

1. Direct-acting reciprocating steam-driven return-line vacuum pumps.
2. Reciprocating power-driven return-line vacuum pumps.
3. Motor-driven return-line vacuum pumps of the centrifugal or rotary type having one of the following arrangements:

- (a) One pumping unit and motor for handling both air and condensate.
- (b) One pumping unit and motor for handling air and a separate pumping unit and motor for handling condensate.

TABLE 8. DUPLEX PISTON TYPE STEAM-DRIVEN PUMP AND RECEIVERS
30 lb. Pressure

SIZE OF PUMP INCHES	SIZE OF RECEIVER INCHES	SQUARE FEET OF DIRECT RADIATION	PIPE SIZES, INCHES			
			Steam	Exhaust	Suction	Discharge
3 x 2 x 3	12 x 23	5,000	3/8	1/2	1 1/4	1
4 1/2 x 2 3/4 x 4	12 x 23	10,000	1/2	3/4	2	1 1/2
5 1/4 x 3 1/2 x 5	16 x 32	20,000	1	1 1/4	2 1/2	1 1/2
6 x 4 x 6	16 x 32	40,000	1	1 1/2	3	2
7 x 4 1/2 x 8	20 x 43	60,000	1 1/4	1 1/2	4	3
8 x 5 x 10	24 x 46	90,000	1 1/2	2	4	3

10 lb. Pressure

SIZE OF PUMP INCHES	SIZE OF RECEIVER INCHES	SQUARE FEET OF DIRECT RADIATION	PIPE SIZES, INCHES			
			Steam	Exhaust	Suction	Discharge
4 1/2 x 2 x 4	12 x 23	6,000	1/2	3/4	2	1 1/2
5 1/4 x 2 1/4 x 5	12 x 23	9,000	1	1 1/4	2 1/2	1 1/2
6 x 2 1/2 x 6	16 x 32	16,000	1	1 1/2	3	2
7 x 3 x 8	16 x 32	25,000	1 1/4	1 1/2	4	3
8 x 3 1/2 x 10	20 x 43	45,000	1 1/2	2	4	3
10 x 4 1/2 x 10	24 x 46	70,000	2	2 1/2	5	4

TABLE 9. CHARACTERISTICS OF CENTRIFUGAL RETURN PUMPS AND RECEIVERS
DELIVERING AGAINST VARIOUS PRESSURES

RATING SQUARE FEET EQUIVALENT CAST IRON DIRECT RADIATION	ACTUAL MEASURED WATER CAPACITY GALLONS PER MINUTE	MOTOR HORSEPOWERS DISCHARGE PRESSURE, POUNDS PER SQUARE INCH AT PUMP					
		10 lb.	20 lb.	30 lb.	40 lb.	50 lb.	60 lb.
2,000	4	1/8	1/2	3/4	1	1	2
4,000	6	1/8	1/2	3/4	1	1	2
6,000	8	1/8	1/2	3/4	1	1 1/2	2
8,000	11	1/8	1/2	3/4	1	1 1/2	2
10,000	13	1/8	1/2	3/4	1	1 1/2	2
12,000	16	1/8	3/4	1	1 1/2	1 1/2	...
16,000	22	1/2	3/4	1	1 1/2	1 1/2	...
26,000	35	3/4	1	1 1/2	3	5	7 1/2
40,000	60	1 1/2	2	3	5	7 1/2	10
65,000	90	1 1/2	3	5	5	7 1/2	10
100,000	150	2	5	7 1/2	7 1/2	10	15
150,000	200	3	5	7 1/2	10	15	15

- (c) One pumping unit and motor for handling condensate with an air ejector operated by a recirculated portion of the condensate for handling the air.
- (d) One pumping unit for handling condensate and another for handling the air, both operated by one motor.

The volumetric displacement rate of the water cylinders of steam or power-driven reciprocating return-line vacuum pumps should be from 8 to 10 times the volumetric rate of flow of the condensate to be handled.

The piston speed in feet per minute of steam reciprocating return-line vacuum pumps should not be more than 20 times the square root of the number of inches in the length of stroke.

The speed of crank shafts of power-driven reciprocating return-line vacuum pumps should not exceed the following:

LENGTH OF STROKE INCHES	MAXIMUM CRANK SHAFT SPEED R. P. M.
3	80
6	50
8	50
12	40
20	25

The type of drive to be employed between motor and pump may be chain, belt or gear. When gears are used they should be of a type which will be quiet in operation.

The receiving tank may be placed either on the suction or on the discharge side of the pump; generally on the suction side.

The capacity of receiving tanks, when placed on the suction side of pumps, should be proportioned to the operating condition to be met. To this end its capacity should be such as to retain the condensate and to take care of fluctuations between the rate of returning condensate and the rate of the pump delivery. This capacity in case of automatically controlled units should be the capacity of the tank in gallons between the high and low water levels in the tank, as determined by the water-line control, and when not otherwise provided for, should be in accordance with Table 10.

TABLE 10. RECEIVER TANK CAPACITIES FOR CENTRIFUGAL OR
ROTARY VACUUM HEATING PUMPS

SQUARE FEET EQUIVALENT DIRECT CAST IRON RADIATION	TOTAL RECEIVER TANK CAPACITY IN GALLONS	RECEIVER TANK CAPACITY BETWEEN HIGH AND LOW WATER LIMITS WHERE AUTOMATIC WATER LINE CONTROL IS USED
2,500	6	6
5,000	6	6
8,000	28	20
16,000	33	27
26,000	47	34
40,000	55	44
65,000	69	54
100,000	80	63