



CIRCULATION AND BASIC POOL CALCULATIONS

Water Recreation Program

Why Should I Know the Volume of My Pool?

- ❖ Essential calculation to maintain proper management of each water recreation facility
- ❖ Needed to calculate flow rate and turnover rate
- ❖ Determining the chemical correction requirements for your pool

Pool Volume Calculation

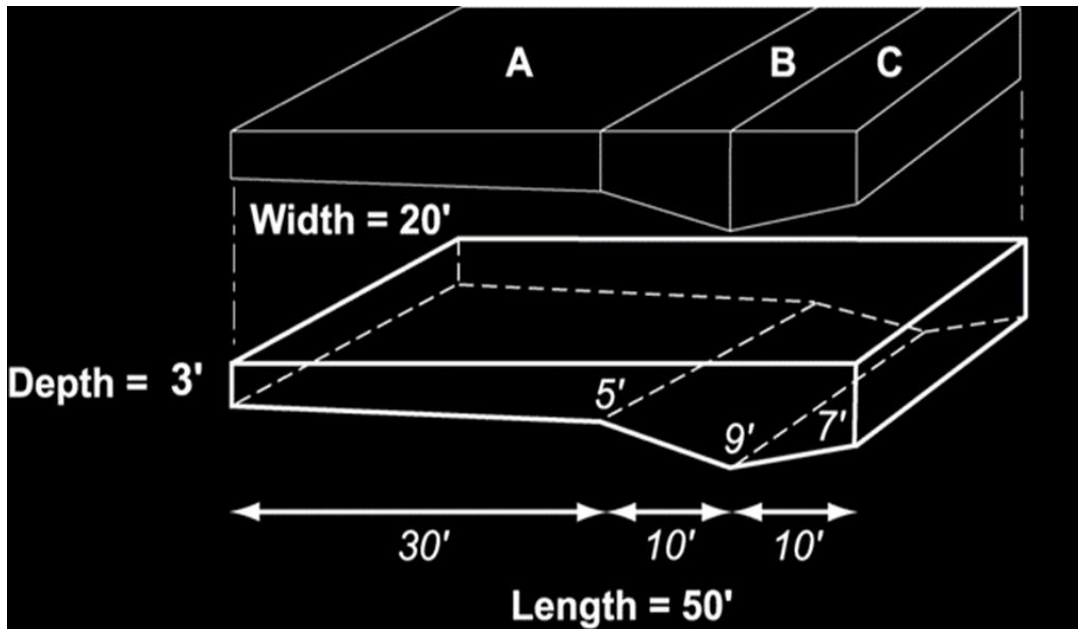
- Rectangular Pool
 - Volume (gallons) = $L \times W \times \text{Average Depth}(D) \times 7.5 \text{ gal/cu.ft.}$

- Steps:
 - i. Calculate the surface area ($L \times W$)
 - ii. Average depth (ft.) = $D1 + D2 \div 2$
 - iii. One cubic foot ($L \times W \times D$) holds 7.5 gallons of water



Calculating Volume Where Slope Changes

$$\text{Volume} = L \times W \times D_{\text{Avg}} \times 7.5$$



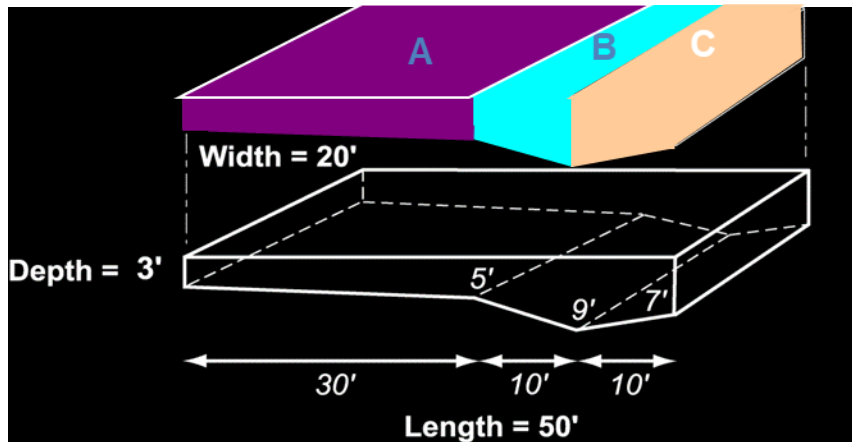
Take each section separately, then add sections together.

$$A = 30' \times 20' \times 4' \times 7.5 =$$

$$B = 10' \times 20' \times 7' \times 7.5 =$$

$$C = 10' \times 20' \times 8' \times 7.5 =$$

Pool Volume Example



Section A	18,000
Section B	10,500
Section C	12,000

Total volume is 40,500 gallons

Turnover Rate (TOR) Requirement

- Means the minimum time necessary to circulate the entire volume of the pool water through the treatment system.
- Equipment shall be of adequate size to turnover the entire pool capacity

Pool Type	WAC Requirements
Swimming Pool	6 hours or less
Wading Pool	3 hours or less
Spa	*30 minutes or less
Recirculated Spray Pool	30 minutes or less

Assess Turnover Rate (TOR)

1. Determine the pool volume in gallons from the plans or records
2. Determine the required turnover rate based on pool type
3. Check flow meter installation/characteristics
4. Record the flow meter reading (gpm)
5. Calculate the turnover rate using the formula below:

$$\text{Pool volume} \div \text{flow rate (gpm)} \div 60 \text{ min/hr.} = \text{TOR}$$

Turnover Rate Example

Formula: Pool volume ÷ flow rate ÷ 60 min/hr. = TOR

- ❖ A 175,000-gallons pool has a flow meter reading of 505 gpm.
- ❖ What is the TOR (in hours) for this pool?
- ❖ Does the pool meet the required TOR?

$TOR = 175,000 \text{ gal} \div 505 \text{ gpm} = \mathbf{346.5 \text{ minutes}} \div 60 \text{ min./hr.}$
 $= \mathbf{5.77 \text{ hrs.}}$

Turnover Rate Example

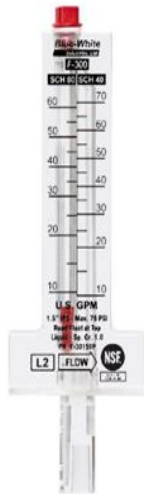
Formula: Pool volume ÷ flow rate ÷ 60 min/hr. = TOR

- ❖ A 16,500 gallons pool has a flow meter reading of 180 gpm.
- ❖ What is the turnover rate (in hours) for this wading pool?
- ❖ Does the wading pool meet the required TOR?

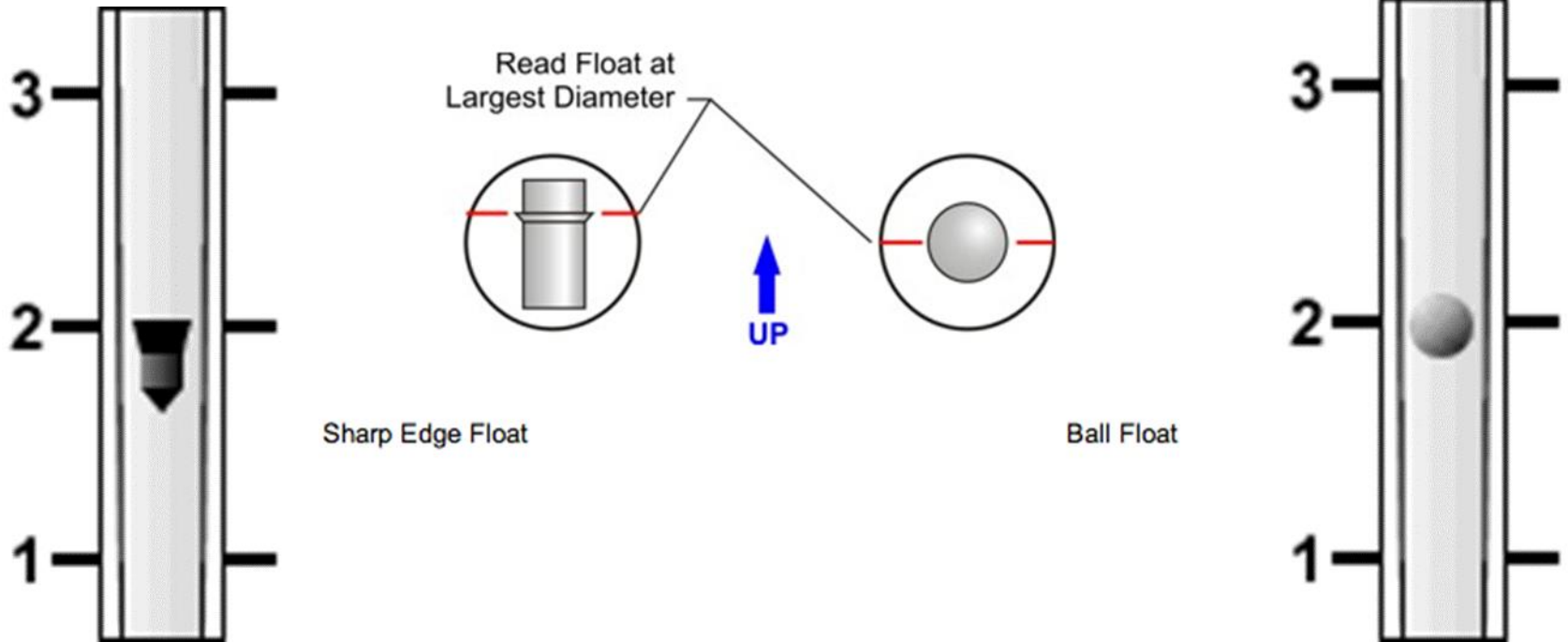
TOR = 16,500 gal ÷ 180 gpm = 91.6 mins or 1.53 hours

Flow rate

- What does flow rate mean?
- How do I know my flow rate?



How to read my flow meter?



Calculating flow rate



Example 1

You have a swimming pool volume of 300,000 gallons with a TOR of 6 hours.

What is the flow rate?

Answer: 833 gpm



Example 2

You have a spa volume of 950 gallons with a TOR of 30 minutes.

What is the flow rate?

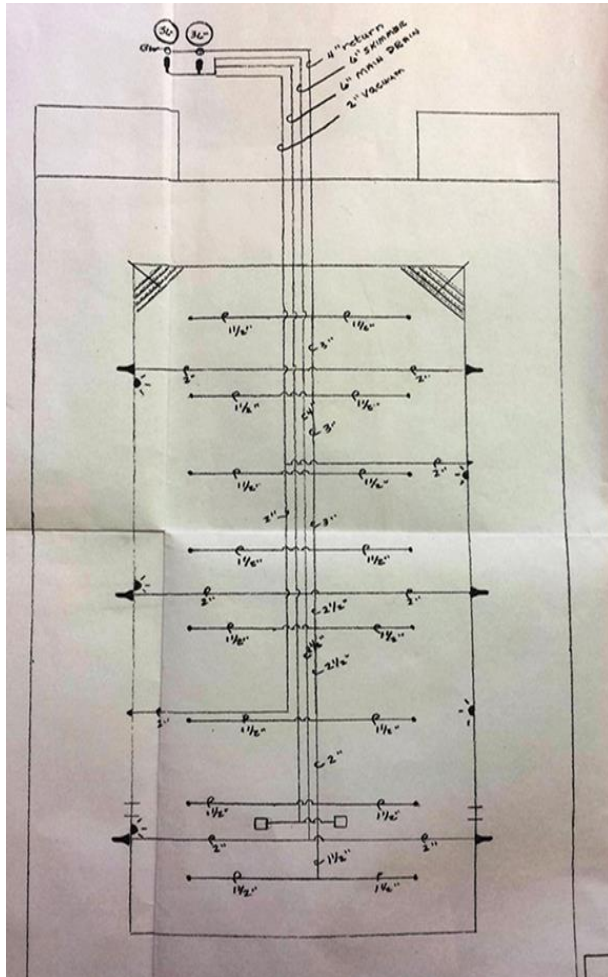
Answer: 32 gpm

Flow rate (gpm) = Pool Volume ÷ Turnover Rate in hours ÷ 60 min/hr

Importance of Circulation

- Allows you to filter your water and remove small and large particles.
- Helps spread chemicals throughout the pool for proper water quality.
- Proper education and circulation

Determine Pool Volume and Flow Rate



➤ Given

- L = 50 feet
- W = 30 feet
- Average Depth = 4 feet
- Turnover Rate Required = 6 hrs.

Formulas

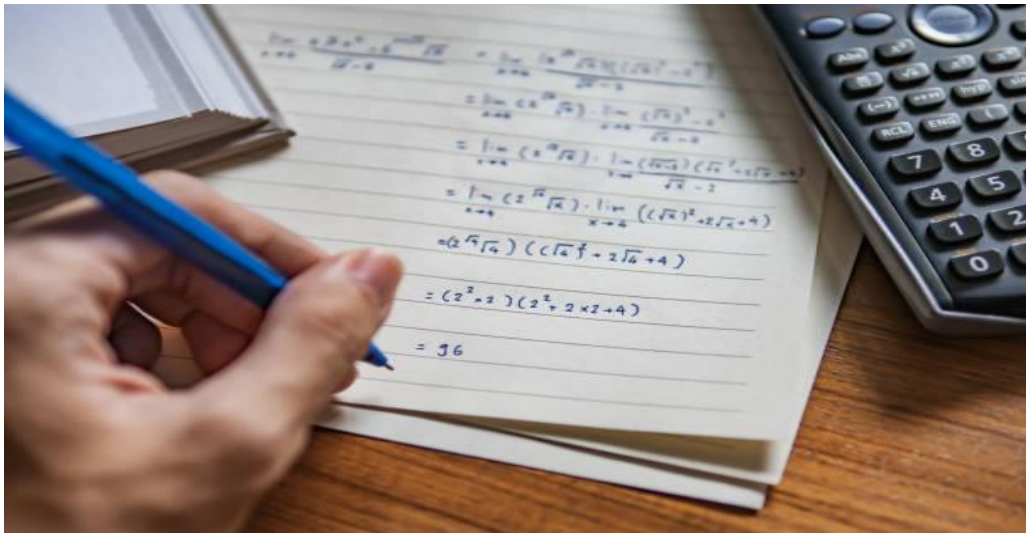
- Volume = L x W x Avg Depth x 7.5 gal./cu. ft.
- FR = Volume (gal)
Turnover Rate (hrs.) ÷ 60
(min/hr.)

Determine Pool Volume and Flow Rate

➤ Solution

$$\text{Volume} = 50' \times 30' \times 4' \times 7.5 \text{ cu.ft./gal} = 45,000 \text{ gal}$$

$$\text{Flow Rate} = 45,000 \text{ gal} \div 6 \text{ hrs.} \div 60 \text{ (min/hour)} = 125 \text{ gpm}$$



Questions?

Contact

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