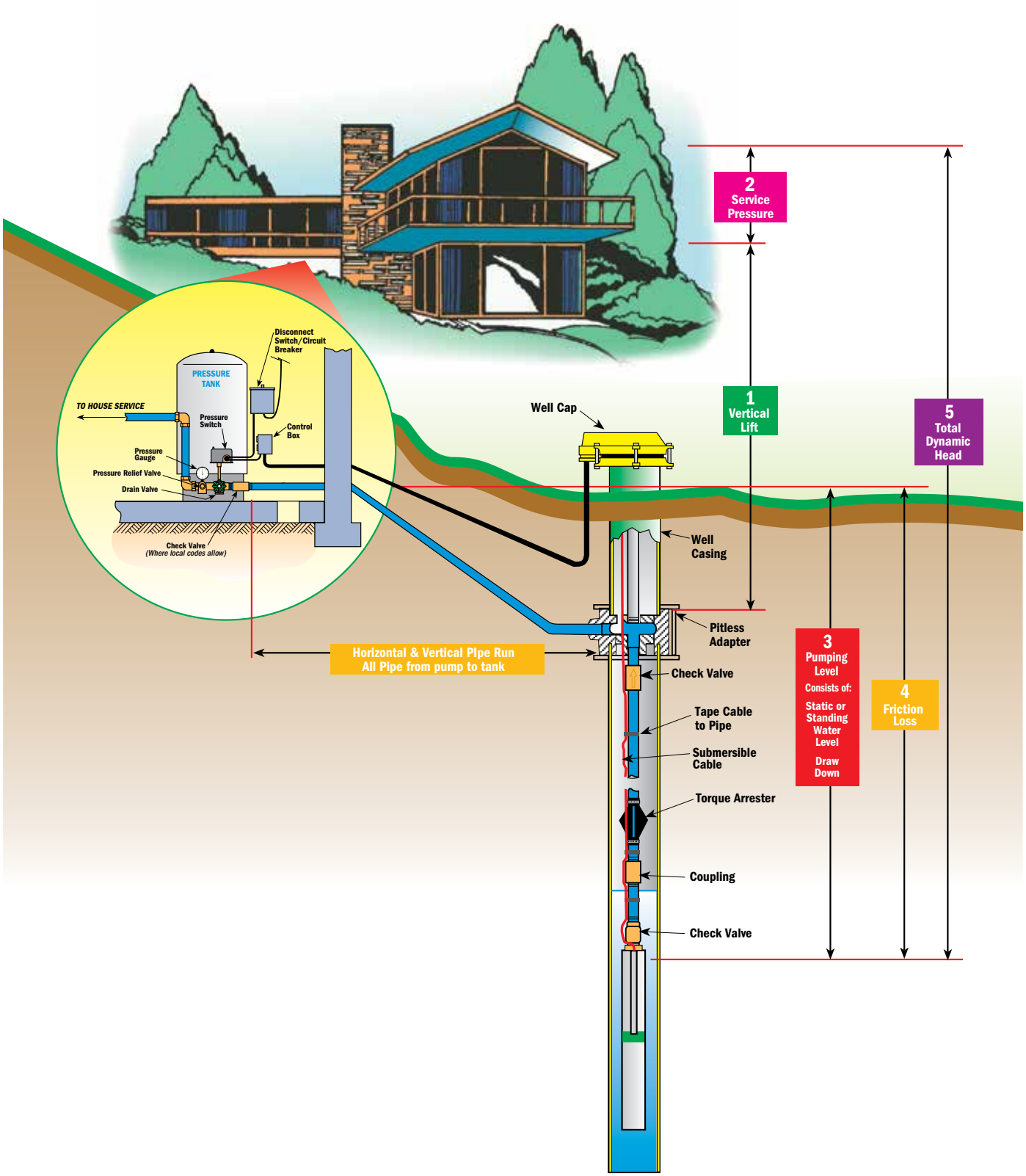
Typical Submersible Installation



Pump Sizing - Submersible Pumps

MORE ABOUT...

VERTICAL LIFT/ ELEVATION
The vertical distance between the well head and the level at the point of use. It must be added to the TOTAL DYNAMIC HEAD if the inlet is lower than the outlet and subtracted if the inlet is higher. As a rule of good installation practice, however, pipes should slope continuously upward from the inlet to the outlet to prevent entrapment of air.

SERVICE PRESSURE
The range of pressure in the pressure tank during the pumping cycle.

PUMPING LEVEL
The lowest water level reached during pumping operation. (Static level – drawdown)

STATIC OR STANDING WATER LEVEL
The undisturbed level of water in the well before pumping. Not as important as pumping level.

DRAWDOWN
The distance that the water level in the well is lowered by pumping. It is the difference between the STATIC WATER LEVEL and the PUMPING LEVEL.

FRICTION LOSS
The loss of pressure or head due to the resistance to flow in the pipe and fittings. Friction loss is influenced by pipe size and fluid velocity, and is usually expressed in feet of head.

HORIZONTAL RUN
The horizontal distance between the point where fluid enters a pipe and the point at which it leaves.

TOTAL DYNAMIC HEAD or TDH
TDH and capacity required determines pump size. The total pressure or head the pump must develop is the sum of the VERTICAL LIFT/ELEVATION, THE SERVICE PRESSURE, PUMPING LEVEL, and THE FRICTION LOSS. All of these measurements must be expressed in the same units, usually feet of head or pressure (PSI), before adding them together.

Determining Total Dynamic Head

Well Size
(inside diameter in inches)

_____

HEAD

1 Vertical Lift / Elevation
The vertical distance in feet from the pitless adapter to the top of the pressure tank

[ ]

+

2 Service Pressure
The average (pump shut-off) pressure switch setting x 2.31'.
Example for a 30/50 switch: 40 x 2.31' = 92.4 feet

[ ]

Convert PSI to feet (X 2.31)

+

3 Pumping Level
The vertical distance in feet from the pitless adapter or well seal to the water drawdown level in the well that yields the flow rate required by the pump

[ ]

+

4 Friction Loss
Water flowing through piping will lose head depending on the size, type and length of piping, number of fittings, and flow rate. Example: Pumping 20 GPM through 500 ft. of 1 1/4" plastic pipe with three elbows will cause a friction loss equal to:

[ ]

$$\frac{500 \text{ ft.} + 21 \text{ ft. (elbow loss)}}{100 \text{ ft.}} \quad \text{X } 6.00 \text{ ft (loss per 100')} = 31.26 \text{ ft.}$$

=

Feet of Pipe _____ **Diameter of Pipe** _____

Type of Pipe _____

See Friction Loss Charts on Page 16

5 Total Dynamic Head
After determining TDH, match this number with capacity required on pump curves of specific pumps in this catalog to select the correct pump.

[ ] **Ft.**

Gallons Per Minute (or Hour) Needed

[ ]

Determining Flow Rate

Although methods will vary, in general, the Water Systems Council bases pump flow selection for a residential system on total gallon usage during a seven minute peak demand period. This can be supplemented by using a properly sized pressure tank.

Farms, irrigation, and lawn sprinklers demand more water.

Friction Loss - Charts

LOSS OF HEAD IN FEET, DUE TO FRICTION PER 100 FEET OF PIPE

3/4" Pipe

FLOW US GAL MIN	STEEL C-100 ID .824"	PLASTIC C-140 ID .824"
1.5	1.13	.61
2.0	1.93	1.04
2.5	2.91	1.57
3.0	4.08	2.21
3.5	5.42	2.93
4.0	6.94	3.74
4.5	8.63	4.66
5.0	10.50	5.66
6.0	--	7.95
7.0	--	10.60

1" Pipe

FLOW US GAL MIN	STEEL C-100 ID 1.049"	PLASTIC C-140 ID 1.049"
2	.595	.322
3	1.26	.680
4	2.14	1.15
5	3.42	1.75
6	4.54	2.45
8	7.73	4.16
10	11.7	6.31
12	--	8.85
14	--	11.8

1 1/4" Pipe

FLOW US GAL MIN	STEEL C-100 ID 1.380"	PLASTIC C-140 ID 1.380"
4	.564	.304
5	.853	.460
6	1.20	.649
7	1.59	.860
8	2.04	1.10
10	3.08	1.67
12	4.31	2.33
14	5.73	3.10
16	7.34	3.96
18	9.13	4.93
20	11.10	6.00
25	--	9.06

1 1/2" Pipe

FLOW US GAL MIN	STEEL C-100 ID 1.61"	PLASTIC C-140 ID 1.61"
4	.267	.144
6	.565	.305
8	.962	.520
10	1.45	.785
12	2.04	1.10
14	2.71	1.46
16	3.47	1.87
18	4.31	2.33
20	5.24	2.83
25	7.90	4.26
30	11.1	6.0
35	--	7.94
40	--	10.20

2" Pipe

FLOW US GAL MIN	STEEL C-100 ID 2.067"	PLASTIC C-140 ID 2.067"
10	.431	.233
15	.916	.495
20	1.55	.839
25	2.35	1.27
30	3.29	1.78
35	4.37	2.36
40	5.60	3.03
45	6.96	3.76
50	8.46	4.57
55	10.10	5.46
60	11.90	6.44
70	--	8.53
80	--	10.90

2 1/2" Pipe

FLOW US GAL MIN	STEEL C-100 ID 2.469"	PLASTIC C-140 ID 2.469"
20	.654	.353
30	1.39	.750
40	2.36	1.27
50	3.56	1.92
60	4.99	2.69
70	6.64	3.58
80	8.50	4.59
90	10.60	5.72
100	--	6.90
110	--	8.25
120	--	9.71
130	--	11.30

3" Pipe

FLOW US GAL MIN	STEEL C-100 ID 3.0"	PLASTIC C-140 ID 3.068"
20	.149	.129
30	.316	.267
40	.541	.449
50	.825	.676
60	1.17	.912
70	1.57	1.22
80	2.03	1.56
90	2.55	1.95
100	3.12	2.37
110	3.75	2.84
120	4.45	3.35
130	5.19	3.90
140	6.00	4.50

4" Pipe

FLOW US GAL MIN	STEEL C-100 ID 4.0"	PLASTIC C-140 ID 4.026"
20	.038	.035
30	.076	.072
40	.128	.120
50	.194	.179
60	.273	.250
70	.365	.330
80	.470	.422
90	.588	.523
100	.719	.613
110	.862	.732
120	1.02	.861
130	1.19	1.00
140	1.37	1.15

Example:
10 GPM with 1' plastic pipe has 6.31' of loss per 100 ft. - if your run is 50 ft., multiply by .5, if 250 ft. multiply by 2.5, etc.

Loss through fittings in terms of equivalent lengths of pipe

TYPE FITTING & APPLICATION	PIPE & FTG. MATERIAL. (Note 1)	EQUIVALENT LENGTH OF PIPE NOMINAL SIZE FITTING & PIPE						
		1/2	3/4	1	1¼	1½	2	2½
Insert coupling	Plastic	3	3	3	3	3	3	3
Threaded adapter Plastic or copper to thread	Copper	1	1	1	1	1	1	1
	Plastic	3	3	3	3	3	3	3
90° standard elbow	Steel	2	3	3	4	4	5	6
	Copper	2	3	3	4	4	5	6
	Plastic	4	5	6	7	8	9	10
Standard tee Flow through side	Steel	4	5	6	8	9	11	14
	Copper	4	5	6	8	9	11	14
	Plastic	7	8	9	12	13	17	20
Gate valve	Note 2	2	3	4	5	6	7	8
Swing check valve	Note 2	4	5	7	9	11	13	16

Note 1: Loss figures are based on equivalent lengths of indicated pipe material
Note 2: Loss figures are for screwed valves and are based on equivalent lengths of steel pipe
Note 3: Loss figures for copper lines are approximately 10% higher than shown for plastic