Pump Guidance Document

1. Determine the Daily Design Flow. Multiply the number of bedrooms times 150 gallons per day. *(# Bedrooms x 150 GPD)* Next you will need to determine the drainback from the force main. Multiply the volume (as indicated in the chart below) times the linear feet of pipe.

Drainback Calculation						
Diameter (*Inches)*	1"	1 ¼"	1 ½"	2"	3"	4"
Volume *(Gal./ft.)*	.045	.078	.106	.174	.384	.650

Ex. 197 ft. x .174 gal./ft. = 34.3 gal. add to DDF (3 bed = 450 GPD) = 484.3 gal.

Daily Design Flow *(in one dose)* = _____ (GPD + Drainback).

2. Determine the Required Pump Discharge Rate. The desired rate is determined from Table VII *(pg.30)* ISDH Rule 410 6-8.1.

Required Pump Discharge Rates for Flood Dosed Systems	
Number of Bedrooms	Discharge Rate (GPM)
1	30
2	30
3	30-45
4	30-60
5	38-75
6	45-90

3. Determine the Total Head. Add the static head to the friction loss to determine the total head. The static head is the elevation difference between the **pump off** and the high point of the line, which is normally the outlet in the distribution box.

Next you will need to determine the friction loss. Add the additional footage from the Fitting Friction Chart below to your total pipe length.

Fitting Friction Chart						
Nominal Pipe Size	90° Elbow	45° Elbow	Tee (Thru-flow)	Tee (Branch flow)	Swing Check Valve	Gate Valve
1 ½"	4.0 ft	2.1 ft	2.7 ft	8.0 ft	------	1.0 ft
2"	5.2 ft	2.8 ft	3.5 ft	10.3 ft	17.2 ft	1.4 ft
2 ½"	6.2 ft	3.3 ft	4.1 ft	12.3 ft	20.6 ft	1.7 ft
3"	7.7 ft	4.1 ft	5.1 ft	15.3 ft	25.5 ft	2.0 ft
4"	12.0 ft	5.1 ft	8.3 ft	22.0 ft	-----	-----

Once you have determined the total linear footage of pressurized pipe *(including the additional footage due to fittings)*, use **Table VIII** from the rule to determine total friction loss.

Table VIII – Friction Losses in Plastic Pipe **Based on Sch 40 pipe. SDR 26 and 21 values will vary slightly*						
Friction loss in feet / 100 feet						
Flow (gpm)	Pipe size 1 1/4"	1 ½"	2"	2 ½"	3"	4"
30	11.85	5.53	1.82	0.66	0.23	0.06
35	15.76	7.36	2.42	0.86	0.35	0.08
40	19.01	8.98	3.10	1.12	0.43	0.11
45	------	11.17	3.85	1.39	0.54	0.13
50	------	13.58	4.86	1.70	0.65	0.16

Ex.100 ft. of 2" pipe w/ 2 - 90° elbows. (100ft.+10.4ft = 110.4ft) (110.4ft x 1.82 (30gpm)= 200.9 / 100 = 2ft)

To summarize:

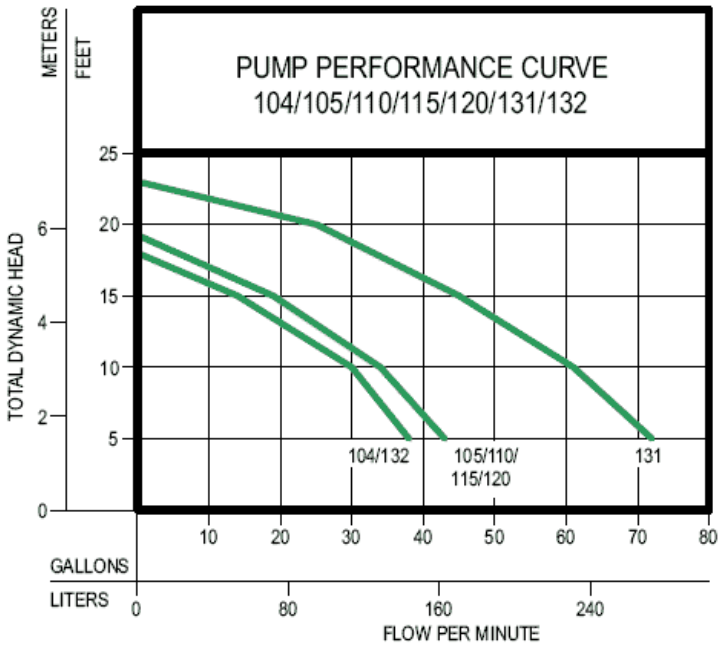
Total Head = Static Head + Friction Loss

4. Pump Selection

Now that we know the desired pump discharge rate and the total head we can choose an appropriate pump. To determine if the selected pump is suitable, you will need a copy of the pump performance curve. Follow the head value you have selected from the y-axis horizontally to where it intersects with the pump curve line. From that point, move vertically to the flow measurement on the x-axis.

Based on the pump curve to the right, which pump would be best suited for a 3 bedroom home with a total head of 15 feet?

Answer: Pump 131 would be the only pump which would meet the required discharge rates of Table VII (30 – 45 gpm). The other pumps would discharge too slowly.



The following page is an example Flood Dosed Work Sheet. →

FLOOD DOSED WORK SHEET

Project: _____ Date: _____

Installer: _____ Cert. # _____

**Refer to 410 IAC 6-8.1-53, Sec r*

Daily Design Flow *in one dose* + Drainback =_____ gallons/day.

Pump Discharge Rate (Table VII) = _____ gallons/minute.

Total Head

Elevation difference between pump off and the high point in the line. *(Static Head)* _____ **feet**

Fitting Friction Loss Feet of pipe equivalent **+**
_____ feet + actual feet of pipe =

_____Total feet of pipe

Friction loss in_____ total feet of ____ inch pipe.
(Table VIII) _____ **feet**

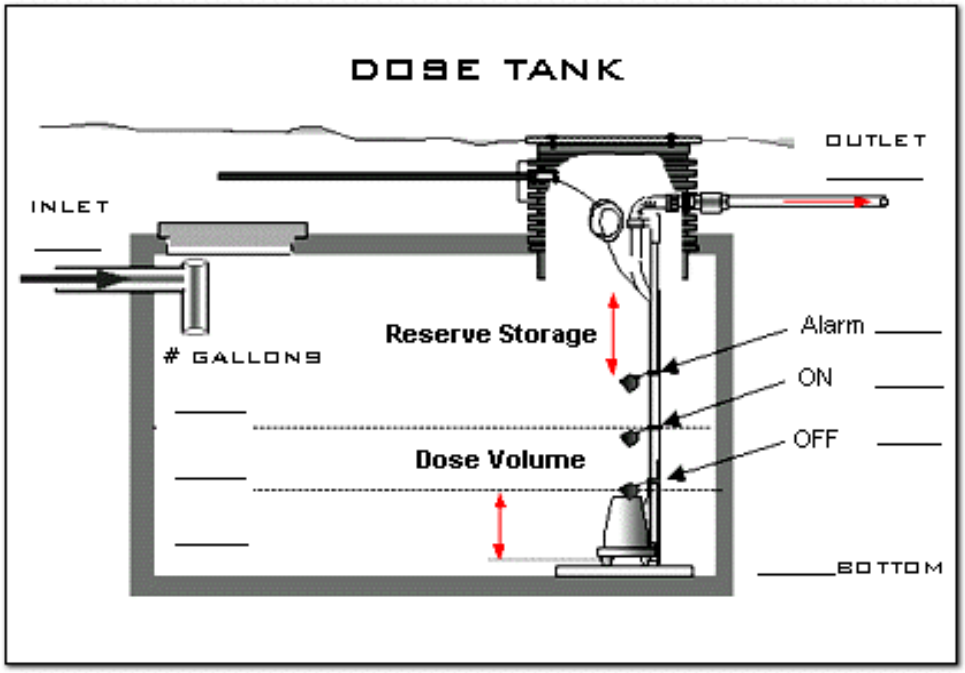
= **Total Head** _____ **feet**

Pump selected: _____

Provide a copy of the **pump curve** to the _____ County Health Department

5. Pump Settings and Dose Tank Sizing.

Finally, you will need to determine the correct float settings and the capacity needed for the dose tank.



Pump Settings

1. **Off Float**
   A. 13" above the bottom of tank *(keeps pump submerged)*
2. **On Float**
   A. Subtract the difference between on and off positions.
   B. Convert to inches. *(1ft = 12in & 1in = .083 ft)*
   C. Multiply separation by the Gal./IN. for that tank. *(Gallons per inch vary by manufacturers)*

Ex:	a. 831.1 (on) - 828.7 (off) =	**2.4 ft difference**
	b. 2.4 ft (12in/1ft) =	**28.8 inches**
	c. 28.8 in X 19.5 gal/in =	**561.6 gal**

   D. The answer of 561.6 gal should equal the **Daily Design Flow** *(step 1)*
   E. If they do not subtract the difference in answers
   634 - 561.6 = 73 gal
   73/19.5 = 3.7 inches of difference in where the on float should be
   (if the number is negative it needs lowered, if positive it needs raised)

3. **Alarm float**
   A. Set 3 - 6 inches above the pump on float
4. **Tether Length** (use when there are two floats instead of three)
   A. Tether length = Square root of $x^2/2$ (x = the difference between on & off position)
   Ex: Square root of $(28^2/2)$ = 784/2 = square root of 392, which is 19.8 inches.