

# Pressure Distribution, Orifice, Pipe & Pump Sizing

This design worksheet was developed by the  
Alberta Onsite Wastewater Management Association.

The completed installation is to comply with Alberta Private Sewage Standard of Practice 2021.

This worksheet is for use in Alberta to: size the orifices in distribution lateral pipes, size effluent delivery piping, and to calculate the required capacity and pressure head capability of the effluent pump.

It can be used for: calculating delivery of effluent to laterals in disposal fields, mounds and sand filters.

**This worksheet does NOT consider all of the mandatory requirements of the Standard.**

**It is intended for use by persons having training in the private sewage discipline.**

Note: Page numbers refer to the Private Sewage Systems Standard of Practice 2021.

Use only Imperial units of measurement throughout (feet, inches, Imperial gallons, etc...).

## Step 1) Select the pressure head to be maintained at the orifices:

Minimum pressure at the orifice:

3/16" or less orifice = 5 ft. Minimum - 2.6.2.5 (1), (p 43)

larger than 3/16" orifice = 2 ft. Minimum - 2.6.2.5 (1) (p 43)

Design pressure at lateral orifices

ft.

P1

*Note: worksheet will not provide an adequate design if laterals are at different elevations. Differing elevations will result in a different pressure head and volume of discharge at the orifices in each lateral. Additional considerations must be made for laterals at differing elevations.*

## Step 2) Select the size of orifice in the laterals:

Minimum size: 2.6.1.5. (1)(e) p. 41

1/8"

Orifice Diameter  
selected

in.

P2

Note: larger sizes are less likely to plug.

## Step. 3) Select the spacing of orifices and determine the number of orifices to be installed in distribution laterals:

Length of Distribution Lateral

From system design drawings

Spacing of Orifices selected for  
design

Resulting number of orifices  
per lateral

ft.

÷

ft.

=

P3a

Select a spacing of orifices to attain even distribution over the treatment area:

Maximum spacings are determined for :

\* 5 ft. Primary treated effluent: 2.6.1.5. (1)(e) p. 41

\* 3 ft. Secondary treated effluent: 8.1.1.8 & 2.6.2.2 (c) (pp 85 & 41)

\* 3 ft. On sandy textured soils: 8.1.1.8 (p. 85)

\* 1 orifice every 5.5 ft<sup>2</sup> on the sand layer of a sand mound 8.4.2.6.(1) p. 105

\* 2 ft. in an LFH At-Grade 8.6.2.2. (1) p. 115

X

=

P3b

From P3a

Number of Laterals

Total Number of Orifices All Laterals

*If laterals are of differing lengths, calculate each separately and add the number of orifices together.*

**Step 4) Determine the minimum pipe size of the distribution laterals:**

Enter the system design information into the 3 boxes below. If distribution laterals are of differing lengths, each lateral must be considered separately.

**Orifice Diameter**

in.

**From P2**

**Length of Distribution Lateral**

ft.

From System Design Drawings

**Total Orifices Each Lateral**

**From P3a**

Use Table A.1.A. (pp 128 - 131) when applying the information entered in this step to determine the minimum size of the distribution lateral pipe.

**Size of Distribution Lateral Pipe**

From Table A.1.A.

in.

**P4**

**Step 5) Determine the total flow from all orifices:**

**Total Number of Orifices in all laterals**

**From P3b**

**X**

**Gal/min for each Orifice at Head Pressure Selected**

From Table A.1.B.  
(pp 132 - 135)

Imp. gal  
/min.

**=**

**Total flow from all lateral orifices**

Imp. gal  
/min.

**P5**

**Step 6) Select the type and size of effluent delivery pipe:**

Use Tables A.1.C.1 to A.1.C.4 (pp 136 - 139) to aid in decision. A larger pipe will reduce pressure loss.

Type of pipe used  
for effluent delivery

Pipe size selected

inch  
- NPS

**P6**

Choose a friction loss from Tables A.1.C.1 to A.1.C.4 in between the bolded lines to ensure a flow velocity between 2 to 5 feet per second. The pipe size selected will affect the amount of friction loss the pump must overcome to deliver effluent.

**Step 7) Calculate the equivalent length of pipe for pressure loss due to fittings:**

Insert total from Worksheet "A" on last page (p.5) of this Pressure Distribution Worksheet

**Equivalent Length of All Fittings**

ft.

**P7**

For Pressure Loss

**Step 8) Calculate the equivalent length of pipe from pump to the farthest end of header of distribution laterals for pressure loss:**

<b>Length of Piping (ft)</b> <input style="width: 100%; height: 40px;" type="text"/>	+	<b>Equivalent Length of Fittings (ft)</b> <input style="width: 100%; height: 40px;" type="text"/>	=	<b>Length of Pipe for Friction Loss (ft)</b> <input style="width: 100%; height: 40px;" type="text"/>	<b>P8</b>
Length from pump to farthest end of distribution header supplying laterals.		Equivalent fitting length from <b>P7</b> .		Used to determine total pressure head loss due to friction loss in piping.	

**Step 9) Calculate the pressure head loss in delivery pipe including fittings:**

<b>Total Length of Pipe for Friction Loss</b> <input style="width: 100%; height: 40px;" type="text"/>	X	<b>Friction Loss per 100 feet of pipe</b> <input style="width: 100%; height: 40px;" type="text"/> ft.	=	<b>Delivery Piping Pressure Head Loss</b> <input style="width: 100%; height: 40px;" type="text"/> ft.	<b>P9</b>
Divide by 100 ft.					
From P8  Don't forget to divide the length by 100 feet to match the factors in the tables.		Use Tables A.1.C. On pp 136-139 using flow volume from <b>P5</b> .			

**Step 10) Calculate the total pressure head required at pump:**

Delivery piping pressure loss	+	<input style="width: 100%; height: 30px;" type="text"/> ft.	<b>From P9</b>
Lift distance of effluent from effluent level in tank to orifices	+	<input style="width: 100%; height: 30px;" type="text"/> ft.	Measure from lowest effluent level in tank to elevation of orifices.
Design pressure at orifices	+	<input style="width: 100%; height: 30px;" type="text"/> ft.	<b>From P1</b>
Head loss allowed if an inline filter is used in pressure piping	+	<input style="width: 100%; height: 30px;" type="text"/> ft.	<b>Explain Pressure Loss Allowed if Applied</b> <input style="width: 100%; height: 20px;" type="text"/>
Add 1 ft to allow for pressure loss along the distribution lateral	+	<input style="width: 100%; height: 30px; text-align: center;" type="text" value="1"/> ft.	
<b>Total minimum pressure head pump must provide at Imp. gal/min required to supply orifices</b>		<input style="width: 100%; height: 30px;" type="text"/> ft.	<b>P10</b>

**Step 11) Select the size of the drain back orifice if used and determine the flow from the drain back orifice. Then calculate total flow requirement for pump:**

Size of Drain Back Orifice

Determine flow using Head Pressure at Drain Back Orifice

Flow from all lateral orifices

Total Imp. Gallons per Minute from the pump

 in.

 Imp. gal /min

 Imp. gal /min

=

 Imp. gal /min **P11**

Use pressure head from P10 to find flow from Table A.1.B.1

From P5

**Step 12) Details of the pump specifications required:**

Required Flow Rate (Imp. gal/min)

Required Pressure Head (ft)

@

From P11

From P10

Select the appropriate pump by reviewing the pump curve of available pumps. Select a pump that exceeds the requirements set out in this step by approximately 10% considering both pressure head and volume.

Imp. gal (P11) multiplied by 1.2 = U.S. gallons

Required Flow Rate (US gal/min)

**Step 13) Consider the pumping demands of the system. If they are considered excessive, redesign the pressure distribution system and recalculate the pump demands.**

**Worksheet "Appendix A" Determine Equivalent Length of Pipe due to fittings in piping system.**

Determine the equivalent length of pipe to allow for friction loss due to fittings in the piping system:

	Number of Fittings		Friction loss as per Table A.1.C.5 or 6 (p. 140)		Total
90° Elbows		X		=	
					+
45° Elbows		X		=	
					+
Gate and Ball Valves		X		=	
					+
Tee-on- Branch (TOB)		X		=	
					+
Tee-on-Runs (TOR)		X		=	
					+
Male Iron pipe Adaptors (MIP) (M/F Threaded Adaptors)		X		=	
					=
Total Equivalent Length of pipe to allow for fittings in piping system					
<b>(Enter this total, Box P7)</b>					