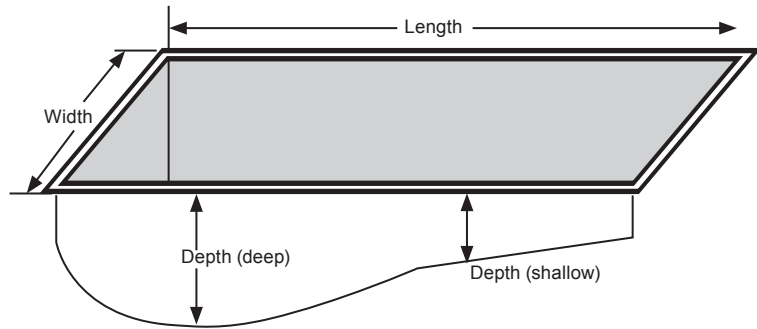
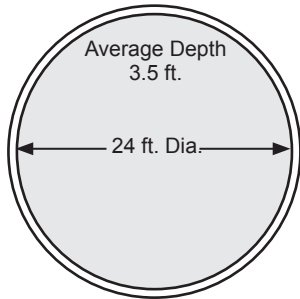


ENGINEERING DATA

Product Catalog 2025 - 2026

ENGINEERING DATA

ESTIMATING TOTAL GALLONS IN A POOL OR SPA



$\text{Radius}^2 \times 3.14 \times \text{A.D.} \times 7.5 = \text{Gallons}$

$12 \times 12 \times 3.14 \times 3.5 \times 7.5 = 11,869$
Gals.

$\text{Dia.} \times \text{Dia.} \times \text{Av Dp} \times 5.9 = \text{Gallons}$

$24 \times 24 \times 3.5 \times 5.9 = 11,894$ Gals.

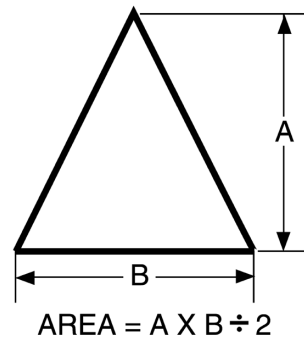
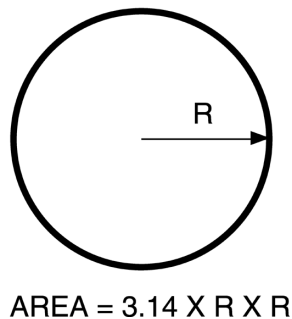
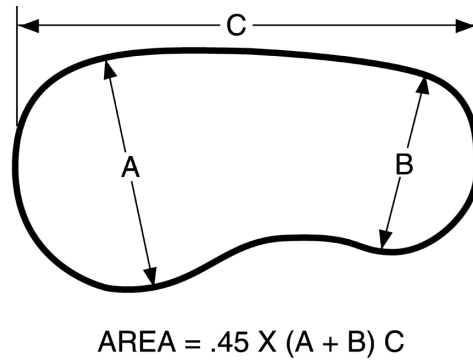
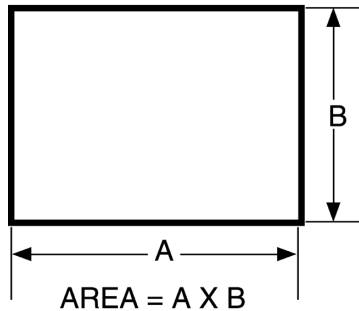
| | |
|------------|-----|
| Gal.cu.ft. | |
| Rectangle: | 7.5 |
| Oval: | 6.7 |
| Kidney: | 7.0 |

Formula A: $\text{Length} \times \text{Width} \times \text{Average Depth} \times \text{Gal.cu.ft.} = \text{Gallons}$

Example: Pool Length = 40 ft.
Pool Width = 20 ft.
Shallow Depth = 3 ft.
Deep Depth = +8 ft.

Total Depth = 11 ft.

Using formula A: $40 \times 20 = 800$ sq. ft., $800 \times 5.5 = 4,400$ cubic ft., $4,400 \times 7.5 = 33,000$ gallons



ENGINEERING DATA

UNITS OF MEASURE

UNITS OF LENGTH

| UNIT | INCH | FOOT | YARD | METER |
|-------|-------|-------|-------|-------|
| INCH | 1.0 | .0833 | .0278 | .0254 |
| FOOT | 12.0 | 1.0 | .333 | .305 |
| YARD | 36.0 | 3.0 | 1.0 | .9144 |
| METER | 39.37 | 3.281 | 1.094 | 1.0 |

UNITS OF AREA

| UNIT | SQUARE INCH | SQUARE FOOT | SQUARE YARD | SQUARE METER |
|--------------|-------------|-------------|-------------|--------------|
| SQUARE INCH | 1.0 | .00694 | .000772 | .000645 |
| SQUARE FOOT | 144.0 | 1.0 | .1111 | .0929 |
| SQUARE YARD | 1,296.0 | 9.0 | 1.0 | .836 |
| SQUARE METER | 1,550.0 | 10.76 | 1.196 | 1.0 |

UNITS OF VOLUME

| UNIT | U.S. GALLON | IMPERIAL GALLON | CUBIC FEET | POUNDS OF WATER | CUBIC METERS |
|-----------------|-------------|-----------------|------------|-----------------|--------------|
| U.S. GALLON | 1.0 | .833 | .1337 | 8.33 | .003785 |
| IMPERIAL GALLON | 1.2 | 1.0 | .1605 | 10.0 | .004546 |
| CUBIC FEET | 7.481 | 6.232 | 1.0 | 62.37 | .0283 |
| POUNDS OF WATER | .12 | .09996 | .0160 | 1.0 | .00045 |
| CUBIC METERS | 264.2 | 220.0 | 35.31 | 2,204.0 | 1.0 |

UNITS OF FLOW

| UNIT | U.S. G.P.M. | IMPERIAL G.P.M. | CUBIC FEET/SECOND | CUBIC FEET/HOUR | LITERS/SECOND |
|----------------------|-------------|-----------------|-------------------|-----------------|---------------|
| U.S. G.P.M. | 1.0 | .833 | .00223 | 8.02 | .0631 |
| IMPERIAL G.P.M. | 1.2 | 1.0 | .00268 | 9.63 | .0757 |
| CUBIC FT. PER SECOND | 448.8 | 374.0 | 1.0 | 3.600 | 28.32 |
| CUBIC FT. PER HOUR | .1247 | .104 | .00028 | 1.0 | .0078 |
| LITERS PER SECOND | 15.85 | 13.21 | .0353 | 127.13 | 1.0 |

ENGINEERING DATA

UNITS OF MEASURE

UNITS OF PRESSURE

| UNIT | INCHES OF WATER | FEET OF WATER | POUNDS PER SQUARE INCH | INCHES OF MERCURY |
|------------------------|-----------------|---------------|------------------------|-------------------|
| INCHES OF WATER | 1.0 | .0833 | .0361 | .0736 |
| FEET OF WATER | 12.0 | 1.0 | .433 | .883 |
| POUNDS PER SQUARE INCH | 27.72 | 2.31 | 1.0 | 2.04 |
| INCHES OF MERCURY | 13.596 | 1.133 | .4906 | 1.0 |

PRESSURE AND EQUIVALENT FEET HEAD OF WATER

$$H = \frac{\text{pressure (psi)} \times 144}{62.4}$$

| Lbs. per Sq. In. | Feet Head | Lbs. per Sq. In. | Feet Head | Lbs. per Sq. In. | Feet Head | Lbs. per Sq. In. | Feet Head |
|------------------|-----------|------------------|-----------|------------------|-----------|------------------|-----------|
| 1 | 2.31 | 20 | 46.18 | 120 | 276.42 | 225 | 519.23 |
| 2 | 4.62 | 25 | 57.72 | 125 | 288.46 | 250 | 576.92 |
| 3 | 6.93 | 30 | 69.27 | 130 | 300.00 | 275 | 634.62 |
| 4 | 9.24 | 40 | 92.36 | 140 | 323.08 | 300 | 692.31 |
| 5 | 11.54 | 50 | 115.38 | 150 | 346.15 | 325 | 750.00 |
| 6 | 13.85 | 60 | 138.46 | 160 | 369.23 | 350 | 807.69 |
| 7 | 16.16 | 70 | 161.53 | 170 | 392.31 | 375 | 865.38 |
| 8 | 18.47 | 80 | 184.62 | 180 | 415.38 | 400 | 923.08 |
| 9 | 20.78 | 90 | 207.69 | 190 | 438.46 | 500 | 1153.85 |
| 10 | 23.09 | 100 | 230.77 | 200 | 461.54 | 1000 | 2307.69 |
| 15 | 34.63 | 110 | 253.85 | | | | |

ENGINEERING DATA

UNITS OF MEASURE

EQUIVALENT VALUES OF PRESSURE 1 in. of Mercury (hg) = 1.13 ft. of water

| Inches of Mercury | Feet of Water | Pounds per Sq. In. | Inches of Mercury | Feet of Water | Pounds per Sq. In. | Inches of Mercury | Feet of Water | Pounds per Sq. In. |
|-------------------|---------------|--------------------|-------------------|---------------|--------------------|-------------------|---------------|--------------------|
| 1 | 1.13 | 0.49 | 11 | 12.45 | 5.39 | 21 | 23.78 | 10.3 |
| 2 | 2.26 | 0.98 | 12 | 13.57 | 5.87 | 22 | 24.88 | 10.8 |
| 3 | 3.39 | 1.47 | 13 | 14.70 | 6.37 | 23 | 26.00 | 11.28 |
| 4 | 4.52 | 1.95 | 14 | 15.82 | 6.86 | 24 | 27.15 | 11.75 |
| 5 | 5.65 | 2.44 | 15 | 16.96 | 7.35 | 25 | 28.26 | 12.25 |
| 6 | 6.78 | 2.93 | 16 | 18.09 | 7.84 | 26 | 29.40 | 12.73 |
| 7 | 7.91 | 3.42 | 17 | 19.22 | 8.33 | 27 | 30.52 | 13.23 |
| 8 | 9.04 | 3.91 | 18 | 20.35 | 8.82 | 28 | 31.65 | 13.73 |
| 9 | 10.17 | 4.40 | 19 | 26.47 | 9.31 | 29 | 32.80 | 14.22 |
| 10 | 11.30 | 4.89 | 20 | 22.60 | 9.80 | 29.929 | 33.947 | 14.6969 |

WEIGHT

1 U.S. GALLON OF WATER = 8.33 LBS.

1 CUBIC FOOT OF WATER = 62.35 LBS.

1 KILOGRAM (LITRE) = 2.2 LBS.

1 IMPERIAL GALLON = 10.0 LBS.

CURRENT CAPACITY (AMPS) OF WIRE *

Three wires in cable, ambient temp. 86°F

| WIRE SIZE | AMPERES | |
|-----------|---------|-----------|
| | COPPER | ALUMINIUM |
| 14 | 20 | — |
| 12 | 25 | 20 |
| 10 | 30 | 25 |
| 8 | 40 | 30 |
| 6 | 55 | 40 |
| 4 | 70 | 55 |
| 3 | 85 | 65 |
| 2 | 95 | 75 |
| 1 | 110 | 85 |
| 0 | 125 | 100 |

* Wire size is minimum for amperes listed.

EFFICIENCY

| EFFICIENCY | POWER OUTPUT POWER INPUT |
|--------------------------------|---|
| MOTOR EFFICIENCY | $\frac{\text{HP OUTPUT}}{\text{K.W. INPUT}}$ |
| PUMP EFFICIENCY | $\frac{\text{G.P.M.} \times \text{TOTAL HEAD (F.T.)}}{3960 \times \text{BHP}}$ |
| OVERALL PLANT EFFICIENCY (OPE) | $\frac{\text{G.P.M.} \times \text{TOTAL HEAD (F.T.)}}{5310 \times \text{K.W. INPUT}}$ |

| | |
|--------------------------|--|
| Amperage = | $\frac{\text{Watts}}{\text{Volts}}$ |
| Watts = | Volts x Amperage |
| WHP = | Water Horsepower (output HP of pump) = $\frac{\text{g.p.m} \times \text{total head}}{3960}$ |
| HP input (to motor) = | KW input x 1.341 |
| Total Head = | Discharge head + Pumping water level (ft) |
| Discharge Head = | Discharge Pressure (PSI) x 2.31 ft. of head |

ENGINEERING DATA

HEATER SIZING INFORMATION

Pool heaters can be sized by the volume method for maintenance heating or for spot heating. For many days during the swimming season, the sun maintains a desirable pool temperature of 78–80°F. and the pool requires no supplemental heating. However, during cooler periods a pool will usually lose 2–4°F. per day.

To get the water to the desired temperature, you could choose a smaller heater and run it during the daily filter cycle of 4–6 hours every day. This would be sufficient to overcome a slight temperature drop between filter cycles, but it would mean leaving the heater on every day. If you don't use the pool daily, it's more economical to spot heat the pool, say for the weekend. In this case, you could choose a larger heater which will heat the pool faster, and then can be turned off between uses. With either, maintenance heating or spot heating, you need to determine the size of heater to select and the time it will require to heat the pool.

MASTERTEMP AND MAX-E -THERM MODEL REQUIRED TO HEAT POOL IN 24 HOURS

Pool Sizing *

| ° F Temperature Change/24 Hrs. | Pool Volume (Gallons) | | | | | | | | | |
|--------------------------------|--------------------------|-----------|-----------------|-----------|-----------------|--|-----------|-----------------|-----------|-----------------|
| | Model 175 | Model 200 | Model 250/250HD | Model 300 | Model 400/400HD | Model 175 | Model 200 | Model 250/250HD | Model 300 | Model 400/400HD |
| | Pool Capacity in Gallons | | | | | Pool Surface Area in Sq. Ft. at 5.5' Depth | | | | |
| 5 | 85,210 | 97,383 | 121,729 | 146,075 | 194,766 | 2,069 | 2,364 | 2,955 | 3,546 | 4,727 |
| 10 | 42,605 | 48,691 | 60,864 | 73,037 | 97,383 | 1,034 | 1,182 | 1,478 | 1,773 | 2,364 |
| 15 | 28,403 | 32,461 | 40,576 | 48,692 | 64,922 | 690 | 788 | 985 | 1,182 | 1,576 |
| 20 | 21,303 | 24,346 | 30,433 | 36,519 | 48,691 | 517 | 591 | 739 | 887 | 1,182 |
| 25 | 17,042 | 19,477 | 24,346 | 29,216 | 29,216 | 414 | 473 | 591 | 710 | 945 |
| 30 | 14,201 | 16,230 | 20,288 | 24,345 | 32,461 | 345 | 394 | 493 | 591 | 788 |
| 35 | 12,173 | 13,912 | 17,390 | 20,868 | 27,824 | 296 | 338 | 423 | 507 | 675 |
| 40 | 10,651 | 12,173 | 15,216 | 18,260 | 24,346 | 259 | 295 | 369 | 443 | 591 |

MASTERTEMP AND MAX-E -THERM MODEL REQUIRED TO HEAT THE SPA 30°F IN A GIVEN TIME PERIOD

Spa Sizing *

| Model | Spa Volume (Gallons) | | | | | | | | |
|-----------|--|------|------|------|------|------|------|------|-------|
| | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
| | Minutes for 30° F Temperature Rise (Heater Input in 1000 BTU/HR) | | | | | | | | |
| 174 | 21.0 | 31.0 | 40.0 | 50.0 | 61.0 | 71.0 | 81.0 | 91.0 | 102.0 |
| 200 | 18.0 | 27.0 | 35.0 | 44.0 | 53.0 | 62.0 | 71.0 | 80.0 | 89.0 |
| 250/250HD | 15.8 | 23.5 | 30.8 | 38.5 | 46.5 | 54.3 | 62.0 | 70.0 | 77.8 |
| 300 | 13.5 | 20.0 | 26.5 | 33.0 | 40.0 | 46.5 | 53.0 | 60.0 | 66.5 |
| 400/400HD | 9.0 | 13.0 | 18.0 | 22.0 | 27.0 | 31.0 | 35.0 | 40.0 | 44.0 |

Note: The chart is based on a 30° F (16.6° C) temperature rise, discounting losses and only based on heat required to raise temperature in minutes. Two-year limited warranty. See warranty for details.

* ASME models available. Please see your Pentair Aquatic Systems Representative for details.

* For Commercial Heaters 500,000 BTU/hr and over please contact factory for sizing.

$$\begin{aligned} \text{TIME IN HOURS} &= \frac{\text{Vol. in Gal.} \times 8.34 \text{ lb./gal.} \times \text{temprise}}{\text{Heater BTUH input} \times \text{efficiency of heater}} \\ \text{POOL \& SPA} & \\ \text{TIME IN MINUTES} &= \frac{\text{Vol. in Gal.} \times 8.34 \text{ lb./gal.} \times \text{temprise} \times 60}{\text{Heater BTUH input} \times \text{efficiency of heater}} \\ \text{SPA} & \end{aligned}$$

ENGINEERING DATA

HEATER SIZING INFORMATION

ETi 400 ASME HIGH EFFICIENCY HEATER MODEL
REQUIRED TIME TO TEMPERATURE RISE

| ° F Temperature Rise | Pool Volume (Gallons) | | | | | | | | | |
|----------------------|----------------------------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| | 10,000 | 20,000 | 30,000 | 40,000 | 50,000 | 60,000 | 70,000 | 80,000 | 90,000 | 100,000 |
| | Hours to Reach Temperature | | | | | | | | | |
| 5 | 1.08 | 2.17 | 3.26 | 4.34 | 5.43 | 6.52 | 7.60 | 8.69 | 9.77 | 10.86 |
| 10 | 2.17 | 4.34 | 6.52 | 8.69 | 10.86 | 13.03 | 15.20 | 17.38 | 19.55 | 21.72 |
| 15 | 3.25 | 6.52 | 9.77 | 13.03 | 16.29 | 19.55 | 22.80 | 26.06 | 29.32 | 35.58 |
| 20 | 4.35 | 8.69 | 13.03 | 17.38 | 21.72 | 26.06 | 30.41 | 34.75 | 39.09 | 43.44 |
| 25 | 5.43 | 10.86 | 16.29 | 21.72 | 27.15 | 32.58 | 38.01 | 43.44 | 48.87 | 54.30 |
| 30 | 6.52 | 13.03 | 19.55 | 26.06 | 32.58 | 39.09 | 45.61 | 52.13 | 58.64 | 65.16 |
| 35 | 7.60 | 15.20 | 22.80 | 30.41 | 38.01 | 45.61 | 53.21 | 60.81 | 68.41 | 76.02 |
| 40 | 8.68 | 17.38 | 26.06 | 34.75 | 43.44 | 52.13 | 60.81 | 69.50 | 78.19 | 86.88 |
| 50 | 9.77 | 19.55 | 29.32 | 39.09 | 48.87 | 58.64 | 68.41 | 78.19 | 87.96 | 97.73 |
| | 10.87 | 21.72 | 32.58 | 43.44 | 54.30 | 65.16 | 76.02 | 86.88 | 97.73 | 108.59 |

ENGINEERING DATA

HEATER GAS SUPPLY AND PIPE SIZING INFORMATION

When installing any Pentair or Sta-Rite pool or spa heater, it is very important to have the proper amount of gas supplied to all Pentair or Sta-Rite Heaters for pools. Below, for your information, is a table which will assist you in selecting the correct size of piping for the installation.

When installing any gas appliance, it is very important to have the proper size gas meter and home pressure regulator installed. Once you have selected the correct size heater for the pool or spa, contact the local utility which supplies the gas and request a field review of the installation and have them install the proper size meter and proper size pressure regulator.

LOW PRESSURE, SINGLE STAGE PIPE SIZING FOR GAS LINE CONNECTIONS

4

Natural gas at 1000 BTU per Cubic Foot

Propane Gas at 2500 BTU per Cubic Foot

| MODEL | 1/2 in. | | 3/4 in. | | 1 in. | | 1-1/4 in. | | 1-1/2 in. | | 2 in. | | 2-1/2 in. | |
|----------|---------|--------|---------|---------|---------|---------|-----------|---------|-----------|---------|---------|---------|-----------|-----|
| | NAT | PRO | NAT | PRO | NAT | PRO | NAT | PRO | NAT | PRO | NAT | PRO | NAT | PRO |
| 100 & 75 | 20 ft. | 50 ft. | 50 ft. | 150 ft. | 150 ft. | 600 ft. | - | - | - | - | - | - | - | - |
| 150 | 10 ft. | 40 ft. | 50 ft. | 150 ft. | 150 ft. | 600 ft. | - | - | - | - | - | - | - | - |
| 200 | - | 20 ft. | 30 ft. | 80 ft. | 125 ft. | 250 ft. | 450 ft. | 600 ft. | - | - | - | - | - | - |
| 250 | - | 10 ft. | 20 ft. | 50 ft. | 70 ft. | 150 ft. | 250 ft. | 500 ft. | 600 ft. | - | - | - | - | - |
| 300 | - | - | 10 ft. | 30 ft. | 50 ft. | 100 ft. | 200 ft. | 350 ft. | 400 ft. | 600 ft. | - | - | - | - |
| 350 | - | - | 10 ft. | 20 ft. | 30 ft. | 70 ft. | 125 ft. | 250 ft. | 250 ft. | 500 ft. | 500 ft. | - | - | - |
| 400 | - | - | - | 10 ft. | 20 ft. | 60 ft. | 100 ft. | 150 ft. | 200 ft. | 450 ft. | 400 ft. | - | - | - |
| 525 | - | - | - | 5 ft. | 15 ft. | 35 ft. | 65 ft. | 150 ft. | 130 ft. | 360 ft. | 390 ft. | 700 ft. | - | - |
| 750 | - | - | - | - | - | 20 ft. | 35 ft. | 80 ft. | 75 ft. | 180 ft. | 260 ft. | 600 ft. | - | - |
| 900 | - | - | - | - | - | 15 ft. | 20 ft. | 45 ft. | 45 ft. | 100 ft. | 150 ft. | 360 ft. | 400 ft. | - |

| Gas Pressure | Model | Natural | Propane |
|---|-------|--------------|---------|
| | | Inches W. C. | |
| Gas Pressure Requirements Pentair Water Heaters | | | |
| Maximum Inlet | CH | 10 | 14 |
| | STD | 10 | 14 |
| | TSI | 10 | N/A |
| | LN | 10 | N/A |
| Minimum Inlet | CH | 6 | 12 |
| | STD | 6 | 12 |
| | TSI | 4 | N/A |
| | LN | 6 | N/A |
| Manifold | CH | 4 | 11 |
| | STD | 4 | 11 |
| | TSI | 2 | N/A |
| | LN | 4 | N/A |

| Gas Pressure | Natural | Propane |
|--|--------------|---------|
| | Inches W. C. | |
| Gas Pressure Requirements for MiniMax 75 & 100 Pentair Water Heaters | | |
| Normal Altitudes (0–2500 ft. above Sea Level) | | |
| Maximum Inlet | 10 | 14 |
| Minimum Inlet | 5 | 12 |
| Normal Manifold | 4 | 11 |
| High Altitudes (2500–7000 ft. above Sea Level) | | |
| Maximum Inlet | 10 | 14 |
| Minimum Inlet | 5 | 12 |
| Normal Manifold | 3 | 7 |

| Gas Pressure | Model | Natural | Propane |
|---|-------|--------------|------------|
| | | Inches W. C. | |
| Gas Pressure Requirements for MasterTemp, Max-E-Therm and ETi 400 Pentair Water Heaters | | | |
| Maximum Inlet | MT | 14 | 14 |
| Minimum Inlet | MT | 4 | 4 |
| Manifold | MT | -0.2 ± 0.1 | -0.2 ± 0.1 |

Note: All readings must be taken while heater is operating. Any adjustments or readings made while heater is off will give incorrect readings and should not be used for evaluation of heater operation.

All Values are +/- 0.2 inch W. C.

ENGINEERING DATA

HEATER GAS SUPPLY AND PIPE SIZING INFORMATION

“RESIDENTIAL” PROPANE GAS 2 STAGE REGULATION

In many Propane gas line installations, the gas supplier and or installer will utilize a two stage regulation process whereby, at the supply tank, they will install the first stage gas regulator, which would be at a higher pressure, usually 10 psi. This higher pressure allows for much longer distance and in a much smaller pipe size. Then, within a short distance from the pool heater, generally around 24 inches, a second regulator, which is the second stage, would be installed and set at the required inlet pressure of the heater.

SEE “GAS PRESSURE REQUIREMENT CHART.”

| Stage One “High Pressure” Gas Pipe Sizing | | | | Stage Two “Low Pressure” Gas Pipe Sizing | | |
|---|--------------|----------------|-----------------|--|--------------|---------------|
| 10 PSI @ 2500 BTU Per CU. FT. | | | | Stage 2 set at 14 in. W.C. | | |
| MAXIMUM EQUIVALENT PIPE LENGTH | | | | MAXIMUM EQUIVALENT PIPE LENGTH | | |
| Model | 0 to 50 Feet | 50 to 100 Feet | 100 to 150 Feet | Model | 0 to 10 Feet | 10 to 20 Feet |
| 75 through 400 | 1/2 in. | 1/2 in. | 1/2 in. | 75 through 400 | 3/4 in. | 3/4 in. |

“RESIDENTIAL” NATURAL GAS 2 STAGE REGULATION

In many Natural gas line installations, the gas supplier and or installer will utilize a two stage regulation process whereby, at the street’s main gas supply, they will install the first stage gas regulator, which would be at a higher pressure. This higher pressure is usually set at 2 psi or 5 psi and can be run for long distances and in a much smaller pipe size. Then, within a short distance from the pool heater, generally around 24 inches, they will install a second regulator, which is the second stage. This second stage regulator would be set at the minimum operating pressure for the heater. For “Natural Gas Pentair Pool Heaters” the minimum is 7 inches W.C.

| Stage One “High Pressure” Gas Pipe Sizing | | | | Stage Two “Low Pressure” Gas Pipe Sizing | | |
|---|--------------|---------------|----------------|--|-------------|--------------|
| 2 PSI @ 1000 BTU Per CU. FT. | | | | Stage 2 set at 7 in. W.C. | | |
| MAXIMUM EQUIVALENT PIPE LENGTH | | | | MAXIMUM EQUIVALENT PIPE LENGTH | | |
| Model | 0 to 20 Feet | 20 to 90 Feet | 90 to 200 Feet | Model | 0 to 5 Feet | 0 to 15 Feet |
| 75 through 400 | 3/4 in. | 1 in. | 1-1/4 in. | 75 through 300 | 3/4 in. | 1 in. |
| | | | | 350 & 400 | 1 in. | 1 in. |

| Stage One “High Pressure” Gas Pipe Sizing | | | | Stage Two “Low Pressure” Gas Pipe Sizing | | |
|---|--------------|----------------|-----------------|--|-------------|--------------|
| 5 PSI @ 1000 BTU Per CU. FT. | | | | Stage 2 set at 7 in. W.C. | | |
| MAXIMUM EQUIVALENT PIPE LENGTH | | | | MAXIMUM EQUIVALENT PIPE LENGTH | | |
| Model | 0 to 50 Feet | 50 to 100 Feet | 100 to 200 Feet | Model | 0 to 5 Feet | 0 to 15 Feet |
| 75 through 400 | 3/4 in. | 3/4 in. | 3/4 in. | 75 through 300 | 3/4 in. | 1 in. |
| | | | | 350 & 400 | 1 in. | 1 in. |

ENGINEERING DATA

BLOWER SIZING

HORSEPOWER

| To Get This | Divide This | By This |
|--|-------------------------|-----------|
| Horsepower | Kwatts | 0.746 |
| Horsepower | Watts | 746 |
| Horsepower | Torque (ft. lbs.) X RPM | 33000 |
| Horsepower | Torque (ft. lbs.) X RPS | 550 |
| Horsepower required to pump water at a given rate to a given Height, assuming 100% eff. AKA Water Horsepower | GPM x TDH (ft.) | 3960 |
| | GPH X TDH (psi) | 103000 |
| Brake HP | Water HP | Pump eff. |

AIR BLOWER SIZING GUIDE

| BLOWER MOTOR SIZE | VOLTS | AMPS | MAXIMUM INCHES OF WATER DEPTH | JETS ONLY RECOMMENDED NUMBER OF JETS |
|-------------------|-------|------|-------------------------------|--------------------------------------|
| 1 HP | 120V | 6.6 | 35 in. | 5-10 |
| 1-1/2 HP | 120V | 7.4 | 45 in. | 9-15 |
| 2 HP | 120V | 9.3 | 55 in. | 12-17 |
| 1 HP | 240V | 3.9 | 30 in. | 4-9 |
| 1-1/2 HP | 240V | 4.3 | 40 in. | 8-13 |
| 2 HP | 240V | 5.0 | 50 in. | 12-17 |

BLOWER SIZING FORMULA

Measure total depth of water in spa (not total spa depth)

Add - 1 in. water for each 10 ft. of 2 in. air pipe

Add 1/2 in. water for each 90 deg. 2 in. elbow

Compare your total with maximum inches of water column and select that size or the next size higher blower than your total, in your selected voltage.

The number of holes in the air channel (both floor and seat) should be approximately 1.6 sq. in. total plus or minus .5

1/8 in. hole = .0123 sq. in.

3/16 in. hole = .0276 sq. in.

5/32 in. hole = .0192 sq. in.

1/4 in. hole = .0491 sq. in.

ENGINEERING DATA, FRICTION FLOW

FRICTION/FLOW CHART FOR SCHEDULE 40 RIGID PVC PIPE *

| U.S. Gal. per min. | 3/4 in. pipe | | 1 in. pipe | | 1-1/4 in. pipe | | 1-1/2 in. pipe | | 2 in. pipe | | 2-1/2 in. pipe | | 3 in. pipe | | 4 in. pipe | | 5 in. pipe | | 6 in. pipe | | U.S. Gal. per min. | |
|--------------------|--------------------------|--------------|--------------------------|--------------|--------------------------|--------------|--------------------------|--------------|--------------------------|--------------|--------------------------|--------------|--------------------------|--------------|--------------------------|--------------|--------------------------|--------------|--------------------------|--------------|--------------------|------|
| | Velocity feet per second | Loss in feet | Velocity feet per second | Loss in feet | Velocity feet per second | Loss in feet | Velocity feet per second | Loss in feet | Velocity feet per second | Loss in feet | Velocity feet per second | Loss in feet | Velocity feet per second | Loss in feet | Velocity feet per second | Loss in feet | Velocity feet per second | Loss in feet | Velocity feet per second | Loss in feet | | |
| 1 | .71 | .40 | .40 | .10 | 0.26 | 0.03 | | | | | | | | | | | | | | | 1 | |
| 2 | 1.43 | 1.44 | .80 | .35 | .51 | .12 | .36 | .05 | | | | | | | | | | | | | | 2 |
| 3 | 2.14 | 3.05 | 1.20 | .75 | .77 | .25 | .53 | .10 | | | | | | | | | | | | | | 3 |
| 4 | 2.85 | 5.19 | 1.60 | 1.28 | 1.03 | .43 | .71 | .18 | | | | | | | | | | | | | | 4 |
| 5 | 3.56 | 7.85 | 2.00 | 1.94 | 1.28 | .65 | .89 | .27 | .50 | .07 | .32 | .02 | .22 | .01 | | | | | | | | 5 |
| 6 | 4.28 | 11.01 | 2.41 | 2.71 | 1.54 | .92 | 1.07 | .38 | .60 | .09 | .38 | .03 | .27 | .01 | | | | | | | | 6 |
| 8 | 5.70 | 18.75 | 3.21 | 4.62 | 2.05 | 1.56 | 1.43 | .64 | .80 | .16 | .51 | .05 | .36 | .02 | | | | | | | | 8 |
| 10 | 7.13 | 28.34 | 4.01 | 6.99 | 2.57 | 2.36 | 1.78 | .97 | 1.00 | .24 | .64 | .08 | .45 | .03 | | | | | | | | 10 |
| 15 | 10.69 | 60.06 | 6.01 | 14.81 | 3.85 | 5.00 | 2.67 | 2.06 | 1.50 | .51 | .96 | .17 | .67 | .07 | | | | | | | | 15 |
| 20 | | | 8.02 | 25.24 | 5.13 | 8.52 | 3.56 | 3.51 | 2.00 | .87 | 1.28 | .29 | .89 | .12 | .50 | .03 | | | | | | 20 |
| 25 | | | 10.02 | 38.16 | 6.41 | 12.88 | 4.45 | 5.31 | 2.51 | 1.31 | 1.60 | .44 | 1.11 | .18 | .63 | .04 | | | | | | 25 |
| 30 | | | 12.03 | 53.48 | 7.70 | 18.06 | 5.34 | 7.44 | 3.01 | 1.83 | 1.92 | .62 | 1.34 | .26 | .75 | .06 | .48 | .02 | | | | 30 |
| 35 | | | | | 8.98 | 24.03 | 6.24 | 9.89 | 3.51 | 2.44 | 2.24 | .82 | 1.56 | .34 | .88 | .08 | .56 | .03 | | | | 35 |
| 40 | | | | | 10.26 | 30.77 | 7.13 | 12.67 | 4.01 | 3.13 | 2.57 | 1.06 | 1.78 | .43 | 1.00 | .11 | .64 | .04 | | | | 40 |
| 45 | | | | | 11.54 | 38.27 | 8.02 | 15.76 | 4.51 | 3.89 | 2.89 | 1.31 | 2.00 | .54 | 1.13 | .13 | .72 | .05 | | | | 45 |
| 50 | | | | | 12.83 | 46.51 | 8.91 | 19.16 | 5.01 | 4.72 | 3.21 | 1.60 | 2.23 | .66 | 1.25 | .16 | .80 | .05 | .56 | .02 | | 50 |
| 60 | | | | | | | 10.69 | 26.85 | 6.01 | 6.62 | 3.85 | 2.24 | 2.67 | .92 | 1.50 | .23 | .96 | .08 | .67 | .03 | | 60 |
| 70 | | | | | | | | | 7.01 | 8.81 | 4.49 | 2.98 | 3.12 | 1.23 | 1.75 | .30 | 1.12 | .10 | .78 | .04 | | 70 |
| 80 | | | | | | | | | 8.02 | 11.28 | 5.13 | 3.81 | 3.56 | 1.57 | 2.00 | .39 | 1.28 | .13 | .89 | .05 | | 80 |
| 90 | | | | | | | | | 9.02 | 14.03 | 5.77 | 4.74 | 4.01 | 1.95 | 2.25 | .48 | 1.44 | .16 | 1.00 | .07 | | 90 |
| 100 | | | | | | | | | 10.02 | 17.06 | 6.41 | 5.76 | 4.45 | 2.37 | 2.51 | .59 | 1.60 | .20 | 1.11 | 0.08 | | 100 |
| 125 | | | | | | | | | | | 8.02 | 8.71 | 5.57 | 3.59 | 3.13 | .88 | 2.00 | .30 | 1.39 | .12 | | 125 |
| 150 | | | | | | | | | | | 9.62 | 12.20 | 6.68 | 5.03 | 3.76 | 1.24 | 2.41 | .42 | 1.67 | .17 | | 150 |
| 175 | | | | | | | | | | | | | 7.79 | 6.69 | 4.38 | 1.65 | 2.81 | .56 | 1.95 | .23 | | 175 |
| 200 | | | | | | | | | | | | | 8.91 | 8.56 | 5.01 | 2.11 | 3.21 | .71 | 2.23 | .29 | | 200 |
| 225 | | | | | | | | | | | | | 10.02 | 10.65 | 5.64 | 2.63 | 3.61 | .89 | 2.51 | .37 | | 225 |
| 250 | | | | | | | | | | | | | 11.13 | 12.95 | 6.26 | 3.19 | 4.01 | 1.08 | 2.78 | .44 | | 250 |
| 275 | | | | | | | | | | | | | | | 6.89 | 3.81 | 4.41 | 1.29 | 3.06 | .53 | | 275 |
| 300 | | | | | | | | | | | | | | | 7.52 | 4.48 | 4.81 | 1.51 | 3.34 | .62 | | 300 |
| 325 | | | | | | | | | | | | | | | 8.14 | 5.19 | 5.21 | 1.75 | 3.62 | .72 | | 325 |
| 350 | | | | | | | | | | | | | | | 8.77 | 5.95 | 5.61 | 2.01 | 3.90 | .83 | | 350 |
| 375 | | | | | | | | | | | | | | | 9.39 | 6.77 | 6.01 | 2.28 | 4.18 | .94 | | 375 |
| 400 | | | | | | | | | | | | | | | 10.02 | 7.63 | 6.41 | 2.57 | 4.45 | 1.06 | | 400 |
| 425 | | | | | | | | | | | | | | | | | 6.81 | 2.88 | 4.73 | 1.19 | | 425 |
| 450 | | | | | | | | | | | | | | | | | 7.22 | 3.20 | 5.01 | 1.32 | | 450 |
| 475 | | | | | | | | | | | | | | | | | 7.62 | 3.54 | 5.29 | 1.46 | | 475 |
| 500 | | | | | | | | | | | | | | | | | 8.02 | 3.89 | 5.57 | 1.60 | | 500 |
| 550 | | | | | | | | | | | | | | | | | 8.82 | 4.64 | 6.12 | 1.91 | | 550 |
| 600 | | | | | | | | | | | | | | | | | 9.62 | 5.46 | 6.68 | 2.25 | | 600 |
| 650 | | | | | | | | | | | | | | | | | | | 7.24 | 2.61 | | 650 |
| 700 | | | | | | | | | | | | | | | | | | | 7.79 | 2.99 | | 700 |
| 750 | | | | | | | | | | | | | | | | | | | 8.35 | 3.40 | | 750 |
| 1000 | | | | | | | | | | | | | | | | | | | 11.13 | 5.79 | | 1000 |

* Friction loss of water in feet per 100 feet length of pipe. Based on Williams & Hazen formula using constant 150.

* Recommended operating flow velocities indicated by boxed areas.

