

POOL HYDRAULIC ANALYSIS

Cherokee County Environmental Health Services

Pool Name: _____

Address: _____ GA _____
Street Suite/Bldg. No. City Zip Code

Property Owner's Name: _____ Contact No.: _____

Address: _____ GA _____
Street Suite/Bldg. No. City Zip Code

Pool Builder's Name: _____ Contact No.: _____

Designer / Engineer's Name: _____ Cert. No.: _____ Contact No.: _____

Contact: _____
Phone No. Fax No. E-mail

Date Plans Submitted: _____ Date Plans Initial Review: _____ Date Plans Reviewed / Approved : _____

Signature Pool Representative _____ Signature Environmental Health _____

Pool Type: Swimming Pool Whirlpool Wading Multi-Purpose Waterslide Special Purpose Spray Pool Zero-depth

Location: Indoor Pool Outdoor Pool **Operation:** Seasonal Year-round **Government-owned** Yes No

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

Min. Depth (ft.): _____ Break Depth (ft.): _____ Max. Depth (ft.): _____ Slope (< 5') = 1 ft. in _____ ft.

Slope (> 5') = 1 ft. in _____ ft. Pool Surface Area: _____ Sq. Ft. Pool Volume: _____ gallons

Pool Base Material: Gunite Poured Other: _____ Type of Piping: _____

I. Design Flow Rate:

$$\frac{\text{pool volume}}{\text{turnover rate} * } = \frac{\text{gallons}}{\text{minutes}} = \text{_____ gpm is Design Flow Rate}$$

*For pool - minimum turnover rate 360 minutes (6 hr for)
Wading pool - minimum turnover rate 120 minutes (2 hr)
Whirlpool - minimum turnover time 30 minutes (1/2 hr)

**Check minimum skimmer flow rate. If turnover time is inadequate minimum skimmer operation (as per manufacturer or 25 gpm) then design flow rate must be increased to provide minimum skimmer flow rate.

II. Number of Skimmers Required:

$$\text{Pool Surface Area} = \text{_____ sq. ft} = \text{_____ No. of skimmers required: _____ No. of skimmers provided}$$
$$\text{Sq. ft. per skimmer} * = \text{_____ sq. ft}$$

*Swimming Pools (see Appendix A, Fig.4) minimum two skimmers, then one skimmer per 500 sq. ft pool surface area, Wading pools minimum one skimmer per 200 sq. ft pool surface area, whirlpool minimum one skimmer per 100sq. ft pool surface area

III. Skimmer / Gutter Flow Rate:

$$\frac{\text{Design Flow Rate}}{\text{No. of skimmers provided}} = \frac{\text{_____ gpm}}{\text{Skimmers}} = \text{_____ gpm Skimmer Flow Rate}$$

* Must be > or = 25 gpm and < or = 55 gpm or per manufacture specifications

IV. Number of Inlets Required:

$$\frac{\text{Perimeter}}{\text{No. inlets per ft.}} = \frac{\text{_____ ft}}{\text{X *}} = \text{_____ (use next whole number = _____.)}$$

* For pools X = 20 feet For wading pools or whirlpools X = 10 feet

V. Pipe Size Selection

A. Skimmer / Gutter Line Size: select pipe size, which gives max. 6 fps velocity at skimmer / gutter flow rate*:

	<u>Branch 1</u>	<u>Branch 2</u>	<u>Branch 3</u>	<u>Branch 4</u>	<u>Branch 5</u>	<u>Branch 6</u>	<u>Branch 7</u>	<u>Branch 8</u>
No. of Skimmers Served by Pipe	_____	_____	_____	_____	_____	_____	_____	_____
Pipe Size (inches)	_____	_____	_____	_____	_____	_____	_____	_____
Flow in Pipe (gpm)	_____	_____	_____	_____	_____	_____	_____	_____
Velocity (fps)	_____	_____	_____	_____	_____	_____	_____	_____

For additional branches use additional sheet(s)

B. Return Line Size: Select pipe sizes and branches which give max. 10 fps velocity at design flow rate*:

	<u>Branch 1</u>	<u>Branch 2</u>	<u>Branch 3</u>	<u>Branch 4</u>	<u>Branch 5</u>	<u>Branch 6</u>	<u>Branch 7</u>	<u>Branch 8</u>
No. of Inlets Served by Pipe	_____	_____	_____	_____	_____	_____	_____	_____
Pipe Size (inches)	_____	_____	_____	_____	_____	_____	_____	_____
Flow in Pipe (gpm)	_____	_____	_____	_____	_____	_____	_____	_____
Velocity (fps)	_____	_____	_____	_____	_____	_____	_____	_____

For additional branches use additional sheet(s)

VI. Main Drain:

A. Select pipe size that gives maximum 6 fps velocity at the Design Flow Rate:

Pipe size (inches): _____ Design flow rate (gpm): _____ Velocity (fps) _____

B. Grate Selection: Minimum 2 main drains required; each main drain must accommodate 100% of the Design Flow Rate; each drain outlet pipe open area to drain grate open area ratio must be minimum 4 to 1; maximum 1½ fps. velocity through each drain grate:

(1) Frame / Grate Catalog Number: _____ Grate Open Area _____ sq. in.

(2). Drain outlet pipe open area to drain grate open area ratio must be minimum 4 to 1:

Pipe Size _____ in. Pipe Open Area _____ sq. in. Grate Open Area _____ sq. in.

Pipe Open Area = _____ sq. in. X 4 = _____ sq. in. < Grate Open Area _____ sq. in.

Is drain outlet pipe open area to drain grate open area ratio approved? Yes / No

(3). Maximum velocity through each grate 1½ fps.

(.321 x Design Flow Rate _____ gpm) / Grate Open Area _____ sq. in. = Velocity _____ fps

Velocity _____ fps. < 1.5 fps.

Is velocity through each drain grate approved? Yes / No

(4) **Grate Approved: Yes / No**

For additional drain grates use additional sheet(s)

C. Main Drain Line Head Loss

Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.

_____ No. elbows x equiv. length _____ = _____ ft.

_____ No. tees x equiv. length _____ = _____ ft.

_____ No. valves x equiv. length _____ = _____ ft.

Total equiv. length = _____ ft.

Friction loss per 100' based on above flow rate = _____ x total equiv. length _____ ÷ 100 = _____ ft.
(enter on page 6)

VII. Skimmer / Gutter Line Loss

Calculate skimmer line loss for each branch or run of entire skimmer line

Branch No.1: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.2: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.3: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.4: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.5: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.6: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.7: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.8: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

For additional branches use additional sheet(s)

Friction loss over the skimmer weir @ _____ gpm = _____ ft.

Total return line friction loss = _____ ft.
 (enter on page 6)

VIII. Return Line

Calculate return line loss for each branch or run of entire return line

Branch No.1: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.2: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.3: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.4: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.5: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.6: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.7: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

Branch No.8: Straight pipe size = _____ in. Straight pipe length @ _____ gpm = _____ ft.
 No. of elbows _____ x equiv. length _____ = _____ ft.
 No. of tees _____ x equiv. length _____ = _____ ft.
 No. of valves _____ x equiv. length _____ = _____ ft.
 Friction loss (for above pipe size) per 100' = _____ x total equiv. length _____ ft. ÷ 100 = _____ ft.

For additional branches use additional sheet(s)

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

Total skimmer / gutter line friction loss = _____ ft.

(enter on page 6)

IX. Total Dynamic Head Required:

A. Main Drain Line Loss = _____ ft.
(from page 3)

Use Main Drain Line Loss or Skimmer / Gutter Line Loss, whichever is greater

B. Skimmer / Gutter Line Loss = _____ ft.
(from page 4)

C. Return Line Loss = _____ ft.
(from page 5)

D. Filter Loss When Dirty = _____ ft.
(*see below)

E. Heater Loss = _____ ft.
(from manufacturer)

F. Other (multi-port valves, etc.) = _____ ft.
(from manufacturer)

G. Total Dynamic Head Required = _____ ft.

*For D. above use the following: Cartridge Filter = 23.1 ft. (or per manufactures specifications)
Sand Filter = 34.7 ft. (or per manufactures specifications)
Pressure D.E. = 57.8 ft. (or per manufactures specifications)
Vacuum D.E. = 4.3 ft. (or per manufactures specifications)

X. Pump Selection:

A. Pump Manufacturer: _____ Model: _____ Horsepower: _____

Pump Rated: _____ gpm @ _____ TDH Number of pumps: _____

Pump specification sheet with performance curve submitted: Yes No

XI. Filter Selection:

Minimum Filter Area Required = $\frac{\text{Design Flow Rate}}{\text{Filter Flow Rate}^*} = \frac{\text{gpm}}{\text{gpm/sq.ft.}} = \text{_____ sq. ft.}$

*Use manufacture's Filter Flow Rate (In absence of that information use the following Filter Flow Rates : Diatomaceous = 1 gpm / sq. ft.; Hi-rate Sand = 15 gpm / sq. ft.; Cartridge = .3 gpm / sq. ft)

Manufacturer: _____ Model: _____ Catalog No. : _____

Filter Type: _____ Diameter (each filter): _____ inches

Filter Area (each): _____ sq. ft. No. of Filters: _____ Total Filter Area: _____ sq. ft.

XII. Other Information:

Indicate which chart used for equivalent lengths: _____

Certified Contractor's Signature: _____ **Date:** _____

Plans Reviewed and Approved & by: _____ **Date:** _____

EHS Staff