

HYDRONICS SEMINAR:

Equations:

$Q = \text{HEAT QUANTITY}$

$Q = \text{GPM} \times 500 \times \text{TEMP DIFF}$

$\text{GPM} = Q / (500 \times \text{TEMP DIFF})$

$\text{TEMP DIFF} = Q / (500 \times \text{GPM})$

$\text{GPM} = Q / 10,000$ (For heating with 20 deg Dt.)

$\text{GPM} = Q / 5,000$ (For chilled with 10 deg Dt.)

1 PSI = 2.31 feet water

For estimating the quantity of heat required use the following;

For a good new building $Q = 35$ to 45 btu / sq ft

For an older remodel $Q = 40$ to 55 btu / sq f

Chilled water	Office bldg	350 sq ft / ton
	Hospital	270 sq ft / ton
	Lab bldg	250 to 300 sq ft / ton

1 ton of chilled water = 2.4 gpm @ 10 deg temp diff
or $\text{GPM} = Q / 5,000$

Pump horsepower = $\text{GPM} \times \text{ft head} \times .0002525 / \text{pump eff.}$

One pound of steam is approx = 1,000 btu.

WATER FLOW IN PIPES

February 12, 1990

PIPE SIZE	GPM	VELOCITY FPS	TONS @2.4GPM/TON 10 DEG DT	MBH @20 DEG DT
1/2"	1.5	1.5	0.6	15
3/4"	4.2	2.5	1.75	42
1"	8	2.8	3.3	80
1 1/4"	17	3.8	7	170
1 1/2"	25	3.8	10	250
2"	50	4.5	20	500
2 1/2"	80	5.2	33	800
3"	150	6.2	62	1,500
4"	300	7.0	125	3,000
6"	850	8.5	350	8,500
8"	1,700	10	710	17,500
10"	2,600 (3,200)	10 (12)	1,080 (1,333)	26,000 (32,000)
12"	3,600 (5,000)	10 (13)	1,500 (2,080)	36,000 (50,000)

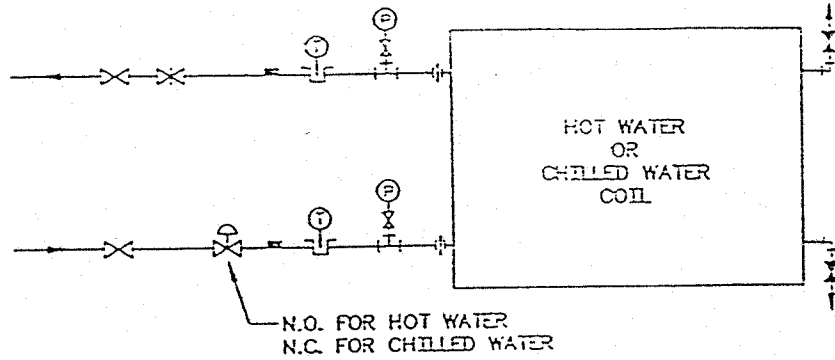
Above sizes based on not exceeding 10 fps.
 (---)These values are for use on intermittent flow.

NOTES AND CHECK LIST:

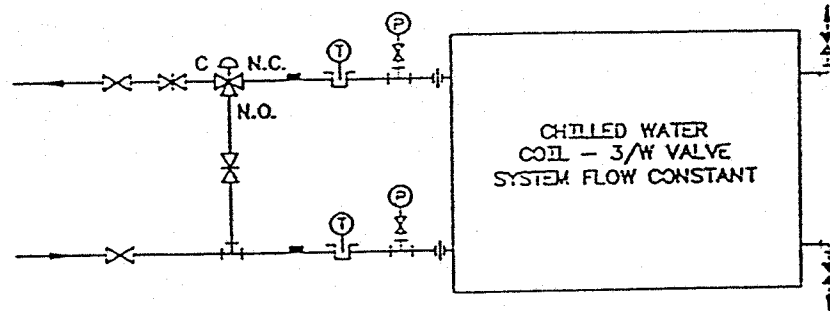
1. Be sure that every pump has a strainer in front of it to protect it from junk.
2. Steam heat exchangers: May be reset with outside temperatures.
 - Select for 2 psi steam.
 - Vacuum breaker after control valve
 - Install COMPOUND pressure gauge at steam inlet to the heat exchanger.
 - Install Thermometers across the unit
 - Install high enough for condensate drainage into traps
 - Do not lift condensate.
3. The Sequence is:
Heat exchanger--Air seperator--Pump--System
4. Use reverse return on all piping. Where not practical, be sure that the system can be balanced and stay in balance. Watch take-offs for expansion and contraction.
5. Expansion tank:
 - Must have a sight glass with valves
 - Set pressure 5 psi greater than building height above the tank.
 - Be sure the tank has a drain fitting
 - Connect to system with an air fitting
6. Connect the domestic water to the system between the air seperator and the expansion tank. Be sure to use a BACK FLOW PREVENTER.
7. Do not vary the water temperature in any boiler except a Cast Iron sectional. Never run a steel boiler below 180 deg.
8. On multi-temperature systems, use heat exchangers or 3/way control valves. If using 3/way valves, watch the return connections to prevent overheating.
9. Use a seperate pump for each different temperature.
10. Water connections into coils IN THE BOTTOM--OUT THE TOP. This is to remove air traped at the top. Install air vent at the top of the coil and a drain at the bottom.

11. Radiation:
 - Select for 25% excess capacity
 - Each element to have an air vent
 - Each element to have a balancing valve
 - With several rooms in series, use a 2 position valve--do not modulate
 - Select for 160 deg in 180 deg out.
12. Cabinet heater or Unit heaters:
 - Pipe same as radiation
 - Verify what turns it on
13. Fan Coil Units:
 - On 4 pipe-C W valve is Normally closed.
 - Be sure drain connection is min 1"
 - Be sure CW valve is over drain pan.
14. Pumps:
 - Never select a pump without a curve.
 - Use 1750 RPM pumps
 - Pump must have strainer ahead of pump.
 - Pump must have balancing valve in disch
 - Pump must have isolation valves
 - Pump must have a check valve in discharge when multiple pumps are installed.
 - Install Pressure gages across pump
15. Chemical Treatment:
 - Use a "Pot Type" feeder for closed loop hydronic systems.
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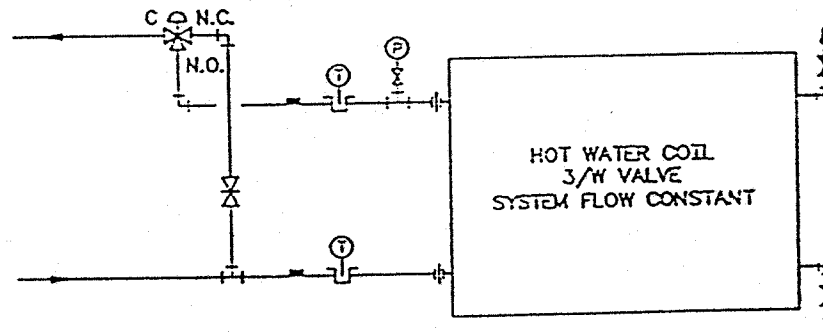
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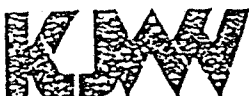
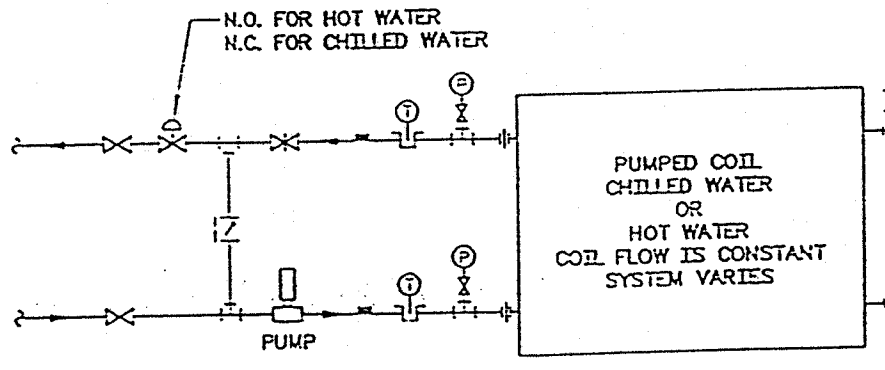
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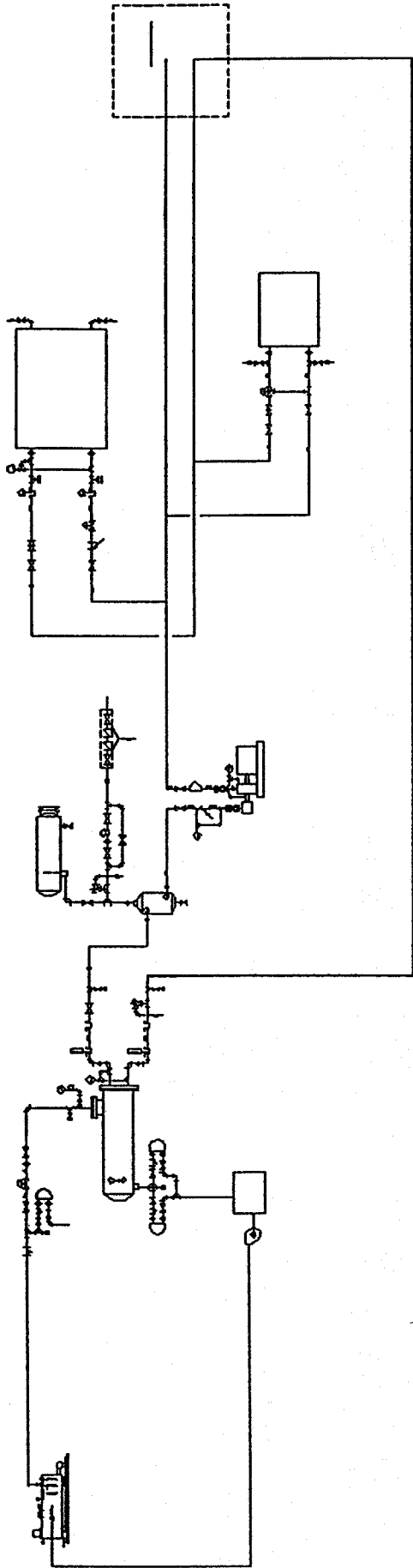


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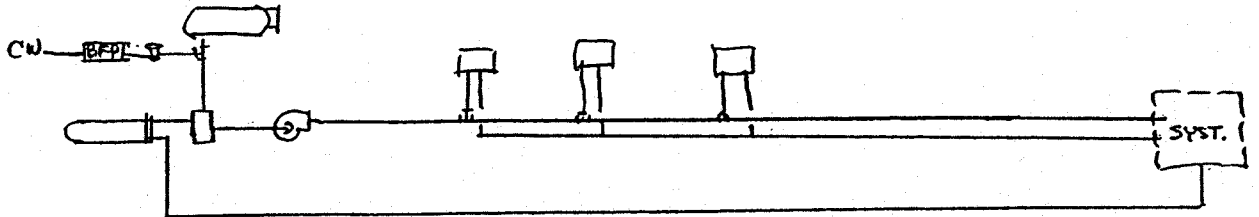
TYPICAL H.W. HEATING SYSTEM



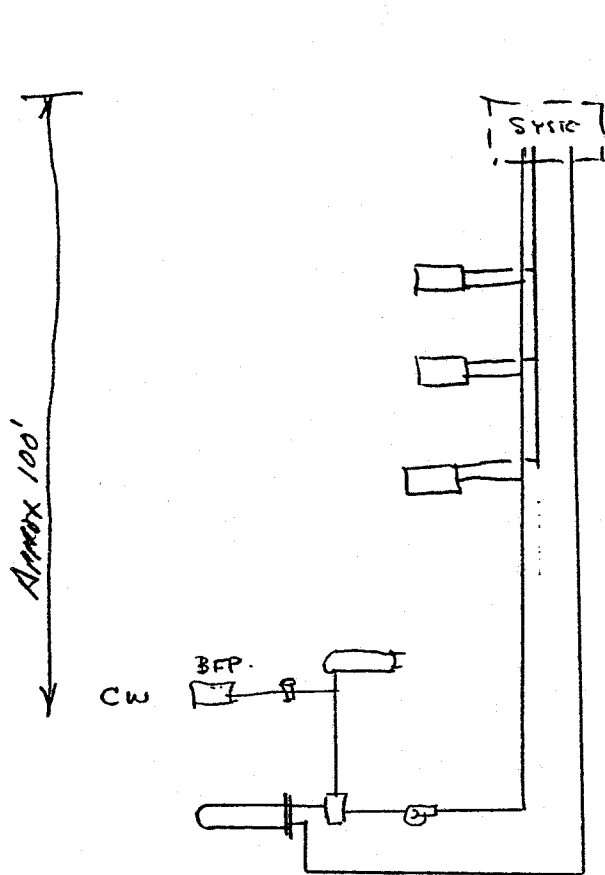
ENGINEERING CONSULTANTS

PROJECT	Hydraulics - "SYSTEM PRESSURE"	DATE	10-24-91	BY	SCW	PROJECT NO.	70000
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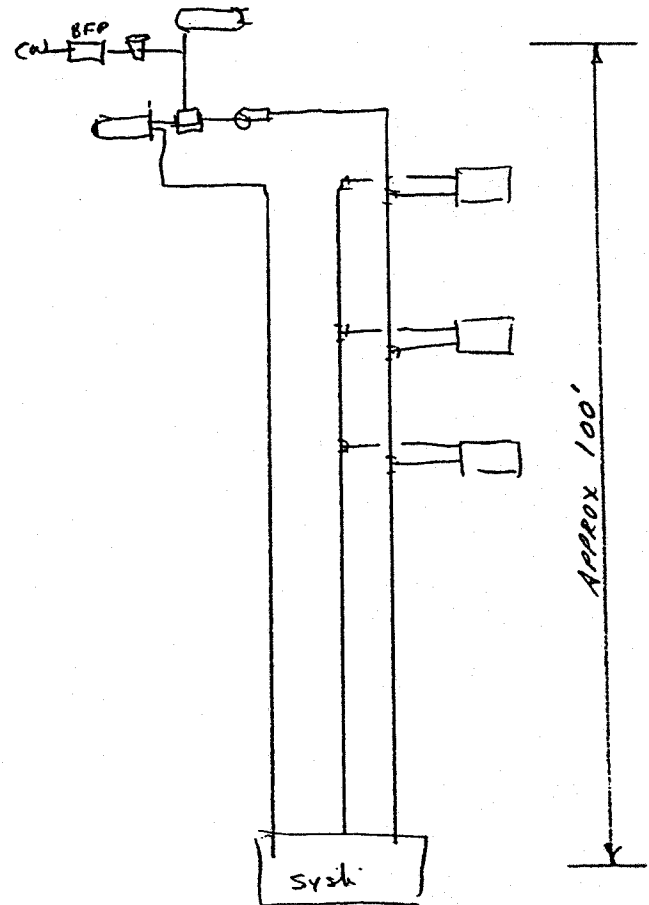
SYSTEM PRESSURE @ EXP. TANK CONN.



SYSTEM PRESS 9 psi (20')
Pump head (40')



System Pressure 50 psi (115')
Pump head = (40')



System Press = 9psi - (20')
Pump head = 40'