DUAL DIAMETER TRANSPORT PIPES IN GRAVITY POWERED FLOUT DOSING SYSTEMS

This discussion considers a system design where the distance between the dosing tank and leach field is far greater than the 'average' system. Horizontally it could be several hundred feet, and/or vertically several times the height required to 'power' a particular design.

FUNDAMENTALS

For a Flout system to function properly, the transport pipe must completely fill with effluent by driving all the air out. The vertical elevation of the top of the fully flooded pipe above the elevation of the leach field is the driving 'head' that produces the design flowrate and squirt height. Systems are designed to deliver intermittent doses 4 to 8 times per day depending on soil conditions. The daily design volume of effluent flowing from the dwelling is divided by the number of doses to determine the volume of each dose and the size of the Flout dosing tank.

With the discharge of each dose, the flowing effluent enters the transport pipe and must drive out all the air in the transport pipe and field distribution piping before the full squirt height can be realized – and held for a major part of the discharge cycle (typically 1 to 3 minutes). As it fills, incoming flow rate must always be higher than the increasing outflow rate from the orifices.

For expected results, the actual dose volume must, in practice, be 2 to 3 times the total pipe volume in the system. One can see for systems with longer transport pipes, the minimum dose required for proper system operation may well be in excess of the minimum design dose requirement. With insufficient dose volume, the system could run out of dose before the air is fully purged. The field would then never reach design squirt height. Transport pipes of larger diameter and larger pipe volume just add to the dose volume problem.

Considering systems with excess vertical drop, the issue becomes how to dissipate excess pressure (head) that would otherwise result in erosion caused by high effluent velocities in the transport pipe and excessively high squirt height at the field. Shut-off valves at each lateral in the field could be effective in reducing flow rate and squirt height, however, the flow must be balanced between each lateral. Use of the valves at a later time for any reason may require a complete rebalance by a qualified maintenance technician.

DESIGN CONSIDERATIONS

Pipe design for Gravity Powered Flout Dosed Pressure Fields requires the designer to think outside of the engineering toolbox. Flout dosing is cyclical. The fluid dynamics involve not just water but water and air interacting in a dynamic and transient environment.

Standard pipe sizing involves steady state, fully flooded flow through pipes sized to limit friction and limit the power required to drive circulation. Pipe friction is not a prime concern with Flout systems. The ability to vent quickly and flood quickly is the prime concern. Whatever the piping design is, the pipe friction, orifice exit loss and squirt height will always settle at an equilibrium point with the vertical elevation drop at the site.

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A 3”dia. Flout would be adequate to service a typical single family residence. Pipe sizes in the system design could be 2”, 3” or 4”. 2” pipe connecting to the discharge of a 3” Flout has a smaller volume per foot of pipe and would be overwhelmed and fully flood almost immediately. This would be the first choice for the flow to the field. 3” pipe should be avoided because flow from the Flout conflicts with rising air in the pipe producing turbulence with entrapped air resulting in inadequate and impossible to predict residual head at the field. 4” pipe will only partially flood and effluent will pass down the pipe with predictable channel flow. The air in the pipe above the flow prevents any gain in static head in the descending pipe.

DESIGN FOR SITES WITH LONG RUNOUT AND EXCESS HEAD

Use the **GRAVITY2017 Excel program** to determine the minimum head required by inputting size and number of orifices, squirt height and 30’ of 2” transport line. Add a trial 10’ head.

Pick a site location for the Flout dosing tank suitable to provide the minimum head desired.

Re-input the actual length of the transport pipe and adjust the head accordingly. (This may take a couple of iterations.)

Now you have a choice:

(1) Place the Flout dosing tank at the selected elevation and run a 4” sewer line from the outlet of the septic tank to the inlet of the dosing tank. Make sure the septic tank has a filter and a 2” air bypass from the outlet pipe up to the septic tank riser. Connect a 2” transport pipe from the Flout dosing tank to the field manifold, OR

(2) Place the Flout dosing tank close to the outlet of the septic tank. Transition the Flout outlet from 3” to 4”. Run a 4” sewer pipe down to what would have been the location of the Flout dosing tank in choice (1) and transition down from 4” to 2” pipe connecting to the field manifold. Connect an additional 2” vent from a point 2 -3ft away from the Flout dosing tank on a SLOPED section of the 4” pipe (where air and water co-exist) and connect back to the Flout dosing tank above the high water line. This will ensure the effluent reaches the 4”/2” transition at high flow rate and at atmospheric pressure.

It is important to note that the flow rate to the field, as determined by the **GRAVITY2017** program calculation, must not be greater than the minimum flow rate of the free flowing outlet from the Flout dosing tank. This will ensure that the flow at the transition point will have a tendency to slowly back up into the end of the 4” pipe and ensure the 2” pipe to the field stays fully flooded with no risk of inducing air which would reduce the squirt height. The flowrate to the field must be approximately 50 gallons per minute or less.

Either of these choices will allow the system to function with a smaller dose volume as a result of the relatively short run of fully flooded 2” pipe required.

Please see attachments and our website: www.premierplastics.com

I guarantee your customers will love this system.

Call us any time if you are new or are already a big fan of the Flout Dosing System.

JOHN RICHARDSON MAY16, 2020