Residential Circulation Sizing -2 Calculations

Proper Circulation/Pipe/Filter/Suction Outlet Selection has 2 primary concerns

1.For Circulation/Filtration Energy Efficiency (APSP 15)
2.For Suction Entrapment Avoidance & Safety (APSP 7)

Pool Owner_____

Location_____

1. For Circulation/Filtration Energy Efficiency (APSP 15)

Determine Pool Volume

1. May be determined from CAD design program
2. Basic Formula- Pool Surface Area X Average Depth X 7.5 = Pool Volume in Gallons

Pool/Spa total volume_____gallons

Determine Desired Flow Rate(s)

Maximum Filtration Flow Rate (gpm)= **Pool Volume (Gallons) _____÷360 = _____gpm** (Pool smaller than 13,000 gallons–use 36gpm) (Turnover Rate– 6 hours) Normal Low speed operation flow rate.

Is there an auxiliary need for circulation? ____Yes? ____No?

Is a calculated **auxiliary flow rate required for Spa Jets or Waterfeatures? _____gpm**

Spa– Number of jets____ X Flow requirement____ of specific spa jets = _____Desired Aux Flow Rate

Waterfeatures– Design Flow requirements for Waterfall or Fountain

Desired Calculated Auxiliary Flow Rate _____gpm

Determine Proper Pipe Size

Max Water Velocity- 8 ft. per second for pressure piping & 6 ft. per second for suction piping

Minimum Suction pipe size @ 6 fps____in. & Suction Branch Pipe size@ 6 fps____in.

Minimum Return pipe size @ 8 fps____in. & Return Branch Pipe size@ 8 fps____in.

Pipe Size	1.5"	2"	2.5"	3"	3.5"	4"
Nominal GPM @ 6fps	38	63	90	138	185	238
Nominal GPM @ 8fps	51	84	119	184	247	317

Determine Filter Size: Cartridge .375 gpm/sq ft Sand 15 gpm/sq ft DE 2 gpm/sq ft

Filter Size– Pool Flow Rate ÷ Filter Factor = _____sq ft

Filter Make & Model

Pump Controls- Integral to Pump____ Time Clock____ Digital Controller_____

Filtration Pump with No Auxiliary load requires only 1 speed.

Filtration pump with Auxiliary (Spa or Waterfeature) may use higher speed, but must default to low speed within 24 hours. Requires Integral or Digital Controller. (Higher velocity still must NOT exceed safety for APSP 7)

Controller Make & Model

Heater Natural Gas/Propane_____ Heat Pump_____

Heater /Heat Pump Make & Model

Gas Heater Efficiency_____Heat Pump Efficiency_____

Gas heater efficiency –over 82% Heat Pump efficiency coefficient must be over 4.0

2. For Suction Entrapment Avoidance & Safety (APSP 7)

For APSP 7– Calculate the Maximum Flow of the pump in this application to determine that the pump will not create a dangerous entrapment condition.

We must calculate the resistance to flow in the pipes and equipment for this particular pool–

From Part 1– Desired Filtration Flow Rate (Min. 36 gpm) _____gpm

Desired Auxiliary Flow Rate _____gpm (Auxiliary Flow rate is determined by —
Spa– Number & Flow requirement of specific spa jets
Waterfeatures– Design Flow requirements for Waterfall or Fountain

Maximum system flow can be determined

1. Use Calculated TDH (Total Dynamic Head) with manufacturer's certified pump curve.
2. Use calculated Simplified TDH with manufacturer's certified pump curve.
3. For existing pool- Calculated TDH based on Actual Pressure & Vacuum gauge readings.

To calculate TDH for a pool

The calculation for TDH is done by adding the factor for each pipe fitting, each foot of pipe and the factor for each piece of equipment together.

The swimming pool equipment manufacturers have tools to make these calculations easier.

A Simplified TDH is sometimes estimated by simply taking the number of feet of Suction

Simplified TDH Calculation (estimate) For each pipe size-

Length of Pipe_____ft./100 X Friction loss_____(@6fps) = Est. TDH_____

example	GPM	Velocity	TDH Loss/100 ft
2"PVC	60	5.74	5.6

Add + Equipment Loss (Filter +Heater)_____TDH

= Total estimated (Simplified) TDH_____TDH

The Simplified estimated TDH will always lead to a lower value than the actual TDH. Adding the actual resistance of all of the fittings, etc. will increase the resistance– decreasing the actual flow assuring that the Suction Outlet fitting will have flow less than Maximum.

Pump Selection-

Pump Make & Model

From Pump Curve-Max Flow Rate for this pump @ TDH determined by method above._____gpm

Submerged Suction Outlets-

Suction Outlet Make & Model

Max. Flow Rate for Drain-Must be less than Max. Flow Rate of Pump above. Yes No

Unblockable? If No, Multiple drains at least 3 ft apart are required.

Property Owner_____ Location_____ Contractor Company Name_____ Contractor Name _____Contractor Phone_____& email_____