Drip Dispersal Information for Site Assessors, Engineers, Architects and Contractors.

The publication of the revised 2021 EPA Waste Water Code of Practice (CoP) included detailed installation conditions for Drip Dispersal systems for the first time. We in Ashtecs have been working for many years to have drip systems approved for use in Ireland and we are pleased that they are now available for widespread use. We supplied the designs and drip systems that were successfully evaluated by Trinity College for the Environmental Protection Agency (EPA) which allowed their inclusion in the 2021 EPA CoP.

Drip Dispersal in the EPA CoP 2021

Based on the changes to the CoP, **Drip dispersal systems are now very competitive with other infiltration systems** both in terms of cost and space required. Due to the shallow placement of drip at 150-220mm BGL and no aggregate, drip systems are **significantly lower visual profile** than other infiltration systems and tertiary filters in all soil types. Additionally in PV's from 76 to 120 the vertical depth of unsaturated soil below the invert is reduced to 600mm on many sites which is less than for all other options. Cost comparisons for Drip systems are usually similar or less than other options depending on the site conditions.

Drip systems are now a cost-effective option in all soil types including free draining and low permeability soils.

We plan to work with Site Assessors, Engineers, Architects and Contractors to work through the changes and continue to offer a specialist design, supply and installation service for all pressure system options (2, 4 and 5 in section 10.1 of the new Code). As Drip systems have been proven to be successful in all trials resulting in their inclusion in the 2021 CoP, **we expect the small area requirements of drip systems combined with their low visual impact on the site to provide a popular solution for most sites.** We carry professional indemnity insurance for design and installation services for your peace of mind.
A list of FAQ's for drip systems and the new CoP guidelines are available for download at www.ashtecs.com/downloads.

Wastewater Suitable Drip Tubing

Ashtecs drip tubing is manufactured by Geoflow in the USA specifically for use with wastewater and is pre-treated to prevent bacterial deposits and root intrusion **as required in the CoP.** Beware of agricultural drip irrigation tubing used in Europe with potable water to irrigate crops and offered by pipe supply companies. It is not suitable for wastewater use and it is will not meet the requirements of the CoP. Our drip manufacturer Geoflow sells both wastewater and agricultural drip tubing and they are completely different products.

www.ashtecs.com; email: info@ashtecs.com.

Doing Site Assessments for Drip Dispersal Systems

Drip systems disperse the secondary treated wastewater higher in the soil profile than other infiltration systems. As a result the invert level is closer to the ground level at 150-200mm BGL and can be above GL on some sites. This should have an impact on how site assessments are done to allow all infiltration options to be explored, as drip dispersal is a viable option in all soil types. Sites with at least 500mm existing depth of soil are suitable for new construction development. Sand fill material can be added below driplines to meet the additional Table 6.3 vertical soil depth requirements.

Minimum depths of unsaturated soil based on GWPR in Table 6.3

Infiltration/treatment area	Minimum depth (m)		
Percolation values (PV'S)	GWPR R1 and R2[1]	GWPR R2[2], R2[3], R2[4], and R3[1]	GWPR R3[2]
3 ≤ PV ≤75	900	1.2	1.8
76 ≤ PV ≤120	600	0.9	1.2

These depths refer to the minimum depth of unsaturated soil and/or subsoil between the point of infiltration and the bedrock and the water table. The point of infiltration for drip dispersal is the tubing itself. So the invert level is at the depth of the drip tubing.

Invert Level Examples

The following are typical invert level depths for sites with various unsaturated soil depths ≥ 500mm and where PV is ≤ 120 for GWPR R1 and R2[1], requiring 600mm soil depth below the drip tubing. The site work indicated is to increase the vertical depth of soil to meet the 600mm or 900mm soil depth requirement where necessary based on the PV in Table 6.3.

Soil depth mm	Invert Level GWPR R1 and R2[1]	Preparatory site work required
500	GL +100	Remove 100mm sod, import 200-500mm sand, peg driplines in place on sand and cover driplines with 150-200mm topsoil.
600	GL	Remove 100mm sod, import 100-400mm sand, peg driplines in place on sand and cover driplines with 150-200mm topsoil.
700	GL-100	PV 76+. Remove 100mm sod, peg driplines in place on exposed topsoil and cover driplines with 150-200mm topsoil.
750	GL-150	PV76+ Insert driplines into existing soil 150 mm BGL.
≥750	GL-150-200	PV76+ Insert driplines into existing soil 150-200mm BGL.
900	GL+200	PV3-75. Remove sod and add sand as required as above
≥1100	GL-150	PV 3-120. Insert driplines into existing soil 150 mm BGL.

Sub-Surface PV testing for Drip Systems Use

Appendix D Percolation Test Procedure of the 2021 CoP states that "*each hole should be 300 mm x 300 mm x 400 mm deep and the top of the hole should be located as close as possible to the invert of the percolation pipe". "Change in the size of hole will affect the validity of the results."*

As a result, the invert level of the dripline will have an impact on the depth at which the sub-surface percolation tests are done for drip systems:

a) Where sufficient depth of soil exists to satisfy the GWPR rating and the PV is ≤ 120, the driplines can be inserted into the existing soil. The invert level will be 150mm BGL so the top of the testing hole will be 150mm BGL.
b) Where insufficient depth of indigenous soil exists to satisfy the GWPR depth on sites with ≥500mm of unsaturated soil/subsoil and the PV is ≤ 120, then additional sand fill material can be added below the dripline. The invert level may be at or above ground level.

Sub-surface PV testing for **sites where fill is required** may be as shallow as possible purely to allow the 400mm testing depth for the test hole. In principle this could be at the same depth as the surface PV test or at ground level, as the invert level could be at or above GL to achieve 600mm or greater depth of soil required. Testing below 400mm may not be relevant if the invert level is at or above GL and may be more appropriate for systems with deeper invert levels.

Design Details for Drip Systems

Design recommendations for drip systems must be provided on the site characterisation form. Drip infiltration areas are typically long and narrow ideally with the driplines laid along any site contours parallel to the slope, so the water moves slowly away from the discharge point in the topsoil along an elongated footprint. However, the footprint can be shaped as is necessary to fit small or tight spaces available on the site. Odd shapes and multiple small pockets of soil such as landscaped areas around flower beds can be used. Drip infiltration areas are not impacted by tree and plant roots.

Drip area requirements per person are given in Table 10.1 of the CoP and copied below for a 4 bedroom 6 person house. Driplines are spaced 600mm apart. Two driplines may be connected at the far ends before looping back to a single trench containing the two PVC supply and return manifolds which minimises site work. Alternatively, the PVC manifolds can be located at each end of the drip lines if that suits the site. The supply manifold is connected to the pump line from the pump tank. The return line allows flushing of solids and slimes from the drip network and is usually connected to the primary tank to allow the solids to be removed with desludging. When sizing drip infiltration areas the typical dimension areas in the table below take account of the dripline spacing and looping to

minimise site groundwork. They may be useful when recommending drip systems on the site characterisation form but the lengths of driplines can be varied to suit individual sites.

Percolation value	Drip Dispersal 10.1 Option 5	Typical Drip Dimensions	Driplines at 600mm centres
	6 PE area M2		
PV < 3	-		
PV 3-20	30 m2	2.4m x 12.5m	4 x 13 m driplines
PV 21-40	84 m2	3.6m x 23.4m	6 x 24 m driplines
PV 41-50	96 m2	3.6m x 26.7m	6 x 27 m driplines
PV 51-75	132 m2	6m x 22m	10 x 22 m driplines
PV 76-90	204 m2	6m x 34m	10 x 34 m driplines
PV 91-120	324 m2	9.6 x 33.8	16 x 34 m driplines

Areas from Table 10.1 of the 2021 EPA Code of Practice are below with typical drip dimensions.

When ≥500mm of unsaturated soil is available on a site but extra depth of soil is required to meet the soil depths in the CoP for the GWPR and PV value encountered, sand (un-graded) material is recommended to increase soil depths. Sand is our recommendation to be used as fill material below the drip invert whenever soil depth must be increased. This is so soil structure does not have to be re-established in the imported fill material. Compaction issues are less likely also when using sand although machinery should be kept off the infiltration area at all times. If necessary, backfilling should be done in stages to allow this. The driplines are covered with 150- 200mm of topsoil and grassed. As with most other soil infiltration areas, the area is safe for pedestrian use and as an amenity area but heavy machinery should be kept off especially during wet weather when soils are soft.

The low visual profile of drip systems is a major benefit as most people prefer not to have their wastewater system visible in their back garden or from their patio! Examples of the small area sizes of drip dispersal systems and the minimal visual profile compared to other options are given at the end of this document.

Installation

Although the drip technology is very sophisticated, its installation, operation and servicing is very simple and trouble free with a long 30 year plus anticipated lifespan. The dripline is usually inserted directly into the soil just inches below the ground surface by a hand held mechanical mole plough.

Drip lines are spaced 600mm apart in a closed loop pumped network. The water from the treatment system is pumped via a PVC pipe (through a filter that removes fine particles) to the drip network. Most domestic drip systems can be completed in less than a day.

	
The dripline is usually inserted directly into the soil just inches below the ground surface by a hand held mechanical mole plough. Most domestic drip systems can be completed in less than a day.	Sand below driplines can increase soil depth with lines pegged in place before backfilling. Drip lines are spaced 600mm apart in a closed loop pumped network.

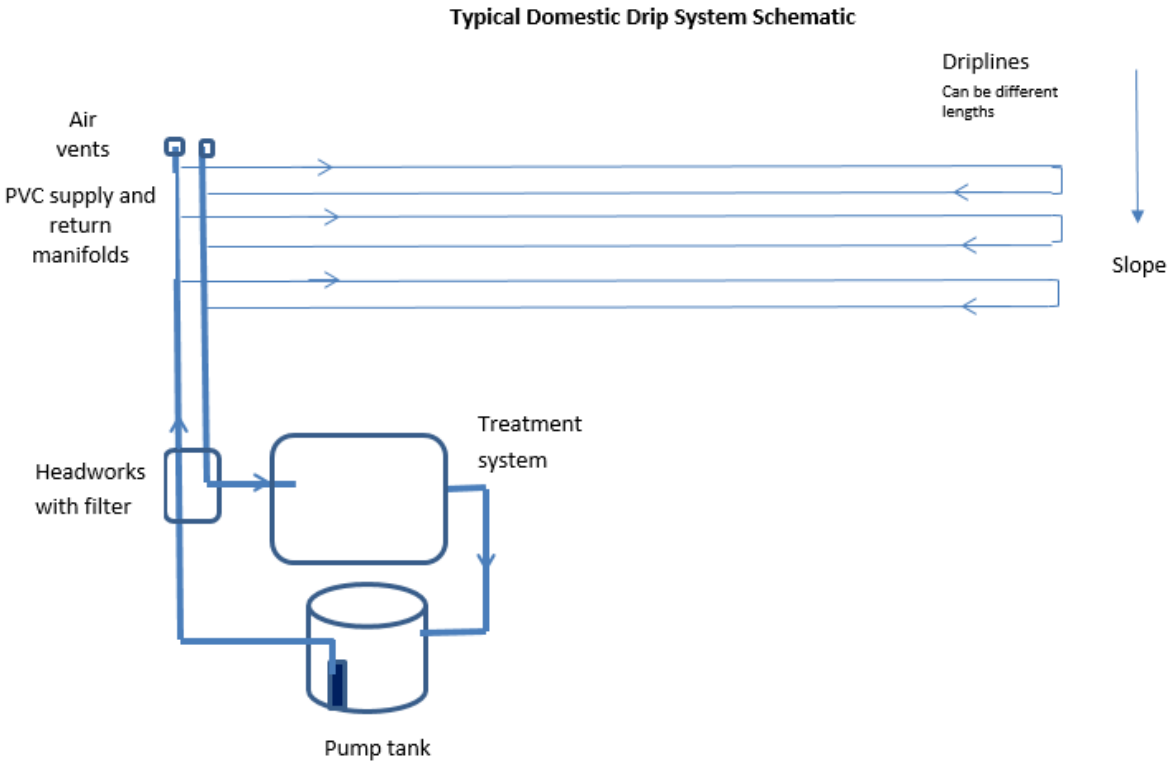
Where the water table or other soil limiting horizon is less than 750mm of the surface, then imported sand can provide the extra depth required depending on the groundwater protection response rating. The driplines will be pegged in place on the imported sand material and covered with 150-200mm of topsoil and grassed. Installations are usually completed within one day unless a lot of site preparation is required.

We provide a design service for all pumped infiltration systems (LPD, LPP and Drip) to treatment system suppliers, engineers, architects, site assessors and building contractors. CPD training can be arranged for groups, with local authorities or professional bodies for design and/or planning application review purposes.

The PVC supply pipe to the dripfield and the return pipe to the treatment system is directed through the system headworks containing a fine mesh 130 micron filter. Flushing and backwashing of the filter and the drip network is provided.

Ashtecs will install the drip systems and will train installers until they can be **certified as trained drip installers by us**. Many secondary treatment system suppliers will install drip systems once they have been become familiar with their installation.

Ashtecs Drip Dispersal Packages



The schematic above is a typical drip system for PV's 21-40 and 41 -50. Higher PV's will have more driplines.

We provide ready assembled packages of drip dispersal systems to treatment system suppliers and contractors for their use. We will also continue to install and commission drip systems and all pumped discharge options nationwide.

Our domestic kits include:

- Wastewater drip tubing
- 0.6 kW high head pump
- Control panel with sonic sensors or float switches
- Pre-assembled headworks with filter, system flushing ball valves and pressure gauge
- Pre-assembled manifold sections for hand connection to the installed driplines similar to garden hose connections.

150m rolls of Geoflow wastewater dripline

Pre-assembled PVC manifolds and air vents

Pump and control panel

Drip mole plough for simple drip line installation

Dripline is usually mechanically inserted 150 -200mm BGL into topsoil when soil depth to limiting condition is sufficient. Finished systems are hardly visible.

In shallow soils sand is added below the driplines to increase soil depth, with the dripline pegged on the exposed area and backfilled with 200mm topsoil.

Pre-assembled headworks with filter and valves

Driplines are connected to PVC pump supply and return manifolds via the headworks

Operation and Servicing

Drip systems operate at a constant pressure of approximately 1 bar or more. The patented emitters or drippers restrict the discharge to drips, unlike other pumped options that lose pressure from each orifice and operate at low pressure to prevent discharges of high velocity water jets.

The dripline has a series of patented drippers or emitters spaced at 600 mm intervals in the drip tubing which are moulded into the dripline at manufacture. Each pressure compensating emitter opens when the design pressure is reached and releases only 3ml/min of water to literally drip into the soil. Each dripper releases small precise amounts of wastewater throughout the infiltration area. An air vent with floating ball shut off on each manifold prevents soil being sucked in when the pump shuts off. The dripline is specially designed for wastewater with anti-bacterial coating to prevent the build-up of slimes on the tubing. It also contains a root-repellent Rootguard® that prevents roots from shrubs and trees from blocking the drippers. This meets the CoP requirements for wastewater suitable drip.

The PVC supply pipe to the dripfield and the return pipe to the treatment system are directed through the system headworks containing a fine mesh 130 micron filter. Flushing and backwashing of the filter and the drip network is also provided in the headworks. The filter screen should be cleaned or replaced during servicing.

The dripfield is dosed intermittently and rested between pumping events to assist the water to infiltrate into the subsoil and for the soil to remain air filled and unsaturated. The secondary treated effluent is distributed uniformly over the total area. A pump tank with sufficient volume (e.g. 60-70% of design flow) will allow cycles of dosing and resting and flow equalisation. A submersible pump generates the required pressure to pressurise the dripline.

The uniform dosing and resting operation combined with the shallow placement in the topsoil over an elongated area is intended to:

1. Enhance the soil infiltration and percolation through the subsoils;
2. Allow reaeration of the soils by intermittent dosing and resting intervals;
3. Maximise the treatment of the wastewater in the unsaturated topsoil;
4. Minimise the impact of water mounding during periods of seasonal high water table;
5. Encourage evapotranspiration during dry weather periods;
6. Minimise nitrogen and phosphorous pollution via nutrient uptake by the grass roots;
7. Facilitate horizontal water movement in the soil for pollution attenuation and safe effluent dispersal and recycling of water and nutrients.

Drip systems are very competitive with other soil infiltration systems to purchase and once installed use very little electricity and similar to a standard light bulb. Typically the 0.6 kW

pump runs for less than 1 hour each day. All pumped systems and mechanical secondary treatment systems should be serviced annually and this includes drip systems.

Grass on drip infiltration areas should be mown regularly to assist evapotranspiration throughout the growing season.

Our Geoflow Wasteflow drip tubing has an expected life of over 30 years. Ashtecs has over 10 years of trouble free use of drip systems in Ireland. Some commercial systems have been strenuously tested by intermittent upstream malfunctions releasing sludge to the drip system without clogging or blocking damage to the drip system during the period of the malfunction. A system of continuous line flushing and filtering of the effluent together with the anti-bacterial and anti-root coating ensures a trouble-free life. Septic tank effluent containing more sewage particles is commonly used with drip in other countries but requires more maintenance, so our 90% cleaner secondary effluent will give a long and trouble-free life. However, non-wastewater suitable drip tubing designed for use with potable water to irrigate continental crops is likely to clog after a few years as the emitters and tubing are not suitable for wastewater and not permitted by the CoP. Authorities will be strictly monitoring the drip line quality and manufacturers specification to ensure that it is suitable for use with wastewater.

Ashtecs will train regional installers and operate a quality control certification programme for interested installers and treatment system suppliers to install and service the drip systems.

Benefits of Drip Dispersal Systems

- Efficient natural treatment and reuse of wastewater.
- Drip can provide significant savings over other options.
- Installations are invisible and safe to walk or play on.
- Use on difficult sites- high water tables, tight soils, rocky terrain, steep slopes, around existing buildings and trees.
- Installed systems are low profile and hardly visible
- Easy to install directly into existing soils with little disturbance.
- Multiple zones can be used for large areas or compact sites.
- Can be used with existing or customised treatment systems.
- Shallow installation allows treatment in the biologically active topsoil
- Uptake of water by evapotranspiration is maximised.
- Removal of pathogens and viruses in the aerated soil is maximised.
- Uptake of phosphorous and nitrates is increased.
- Wastewater is recycled in an environmentally sensitive manner.
- 15-year warranty for root intrusion and drip tubing integrity.

- Systems are robust with an expected life of over 30 years.
- Turnkey design, installation and service options.

Non-Domestic Drip Systems

There is no limit to the size of a drip dispersal system unlike LPP and other pumped PVC pipe systems that progressively lose pressure from each orifice or hole. In drip systems, pressure is maintained by the specially engineered and pressure compensating emitters which restrict the release of water to drips. This combined with the use of sequentially dosed multiple zones allows unlimited sizes of drip systems using landscaped common areas and other imaginative concepts. Whole towns have been used with drip systems internationally while Ashtecs has installed multiple zone systems over many acres in size in Ireland. Schools, hotels, factories and other trade effluent discharges in un-sewered areas are viable and cost effective applications for drip dispersal systems. We have experience of these types of larger systems and would be happy to assist with designs and guidance.

Other Services

We can provide training seminars to professional associations and Local Authority staff who receiving planning applications as well as site assessors, engineers, architects and builders when requested.

We continue to provide specialist designs and quotes for all pumped distribution systems options 2, 4 and 5 in section 10.1 of the new CoP as is required in the Code.

Please note that the information in this document is prepared by Ashtecs and is intended to assist with drip system percolation testing and designing and is not intended to override EPA CoP guidance, Local Authority or any other guidance or regulation.

Joe Walsh
Aug 25, 2021

Drip Infiltration Area Comparisons for a Range of Sites

Due to the **shallow placement of drip** at 150-220mm BGL and no aggregate, drip systems are low visual profile in most soil types. Additionally in soils from PV 76 to 120, the depth of soil is reduced to 600mm in GWPR R1 and R2[1]. Soils with PV 3-75 require soil depths similar to other polishing filters -Table 6.3 of the CoP. Cost comparisons for Drip systems are usually similar or less depending on the site conditions.

Some examples are given below of the **area sizes and the finished height at or above ground level** (GL) for a 4 bedroom, 6 person house for various percolation values, groundwater protection response categories and unsaturated soil depths to limiting horizons.

Example 1: PV 3-20; GWPR R1 and R2[1]; 500mm to seasonal watertable or bedrock (900mm soil depth required)

	6PE Area Size per table 10.1	Finished Height above GL	
	'm2	mm	
Drip Dispersal Option 5	30	600	200 over dripline
Pumped discharge option 2	45	1100	700 gravel and soil
Tertiary option 6	22.5	1600	assumes 900 filter and 300 gravel

Comment: Areas are all small but Drip would be lower and far less obvious on the site

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Example 2: PV 21-40; GWPR R1 and R2[1]; 800mm to seasonal watertable or bedrock (900mm soil depth required)

	6PE Area Size per table 10.1	Finished Height above GL	
	'm2	mm	
Drip Dispersal Option 5	84	300	200 over dripline
Pumped discharge option 2	90	800	700 gravel and soil
Tertiary option 6	45	1300	assumes 900 filter and 300 gravel

Comment: Some difference in areas but Drip would be lower and far less obvious on the site

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Example 3: PV 21-40; GWPR R1 and R2[1]; 1100mm to seasonal watertable or bedrock (900mm soil depth required)

	6PE Area Size per table 10.1	Finished Height above GL	
	'm2	mm	
Drip Dispersal Option 5	84	GL	Dripline at 150-200 BGL
Pumped discharge option 2	90	500	700 gravel and soil
Tertiary option 6	45	1000	assumes 900 filter and 300 gravel

Comment: Some difference in areas but Drip would be at ground level on the site

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Example 4: PV 41-50; GWPR R1 and R2[1]; 800mm to bedrock or water table (900mm soil depth required)

	6PE Area Size per table 10.1	Finished Height above GL	
	'm2	mm	
Drip Dispersal Option 5	96	300	200 over dripline
Pumped discharge option 2	180	800	700 gravel and soil
Tertiary option 6	90	1300	assumes 900 filter and 300 gravel

Comment: Drip would be lower and far less obvious on the site and ideal for small sites in this PV range

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Example 5: PV 51-75; GWPR R2[2]; 1100mm to bedrock or water table (900mm soil depth required)

	6PE Area Size per table 10.1	Finished Height above GL	
	'm2	mm	
Drip Dispersal Option 5	132	GL	Dripline at 150-200 BGL
Pumped discharge option 2	300	800	700 gravel and soil
Tertiary option 6	150	1300	assumes 900 filter and 300 gravel

Comment: Drip would be at ground level on the site and is the smallest area -suitable for small sites

Example 6 PV 76-90; GWPR R1 and R2[1]; 500mm to watertable/bedrock (600mm soil depth required)

	6PE Area Size per table 10.1	Finished Height above GL	
	'm2	mm	
Drip Dispersal Option 5	204	300	200 over dripline
Pumped discharge option 2	Not permitted	n/a	
Tertiary option 6	Not permitted	n/a	

Comment: Drip would be at 100mm above ground level and the only option available in these soils

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Example 7 PV 91-120; GWPR R2[2]; 1100mm to watertable/bedrock (600mm soil depth required)

	6PE Area Size per table 10.1	Finished Height above GL	
	'm2	mm	
Drip Dispersal Option 5	324	GL	Dripline at 200 BGL
Pumped discharge option 2	n/a	n/a	
Tertiary option 6	n/a	n/a	

Comment: Drip would be at ground level on the site and the only option available

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I hope the information in this document will assist with assessing sites and designing drip dispersal systems in line with the new 2021 Waste Water Code of Practice. Comments are welcome to Joe.walsh@ashtecs.com.

Ashtecs also provides design assistance for large and small projects.

Please contact us with your project details and we will be glad to assess and assist you with your project at Joe.walsh@ashtecs.com or info@ashtecs.com.

Joe Walsh
Aug 25 2021