

PSDS Design - Worksheet "P" v1.3

Pressure Distribution: Orifice, Pipe and Pump Sizing

The completed installation is to comply with the Alberta Private Sewage Systems Standard of Practice 1999.

Orifice and Pump: Sizing

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 o

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

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

Minimum pressure at the orifice:

sand filter 9.2.7.(c) - 5 ft.,

mound 8.1.8. - 2 ft.

pressure distribution lateral

7A.1.9.(b) - 5 ft.

Design pressure at orifice (ft) = **ft.**

P1

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

Minimum size 7A.1.9.(d)(i) - 1/8 in.

Orifice diameter selected (in.) = **in.**

P2

Step 3) Select the number of orifices to be installed in distribution laterals:

Number of orifices per lateral

X

Number of laterals

=

Total number of orifices

P3

The minimum and maximum number is to be determined by:
- for a sand filter 9.2.7.(f) pp 36, or
- for a mound or disposal field 7A.1.9 pp26 with some information summarized in Table A.1.A. pp 42.

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

Distribution Lateral Design:

Use Table A.1.A. to assist in designing the distribution laterals. This Table lists the minimum and maximum number of orifices that can be installed in laterals of different sizes and lengths. The minimum number is based

Step 4) Determine the total flow from all orifices:

Total number of orifices

*From **P3** this worksheet.*

X

Gal./min. for each orifice

From Table A.1.B. pp 46.

=

Total gallons per minute

(Required from pump.)

P4

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Step 5) Select the type and size of effluent delivery pipe:

Use Tables A.1.C.1. to A.1.C.4.
on pp 47 to pp 50 to aid in decision.
A larger pipe will reduce pressure loss.

Pipe type and size selected = in.-NPS **P5**

A minimum flow rate as follows will help scour the pipe:
13 gpm for 1-1/2", 17 gpm for 2", 37 gpm for 3"

Step 6) Calculate the equivalent length of pipe for pressure loss due to fittings:

Number of fittings		Equivalent length (ft)		Equivalent length of fittings
<input type="text"/>	X	<input type="text"/> ft.	=	<input type="text"/> ft. P6
<i>(In the line from the pump to the farthest end of the header for the distribution laterals.)</i>		<i>(For each fitting.) Refer to Table A.1.C.5. pp 50.</i>		<i>(For pressure loss.)</i>

Step 7) Calculate the equivalent length of pipe from pump to the farthest end of header of distribution laterals for pressure loss:

Length of piping (ft)		Equivalent length of fittings (ft)		Total equivalent length (ft)
<input type="text"/> ft.	+	<input type="text"/> ft.	=	<input type="text"/> ft. P7
<i>(From pump to far end of header for the distribution laterals.)</i>		<i>(For pressure loss.) From P6 this worksheet.</i>		<i>(For pressure loss calculation.)</i>

Step 8) Calculate the pressure head loss in delivery pipe including fittings:

Total equivalent length (ft)		Friction loss (ft)		Pressure head loss (ft)
<input type="text"/> ft. / 100	X	<input type="text"/> ft.	=	<input type="text"/> ft. P8
<i>From P7 this worksheet. Don't forget to divide the length by 100 ft. to match the Tables.</i>		<i>(Per 100 ft. of pipe) Use Tables A.1.C.1.-4. on pp 47-50 using volume from P4 this worksheet.</i>		<i>(In delivery piping.)</i>

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Step 9) Calculate the total pressure head required at pump:

Delivery piping pressure loss (ft)	+	ft.	<i>From P8 this worksheet.</i>
Lift distance of effluent from low effluent level in tank to highest orifices (ft)	+	ft.	<i>Measure from lowest level in tank to elevation of highest orifices.</i>
Design pressure at orifices (ft)	+	ft.	<i>From P1 this worksheet.</i>
Total pressure head required at pump (ft)	=	ft.	P9

Step 10) Detail the Pump Specifications Required:

Required Flow Rate (gal/min)		Required Pressure Head (ft)
gal./min.	@	ft.
<i>From P4 this worksheet.</i>		<i>From P9 this worksheet.</i>

Step 11) Repeat the calculations if it is necessary to change the pump spec.'s:

If the flow rate is too high: reduce the orifice size in Step 3, reduce the number of orifices in Step 1, or include a distributing valve to sequentially dose small portions of the disposal field.

If the pressure head is too high: select a lower design pressure in Step 2, reduce the flow rate as above, or increase the effluent delivery pipe size in Step 5.

Step 12) Select a make / model of pump and screen assembly:

Make or Manufacturer	Model	HP/Watts
		HP - Watts
Voltage & 1 Phase or 3 Phase	Amps.	Weight
	amps.	lb. - kg.
Pump Flow Rate	Pump Pressure Head	Screen Description
gal/min	ft.	
P12a	P12b	

Don't forget that the effluent to a pressure distribution system must be screened, Article 7A.1.9.(f).

Step 13) Confirm the design complies with the Standard of Practice.

This worksheet does NOT consider all the requirements of the mandatory Standard. Please work safely and follow safe practices near trenches and open excavations.