

# Determining the Skimmer Size and the Required Orifice for the *Faircloth Skimmer*<sup>®</sup> Surface Drain

**November 2007**

**Important note:** *The orifice sizing chart in the Pennsylvania Erosion Control Manual and reproduced in the North Carolina Design Manual **DOES NOT APPLY** to our skimmers. It will give the wrong size orifice and not specify which size skimmer is required. Please use the information below to choose the size skimmer required for the basin volume provided and determine the orifice size required for the drawdown time, typically 4-7 days in Pennsylvania and 3 days in North Carolina.*

The **size** of a Faircloth Skimmer<sup>®</sup>, for example a 4" skimmer, refers to the maximum diameter of the skimmer inlet. The inlet on each of the 8 sizes offered can be reduced to adjust the flow rate by cutting a hole or **orifice** in a plug using an adjustable cutter (both supplied).

Determining the skimmer size needed and the orifice for that skimmer required to drain the sediment basin's volume in the required time involves two steps: **First**, determining the size skimmer required based on the volume to be drained and the number of days to drain it; and **Second**, calculate the orifice size to adjust the flow rate and "customize" the skimmer for the basin's volume. *The second step is not always necessary* if the flow rate for the skimmer with the inlet wide open equals or is close to the flow rate required for the basin volume and the drawdown time.

Both the skimmer size and the required orifice radius for the skimmer should be shown for each basin on the erosion and sediment control plan. Make it clear that the dimension is either the radius or the diameter. It is also helpful to give the basin volume in case there are questions. During the skimmer installation the required orifice can be cut in the plastic plug using the supplied adjustable cutter and installed in the skimmer using the instructions provided.

The plan review and enforcement authority may require the calculations showing that the skimmer used can drain the basin in the required time.

## Determining the Skimmer Size

**Step 1.** Below are approximate **skimmer maximum flow capacities** based on typical draw down requirements, which can vary between States and jurisdictions and watersheds. If one 6" skimmer does not provide enough capacity, multiple skimmers can be used to drain the basin. For drawdown times not shown, multiply the 24-hour figure by the number of days required.

**Example:** A basin's volume is 29,600 cubic feet and it must be drained in 3 days. A 3" skimmer with the inlet wide open will work perfectly. (Actually, the chart below gives 29,322 cubic feet but this is well within the accuracy of the calculations and the basin's constructed volume.)

**Example:** A basin's volume is 39,000 cubic feet and it must be drained in 3 days. The 3"

skimmer is too small; a 4" skimmer has enough capacity but it is too large, so the inlet will need to be reduced using step 2 to adjust the flow rate for the basin's volume. (It needs a 3.2" diameter orifice.)

1½" skimmer: with a 1½" head	1,728 cubic feet in <b>24 hours</b>	6,912 cubic feet in <b>4 days</b>
	3,456 cubic feet in <b>2 days</b>	12,096 cubic feet in <b>7 days</b>
	5,184 cubic feet in <b>3 days</b>	
2" skimmer: with a 2" head	3,283 cubic feet in <b>24 hours</b>	13,132 cubic feet in <b>4 days</b>
	6,566 cubic feet in <b>2 days</b>	22,982 cubic feet in <b>7 days</b>
	9,849 cubic feet in <b>3 days</b>	
2½" skimmer: with a 2.5" head	6,234 cubic feet in <b>24 hours</b>	24,936 cubic feet in <b>4 days</b>
	12,468 cubic feet in <b>2 days</b>	43,638 cubic feet in <b>7 days</b>
	18,702 cubic feet in <b>3 days</b>	
3" skimmer: with a 3" head	9,774 cubic feet in <b>24 hours</b>	39,096 cubic feet in <b>4 days</b>
	19,547 cubic feet in <b>2 days</b>	68,415 cubic feet in <b>7 days</b>
	29,322 cubic feet in <b>3 days</b>	
4" skimmer: with a 4" head	20,109 cubic feet in <b>24 hours</b>	80,436 cubic feet in <b>4 days</b>
	40,218 cubic feet in <b>2 days</b>	140,763 cubic feet in <b>7 days</b>
	60,327 cubic feet in <b>3 days</b>	
5" skimmer: with a 4" head	32,832 cubic feet in <b>24 hours</b>	131,328 cubic feet in <b>4 days</b>
	65,664 cubic feet in <b>2 days</b>	229,824 cubic feet in <b>7 days</b>
	98,496 cubic feet in <b>3 days</b>	
6" skimmer: with a 5" head	51,840 cubic feet in <b>24 hours</b>	207,360 cubic feet in <b>4 days</b>
	103,680 cubic feet in <b>2 days</b>	362,880 cubic feet in <b>7 days</b>
	155,520 cubic feet in <b>3 days</b>	
8" skimmer: with a 6" head	97,978 cubic feet in <b>24 hours</b>	391,912 cubic feet in <b>4 days</b>
	195,956 cubic feet in <b>2 days</b>	685,846 cubic feet in <b>7 days</b>
	293,934 cubic feet in <b>3 days</b>	

## Determining the Orifice

**Step 2.** To determine the orifice required to reduce the flow rate for the basin's volume and the number of days to drain the basin, simply use the formula volume ÷ **factor** (from the chart below) for the same size skimmer chosen in the first step and the same number of days. This calculation will give the **area** of the required orifice. Then calculate the orifice radius using Area =  $\pi r^2$  and solving for  $r$ ,  $r = \sqrt{(Area/3.14)}$ . The supplied cutter can be adjusted to this radius to cut the orifice in the plug. The instructions with the plug and cutter has a ruler divided into tenths of inches. Again, this step is not always necessary as explained above.

An alternative method is to use the orifice equation with the head for a particular skimmer shown on the previous page and determine the orifice needed to give the required flow for the volume and draw down time. C = 0.59 is used in this chart.

**Example:** A 4" skimmer is the smallest skimmer that will drain 39,000 cubic feet in 3 days but a 4" inlet will drain the basin too fast (in 1.9 days) To determine the orifice required use the factor of 4,803 from the chart below for a 4" skimmer and a drawdown time of 3 days.  $39,000 \text{ cubic feet} \div 4,803 = 8.12$  square inches of orifice required. Calculate the orifice radius using  $\text{Area} = \pi r^2$  and solving for  $r$ ,  $r = \sqrt{(8.12/3.14)}$  and  $r = 1.61"$ . As a practical matter 1.6" is about as close as the cutter can be adjusted and the orifice cut..

**Factors** (in cubic feet of flow per square inch of opening through a **round** orifice with the head for that skimmer and for the drawdown times shown) for determining the **orifice radius** for a basin's volume to be drained. This quick method works because the orifice is centered and has a constant head (given above in Step 1).

<b>1½" skimmer:</b>	960 to drain in <b>24 hours</b>	3,840 to drain in <b>4 days</b>
	1,920 to drain in <b>2 days</b>	6,720 to drain in <b>7 days</b>
	2,880 to drain in <b>3 days</b>	
<b>2" skimmer:</b>	1,123 to drain in <b>24 hours</b>	4,492 to drain in <b>4 days</b>
	2,246 to drain in <b>2 days</b>	7,861 to drain in <b>7 days</b>
	3,369 to drain in <b>3 days</b>	
<b>2½" skimmer:</b> Revised 11-6-07	1,270 to drain in <b>24 hours</b>	5,080 to drain in <b>4 days</b>
	2,540 to drain in <b>2 days</b>	8,890 to drain in <b>7 days</b>
	3,810 to drain in <b>3 days</b>	
<b>3" skimmer:</b>	1,382 to drain in <b>24 hours</b>	5,528 to drain in <b>4 days</b>
	2,765 to drain in <b>2 days</b>	9,677 to drain in <b>7 days</b>
	4,146 to drain in <b>3 days</b>	
<b>4" skimmer:</b> Revised 11-6-07	1,601 to drain in <b>24 hours</b>	6,404 to drain in <b>4 days</b>
	3,202 to drain in <b>2 days</b>	11,207 to drain in <b>7 days</b>
	4,803 to drain in <b>3 days</b>	
<b>5" skimmer:</b>	1,642 to drain in <b>24 hours</b>	6,568 to drain in <b>4 days</b>
	3,283 to drain in <b>2 days</b>	11,491 to drain in <b>7 days</b>
	4,926 to drain in <b>3 days</b>	
<b>6" skimmer:</b>	1,814 to drain in <b>24 hours</b>	7,256 to drain in <b>4 days</b>
	3,628 to drain in <b>2 days</b>	12,701 to drain in <b>7 days</b>
	5,442 to drain in <b>3 days</b>	
<b>8" skimmer:</b>	1,987 to drain in <b>24 hours</b>	7,948 to drain in <b>4 days</b>
	3,974 to drain in <b>2 days</b>	13,909 to drain in <b>7 days</b>
	5,961 to drain in <b>3 days</b>	

**J. W. Faircloth & Son, Inc.**  
**Post Office Box 789**  
**Hillsborough, North Carolina 27278**

**Telephone (919) 732-1244      FAX (919) 732-1266**

**FairclothSkimmer.com**

© J. W. Faircloth & Son, Inc 2007

Orifice sizing Revised 2-2-01; 3-3-05; 2-1-07; 11-6-07; 3-20-20.