

# BASIC POOL CALCULATIONS

## Step 1: Calculate Quantity of Water

Use the following formulas:

Shape	Formula
Rectangular	Length X Width X Avg. Depth X 7.48
Circular	3.14 ( $\pi$ ) X radius X radius
Oval	Length X Width X Avg. Depth X 5.9

Example: 20 ft. X 40 ft. Rectangular-shaped pool with average water depth of 4 ft.  
20 ft. X 40 ft. X 4 ft. X 7.48 = 23,936 gallons

## Step 2: Calculate Minimum Flow Rate for Required Turnover

Johnson County Environmental Sanitary Code Requirements:

Pool	6 hours (360 Minutes)
Wading Pool	2 hours (120 Minutes)
Spa	30 minutes

Divide Quantity of Water calculated in step 1 (above) by the turnover rate (in minutes only).

Example: 23,936 gallons  $\div$  360 minutes = 66.5 gallons per minute (gpm) is the minimum flow rate required at all times from the pool recirculation pump. Keep in mind that although you need a pump with at least 66.5 gpm capacity, you should purchase an oversized pump, because when the filter is dirty, flow rate will decrease. Thus, slight oversizing (25% of minimum flow rate) of the pump is recommended. Therefore, in this example, you would purchase a pump that provides at least 84 gpm.

Pump sizing is based on amount of head loss in the recirculation system. Some factors that determine head loss include pipe size, number of 90° bends in the pipe, amount of vertical lift, distance of the pump from the pool, etc. Consult an engineer or pool professional to calculate head loss on a new pool before installing pump. If the pool is existing, a flowmeter should be installed to determine if minimum flow rates are met.

### Step 3: Calculate Minimum Filter Size

Minimum filter size is calculated by dividing pump capacity (flow rate) by maximum filtration rate in the following table.

Filter Media Type	Max Filtration Rate (gallons per minute ÷ square foot filter surface area)
High Rate Sand	15
Rapid Sand	3
Cartridge	.375
Diatomaceous Earth	2 (continuous slurry feed) 2 ½ (without continuous slurry feed)

Example: If a 90 gpm pump is chosen and you want to install a high rate sand filter:  
 $90 \div 15 = 6$  square feet is the minimum size filter for the job.

If you chose to use a cartridge filter, with the same pump:  
 $90 \div .375 = 240$  square feet is the minimum size filter for the job.

Note: Filters are sold with preset surface areas. Always round to at least the highest filter size. Depending on the amount of space available in the filter room, you could purchase either:

Two (2) 3.1 square foot high rate sand filters **or** one 6.9 square foot high rate sand filter

**OR**

One 300 square foot cartridge filter

### Step 4: Choosing the Right Filter

All filter media have distinct advantages and disadvantages. There is no one filter that is best for all applications. Consider the following when choosing the filter media for your needs:

- Maximum particle size the filter will remove.
- Ease of cleaning the filter
- Ease of installation of the filter
- Physical filter size for the space available
- Cost and labor of filter media replacement