

SWIMMING POOL HYDRAULIC ANALYSIS WORKSHEET

Pool Name: _____ Type: _____ Date: _____

Pool Address: _____

Shape: _____ Perimeter: _____ ft. Length: _____ ft. Width: _____ ft.

Minimum Depth: _____ ft. Break Depth: _____ ft. Maximum Depth: _____ ft.

Slope = 1 ft. in _____ ft. Area: _____ sq. ft. Volume: _____ gal.

Gunité Poured Other: _____

Pool Surface Material: _____ Piping Material: _____ Indoor / Outdoor / Both (circle one)

$$\text{Design Flow Rate} = \frac{\text{Pool Volume}}{\text{Turnover Time}_1} = \frac{(\quad) \text{ gal}}{(\quad) \text{ min}} = \underline{\hspace{2cm}} \text{ gpm}^*$$

*Check minimum skimmer flow rate. If turnover rate is inadequate for minimum skimmer operation (per manufacturer or 25 gpm/skimmer) then the design flow rate must be increased to provide the combined minimum flow rate for all skimmers.

I. Number of Skimmers Required (Two skimmers minimum, except for spas)

$$\text{Quantity} = \frac{\text{Pool Area}}{X_2} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ **}$$

II. Skimmer Flow Rate:

$$\text{Skimmer Flow Rate} = \text{Design Flow Rate} = \underline{\hspace{2cm}} \text{ gpm}$$

III. Flow Through Each Skimmer:

$$\frac{\text{Skimmer Flow Rate}}{\text{No of Skimmers Provided}} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ gpm}$$

(Min. 25 gpm / Max. 55 gpm)

IV. Number of Inlets Required:

$$\text{Number of Inlets} = \frac{\text{Pool Perimeter}}{20 \text{ ft.}_3} = \underline{\hspace{2cm}} = \underline{\hspace{2cm}} \text{ **}$$

(Minimum 2 inlets)

1 Standard Pools: 6 hours (360 minutes) or product of 1.5 x avg. depth (in hours), whichever is less; Wading Pools: 60 minutes; Spas: 30 minutes. See Part 9 of rule for additional pool types.

2 Standard Pools: 1 per 400 sq. ft. of surface area or fraction thereof (minimum 2 skimmers); Spas: 1 per 100 sq. ft. of surface area or fraction thereof.

3 Divide perimeter by 20 or pool surface area by 300, whichever is greater, to determine the number of required inlets.

** Round fractions up to the next whole number

V. **Pipe Size Selection:**

A. **Skimmer Line Sizes** (Velocity in selected pipe size shall not exceed 6 fps at the design flow rate.)

	Branch 1	Branch 2	Branch 3	Branch 4
No. of Skimmers Served by Pipe	_____	_____	_____	_____
Pipe Size	_____	_____	_____	_____
Flow in Pipe	_____	_____	_____	_____
Velocity (fps)	_____	_____	_____	_____

Indicate which chart used for velocity numbers: _____

B. **Return Line Size** (Velocity in selected pipe size shall not exceed 8 fps at the design flow rate.)

	Branch 1	Branch 2	Branch 3	Branch 4	Branch 5
No. of Inlets Served by Pipe	_____	_____	_____	_____	_____
Pipe Size	_____	_____	_____	_____	_____
Flow in Pipe	_____	_____	_____	_____	_____
Velocity (fps)	_____	_____	_____	_____	_____

Indicate which chart used for velocity numbers: _____

C. **Main Drain Size** (Velocity in selected pipe size shall not exceed 6 fps at the design flow rate.)

Pipe size (in.): _____ Design Flow Rate (gpm): _____ Velocity (fps): _____

VI. **Main Drain/Suction Outlet Cover Selection**

Cover Size (each)	Max. Pump Flow* (gpm)	# of Covers	Flowrate/Cover**	Capacity (all covers)

Suction Outlet Cover Manufacturer: _____ Model#: _____

Suction Outlet Cover Quantity: _____

*Use the pump's maximum flow rate from its performance curve to determine the flowrate per cover.

**For three or more branched suction outlets, flow rate/cover = DFR/(N-1) (See Part 12, (4)(a) for more info.)

NOTE: Spas must have two suction outlets provided for each pump in the system with covers sized for each pump's maximum flow rate.

VII. Calculate Return Line Loss (use additional sheets if necessary)

State which chart, graph, nomograph, etc. used: _____

1. Straight pipe size: _____ Straight pipe length = _____ @ _____ gpm
 _____ # Elbows X Equiv. length _____ = _____
 _____ # Tees X Equiv. length _____ = _____
 _____ # Valves X Equiv. length _____ = _____
 Friction loss per 100' _____ X Total equiv. length _____ ÷ 100
 = _____ ft. (for above pipe)

2. Straight pipe size: _____ Straight pipe length = _____ @ _____ gpm
 _____ # Elbows X Equiv. length _____ = _____
 _____ # Tees X Equiv. length _____ = _____
 _____ # Valves X Equiv. length _____ = _____
 Friction loss per 100' _____ X Total equiv. length _____ ÷ 100
 = _____ ft. (for above pipe)

3. Straight pipe size: _____ Straight pipe length = _____ @ _____ gpm
 _____ # Elbows X Equiv. length _____ = _____
 _____ # Tees X Equiv. length _____ = _____
 _____ # Valves X Equiv. length _____ = _____
 Friction loss per 100' _____ X Total equiv. length _____ ÷ 100
 = _____ ft. (for above pipe)

4. Straight pipe size: _____ Straight pipe length = _____ @ _____ gpm
 _____ # Elbows X Equiv. length _____ = _____
 _____ # Tees X Equiv. length _____ = _____
 _____ # Valves X Equiv. length _____ = _____
 Friction loss per 100' _____ X Total equiv. length _____ ÷ 100
 = _____ ft. (for above pipe)

5. Straight pipe size: _____ Straight pipe length = _____ @ _____ gpm
 _____ # Elbows X Equiv. length _____ = _____
 _____ # Tees X Equiv. length _____ = _____
 _____ # Valves X Equiv. length _____ = _____
 Friction loss per 100' _____ X Total equiv. length _____ ÷ 100
 = _____ ft. (for above pipe)

6. Straight pipe size: _____ Straight pipe length = _____ @ _____ gpm
 _____ # Elbows X Equiv. length _____ = _____
 _____ # Tees X Equiv. length _____ = _____
 _____ # Valves X Equiv. length _____ = _____
 Friction loss per 100' _____ X Total equiv. length _____ ÷ 100
 = _____ ft. (for above pipe)

Friction loss due to inlet resistance @ _____ gpm = _____ ft.

Total return line loss (add all totals) = _____ ft. **(Enter on page 5)**

VIII. Calculate Skimmer Line Loss (use additional sheets if necessary)

State which chart, graph, nomograph, etc. used: _____

1.	Straight pipe size: _____		Straight pipe length = _____	@ _____	gpm
	_____ # Elbows X	Equiv. length _____	= _____		
	_____ # Tees X	Equiv. length _____	= _____		
	_____ # Valves X	Equiv. length _____	= _____		
	Friction loss per 100' _____	X	Total equiv. length _____	÷ 100	
		=			ft. (for above pipe)
2.	Straight pipe size: _____		Straight pipe length = _____	@ _____	gpm
	_____ # Elbows X	Equiv. length _____	= _____		
	_____ # Tees X	Equiv. length _____	= _____		
	_____ # Valves X	Equiv. length _____	= _____		
	Friction loss per 100' _____	X	Total equiv. length _____	÷ 100	
		=			ft. (for above pipe)
3.	Straight pipe size: _____		Straight pipe length = _____	@ _____	gpm
	_____ # Elbows X	Equiv. length _____	= _____		
	_____ # Tees X	Equiv. length _____	= _____		
	_____ # Valves X	Equiv. length _____	= _____		
	Friction loss per 100' _____	X	Total equiv. length _____	÷ 100	
		=			ft. (for above pipe)
4.	Straight pipe size: _____		Straight pipe length = _____	@ _____	gpm
	_____ # Elbows X	Equiv. length _____	= _____		
	_____ # Tees X	Equiv. length _____	= _____		
	_____ # Valves X	Equiv. length _____	= _____		
	Friction loss per 100' _____	X	Total equiv. length _____	÷ 100	
		=			ft. (for above pipe)
5.	Straight pipe size: _____		Straight pipe length = _____	@ _____	gpm
	_____ # Elbows X	Equiv. length _____	= _____		
	_____ # Tees X	Equiv. length _____	= _____		
	_____ # Valves X	Equiv. length _____	= _____		
	Friction loss per 100' _____	X	Total equiv. length _____	÷ 100	
		=			ft. (for above pipe)
6.	Straight pipe size: _____		Straight pipe length = _____	@ _____	gpm
	_____ # Elbows X	Equiv. length _____	= _____		
	_____ # Tees X	Equiv. length _____	= _____		
	_____ # Valves X	Equiv. length _____	= _____		
	Friction loss per 100' _____	X	Total equiv. length _____	÷ 100	
		=			ft. (for above pipe)
	Friction loss over the weir @ _____	gpm	= _____		ft.
	Total skimmer line loss (add all totals)		= _____		ft. (Enter on page 5)

Total Dynamic Head Required:

Return Line Loss	(from page 3)	=	_____	ft.
Filter Loss When Dirty	(see below*)	=	_____	ft.
Skimmer Line Loss	(from page 4)	=	_____	ft.
Heater Loss	(from manufacturer)	=	_____	ft.
Other (multiport valves, etc.)	(from manufacturer)	=	_____	ft.
Total Loss:		=	_____	ft.

*Sand Filter: 34.7 ft.
 Cartridge Filter: 23.1 ft.
 Pressure D.E.: 57.8 ft.
 Vacuum D.E.: 4.3 ft.

Pump Selection: (Submit performance curve)

Manufacturer: _____ Model: _____ HP: _____
 Number of pumps used: _____
 Pump Rated: _____ gpm @ _____ TDH
 Backwash Rate: _____ gpm @ _____ TDH**

**Backwash TDH = TDH – Return Piping and Fixtures Loss + Backwash Line Loss

Filter Selection:

$$\text{Filter area required} = \frac{(\text{Design flow rate})}{(\text{Flow rate per sq. ft.}^{***})} = \frac{(\quad)}{(\quad)} = \underline{\hspace{2cm}} \text{ sq. ft.}$$

***Flow rate per sq. ft.: Hi-Rate Sand = 15 gpm/sq. ft., Cartridge = 0.3 gpm/sq. ft., Pre-coat D.E. = 2 gpm/sq. ft.

Manufacturer: _____ Model: _____
 Filter area: _____ sq. ft. No. Tanks: _____ Size: _____

Designer/Contractor Information:

Pool Design Professional: _____ GA License #: _____
 Pool Contractor: _____

EH Review Information:

Approved By: _____
 Approval Date: _____