THE AERCO KC COMMERCIAL LAUNDRY HOT WATER HEATER SYSTEM

The AERCO KC system recommended for commercial/industrial laundries (i.e. hospital or hotel laundries) is illustrated in SD-A-432. Because laundries are subjected to periodic surge flows, supplementary storage is usually required to keep the maximum load on a gas-fired water heater within the heater's maximum capacity.

PRINCIPAL OF OPERATION

BTUs are stored in a stratified storage tank on a constant temperature-variable volume (of hot water) basis, i.e., the system depends on an absolute minimum of mixing of cold water and hot water in the tank. The discharge to the system is taken from the top of the tank and/or the heater. The supply of hot water in the upper portion of the tank is replenished at a constant rate by the heater operating at its maximum capacity. Tank storage must be large enough to accommodate the cumulative surge flows that occur in the maximum usage period.

Sizing and selection of the components is covered in the following explanation and example. System set up and adjustment consists simply of setting the system final outlet temperature and adjusting one balancing cock to set the circulating pump to operate at the correct point on its curve.

DETERMINATION OF LAUNDRY HOT WATER REQUIREMENTS: AVERAGE HOURLY HOT WATER RATE (AHHWR)

Commercial laundry equipment generally uses two gallons or less of 180°F water per pound of cloths or linens washed. This figure is recommended by most machine manufacturers. Most "heavy" work requires a nominal one hour wash cycle, inclusive of loading and unloading the machine, and is based on a 50-60 second fill time. The use of the shorter 30 second fill time will shorten the total cycle only 3 to 4 minutes.

The shorter cycles more commonly used are not shorter because of shorter fill time, but, instead, are achieved by the elimination of a suds- or rinse-cycle or both. These are generally employed with synthetic fabrics which also use lower water temperatures. Thus, the figure of two gallons/pound of fabrics being washed can be considered to be two gallons/pound of machine capacity for determination of the AHHWR.

If a 30 second fill cycle is standard for the entire laundry operation, this figure might be increased 6 to 7% to 2.14 gallons/pound of machine capacity. However, the figures used are conservative enough to preclude this necessity.

Average Hourly Hot Water Rate = (2) • (total machine capacity in pounds)

SIZING THE KC SERIES GAS-FIRED HEATER

$$\textit{Heater Capacity (recovery rate) in GPM} = \frac{\textit{AHHWR}}{\textit{60 mins}} = \frac{\textit{2GPH • total machine capacity in pounds}}{\textit{60 minutes}}$$

(See Chart A for heater selection)

SIZING THE STRATIFIED STORAGE TANK

Approximately ? o f the water usage in the normal laundry machine occurs in a 20 minute time period (?) hour. During this period, the heater can make only half of this required amount or ? of the hourly requirement.

The stratified storage tank must provide the other half or ? of a full ho ur requirement. Stratification within the tank precludes 100% usability. Standard practice has shown that the tank is able to deliver between 60% and 80% of its total capacity without excessive temperature degradation. AERCO recommends using 70% of the total capacity of an un-baffled vertical tank piped as shown in Figure one

$$\textit{Storage Tank size in gallons} = \frac{\textit{2GPH} \bullet \textit{machine capacity in pounds}}{\textit{3} \bullet \textit{0.7}}$$

SIZING THE CIRCULATOR

Select the required pump flow rate from Chart B below, based on desired system set point and number of KC units selected. Head loss depends on loop piping.

Chart A - Heater Selection (in GPM)

	(1)*KC1000*	(2)*KC1000*	(3)*KC1000*
40 - 140	*18*	*36*	*54*
40 - 160	*15*	*30*	*45*
40 - 180	*13*	*26*	*39*

Chart B - Circulator Selection (in GPM)

	(1)*KC1000*	(2)*KC1000*	(3)*KC1000*
40 - 140	*18*	*36*	*54*
40 - 160	*15*	*30*	*45*
40 - 180	*13*	*26*	*39*

If recovery rate is less than or equal to capacities shown above, select that number of KC water heaters.

EXAMPLE: Given washer capacities of:
and a required temperature rise of 40°F – 160°F

1	400#
1	200#
1	100#
1	75#
Total	775#

$$\text{AHHWR} = 2 \bullet \textit{775\#} = 1550$$

$$\text{Heater Capacity} = \frac{2 \bullet \textit{775\#}}{60} = \text{26 GPM; from Chart A: 2 KC1000s}$$

$$\text{Tank Capacity} = \frac{2 \bullet \textit{775\#}}{\textit{3} \bullet \textit{0.7}} = \text{738 gallons}$$

Circulator Capacity = 30 GPM, from Chart B

DETERMINATION OF MAXIMUM INSTANTANEOUS DEMAND (MID)

The nominal machine cycle of 45 to 50 minutes, exclusive of loading and unloading, is generally based on a 50 to 60 second time to fill to high fill level. Many machine manufacturers are currently recommending a 30 second fill time to fill to high level. While fill time has *no impact* on tank and circulator sizes, and none on heater capacity, it does impact *line sizes* and dictates the *maximum surge flow through the nozzles* which must be accommodated. Therefore, it is essential to be able to determine this flow for various "fill" times.

The factors used in the following examples are machine manufacturer's recommended factors to account for diversity resulting from a varying number of machines and variations in machine sizes.

2-minute fill time

1 or 2 machines:

MID = 0.15GPM • capacity of largest machine in pounds

3 or more machines:

MID = 0.15GPM • capacity of largest machines in pounds PLUS
0.10GPM • total capacity of all other machines in pounds

1-minute fill time

1 or 2 machines:

MID = 0.30GPM • capacity of largest machine in pounds

3 or more machines:

MID = 0.30GPM • capacity of largest machines in pounds PLUS
0.15GPM • total capacity of all other machines in pounds

30-second fill time

1 or 2 machines:

MID = 0.60GPM • capacity of largest machine in pounds

3 or more machines:

MID = 0.60GPM • capacity of largest machines in pounds PLUS
0.25GPM • total capacity of all other machines in pounds

SELECTING TANK NOZZLES AND PIPE SIZES

Using the calculated MID, select a tank nozzle and pipe sizes from Chart C. Choose tank water inlet and outlet connections to keep velocities below 2fps (feet per second). Choose sizes to velocities below 7fps. Note on SD-A-432, that the piping between the tank and heater(s) does not see the MID, only the pumped flow rate. Therefore, this piping only needs to be selected for the pumped flow rate.

ALTERNATE SIZING: DESIGNING FOR NO SUPLEMENTAL STORAGE

In a small laundry (up to 200 pound total machine capacity, and where fill times of 1 minute or longer are acceptable), it is practical to consider the use of the AERCO KC1000 heater without any supplemental storage.

Heater capacity is selected equal to the maximum instantaneous demands (MID) as calculated for the standard system above.

EXAMPLE (Alternate Sizing): A small laundry with incoming water 40°F in winter and water to machines 160°F, has the following laundry machines:

1 with 75 pound capacity
1 with 50 pound capacity
125 pounds = Total Capacity

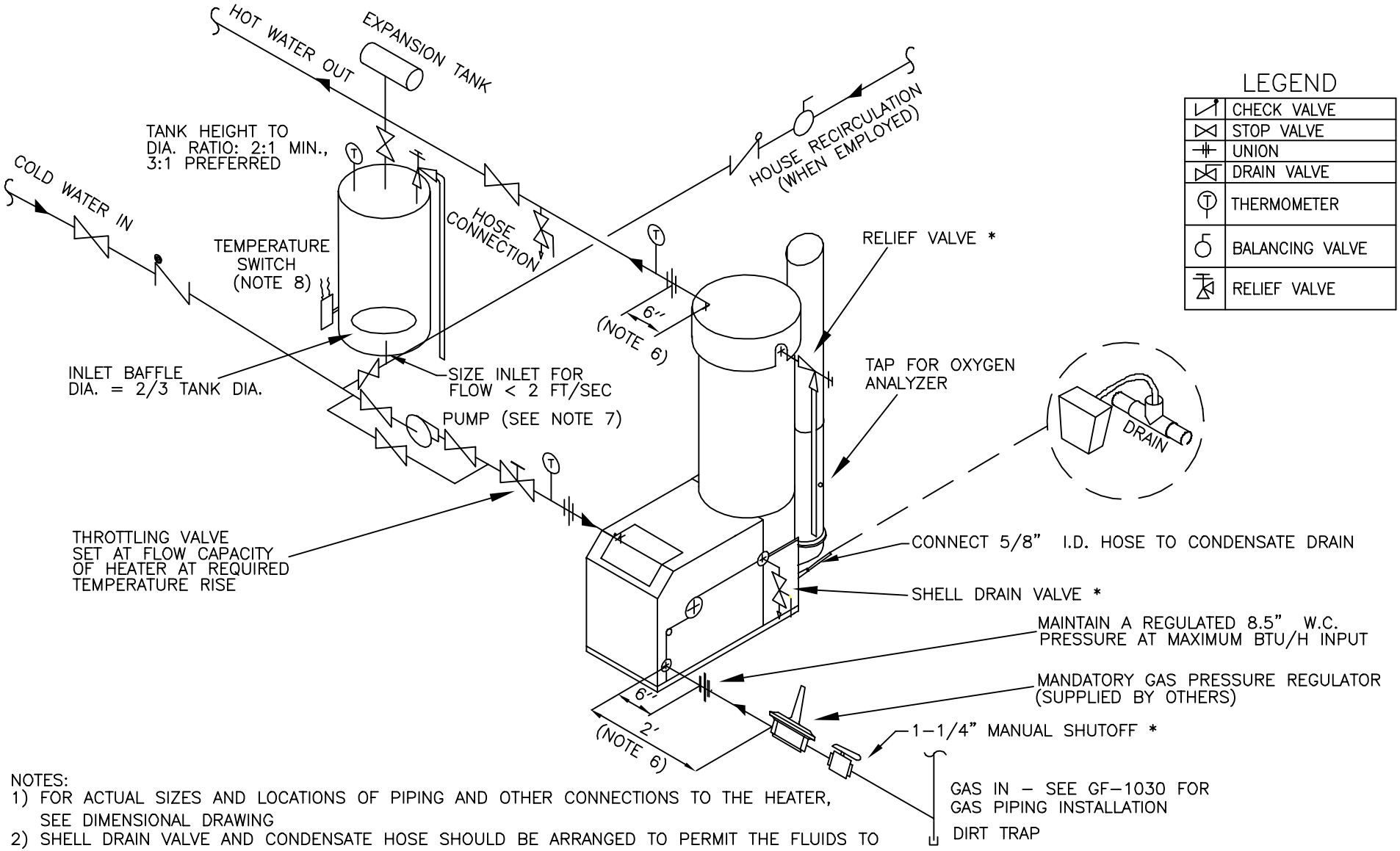
Heater Capacity

MID for largest machine	=	75 pounds • 0.30GPM	=	22.5 GPM
MID for all other machines	=	50 pounds • 0.15GPM	=	7.5 GPM
		Total MID	=	30.0 GPM

From Chart A, heater selection is: 2 KC1000 heaters

Chart C – Velocity of water in fps (feet per second) in schedule 40 pipe for water at 60°F

GPM	2”	2 ½”	3”	3 ½”	4”	5”	6”	8”
6	0.574							
8	0.765							
10	0.956	0.670						
15	1.43	1.01						
20	1.91	1.34	0.868					
25	2.39	1.68	1.09	0.812				
30	2.87	2.01	1.30	0.974				
35	3.35	2.35	1.52	1.14	0.882			
40	3.83	2.68	1.74	1.30	1.01			
45	4.30	3.02	1.95	1.46	1.13			
50	4.78	3.35	2.17	4.62	1.36			
60	5.74	4.02	2.60	1.95	1.51			
70	6.70	4.69	3.04	2.27	1.76	1.12		
80	7.65	5.36	3.47	2.60	2.02	1.28		
90	8.60	6.03	3.91	2.92	2.27	1.44		
100	9.56	6.70	4.34	3.25	2.52	1.60	1.11	
125	11.97	8.38	5.43	4.06	3.15	2.01	1.39	
150	14.36	10.05	6.51	4.87	3.78	2.41	1.67	
175	16.75	11.73	7.60	5.68	4.41	2.81	1.94	
200	19.14	13.42	8.68	6.49	5.04	3.21	2.22	
225		15.09	9.77	7.30	5.67	3.61	2.50	1.44
250			10.85	8.13	6.30	4.01	2.78	1.60
275			11.94	8.93	6.93	4.41	3.05	1.76
300			13.00	9.74	7.56	4.81	3.33	1.92
325			14.12	10.53	8.19	5.21	3.61	2.08
350				11.36	8.82	5.62	3.89	2.34
375				12.17	9.45	6.02	4.16	2.40
400				12.98	10.08	6.42	4.44	2.56
425				13.80	10.71	6.82	4.72	2.73
450				14.61	11.34	7.22	5.00	2.89
475					11.97	7.62	5.27	3.04
500					12.60	8.02	5.55	3.21
550					13.85	8.82	6.11	3.53
600					15.12	9.63	6.66	3.85
650						10.43	7.22	4.17
700						11.23	7.78	4.49
750						12.03	8.33	4.81
800						12.83	8.88	5.13
850						13.64	9.44	5.45
900						14.44	9.99	5.77



LEGEND

	CHECK VALVE
	STOP VALVE
	UNION
	DRAIN VALVE
T	THERMOMETER
	BALANCING VALVE
	RELIEF VALVE

NOTES:

1) FOR ACTUAL SIZES AND LOCATIONS OF PIPING AND OTHER CONNECTIONS TO THE HEATER, SEE DIMENSIONAL DRAWING
2) SHELL DRAIN VALVE AND CONDENSATE HOSE SHOULD BE ARRANGED TO PERMIT THE FLUIDS TO DRAIN FREELY, BY GRAVITY, TO A FLOOR DRAIN.RELIEF VALVE SHOULD BE PIPED VERTICALLY TO A HEIGHT 18" ABOVE THE FLOOR.
3) ALL (*) ITEMS ARE INCLUDED SEPARATELY IN SHIPMENT.
4) THIS IS A TYPICAL INSTALLATION DRAWING. LOCAL CODES AND AUTHORITIES SHOULD BE CONSULTED.
5) HOSE CONNECTION AT HEATER OUTLET IS FOR INITIAL HEATER CALIBRATION DURING START-UP.
6) LOCATE WATER INLET AND OUTLET FITTINGS (i.e.UNIONS, ELBOWS, ETC.) A MINIMUM OF 6" FROM WATER HEATER FITTINGS, TO PREVENT INTERFERENCE WITH REMOVAL OF HEATER PANELS. ALL PIPING & ELECTRIC CONNECTIONS SHOULD BE 6" AWAY FROM SIDE PANELS. LOCATE GAS PRESSURE REGULATOR A MINIMUM OF 2' FROM HEATER.
7) PUMP SHOULD BE CAPABLE OF HEATER'S RATED FLOW AT DESIGN TEMPERATURE RISE.
8) MOUNT TEMPERATURE SWITCH 1/3 UP FROM THE BOTTOM OF THE TANK, SWITCH WILL TURN PUMP ON AND OFF.

AERCO INTERNATIONAL, INC.
NORTHVALE, NJ 07647

KC1000 1 MIL. BTU
GAS FIRED WATER HEATER
STRATIFIED STORAGE TANK INSTALLATION

DWN.BY SCD DATE 111198
SCALE NTS
APPD. MPC DATE 122298

SD-A-432

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