIPE DEVICE.

KEYED NOTES

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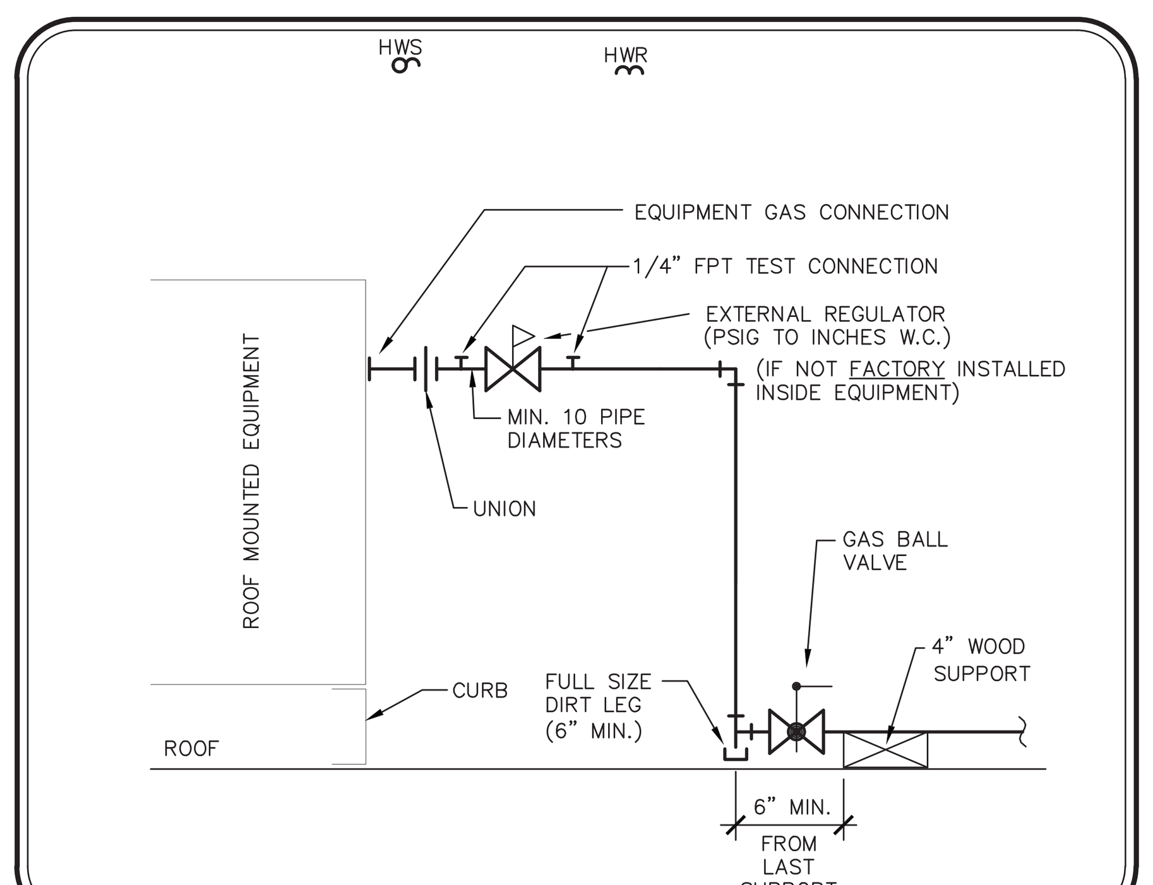
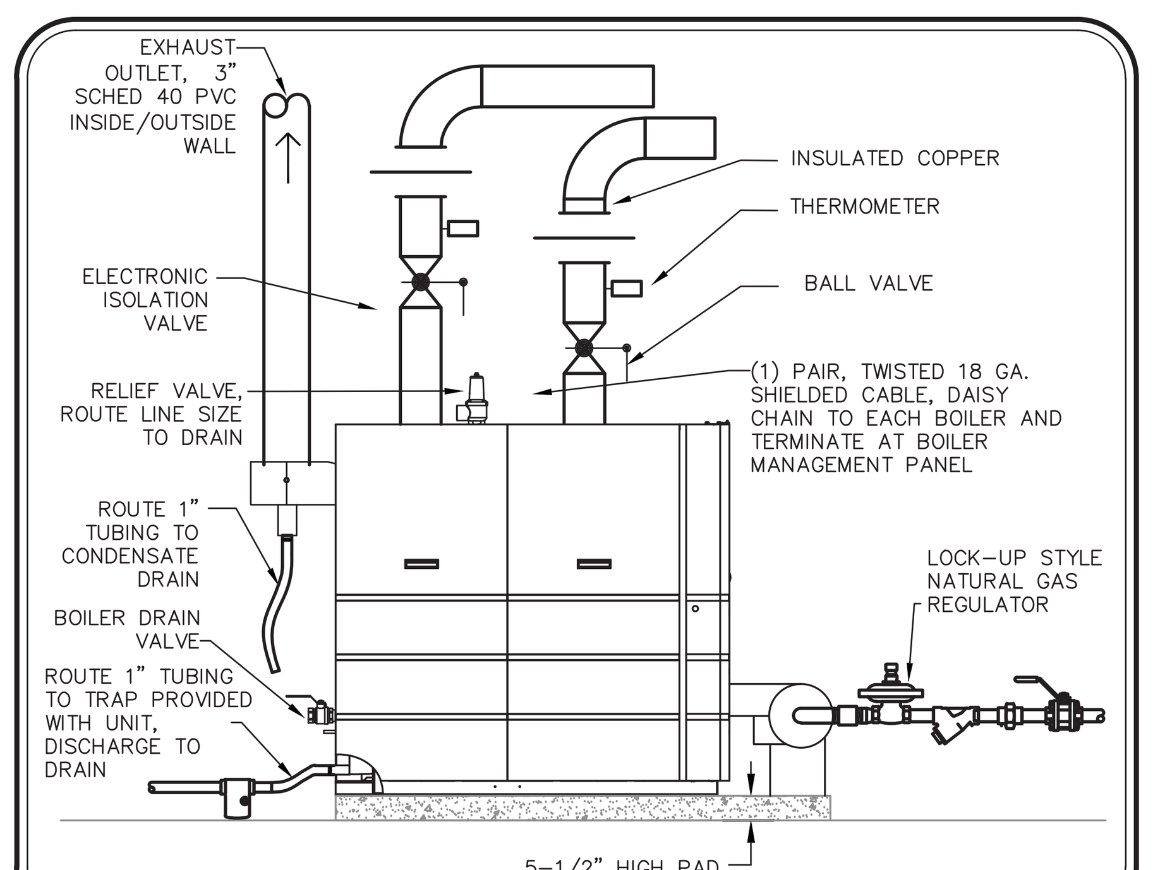


4 GAS CONNECTION DETAIL

M1.3

SCALE: NO SCALE

Detail NO.: PI002

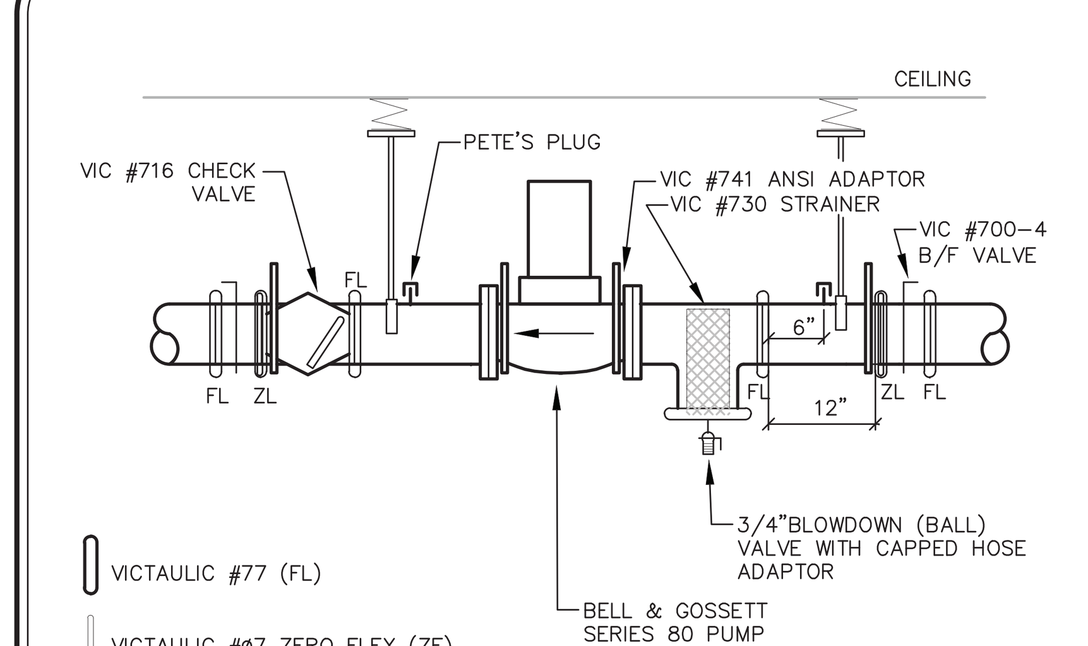


3 BOILER PIPING DETAIL

M1.3

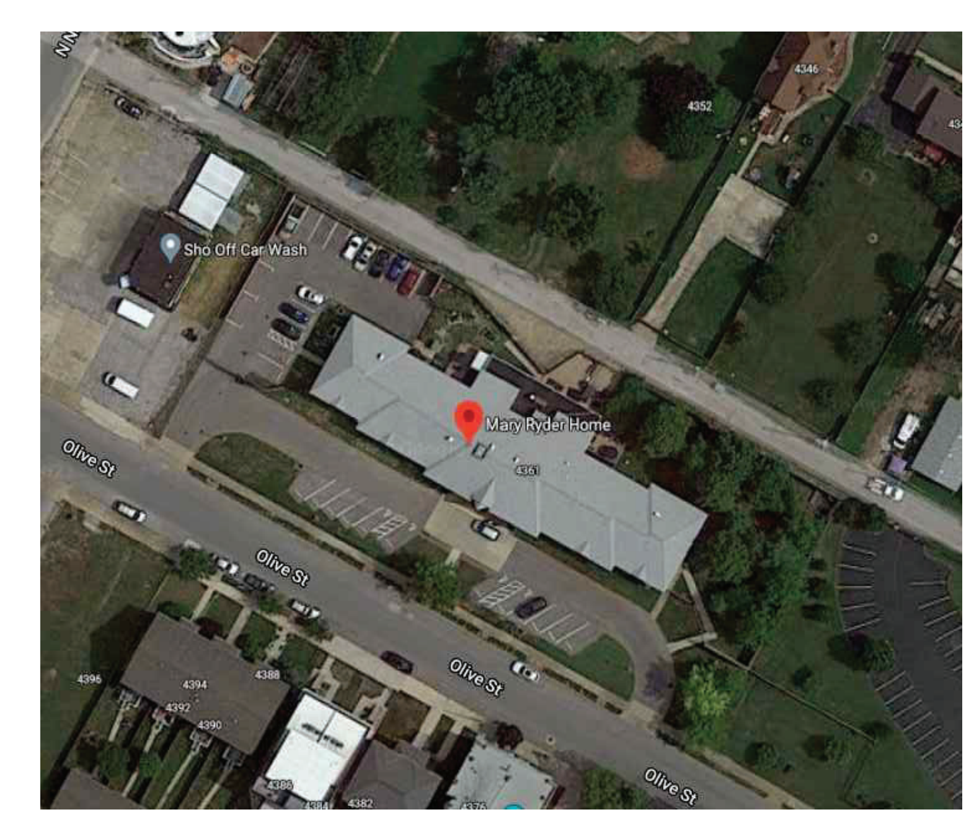
SCALE: NO SCALE

Detail NO.: PI005B



2 INLINE PUMP (HANGING ONLY)

M1.3



KEY PLAN

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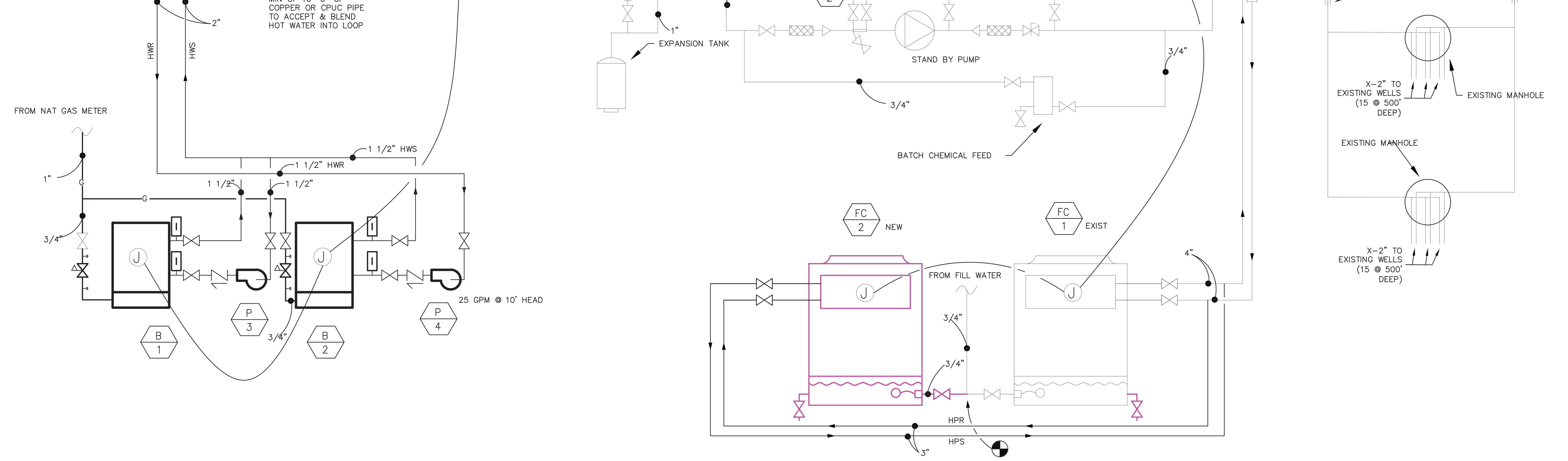

SEQUENCE OF CONTROL

- LOOP CONTROLLER SHALL ALLOW FOR MANUAL SET POINT ADJUSTMENT. AT HMI (HUMAN MACHINE INTERFACE GRAPHIC)
- LOOP CONTROLLER SHALL CYCLE ON BOILER & FLUID COOLER FAN TO MAINTAIN LOOP TEMPERATURE BETWEEN 40°F AND 95°F
- LOOP CONTROLLER TO STAGE BOILER & BOILER PUMP. BOILER LOOP TEMPERATURE TO RESET BASED ON OUTSIDE AIR TEMPERATURE. AT 40°F EXTERIOR HWS TEMP 120°F AT 80°F EXTERIOR, HWS TEMP IS 80°F.
- LOOP CONTROLLER TO MODULATE FLUID COOLER VSD AS NEEDED TO MAINTAIN FLUID LOOP TEMPERATURE.
- LOOP CONTROLLER TO ATTEMPT TO MAINTAIN 65°F LOOP TEMPERATURE ALL YEAR ROUND TO ALLOW HEAT PUMPS TO PROVIDE ADEQUATE SPACE COMFORT SETTINGS.

1 PI&D
M1.4 SCALE: NTS

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