SINGLE PIPE

Yes! One (1) single pipe connected to all units on single pipe loop(s); no return pipe!

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WATER-SOURCE HEAT PUMPS

Introduction to “Single Pipe” systems design elements

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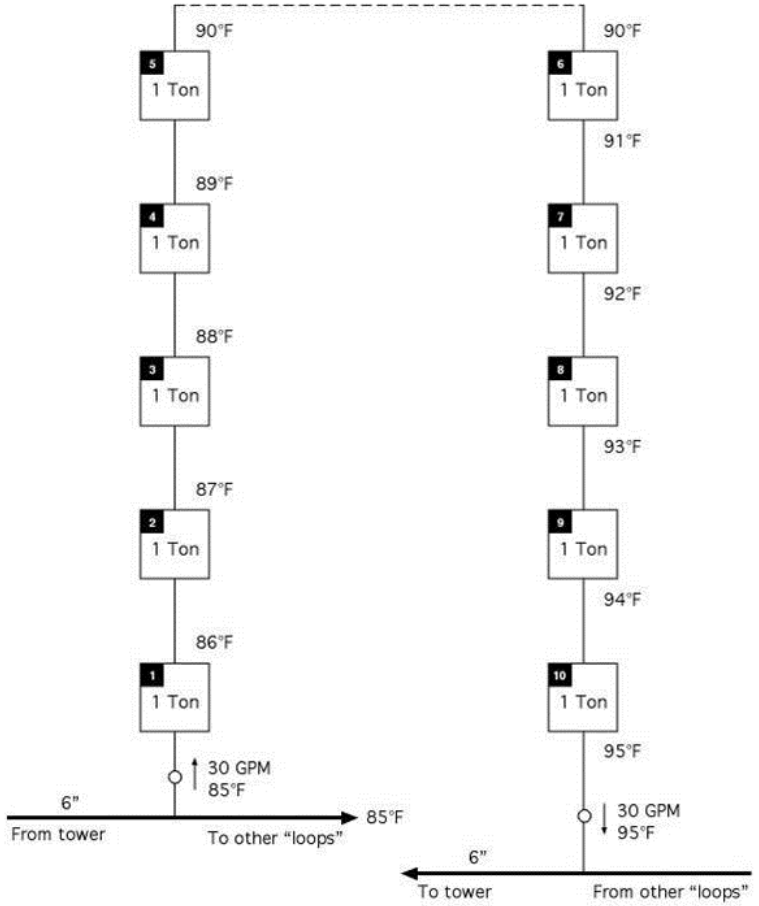
- 5 Story Lodge
- Simple conceptual layout
- All units 1 ton @ 3 gpm



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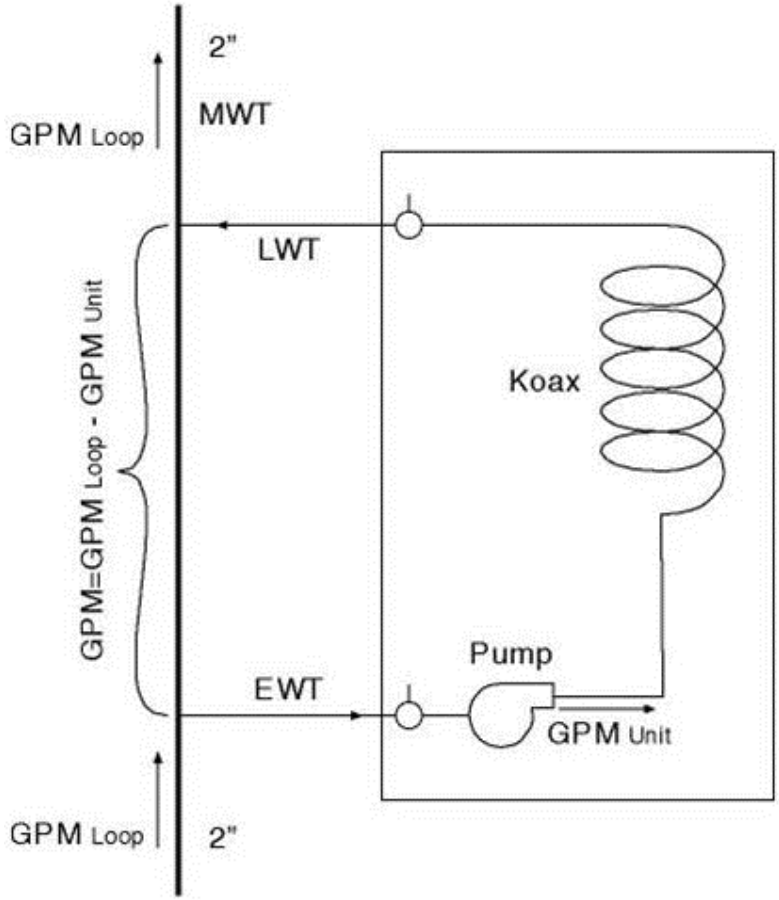
- Individual unit schematic flow layout
- Pump factory installed in VHS unit



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For single pipe output temperature of any single unit

$$MWT \times GPM_{loop} = EWT(GPM_{loop} - GPM_{unit}) + LWT(GPM_{unit})$$

Where:

MWT = Mixed Water Temperature

EWT = Entering Water Temperature

LWT = Leaving Water Temperature

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Example 1-3 gpm/ton

Unit 1 (1 Ton unit @ 3 GPM)

MWT x 30 = 85(30-3) + (85 + 10)3

MWT x 30 = 85(27) + 95(3)

MWT = (2295 + 285) / 30

MWT = 86°

Since all units 1 Ton @ 3 GPM/ton, each unit raises single pipe water temperature 1°

Since GPM_{loop} = Total GPM of all units @ 3 GPM per ton (10° rise),

Temperature leaving total single pipe loop = 95°

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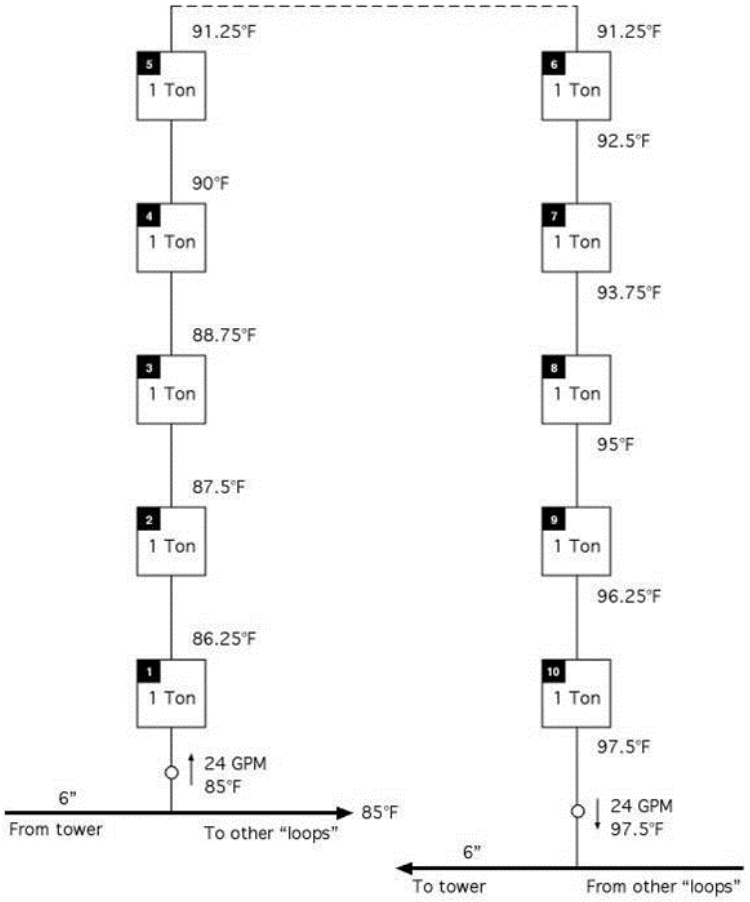
- 5 Story Lodge
- Simple conceptual layout
- All units 1 ton @ 2.4 gpm



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Example 2- 2.4 gpm/ton

Unit 1 (1 Ton unit @ 2.4 GPM)

MWT x 24 = 85(24-2.4) + (85 + 12.5)2.4

MWT x 24 = 85(27) + 97.5(2.4)

MWT = (1836 + 234) / 24

MWT = 86.25°

Since all units 1 Ton @ 2.4 GPM/ton, each unit raises single pipe water temperature 1.25°

Since GPM_{loop} = Total GPM of all units @ 2.4 GPM per ton (12.5° rise),

Temperature leaving total single pipe of loop = 97.5°

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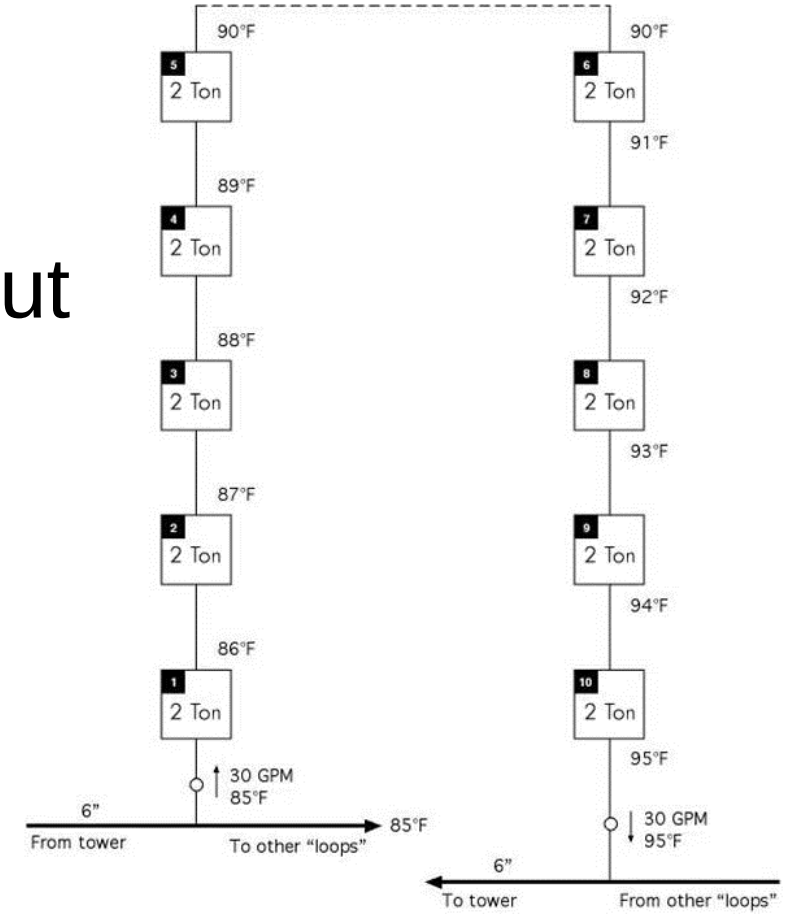
- 5 Story Lodge
- Simple conceptual layout
- All units 2 ton @ 3 gpm



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Example 3- 2 ton units-3gpm/ton

Unit 1 (2 Ton unit @ 3 GPM)

MWT x 60 = 85(60-6) + (85 + 10)6

MWT x 60 = 85(54) + 95(6)

MWT = (4590 + 570) / 60

MWT = 86°

Since all units 2 Ton @ 3 GPM/ton, each unit raises single pipe water temperature 1°

Since GPM_{loop} = Total GPM of all units @ 3 GPM per ton (10° rise),

Temperature leaving total single pipe of loop = 95°

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Example 4-2 ton units-2.4gpm/ton

Unit 1 (2 Ton unit @ 4.8 GPM)

MWT x 48 = 85(48-4.8) + (85 + 12.5)4.8

MWT x 48 = 85(43.2) + 97.5(4.8)

MWT = (3672 + 468) / 48

MWT = 86.25°

Since all units 1 Ton @ 2.4 GPM/ton, each unit raises single pipe water temperature 1.25°

Since GPM_{loop} = Total GPM of all units @ 2.4 GPM per ton (12.5° rise),

Temperature leaving total single pipe of loop = 97.5°

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Single Pipe Design Keys

- Use same common pipe size for all units on a single pipe loop (typ. 10-15 units per loop)
- Size single pipe dia. for cumulative gpm of all units on single pipe loop (our job 2” & 2 ½”)
- Ave total temperature rise of entire single pipe loop = 10° rise if units ave. 3 GPM/ton; 12.5° rise if units ave. 2.4 GPM/ton; 15.0° rise if units ave. 2.0 GPM/ton

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Keys (cont.)

- Not all units on at the same time, so diversity occurs.
- All pumps do not operate exactly at the above exact incremental gpms (operate on pump curve) unless AFR valve installed; so “free floating” of loop temperatures occurs based on actual gpm of individual pumps in unit. (Note our target gpms will fall between 2 and 3 gpm per ton; impending lab testing will confirm).

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Let’s look at performance chart

- Note that contractor used performance ratings at higher EWT’s the further along single pipe loop he went, so room load satisfied if unit at end of loop

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What are the driving forces?

- Lower equipment costs (VHS) one pipe vrs 2
- Onsite labor savings 1 braze joints/ unit
- Core drilling savings (every 4th unit “free”), approximately 33% savings
- Fire-stop material and labor savings, approximately 33%
- Main pump energy savings up to 25’ pump head savings; however cumulative consumption of individual unit pumps decreases total savings
- Possible smaller pump size, smaller electrical requirements

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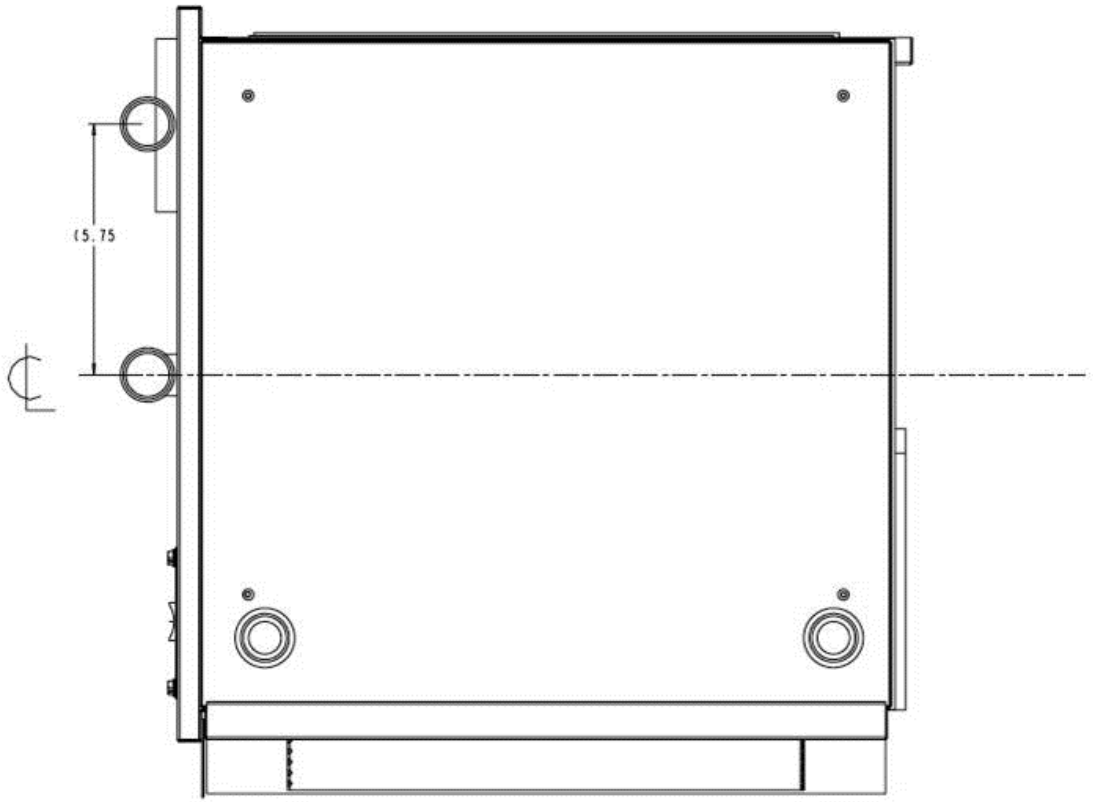
Plan view of VHS single pipe



DISTANCE TO SUPPLY/RETURN RISER WILL BE AS SHOWN.
SIZE 10/15 LEFT RETURN UNIT SHOWN RIGHT RETURN WILL BE MIRROR IMIGE.

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PRODUCT IMPROVEMENTS

- 1. COMPRESSORS-TWO STGE AND VARIABLE SPEED
- 2.ECM MOTORS
- 3. FACTORY MOUNTED OPTIONS /COMPONENTS
- 4. ENHANCED CONTROLS

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Airflow Selection

AIRFLOW SELECTION			
	C	F	M
HEAT STAGE 1	6	0	0
HEAT STAGE 2	7	5	0
AUXILIARY HEAT	8	5	0
EMERGENCY HEAT	8	5	0
COOL STAGE 1	5	2	5
COOL STAGE 2	7	0	0
COOL DEHUM 1	4	2	5
COOL DEHUM 2	5	5	0
CONTINUOUS FAN	3	5	0
HEAT OFF DELAY	6	0	
COOL OFF DELAY	3	0	

◄ PREVIOUS NEXT ►

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DXM2 Real-time Display

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          SYSTEM  STATUS

LT1   TEMP                    38.1
LT2   TEMP                    79.9
COMP  DISCHARGE              157.7
HOT  WATER  EWT              121  5
LEAVING  AIR                  75.1
LEAVING  WATER                73.3
ENTERING  WATER               78.5
ECM  BLOWER  RPM              550
ECM  TARGET  CFM              800
ECM  BLWR  STATIC             0.5
PUMP  WATTS                   140
FLOW  RATE  GPM               7.4
PUMP  SPEED                   60%
◄  PREVIOUS
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Thank you!

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