

Selection and Application of a Remote Sump Tank 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 M26.

Remote sump tanks are used on evaporative cooling systems to provide a means of cold water basin freeze protection during cold weather operation. When the recirculating pump of a closed circuit cooling tower or evaporative condenser is not operating, all of the recirculating water drains by gravity to the remote sump. The remote sump tank is usually located in a heated, indoor space, and may preclude the need to winterize the cold water basin.

The remote sump tank must be sized to accommodate the suction head for the pump plus a surge volume to hold all the water that will drain back to the tank when the pump is shut down. This surge volume (also called drain down volume) includes water in the evaporative cooling equipment and water held in the piping between the unit and the remote sump. The volume of water in the evaporative equipment includes the water in suspension (water within the spray distribution system and falling through the heat transfer section) and water in the cold water basin during normal operation. Tables 1 through 4 provide the volume of water in suspension plus the water in the cold water basin, labeled as "spray water volume." Table 5 can be used to calculate the volume of water in the piping between the unit and the remote sump (includes riser and drain piping) for applications where piping is Schedule 40.

To select a remote sump tank for a particular application, determine the total volume (spray water volume plus piping volume) and select a remote sump tank with a net available volume that is 5% greater than required. See page L5 for RS Remote Sump Tank Engineering Data.



Application Notes

The standard close-coupled centrifugal pump normally furnished with BAC units is designed and selected specifically for the pump head and flow rate required when the pump is mounted on the unit. **This pump cannot be used for remote sump applications and is therefore omitted.** The following factors should be considered when selecting remote pumps:

- Total static head from the remote sump tank operating level to the inlet of the evaporative equipment.
- Pipe and valve friction losses.
- For FXV and HXV Closed Circuit Cooling Towers and CXV Evaporative Condensers, 1.0 psig water pressure is required at the inlet of the water distribution system. For Series V Closed Circuit Cooling Towers and Evaporative Condensers, 2.0 psig water pressure is required at the inlet of the water distribution system.
- Required flow rate as shown in Tables 1 through 4.

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 cause leaks in 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.

On remote sump applications, the standard float valve(s) and strainer(s) are omitted from the cold water basin and a properly sized outlet connection is added. Tables 1 through 4 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 or at www.BaltimoreAircoil.com.

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 tables below for the operating weight deduct associated with a remote sump application.

Table 1. FXV/CXV/HXV Remote Sump Data

| Closed Circuit Cooling Tower Model | Evaporative Condenser Model | Spray Water Volume ^{1/2} (gallons) | Required Flow Rate (GPM) | Outlet Size ³ (in) | Weight Deduct (lbs) |
|------------------------------------|-----------------------------|---|--------------------------|-------------------------------|---------------------|
| FXV-42X | CXV-64 to 95 | 270 | 190 | 6 | 290 |
| FXV-43X | CXV-103 to 153 | 290 | 290 | 6 | 330 |
| FXV-44X | CXV-160 to 206 | 550 | 500 | 8 | 560 |
| FXV-64X/HXV-64X | CXV-196 to 305 | 600 | 715 | 10 | 560 |
| FXV-66X/HXV-66X | CXV-310- to 481 | 750 | 900 | 10 | 560 |
| N/A | CXV-420 to 610 | 1,200 | 1,430 | (2) 10 | 1,120 |
| N/A | CXV-620 to 962 | 1,500 | 1,800 | (2) 10 | 1,120 |
| FXV-288X | CXV-T645 to T792 | 1,625 | 1,720 | 12 | 1,400 |
| FXV-364X | CXV-T791 to T944 | 2,000 | 1,720 | 12 | 1,400 |
| N/A | CXV-T1290 to T1584 | 3,250 | 3,440 | (2) 12 | 2,800 |
| N/A | CXV-T1582 to T1888 | 4,000 | 3,440 | (2) 12 | 2,800 |

Table 2. Low Profile Series V (VFL/VCL) Remote Sump Data

| Closed Circuit Cooling Tower Model | Evaporative Condenser Model | Spray Water Volume ^{1/2} (gallons) | 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 3. Series V Centrifugal Fan (VF1/VC1) Remote Sump Data

| Closed Circuit Cooling Tower Model | Evaporative Condenser Model | Spray Water Volume ^{1/2} (gallons) | 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 | N/A | 720 | 770 | (2) 6 | 4,200 |
| VF1-288-N | N/A | 1,040 | 1,160 | (2) 6 | 6,500 |
| VF1-144-X | VC1-386 to 516 | 600 | 585 | 8 | 4,510 |
| VF1-216-X | VC1-540 to 804 | 710 | 835 | 10 | 6,560 |
| VF1-288-X | VC1-772 to 1032 | 1,360 | 1,170 | 10 | 8,170 |
| VF1-432-X | VC1-1158 to 1608 | 2,090 | 1,670 | 12 | 13,270 |
| N/A | VC1-C216 to C320 | 360 | 385 | 6 | 2,100 |
| N/A | VC1-C339 to C469 | 520 | 580 | 6 | 3,250 |



Table 4. Series V Axial Fan (VCA) Remote Sump Data

| Evaporative Condenser Model | Basin Volume Overflow (gallons) | Required Flow Rate (GPM) | Outlet Size (in) | Weight Deduct (lbs) |
|-----------------------------|---------------------------------|--------------------------|------------------|---------------------|
| VCA-122A to 191A | 350 | 260 | 6 | 2,020 |
| VCA-174A to 259A | 425 | 330 | 8 | 3,230 |
| VCA-261A to 322A | 496 | 400 | 8 | 3,700 |
| VCA-323A to 446A | 753 | 600 | 10 | 5,590 |
| VCA-300A to 512A | 683 | 500 | 8 | 4,630 |
| VCA-460A to 779A | 1,037 | 760 | 10 | 7,060 |
| VCA-662A to 1024A | 1,367 | 510 | 12 | 11,530 |
| VCA-S700A to S884A | 1,367 | 510 | 12 | 11,530 |
| VCA-920A to 1558A | 2,073 | 770 | 14 | 17,090 |
| VCA-302A to 661A | 871 | 610 | 8 | 4,760 |
| VCA-526A to 1010A | 1,322 | 920 | 10 | 7,490 |
| VCA-605A to 1321A | 1,743 | 620 | 12 | 14,460 |
| VCA-S870A to S1204A | 1,743 | 620 | 12 | 14,460 |
| VCA-930A to 2019A | 2,644 | 930 | 14 | 21,470 |

Notes Tables 1 - 4:

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 an asterisk, which are based on an end outlet sized as noted.
3. Outlet size is for remote sump applications only.



Table 5. Schedule 40 Pipe Capacities*

| Nominal Pipe Sizes | 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 | 7.040 |
| 16 | 9.193 |
| 18 | 11.636 |
| 20 | 14.461 |
| 24 | 20.916 |

* Not applicable for other types of piping.

Example

An FXV-421 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-inch 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 1, the spray water volume for an FXV-421 is 270 gallons.

From Table 5, the 6-inch pipe will contain 1.503 gallons of water per linear foot. The total volume contained in the 6-inch pipe is 40 feet x 1.503 gallons/foot = 60 gallons.

The total volume required is:

$$\begin{array}{r}
 \text{Spray Water Volume} \quad (270 \text{ gallons}) \\
 + \text{System Piping Volume} \quad (60 \text{ gallons}) \\
 \hline
 = \text{Total Volume} \quad 330 \text{ gallons}
 \end{array}$$

330 gallons x 1.05 (safety factor) = 347 gallons required.

From the engineering data on page L5, the correct RS Remote Sump Tank selection is an RS-457, which has a net available volume of 351 gallons.

