PRESSURE DISTRIBUTION COMPONENT MANUAL FOR PRIVATE ONSITE WASTEWATER TREATMENT SYSTEMS (VERSION 2.0)

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I. INTRODUCTION AND SPECIFICATIONS

This Private Onsite Wastewater Treatment System (POWTS) component manual provides design, construction, inspection, operation, and maintenance specifications for a pressure distribution component. However, these items must accompany a properly prepared and reviewed plan acceptable to the governing unit to help provide a system that can be installed and function properly. Violations of this manual constitute a violation of chs. Comm 83 and 84, Wis. Adm. Code. The design provides equal distribution of effluent from a dose tank into a distribution cell of a soil treatment or dispersal component. To ensure that equal distribution is achieved, specifications in Tables 1, 2, and 3 must be met.

Note: Detailed plans and specifications must be developed and submitted for review and approval by the governing unit having authority over the plan for the installation. Also, a Sanitary Permit must be obtained from the department or governmental unit having jurisdiction. See Section XI for more details.

Table 1
FLOWS AND LOADS

Design Wastewater Flow (DWF)	≤ 5000 gal/day
Number of effluent doses	Must conform to the requirements of the receiving component design.
Wastewater particle size	≤ 1/8-inch diameter
Volume of a single dose to a distribution cell	≥ 5 times the void volume of the distribution lateral(s) and ≤ 20% of the Design Wastewater Flow
Head pressure at distal end of lateral(s)	≥ 2.5 ft. for 1/4- and 3/16-inch orifices, ≥ 3.5 ft. for 5/32-inch orifices, and ≥ 5 ft. for 1/8 inch orifices
Network pressure compensation for fittings	= Distal head pressure + 30 percent
Flow velocity in force main and manifold	≥ 2 ft/sec and ≤. 10 ft/sec

Table 2
SIZE AND ORIENTATION

Measurement	Minimum (inches)	Maximum (inches)
Force Main diameter	0.75	6.00
Manifold diameter	1.25	3.00
Lateral diameter	0.75	3.00
Orifice diameter	0.125	0.250
Lateral Spacing distance	12.00	48.00
Lateral to Edge of Cell distance	half of lateral spacing	half of lateral spacing
Last Discharge Orifice to Cell End distance	6.00	24.00

Table 2 **SIZE AND ORIENTATION** (continued)	
Elevation of laterals	Level or ≤ 1-inch slope back to manifold
Location of orifices for laterals in stone aggregate	Bottom of lateral if orifice shields are not provided or top of lateral if orifice shields are provided
Location of orifices for laterals not in stone aggregate	Bottom or top of lateral, if orifice shields are provided or other means are provided to prevent soil erosion of the infiltrative surface

Table 3 **OTHER SPECIFICATIONS**	
Spacing between pipe supports for horizontal pipe	Meets requirements of s. Comm 82.60, Wis. Adm. Code
Material specifications	Meet requirements of s. Comm 84.30, Wis. Adm. Code
Joint specifications	Meets requirements of s. Comm 84.40, Wis. Adm. Code
Connection to manifold or laterals	By use of tee patterned fitting or 90° elbow
Turn ups	Provide a means of flushing out all laterals in accordance with Section V of this manual. Turn-ups are installed in a protective enclosure
Pump	Rated by pump manufacturer as an effluent or sewage pump
Siphon	Rated by siphon manufacturer as an effluent or sewage siphon
Septic tank effluent pump system	Meets requirements of s. Comm 84.10, Wis. Adm. Code and this component manual
Dose tank or compartment volume employing one pump	≥ Volume of a single dose + reserve capacity[a] + drain back volume[b] + (6 inches x average gal/inch of tank)[c] Notes: a: Reserve capacity ≥ the estimated daily flow. b: Drain back volume ≥ Volume of wastewater that will drain into the dose tank from the distribution cell. c: Four inches of this dimension ≥ vertical distance from pump intake to bottom of tank. Two inches of this dimension ≥ vertical distance between pump on elevation and high-water alarm activation elevation.
Dose tank or compartment volume employing duplex pumps	≥ Volume of a single dose + drain back volume[a] + (6 inches x average gal/inch of tank)[b] Notes: a: Drain back volume ≥ Volume of wastewater that will drain into the dose tank from the force main. b: Four inches of this dimension ≥ vertical distance from pump intake to bottom of tank. Two inches of this dimension ≥ vertical distance between pump on elevation and high-water alarm activation elevation.

Table 3 **OTHER SPECIFICATIONS** (continued)	
Siphon tank or compartment volume	≥ What is required to accommodate volumes necessary to provide dosing as specified in this manual
Pump controls	Meet requirements of chs. Comm 83 and 84, Wis. Adm., Code
Electrical equipment and wiring	Meet requirements of ch. Comm 16 and 83, Wis. Adm. Code
Access to pump	Means of removing pump while maintaining compliance with confined space entry requirements must be provided
Alarm or warning system	Meets requirements of ch. Comm 83, Wis. Adm. Code
Duplex pumps	Meet requirements of ch. Comm 83, Wis. Adm. Code
Installation inspection	In accordance with ch. Comm 83, Wis. Adm. Code
Management	Meets requirements of ch. Comm 83, Wis. Adm. Code and this manual

II. DEFINITIONS

Definitions unique to this manual are included in this section. Other definitions that may apply to this manual are located in ch. Comm 81 of the Wis. Adm. Code or the terms use the standard dictionary definition.

A. “Distribution line” means the total length of two laterals that are connected to a manifold at a common point.

B. “Distribution network” means the piping of the pressurized system that include manifold(s) and lateral(s).

C. “Drain back” means the amount of treated effluent that will drain from the forcemain to the dose tank after a single dosing event.

D. “Force main” means the piping from the pump or siphon to the manifold or to the lateral tee or coupling connecting laterals to the force main.

E. “Lateral” means the length of perforated pipe starting at the point of effluent entry to the distal end orifice.

F. “Manifold” means the piping between the force main and the laterals.

G. “Network pressure compensation” means the pressure loss due to fittings in the pressure distribution network.

H. “Orifice shield” means a device that dissipates the energy of the orifice discharge and/or that protects the orifice from blockage due to aggregate.

I. “Septic tank effluent pump system” means a septic tank which has a pump installed in the tank that will pump effluent from the clear zone.

J. “Turn ups” means a means of providing a full size opening in the downstream end of laterals to allow for flushing of the system.

III. DESCRIPTION AND PRINCIPLE OF OPERATION

Pressure distribution is a method to provide a specific volume of effluent to a specific area with each dosing cycle. The design of a pressure distribution component on one elevation is such that the volume of water passing out each hole in the network is approximately equal. This is achieved by designing for 75 to 85 percent of the total head loss in the network to be lost when liquid passes through the distribution hole and only 10 to 15 percent of the total head loss to occur in the delivery piping.

The component consists of a dosing chamber (containing a pump or siphon with appropriate controls) that discharges effluent into a network of small diameter perforated pipes designed to discharge equal amounts of effluent from each orifice.

In a pressure distribution component using a pump, partially or fully treated wastewater enters a dose chamber through the inlet. As liquid begins to fill the dose chamber, it raises the “off” float. When the liquid level in the tank is lifted to the “pump on” level, the “on” float activates the pump and the predetermined dose is pumped from the pump chamber through the force main to the distribution network. The “on” and “off” float may be one float.

In a pressure distribution component using a siphon, partially or fully treated wastewater enters a dose chamber through the inlet. When the liquid level reaches a pre-determined depth in the dose chamber, the siphon discharges the liquid through a forcemain to the distribution network. Although the siphon functions without any moving parts, it does require monitoring. Studies have shown that the siphon may begin to “trickle” when the bell loses it’s air charge due to an air leak around the snifter tube, if this problem is not corrected, the holes and laterals may foul or it reverts to gravity discharge.

The laterals are designed to fill quickly to provide equalization throughout the system. Air is pushed ahead of the liquid through the force main, manifold (if a manifold is required), laterals, and discharged through the drilled holes, entering the distribution cell.

A properly designed and installed pressure distribution component uniformly distributes effluent over the entire distribution cell. This strives to prevent the soil from becoming overloaded in one area. It also allows for a period of time between doses to drain the infiltrative surface to maintain unsaturated flow conditions in the soil.

The primary application of a pressure distribution component is in locations where it is desirable to:

1. Maintain a uniform effluent application rate throughout the distribution cell;
2. Aid in mitigating the potential contamination of groundwater in areas of excessively permeable soils;
3. Improve the performance and increase the life span of a dispersal cell; and
4. Reduce the chance of breakout or seepage on slopes.

Pressure distribution components are used in at-grades, in-ground soil absorption, mounds, single pass sand filters and other components. Also, pressure distribution may be appropriate for larger dispersal cell components.

This manual specifies the design, construction, inspection, operation, and maintenance criteria for one method of providing equal distribution of wastewater in a soil treatment and/or dispersal component. The designer must also be familiar with the requirements of the component for which the pressure distribution component will be used in order to have a complete system design that will meet the Wisconsin Administrative Code.

IV. DESIGN

The following steps need to be followed to design a pressure distribution component:

1. Determine soil treatment and/or dispersal component layout - This is based on the type of component and the design soil application rate.

2. Determine lateral length and spacing in accordance with the soil treatment/dispersal component design or Table 2, if not specified in the soil treatment/dispersal component design. See Figure 1.

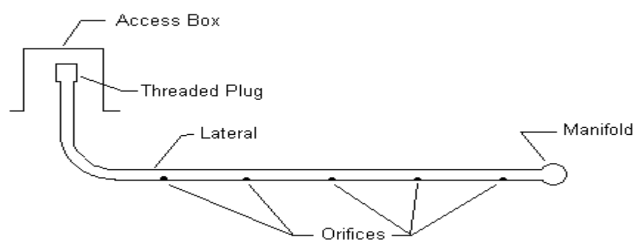


Figure 1 – Lateral Length

3. Determine manifold length and location.

4. Determine number of orifices in a lateral. How many orifices should be drilled in a lateral depends on the type of system, area allowed per orifice, and the design loading rate of the distribution cell. The number of orifices is determined by using the following equation. See figure 2.

$$n = L/x + .5$$

Where: n = number of orifices
L = lateral length
x = orifice spacing

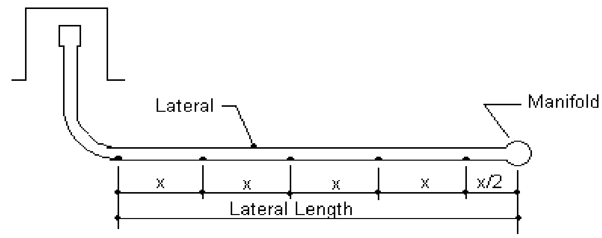


Figure 2 – Number of Orifices in a Lateral

5. Determine the number of orifices in a distribution lateral. The number of orifices is determined by using the following equation. See figure 3.

$$n = d/x + 1$$

Where: n = number of orifices
d = distribution lateral length
x = orifice spacing

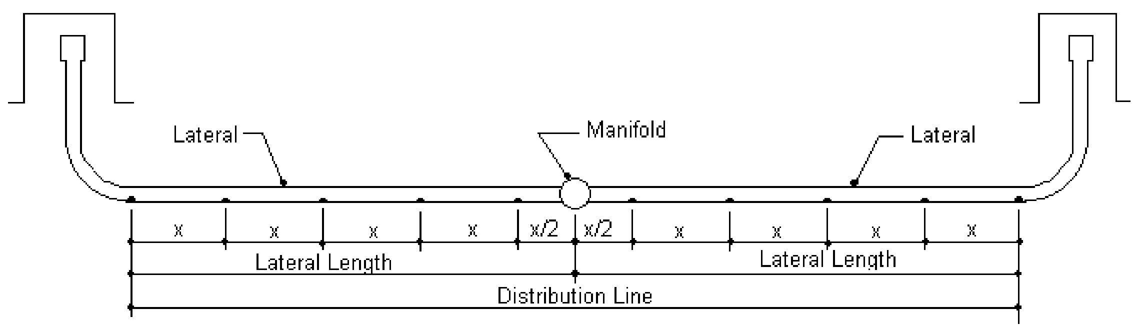


Figure 3 – Number of Orifices in a Distribution Line

6. Select orifice size of 1/8, 5/32, 3/16, or 1/4 inch.

7. Determine lateral diameter - Using Graphs 1 through 8.

8. Select distal pressure - A design option based on site specific elevations and effluent delivery preferences and requirements of Tables 1 through 3.

9. Calculate lateral discharge rate using Table 4. (orifice discharge rate at selected distal pressure multiplied by the number of holes per lateral).

10. Determine manifold diameter - Determined by using Table 5.

11. Calculate component discharge rate - By multiplying the lateral discharge rate by the number of laterals.

12. Select a pipe size for the force main by using the calculated discharge rate and Table 6.

13. Determine the void volume of the distribution laterals by multiplying the summation of the laterals by the volume given in Table 7 for the diameter of the laterals.

    If a pump is selected, follow step #14.

    If a siphon is selected proceed to step # 16

14. Determine volume of dose chamber for components pressurized by a pump. (Volume of a septic tank effluent pump system is determined by department plumbing product approval.)

    The dose chamber employing one pump shall contain sufficient volume to dose the distribution cell as required by its system design, retain drain back volume, contain a one day reserve zone, provide minimum 2 inch separation between alarm activation and pump-on activation, and allow for protection of the pump from solids.

    A reserve capacity is required on a system with only one pump. Other reserve capacities may also be required by the manual for the component type the dose chamber serves.

    The reserve volume is at least equal to the estimated daily flow from for the building. Reserve capacity may be calculated based using 100 gallons per bedroom per day for one and two family residences. Reserve capacity must also meet requirements in the manual for a component type, which contains the pressure distribution component.

    The dose volume shall be included in the sizing of the dose chamber.

    The pump alarm activation point must be at least 2 inches above the pump activation point.

    Allow "dead" space below the pump intake to permit settling of solids in the pump tank. This can be accomplished by placing the pump on concrete blocks or other material that can form a pedestal.

    The pump manufacturer requirements shall be followed. This may include the "pump off" switch located high enough to allow for complete immersion of the pump in the tank.

15. Select a pump that will provide an average flow equal to or greater than the total discharge rate of the orifices at a pressure equal to or greater than the sum of the distal pressure, network pressure compensation, and pressure loss due to friction in the force main. The system head will be insufficient if the perforation discharge rate is greater than the pump discharge rate.

16. Select a siphon that will provide an average flow equal to or greater than the total discharge rate of the orifices at a pressure equal to or greater than the operational pressure plus the friction loss of the force main. The system head for components using automatic siphons must be developed in the force main. The difference in the elevation from the bottom of the siphon bell to the lateral must be greater than or equal to the force main friction loss plus the system head required.

If the perforation discharge rate is greater than the siphon discharge rate, the system head will be insufficient.

17. Determine volume of dose chamber for components pressurized by a siphon.

    The dose chamber shall contain sufficient volume to allow the siphon to dose the component as required by the soil treatment and/or dispersal component design and allow for protection of the siphon from solids.

V. SITE PREPARATION AND CONSTRUCTION

Procedures used in the construction of a pressure distribution component are just as critical as the design of the treatment and/or dispersal component. A good design with poor construction results in failure. Construction procedures for a pressure distribution component are as follows:

1. Review design and installation requirements for the type of treatment and/or dispersal component for which the pressurized system is to be installed.

2. Drill holes for the orifices at the locations required by the design. Remember it is very important to use a sharp drill bit and to remove all burrs from the pipe and orifices in order for the system to work as designed.

3. Assemble the distribution network as determined by the pressure distribution component design, making sure to solvent cement all joints in the system.

4. Extend the end of each lateral up with the use of long turn or 45° fitting to a point within six inches of the final grade. Terminate the ends of the laterals with a valve, threaded cap or threaded plug. Provide access from final grade for the valve, threaded cap or threaded plug.

5. Install the pump or siphon as required by ch. Comm 83 of the Wis. Adm. Code.

VI. OPERATION, MAINTENANCE AND PERFORMANCE MONITORING

A. The component owner is responsible for the operation and maintenance of the component. The county, department or POWTS service contractor may make periodic inspections of the components, checking for sludge accumulation in the dose chamber, condition of electrical components, alarms, dose rate, dose volume and frequency, etc.

   The owner or owner's agent is required to submit maintenance records routinely to the county or other appropriate jurisdiction and/or the department.

B. Design approval and site inspections before, during, and after the construction is accomplished by the county or other appropriate jurisdictions in accordance with ch. Comm 83 of the Wis. Adm. Code.

C. Other routine and preventative maintenance aspects are:

1. Dose chambers are to be inspected routinely and maintained when necessary in accordance with their approvals.
2. Inspection of the component performance is required at least every three years. Inspection includes checking the dose rate, volume and frequency.
3. Partial plugging of the distribution network may be detected by extremely long dosing times. The ends of the distribution laterals should be exposed and the pump activated to flush out any solid material. The liquid that is flushed out of the laterals is to be directed back into the distribution cell. The liquid may also be directed into an acceptable container and disposed of properly. If necessary, the laterals can be cleaned.

D. User's Manual: A user's manual is to accompany the pressure distribution component. The manual is to contain the following as a minimum:

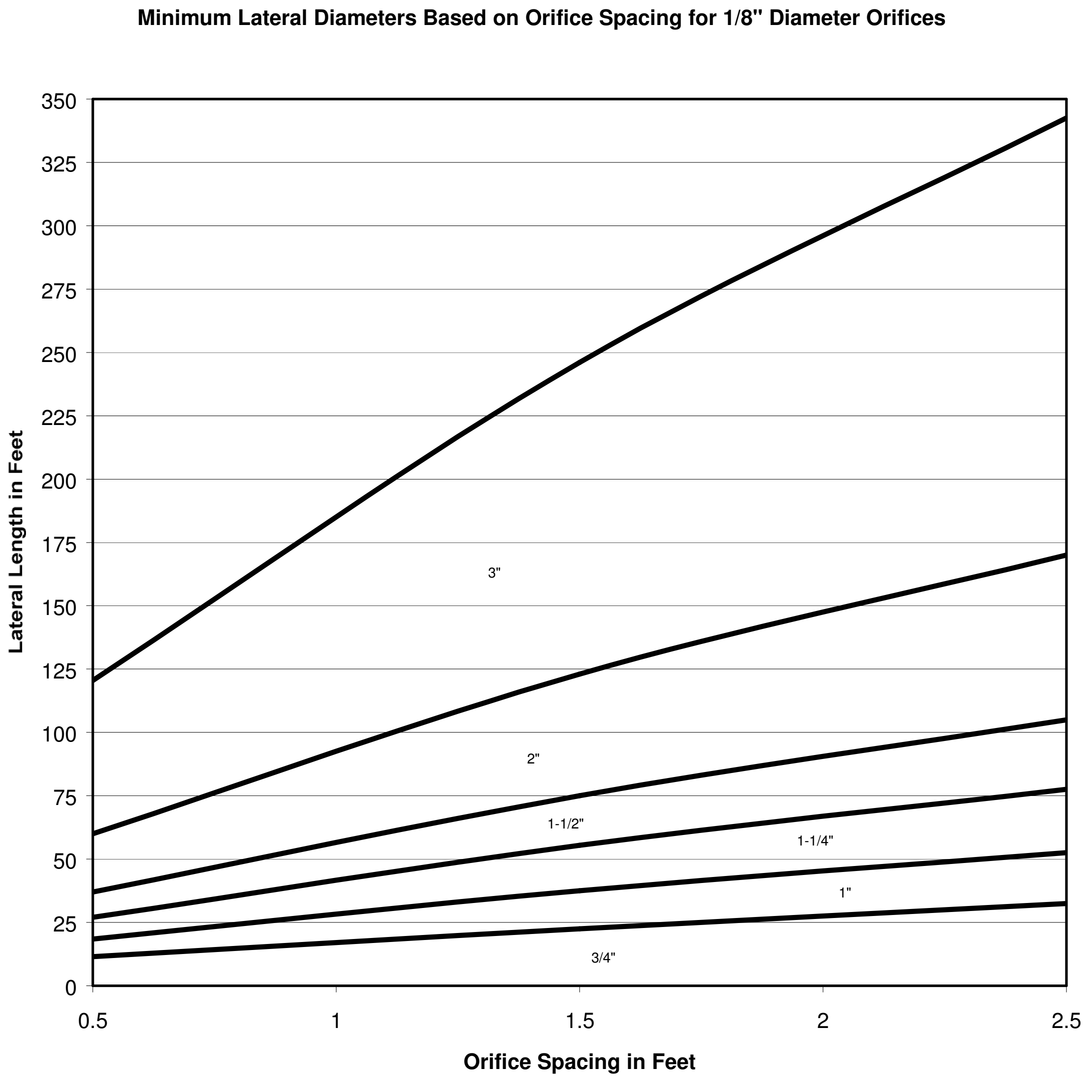
1. Diagrams of all components and their location. This should include the location of the access ports for cleaning and/or flushing the component.
2. Specifications for all electrical and mechanical components.
3. Names and phone numbers of local health authority, component manufacturer or management entity to be contacted in the event of a failure.
4. Information on the periodic maintenance of the component, including electrical/mechanical components.

E. Performance monitoring must be performed on pressure distribution systems installed under this manual.

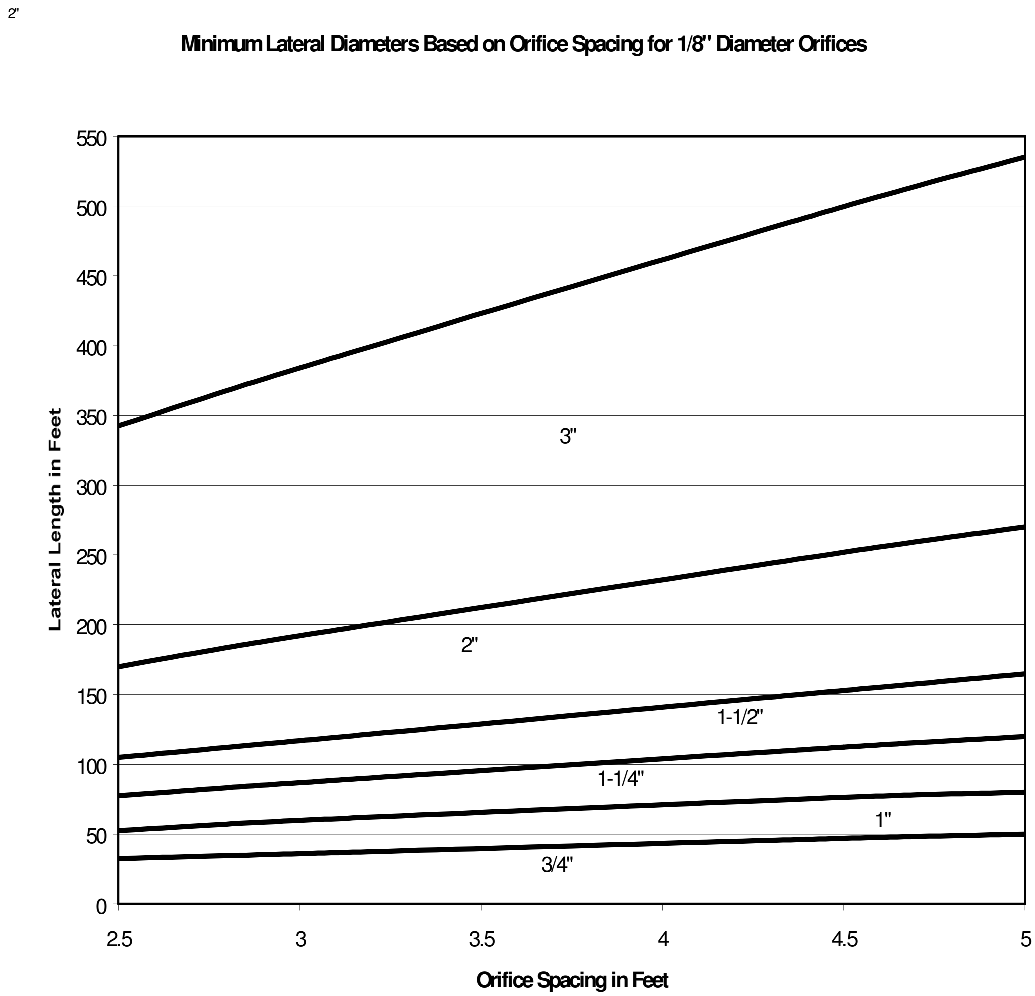
1. The frequency of monitoring must be:
   a. At least once every three years following installation and,
   b. At time of problem, complaint, or failure.
2. Reports are to be submitted in accordance with ch. Comm 83, Wis. Adm. Code.

VII. GRAPHS

Graph 1



Graph 2

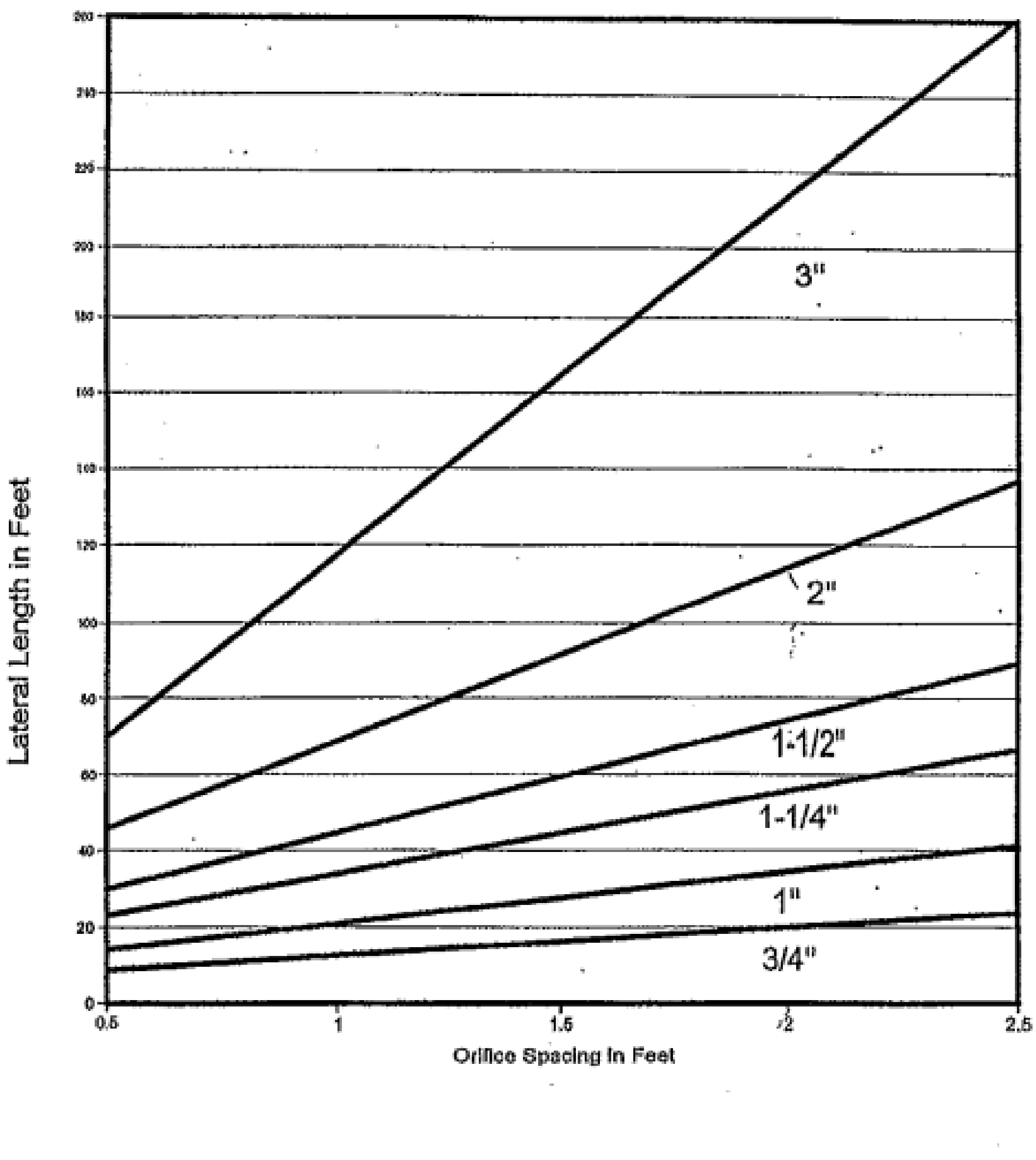

2"
Minimum Lateral Diameters Based on Orifice Spacing for 1/8" Diameter Orifices
Lateral Length in Feet
Orifice Spacing in Feet
0
50
100
150
200
250
300
350
400
450
500
550
2.5
3
3.5
4
4.5
5
3"
2"
1-1/2"
1-1/4"
1"
3/4"

Errata sheet dated April 5, 2001

Correction to *Minimum Lateral Diameters on Graph 3*

Graph 3

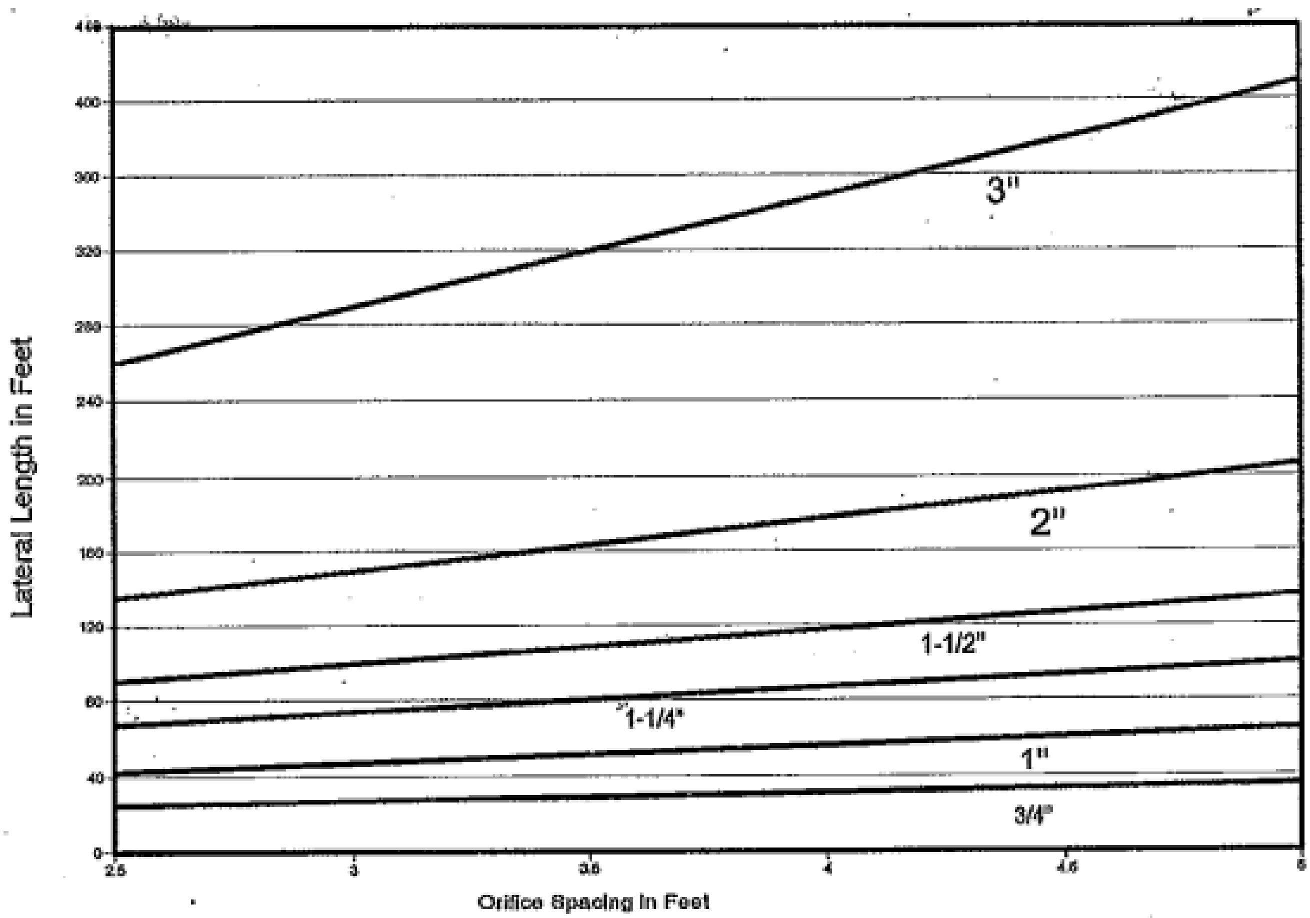
Minimum Lateral Diameter Based on Orifice Spacing for 5/32" Diameter Orifices



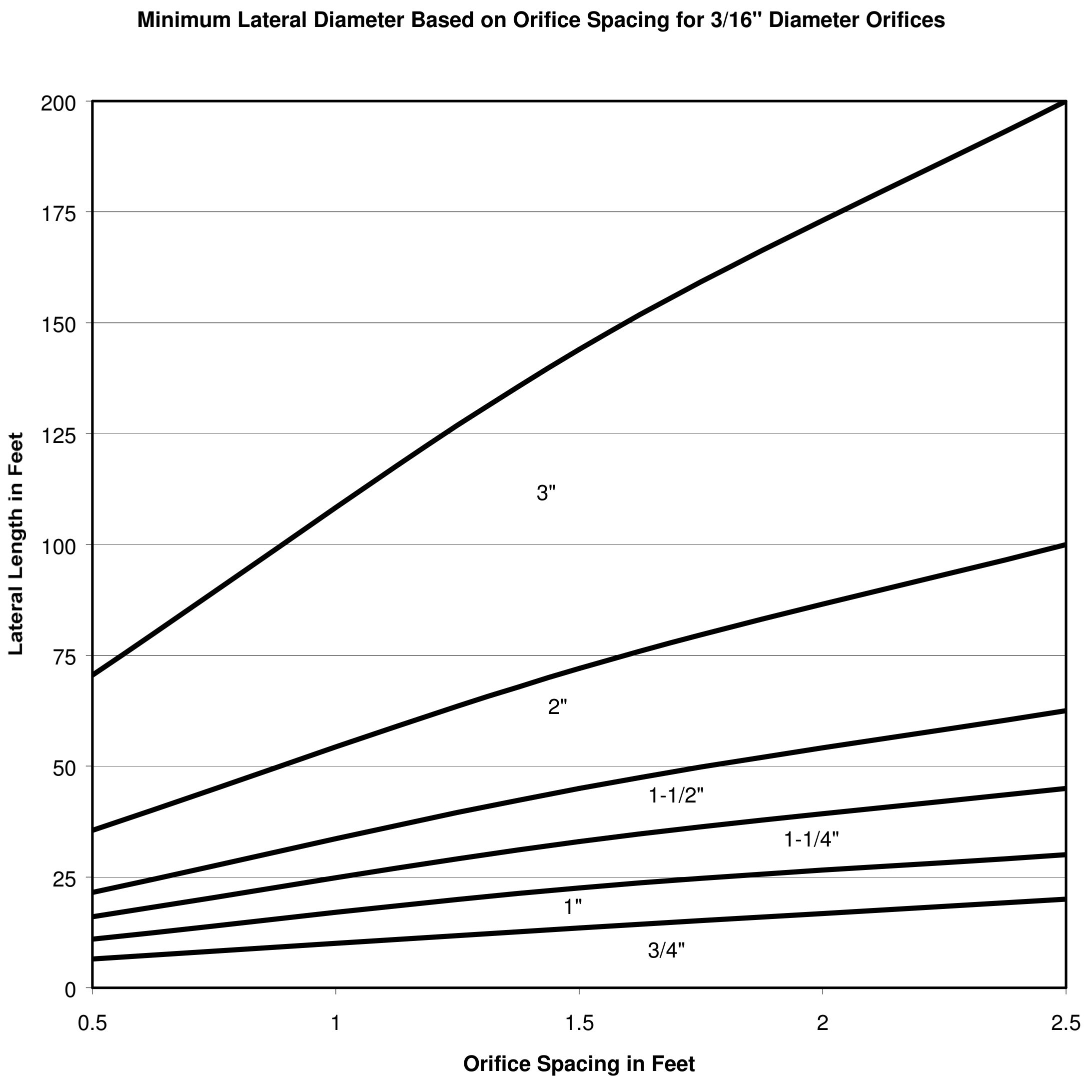
Errata sheet dated April 5, 2001
Correction to *Minimum Lateral Diameters on Graph 4*

Graph 4

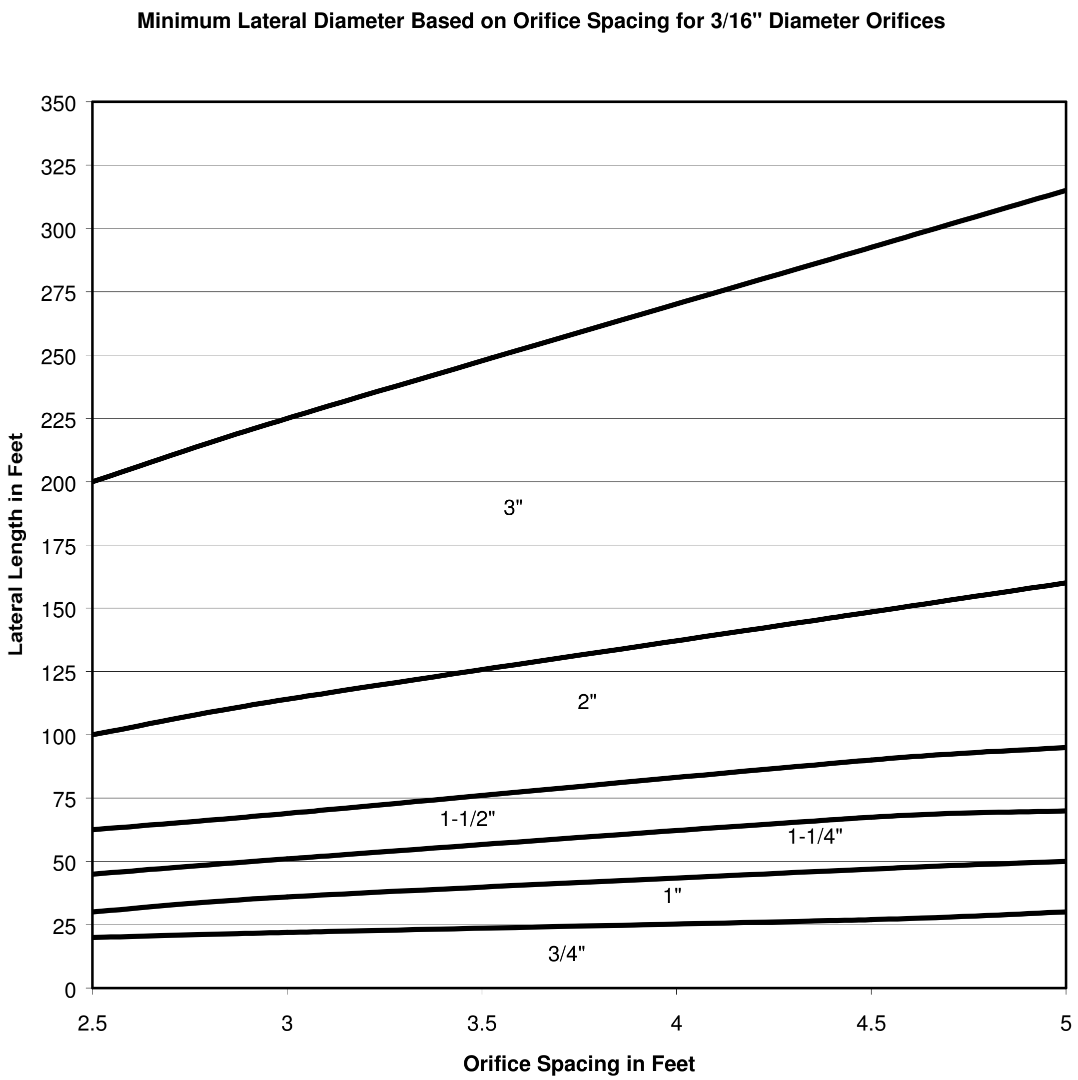
Minimum Lateral Diameter Based on Orifice Spacing for 5/32" Diameter Orifices



Graph 5

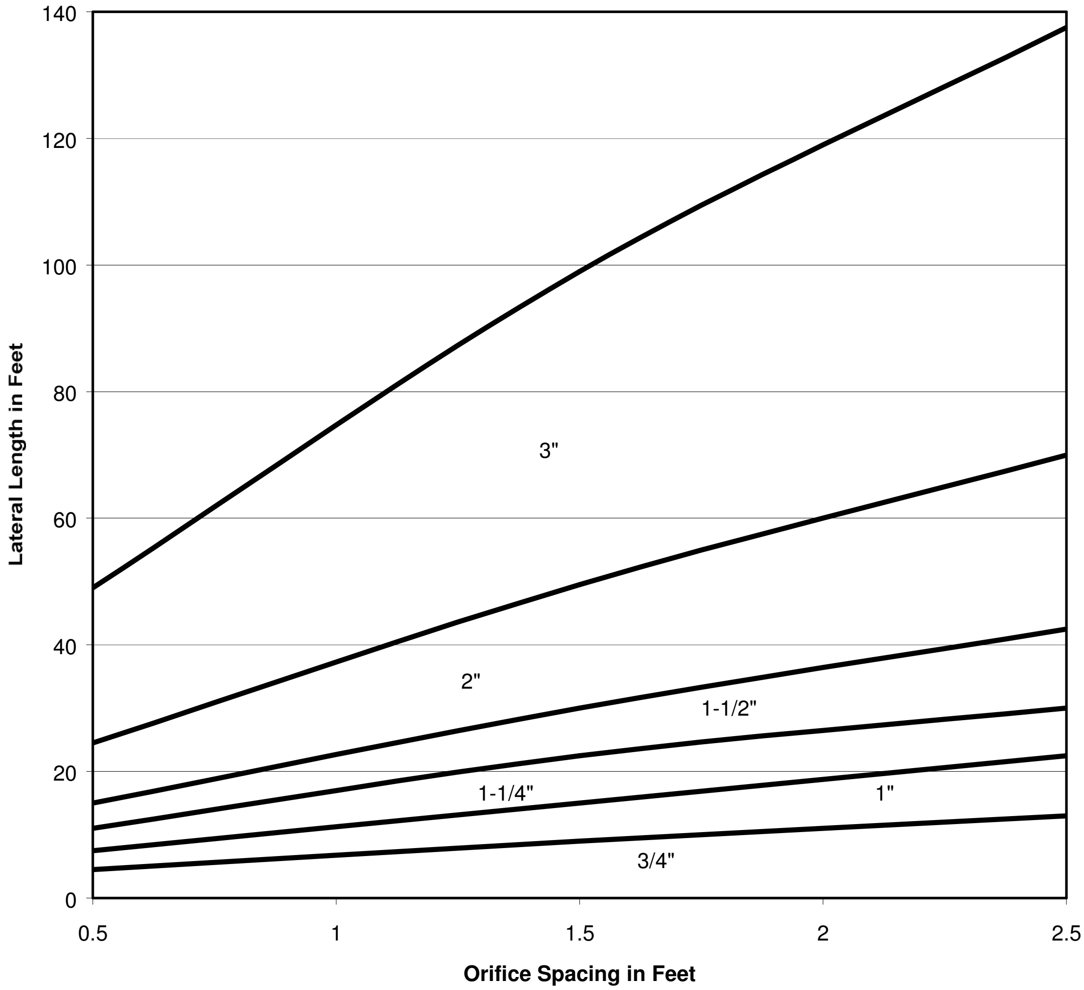

Minimum Lateral Diameter Based on Orifice Spacing for 3/16" Diameter Orifices
Lateral Length in Feet
200
175
150
125
100
75
50
25
0
3"
2"
1-1/2"
1-1/4"
1"
3/4"
0.5
1
1.5
2
2.5
Orifice Spacing in Feet

Graph 6

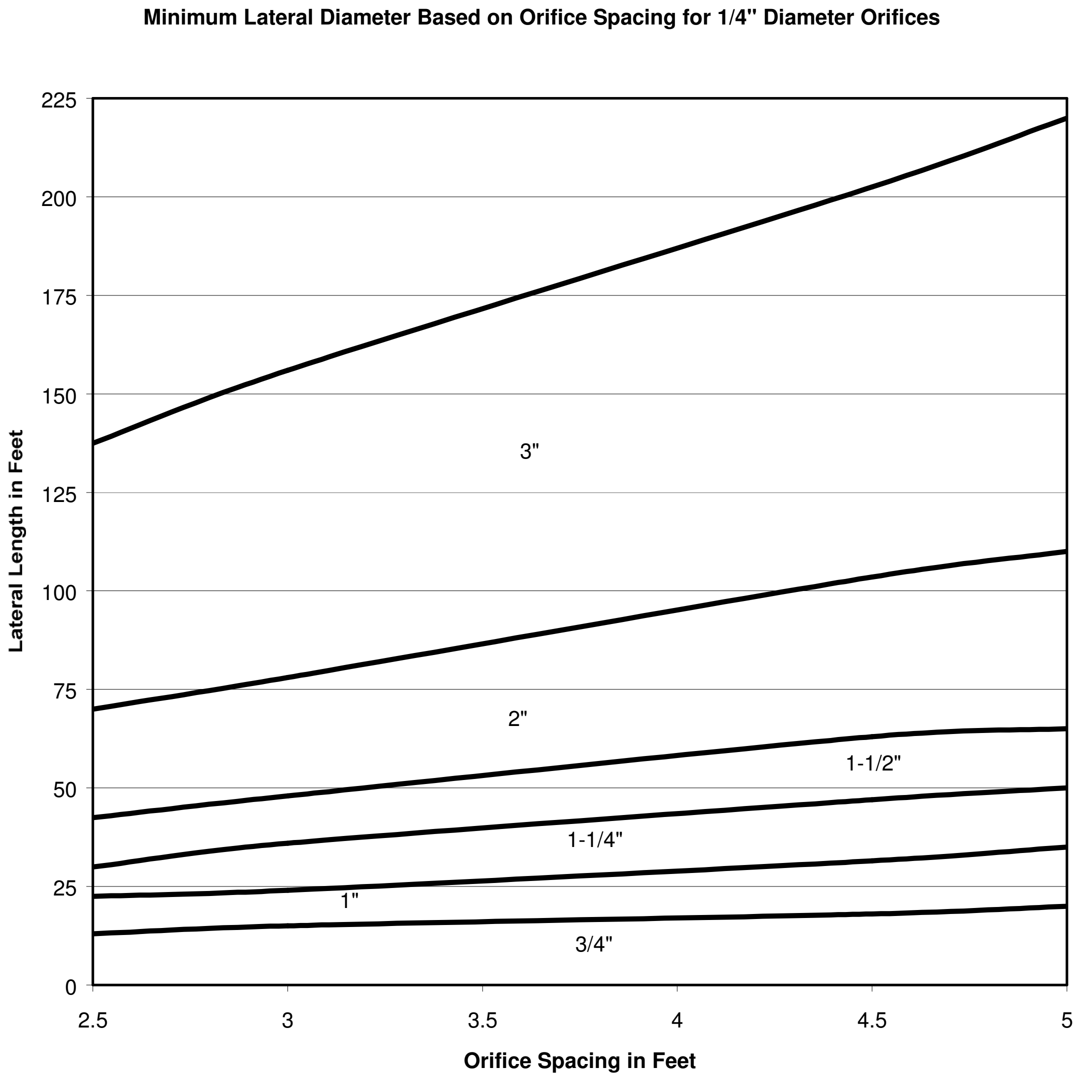

Minimum Lateral Diameter Based on Orifice Spacing for 3/16" Diameter Orifices
Lateral Length in Feet
350
325
300
275
250
225
200
175
150
125
100
75
50
25
0
2.5
3
3.5
4
4.5
5
Orifice Spacing in Feet
3"
2"
1-1/2"
1-1/4"
1"
3/4"

Graph 7

Minimum Lateral Diameter Based on Orifice Spacing for 1/4" Diameter Orifices



Graph 8


Minimum Lateral Diameter Based on Orifice Spacing for 1/4" Diameter Orifices
225
200
175
150
125
100
75
50
25
0
Lateral Length in Feet
3"
2"
1-1/2"
1-1/4"
1"
3/4"
2.5
3
3.5
4
4.5
5
Orifice Spacing in Feet

VIII. TABLES

Table 4

Discharge Rates in Gallons per Minute from Orifices[a]

Pressure in feet	Orifice Diameter			
	1/8	5/32	3/16	1/4
2.5	NP	NP	0.66	1.17
3	NP	NP	0.72	1.28
3.5	NP	0.54	0.78	1.38
4	NP	0.58	0.83	1.47
4.5	NP	0.61	0.88	1.56
5	0.41	0.64	0.93	1.65
5.5	0.43	0.68	0.97	1.73
6	0.45	0.71	1.02	1.80
6.5	0.47	0.73	1.06	1.88
7	0.49	0.76	1.10	1.95
7.5	0.50	0.79	1.14	2.02
8	0.52	0.81	1.17	2.08
8.5	0.54	0.84	1.21	2.15
9	0.55	0.86	1.24	2.21
9.5	0.57	0.89	1.28	2.27
10	0.58	0.91	1.31	2.33

Note a: Table is based on - Discharge in GPM = 11.79 x Orifice Diameter^2 in inches x (Pressure in Feet)$^{1/2}$

NP means not permitted

Table 5

Maximum Manifold Length Based on Individual Lateral Flow Rates and Lateral Spacing

Individual Lateral Discharge Rate		1-1/4" Diameter Manifold						1-1/2" Diameter Manifold					
End	Center	Lateral Spacing						Lateral Spacing					
Manifold	Manifold	1.5	2	2.5	3	3.5	4	1.5	2	2.5	3	3.5	4
10	5	4.5	6	7.5	9	10.5	8	7.5	8	10	12	14	12
20	10	3	4	5	6	7	8	4.5	6	7.5	6	7	8
30	15	3	4					3	4	5	6	7	8
40	20							3	4	5	6		
50	25							3	4				
60	30							3					

Individual Lateral Discharge Rate		2" Diameter Manifold						3" Diameter Manifold					
End	Center	Lateral Spacing						Lateral Spacing					
Manifold	Manifold	1.5	2	2.5	3	3.5	4	1.5	2	2.5	3	3.5	4
10	5	12	14	15	18	21	20	22.5	28	32.5	36	38.5	44
20	10	7.5	8	10	12	14	12	15	18	20	24	24.5	28
30	15	6	6	7.5	9	10.5	12	12	14	15	18	21	20
40	20	4.5	6	7.5	6	7	8	9	12	12.5	15	17.5	16
50	25	4.5	4	5	6	7	8	7.5	10	12.5	12	14	16
60	30	3	4	5	6	7	8	7.5	8	10	12	14	12
70	35	3	4	5	6	7	8	6	8	10	9	10.5	12
80	40	3	4	5	6	7		6	8	7.5	9	10.5	12
90	45	3	4	5	6			4.5	6	7.5	9	10.5	12
100	50	3	4	5				4.5	6	7.5	9	10.5	12
110	55	3	4					4.5	6	7.5	9	10.5	8
120	60	3						4.5	6	7.5	6	7	8
130	65	3						4.5	6	5	6	7	8
140	70							4.5	6	5	6	7	8
150	75							4.5	6	5	6	7	8
160	80							4.5	4	5	6	7	8
170	85							4.5	4	5	6	7	8
180	90							3	4	5	6	7	8
190	95							3	4	5	6	7	8
200	100							3	4	5	6	7	8

Table 6
FRICTION LOSS (FOOT/100 FEET) IN PLASTIC PIPE[a]

Flow in GPM	Nominal Pipe Size							
	3/4	1	1-1/4	1-1/2	2	3	4	6
1								
2								
3	3.24							
4	5.52							
5	8.34	2.05						
6	11.68	2.88					Velocities in this area are below 2 feet per second	
7	15.53	3.83						
8	19.89	4.91	1.65					
9	24.73	6.10	2.06					
10	30.05	7.41	2.50					
11	35.84	8.84	2.99					
12	42.10	10.39	3.51	1.44				
13	48.82	12.04	4.07	1.67				
14	56.00	13.81	4.66	1.92				
15		15.69	5.30	2.18				
16		17.68	5.97	2.46				
17		19.78	6.68	2.75				
18		21.99	7.42	3.06				
19		24.30	8.21	3.38				
20		26.72	9.02	3.72	0.92			
25		40.38	13.63	5.62	1.39			
30			19.10	7.87	1.94			
35			25.41	10.46	2.58			
40			32.53	13.40	3.30			
45				16.66	4.11	0.57		
50				20.24	4.99	0.69		
60					7.00	0.97		
70					9.31	1.29		
80					11.91	1.66	0.41	
90			Velocities in this area Exceed 10 feet per second, which is too great for various flow rates and pipe diameter		14.81	2.06	0.51	
100					18.00	2.50	0.62	
125						3.78	0.93	
150						5.30	1.31	
175						7.05	1.74	
200						9.02	2.23	0.31
250							3.36	0.47
300							4.71	0.66
350							6.27	0.87

Note a: Table is based on – Hazen-Williams formula: $h = 0.002082L \times (100/C)^{1.85} \times (gpm^{1.85} \div d^{4.8655})$

Where: h = feet of head

L = Length in feet

C = Friction factor from Hazen-Williams (145 for plastic pipe)

gpm = gallons per minute

d = Nominal pipe size

Table 7 VOID VOLUME FOR VARIOUS DIAMETER PIPES BASED ON NOMINAL I.D.[a]	
Nominal Pipe Size	Gallons per Foot
¾	0.023
1	0.041
1-1/4	0.064
1-1/2	0.092
2	0.163
3	0.367
4	0.65
6	1.469

Note a: Table is based on - $\pi(d/2)^2$ x 12"/ft ÷ 231 cu.in./cu.ft.
Where: d = nominal pipe size in inches

IX. REFERENCES

Department of Industry, Labor and Human Relations 1994, "Pressure Distribution Manual"
Small Scale Waste Management Project, University of Wisconsin – Madison, 1981, R.J. Otis, "Design of Pressure Distribution Networks for Septic Tank-Soil Absorption Systems."

Lateral Design Table 8 (a)

Orifice (inches)	Lateral (inches)	Orifice Spacing (feet)	Maximum Lateral Length (feet)
1/8	1	1.5	42
1/8	**1**	**2**	**50**
1/8	1	2.5	57.5
1/8	**1**	**3**	**66**
1/8	1	4	80
1/8	**1**	**5**	**90**
1/8	1	6	102
1/8	**1.25**	**1.5**	**66**
1/8	1.25	2	80
1/8	**1.25**	**2.5**	**92.5**
1/8	1.25	3	105
1/8	**1.25**	**4**	**124**
1/8	1.25	5	145
1/8	**1.25**	**6**	**162**
1/8	1.5	1.5	85.5
1/8	**1.5**	**2**	**104**
1/8	1.5	2.5	120
1/8	**1.5**	**3**	**135**
1/8	1.5	4	164
1/8	**1.5**	**5**	**190**
1/8	1.5	6	210
1/8	**2**	**1.5**	**132**
1/8	2	2	160
1/8	**2**	**2.5**	**185**
1/8	2	3	207
1/8	**2**	**4**	**248**
1/8	2	5	290
1/8	**2**	**6**	**324**

Lateral Design Table 8 (b)

Orifice (inches)	Lateral (inches)	Orifice Spacing (feet)	Maximum Lateral Length (feet)
5/32	1	1.5	31.5
5/32	**1**	**2**	**36**
5/32	1	2.5	42.5
5/32	**1**	**3**	**48**
5/32	1	4	56
5/32	**1**	**5**	**65**
5/32	1	6	72
5/32	**1.25**	**1.5**	**48**
5/32	1.25	2	58
5/32	**1.25**	**2.5**	**67.5**
5/32	1.25	3	75
5/32	**1.25**	**4**	**92**
5/32	1.25	5	105
5/32	**1.25**	**6**	**120**
5/32	1.5	1.5	63
5/32	**1.5**	**2**	**76**
5/32	1.5	2.5	87.5
5/32	**1.5**	**3**	**99**
5/32	1.5	4	120
5/32	**1.5**	**5**	**140**
5/32	1.5	6	156
5/32	**2**	**1.5**	**96**
5/32	2	2	116
5/32	**2**	**2.5**	**135**
5/32	2	3	150
5/32	**2**	**4**	**184**
5/32	2	5	210
5/32	**2**	**6**	**240**

Lateral Design Table 8 (c)

Orifice (inches)	Lateral (inches)	Orifice Spacing (feet)	Maximum Lateral Length (feet)
3/16	1	1.5	24
3/16	**1**	**2**	**28**
3/16	1	2.5	32.5
3/16	**1**	**3**	**39**
3/16	1	4	44
3/16	**1**	**5**	**50**
3/16	1	6	60
3/16	**1.25**	**1.5**	**37.5**
3/16	1.25	2	46
3/16	**1.25**	**2.5**	**52.5**
3/16	1.25	3	60
3/16	**1.25**	**4**	**72**
3/16	1.25	5	85
3/16	**1.25**	**6**	**96**
3/16	1.5	1.5	49.5
3/16	**1.5**	**2**	**60**
3/16	1.5	2.5	70
3/16	**1.5**	**3**	**78**
3/16	1.5	4	92
3/16	**1.5**	**5**	**110**
3/16	1.5	6	120
3/16	**2**	**1.5**	**76.5**
3/16	2	2	92
3/16	**2**	**2.5**	**23**
3/16	2	3	120
3/16	**2**	**4**	**144**
3/16	2	5	165
3/16	**2**	**6**	**186**

Lateral Design Table 8 (d)

Orifice (inches)	Lateral (inches)	Orifice Spacing (feet)	Maximum Lateral Length (feet)
1/4	1	1.5	16.5
1/4	**1**	**2**	**20**
1/4	1	2.5	22.5
1/4	**1**	**3**	**27**
1/4	1	4	32
1/4	**1**	**5**	**35**
1/4	1	6	42
1/4	**1.25**	**1.5**	**27**
1/4	1.25	2	32
1/4	**1.25**	**2.5**	**37.5**
1/4	1.25	3	42
1/4	**1.25**	**4**	**48**
1/4	1.25	5	55
1/4	**1.25**	**6**	**66**
1/4	1.5	1.5	34.5
1/4	**1.5**	**2**	**42**
1/4	1.5	2.5	47.5
1/4	**1.5**	**3**	**54**
1/4	1.5	4	64
1/4	**1.5**	**5**	**75**
1/4	1.5	6	84
1/4	**2**	**1.5**	**52.5**
1/4	2	2	64
1/4	**2**	**2.5**	**72.5**
1/4	2	3	81
1/4	**2**	**4**	**100**
1/4	2	5	115
1/4	**2**	**6**	**126**

X. PRESSURE DISTRIBUTION WORKSHEET

Information needed for Pressure Distribution Design:

Daily wastewater flow = _________ **gal/day**

Design loading rate = ___________ **gal/ft^2/day**

System Configuration:

1. _______ ft. system width

2. _______ ft. system length

Proposed Lateral Layout:

3. _______ number of laterals

4. _______ central or end manifold

5. _______ ft. manifold length

6. _______ ft. distal pressure requirement (Based on orifice diameter, see Table 1)

7. _______ in. orifice diameter

8. _______ ft. estimated lateral length

Choose the Orifice Spacing:

9. _______ ft. orifice spacing divided by 12 to convert to feet.

10. ______ number of orifices per lateral

$$n = L/x + .5$$

Where: n = number of orifices
L = lateral length, in feet
x = orifice spacing, in feet

Note: Networks with central manifold have laterals on each side of the manifold. Therefore, the number of laterals are two times as many as a network with an end manifold.

Re-evaluate the Lateral Length:

11. _______ ft. final lateral length
    (# of orifices x orifice spacing - 1/2 orifice spacing = optimal length)

Choose the Lateral Diameter:

12. _______ in. (Graphs 1-8)

Calculate the Lateral Discharge Rate:

13. _______ **gpm** lateral discharge rate.
    Discharge rate per orifice x # of orifices per lateral = lateral discharge rate.

Choose the Manifold Diameter:

14. ________ in. (Table 5)

Calculate the System Discharge Rate:

15. ________ gpm (# of laterals x lateral discharge rate)

Calculate the Force Main Friction Loss (for each segment of different diameter or between tees in the force main):

16. ________ ft. force main length

17. ________ in. force main diameter (Table 6)

18. ________ gpm system discharge rate (from #15)

19. ________ ft. friction loss in ft/100 ft. x length ÷ 100 ft. (Table 6)

Calculate the Total Dynamic Head:

20. ________ ft. distal pressure #6

21. ________ **ft.** network pressure compensation [losses due to fittings, etc. (0.3 x distal pressure)]

22. ________ ft. vertical lift (pump off to lateral elevation)

23. ________ ft. friction loss (in the force main in feet #19)

24. ________ ft. Total Dynamic Head (TDH) (sum of #20 through #23)

Calculate the Dose Volume:

25. _______ **gal.** based on system type.

26. _______ **gal.** - drain back

27. _______ **gal.** - actual dose volume (#25 + #26)

Pump Selection:

28. _______ **gpm** pump discharge rate at TDH (#24)
(not less than system discharge rate, #15)

Dose Chamber Sizing: (Sizing of dose chamber serving a sand filter may have different requirements. See component manual or manufacturer's or designer's specifications for sizing criteria.)

29. _______ **in.** tank bottom to "off" switch ________ gal.

30. _______ **in.** dose volume (from #27) ________gal.
("off" to "on" switch)

31. _______ **in.** "on" switch to alarm switch ________gal.

32. _______ **in.** reserve capacity ________gal.
(residential = 100 gal/BR)

33. _______ **in.** dose chamber capacity ________gal.

XI. PLAN SUBMITTAL AND INSTALLATION INSPECTION

A. Plan Submittal

In order to install a system correctly, it is important to develop plans that will be used to install the system correctly the first time. The following checklist may be used when preparing plans for review. The checklist is intended to be a **general guide**. Not all needed information may be included in this list. Some of the information may not be required to be submitted due to the design of the system. Conformance to the list is not a guarantee of plan approval. Additional information may be needed or requested to address unusual or unique characteristics of a particular project. Contact the reviewing agent for specific plan submittal requirements, which the agency may require that are different than the list included in this manual.

<u>General Submittal Information</u>

- Photocopies of soil reports forms, plans, and other documents are acceptable. However, an original signature is required on certain documents.
- Submittal of additional information requested during plan review or and questions concerning a specific plan must be referenced to the Plan Identification indicator assigned to that plan by the reviewing agency.
- Plans or documents must be permanent copies or originals.

<u>Forms and Fees</u>

- Application form for submittal, provided by reviewing agency along with proper fees set by reviewing agent.

<u>Soils Information</u>

- Complete Soils and Site Evaluation Report (form # SBD-8330) for each backhoe pit described; signed and dated by a certified soil tester, with license number.
- Separate sheet showing the location of all borings. The location of all borings and backhoe pits must be able to be identified on the plot plan.

<u>Documentation</u>

- Architects, engineers or designers must sign, seal and date each page of the submittal or provide an index page, which is signed, sealed and dated.
- Master Plumbers must sign, date and include their license number on each page of the submittal or provide an index page, which is signed, sealed and dated.
- Three completed sets of plans and specifications (clear, permanent and legible); submittals must be on paper measuring at least 8-1/2 by 11 inches.
- Designs that are based on department approved component manual(s) must include reference to the manual(s) by name, publication number and published date.

<u>Plot Plan</u>

- Dimensioned plans or plans drawn to scale (scale indicated on plans) with parcel size or all property boundaries clearly marked.
- Slope directions and percent in system area.
- Benchmark and north arrow.
- Setbacks indicated as per appropriate code.
- Two-foot contours or other appropriate contour interval within the system area.
- Location information; legal description of parcel must be noted.
- Location of any nearby existing system or well.

Plan View

- Dimensions for distribution cell(s).
- Location of observation pipes.
- Dimensions of dispersal/treatment component.
- Pipe lateral layout, which must include the number of laterals, pipe material, diameter and length; and number, location and size of orifices.
- Manifold/force main locations, with materials, length and diameter of each.

Cross Section Of System

- Include tilling requirement, distribution cell details, percent slope, side slope, and cover material.
- Lateral elevation, position of observation pipes, dimensions of distribution cell, and type of cover material such as geotextile fabric, if applicable.

System Sizing

- For one- and two-family dwellings, the number of bedrooms must be included.
- For public buildings, the sizing calculations must be included.

Tank And Pump / Siphon Information

- All construction details for site-constructed tanks.
- Size and manufacturer information for prefabricated tanks.
- Notation of pump or siphon model, pump performance curve, friction loss for force main and calculation for total dynamic head.
- Cross section of dose tank / chamber to include storage volumes; connections for piping, vents, and power; pump "off" setting; dosing cycle and volume, high water alarm setting, and storage volume above the highwater alarm; and location of vent and manhole.
- Cross section of two compartment tanks or tanks installed in a series must include information listed above.

B. Inspections.

Inspection shall be made in accordance with ch. 145.20, Wis. Stats and s. Comm 83.26, Wis. Adm. Code. The inspection form on the following two pages may be used. The inspection of the system installation and/or plans is to verify that the system at least conforms to specifications listed in Tables 1 - 3 of this manual.

POWTS INSPECTION REPORT

(ATTACH TO PERMIT)

GENERAL INFORMATION

Permit Holder's Name	☐ City ☐ Village ☐ Town of	County	Sanitary Permit No.
State Plan ID No.	Tax Parcel No.	Property Address if Available	

TREATMENT COMPONENT INFORMATION			SETBACKS (FT)				
TYPE	MANUFACTURER AND MODEL NUMBER	CAPACITY	P/L	WELL	WATER LINE	BLDG.	VENT
SEPTIC							
DOSING							
AERATION							
HOLDING							
FILTER							

PUMP / SIPHON INFORMATION

Manufacturer:	Model No.	Demand in GPM	TDH - Design

FORCE MAIN INFORMATION			FRICTION LOSS (FT)			
Length	Diameter	Dist. To Well	Component Head	Force Main Losses	Vert. Lift	TDH - As Built

SOIL ABSORPTION COMPONENT

TYPE OF COMPONENT:			COVER MATERIAL:			
Cell Width	Cell Length	Cell Depth	Cell Spacing	No. of Cells		
LEACHING CHAMBER OR UNIT	Manufacturer				Model No.	
SETBACK INFO. (FT)	Property Line	Bldg.	Well		Water Line	OHWM

DISTRIBUTION COMPONENT

Elevation data on back of form

Header / Manifold		Distribution Lateral(s)			Orifice size	Orifice Spacing	Obs. Pipes Inst. & No.
Length	Dia.	Length	Dia.	Spacing			

SOIL COVER

Depth over center of cell:	Depth over edge of cell:	Depth of Cover material	Texture	Seeded / Sodded	Mulched

DEVIATIONS FROM APPROVED PLAN

DATE OF INST. DIRECTIVE:	DATE OF ENFORCEMENT ORDER:
DATE OF REFERRAL TO LEGAL COUNSEL:	

COMMENTS (Persons present, discrepancies, etc.)

COMPONENTS NOT INSPECTED

Plan Revision Required ☐ Yes ☐ No	Date:	Signature of Inspector:	Cert. Number

Sketch on other side

ELEVATION DATA

Point	Back sight	Height of instrument	Foresight	Elevation	Comments
Bench mark					
Bldg. sewer					
Tank inlet					
Tank outlet					
Tank inlet					
Tank outlet					
Dose tank inlet					
Bottom of dose tank					
Dist. lateral 1					
System elev. 1					
Dist. lateral 2					
System elev. 2					
Dist. lateral 3					
System elev. 3					
Grade elev. 1					
Grade elev. 2					
Grade elev. 3					

SKETCH OF COMPONENT & ADDITIONAL COMMENTS