

# DESIGN DATA

1. **QUICK PIPE SIZING GUIDE** for pressure flows with appr. 3.0m/0.3bar/10'/3.34kpa pressure drop per 30m / 100 feet of pipe.
- |             |    |        |        |     |     |      |      |      |      |       |
|-------------|----|--------|--------|-----|-----|------|------|------|------|-------|
| PIPE SIZE:  | 1" | 1 1/4" | 1 1/2" | 2"  | 3"  | 4"   | 6"   | 8"   | 10"  | 12"   |
| FLOW USGPM: | 9  | 19     | 28     | 52  | 200 | 380  | 880  | 1600 | 2400 | 3500  |
| FLOW L/min: | 34 | 72     | 106    | 197 | 757 | 1438 | 3330 | 6056 | 9084 | 13247 |
- DO NOT USE PRESSURE FLOW TABLES FOR GRAVITY FLOWS , use Manning sewer flow tables!**

2. **QUICK SIZING GUIDE FOR PERFORATED SUCTION STRAINERS WITH 40% + OPEN AREAS**  
Opening size to be appr. 50% of nozzle orifices.
- |                               |     |        |        |        |        |        |        |
|-------------------------------|-----|--------|--------|--------|--------|--------|--------|
| SCREEN OPENINGS:              | 1mm | 1.5mm  | 2mm    | 3mm    | 4mm    | 6mm    | 10mm   |
| FLOW \ L/min per m2 :         | 220 | 380    | 530    | 740    | 950    | 1200   | 3000   |
| SCREEN OPENINGS:              |     | 0.063" | 0.125" | 0.250" | 0.375" | 0.500" | 0.750" |
| FLOW \ USGPM per square foot: |     | 12     | 17     | 25     | 50     | 100    | 270    |

3. **ANTIVORTEX COVERS OVER PUMP SUCTION FITTINGS**  
Required in most installations to prevent entry of air into system by vortexing. Size depends on waterdepth and flow.

4. **NPSHA : (NET POSITIVE SUCTION HEAD AVAILABLE) :**  
Term describing the depth of water over the pump suction required to permit pump to perform as advertised , the pump supplier usually furnishes this information, which is essential during design/engineering of a pump system.

5. **SURGE/SPLASH COLLAR:** Structural part of a pool or device that encloses the falling water of a spray effect to prevent content of pool to surge and cause spray effect to jump especially in circular or square pool.

6. **BALANCED OVERFLOW:** An overflow that is sized to remove the greatest possible inflow into a pool before the pool overflows, usually sizing is done to draw off the full flow of a water supply into a pool (2 x #1 on this page). Sizing of overflow is done by establishing linear weir length of overflow device (multiply pipe diameter x 3.14) and possible head of water before pool overflow can occur, then check waterfall data below for flow rates. For very large pool and / or inflows consider an appropriate length overflow weir in front of a suitable size drain in the pool floor. In multi level pools or cascades the overflow to be sized for the entire water surface area and set above non operating water level into base pool.

7. **TO ESTIMATE APPR. 60 Hz PUMP HP / KW FOR A KNOWN PERFORMANCE:**  
(Flow in USGPM X MC (total, in feet head)) DIVIDE BY: 2970 or (3960 X 75% of known Efficiency) : KW x 1.34 : HP  
**TO ESTIMATE APPR. 50 Hz PUMP HP / KW FOR A KNOWN PERFORMANCE:**  
(Flow in L/min X MC (total , in meter head) DIVIDE BY: 2970 or (3960 X 75% of known Efficiency): KW x 1.34 : HP  
(Final engineering calculations might differ from above, as other factors and/or variations are to be considered.)

8. **APPROXIMATE COSTS OF OPERATING A PUMP:** Based upon the hourly operating costs of an electrical motor:  
MULTIPLY : KNOWN KWH COSTS X FACTORS SHOWN :
- |              |      |      |      |      |      |      |      |
|--------------|------|------|------|------|------|------|------|
| 1 PHASE HP : | 1/3  | 1/2  | 3/4  | 1    | 2    | 3    | 5    |
| KW :         | 1.34 | 2.68 | 4.02 | 6.70 |      |      |      |
| FACTOR :     | .408 | .535 | .760 | 1.0  | 2.0  | 2.95 | 4.65 |
| 3 PHASE HP : | 1    | 3    | 5    | 10   | 20   | 30   | 50   |
| KW :         | 1.34 | 4.02 | 6.7  | 13.4 | 26.8 | 40.2 | 67.5 |
| FACTOR :     | .96  | 2.7  | 4.5  | 9.0  | 16.9 | 25.0 | 41.3 |

9. **PERFORMANCE DIFFERENCES BETWEEN 50 Hertz & 60 Hertz (Cycles) ELECTRICAL MOTORS:**  
Pumps with 50 Hz motors have an appr. 19% lower performance than with 60 Hz motors.  
Pumps with 60 Hz motors have an appr. 16% higher performance than with 50 Hz motors.

10. **CONVERSION DATA:**

**FLOW:**

1 L/min (LPM) :	.264 USGPM	\ .220 IGPM
1 USGPM (G) :	3.785 L/min	\ 0.833 IGPM
1 IGPM :	4.546 L/min	\ 1.2 USGPM
1 L/sec. :	15.85 USGPM	\ 13.2 IGPM
1 m3/min :	264.2 USGPM	\ 220.08 IGPM

**PRESSURE:**

1m/head (MC) :	0.1 bar / 9.82kpa / 3.28'head / 1.422PSI
1'head (FT) :	0.305m / 2.99kpa / 0.0305bar / 0.433PSI

**DISTANCE / HEIGHT / DEPTH:**

1 Meter :	39.37 Inches(") / 3.28083 Feet(")
1 Inch(") :	25.4mm
1 Foot(') :	30.4801cm

**AREA:**

1 m2 :	10.76 Square Feet (Sqft)
1 Sqft :	0.0929 m2

**WEIGHTS OF WATER:**

1Kg or 1 Liter :	2.207 Lbs
1m3 :	1000 kg / 2203 Lbs
1 cbft :	62.4 2Lbs / 28.28 Kg
1 US Gallon :	3.785 Kg / 8.36Lbs

**VOLUMES OF WATER:**

M3 :	Cubic meter
1M3 :	1000 Liter / 35.31 cbft
1 cubic foot :	28.316 Liter / 7.4805 US Gallons
1 Liter :	0.001 M3 / 0.353 cbft

**TORQUE :** (Tightening of facering bolts of lightfixtures)

1 (Newton Meter) NM :	8.85 Inch Lbs
1 (Inch Pound)"lbs :	0.12 NM

**LUMINANCE OF ILLUMINATION:**

1 CP,Candle Power per square foot :	10.764 CP/m2
1 CP,Candle Power per square inch :	1550.0 CP/m2
1 LM,Lumen per square foot :	10.763 LM/m2

11. **WATERFALLS ('A' : Height of water overflowing over weir)**  
Suggested flow volumes per linear meter of waterfall, waterwall or overflow.
- |       |       |                                     |
|-------|-------|-------------------------------------|
| 'A'   | L/min | Suggested maximum free fall height. |
| 3.5mm | 66    | 0.5m                                |
| 7mm   | 150   | 1.0m                                |
| 10mm  | 250   | 1.2m                                |
| 15mm  | 380   | 1.5m                                |
| 20mm  | 510   | 1.8m                                |
| 30mm  | 690   | 2.4m                                |
| 40mm  | 1100  | 3.0m                                |
| 50mm  | 1500  | 3.5m                                |

The longer the overflow weir , the greater 'A' shall be to overcome minute elevation differences in the weir.  
For noise and splash reduction of waterfalls have water fall into center of a foam bed generated by a movable double row of PEM 64 Foam Jets.  
For multi level pools , storage cubic area must be provided into the base pool to store all of the run off of the upper level pools before it overflows.  
Run off happens when the circulating pump is shut off !