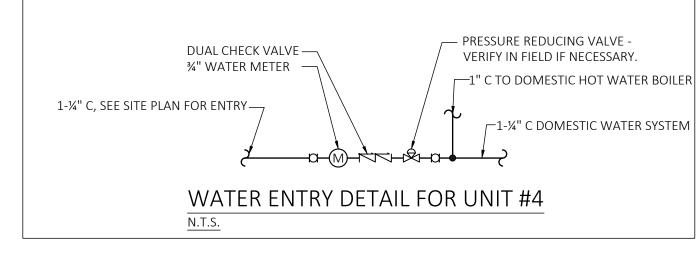
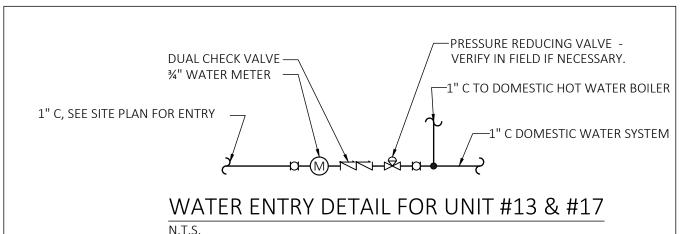
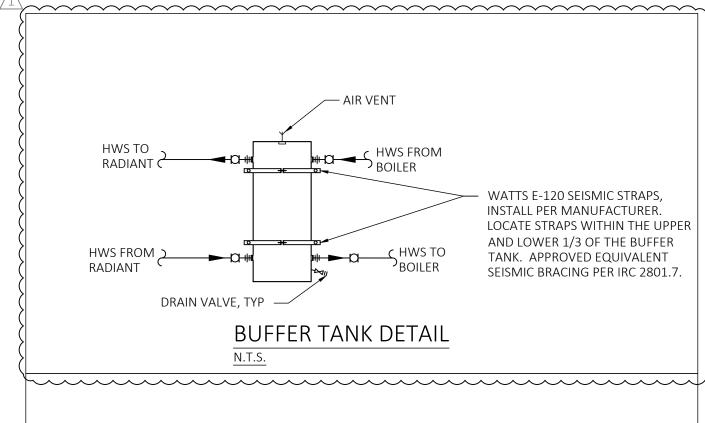
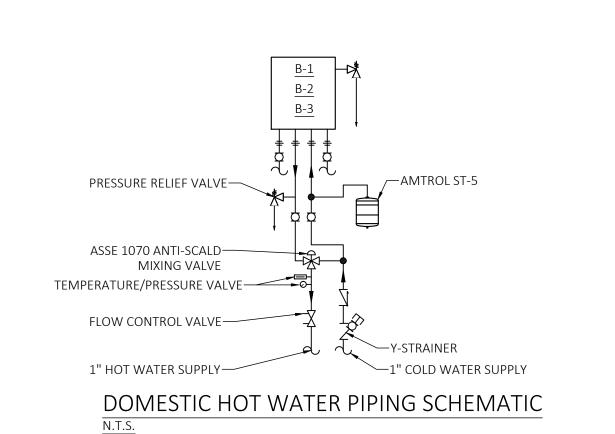
Village Nest Sheet Index					
Sheet Name					
Cover Sheet					
First and Second Floor Mechanical Plan Unit #4					
First and Second Floor Mechanical Plan Unit #13					
First and Second Floor Mechanical Plan Unit #17					
First and Second Floor Hydronic Plan Unit #4					
First and Second Floor Hydronic Plan Unit #13					
First and Second Floor Hydronic Plan Unit #17					
Piping Schematics					
Mechanical Equipment Schedules					
Mechanical and Plumbing Specifications					









UNIT#4 GAS LOAD SCHEDULE - PROPANE							
APPLIANCE QTY. BTUH RATINGS, SUBTOTAL							
BOILER	1	199,000	199000				
LONGEST LENGTH = 50'-0" TOTAL CONNECTED LOAD 199,000							
NOTES: INPUT LOADS ARE DERATED FOR ELEVATION PER							
MANUFACTURERS RECOMMENDATIONS.							

UNIT#13 & #	UNIT#13 & #17 GAS LOAD SCHEDULE - PROPANE						
APPLIANCE	QTY.	BTUH RATINGS, INPUT	SUBTOTAL				
BOILER	1	199,000	199000				
LONGEST LENGTH = 48'-0" TOTAL CONNECTED LOAD 199,000							
NOTES: INPUT LOADS ARE DERATED FOR ELEVATION PER							
MANUFA	MANUFACTURERS RECOMMENDATIONS.						

GENERAL NOTES

UNDER FLOOR AND ATTIC SPACES CONTAINING EQUIPMENT REQUIRING SERVICE SHALL HAVE AN UNOBSTRUCTED PATH WAY LARGE ENOUGH TO REMOVE THE EQUIPMENT, BUT NOT LESS THAN 30 INCHES WIDE BY 22 INCHES TALL. THE PATHWAY SHALL BE LESS THAN 20 FEET IN LENGTH. PROVIDE LUMINARIES CONTROLLED BY A SWITCH AT THE OPENING AND RECEPTACLE OUTLET AT OR NEAR ALL APPLIANCES.

PROVIDE 30 INCH DEEP BY 30 INCH WIDE BY 30 INCH HIGH LEVEL CLEAR SPACE IN FRONT OF EQUIPMENT FOR

- PROVIDE FLOOR DRAINS IN ALL LAUNDRY AND MECHANICAL ROOMS WITH SURE SEAL TRAP SEALER.
- LOCATE ALL E/A TERMINATIONS NOT LESS THAN 3' FROM OPENINGS INTO BUILDING AND MINIMUM OF 18" ABOVE GRADE. PROVIDE WALL CAP WITH BACKDRAFT DAMPERS AND SCREENS. VERIFY WALL CAP STYLE AND COLOR WITH ARCHITECT.
- LOCATE ALL O/A TERMINATIONS NOT LESS THAN 10' FROM E/A TERMINATIONS. PROVIDE WALL CAP WITH BACKDRAFT DAMPERS AND SCREENS.
- RADON MITIGATION SHALL BE INSTALLED PER IRC APPENDIX F. A PLUMBING TEE SHALL BE INSERTED BENEATH THE BASEMENT SLAB AND CONNECT TO A 4"Ø SCHEDULE 20 PVC VENT PIPE. THE VENT PIPE SHALL EXTEND U THROUGH THE BUILDING AND TERMINATE NOT LESS THAN 12 INCHES ABOVE THE ROOF IN A LOCATION AT LEAST 10 FEET FROM WINDOWS OR ANY OTHER OPENINGS INTO THE BUILDING OR ANY ADJACENT BUILDING. PROVIDE A POWER SOURCE IN THE ATTIC FOR FUTURE INSTALLATION OF FAN. IN THE EVENT RADON LEVELS ARE TESTED ABOVE ACCEPTABLE LEVELS, THE FAN SHALL BE SIZED FOR 90 TO 150 CFM AT 0" STATIC PRESSURE. PROVIDE RAIN CAP FOR THE TERMINATION.
- PROVIDE WATER HAMMER ARRESTORS AT QUICK CLOSING VALVES; DISH WASHERS; CLOTHES WASHER.

	A	ABBREVIATIO	NS	
—с— -	DOMESTIC COLD WATER	AFF	-	ABOVE FINISHED FLOOR
—н— -	DOMESTIC HOT WATER	BDD	-	BACK DRAFT DAMPER
-CIRC	RECIRCULATED HOT WATER	CFM	-	CUBIC FEET PER MINUTE
-HWS	HOT WATER SUPPLY	CLG	-	CEILING
-HWR	HOT WATER RETURN	CONN	-	CONNECT
— G — -	NATURAL GAS	CO	-	CLEANOUT
—MG— -	MEDIUM PRESSURE GAS	COTG	-	CLEANOUT TO GRADE
—LPG— -	LIQUID PROPANE GAS	DN	-	DOWN
— GW — -	GREASE WASTE PIPE	(E)	-	EXISTING
— ST — -	STORM DRAIN PIPE	EAT	-	ENTERING AIR TEMPERATURE
- ST(OF) - -	STORM DRAIN OVERFLOW	E/A	-	EXHAUST AIR
- W	WASTE PIPE	EWT	-	ENTERING WATER TEMPERATURE
—V— -	PLUMBING VENT PIPE	FA	-	FREE AREA
		FCO	-	FLOOR CLEANOUT
		GPM	-	GALLONS PER MINUTE
		LAT	-	LEAVING AIR TEMPERATURE
		LWT	-	LEAVING WATER TEMPERATURE
		(N)	-	NEW
		OBD	-	OPPOSED BLADE VOLUME DAMPER
		OC	-	ON CENTER
		O/A	-	OUTSIDE AIR
		R/A	-	RETURN AIR
		S/A	-	SUPPLY AIR
		TYP	-	TYPICAL
		UNO	-	UNLESS NOTED OTHERWISE
		W/	-	WITH
		WCO	-	WALL CLEANOUT
		SF	-	SQUARE FEET
		LEGEND		

	TEEN CONTILECTION	T	1103E DID
%	DIFFERENTIAL PRESSURE REGULATOR	J	
ح	PIPE BREAK	ſ	AIR SEPERATOR
•	POINT OF CONNECTION		
ı l ı	UNION	丸	PRESSURE RELIEF VALVE
- ₩II	DRAIN VALVE	Ţ	
\bowtie	CIRCUIT SETTER	,	
а	BALL VALVE	TAG SIZE	
\Box	CHECK VALVE	FLOW	DIFFUSER TAG
$\stackrel{\circ}{\bowtie}$	CONTROL VALVE	LOCALE	TUEDA AGOTA T
Ŕ	3 WAY CONTROL VALVE	0	THERMOSTAT
Θ	ISOLATION VALVE	\oplus	HUMIDISTAT STAT
\bowtie	PLUG VALVE	\bigcirc	VENTILATION CONTROLLER
Ø	PRESSURE REDUCING VALVE	\$	PUSH BUTTON/SWITCH
Д	ACTUATOR	<u>s</u>	REMOTE SENSOR
Y	AIR VENT		SECTION THRU O/A OR S/A D
\Box	CAP		SECTION THRU R/A OR E/A DI
FS	FLOW SWITCH		SECTION THRU N/A OR E/A DO

PRESSURE GAUGE PRESSURE SWITCH

I_/1 STRAINER

↑ P AND T PLUG

TEMPERATURE GAUGE

OR S/A DUCT OR E/A DUCT ——— OPPOSED BLADE MANUAL DAMPER

——M MOTORIZED DAMPER BACKDRAFT DAMPER

 ■ BUILDING
 ■ STRUCTURA
 ■ MECHANICAL
 ■ CHARLE
 ■ ACCESSIBILITY
 ■ FIRE PLAN REVIEW ACCEPTANCE OF DOCUMEN DOES NOT AUTHORIZE CONSTRUCTION T PROCEED IN VIOLATION OF ANY FEDERAL STATE, OR LOCAL REGULATIONS. MEM

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1322 Pacific Avenue Venice, C. T: 310 399 5757 F: 310 399 3. The use of these plans & specifications shall be rewith HUGHES UMBANHOWER ARCHITECTS, Umbanhower Hughes

VILLAGE 5778 N. DAY EDEN, UTAF

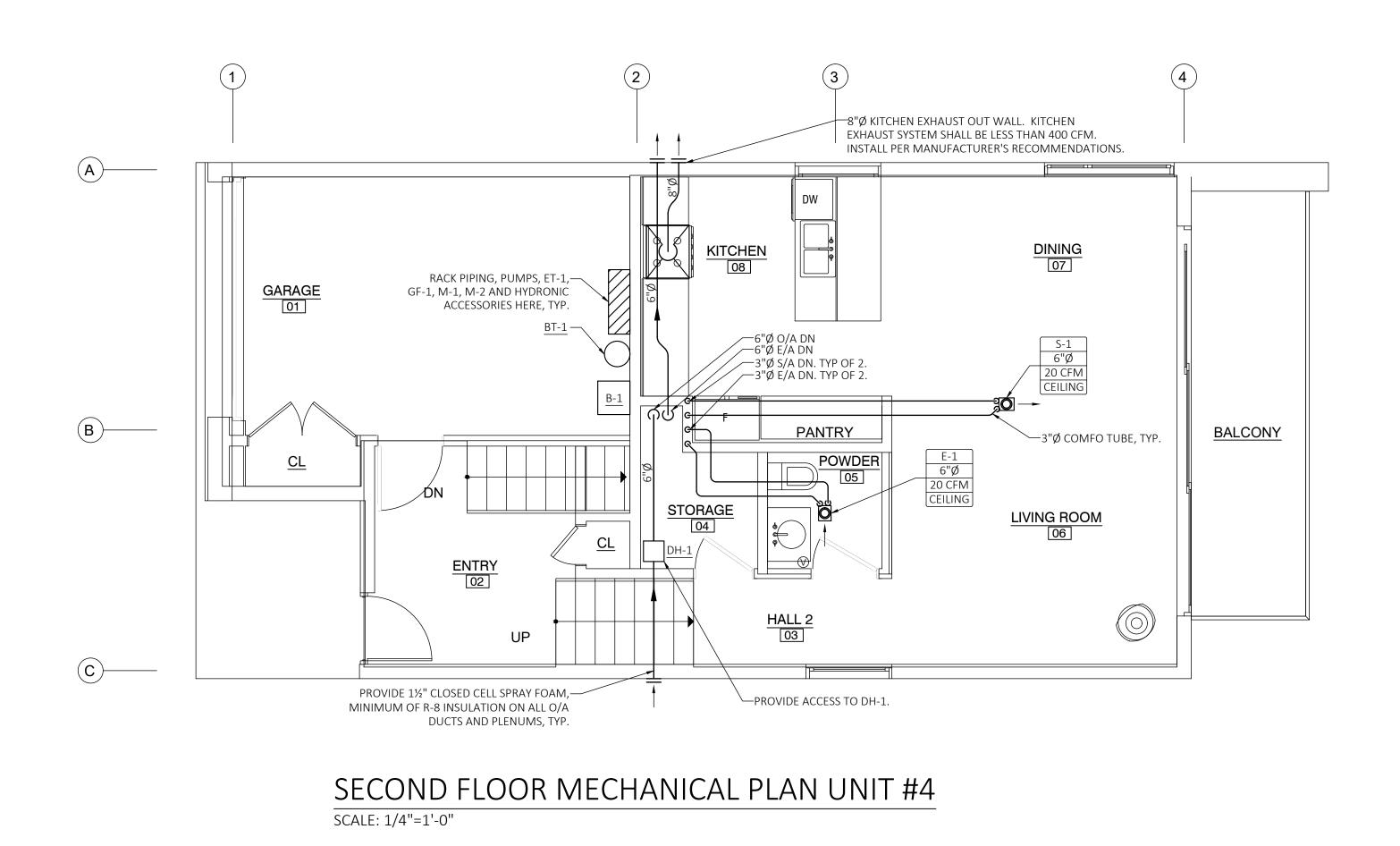
Architects

10/30/17

COUNTY

COMMENTS

CD SET 11/13/17



10/30/17 CD SET 11/13/17

COUNTY COMMENTS

> VILLAGE NEST 5778 N. DAYBREAK E EDEN, UTAH 84310

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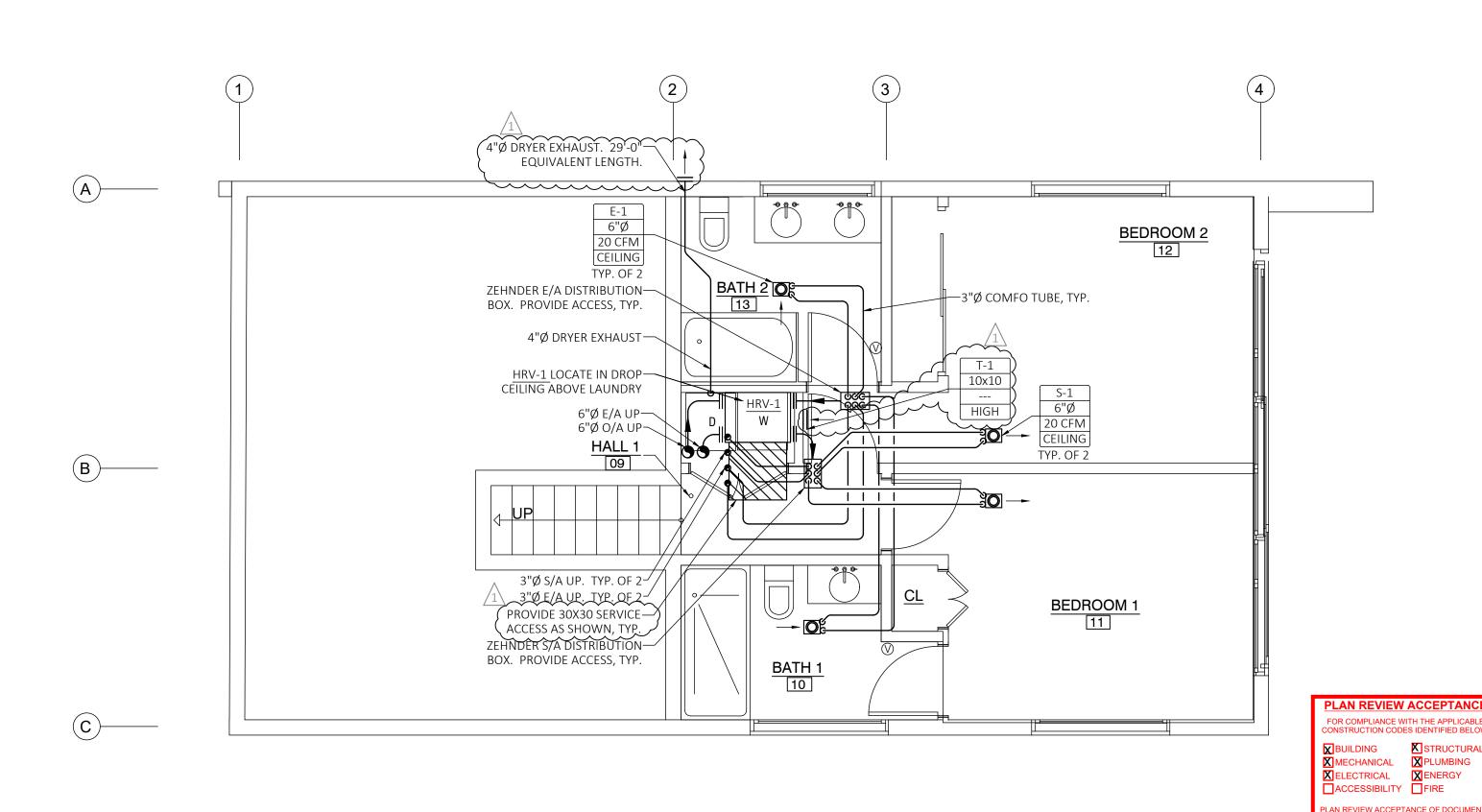
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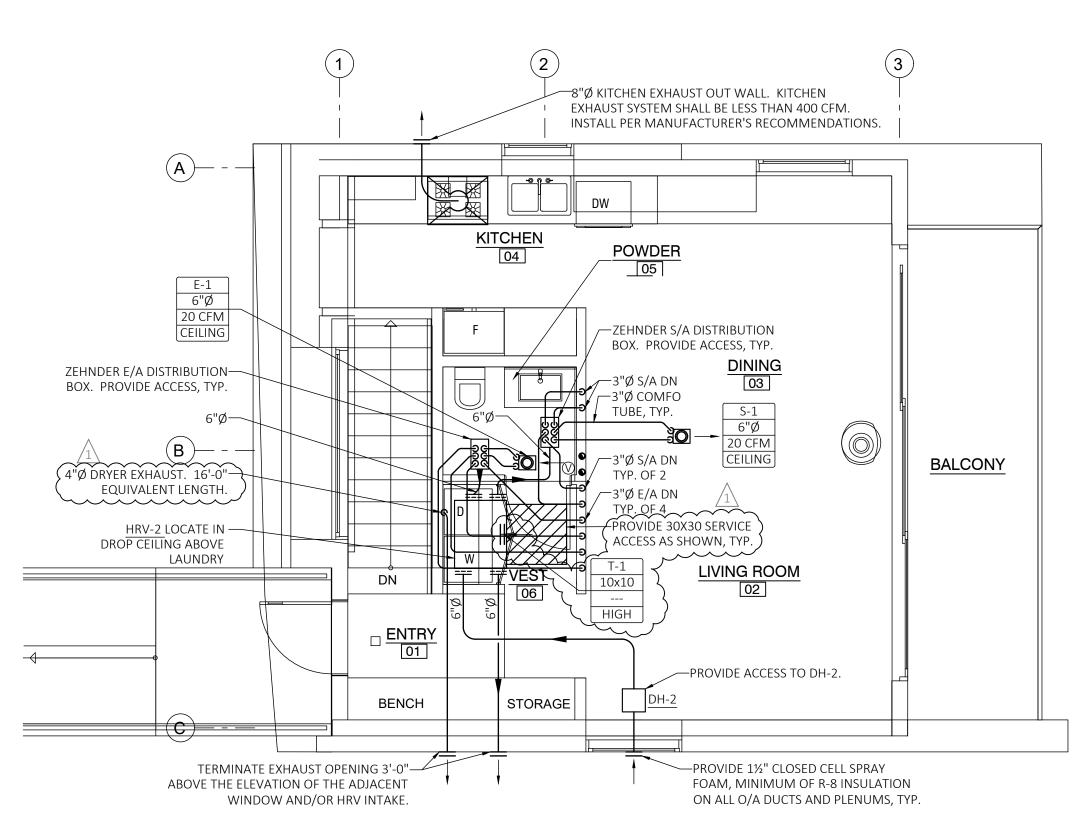
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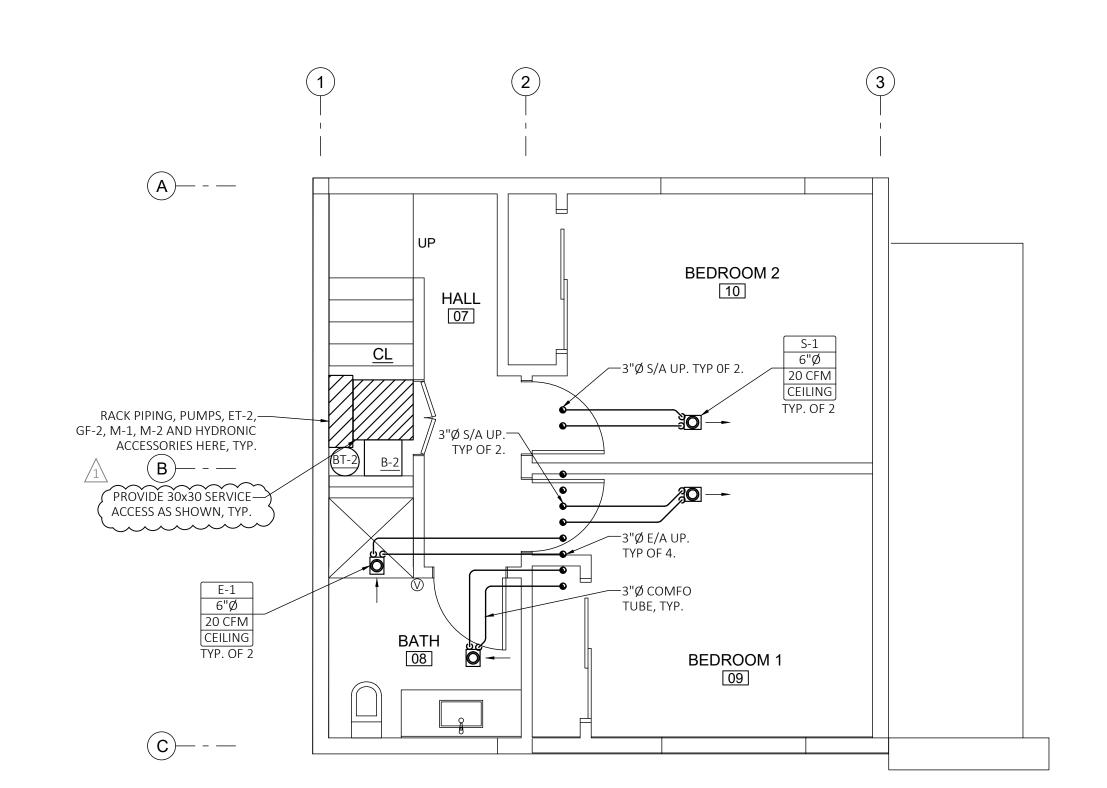


FIRST FLOOR MECHANICAL PLAN UNIT #4

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



SECOND FLOOR MECHANICAL PLAN UNIT #13 SCALE: 1/4"=1'-0"



FIRST FLOOR MECHANICAL PLAN UNIT #13 SCALE: 1/4"=1'-0"

 XBUILDING
 XSTRUCTURA
 XMECHANICAL
 XPLUMBING
 XELECTRICAL
 XENERGY
 ACCESSIBILITY
 TRE MEM EST COAST CODE CONSULTANTS, INC

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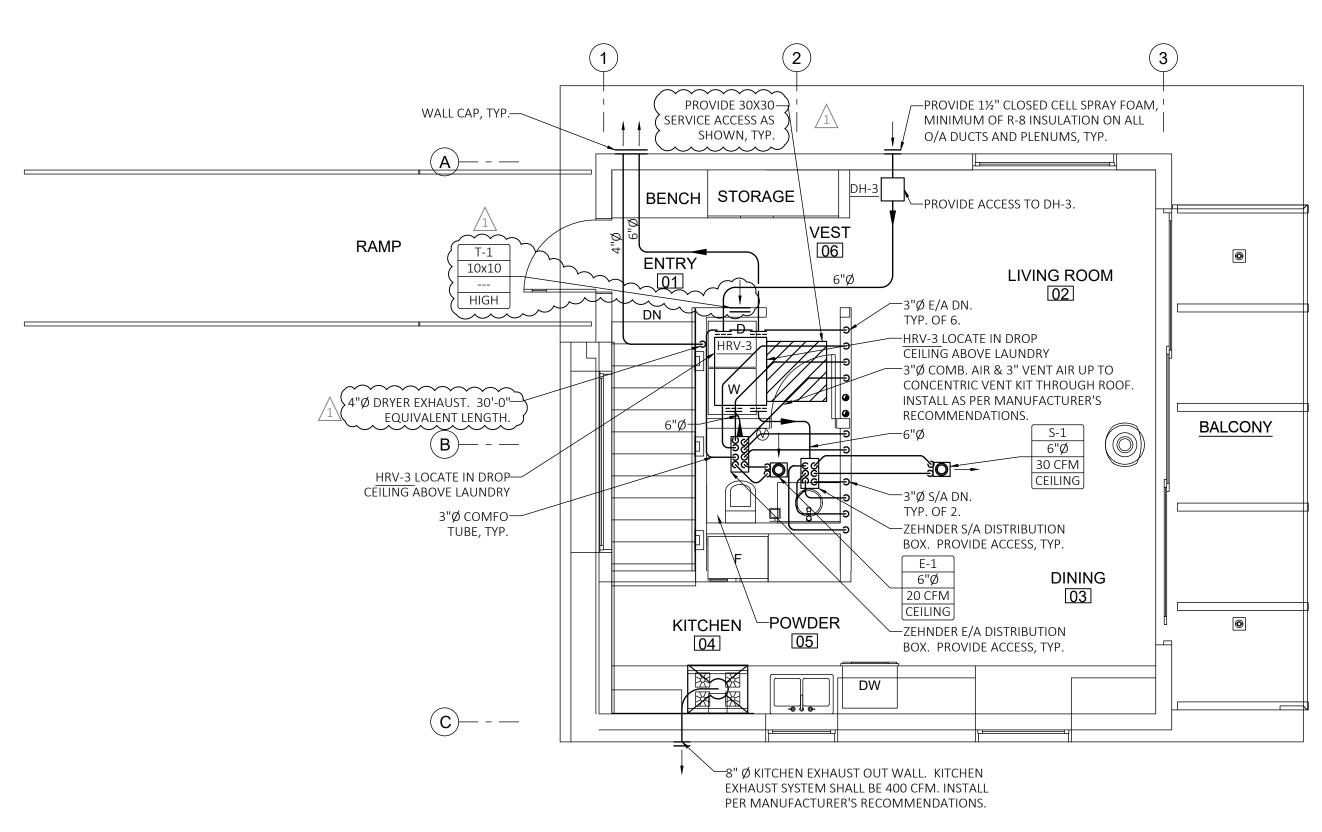
10/30/17 CD SET 11/13/17

COUNTY COMMENTS

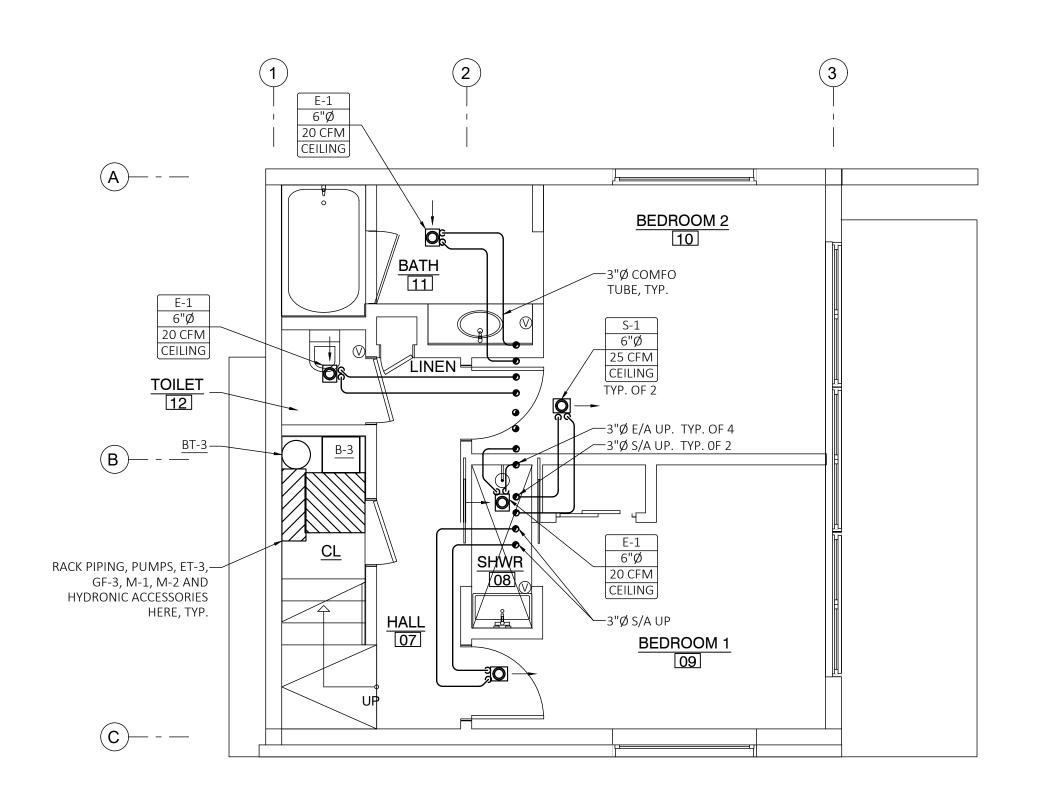
VILLAGE NEST 5778 N. DAYBREAK E EDEN, UTAH 84310

Architects

Umbanhower



SECOND FLOOR MECHANICAL PLAN UNIT #17 SCALE: 1/4"=1'-0"



FIRST FLOOR MECHANICAL PLAN UNIT #17 SCALE: 1/4"=1'-0"

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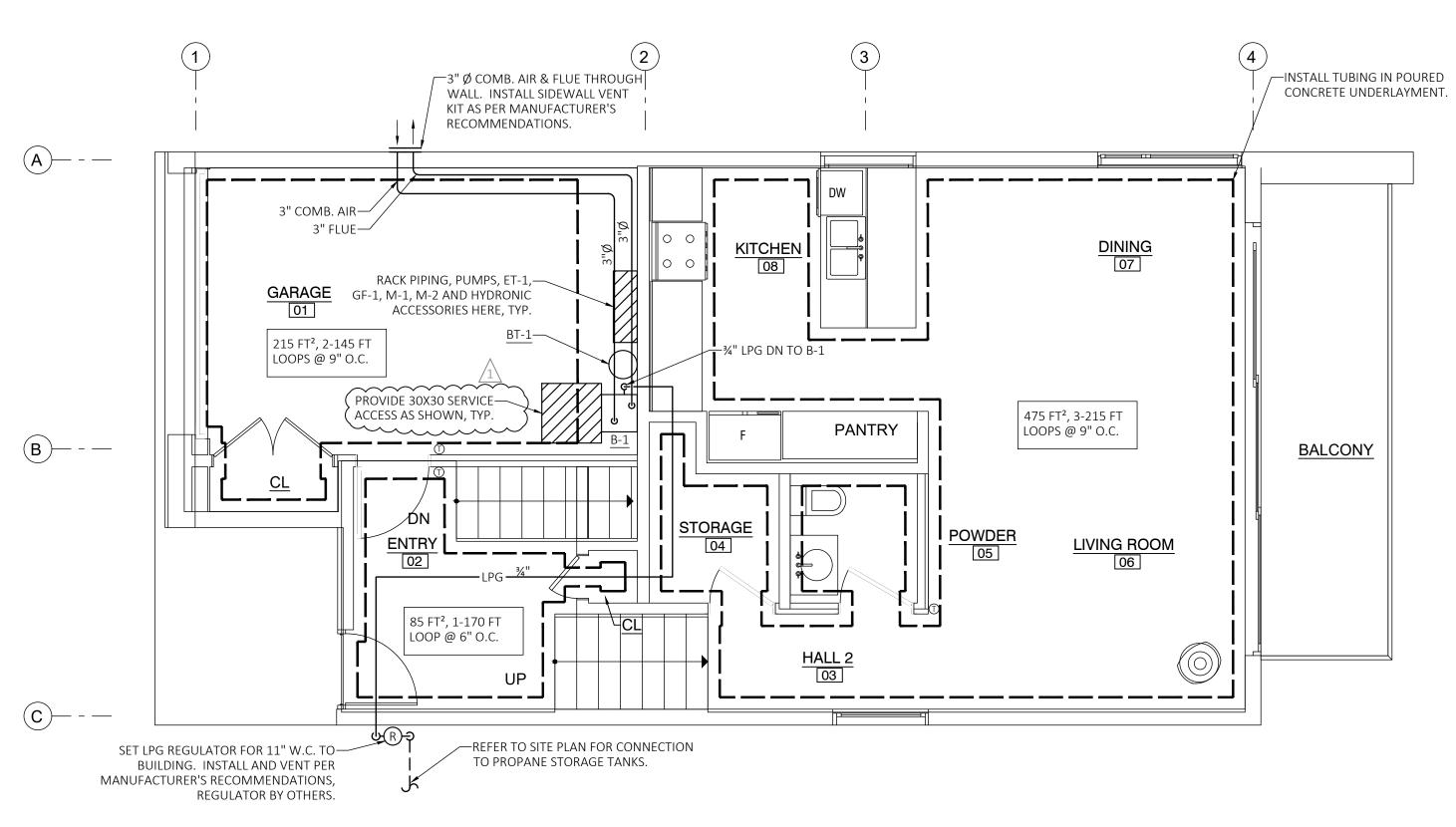
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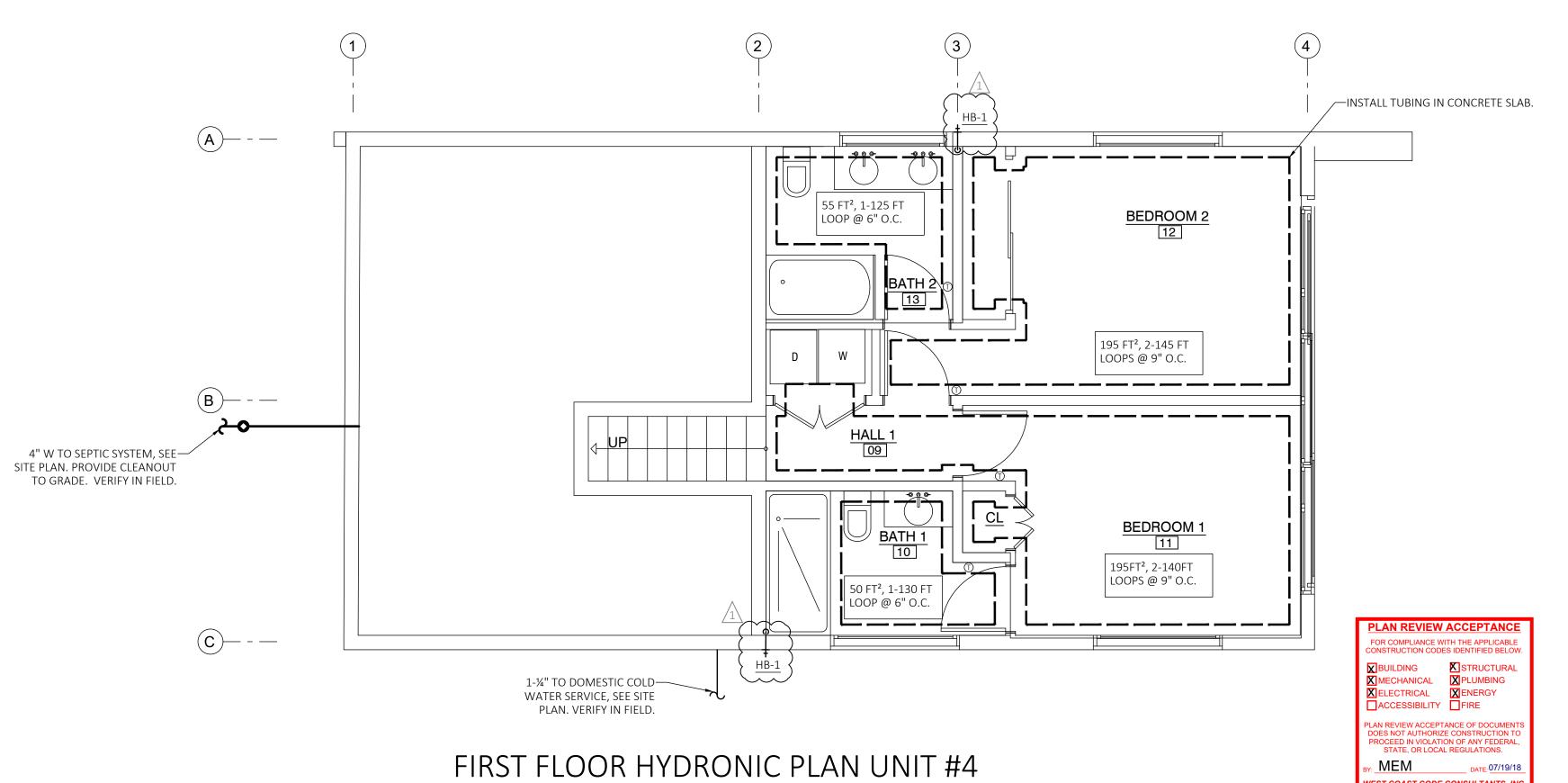
COUNTY COMMENTS

BRIDGE

VILLAGE NEST 5778 N. DAYBREAK E EDEN, UTAH 84310



SECOND FLOOR HYDRONIC PLAN UNIT #4 SCALE: 1/4"=1'-0"



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

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COUNTY COMMENTS

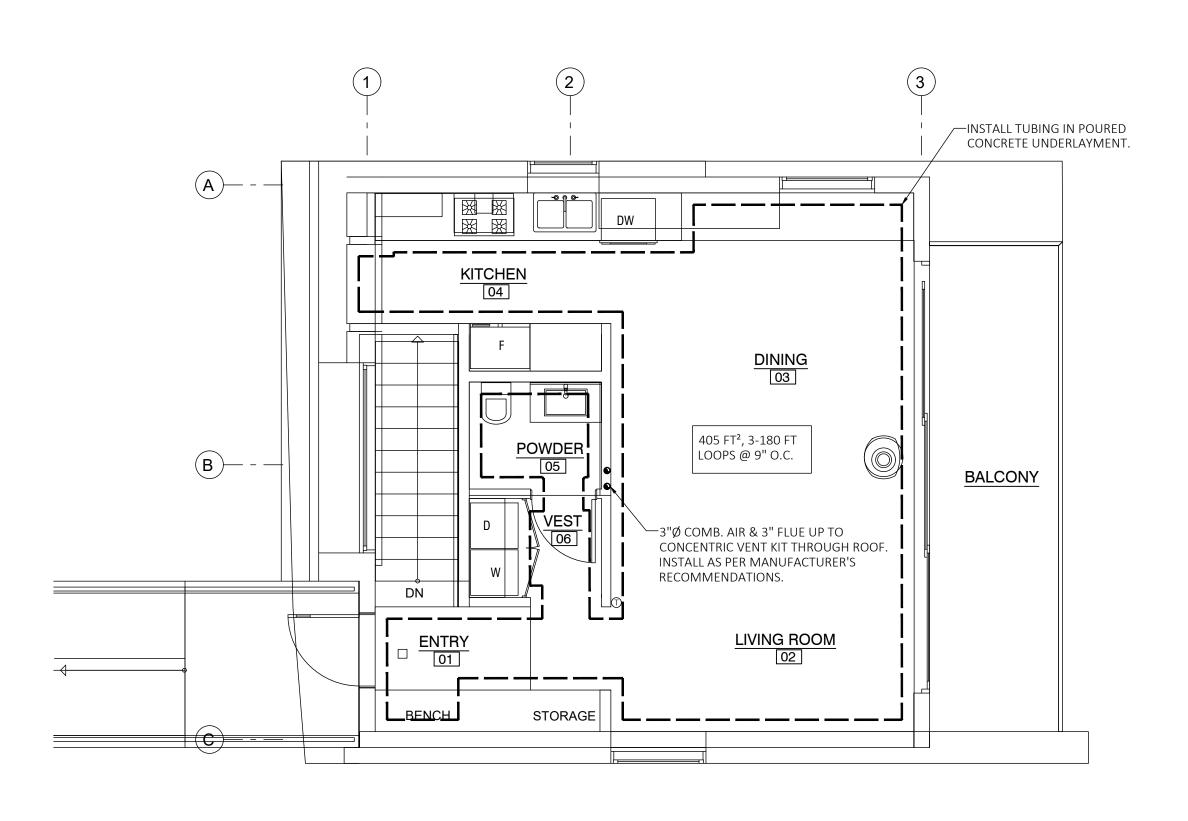
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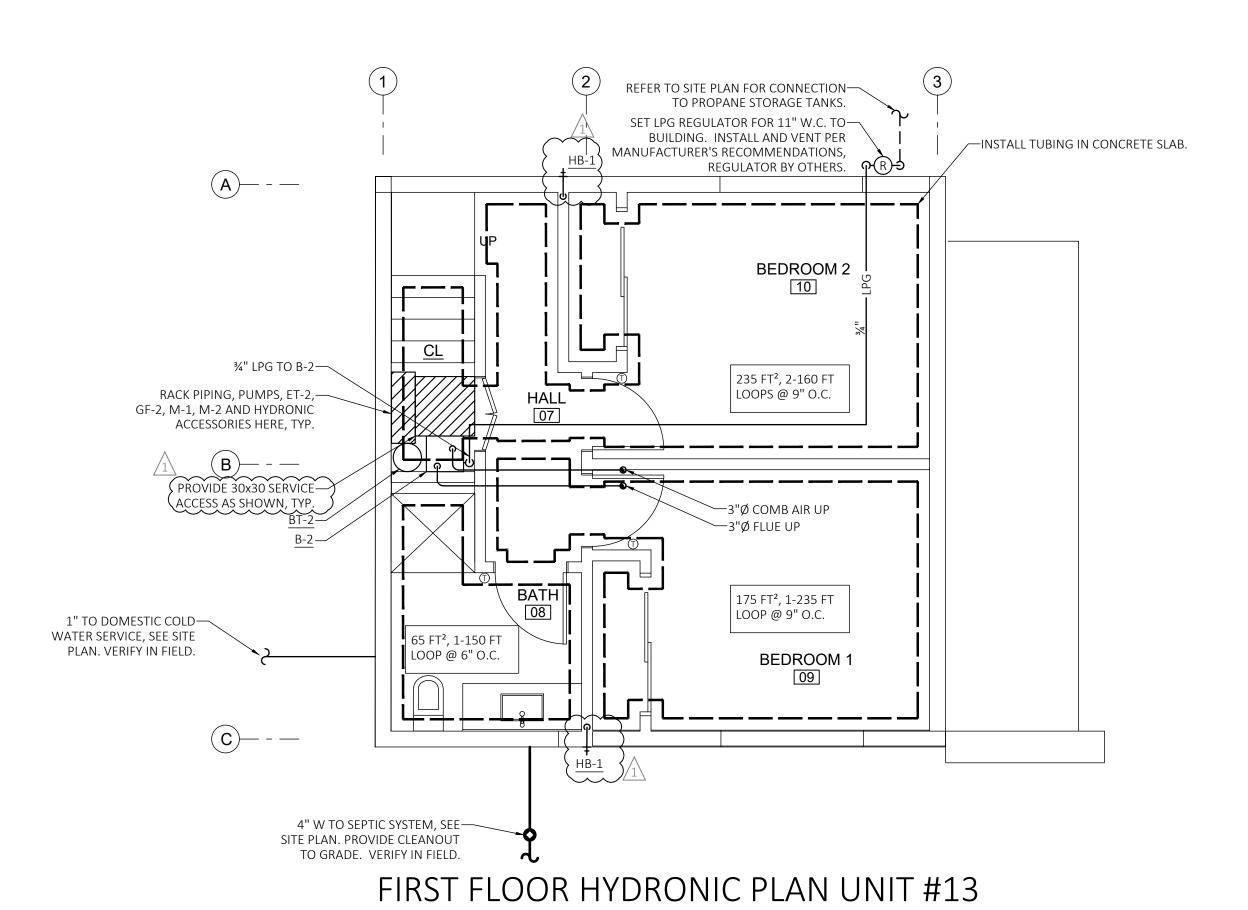
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SECOND FLOOR HYDRONIC PLAN UNIT #13 SCALE: 1/4"=1'-0"



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

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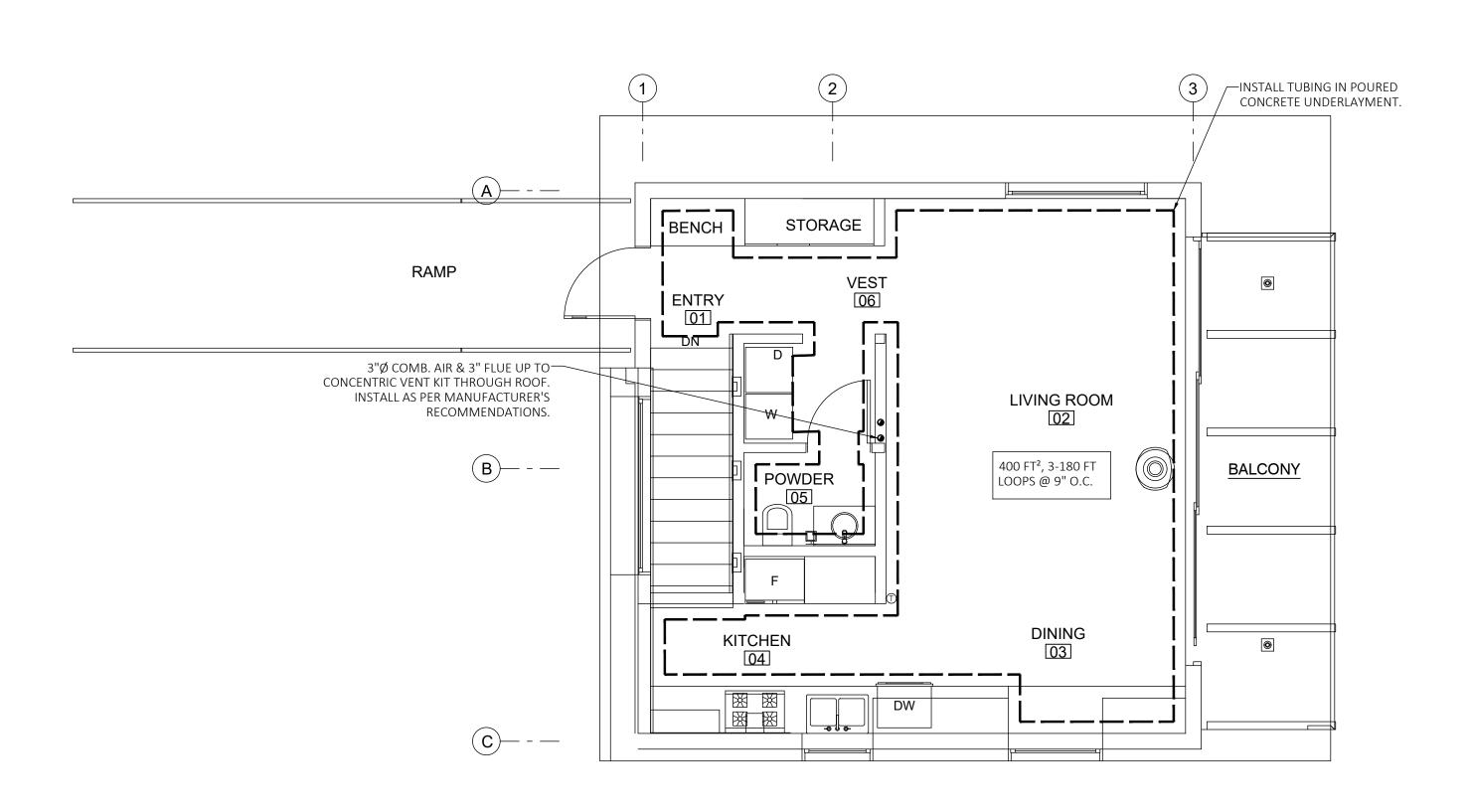
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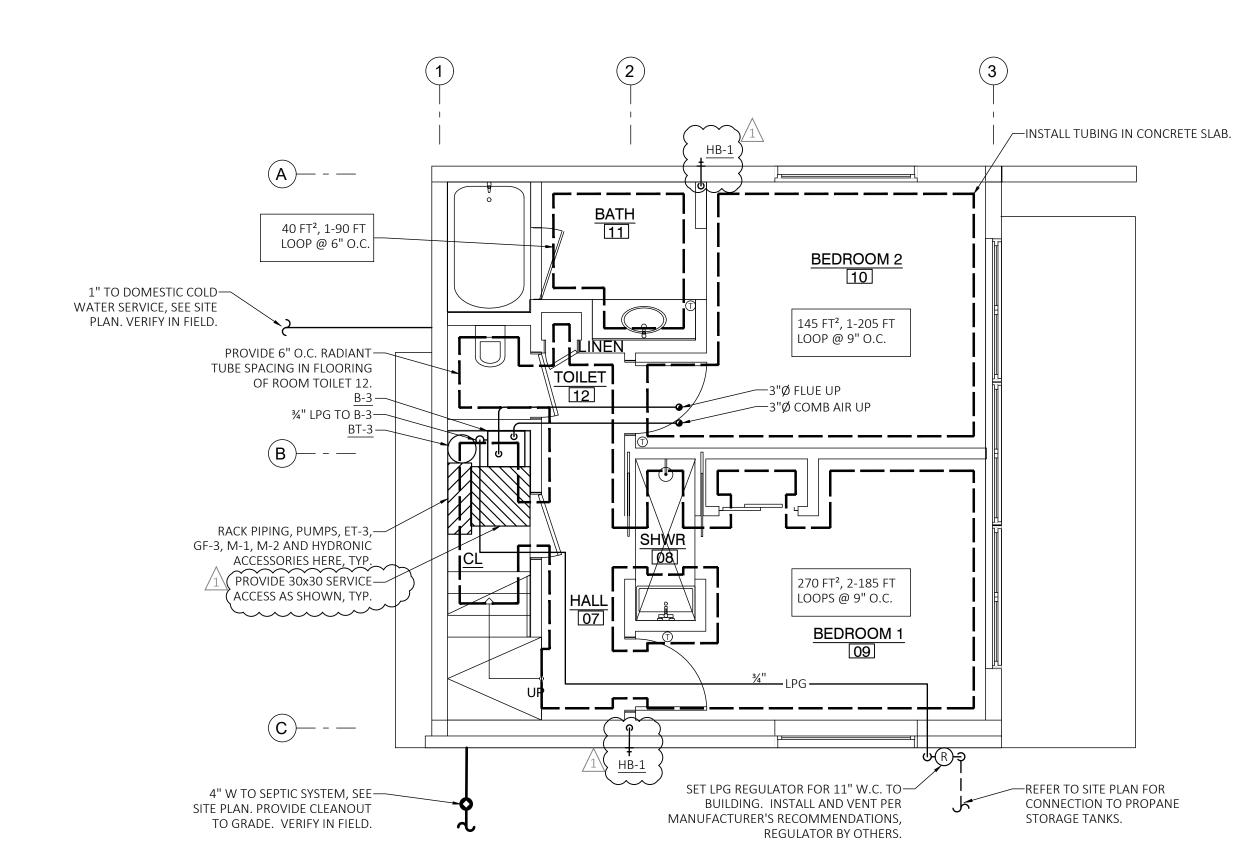
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1322 Pacific T: 310 399



SECOND FLOOR HYDRONIC PLAN UNIT #17

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



FIRST FLOOR HYDRONIC PLAN UNIT #17
SCALE: 1/4"=1'-0"

PLAN REVIEW ACCEPTANCE

FOR COMPLIANCE WITH THE APPLICABLE CONSTRUCTION CODES IDENTIFIED BELOW.

BUILDING STRUCTURAL PLUMBING ELECTRICAL ENERGY

ACCESSIBILITY FIRE

PLAN REVIEW ACCEPTANCE OF DOCUMENTS DOES NOT AUTHORIZE CONSTRUCTION TO PROCEED IN VIOLATION OF ANY FEDERAL, STATE, OR LOCAL REGULATIONS.

BY: MEM DATE:07/19/18

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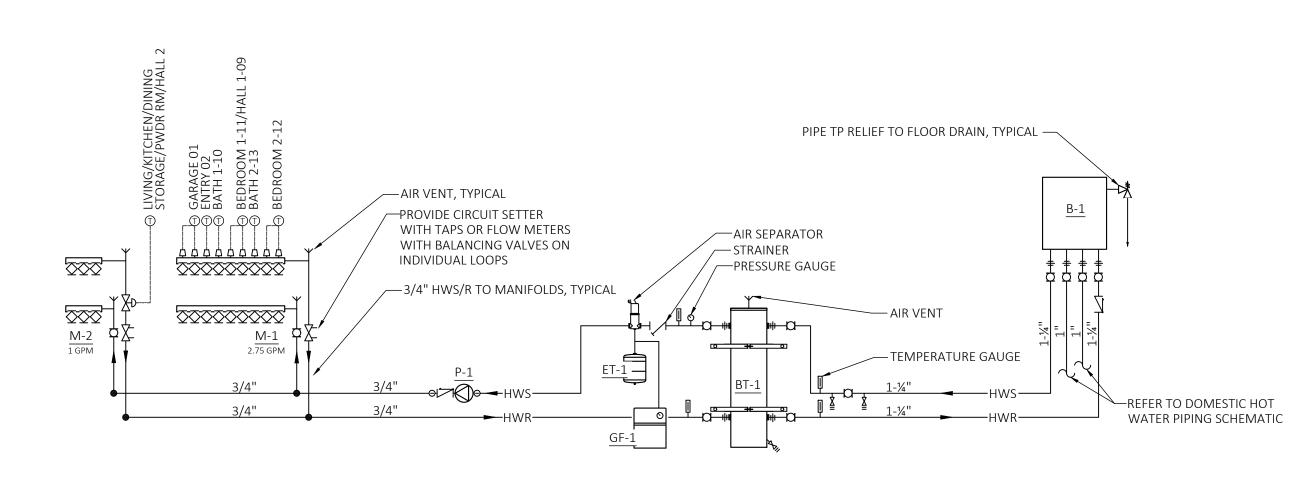
Architects

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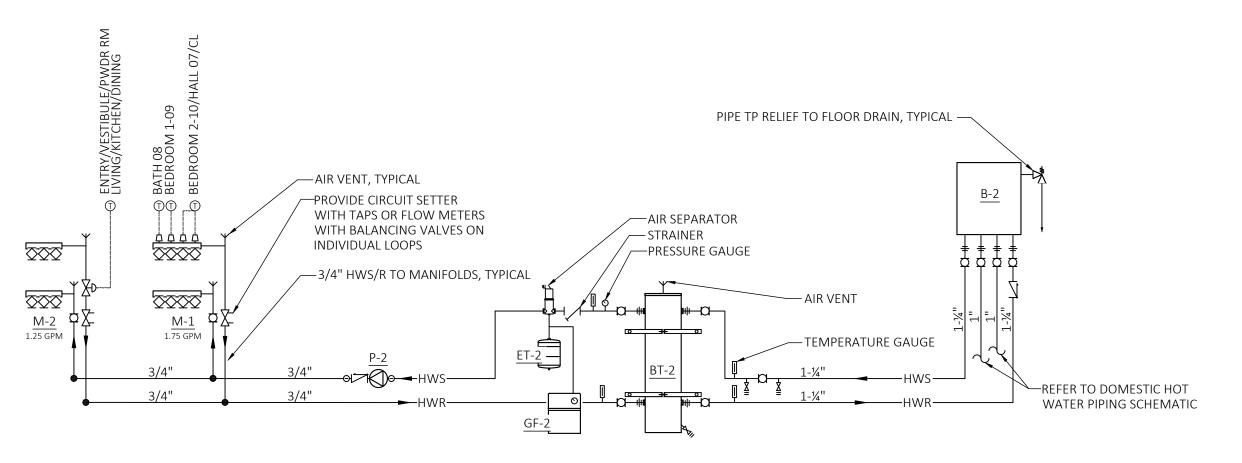
Hughes

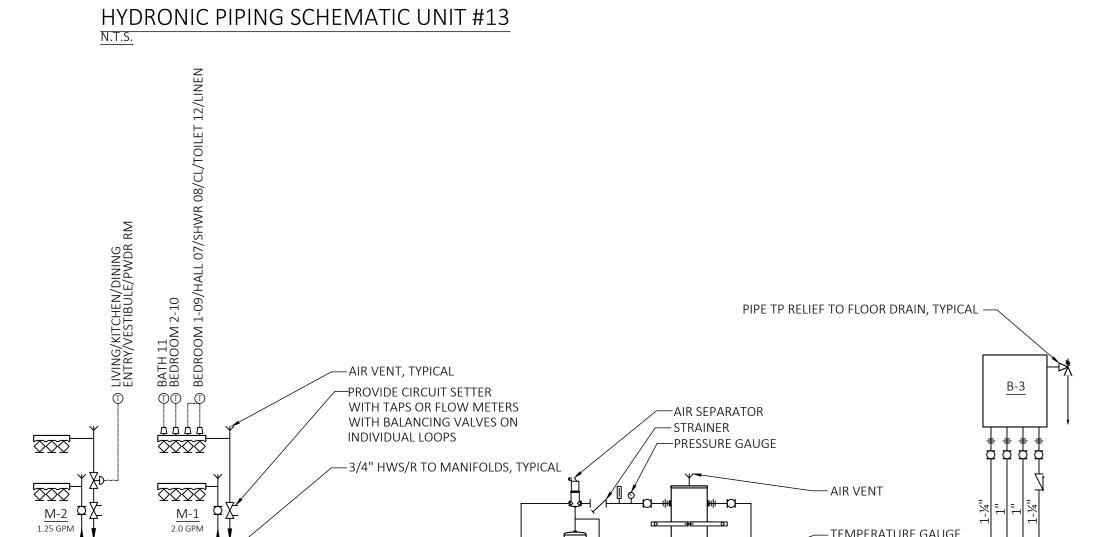
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HYDRONIC PIPING SCHEMATIC UNIT #4





GF-3

HYDRONIC PIPING SCHEMATIC UNIT #17
N.T.S.

MEM EST COAST CODE CONSULTANTS, INC

REFER TO DOMESTIC HOT WATER PIPING SCHEMATIC

TEMPERATURE GAUGE

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10/30/17 CD SET

BRIDGE

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1322 Pacific T: 310 399

PIPE HANGER SPACING INTERVALS							
PIPE TYPE PIPE SIZE HORIZONTAL SPACING VERTICAL SPACIN							
	½" THROUGH 1 ¼"	8'-0"	15'-0"				
STEEL PIPE	1½" AND 2"	10'-0"	15'-0"				
	2½" AND 3"	12'-0"	15'-0"				
	1/2"	6'-0"	6'-0"				
STEEL PIPE, GAS	¾ " AND 1"	8'-0"	8'-0"				
	1 1/4" AND ABOVE	10'-0"	EVERY FLOOR				
CODDED DIDE	½" THROUGH 1 ½"	6'-0"	10'-0"				
COPPER PIPE	2" AND ABOVE	10'-0"	10'-0"				
PEX	½" THROUGH 1"	2'-8"	10'-0"				
PEX-AL-PEX	½" THROUGH 1"	2'-8"	4'-0"				
CAST IRON	2" THROUGH 4"	5'-0" OR 1 EACH JOINT	15'-0"				
ABS & PVC	1½" AND ABOVE	4'-0"	10'-0"				

• SPACING SHOWN ARE MAXIMUM. USE CLOSER SPACING IF REQUIRED BY THE

PLUMBING FIXTURE CONNECTION SCHEDULE									
FIXTURE	Н	С	W	>	FIXTURE	Н	С	W	\ \
WATER CLOSET FLUSH TANK	-	1/2"	4"	2"	KITCHEN SINK	1/2"	1/2"	2"	1½"
WATER CLOSET FLUSH VALVE	-	1"	4"	2"	BAR SINK	½"	1/2"	1½"	1½"
URINAL	-	1"	2"	1½"	DISH WASHER	½"	-	2"	1½"
LAVATORY	1/2"	1/2"	2"	1½"	MOP SINK	½"	1/2"	3"	2"
SHOWER	3/4"	3/4"	2"	1½"	LAUNDRY SINK	½"	1/2"	2"	1½"
BATH TUB	3/4"	3/4"	2"	1½"	CLOTH WASHER	½"	1/2"	2"	1½"
HOSE BIB	-	3/4"	-	-	FLOOR SINKS			3"	2"

- SIZES SHOWN ARE MINIMUM CONNECTIONS TO INDIVIDUAL FIXTURES. USE LARGER PIPE SIZES WHEN RECOMMENDED BY THE MANUFACTURER.
- PROVIDE MINIMUM 3/4" PIPE TO 2 OR MORE FIXTURES. REDUCE SIZE AT FIXTURE AS

NO. MANUFACTURER & MODEL WB-1 GUY GRAY MODEL NO. EB-200		
		WASHING MACHINE BOX (WB)
WB-1 GUY GRAY MODEL NO. FB-200	NO.	MANUFACTURER & MODEL
TO THE TOTAL PROPERTY OF THE TOTAL PROPERTY	WB-1	GUY GRAY MODEL NO. FB-200

- PROVIDE CLOTHES WASHER ROUGH-IN BOX FOR HOT AND COLD WATER LINES AND WASTE ROUGH-IN BOX SHALL HAVE HOT AND COLD WATER SHUT-OFF AND SHALL BE EQUIPPED WITH AN OVERFLOW GUARD.
- FABRICATED OF 16 GAUGE STEEL WITH EPOXY FINISH.
- 2" WASTE CONNECTION, 1/2" COLD AND HOT WITH BRASS SWEAT CONNECTION.

	FLOOR DRAIN SCHEDULE						
EQ. TAG	SERVING	MANUFACTURER & MODEL#					
FD-1	FLOOR DRAIN	ZURN Z415					
	NOTES: PROVIDE SURE SEAL TRAP SEAL. DRAIN SAME SIZE AS PIPE.						

PUMP SCHEDULE							
EQ. TAG	SERVING	D. TAG SERVING FLOW FEET OF		ELECTRICAL DATA		MANUFACTURER &	
,			HEAD -	W OR HP	VOLTS/ PH	MODEL#	
P-1	RADIANT FLOOR	3.75 GPM	10	45 W	120/1	GRUNDFOS ALPHA 15-55F	
P-2	RADIANT FLOOR	3.0 GPM	10	45 W	120/1	GRUNDFOS ALPHA 15-55F	
P-3	RADIANT FLOOR	3.25 GPM	10	45 W	120/1	GRUNDFOS ALPHA 15-55F	

- PROVIDE ISOLATION FLANGES OR UNIONS AND BALL VALVES. INCLUDE ALL NECESSARY NUTS, GASKETS, ETC.
- PROVIDE INTEGRAL CHECK VALVE.

	BOILER SCHEDULE							
EQ. TAG	SERVING	RATED INPUT @ SEA LEVEL	ELECTRICAL DATA	MANUFACTURER & MODEL #				
B-1	UNIT 4	199,000 BTU	120V, 1PH, 15A	LOCHINVAR NKC199L				
B-2	UNIT 13	199,000 BTU	120V, 1PH, 15A	LOCHINVAR NKC199L				
B-3	UNIT 17	199,000 BTU	120V, 1PH, 15A	LOCHINVAR NKC199L				

- PROVIDE 30 PSI T&P RELIEF VALVE, WATER TEMPERATURE LIMIT SWITCH,
- HIGH ALTITUDE KIT, FACTORY INCLUDED BOILER PUMP, LOW WATER CUTOFF,
- OUTDOOR AIR SENSOR WITH OUTDOOR RESET. BOILER FUEL: PROPANE, 95% AFUE

• MAX PRESSURE: 75 PSI

BUFFER TANK SCHEDULE							
EQ. TAG	SERVING	SIZE H/D	MANUFACTURER & MODEL #				
BT-1	B-1	18 GAL	46"/14 1/4"	BOILER BUDDY BB-18			
BT-2	B-2	18 GAL	46"/14 1/4"	BOILER BUDDY BB-18			
BT-3	B-3	18 GAL	46"/14 1/4"	BOILER BUDDY BB-18			
NOTES:							

EXPANSION TANK SCHEDULE							
EQ. TAG	SERVING	TOTAL VOLUME	ACCEPTANCE VOLUME	SIZE H/D	MANUFACTURER & MODEL #		
ET-1	UNIT #4	4.4 GAL	2.5 GAL	15 ½"/11"	EXTROL 30		
ET-2	UNIT #13	4.4 GAL	2.5 GAL	15 ½"/11"	EXTROL 30		

EQUIVALENT OR ENGINEER APPROVED.

WELDED STEEL CONSTRUCTION WITH BLADDER COMPATIBLE WITH PROPYLENE AND

ET-3 UNIT #17 4.4 GAL 2.5 GAL 15 ½"/11" EXTROL 30

ETHYLENE GLYCOL. MAX WORKING PRESSURE OF 60 PSI AND MAX WORKING TEMP OF 200°F.

/	~~~	······	······	<u>/</u> 1		
\ \ \	HOSE BIBB SCHEDULE					
\ \ \	EQ. TAG	SERVING	MANUFACTURER & MODEL #	\ < <		
>	HB-1	HOSE BIBB	WOODFORD MODEL 25 FREEZELESS FAUCET	ا پ		
>	NOTES:			k		

FREEZELESS WALL FAUCET WITH ¾" HOSE THREAD AND VACUUM BREAK
 SHALL BE ASSE 1019B AND 1011 APPROVED

AIR TO AIR HEAT EXCHANGER SCHEDULE						
EQ. TAG	SERVING	CFM	ESP (IN.)	ELECTRICA DUCT HEATER	L DATA	MANUFACTURER & MODEL #
HRV-1 & DH-1	UNIT #4	60	0.3	240V, 1KW, 4.2A	230V, 67W, 0.3A	ZEHNDER 160 THERMO-AIR TER 6-1-240
HRV-2 & DH-2	UNIT #13	60	0.3	240V, 1KW, 4.2A	230V, 67W, 0.3A	ZEHNDER 160 THERMO-AIR TER 6-1-240
HRV-3 & DH-3	UNIT #17	80	0.3	240V, 1KW, 4.2A	230V, 67W, 0.3A	ZEHNDER 160 THERMO-AIR TER 6-1-240

CD SET 11/13/17 COUNTY COMMENTS

- UNIT SHALL RUN CONTINUOUSLY ON 60% MOTOR RPM FOR VENTILATION. PROVIDE ALL NECESSARY ZEHNDER ACCESSORIES, INCLUDING CONTROLS, DUCTING,
- DISTRIBUTION BOXES, DIFFUSER BOXES, AND WALL CAPS. PROVIDE F7 MERV 13 FILTER KIT, WIRELESS REMOTE, WATERLESS P-TRAP, AND
- HORIZONTAL CONDENSATE DRAIN KIT.
- PROVIDE COMFOSENSE CONTROLLER IN MAIN LIVING AND REMOTE CONTROL TIMERS IN BATHROOMS DUCT HEATER, DH-1, 2, & 3 SHALL BE LOCATED ON THE OUTSIDE AIR DUCT AND BE
- MODULATED TO MAINTAIN 25°F LAT. DH-1, 2 & 3 SHALL COME FACTORY STOCK WITH DUCT TEMPERATURE SENSOR, AUTOMATIC RESET CUTOUT, AND AIR FLOW
- VENTILATION REQUIREMENTS PER 2015 IRC BATHROOMS - 20/50 CFM CONTINUOUS/INTERMITTENT EXHAUST WHOLE HOUSE - 45 CFM

	ļ						
l							
) 		GRILLES, REGISTERS, AND DIFFUSERS SCHEDULE					
		EQ. TAG TYPE		MANUFACTURER & MODEL #			
		S-1 CEILING SUPPLY DIFFUSER ZE		ZEHNDER VENEZIA			
7							

CEILING EXHAUST

TRANSFER GRILLE

• PROVIDE OPPOSED BLADE DAMPERS FOR ALL SUPPLY. • PROVIDE ZEHNDER TVA-75 2 PORT DIFFUSER BOX FOR SUPPLY AND RETURN DIFFUSER. PROVIDE BACKDRAFT DAMPERS FOR ALL EXHAUST LOUVERS.

ZEHNDER STB-2

HART & COOLEY 94A

• VERIFY COLOR WITH ARCHITECT/ OWNER.

	GLYCOL FEEDER SCHEDULE						
EQ. TAG	SERVING	CAPACITY	ELECTRICAL DATA (1PH)		MANUFACTURER &		
			W	VOLTS	MODEL#		
GF-1	SYSTEM	6 GAL	50W	120	AXIOM MF200 RIA 10-1-SSA		
GF-2	SYSTEM	6 GAL	50W	120	AXIOM MF200 RIA 10-1-SSA		
GF-3	SYSTEM	6 GAL	50W	120	AXIOM MF200 RIA 10-1-SSA		
	·		•		·		

PROVIDE LOW LEVEL ALARMOR ENGINEER APPROVED

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VILLAG 5778 N. D EDEN, UT

Architects

Umbanhower

Hughes

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B. Work Not Included (Specified elsewhere): Certain labor and materials may be furnished and/or installed under other divisions of these specifications. Coordinate with other trades and arrange the work to

using first grade equipment and material new and previously unused.

Prior to the start of excavation, utility companies shall be contacted and advised of proposed work where sewer, telephone, water, such underground installations are located. When the excavation approaches the estimated location of such an installation, the exact ocation shall be determined and when it is uncovered, proper supports

2. If active utilities are encountered that are not indicated on the drawings, ask for instructions from the Architect. Any relocation or remodeling required will then be directed by the Architect.

3. Assume all responsibility for protection of all utilities, shown or not, and repair any damage caused by this construction at no extra

Investigate with proper authorities for all existing water taps, etc. and make arrangements to pay for all removal charges in original bid.

1. Provide: Contractor shall furnish and install item or items specified. Contractor shall perform all labor and furnish all materials and equipment necessary so that specified item or system

2. Furnish: Contractor shall deliver to the site item(s) specified, as . as additional specialized materials and/or accessories necessary for the use and operation of item or items specified.

3. Install: Contractor shall set in place, connect and adjust for use. Contractor shall furnish miscellaneous specialty items such as hangers, valves, unions, piping, sheet metal, etc. as necessary for a complete and operating installation.

Exposed: Accessible in mechanical rooms, unfinished areas, above T-grid ceilings, accessible tunnels, etc. . Concealed: In such spaces as chases, trenches, above drywall ceilings, in walls and buried where materials are inaccessible when building is completed $\,$

1.02 COORDINATION: General: Coordinate and order the progress of mechanical work to conform to the schedule and the progress of the work of the other

B. Drawings and Specifications:
1. Contract drawings for mechanical work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement of equipment, ducts, piping, approximate sizes and location of equipment and outlets. Drawings do not necessarily indicate every required offset, fitting, etc. Take all dimensions from the structure itself before fabricating any work. Verify all space requirements, coordinating with other trades and install the systems in the space

The drawings are not intended to be scaled for roughing in measurements nor to serve as shop drawings. 3. Should there be a conflict within the Specifications or within Drawings of the same scale, the more stringent or higher quality

requirements shall apply. 4. In the Drawings, the precedence shall be drawings of larger scale PART 1 - GENERAL over those of smaller scale.

5. Should a conflict arise between the Drawings and the Specifications for products indicated on the Drawings, the Specifications shall have 6. Should there be a conflict in dimensions or locations between Mechanical Drawings and Architectural Drawings, the Architectural

1.03 QUALITY ASSURANCE

A. Workmanship: Perform work in accordance with good trade practice.
The good appearance of the finished work shall be of equal importance with its mechanical efficiency. The Architect and/or Engineer may reject work if workmanship and appearance are not satisfactory. B. Supervision: Be responsible for and coordinate the work of all subcontractors working under Division 15.

Confer and cooperate with other trades and coordinate the work in proper relation with theirs.

2. Install all work to permit removal (without damage to other parts) of coils, furnaces, boilers, fan shafts and wheels, filters, and all other parts which might require periodic replacement or maintenance. traps, motors and control components.

3. Offsets, transitions and changes in direction in pipes and ducts shall be made as required. Maintain proper headroom and pitch of sloping pipes whether or not indicated on the drawings. Furnish and install all ductwork fittings, traps, air vents, sanitary vents, etc. as required to affect these offsets, transitions and changes in

4. Under floor spaces and attic spaces containing equipment requiring

access for service shall be provided with an unobstructed passageway large enough to remove the equipment, but not less than 30 inches high and 22 inches wide. The passage way shall not be longer than 20 feet length when measured along the centerline of the passageway from the opening to the equipment.

5. Install equipment and materials in accordance with manufacturers' recommendations unless specifically indicated otherwise, or where local codes or regulations take precedence.

6. Conceal all piping in finished areas of the building. D. Protection: Close ends of pipe and ductwork during construction with caps or plugs to prevent entry of foreign material. Protect insulation against damage before, during and after installation. Protect fixtures

and equipment against damage during mechanical work. 1.04 REGULATORY AND CODE REQUIREMENTS:

A. Obtain all permits and licenses required for work performed under Division 15 and pay for all fees and inspections in connection with

B. All work shall be executed in accordance with the local, state and other attending rules and regulations applicable to the trade affected and be subject to the inspection of these departments. C. Where work required by the Drawings and Specifications is above the standard required by local regulations, it shall be done as shown and/or

1.05 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS: A. Use of the permanent heating system will not be allowed without approval from the Owner/Architect/Engineer. In case where the permanent Contractor shall pay all costs until acceptance by the Owner.

B. If the permanent heating system is authorized for use, the building must be totally enclosed with final building materials in place without temporary barriers. All dust producing finish work must be complete and the source of heat supply is permanently installed. System must be sufficiently complete, including controls, to permit its safe operation as acceptable to the Mechanical Contractor. Mechanical Contractor is solely responsible for the safe operation of the system.

C. When any air handling equipment is used for temporary heat, install and maintain temporary filters. Before building acceptance by Owner, install new filters. Clean furnace and duct liner, if necessary, as

D. Systems used for temporary heat are the Contractor's responsibility to maintain and should be put into first class working order before

E. Equipment warranties that start with the use of equipment for temporary heat shall be extended by the Contractor so that the Owner . have the full one year warranty from the date of acceptance of the 1.06 DELIVERY, STORAGE AND HANDLING:

Provide for proper storage of all materials and equipment and assume responsibility for losses due to any cause. Cover and store all equipment and materials out of the elements and off of the ground; any rusted or weather damaged item will not be permitted to be used. 1.07 PRODUCT OPTIONS AND SUBSTITUTIONS:

Prior to Bidding:

1. Materials or products specified by name or manufacturer, brand or trade name shall be furnished under the Contract unless changed by an Addendum or a contract modification. Where two or more materials are

2. Action for substitutions specified herein will be given only after the receipt of complete data showing performance, physical dimensions and material construction. One copy of all descriptive data shall be submitted to the Mechanical Engineer's office. 3. Material and equipment specified is used as a basis of standard, and while not specifically mentioned, material gauges, weights, appearance and space requirements must be met by any substitutions.

1.08 CLEANING: A. Clear away all debris, surplus materials, etc. resulting from Mechanical Contractor's work or operations, leaving the job and equipment in a clean condition. This includes attic and crawlspace. B. All surfaces of all coils, fans, air units, air filters, etc. shall be wiped clean or washed if required. All plumbing fixtures shall be thoroughly cleaned of all foreign matter including stickers. Clean all items furnished such as floor drains, pumps, motors, traps, etc. leaving the entire installation in a first-class condition.

1.09 PROJECT RECORD DRAWING: A. File at the job site one copy of Drawings, Specifications, Addenda, change orders, field orders and other modifications to Contract B. Do not use Project Record Documents for construction purposes.

C. Legibly mark with red pencil field changes, referenced to permanent and accessible features of the site or building as applicable. Do not conceal any work until required information is recorded.

.10 OPERATION AND MAINTENANCE DATA: A. Prepare 1 typed and hard bound copy of Operating and Maintenance Manual to Architect for approval prior to scheduling any system demonstration for the Owner. Book shall be arranged in sequence to

match the equipment schedules included in the specifications.

B. The books shall contain, but not be limited to, the following general items; each item shall be provided with a separate index tab:

1. Product data on each piece of equipment installed identified by drawing code numbers as they appear on the drawing and in the specifications. Data shall include the following: installation instruction sheets, spare parts lists, operating manuals and complete

2. All warranties provided by the manufacturer on their equipment that run longer than the one year warranty by the Contractor.

A. When the Contractor notifies the Architect that the project is ready for a final observation, the Architect will visit the job site and will prepare a final punch list of all the items on the project that shall be finished or corrected before the project can be accepted.

B. When the Contractor notifies the Architect that all items on the above punch list have been completed and corrected, the Architect will visit the project to ascertain that all the items on the punch list have been

A. All materials and equipment shall be new unless otherwise specified.

B. Provide warranty to the Owner covering the entire mechanical work to be free from defective materials, equipment and workmanship for a period of one year after Date of Acceptance. During this period, provide labor and materials as required to repair or replace defects at no additional cost to the Owner. Provide certificates in O & M Manuals for such materials or equipment which have warranties in excess of one year. from use of equipment for construction heat or ventilation.

A. The Mechanical Contractor shall provide personnel for initial startup and operation of the mechanical equipment and for a trial run of the equipment to demonstrate that the equipment and associated systems are properly installed and operating as intended

B. The Mechanical Contractor shall instruct the Owner in the proper startup, operation, observation and maintenance of all mechanical equipment installed under this contract. PART 1 GENERAL

At the completion of the installation, the forced air system and hydronic system shall be adjusted and balanced by the Contractor. All air balancing shall be done at dampers in branch ducts and spin fittings irst, then at the supply registers. Provide air quantities as shown or

B. Air and water testing and balancing shall not begin until the system has been completed and is in full working order. C. Adjust all air and water systems within +5% to -5% of design flow

D. Mark final settings of volume dampers with permanent marking when balancing is complete.

PART 3 - EXECUTION

Not Applicable END OF SECTION 15010

> SECTION 15050 BASIC MATERIALS AND METHODS

WORK INCLUDED: Pipe Supports

Pipe Installation

PART 3 - EXECUTION

2.01 EQUIPMENT MANUFACTURERS: Equipment such as motors, pumps, gauges, valves, etc. shall be of one manufacturer or available through one manufacturer to facilitate ease of maintenance for the Owner.

Furnish access doors at locations where required for access to concealed valves, dampers, cleanouts, control devices and equipment. 2.03 PIPE SUPPORTS AND HANGERS:

A. General: Use adjustable pipe hangers on suspended pipe. Provide hangers to support the systems without sagging, including hangers at each offset or change in direction, at ends of branches over five feet in length and at the following maximum spacing: B. PIPE SUPPORT SPACING: See Schedule on Drawings.

Individual hangers for copper piping, 1-1/4" and larger shall be copper plated or plastic coated steel. 2. Individual hangers for steel piping $1-1/4\,\text{"}$ and larger shall be zinc plated, adjustable swivel ring hangers. 3. Individual hangers for piping up to 1" shall be same as above or may be Sioux Strap plastic tube hangers or approved equivalent.

D. Trapeze Hangers:1. Parallel runs of piping may be supported on trapeze hangers.Hangers shall be spaced for smallest pipe in group. 2. All steel pipe shall have standard pipe straps at each support. 3. All copper pipe shall rest on neoprene sleeves and have standard pipe straps at each support.

Provide friction riser clamps, supported and braced. Clamps for copper piping shall be plastic coated steel. Support cast iron soil pipe at less than every story height and at its base. Support copper tubing

A. Pressure Ratings: Unless otherwise indicated, use valves suitable for minimum 125 psig at 450 deg. F and 200 psig at 250 deg. F. B. Valve Connections: Provide valves suitable to connect to adjoining piping as specified for pipe joints. Solder or screw to solder adapters for copper tubing.

Base final installation of materials and equipment on job site dimensions and conditions. Job site dimensions shall take precedence over Drawing dimensions. Field measure critical dimensions and do not fabricate or cut materials to length until such measurements are made. Be responsible for accurate location of rough-ins as required for equipment being

3.02 EXCAVATION AND BACKFILL: A. The Contractor shall do all trench and pit excavations and backfilling required for work under this section of the specifications, inside and outside the building including repairing of finished surfaces, all required shoring, bracing, pumping and all protection for safety of persons and property. Local or state safety codes shall be strictly observed.

B. Extreme caution shall be exercised to prevent damage to installation; when soft materials such as copper tubing are being buried.

Provide vibration isolation for each air handling unit by Mason Industries or equivalent neoprene vibration isolators.

responsible for the cost of cutting and patching for work under

A. Where horizontal ducts and pipe pass through walls, and vertical ducts and pipes pass through floors or roofs, seal off void between opening and duct or pipe and sleeve. All penetrations of exterior wall below grade shall be sealed watertight. All penetrations of exterior walls above grade shall be sealed weather tight

3. Wherever any pipe or other material penetrates through fire-resistant wall, ceiling or floor, completely seal voids in construction with cement grout, plaster or other fire resistant material as approved by authority having jurisdiction. Embed sealing material full thickness of material being penetrated. Sealants to be installed in manufacturer's instructions and shall have been tested and classified by Underwriters Laboratories.

All flashings will be done under roofing division except as noted or detailed elsewhere in these specifications.

3.07 PIPE INSTALLATION: A. Install piping without springing or forcing, and to clear windows, doors and other openings. Cutting or other weakening of the building structure to facilitate piping installation is not permitted. Install vertical risers plumb and straight, horizontal lines parallel with walls and partitions. and partitions. Conceal piping above ceilings and within furring and walls unless otherwise indicated.

B. Route piping in general locations indicated in an orderly manner and to maintain required grades. Coordinate with other piping, ducts and equipment making necessary offsets to accommodate the same piping to conserve headroom and interfere as little as possible with use of available space. Group piping wherever possible at common elevations. Install concealed pipes close to the building structure to 3.08 INSTALLATION OF PIPE HANGERS:

Adequately support piping from the building structure with adjustable hangers to maintain uniform grading where required and to prevent sagging and pocketing. Provide supports between piping and building structure where necessary to prevent swaying.

A. Install valves with stems upright or horizontal, not inverted.

B. Provide drain valves at main shut off valves, low points of piping and

Furnish access doors in all non-removable ceilings and in partitions and walls where necessary to maintain access to plumbing cleanouts, fire dampers, manual dampers, valves and other mechanical devices requiring access. Size these as required to provide adequate access for service or

A. Test piping systems prior to concealment. Ensure that the test pressure which might damage fixtures or equipment does not reach such units by valving them off or otherwise isolating them during the test. All tests must be done to the satisfaction of the local authorities having jurisdiction, before covering. Furnish all instruments required for testing. All hydrostatic tests to be held for a minimum of six hours without loss of pressure. Air Tests to be held for a minimum of two hours without loss of pressure. Contractor shall be responsible for furnishing all plugs, piping, valves, hoses and pumps necessary for the required tests and for proper disposal of the water upon completion of the tests.

B. Test all drain, waste and roof drain lines with standing water test of twelve feet of head, held for a minimum of 15.

C. Test all heating water and domestic water piping before connecting to units at 100 psig air pressure maintained for a minimum of 15 minutes. D. Test all gas piping under 60 psig air pressure and maintained for a minimum of $10\ \mathrm{minutes}$.

E. Test all radiant floor tubing under 100 psig hydrostatic pressure for a minimum of 30 minutes and long enough to visually inspect each joints. F. Insure that all piping is protected from freezing conditions where hydrostatic tests are required. Coordinate with the Engineer if hydrostatic tests cannot be conducted.

.12 FLUSHING, CLEANING AND STERILIZING: A. Before final connections are made in the piping systems, all piping except as individually noted below, shall be blown out with air and then completely washed out with cleaning compounds compatible with final fluid to avoid contamination. The systems shall then be flushed for the complete removal of all foreign materials. Furnish all temporary connections, valves, etc. required for this purpose.

B. After flushing, sterilize the domestic water system with approved chlorinating agent to provide a dosage of not less than 50 ppm. After minimum contact period of eight hours, flush the system with clean END OF SECTION 15050

SECTION 15250 PIPE AND DUCT INSULATION

A. This section of the Specification contains items applicable only to pipe and duct insulation work. All insulation work shall be performed in strict accordance with applicable codes and ordinances.

B. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and of performing all operations necessary for the installation of this insulation for the plumbing and heating piping and ductwork. All insulation shall be installed in a workmanlike manner by skilled workmen regularly engaged in this type of work in this type of work.

2.01 ACCEPTABLE MANUFACTURERS AND PRODUCTS: Manville, Armstrong, Keene and Knauf insulation will be considered equivalent.

Imcoa or approved equivalent for piping. PART 3 EXECUTION

3.01 GENERAL INSTALLATION REQUIREMENTS

A. Do Not apply insulation before testing and cleaning of surfaces to be

B. Apply insulation tightly over clean dry surfaces with sections or edges firmly butted together. C. Ductwork insulation shall meet the requirements of NFPA 90A I a test 3.02 PIPING AND EQUIPMENT

A. Domestic Hot and Cold Water Piping: Insulate all domestic hot and cold water supply lines and circulating water lines throughout the building with 1" thick (or R-3) closed cell polyolefin foam insulation such as Imcoa Imcolock or equivalent. Insulation shall have upper temperature limit of at least 210 deg. F, flame spread by E84 of 25, and smoke density by E84 of 50. Thermal conductivity "K" shall be at least 0.25 at 75 deg. F. Seal off ends of pipe insulation at all valves, fittings,

B. Heating Water Piping: Insulate all hot water supply and return lines throughout the building with 1" thick (or R-3) closed cell polyolefin foam insulation such as Imcoa Imcolock or equivalent. Insulation shall have upper temperature limit of at least 210 deg. F, flame spread by E84 of 25, and smoke density by E84 of 50. Thermal conductivity "K" shall be 0.25 at 75 deg or less F. Seal off ends of pipe insulation at all 75 deg or less. F. Seal off ends of pipe insulation at all

U3 DIICH INGIII ATTOM. ulate the outside of all ducts when called for in Section 15800 with -1/2" thick one lb./cubic foot, UL rated, glass fiber insulation with oil-Scrim-Kraft facing. Apply to provide a continuous vapor barrier. eal all joints with 3" wide pressure sensitive aluminum foil tape. All cuts and tears shall be sealed with strips of aluminum foil tape.

END OF SECTION 15250

PLUMBING

PART 1 GENERAL

A. Furnish, install and test all equipment, piping and piping specialties as specified in this Section and/or as indicated on the drawings pertaining to this Division.

B. The work covered in this Section shall include, but not be limited to, furnishing and installing the following materials and equipment: Water Distribution System

umbing Fixtures, Rough-in, Setting and Connection Floor Drains, Hydrants, Etc.

PART 2 PRODUCTS

2.01 WATER PIPING MATERIALS:

Piping Outside Building: All pipe outside the building shall be polyethylene service pipe conforming to the requirements of AWWA Specification C-901, "Polyethylene (PE) Pressure Pipe, Tubing and Fittings, 1/2 inch through 3 inch for water." Tubing shall be class 200 with SDR of 7.3.

B. Piping Inside Building: All domestic cold water and hot water piping within the building above grade shall be Type "L" hard drawn copper pipe with wrought copper fittings with 95-5 (tin/antimony) or Canfield 100% Watersafe solder. An acceptable alternate is non-barrier cross linked lyethylene (pex-a). Uponor and rehau are approved, provide submittal engineer for substitutions. Tubing and fittings shall meet ASTM F876

C. Valves and Specialty Schedule: 1. Gate Valves: Bronze, Class 125, 200 psi W.O.G. screwed or solder. 2. Ball Valves: Bronze, Class 125, chromium plated, brass ball with einforced teflon seats and adjustable stem packing and stainless

3. Check Valves: Bronze, Class 125, 200 psi W.O.G. screwed or solder, horizontal swing renewable disc.

4. Pressure Gauges: Dial gauges shall be 4-1/2" dial size with gauge line valves and pigtail. Danton 101 or approved equivalent. 5. Thermometers: Adjustable angle industrial thermometer with brass case, red-reading mercury and separable socket. Thermometers shall be graduated from plus 20 deg. F to 200 deg. F. U.S. Gauge MN-9 or

6. Dielectric Unions and Flanges: Unions rated for 250 psi with galvanized or plated steel threaded end, copper solder end and impervious isolation gasket approved for use on gas, oil, air and Flanges to be complete with insulated bolt sheaves, 7. Strainers: 250 lb. bronze or cast iron "Y" type screwed with

.02 SOIL WASTE AND VENT MATERIALS INSIDE BUILDING: Schedule 40 ABS DWV plastic pipe and fittings (ASTM D2661) or Schedule 10 PVC DWV plastic pipe and fittings (ASTM D2665). All pipe and fittings shall bear NFS-DWV mark and shall be joined with solvent weld oints as recommended by the manufacturer. B. Service weight hubless cast iron with gasket and clamp fittings.

C. Cleanouts: Bronze plug cleanout with nickel bronze frame in floors. Provide carpet cleanout marker in areas with carpet. Wall cleanouts shall have stainless steel cover in finished areas. Josam or approved

2.03 BUILDING SANITARY MATERIALS OUTSIDE THE BUILDING: PVC gravity sewer pipe complying with ASTM D-3034. Above Grade Piping: Schedule 40 black steel with black steel malleable fittings for pipe 2" and smaller. Piping larger than 2" in size shall be joined with butt welded fittings. Use welded fittings on all pipe in

inaccessible locations.

B. Below Grade Piping: Schedule 40 black steel with black steel malleable tittings. Provide cathodic protection as required. Piping shall be provided with a factory applied coating of either fusion bonded epoxy or ape wrap. Factory coâting must be acceptable to the utility company. C. Gas Cocks: Class 125, 175 lb. W.O.G. working pressure, bronze body, square head straight way cock or bronze bodied ball valve with removable tapered cartridge arranged for gas service.

O. Propane Tank: Provide buried 100 gallon propane tank equipped with all valves, regulators and fittings meeting all code requirements.

PART 3 EXECUTION

B. Inside Building:

A. Water Service:
1. Provide new water service as indicated on the plans. Provide shutoff valves and valve box where shown. 2. Provide piping outside the building with not less than seven feet of cover from finished grade. Surround pipe with 4" of clean sand. Provide 2" thick by 2' wide insulating blue board over full length of water service outside of building.

1. All piping shall be pitched 1" in 40 feet insofar as possible and shall be provided with drains at all low points for complete drain . Drains shall be located in accessible locations. Run piping as direct as possible to required connections. 2. Provide plastic pipe isolators at framing penetrations in walls and

C. Valves and Fittings:

1. Gate valves, plug valves or ball valves may be used for shut-off service. Valves utilizing lever handles shall be installed to allow complete open to close valve operation without interference of

2. Ball valves shall be used for balancing service.

with dielectric unions or fittings.

3. Install unions at all equipment connections when union trim is not furnished as a standard part of the equipment trim or where items cannot be removed from line without unions. 4. Isolate connections between ferrous piping and nonferrous piping

5. Provide unions at connections to fixtures and equipment including valves when union trim is not furnished as a standard part of the equipment trim or where items cannot be removed from line without

6. Dielectric unions shall be used at all connections of ferrous material to non-ferrous material. 7. Couplings can be used wherever unions are not required.

8. Pressure gauges and thermometers are to be used wherever shown on

drawings and shall be located in an accessible position. 3.02 SOIL, WASTE AND VENT PIPING INSIDE BUILDING:
A. Slope: Main lines within the building: provide a uniform fall of not less than 1" in 8 feet. Branches: provide a uniform fall of not less than 1" in 4 feet for 3" and smaller and 1" in 8 feet for sizes 4" and

B. Fixtures: Vent in accordance with sound plumbing practice and applicable codes. Do not install vents within two feet of roof edge. C. Cleanouts: Provide cleanouts in sanitary and storm systems where required by code or as indicated at all bends, angles and not over 50 feet apart for 4" and smaller piping and not over100 feet apart for larger piping. Cleanouts to have chrome plated cover plates for walls,

D. All horizontal and vertical waste mains and storm drain mains from upper floors to lower level slab or crawlspace shall be hubless cast iron. Horizontal mains shall include all piping serving more than one plumbing fixture, all toilets and all storm drain lines.

3.03 BUILDING SANITARY AND STORM SEWER PIPING OUTSIDE BUILDING:

A. Cleanouts: Provide cleanouts at 100 foot intervals. B. Flushing and Cleaning: Flush and clean sewer lines and remove debris before final connection into the existing sewer or septic system is

General: All underground pipe shall be buried 24" minimum and surrounded with clean sand before backfilling. All buried joints shall left exposed until testing has been completed. 2. Furnish and install all gas piping from the meter or propane tank throughout the building and connect to all equipment required.

B. Buried Pipe Coating: Buried pipe tape wrap shall be machine wrapped using a 50% overlap wrap minimum. Pipe shall be coated with primer before wrapping. Fittings and joints shall be double wrapped. Extend fitting and joint wrapping not less than 6" past the end of the fitting and print and pri or joint onto the pipe section. Test pipe, joints and fitting prior to wrapping joints and fittings.

C. Provide lubricated plug valves, 6" long condensate dirt pockets and unions at equipment connections. D. Take branches from top or sides of horizontal pipes, not from bottom.

E. Installation, materials and/or equipment not indicated on the Drawings, specified or covered by the requirements of utility of agency having jurisdiction shall be in accordance with NFPA Manual 54 "Standards for Installation of Gas Piping and Gas Appliances in

F. Pressure Testing: See Section 15050. 3.05 FIXTURES AND EQUIPMENT:

relief valve outlet.

flushing operations are accomplished.

3.04 GAS PIPING:

Install all fixtures and/or rough in according to the fixture schedule. Some plumbing fixtures may require larger pipe sizes than shown on the fixture connection schedule on the drawings. Coordinate 2. All fixtures shall be secured to walls and floor or counter tops in

accordance with manufacturer's roughing in and setting requirements to

3. All pipe at the fixtures which may be exposed to view shall be brass chrome finish, finished with chrome escutcheons where they project 4. Stop valves shall be furnished and installed at all fixtures, for all equipment and at rough in locations.

5. Integral vacuum breakers shall be provided at all outlets with hose

6. Install water, waste and vent lines to refrigerator and ice machines as required by the manufacturer. B. Water Heater: Make connections between water heater and domestic water piping system with dielectric unions when dissimilar materials are jointed. Furnish and install copper drain piping from temperature and pressure relief valve for water heater. Drain piping to be same size as

3.06 FLASHINGS: A. Provide flashing as recommended by roofing manufacturer for each vent or stack and for each roof drain. Clamp flashing into roof drain. B. Flash all drains (i.e. roof, floor, etc.) not installed in slab on grade with 36" square, 4 lb/sq.ft. sheet lead, or chlorinated polyethylene factory laminated to 15 lb. felt. Clamp flashing into

3.07 ADJUSTING AND CLEANING: A. Clean strainers, traps, aerators and valves of debris, sand and dirt. B. At completion, thoroughly clean plumbing fixtures and equipment. C. Adjust faucets, showers and toilets for proper flow after cleaning and

D. Upon completion of water heater installation, verify satisfactory control operation under maximum demand operation as recommended by manufacturer. Adjust discharge water temperature. E. Adjust balancing valves in domestic hot water recirculation lines to insure quick delivery of hot water to fixtures. Set memory stops.

Protect fixtures and related components from damage before, during and after installation to date of final acceptance or Owner move-in. Provide

SECTION 15600 HEAT GENERATION AND LIQUID HEAT TRANSFER

protective coverings or other protection as required.

Furnish, install and test all equipment and piping as specified in this Section and/or as indicated on the drawings pertaining to this B. The work covered in this Section shall include, but not be limited to, furnishing and installing the following materials and equipment: Radiant Floor System Pumps, Piping, Valves, Etc.

PART 2 PRODUCTS 2.01 PIPING MATERIALS: A. Low Temperature (250 F and less): Copper piping shall be used as 1. Hot water heating piping: Type "L" copper with wrought copper fittings and 95-5 (tin/antimony), 96-4 (tin/silver) or Canfield 100% Water safe (silver-tin-copper) solder. Where copper pipe is jointed to brass use silver solder (45% silver composition and BAg-1 classification), ASTM B260-62T.

2. Drain pan piping: Type "M" copper with wrought copper fittings and 95-5 (tin/antimony) solder on all lines not buried. B. Valve and Specialty Schedule Copper, Low Pressure (124 psi and less)
Low Temperature (249 F and less)
1. Gate Valves: Class 125, 200 lb. W.O.G. bronze, screwed or solder

3. Check Valves: Class 125, 200 lb. W.O.G. bronze, screwed or solder 4. Unions: Cast brass type. 5. Strainers: 250 lb. cast brass "Y" type, screwed with stainless

2. Ball Valves: Bronze, full port, chrome plated bronze ball with reinforced teflon seats and packing, 400 psi \dot{W} .O.G. screwed or solder.

6. Pressure Gauges: 42" dial, bronze bourdon tube. Pressure ranges as

required. Brass lever handled cock and pigtail. U.S. Gauge figure 5801, Trerice 600, Danton 101 or equivalent.

7. Press.-Temp. Taps: Peterson Equipment Company #710, Sisco or Hydro-Temp BNO-500, 1/2" NPT, nordel core or equivalent.

8. Thermometers: Multi-angle with separable socket, red reading mercury. U.S. Gauge MN-9, Trerice B \times 9, Duro 9 EZ, Weiss 9 US or equivalent.

9. Dielectric Unions: Unions rated for 250 psi with copper solder end and impervious isolation gasket. 10.Glycol: 30% propylene glycol based heat transfer fluid with corrosion inhibitors shall be used in the heating system. Dowfrost or approved equivalent. Use aluminum safe glycol approved by the boiler

Radiant Floor System:1. Furnish, design and install in accordance with the recommendations of Uponor, Stadler Radiant Heating System, Roth or Rahau. 2. Radiant floor tubing shall be nominal 1/2" inside diameter crosslinked polyethylene (Uponor HE-PEX or approved equivalent). Pipes shall be rated at 180 F/100 psi and shall have an integral oxygen diffusion barrier. Piping shall carry a ten year warranty. If piping is not 1/2" diameter, loops not exceeding pressure drop recommended by manufacturer.

3. Manifolds shall be cast brass construction and shall have integral circuit balancing valves. Manifolds shall be provided with support brackets for wall mounting and pipe bending supports to allow tight bends from slab to manifold. Provide bronze angle valves to connect manifold to supply and return piping. Valves shall be suitable for isolation and balancing. Individual circuit control valves shall be provided on manifold circuit. Each manifold should be provided with

D. Miscellaneous Items:

1. Backflow Preventor: All bronze construction with stainless steel internal parts. Built-in strainer. Reduced pressure principle, Watts Model 909 or approved equivalent.

. Pressure Reducing Valve: 1/2" bronze body pressure reducing valve with integral strainer and built-in check valve. Maximum working pressure of 75 psi and operating temperature of 200 F. Amtrol Model 3. Air Purger: Purger shall be same size as line in which purger is installed. Maximum working pressure of 90 psi. Spirovent or approved

4. Air Vents: Float-type vent with built-in check valve for manual or automatic vention. Maximum water pressure 50 psi. Amtrol Model 700 5. Differential Pressure Regulator: Brass valve body with thermoplastic and stainless steel parts. Diaphragm of EPDM. Maximum temperature 230 F, maximum working pressure 85 psi, regulating pressure range 0 to 17 psi. Used to eliminate excessive pump head pressure due to reduced zone demand. Honeywell Model D146M1032-3/4", D146M1040-1 1/4".

E. Equipment Schedule See Schedules On Drawings

1. Pressure Testing: See Section 15050.

PART 3 EXECUTION 3.01 PIPEWORK:

Piping:

1. Grade and valve all water piping systems with 3/4" hose and end valves to permit complete drainage of the system. All high points in equipment rooms shall be vented with automatic air vents piped to convenient drain. All high points in system outside of equipment rooms to be vented with combination automatic/manual air vents to relieve air in the system.

B. Valves and Specialties: Ball valves may be used in lieu of gate valves on all water services for shut off service wherever the pressure and temperature ratings are satisfactory. Valves utilizing lever handles shall be installed to allow complete open to close valve operation. 2. Balancing shut-off, ball valves shall be used for balancing service on lines 2" and smaller. Balancing shut-off shall be used for balancing service on lines 2" and larger. Provide adjustable memory

stops on all valves used for balancing service. Plug valve symbols 3. Unions or flanges are to be used wherever necessary and in piping at all equipment so that piping may be conveniently broken and moved to facilitate equipment maintenance. 4. Dielectric unions are to be used at all connections where ferrous material is connected to non-ferrous material and where ferrous material is connected to domestic water piping. Couplings can be used

5. Pressure Gauges, Thermometers and Press.-Temp. Taps are to be used wherever shown on drawings. Gauges and taps shall be installed in pipe immediately before and after equipment with no valve or fitting between gauge or tap and equipment. Taps shall be located in an accessible position.

B. Space "tails" evenly to provide even heat distribution.

A. Furnish, design and install in accordance with the recommendations of must be installed in a reverse return pattern.

C. Secure piping to subfloor at sufficient intervals to minimize movement prior to concrete pour by approved fasteners. D. All tubing joints and fittings should be accessible and above the E. Protect tubing passing through doorways with metal plates in areas that will be carpeted.

F. Cover ends of tubing with caps or tape to keep out foreign materials during construction. G. Protect piping from damage prior to and during final pour. H. Maintain continuous 60 psi hydrostatic test during all concrete pours

. The General Contractor shall do all framing required for manifolds. This Contractor is responsible for correct and timely layout for all framing required for this work. No structural members shall be cut. J. All radiant floor zones shall be adjusted and balanced to meet the specified flows. Balancing shall be continued until the results are K. The Contractor shall place all equipment in operation and shall operate it for sufficient time to demonstrate that it functions in

away from the wood sleepers. END OF SECTION 15600

END OF SECTION 15900

accordance with the design requirements.

SECTION 15900

TEMPERATURE CONTROLS 1.01 WORK INCLUDED: A. The temperature control system, electric and electronic, shall be comprised of a complete system, furnished and installed by the B. The Temperature Control Contractor shall be responsible for all control work and for it's proper operation of all work performed in Section 15600 and 15800. It is the responsibility of this contractor to

L. Tubing in wood floor applications shall be installed a minimum of 1"

C. Either one of the sub-contractors in Division 15600 or 15800 may act as the Temperature Control Contractor. It is the responsibility of these contractors to coordinate their responsibilities prior to bidding

D. The Temperature Control Contractor shall comply with the National

oordinate with these trades and be responsible for the proper operation

E. Thermostats shall be mounted in locations where heat gain from refrigerators, lighting dimmers, etc will not effect their operation. A. This specification is based on Tekmar, Honeywell and Uponor equipment. Others must be approved by the Consulting Mechanical Engineer before bidding. It is recognized that packaged equipment comes with other names on controls and that some functions are accomplished with other

B. The Temperature Control Contractor shall provide all control relays, transformers, etc. as necessary to provide complete working system. C. Submit shop drawings of equipment, control panels and complete wiring diagrams to the Consulting Mechanical Engineer for review. A copy of the as-built drawings shall be included in the Owner's Manual.

named components. This specification does not intend to prohibit this

1.03 SEQUENCE OF CONTROL: A. Boiler: The propane gas boiler shall be controlled by it's own controls with outdoor reset. Boilers and circulator pump shall be on anytime there is a demand for heat from the radiant floor system. Anytime the boilers receive a signal to turn on; the pumps shall stay on while the boilers cycle to maintain it's setting. The system pump, radiant pump, and boiler shall be off when the outdoor air temperature is above the warm weather shutdown temperature set point and there is no

B. Radiant Floor: The radiant floor thermostats shall control the circuits in their respective zones. On a call for heat; the radiant floor pump, boiler, boiler pump shall turn on and the zone valves shall

Switching relays: TACO SR506-EXP Room Thermostats: Low voltage programmable thermostat, Honeywell pr Provide all necessary relays and field controls.

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