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

**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 circuit cooling tower, see **page J178**.

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.

**Tables 2** through **8** 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** on the following page 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 H1** 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.

| Model Number | Shipping Weights (lbs) | Maximum Weight (lbs)[1] | Maximum Storage Volume (gal) | "X" Minimum Operating Level[2] | 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 |

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

**NOTES:**

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

| Closed Circuit Cooling Tower Model | Evaporative Condenser Model | Spray Water Volume[1,2] (gal) | Required Flow Rate (GPM) | Outlet Size[3] (in) | Weight Deduct (lbs) |
|---|---|---|---|---|---|
| **FXV-0806x-x-x** | **CXVB-x-0806-x** | 303 | 290 | 6 | 110 |
| **FXV-0809x-x-x** | **CXVB-x-0809-x** | 466 | 500 | 8 | 220 |
| **FXV-0812x-x-x** | **CXVB-x-0812-x** | 628 | 719 | 10 | 210 |
| **FXV-0818x-x-x** | **CXVB-x-0818-x** | 953 | 859 | 10 | 260 |
| **FXV-1212x-x-x** | **CXVB-x-1212-x** | 908 | 859 | 10 | 260 |
| **FXV-1218x-x-x** | **CXVB-x-1218-x** | 1,378 | 1,300 | 12 | 480 |
| — | **CXVB-x-1224-x** | 1,816 | 1,718 | (2) 10 | 520 |
| — | **CXVB-x-1236-x** | 2,756 | 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 2.** FXV/FXV3 and CXVB/CXVT Remote Sump Data

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

| Hybrid Closed Circuit Cooling Tower Model | Spray Water Volume[1,2] (gal) | Required Flow Rate (GPM) | Outlet Size[3] (in) | Weight Deduct (lbs) |
|---|---|---|---|---|
| HXV-1212N-X | 908 | 859 | 10 | 260 |
| HXV-1218N-X | 1,378 | 1,300 | 12 | 480 |

**Table 3.** HXV Remote Sump Data

| Evaporative Condenser Model | Spray Water Volume[1,2] (gal) | Required Flow Rate (GPM) | Outlet Size[3] (in) | Weight Deduct (lbs) |
|---|---|---|---|---|
| VCA-122A to 191A | 350 | 260 | 6 | 2,000 |
| VCA-174A to 259A | 425 | 330 | 8 | 3,220 |
| VCA-261A to 322A | 496 | 400 | 8 | 3,680 |
| VCA-323A to 446A | 753 | 600 | 10 | 5,560 |
| VCA-300A to 512A | 683 | 500 | 8 | 4,600 |
| VCA-460A to 779A | 1,037 | 760 | 10 | 7,020 |
| VCA-662A to 1024A | 1,367 | 1,020 | (2)8 | 9,030 |
| VCA-S700A to S884A | 1,367 | 1,020 | (2)8 | 9,030 |
| VCA-920A to 1558A | 2,073 | 1,540 | (2)10 | 13,870 |
| VCA-302A to 661A | 871 | 610 | 8 | 4,720 |
| VCA-526A to 1010A | 1,322 | 920 | 10 | 7,450 |
| VCA-605A to 1321A | 1,743 | 1,240 | (2)8 | 9,430 |
| VCA-S870A to S1204A | 1,743 | 1,240 | (2)8 | 9,430 |
| VCA-930A to 2019A | 2,644 | 1,860 | (2)10 | 14,870 |

**Table 4.** VCA Remote Sump Data

| Evaporative Condenser Model | Spray Water Volume[1,2] (gal) | Required Flow Rate (GPM) | Outlet Size[3] (in) | Weight Deduct (lbs) |
|---|---|---|---|---|
| VRC-X-1012-XA | 477 | 500 | 8 | 1,774 |
| VRC-X-1018-XA | 699 | 760 | 10 | 2,510 |
| VRC-X-1024-XA | 954 | 500 | 8 | 3,568 |
| VRC-X-1036-XA | 1,398 | 760 | 10 | 5,020 |
| VRC-X-1212-XA | 519 | 610 | 8 | 1,157 |
| VRC-X-1218-XA | 765 | 920 | 10 | 1,707 |
| VRC-X-1224-XA | 1,037 | 610 | 8 | 2,314 |
| VRC-X-1236-XA | 1,529 | 920 | 10 | 3,393 |
| VRC-X-1012-XB | 479 | 500 | 8 | 1,803 |
| VRC-X-1018-XB | 701 | 760 | 10 | 2,520 |
| VRC-X-1024-XB | 959 | 500 | 8 | 3,606 |
| VRC-X-1036-XB | 1,402 | 760 | 10 | 5,041 |
| VRC-X-1212-XB | 521 | 610 | 8 | 1,176 |
| VRC-X-1218-XB | 774 | 920 | 10 | 1,788 |
| VRC-X-1224-XB | 1,042 | 610 | 8 | 2,352 |
| VRC-X-1236-XB | 1,549 | 920 | 10 | 3,577 |

**Table 5.** Vertex™ Evaporative Condenser Remote Sump Data

| Closed Circuit Cooling Tower Model | Evaporative Condenser Model | Spray Water Volume - End Connection[1,2] (gal) | Spray Water Volume - Bottom Connection[1,2] (gal) | Required Flow Rate (GPM) | Outlet Size[3] (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[4] |
| VF1-288-N | — | — | 1,040 | 1,160 | (2) 6 | 6,500[4] |
| 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[4] |
| VF1-216-X | VC1-540 to 804 | — | 710 | 835 | 10 | 6,560[4] |
| VF1-288-X | VC1-772 to 1032 | — | 1,360 | 1,170 | 10 | 8,170[4] |
| VF1-432-X | VC1-1158 to 1608 | — | 2,090 | 1,670 | 12 | 13,270[4] |
| — | VC1-C216 to C320 | 360 | — | 385 | 6 | 2,100 |
| — | VC1-C339 to C469 | 520 | — | 580 | 6 | 3,250 |

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

| Closed Circuit Cooling Tower Model | Evaporative Condenser Model | Spray Water Volume[1,2] (gal) | Required Flow Rate (GPM) | Outlet Size[3] (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 |
| VFL-096-X | VCL-257 to 299 | 405 | 384 | 8 | 1,740 |

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

**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.

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

| Evaporative Condenser Model | Spray Water Volume [1,2] (gal) | Required Flow Rate (GPM) | Outlet Size[3] (in) | Weight Deduct (lbs) |
|---|---|---|---|---|
| PCC-x-0406x | 133 | 100 | 4 | 720 |
| PCC-x-0412x | 265 | 200 | 6 | 1,130 |
| PCC-x-0709x | 389 | 270 | 8 | 2,230 |
| PCC-x-0718x | 793 | 560 | 10 | 3,530 |
| PCC-x-1012x | 675 | 500 | 8 | 3,070 |
| PCC-x-1212x | 798 | 610 | 10 | 3,070 |
| PCC-x-1218x | 1,207 | 920 | 12 | 4,220 |
| PCC-x-1220x | 1,341 | 1,025 | 12 | 3,770 |
| PCC-x-1024x | 1,350 | 1,000 | (2) 8 | 6,140 |
| PCC-x-2012x | 1,350 | 1,000 | (2) 8 | 6,140 |
| PCC-x-1224x | 1,596 | 1,220 | (2) 10 | 6,140 |
| PCC-x-1236x | 2,414 | 1,840 | (2) 12 | 8,450 |
| PCC-x-1240x | 2,682 | 2,050 | (2) 12 | 7,540 |
| PCC-x-2412x | 1,596 | 1,220 | (2) 10 | 6,140 |
| PCC-x-2418x | 2,414 | 1,840 | (2) 12 | 8,450 |
| PCC-x-2420x | 2,682 | 2,050 | (2) 12 | 7,540 |
| PCC-x-2424x | 3,192 | 2,440 | (4) 10 | 12,280 |
| PCC-x-2436x | 4,828 | 3,680 | (4) 12 | 16,920 |
| PCC-x-2440x | 5,364 | 4,100 | (4) 12 | 15,080 |

**Table** 8. PCC Remote Sump Data

| Closed Circuit Cooling Tower Model | Spray Water Volume [1,2] (gal) | Required Flow Rate (GPM) | Outlet Size[3] (in) | Weight Deduct (lbs) |
|---|---|---|---|---|
| PFi-0406N | 117 | 60 | 4 | 210 |
| PFi-0412N | 210 | 130 | 6 | 560 |
| PFi-0709N | 205 | 180 | 6 | 980 |
| PFi-0718N | 446 | 370 | 10 | 1,470 |
| PFi-1012N | 381 | 340 | 8 | 1,180 |
| PFi-1212N | 490 | 410 | 10 | 2,680 |
| PFi-1218N | 861 | 610 | 12 | 3,400 |
| PFi-1024N | 763 | 680 | (2) 8 | 5,490 |
| PFi-2012N | 763 | 680 | (2) 8 | 5,490 |
| PFi-1224N | 980 | 820 | (2) 10 | 5,370 |
| PFi-2412N | 980 | 820 | (2) 10 | 5,370 |
| PFi-1236N | 1,721 | 1,220 | (2) 12 | 6,800 |
| PFi-2418N | 1,721 | 1,220 | (2) 12 | 6,810 |

**Table 9**. PFi Remote Sump Data

| 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 |

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

**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 8**, 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 |
| + | 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 H5**, the correct RS Remote Sump Tank selection is an RS-702, which has a net available volume of 539 gallons.