RAMCO LAUNDRY MACHINERY INSTALLATION ENGINEERING GUIDE

SECTION 1. MACHINE DATA

1-1. MACHINES

For model specifications, features, electrical data, valve data, motor data and outline dimensions refer to the following publications:

EQUIPMENT	CATALOG	DIMENSIONS
Hard Mount, Variable Speed, End-Loading, Washer/Extractors		
HWE 60	HWETS	HWE60WS
HWE 110	HWETS	HWE110WS

EQUIPMENT	CATALOG	DIMENSIONS
Soft Mount, Variable Speed, End-Loading, Washer/Extractors		
LWE 60	LWETS	LWE60WS
LWE 110	LWETS	LWE110WS
LWE 180	LWETS	LWE180WS
LWE 230	LWETS	LWE230WS
LWE 275	LWETS	LWE275WS
LWE 350	LWETS	LWE350WS

EQUIPMENT	CATALOG	DIMENSIONS
Soft Mount, Variable Speed, End-Loading, Washer/Extractors		
SWE 60	SWETS	SWE60WS
SWE 110	SWETS	SWE110WS
SWE 180	SWETS	SWE180WS
SWE 230	SWETS	SWE230WS
SWE 285	SWETS	SWE285WS

EQUIPMENT	CATALOG	DIMENSIONS
Soft Mount, Variable Speed, End-Loading, Tilting, Washer/Extractors		
SWE 230T	SWETILTS	SWE230TWS
SWE 375T	SWETILTS	SWE375TWS
SWE 450T	SWETILTS	SWE450TWS

EQUIPMENT	CATALOG	DIMENSIONS
Soft Mount, Anti-Cross Contamination, Washer/Extractors		
BWE 125	BWETS	BWE125WS
BWE 230	BWETS	BWE230WS

SECTION 2. MACHINE MOUNTING

2-1. GROUND FLOOR

Refer to the detailed specifications for each machine to determine the static and dynamic loads. The anchoring and trough drawings for each machine contain information on anchor bolt placement. Anchor bolts are furnished with all machines.

Proper leveling and grouting is a machine installation requirement. Failure to comply with these instructions may void the machine warranty.

2-2. ABOVE-GROUND FLOOR

For above-ground installations, floor construction must support the static and dynamic load of the machine when fully operational. It is important to determine that the natural frequency of the building does not coincide with the frequency generated by the machine. It is important to verify the floor construction is adequate. If in doubt about floor specifications, contact the RAMCO Sales Engineering Department before proceeding.

CAUTION: Floor must support the static and dynamic load of the machine when fully operational. It is important to verify that floor construction is adequate.

SECTION 3. WATER DRAIN

3-1. WATER USAGE FOR LAUNDERING

Refer to Table 3.1 for further information.

3-2. DRAIN TROUGH

RAMCO end-loading machines can either be connected directly to the sewer pipe or discharged into a drain trough. Barrier machines require a drain trough which must be large enough to contain the rapidly drained water without overflowing. RAMCO Marketing Technical Support Group will furnish detailed drain trough drawings. Trough capacities for single machines are shown in Table 3-1.

TABLE 3-1 DRAIN TROUGH CAPACITY

RAMCO EQUIPMENT	END-LOADING								
	HWE 60	HWE 110	LWE 60	LWE 110	LWE 180	LWE 230	LWE 275	LWE 350	SWE 60
Trough gallons*	40	60	40	60	90	85	88	150	40
Capacity liters	155	230	155	230	305	325	334	57	155

TABLE 3-1 DRAIN TROUGH CAPACITY

RAMCO EQUIPMENT	END-LOADING							BARRIER	
	SWE 110	SWE 180	SWE 230	SWE 285	SWE 230T	SWE 375T	SWE 450T	BWE 125	BWE 230
Trough gallons*	60	90	85	95	85	150	185	75	105
Capacity liters	230	305	325	360	325	570	700	285	400

**Gallons are U. S. measure*

3-3. SEWER PIPE

The drain pipe of an end-loading machine can be piped directly to the sewer pipe provided the sewer pipe size is larger than the drain pipe. If the sewer pipe is smaller, the machine must drain into a trough.

All side-loading machines must drain into a trough.

The sewer pipe connected to the drain trough must be sized large enough to empty the trough in 45-60 seconds. If a number of machines drain into a common trough, the sewer pipe size is calculated as follows:

1. Determine the total trough capacity by adding the trough capacity required for each machine (Table 3-1).
2. Calculate design capacity by multiplying the total capacity by the appropriate modification factor in Table 3-2.
3. Select from Table 3-3 the sewer pipe size that matches the design trough capacity. If the design capacity falls between pipe sizes, select the larger pipe size, i.e., if the trough is 400 gallon, use a 6” pipe rather than a 5” pipe.

TABLE 3-2 MULTIPLE MACHINES TROUGH MODIFICATION FACTORS

Number of Machines	1-2	3-4	5-6	7-8	9-10
Modification Factor**	1.00	0.85	0.75	0.60	0.50

***Design capacity equals the total capacity multiplied by the modification factor.*

TABLE 3-3 SEWER PIPE SIZE & CAPACITY

U. S. Measure	inch	3	4	5	6	8	10	12
	gpm	1.00	200	350	550	1,000	1,800	2,800
Metric	mm	75	100	125	150	200	250	300
	lpm	380	760	1,325	2,082	3,785	6,815	10,600

EXAMPLE: Determine the drain trough capacity and sewer pipe size required for an installation with these RAMCO machines: 1 - SWE 450, 1 - SWE 230, 1 - SWE 110.

1. Total trough capacity (Table 3 -1):

1-SWE 450 = 1 @ 185 gallon = 185 gallon
1-SWE 230 = 1 @ 85 gallon = 85 gallon
1-SWE 110 = 1 @ 60 gallon = 60 gallon
Total trough capacity = **330 gallon**

2. Design trough capacity

Design capacity = Total capacity x modification factor (Table 3-2)

= 330 gallon x .85 = **281 gallon**

3. Sewer pipe size

Design capacity = **281 gallon**

From Table 3-3 **select a 5" sewer pipe** which has a capacity of 350 gpm.

SECTION 4. UTILITIES

4-1. WATER

For productivity, quality, and efficiency, it is essential that the water supply system (softeners, tanks, pumps, heaters, piping, etc.) be adequately sized to provide the required hourly consumption, and the momentary peak demands.

A. AVERAGE HOURLY WATER CONSUMPTION in the wash-room varies according to the poundage processed,the type of work, and the wash formulas. First, determine the required hourly production and then multiply this poundage by the typical water consumption figure given in **Table 4-1**. (In actual operation, the total amount of water used may be considerably less.)

TABLE 4-1 WATER CONSUMPTION

TYPE LAUNDRY	HOT WATER		COLD WATER		TOTAL	
	gallon/pound	liter/kilogram	gallon/pound	liter/kilogram	gallon/pound	liter/kilogram
Lodging	1.0	8.5	1.0	8.5	2.0	17.0
Institutional	2.0	17.0	1.0	8.5	3.0	25.5
Commercial	2.0	17.0	1.0	8.5	3.0	25.5
Linen Supply	2.5	21.0	1.0	8.5	3.5	29.5
Industrial	2.5	21.0	1.5	13.0	4.0	34.0
Diaper	2.5	21.0	1.5	13.0	4.0	34.0

**This engineering guide is intended to serve as a helpful guide in sizing laundries and estimating utility costs. Obviously, from one specific situation to another, there will be variations in such matters as water consumption, electrical usage, poundage generated by a particular type of facility, and the number of loads processed per hour by a washer/extractor. It would be to your advantage to use actual figures when they are available. When questions arise, feel free to contact the RAMCO Service Department at 1-800-878-5578.*

EXAMPLE: Determine the hourly water consumption for an institutional laundry that washes 2400 lb/ hr (see **Table 4-1**).

Hot water = 2400 pounds/hour x 2 gallon/pound = 4800 gallon/hour

Cold water = 2400 pounds/hour x 1 gallon/pound = 2400 gallon/hour

Total water consumption = 7200 gallon/hour

B. MOMENTARY PEAK DEMAND. All components of the water system should be designed to fill the machines at a rate of approximately 1/2 gpm per pound of rated load capacity of a machine. At that flow rate, it takes about 30- 45 seconds to fill a machine to rinse level.

In a multiple machine installation it is unlikely that all machines will fill simultaneously. Thus, peak demand is based on the flow requirements of the largest machine (see **Table 4-2**) plus a percentage of the demand of the additional machines (see **Table 4-3**).

TABLE 4-2 MOMENTARY WATER DEMAND

RAMCO EQUIPMENT	END-LOADING								
	HWE 60	HWE 110	LWE 60	LWE 110	LWE 180	LWE 230	LWE 275	LWE 350	SWE 60
Refill – gpm	30	50	30	50	80	105	125	160	30
Rate – lpm	115	190	115	190	305	400	475	610	115

TABLE 4-2 MOMENTARY WATER DEMAND									
RAMCO EQUIPMENT	END-LOADING							BARRIER	
	SWE 110	SWE 180	SWE 230	SWE 285	SWE 230T	SWE 375T	SWE 450T	BWE 125	BWE 230
Refill – gpm	50	80	105	130	105	160	200	60	105
Rate – lpm	190	305	400	500	400	610	760	230	400

TABLE 4-3 WATER DEMAND MODIFICATION FACTORS					
Number of Machines		1	2-4	5-7	8+
Modification Factor*	Hot	1.00	0.50	0.40	0.30
	Cold	1.00	0.25	0.20	0.15

**Total momentary demand equals the demand of the largest machine plus the factored demand of the additional machines.*

The water header shall then be sized based on flow rates in Table 4-4 so that the water velocity shall not exceed 15 ft/sec (4.5 m/sec) except on short runs.

TABLE 4-4 WATER FLOW RATES IN PIPES										
U. S. Measure	inch	1	1-1/4	1-1/2	2	2-1/2	3	4	5	6
	gpm	20	50	75	150	225	360	600	900	1400
Metric	mm	25	32	50	50	65	76	100	125	150
	lpm	75	190	570	570	850	1300	2250	3400	5300

NOTE: Install manual shut off valves on the hot and cold water lines to each machine.

CAUTION: Make sure all manual shut off valves are installed in a convenient location so the operator can reach them quickly in an emergency.

EXAMPLE: Determine the momentary peak demand, and size the hot and cold water headers for an installation with these RAMCO machines:

2 - SWE 450, 1 - SWE 230, 1 - SWE 110

1. Momentary peak demand (see **Tables 4-2** and **4-3**).

- **Hot Water.** For four machines, the momentary peak demand is the momentary demand of the largest machine (SWE 450 @ 200 gpm) plus 50% of the demand for the other three machines:
- **Hot water demand** = 200 + .5 (200 + 105 + 50) = 200 + .5 (355) = **378 gpm**.
- **Cold Water.** The peak demand is the momentary demand of the largest machine (SWE 450) plus 25% of the demand of the remaining three machines.
- **Cold water demand** = 200 + .25 (200 + 105 + 50) = 200 + .25 (355) = **289 gpm**

2. **Water header size** (see **Table 4-4**).

- **Hot water header** is sized for a flow rate of **378 gpm**. Select a **4" header** (up to 600 gpm).
- **Cold water header** is sized for a flow rate of **289 gpm**. Select a **3" header**.
- **Water Pressure** - Although it is uncommon, water pressure can exceed 55 psi. If water pressure exceeds 55 psi at the installation site, install a pressure regulator ahead of the machine to reduce the pressure to below 55 psi. This will protect the water inlet valves from excessive pressure.

4-2. STEAM

About two-thirds of the energy consumed in a laundry is used to heat water for washing. To save energy, many laundries are now using "low temperature" wash formulas and installing waste water heat reclaimers. Hot water systems, therefore, can vary dramatically. They are custom engineered and designed to meet the individual needs of each plant.

The energy figures given in Table 4-5 are approximate and should be used only as a guide if no other data is available. For example, hot water temperature is assumed to be 160 F (71° C) and no heat reclaimer is contemplated. If higher

temperatures are required to wash more heavily soiled loads, live steam can be injected into the machine. Steam for this purpose should be supplied at 60-100 psi (4-7 bar). The steam pipe size for each RAMCO machine is shown in the technical bulletins, referenced in Section 1-1. For a multiple machine installation the steam pipe header size is equal to the pipe area of the largest machine plus the total pipe area of the remaining machines multiplied by the modification factor in **Table 4-6**. Select the pipe header size which matches the total equivalent pipe area.

TABLE 4-5 ENERGY REQUIRED TO HEAT WATER

TYPE LAUNDRY	ENERGY TO HEAT WATER TO 160°F (71°C)		ENERGY FOR SUPPLEMENTAL STEAM INJECTION		TOTAL ENERGY REQUIRED	
	Btu/lb of wash	kcal/kg of wash	Btu/lb of wash	kcal/kg of wash	Btu/lb of wash	kcal/kg of wash
Lodging	1200	700	500	300	1700	1000
Institutional	2400	1300	500	300	2900	1500
Commercial	2400	1300	500	300	2900	1600
Linen Supply	3000	1650	750	400	3750	2050
Industrial	3000	1650	750	400	3750	2050
Diaper	3000	1650	500	300	3500	1950

TABLE 4-6 STEAM HEADER MODIFICATION FACTORS

Number of Machines	1	2-5	6-8	9+
Modification Factor*	1.00	0.50	0.40	0.30

**Total required pipe area = 100% of the largest pipe plus the total pipe area of the additional machine multiplied by the modification factor.*

NOTE: Install a manual shut-off valve on the steam line to each machine. Make sure all manual shut-off valves are installed in a convenient location so the operator can reach them quickly in an emergency.

EXAMPLE: Determine the steam pipe header size for injecting supplemental steam for an installation with these RAMCO machines:

RAMCO EQUIPMENT	PIPE SIZE	PIPE AREA (SEE TABLE 4-7)
2 - SWE 450	1-1/2”	2.036
1 - SWE 230	1”	0.864
1 - SWE 110	3/4”	0.533

Equivalent pipe area = 2.036 + .5 (2.036 + 0.864 + 0.533) = 3.127 + .5 (6.255) = 6.48 sq in from area closest to 6.48 sq in is the 7.393 sq in area of a 3” pipe.

NOTE: Always select the size larger rather than smaller to the equivalent area. Therefore: Select a 3” steam pipe header.

TABLE 4-7 PIPE SIZES

INSIDE AREA		
PIPE SIZE	SQUARE INCH	MILLIMETRE
1/2	0.304	196
3/4	0.533	344
1	0.864	558
1-1/4	1.495	965
1-1/2	2.036	1313

TABLE 4-7 PIPE SIZES

INSIDE AREA		
PIPE SIZE	SQUARE INCH	MILLIMETRE
2	3.355	2165
2-1/2	4.788	3088
3	7.393	4769
4	1.730	8213
5	20.006	12907

NOTE: Steam pressure must not exceed 100 psi

4.3 COMPRESSED AIR

Each RAMCO machine must have a dependable and adequate supply of clean, dry compressed air as specified in **Table 4-8.**

TABLE 4-8 COMPRESSOR SIZE

RAMCO EQUIPMENT	COMPRESSOR HP	100 PSIG CFM	7 BARS CMH
SWE 60, SWE 110, & SWE 180	1/3	4	1.7
SWE 230 & SWE 230T	1/3	6	1.7
BWE 115 & BWE 230	1/2	4	3.4
SWE 375T & SWE 450T	3/4	8	5.1

In addition to the RAMCO machines, other air-operated equipment is used throughout most laundries. Feeders, folders, presses, etc., all require air. Therefore, to select the proper size air compressor, add up the amount of air required by each piece of equipment, assuming they all function simultaneously. Select the standard size compressor which exceeds the minimum volume by about 10%. To avoid problems and reduce maintenance, the compressor should be equipped with a receiver tank, air filter, dryer, and air cover. Provide a manual shut off on the air line feeding each machine.

NOTE: Make sure all manual shut-off valves are installed in a convenient location so the operator can reach them quickly in an emergency.

4-4. ELECTRICAL

Although each machine must have its own circuit breaker for branch-circuit protection, it is unlikely that all machines in a multi-machine installation will be drawing maximum current at the same time. Thus, the size of the distribution panel is determined by the size circuit breaker (see Table 3T-15) of the two largest machines plus a percentage of the circuit breaker size of the remaining machines per Table 4-9.

TABLE 4-9 DISTRIBUTION PANEL SIZE MODIFICATION FACTORS

Number of Machines	3-4	5-6	7-8	9-12	13+
Modification Factor*	.060	0.50	0.45	0.40	0.35

**Panel size equals 100% of the two largest machines plus the factored circuit breaker sizes of the remaining machines.*

EXAMPLE: Determine the size distribution panel required for an installation with the following RAMCO machines on 240/60/3 electrical system:

2 - SWE 450 @ 125 amps, 1 - SWE2 30 @ 70 amps, 1 - SWE 110 @ 50 amps

Distribution panel size = 125 +125 = 250 (70 + 50) = 120 x 0.60 = 72 + 250 = 322 amps

To determine the total electrical service requirements for the entire laundry, add the 322 amps required by RAMCO to the total amps required by all other equipment and electrical devices in the laundry.

NOTE: The National Electrical Code requires a minimum of 42 inches working aisle in front of the electrical panel. For installations outside the USA consult local electrical codes.

Machines equipped with variable speed drive units require particular attention to the electrical installation.