SWIMMING POOL HYDRAULIC ANALYSIS

Pool Name: ____________________________ Type: _______________ Date: __________

Pool Address: ____________________________________________________________  Land Lot/ District: __________


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

□ Gunite  Outdoor  □ Poured Indoor  Other: ________________________________

Pool Surface Material: _______________  Type of Piping: __________  NSF Rated: __________

Design Flow Rate = \( \frac{\text{Pool Volume}}{\text{Turnover Time}_1} \) = \( \frac{\text{gal}}{\text{min}} \) = __________ gpm*  

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

I. **Number of Skimmers Required (see Rules and Regulations for Swimming Pools, Appendix, Figure 4 for most pools or reference footnote 2 for wading pools and whirlpools)**

   Quantity = \( \frac{\text{Pool Area}}{X_2} \) = ________________ = ________________  

II. **Skimmer Flow Rate:**

   Skimmer Flow Rate = Design Flow Rate = ________________ gpm

III. **Flow Through Each Skimmer:**

   Skimmer Flow Rate \( \text{No of Skimmers Provided} \) = ________________ = ________________ gpm  
   (min. 25 gpm & max. 55 gpm)

IV. **Number of Inlets Required:**

   Number of Inlets \( \text{Pool Perimeter} \) \( X_3 \) = ________________ = ________________  
   (minimum 2 inlets)

1  Turnover time: Use 360 minutes for pools, 120 minutes for wading pools and 30 minutes for spas. See code for additional pool types.
2  Wading pools: 1 skimmer/200 sq. ft. of surface area  Whirlpools: 1 skimmer/100 sq. ft. of surface area


** Round fractions up to the next whole number

*** Round major fractions up to the next whole number
IV. **Pipe Size Selection:**

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

<table>
<thead>
<tr>
<th>No. of Skimmers</th>
<th>Branch 1</th>
<th>Branch 2</th>
<th>Branch 3</th>
<th>Branch 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Served by Pipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipe Size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow in Pipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Velocity (fps)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Indicate which chart used for velocity numbers:*

B. **Return Line Size**  
Velocity in selected pipe size shall not exceed 10 fps at the design flow rate.

<table>
<thead>
<tr>
<th>No. Inlets</th>
<th>Branch 1</th>
<th>Branch 2</th>
<th>Branch 3</th>
<th>Branch 4</th>
<th>Branch 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Served by Pipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipe Size</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Flow in Pipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Velocity (fps)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*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): __________

V. **Main Drain Grate Selection**

Main drain outlet:  
(Minimum 4 to 1 open area ratio per grate)

(2 required)  
(1 ½ fps max. velocity through each main drain grate)

[If therapy jet flow is through the main drain grates, this additional flow must be included in all calculations.]

<table>
<thead>
<tr>
<th>Pipe</th>
<th>Size Pipe</th>
<th>Area</th>
<th>Grate Size (each)</th>
<th>Open Area (each)</th>
<th>Velocity (fps)</th>
<th>Total Flow (both drains)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot;</td>
<td>3.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 ½&quot;</td>
<td>4.8</td>
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<tr>
<td>3&quot;</td>
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<tr>
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<tr>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
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<td></td>
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</tr>
<tr>
<td>8&quot;</td>
<td>50.0</td>
<td></td>
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</tr>
</tbody>
</table>

Open pipe area: ________ sq. in. X 4 = ________ sq. in.  
[must be < main drain grate open area]

Frame & grate catalog number: __________  Quantity: __________
VI. **Main Drain Line Loss**

Head loss calculation must be based on the following for floor or wall returns.

\[
\text{Main drain flow rate} = 0.2 \times \text{design flow rate}
\]

\[
= 0.2 \times \text{__________ gpm}
\]

\[
= \text{______________ gpm}
\]

Straight pipe size: _______ in.  

Straight pipe length: _______ ft.  

_________ Elbows \times \text{Equiv. length} = _______ ft.  

_________ Tees \times \text{Equiv. length} = _______ ft.  

_________ Valves \times \text{Equiv. length} = _______ ft.  

Total equivalent length = _______ ft.

Friction loss per 100 feet: * _______ \times \frac{\text{Total equiv. length}}{100} = _______ ft.

\*

Based on 20% (i.e. 0.2) main drain flow rate

\*

Main drain line loss (Enter on page 6)
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 = ft. (for above pipe)  
   
   ___________________ x ___________________ = ___________________  

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 = ft. (for above pipe)  
   
   ___________________ x ___________________ = ___________________  

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 = ft. (for above pipe)  
   
   ___________________ x ___________________ = ___________________  

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 = ft. (for above pipe)  
   
   ___________________ x ___________________ = ___________________  

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 = ft. (for above pipe)  
   
   ___________________ x ___________________ = ___________________  

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 = ft. (for above pipe)  
   
   ___________________ x ___________________ = ___________________  

Friction loss due to inlet resistance @ gpm = ft.

**Total return line loss** (add all totals) = ft.  (Enter on page 6)
VII  **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 6)
Total Dynamic Head Required:

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

Return Line Loss (from page 4) = ________________ ft.

Filter Loss When Dirty (from manufacturer or chart below*) = ________________ ft.

Skimmer Line Loss (from page 5) = ________________ ft.

Heater Loss (from manufacturer) = ________________ ft.

Other (multiport valves, etc.) (from manufacturer) = ________________ ft.

Total Dynamic Head: = ________________ 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)

Make: ________________ Model: ________________ HP: ________________

Number of pumps used: __________

Pump Rated: __________ gpm @ __________ TDH

Filter Selection

Filter area required = \( \frac{\text{Design flow rate}}{\text{Flow rate per sq. ft.}^*} \) = \( \frac{(\text{Design flow rate})}{(\text{Flow rate per sq. ft.})} \) = ________________ sq.ft.

**Filter Flow Rate (use ANSI/NSF 50 or the following): Sand=15 gpm/sq. ft., Cartridge=.3 gpm/sq. ft., D.E.=1 gpm/sq. ft.

Model: ________________________________ Catalog No.: ________________________________

Filter area: __________ sq. ft. No. Tanks: ________________ Size: ________________________________

Certified Contractor Information

Certified Contractor: ________________________________ Certification Number: ________________

Company Name: ________________________________

Address: ________________________________

Phone #: ________________________________

Contractor Signature: ________________________________ Date: ________________________________