

# Remote Sump Tank Selection for a Closed Circuit Cooling Tower or Evaporative Condenser

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Remote sump tanks are used on evaporative cooling systems to provide a means of cold water basin freeze protection during cold weather operation. The remote sump tank is usually located in a heated, indoor space, and may preclude the need to winterize the cold water basin. A remote sump tank must provide sufficient storage to accommodate the suction head for the pump plus a surge volume to hold all of the water that will drain back to the tank when the pump is shut down.

The surge volume includes:

- **Piping Volume:** Water in the piping between the unit and the remote sump.
- **Water in Suspension:** Water within the spray distribution system and water falling through the coil/fill section.
- **Cold Water Basin Volume:** Water in the cold water basin during normal operation.

**Tables 2 through 9** provide the volume of water in suspension plus the water volume in the cold water basin, labeled as Spray Water Volume. **Table 10** can be used to calculate the volume of water in the piping between the unit and the remote sump, including riser and drain piping for applications where piping is Schedule 40 PVC. For specific information for your application, contact your local BAC Representative.

On remote sump applications, the standard float valve(s) and strainer(s) and pump are omitted from the cold water basin and a properly sized outlet connection is added. The end user should supply a pump that meets the following factors:

- Total static head from the remote sump tank operating level to the inlet of the evaporative equipment.
- Pipe and valve friction losses.
- The required water pressure at the inlet of the spray distribution system should not exceed 2.0 psig for all Closed Circuit Cooling Towers and Evaporative Condensers.
- Required flow rate as shown in **Tables 2 through 9**.

A valve should always be installed in the pump discharge line so that the water flow can be adjusted to the proper flow rate and pressure. Inlet water pressure should be measured with a pressure gauge installed in the water supply riser near the equipment inlet. The valve should be adjusted to permit the specified inlet pressure, which results in the design water flow rate.

Accurate inlet water pressure and flow rate are important for proper evaporative equipment operation. Higher pressure (in excess of 10 psig) can damage to the spray distribution system. Lower pressure or low flow may cause improper wetting of the coils, which will negatively affect thermal performance, promote scaling, and may also cause excessive drift.



**NOTE:** This section provides instruction in the selection of a remote sump tank for a closed circuit cooling tower or evaporative condenser only. For information on sizing a remote sump tank for an open cooling tower, see **page J163**.

**Tables 2 through 9** include the proper outlet size for each model. The remote sump outlet connection is located on the bottom of most units. On smaller Series V units, the connection is located on the end of the unit. To clarify the location of the remote sump outlet connection, refer to the appropriate unit print, available from your local BAC Representative.

Another effect of using a remote sump is that the operating weight of the evaporative unit is reduced (design changes, the omission of the integral spray pump, and/or changes in cold water basin volume can contribute to this deduct). Please refer to the **Table 1** for the operating weight deduct associated with a remote sump application.

## Safety Factor

When selecting a remote sump tank, select a model with a net available volume that is 5% greater than the above defined surge volume. Engineering data on BAC’s RS Remote Sump Tanks is provided below see **page G1** for more information on Remote Sumps. Note that the minimum operating level must be maintained in the remote sump tank to prevent vortexing of air through the tank’s suction connection.

**Table 1. RS Remote Sump Tank Engineering Data**

Model Number	Shipping Weights (lbs)	Maximum Weight (lbs) <sup>[1]</sup>	Maximum Storage Volume (gal)	“X” Minimum Operating Level <sup>[2]</sup>	Net Available Volume (gal)
RS 94	240	1,070	94	8 1/2”	72
RS 212	350	2,220	212	8 1/2”	163
RS 335	470	3,410	335	8 1/2”	257
RS 457	610	4,630	457	8 1/2”	351
RS 702	800	6,970	702	8 1/2”	539
RS 946	1,030	9,340	946	8 1/2”	727
RS 1390	1,260	13,470	1,390	8 1/2”	1,068



**NOTES:**

1. Maximum weight is for tank filled with water to spillout.
2. Minimum operating level “X” is measured from inside bottom of tank.

**Table 2. FXV/FXV3 and CXVB/CXVT Remote Sump Data**

Closed Circuit Cooling Tower Model	Evaporative Condenser Model	Spray Water Volume <sup>1,2</sup> (gal)	Required Flow Rate (GPM)	Outlet Size <sup>3</sup> (in)	Weight Deduct (lbs)
FXV-0806x-x-x	CXVB-x-0806-x	176	290	6	110
FXV-0809x-x-x	CXVB-x-0809-x	308	500	8	220
FXV-0812x-x-x	CXVB-x-0812-x	282	719	10	210
FXV-0818x-x-x	CXVB-x-0818-x	578	859	10	260
FXV-1212x-x-x	CXVB-x-1212-x	473	859	10	260
FXV-1218x-x-x	CXVB-x-1218-x	833	1,300	12	480
—	CXVB-x-1224-x	946	1,718	(2) 10	520
—	CXVB-x-1236-x	1,666	2,600	(2) 12	960
FXV3-1224-x-x	CXVT-x-1224-x and XECXVTx-1224-x	1,625	1,900	12	1,400
FXV3-1426-x-x	CXVT-x-1426-x and XECXVTx-1426-x	2,000	1,900	12	1,400
—	CXVT-x-2424-x and XECXVTx-2424-x	3,250	3,800	(2) 12	2,800
—	CXVT-x-2826-x and XECXVTx-2826-x	4,000	3,800	(2) 12	2,800

Table 3. HXV Remote Sump Data

Hybrid Closed Circuit Cooling Tower Model	Spray Water Volume <sup>1,2</sup> (gal)	Required Flow Rate (GPM)	Outlet Size <sup>3</sup> (in)	Weight Deduct (lbs)
HXV-1212N-X	473	859	10	260
HXV-1218N-X	833	1,300	12	480

Table 4. Vertex™ Evaporative Condenser Remote Sump Data

Evaporative Condenser Model	Spray Water Volume <sup>1,2</sup> (gal)	Required Flow Rate (GPM)	Outlet Size <sup>3</sup> (in)	Weight Deduct (lbs)
VRC-xxxxB-1012N-xA	423	665	8	2,010
VRC-xxxxB-1018N-xA	581	980	10	2,670
VRC-xxxxB-1024N-xA	846	1,330	(2) 8	4,020
VRC-xxxxB-1036N-xA	1,162	1,960	(2) 10	5,340
VRC-xxxxB-1212N-xA	608	760	8	1,380
VRC-xxxxB-1218N-xA	679	1,000	10	1,860
VRC-xxxxB-1224N-xA	1,216	1,520	(2) 8	2,760
VRC-xxxxB-1236N-xA	1,358	2,000	(2) 10	3,720
VRC-xxxxB-1012N-xB	423	665	8	2,030
VRC-xxxxB-1018N-xB	581	980	10	2,690
VRC-xxxxB-1024N-xB	846	1,330	(2) 8	4,060
VRC-xxxxB-1036N-xB	1,162	1,960	(2) 10	5,380
VRC-xxxxB-1212N-xB	608	760	8	1,400
VRC-xxxxB-1218N-xB	679	1,000	10	1,950
VRC-xxxxB-1224N-xB	1,216	1,520	(2) 8	2,800
VRC-xxxxB-1236N-xB	1,358	2,000	(2) 10	3,900

Table 5. VCA Remote Sump Data

Evaporative Condenser Model	Spray Water Volume <sup>1,2</sup> (gal)	Required Flow Rate (GPM)	Outlet Size <sup>3</sup> (in)	Weight Deduct (lbs)
VCA-122A to 191A	189	260	6	2,000
VCA-174A to 259A	147	330	8	3,220
VCA-261A to 322A	193	400	8	3,680
VCA-323A to 446A	282	600	10	5,560
VCA-S700A to S884A	532	1,020	(2)8	9,030
VCA-S870A to S1204A	918	1,240	(2)8	9,430

**Table 6. VF1 and VC1 Remote Sump Data**

Closed Circuit Cooling Tower Model	Evaporative Condenser Model	Spray Water Volume - End Connection <sup>1,2</sup> (gal)	Spray Water Volume - Bottom Connection <sup>1,2</sup> (gal)	Required Flow Rate (GPM)	Outlet Size <sup>3</sup> (in)	Weight Deduct (lbs)
VF1-009-X	VC1- 10 to 25	25	—	35	2.5	180
VF1-018-X	VC1- 30 to 65	50	—	75	3	310
VF1-027-X	VC1-72 to 90	75	—	115	4	440
VF1-036-X	VC1-100 to 135	105	—	150	4	590
VF1-048-X	VC1-150 to 205	140	—	220	6	850
VF1-072-X	VC1-N208 to N230	360	—	305	6	2,250
VF1-096-X	VC1-N243 to N315	360	—	385	6	2,100
VF1-144N-X	VC1-N338 to N470	520	—	580	6	3,250
VF1-192-X	—	—	720	770	(2) 6	4,200 <sup>4</sup>
VF1-288-N-X	—	—	1,040	1,160	(2) 6	6,500 <sup>4</sup>
VF1-1012N-X-X	—	—	390	350	10	2,700
VF1-1018N-X-X	—	—	670	520	10	3,770
VF1-1024N-X-X	—	—	870	700	12	5,210
VF1-1036N-X-X	—	—	1,330	1,040	(2) 10	7,530
VF1-144-X	VC1-386 to 516	—	600	585	8	4,510 <sup>4</sup>
VF1-216-X	VC1-540 to 804	—	710	835	10	6,560 <sup>4</sup>
VF1-288-X	VC1-772 to 1032	—	1,360	1,170	10	8,170 <sup>4</sup>
VF1-432-X	VC1-1158 to 1608	—	2,090	1,670	12	13,270 <sup>4</sup>
—	VC1-C216 to C320	360	—	385	6	2,100
—	VC1-C339 to C469	520	—	580	6	3,250

**Table 7. VFL and VCL Remote Sump Data**

Closed Circuit Cooling Tower Model	Evaporative Condenser Model	Spray Water Volume <sup>1,2</sup> (gal)	Required Flow Rate (GPM)	Outlet Size <sup>3</sup> (in)	Weight Deduct (lbs)
VFL-012-X	VCL-016 to 035	40	45	3	350
VFL-024-X	VCL-038 to 079	95	94	4	550
VFL-036-X	VCL-087 to 120	200	142	4	290
VFL-048-X	VCL-134 to 155	250	192	6	600
VFL-072-X	VCL-167 to 234	385	284	6	720



**NOTES:**

1. The spray water volume is based on the maximum operating water level in the cold water basin with no net drop leg included in the piping system below the unit outlet.
2. All remote sump unit volumes are based on bottom outlets sized except for VF1 and VC1 units as noted.
3. Outlet size is for remote sump applications only.
4. Weight deduct based on bottom connection.

Table 8. PCC Remote Sump Data

Evaporative Condenser Model	Spray Water Volume <sup>1,2</sup> (gal)	Required Flow Rate (GPM)	Outlet Size <sup>3</sup> (in)	Weight Deduct (lbs)
PCC-x-0406x	133	100	4	930
PCC-x-0412x	265	200	6	1,910
PCC-x-0709x	389	270	8	2,430
PCC-x-0718x	793	560	10	5,710
PCC-x-1012x	675	500	8	4,160
PCC-x-1212x	798	610	10	5,670
PCC-x-1218x	1,207	920	12	8,270
PCC-x-1220x	1,341	1,025	12	9,440
PCC-x-1024x	1,350	1,000	(2) 8	8,320
PCC-x-2012x	1,350	1,000	(2) 8	8,320
PCC-x-1224x	1,596	1,220	(2) 10	11,340
PCC-x-1236x	2,414	1,840	(2) 12	16,540
PCC-x-1240x	2,682	2,050	(2) 12	18,880
PCC-x-2412x	1,596	1,220	(2) 10	11,340
PCC-x-2418x	2,414	1,840	(2) 12	16,540
PCC-x-2420x	2,682	2,050	(2) 12	18,880
PCC-x-2424x	3,192	2,440	(4) 10	22,680
PCC-x-2436x	4,828	3,680	(4) 12	33,080
PCC-x-2440x	5,364	4,100	(4) 12	37,760

Table 9. PFi Remote Sump Data

Closed Circuit Cooling Tower Model	Spray Water Volume <sup>1,2</sup> (gal)	Required Flow Rate (GPM)	Outlet Size <sup>3</sup> (in)	Weight Deduct (lbs)
PFi-0406N	86	60	4	460
PFi-0412N	119	130	6	1,320
PFi-0709N	152	180	6	1,416
PFi-0718N	226	370	10	3,300
PFi-1012N	231	340	8	2,435
PFi-1212N	240	410	10	4,770
PFi-1218N	343	610	12	7,720
PFi-1024N	462	680	(2) 8	4,870
PFi-2012N	462	680	(2) 8	4,870
PFi-1224N	480	820	(2) 10	9,540
PFi-2412N	480	820	(2) 10	9,540
PFi-1236N	686	1,220	(2) 12	15,440

**Table 10. Schedule 40 Pipe Capacities - Not Applicable for Other Types of Piping**

Nominal Pipe Size (in)	Gallons Per Linear Foot
2	0.174
3	0.384
4	0.662
6	1.503
8	2.603
10	4.101
12	5.822
14	7.04
16	9.193
18	11.636
20	14.461
24	20.916



**NOTES:**

1. The spray water volume is based on the maximum operating water level in the cold water basin with no net drop leg included in the piping system below the unit outlet.
2. All remote sump unit volumes are based on bottom outlets sized as noted, except those models with separate columns, which are based on an end outlet sized as noted.
3. Outlet size is for remote sump applications only.

**Example**

An FXV-0806A-12D-K will be installed on a system that will also utilize an RS Remote Sump Tank. The system has been designed with 40 feet of 6” pipe that will be above the operating level of the remote sump tank. What is the correct RS Remote Sump Tank selection?

**Solution:** From **Table 2**, the spray water volume for an FXV-0806A-12D-K is 303 gallons.

From **Table 10**, the 6” pipe will contain 1.503 gallons of water per linear foot. The total volume contained in the 6” pipe is 40 feet x 1.503 gallons/foot = 60 gallons.

The total volume required is:

Spray Water Volume	303 gallons
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+ System Piping Volume	60 gallons
= Total Volume	363 gallons

363 gallons x 1.05 (safety factor) = 381 gallons required.

From the remote sump tank engineering data available on **page G5**, the correct RS Remote Sump Tank selection is an RS-702, which has a net available volume of 539 gallons.