CATALOG NO. 8100.10P
Effective: 06-01-13
Replaces: 07-01-03

RAYTHERM WATER HEATER SIZING GUIDE

Raypak®

A Rheem® Company

WATER HEATER SIZING GUIDE

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GENERAL INFORMATION

The information on sizing for various applications such as restaurants, apartments, laundromats, and school gymnasiums, which is contained within this handbook, is the result of over forty years of Raypak engineering in commercial hot water supply combined with American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) data. These charts and formulas are designed to be used as a guide in equipment selection with certain caveats applied: The following sizing information is intended to be used for normal operating conditions. Adjustments must be made in equipment sizing if unusual loads or conditions exist. Sizing of extremely high or very infrequent peaks of demand has been excluded because of the myriad variations possible in such situations. If unique sizing requirements are encountered, contact Raypak, Inc. in Oxnard, California or your local Raypak representative for special assistance, or refer to the latest edition of the ASHRAE Handbook.

As a general rule, higher inputs and lower storage capacities result in operating economies. However if large storage systems are required, a ratio not to exceed 1:3 in GPH recovery to storage is recommended. An alternate method of sizing is to refer to sizing curves in the ASHRAE guide for the appropriate application. The ASHRAE curves show "usable storage capacity" on the horizontal axis and recovery capacity by unit on the vertical. Raypak's tables simplify this procedure and also compensate for the fact that with a Raypak water heater/tank system, an 80% draw without a significant temperature drop can be achieved.

MULTIPLE UNIT DWELLING SIZING

The basic approach to sizing Raypak Hot Water Supply Heaters for domestic hot water systems in multiple unit dwellings such as apartments, condominiums, hotels and motels is a water heater with a storage tank (Uni-Temp 80). The following table should be used as a guideline.

Table 1 Uni-Temp 80-Apartments and Condominiums.
Table 2 Uni-Temp 80-Motels and Hotels
Table 3 Uni-Temp 80-Pump and Piping Specifications

The Uni-Temp 80 provides a guaranteed 80% draw without temperature drop when using Raypak water heaters,tanks, sizing tables and suggested piping.

TABLE 1
RAYTHERM UNI-TEMP 80
APARTMENT AND CONDOMINIUMS

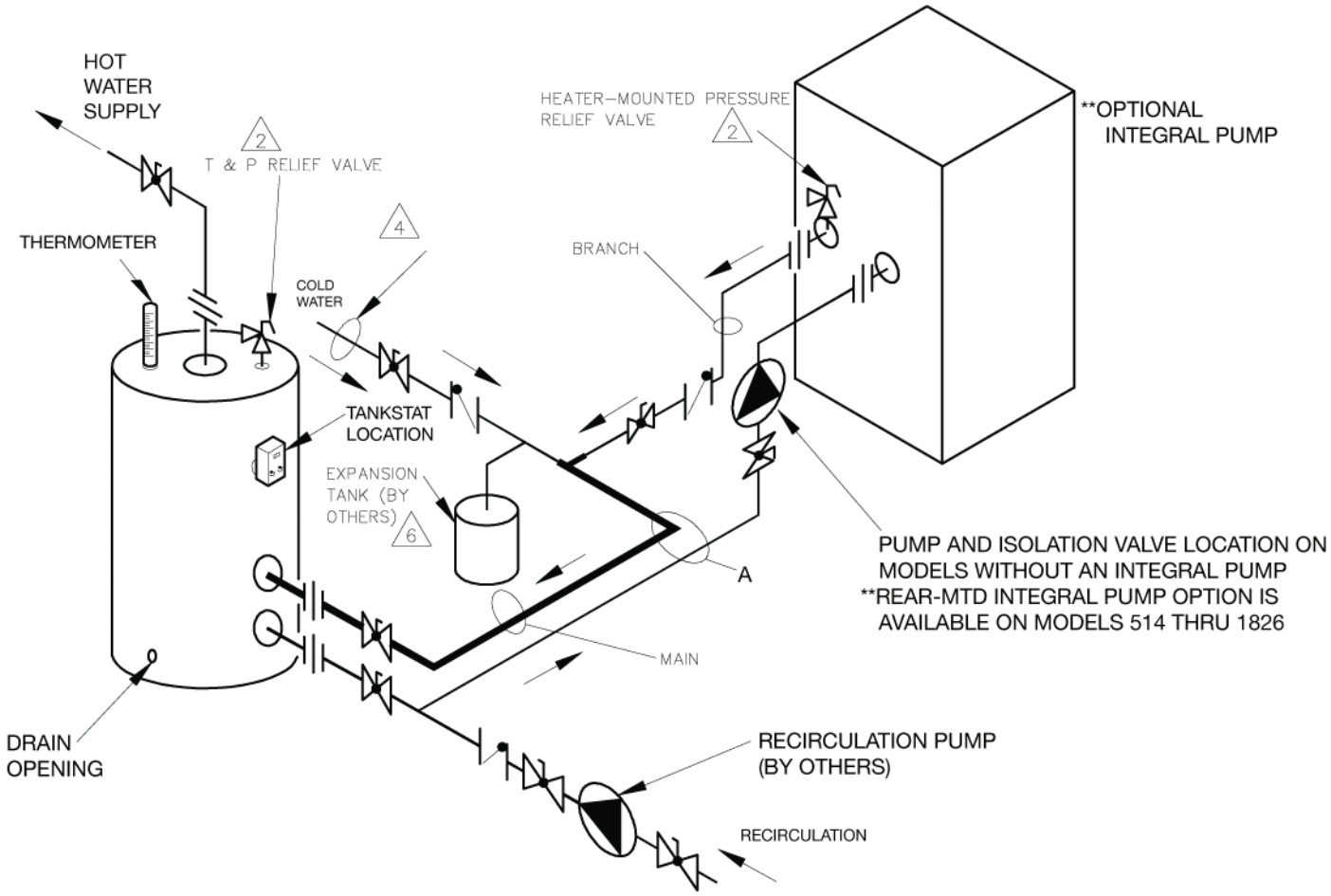
Number of Units	1-2 Bedroom 1 bath				Tank Capacity Gallons	2-3 Bedroom 2 bath				Tank Capacity Gallons
	100° rise		80° rise			100° rise		80° rise		
	Indoor Heater	Outdoor Heater	Indoor Heater	Outdoor Heater		Indoor Heater	Outdoor Heater	Indoor Heater	Outdoor Heater	
10	133	133	133	133	50	133	133	133	133	80
15	182/181	182/181	133	133	80	260/261	260/261	182/181	182/181	80
20	260/261	260/261	182/181	182/181	115	260/261	260/261	260/261	260/261	115
25	330/331	330/331	260/261	260/261	115	330/331	330/331	260/261	260/261	115
30	330/331	330/331	330/331	330/331	175	400/401	400/401	330/331	330/331	175
35	400/401	400/401	330/331	330/331	175	514	514	400/401	400/401	175
40	514	514	400/401	400/401	175	514	514	400/401	400/401	235
45	514	514	400/401	400/401	225	624	624	514	514	235
50	624	624	514	514	225	624	624	514	514	235
55	624	624	514	514	225	724	724	514	514	261
60	624	624	514	514	261	724	724	624	624	261
65	724	724	624	624	261	824	824	624	624	335
70	724	724	624	624	274	824	824	624	624	335
75	824	824	624	624	327	824	824	724	724	335
80	824	824	724	724	327	962	926	724	724	379
85	962	926	724	724	327	962	926	824	824	379
90	962	926	724	724	379	1125	1083	824	824	379
95	962	926	824	824	379	1125	1083	824	824	390
100	962	1083	824	824	379	1125	1083	962	926	534
110	1125	1083	962	926	390	1223	1178	962	926	534
120	1125	1178	962	926	462	1223	1287	1125	1083	534
130	1223	1178	962	1083	462	1336	1414	1125	1083	534
140	1336	1287	1125	1083	524	1468	1414	1125	1178	534
150	1336	1287	1125	1083	524	1468	1571	1223	1178	606
160	1468	1414	1125	1178	524	1631	1571	1223	1287	606
170	1468	1571	1223	1178	606	1631	1758	1336	1287	606
180	1631	1571	1223	1287	606	1826	1758	1336	1414	712
190	1631	1571	1336	1287	606	1826	2/926	1468	1414	712
200	1631	1758	1336	1414	684	1826	2/926	1468	1571	712
210	1826	1758	1468	1414	684	2100	2/1083	1631	1571	712
220	1826	2/926	1468	1414	684	2100	2/1083	1631	1571	803
230	1826	2/926	1468	1571	684	2100	2/1083	1631	1758	803
240	2100	2/1083	1631	1571	712	2100	2/1083	1826	1758	803
250	2100	2/1083	1631	1571	803	2100	2/1083	1826	1758	803
260	2100	2/1083	1631	1571	803	2500	2/1083	1826	2/926	922
270	2100	2/1083	1631	1758	803	2500	2/1178	1826	2/926	922
280	2100	2/1083	1826	1758	803	2500	2/1178	1826	2/926	922
290	2100	2/1083	1826	1758	803	2500	2/1178	2100	2/1038	922
300	2500	2/1083	1826	2/926	922	2500	2/1287	2100	2/1038	922
325	2500	2/1178	2100	2/926	922	2500	2/1287	2100	2/1038	1017
350	2500	2/1287	2100	2/1083	922	3001	2/1414	2100	2/1038	1017
400	3001	2/1414	2100	2/1083	1017	3001	2/1571	2500	2/1178	1164

APARTMENTS AND CONDOMINIUMS

NOTES:

1. Selections include residential dishwashers and individual clothes washers.
2. 3 GPM shower head capacity. For other sizes consult Raypak representative.
3. For units with jetted tubs add to water heater and tank.
   15% for small tubs (standard) - 40 to 70 gallon size.
   25% for large tubs - 70 to 100 gallon size
4. Temperature rise equals
   100 degree F rise = 40 degree F makeup, 140 degree F storage
   80 degree F rise = 60 degree F makeup, 140 degree F storage

TYPICAL RAYTHERM UNI-TEMP 80 SYSTEM



MINIMUM PIPE SIZE	
SIZES MODELS	DIMENSION A
133	1-1/4"
181-401	1-1/2"
514-824	2"
926-1826	2-1/2"
2100-4001	3"

TABLE 2
RAYTHERM UNI-TEMP 80
MOTELS AND HOTELS

Number of Units	1-2 Bedroom 1 bath				Tank Capacity Gallons
	100° rise		80° rise		
	Indoor Water Heater	Outdoor Water Heater	Indoor Water Heater	Outdoor Water Heater	
10	133	133	133	133	80
15	182/181	182/181	133	133	80
20	260/261	260/261	182/181	182/181	80
25	260/261	260/261	260/261	260/261	115
30	330/331	330/331	260/261	260/261	115
35	400/401	400/401	330/331	330/331	175
40	400/401	400/401	330/331	330/331	175
45	514	514	400/401	400/401	175
50	514	514	400/401	400/401	235
55	624	624	514	514	235
60	624	624	514	514	235
65	624	624	514	514	261
70	724	724	624	624	261
75	724	724	624	624	261
80	724	724	624	624	274
85	824	824	624	624	335
90	824	824	724	724	335
95	962	926	724	724	335
100	962	926	724	724	379
110	962	1083	824	824	379
120	1125	1083	824	824	390
130	1125	1083	962	926	534
140	1223	1178	962	926	534
150	1223	1287	1125	1083	534
160	1336	1287	1125	1083	534
170	1336	1414	1125	1083	534
180	1468	1414	1125	1178	534
190	1468	1571	1223	1178	606
200	1631	1571	1223	1287	606

* A Unit is defined as an occupied space requiring hot water, .i.e, Hotel room etc.

NOTE:

1. Laundry and restaurant facilities require additional sizing.
2. Based on 3 GPM per shower head.
3. For tubs add to water heater and tank.
   jetted 15% for small (standard) tubs 40 to 70 gallon.
   25% for large tubs 70 to 100 gallons

TABLE 3
RAYTHERM UNI-TEMP 80
GENERAL SPECIFICATIONS FLOW AND PIPING

MODELS		WATER HARDNESS														
		SOFT					MEDIUM					HARD*				
		3-4 GRAINS PER GALLON					5-15 GRAINS PER GALLON					16-25 GRAINS PER GALLON				
Indoor	Outdoor	ΔT	GPM	ΔP	MPS	SHL	ΔT	GPM	ΔP	MPS	SHL	ΔT	GPM	ΔP	MPS	SHL
133	133	22	10	3.3	1-1/4	5.0	17	13	5.4	1-1/4	8.1	10	22	14.7	1-1/4	23.6
182/181	182/181	15	20	1.8	1-1/2	4.6	12	26	3.1	1-1/2	7.5	7	45	9.2	1-1/2	20.8
260/261	260/261	21	20	1.9	1-1/2	4.6	17	26	3.1	1-1/2	7.6	10	45	9.4	1-1/2	21.0
330/331	330/331	27	20	1.9	1-1/2	4.7	21	26	3.2	1-1/2	7.7	12	45	9.6	1-1/2	21.2
400/401	400/401	30	22	2.3	1-1/2	5.6	25	26	3.3	1-1/2	7.8	15	45	9.8	1-1/2	21.3
514	514	20	42	2.0	2	4.8	16	52	3.0	2	7.1	9	90	9.0	2	19.1
624	624	25	41	2.0	2	4.7	19	54	3.4	2	7.9	11	90	9.5	2	20.9
724	724	29	41	2.1	2	4.9	20	60	4.4	2	9.8	13	90	10.0	2	21.4
824	824	30	45	2.6	2	5.9	20	68	6.0	2	12.8	15	90	10.5	2	21.9
962	926	30	53	3.8	2-1/2	5.3	20	79	8.5	2-1/2	11.5	18	90	11.0	2-1/2	15.2
1125	1083	30	61	5.5	2-1/2	7.5	20	90	12.0	2-1/2	16.2	20	90	12.0	2-1/2	16.2
1223	1178	30	67	7.0	2-1/2	9.3	22	90	12.5	2-1/2	16.7	22	90	12.5	2-1/2	16.7
1336	1287	30	73	8.7	2-1/2	11.5	24	90	13.3	2-1/2	17.5	24	90	13.3	2-1/2	17.5
1468	1414	30	80	11	2-1/2	14.4	27	90	14.0	2-1/2	18.2	27	90	14.0	2-1/2	18.2
1631	1571	30	90	14.8	2-1/2	19.0	30	90	14.8	2-1/2	19.0	30	90	14.8	2-1/2	19.0
1826	1758	33	90	15.4	2-1/2	19.6	33	90	15.4	2-1/2	19.6	33	90	15.4	2-1/2	19.6
2100	-	30	115	5.0	3	7.9	20	172	11.0	3	17.2	17	200	14.8	3	22.9
2500	-	30	137	7.5	3	11.4	20	200	15.8	3	23.9	20	200	15.8	3	23.9
3001	-	30	164	11.2	3	17.0	25	200	16.7	3	24.8	25	200	16.7	3	24.8
3500	-	30	191	16.2	3	23.7	29	200	17.5	3	25.6	29	200	17.5	3	25.6
4001	-	33	200	18.7	3	26.8	33	200	18.7	3	26.8	33	200	18.7	3	26.8

ΔT = Temperature Rise, Degree F @ GPM Flow
GPM = Gallons per Minute Flow
ΔP = Pressure Drop, Ft. thru Heat Exchanger
MPS = Minimum Pipe Size, NPT
SHL = System Head Loss, based on 70 equivalent feet of tubing and heater
* Must use cupronickel tubes. If over 25 grains per gallon a water softener must be utilized.

Table above provides data for selecting in-line pumps for use in a typical Raypak Uni-Temp 80 system for a single boiler and tank according to the following.

1. Flow rates are based on water hardness as measured in grains per gallon.
   Soft 3-4 grains per gallon.
   Medium 5-15 grains per gallon.
   Hard 16-25 grains per gallon. Water softener needed when over 25 grains.
2. Maximum Flow Rates
   Size 133 22 GPM
   Sizes 181 to 401 45 GPM
   Sizes 514 to 1826 90 GPM
   Sizes 2100 to 4001 200 GPM
3. Pressure drop values (ΔP and SHL) and minimum pipe sizes are for two-pass water heaters, except, Model 133 which is four-pass.
4. Sizing based on water heater and tank being placed 5 feet apart.
   Additional pipe and/or fittings will increase the system head loss. Consult factory.
5. Select a pump based on the water hardness, flow and system head loss.
6. If the water heater is more than two stories above the tank, consult the factory.

NOTE: 1. GPM flow rates are limited by maximum acceptable velocity through heat exchanger tubes. Water heater Sizes 514 through 1826 may be provided with an integral rear-mounted pump. This must be specified at time of order. The integral pump will provide sufficient flow to meet the conditions listed in the table.

RESTAURANT SIZING

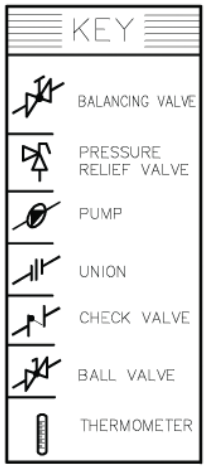
Restaurants require either two temperature systems: 180 °F for dishwashers and 140°F for general purpose water, or a single temperature of 140°F for general purpose water when chemical type dishwashers are used. Generally the dishwasher is the largest user of hot water and must be identified by manufacturer, model and the requirement of the rinse cycle.

For systems needing 180ºF water, Raypak recommends using an H model configured for use on potable water. Low temperature systems can use standard WH models.

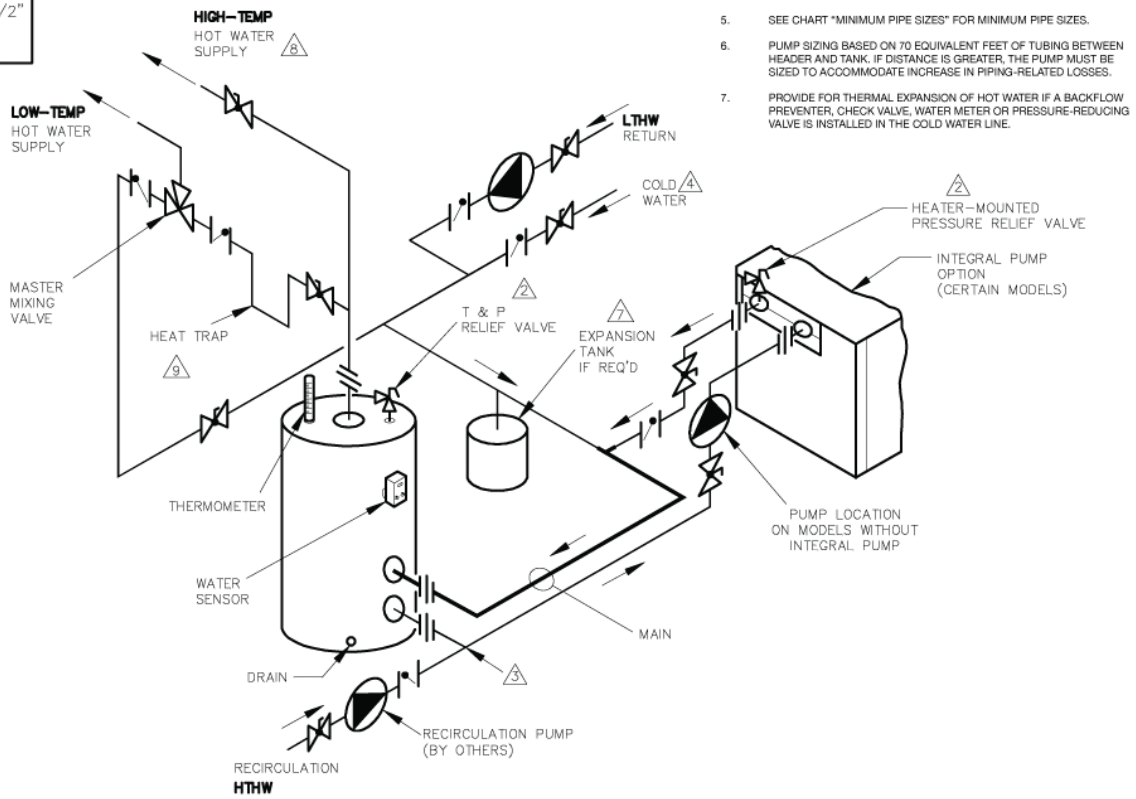
		REQUIRED TEMPERATURE	
		140	180
EXAMPLE:		Gallons Per Hour	
(1) Diswasher-Hobart C44		310	
(1) Silver Washer			88
(1) Vegetable Sink	@45 gph	45	
(1) Double Pot Sink	@60 gph	60	
(1) Pre-rinse	@45 gph	45	
(2) Lavatories	@5 gph	10	
		470	88
Multiply by 1.5 to obtain 140ºF Equiv. GPH			x1.5
			132
Equiv. 140ºF GPH		= 470	+ 132
Total Gallons per hour		602	
Select: H-624 model with a 80 gallon tank			

TYPICAL RESTAURANT PIPING

MINIMUM PIPE SIZES		
	BRANCH	MAIN
RAYTHERM		
133	1–1/4"	1–1/2"
181–401	1–1/2"	2"
514–824	2"	2–1/2"
926–1826	2–1/2"	3"
2100–4001	3"	4"



NOTES:
1. PLUMB SWING CHECK VALVE IN GRAVITY CLOSED POSITION.
2. PIPE ALL RELIEF VALVES TO DRAIN, OR AS LOCAL CODES REQUIRE.
3. LOCATE TEE AS CLOSE AS POSSIBLE TO TANK.
4. INSTALL COLD WATER BETWEEN HEATER OUTLET AND TANK.
5. SEE CHART "MINIMUM PIPE SIZES" FOR MINIMUM PIPE SIZES.
6. PUMP SIZING BASED ON 70 EQUIVALENT FEET OF TUBING BETWEEN HEADER AND TANK. IF DISTANCE IS GREATER, THE PUMP MUST BE SIZED TO ACCOMMODATE INCREASE IN PIPING-RELATED LOSSES.
7. PROVIDE FOR THERMAL EXPANSION OF HOT WATER IF A BACKFLOW PREVENTER, CHECK VALVE, WATER METER OR PRESSURE-REDUCING VALVE IS INSTALLED IN THE COLD WATER LINE.



NOTES:
1. Plumb all swing check valves in gravity-closed position.
2. Minimum pipe size between water heater and tank to be equal to water heater inlet/outlet connection.

SCHOOLS, GYMNASIUMS AND STADIUMS

The Raytherm Uni-Temp 80 system is recommended to meet the high peak demands of this type system. Normally a large storage volume is utilized due to the short but heavy load with this type of system.

DATA:
Period of time allocated for showers:
Physical education classes : 10-15 minutes.
Athletic events : 20 minutes
Period of time between physical education classes.
Normally 40 minutes.
Assume 110°F gross water temperature at shower heads.
Assume 100% usage factor.
Assume 140°F hot water temperature, 100@ F rise.
Lavatory basin usage not included.

SIZING: UNI-TEMP 80 SYSTEM

Codes:

Bg = Water Heater Recovery Rate, GPH
Ba = Floor area of water heater, sq. ft.
Gt = Total Water Required, gal.
Sq = Shower Head Flow Rate, GPM.
Sn = Number of Shower Heads.
Ta = Floor area of tank, sq. ft.
Tc = Class Time, min.
Tg = Tank Capacity, gal.
Tr = Temperature Rise, Deg. F.
Ts = Shower Time, min.
Tu = Usable Tank Capacity, gal. Use 80% of tank capacity.
Wi = Inlet Water Temperature, Deg. F.

1. Data Required

Number of shower Heads	Class Time
Shower Head Flow Rate	Inlet Water Temperature
Shower Time	

2. Calculation

a. Total water required Gt = Sn x Sg x Ts
b. Water Heater Recovery Rate Bg = Gt÷ (Tc ÷ 60)
c. Temperature Rise Tr = 140 - Wi
d. Select water heater from Water Heater Recovery Rate, Table 5.
e. Tank Capacity Tg = Gt - ((Bg x (Ts÷Tc))
f. Select Tank from Storage Tanks, Table 6.

Example:

25 Showers @ 5 GPM each
10 Minute Shower Time
50 Minute Class Time
40°F Inlet Water Temp.

a. Total Water Required, gal	Gt = Sn x Sg x Ts	25 x 5 x 10 = 1250
b. Water Heater Recovery Rate, gal	Bg = Gt ÷ (50 ÷ 60)	1250 ÷ (50 ÷ 60) = 1500
c. Temperature Rise, deg F	Tr = 140- Wi	140 - 40 = 100F
d. Select water heater from Table 5		WH-1631 Indoor
e. Tank Capacity, gal	Tg = Gt ((Bg x (Ts-Tc))	1250 - ((1500 x (10÷50)) = 950
f. Select Tank Size, Table 6		1017 gallon 60 in dia x 93 in lg.

OPTIONAL SIZING:

A. Space requirements limited. Select smaller tank larger water heater.

DATA REQUIRED:

a. Space available - floor area and ceiling height.
The selection of a vertical tank will usually provide an adequate reduction in space required.

b. Use standard sizing to obtain

1. Total Water Required		Gt - Sn x Sg x Ts
2. Select a tank size approximately 50% of required gallons		Tg = 0.50 x Gt
3. Select tank from Table 5.		
4. Determine floor area required, sq. ft		
a. Vertical tank =		Sf = 3.1416 ($D^2 \div 4$)
b. Horizontal Tank		Sf = Dia x Length.
5. Usable water from tank		Tu = Tg x 0.80
6. Water Heater Recovery Rate	Bg = ((Gt÷ (Tc ÷ 60) + Tu - ((Tu x (Tc ÷ 50) x (Ts ÷ Tc))	
7. Select water heater from Table 4.		
8. Determine floor area required. (Include clearances from combustibles)		Ba = L x W

EXAMPLE

a. Space available 25 Showers @ 5 GPM each. 10 minute shower time. 50 minute class time 40 deg F inlet water temp.	100 sq. ft. 12 ft ceiling	
b. Total water required, gal.	= Gt = Sn x Sg x Ts	25 x 5 x 10 = 1250
Tank size	Gt x 0.50	1250 x 0.50 = 625
Select Tank from Table		606 gal Vertical 3.5 ft. dia x 9 ft high
Determine tank floor area 3,1416 x ($d^2 \div 4$)		3.1416 ($(3.5)^2 \div 4$)=9.6 sq.ft.
Usable water from tank	Tu = Tg x 0.80 606 x 0.80 = 484	
• Boiler Recovery Rate	Bg = ((Gt ÷ (Tc ÷ 60)) + Tu - ((Tu x (Tc ÷ 60)) x (Ts ÷ Tc) = ((1250 ÷ (50 ÷ 60)) + 484 - ((484 x (50 ÷ 60)) x (10 ÷ 50) = 1903 gallon recovery	
Select Boiler from Table 4	= WH 2100	
Determine Boiler floor area	= L x W	
Boiler 5.1 ft long + 4 ft clearance	= 9.1 ft	
5.4 ft long =+ 2 ft Clearance	= 7.4 ft	
Total Boiler Floor Area	67.3 sq. ft.	
Tank Area	9.6 sq. ft.	
Total Required	76.9 sq. ft.	

LAUNDRY SIZING

Sizing for Coin-Operated Laundries

Raypak Laundry-Pak water heaters and tanks are ideal for coin-op laundry installations. To determine the correct water heater and tank for your location use the following worksheet.

Worksheet/Coin Laundry Sizing

Sizing and selection of Raytherm Type WH hot water supply water heaters, storage tanks and circulators.

STEP 1: Calculate hot water demand.

Hot water requirements of popular front and top load washers are shown on Page 12.

Washer Manufacturer	Model	Washer Hot Water Gals/Cycle		Number of Washers		Total Hot Water Gals/Cycle
_____	_____	_____	x	_____	=	_____
_____	_____	_____	x	_____	=	_____
_____	_____	_____	x	_____	=	_____
_____	_____	_____	x	_____	=	_____
_____	_____	_____	x	_____	=	_____
		Total Hot Water Gallons/Cycle — all Machines:			=	_____
		Multiply by 2 (Cycles per hour)				_____ x 2
		TOTAL DEMAND IN GALLONS PER HOUR				_____

STEP 2: Select heater, tank and pump.

Determine the temperature rise (° F) required. In the table below, and in the columns headed by the selected temperature rise, find the GPH closest to but not less than the TOTAL GALLONS PER HOUR calculated in Step 1. On that line, and under the appropriate column heading, find the heater model number, the recommended tank size and circulator (pump) specifications. Note that Type WH hot water supply heaters are offered in ***indoor*** and ***outdoor*** styles.

Equipment Specifications

Water Heater:

Raytherm WH hot water supply heaters, indoor or outdoor.
On/Off firing.
Finned copper tube 2-pass heat exchanger.
Bronze headers.
Intermittent electric ignition.
125 psi pressure relief valve.
Adjustable automatic operating control.
Temperature and pressure gauge.
Economaster pump time delay.

Tank

Vertical, w/pipe legs.
Glass lining.
3" NPT connections on sizes 235-534 Gal.
3" NPT connections on sizes 684-1164 Gal.
Tankstat and thermometer (loose).
125 PSI ASME Code.

Pump

Bronze.

Type WH **Indoor** Water Heater					Type WH **Outdoor** Water Heater				Tank		Pump*	
Heater Model Number	Temperature Rise Gallons per Hour 80ºF	90ºF	100ºF	ΔT Across Heater	Heater Model Number	Temperature Rise Gallons per Hour 80ºF	90ºF	100ºF	Normal Capacity Gallons	Diameter X Length	HP	Ft. Hd.**
514	636	565	508	20	514	636	565	508	Stock 235	30 x 84	0.25	4.5
624	779	692	623	20	624	779	692	623	Stock 335	36 x 84		6.9
724	902	802	722	20	724	902	802	722			0.33	9.5
824	1025	911	820	20	824	1025	911	820			0.50	12.5
962	1195	1062	956	20	926	1150	1023	920				11.7
1125	1397	1242	1118	20	1083	1346	1196	1076	390	42 x 72	0.75	16.0
1223	1519	1350	1215	20	1178	1464	1301	1171			0.50	9.9
1336	1661	1476	1328	30	1287	1599	1421	1279				12.1
1468	1823	1620	1458	30	1414	1756	1560	1404	Stock 534	42 x 96		14.8
1631	2025	1800	1620	30	1571	1951	1734	1560			0.75	18.0
1826	2268	2016	1815	30	1758	2184	1941	1747				18.6
				35	(2) 926	2300	2046	1840			0.50	11.7
2100	2609	2319	2087	20					712	48 x 101	1.50	16.3
				20	(2) 1083	2692	2392	2152			0.75	16.0
				20	(2) 1178	2928	2602	2342			0.50	9.9
2500	3105	2760	2484	30					803	54 x 90	0.75	11.7
				30	(2) 1287	3198	2842	2558			0.50	12.1
				30	(2) 1414	3512	3120	2808				14.8
3001	3727	3313	2982	30					922	54 x 102	1.00	16.5
				30	(2) 1571	3902	3468	3120			0.75	18.0
3500	4348	3865	3479	30							2.00	21.5
				30	(2) 1758	4368	3882	3494	1164	60 x 105	0.75	18.6
4001	4970	4418	3976	40							2.00	17.9

*Based on 5-15 per gallon hardness

**Ft. Hd is based on 70 Ft. equivalent length of pipe, valve and fittings between heater and tank placed five (5) feet apart and stated ΔT across heater.

WASHING MACHINE MANUFACTURERS SPECIFICATIONS**

FRONT LOAD

Manufacturer	Model	Capacity (lbs.)	Hot Water Per Cycle (Gals.)	Minutes Per Cycle
Cook/Ald	Prowash 30	30	30	21
Dexter		16	13	20
		20	20	24
	WCB-35	35	35	30
	WCB-50	50	50	30
Hoyt	Mighty Midget	18	18	28
	HD 2000	20	24	18
	HD 3000	30	29	18
IPSO	Mighty Mac-18	18	8	17
	Big Mac-35	35	15	17
	Big Mac-50	50	25	25
Laudercenter	L-18	18	16	25
	L-35	33	33	25
Maytag		18	12	21
		35	24	21
		50	42	21
Pellerin-Milnor	30015CWE	35	27	24
	30020CWE	50	35	24
Primus		18	6	20
		25	7	20
		35	16	20
		50	22	20
Speed Queen	WF 1001N	18	12	27
	CL 9161-63	25	16	30
	WX-401	40	34	22
Unimac		30		15
		50		15
Wascomat	P-10	10	7	25
	EX-7	15	10	
	W-74	18	12	24
	W-124	30	22	24
	W-184	50	34	24
	W-244	75	51	24

TOP LOAD

Manufacturer	Model	Capacity (lbs.)	Hot Water Per Cycle (Gals.)	Minutes Per Cycle
General Electric	WWC9000F	14	18	21
Maytag	A23CS	N/A	16	23
	A23CD	N/A	16	19
	WA4970, 71, 80 & 81	N/A	16	19
	EA1120	N/A	15.2	19
Whirlpool	CA2762XS	N/A	18.6	19

** Source: American Coin-Op Magazine

Sizing for Commercial Washing Machines

Raypak Laundry-Pak Systems utilize larger water heaters and tanks for the most stringent demands of commercial installations and may be sized as follows:

1. Determine gallons per hour required
   GPH = No. of machines x lbs per machine x GPH per lb. x portion of draw that is hot water x no. cycles per hour.
   NOTES: Nominal gallons per pound = 3 gal/lb.
   Portion of hot water draw = 2/3 (0.66)
   Number of cycles per hr. = 2
2. Determine tank size
   Tank capacity, gallons = Total pounds (No machines x lb/ machine) x 2.5

EXAMPLE Two (2) 100 lb machines.
GPH = 2 machines x 100 lb/mach x 3 gal/lb x 0.660 draw x 2 cycles = 800 GPH
Model Selection = WH1 - 824
Tank Size = 200 lbs x 2.5 = 500 gallons
Tank Selections = 534 gal capacity

NOTE: Sometimes the bigger coin-op laundries use the Milnor type 35 pound commercial machines. They may use from 1-4 units. When they use up to 2 units, add the additional GPH to the coin-op sizing. However, when they use 3 or 4 you should add all the additional GPH and only half the tank sizing.

EXAMPLE: (1) 2 - 35 pound machines
70 x 2 x 2 = 280 GPH. Add this to coin-op sizing.

EXAMPLE: (2) 4 - 35 pound machines
140 x 2 x 2 = 560 GPH. Add this to coin-op sizing.

For the tank size 70 x 5 = 350 divided by 2 = 175. Add to required tank size.
See the Laundry-Pak Catalog No. 3000.32 for recommended installation diagram.

RECOVERY RATES
Raytherm Boilers

	Recovery Rates														
	Temperature Rise														
	10F°	20F°	30F°	40F°	50F°	60F°	70F°	80F°	90F°	100F°	110F°	120F°	130F°	140F°	150F°
	Gallons per Hour (GPH)														
Model	Indoor Models														
133	1352	676	451	338	270	225	193	169	150	135	123	113	104	97	90
182/181	1799	900	600	450	360	300	257	225	200	180	164	150	138	129	120
260/261	2624	1312	875	656	525	437	375	328	292	262	239	219	202	187	175
330/331	3320	1660	1107	830	664	553	474	415	369	332	302	277	255	237	221
400/401	3966	1983	1322	991	793	661	567	496	441	397	361	330	305	283	264
514	5084	2542	1695	1271	1017	847	726	636	565	508	462	424	391	363	339
624	6232	3116	2077	1558	1246	1039	890	779	692	623	567	519	479	445	415
724	7216	3608	2405	1804	1443	1203	1031	902	802	722	656	601	555	515	481
824	8200	4100	2733	2050	1640	1367	1171	1025	911	820	745	683	631	586	547
962	9559	4779	3186	2390	1912	1593	1366	1195	1062	956	869	797	735	683	637
1125	11179	5589	3726	2795	2236	1863	1597	1397	1242	1118	1016	932	860	798	745
1223	12151	6075	4050	3038	2430	2025	1736	1519	1350	1215	1105	1013	935	868	810
1336	13285	6642	4428	3321	2657	2214	1898	1661	1476	1328	1208	1107	1022	949	886
1468	14581	7291	4860	3645	2916	2430	2083	1823	1620	1458	1326	1215	1122	1042	972
1631	16201	8101	5400	4050	3240	2700	2314	2025	1800	1620	1473	1350	1246	1157	1080
1826	18145	9073	6048	4536	3629	3024	2592	2268	2016	1815	1650	1512	1396	1296	1210
2100	20873	10436	6958	5218	4175	3479	2982	2609	2319	2087	1898	1739	1606	1491	1392
2500	24839	12419	8280	6210	4968	4140	3548	3105	2760	2484	2258	2070	1911	1774	1656
3001	29818	14909	9939	7455	5964	4970	4260	3727	3313	2982	2711	2485	2294	2130	1988
3500	34788	17394	11596	8697	6958	5798	4970	4348	3865	3479	3163	2899	2676	2485	2319
4001	39758	19879	13253	9939	7952	6626	5680	4970	4418	3976	3614	3313	3058	2840	2651
	Outdoor Models														
133	1352	676	451	338	270	225	193	169	147	135	123	113	104	97	90
182/181	1799	900	600	450	360	300	257	225	195	180	164	150	138	129	120
260/261	2624	1312	875	656	525	437	375	328	284	262	239	219	202	187	175
330/331	3320	1660	1107	830	664	553	474	415	360	332	302	277	255	237	221
400/401	3966	1983	1322	991	793	661	567	496	430	397	361	330	305	283	264
514	5084	2542	1695	1271	1017	847	726	636	565	508	462	424	391	363	339
624	6232	3116	2077	1558	1246	1039	890	779	692	623	567	519	479	445	415
724	7216	3608	2405	1804	1443	1203	1031	902	802	722	656	601	555	515	481
824	8200	4100	2733	2050	1640	1367	1171	1025	911	820	745	683	631	586	547
926	9204	4602	3068	2301	1841	1534	1315	1150	1023	920	837	767	708	657	614
1083	10764	5382	3588	2691	2153	1794	1538	1346	1196	1076	979	897	828	769	718
1178	11709	5854	3903	2927	2342	1951	1673	1464	1301	1171	1064	976	901	836	781
1287	12792	6396	4264	3198	2558	2132	1827	1599	1421	1279	1163	1066	984	914	853
1414	14044	7022	4681	3511	2809	2341	2006	1756	1560	1404	1277	1170	1080	1003	936
1571	15605	7802	5202	3901	3121	2601	2229	1951	1734	1560	1419	1300	1200	1115	1040
1758	17473	8737	5824	4368	3495	2912	2496	2184	1941	1747	1588	1456	1344	1248	1165

TABLE 5
STORAGE TANKS

ASME CODE & NON-CODE: INSULATED & JACKETED

Capacity Gallons	Dimension - Inches		
	Diameter	Height	Connections
80	24-7/16	58-5/8	2-1/2
115	28-1/4	59-1/4	2-1/2
175*	32-1/4	67-1/4	2-1/2

*ASME Code Only

ASME CODE: STOCK

Capacity Gallons	Dimension - Inches		
	Diameter	Shell Length	OAL
235	30	73	84
335	36	70	84
534	42	72	96

ASME CODE: CUSTOM MANUFACTURED

Capacity Gallons	Dimension - Inches		
	Diameter	Shell Length	OAL
115	24	48	63
139	24	60	75
189	30	48	66
235	30	60	84
261	30	72	90
274	36	48	69
335	36	60	84
379	36	72	93
390	42	48	72
534	42	72	96
606	42	84	108
524	48	48	77
610	48	60	89
712	48	72	101
806	48	84	113
803	54	60	90
922	54	72	102
1017	60	60	93
1164	60	72	105
1311	60	84	117
1468	60	96	129
1260	66	60	96
1438	66	72	108
1616	66	84	120
1794	66	96	132
1953	72	84	123
2166	72	96	135
2378	72	108	147
2590	72	120	159

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