



Calculations for Infiltration Rates and Storage Volumes Of the Drivable Grass[®] Pavement System

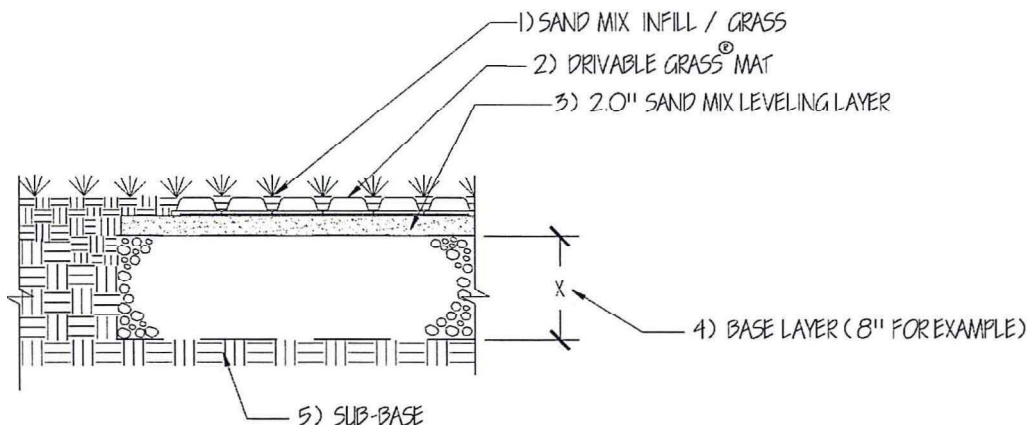
Sample Calculation

Assumptions:

- Product has been installed in accordance with the product specifications
- Infill & 2" bedding course leveling material (sand mix) is 75% well graded sand & 25% organic
 - void ratio of sand mix = $e_{\text{sandmix}} = 0.30$
 - infiltration rate $K_{\text{infill}} = 20$ in / hr (conservative estimate based on attached chart)
- compacted Misc. Aggregate Base layer (see note below for higher infiltration / storage requirements)
 - depth = 8"
 - void ratio of base = $e_{\text{base}} = 0.25$
 - infiltration rate $K_{\text{base}} = 6$ in / hr
- underlying sub-base (native material) is of low permeability
- Drivable Grass[®] mats are considered to be non-porous except for the void spaces at the bottom of the product (the infiltration rate of the Drivable Grass[®] mat is directly proportional to void space). The void space at the bottom of the Drivable Grass[®] mat is 12%.

Infiltration components (SEE FIGURE BELOW)

- 1.) Bedding course mix infill / grass
- 2.) Drivable Grass[®] mat
- 3.) 2.0" bedding course mix layer underneath the Drivable Grass[®] mat
- 4.) Base layer – compacted misc. aggregate base
- 5.) Underlying sub-base material (sub-base infiltration rate controls cross sectional design for storage capacity / full exfiltration. Subdrains may need to be incorporated to drain excess water.)



Drivable Grass® Mat infiltration rate:

$$K_{dg} = (K_{infill} * e_{drivablegrass}) = (20 * 0.12) = 2.4 \text{ in / hr}$$

Where: K_{dg} = Infiltration rate of the Drivable Grass® mat (in / hr)
 K_{infill} = Infiltration rate of the Infill Material (sand mix in this case $k = 20 \text{ in/hr}$)
 $e_{drivablegrass}$ = void space at the bottom of the drivable grass mat = .12

Storage Capacity of Drivable Grass® System

Storage capacity of the system is directly proportional to the volume and void ratio of the infill material and underlying base material

Surface storage: $V_{surface} = d * A_i * e_{sandmix} = 1 * 0.4 * 0.30 = 0.12 \text{ in}$ (will be higher with an established grass mowed 1" - 2" above Drivable Grass® surface)

Sand layer storage: $V_{levelinglayer} = d(\text{levelinglayer}) * e_{sandmix} = 2.0 * 0.30 = 0.60 \text{ in}$

Base layer storage: $V_{base} = d(\text{base}) * e_{base} = 8 * 0.25 = 2 \text{ in}$

Total Storage Capacity per unit area = $V_{total} = V_{surface} + V_{levelinglayer} + V_{base} = 2.72 \text{ in}$

Where: d = depth of infill in product (in)
 $d(\text{levelinglayer})$ = depth of sand layer (in)
 $d(\text{base})$ = depth of base layer (in)
 A_i = area of infill (40% of surface area)
 $e_{sandmix}$ = void ratio of infill & leveling sand mix material
 e_{base} = void ratio of base material

Note: Infiltration can be increased by using different infill material with larger void ratios. Storage capacity is increased with a thicker base layer. If existing sub-base is impermeable, the Drivable Grass® section can be used as a filtration system and may need a sub-drain at a required elevation.

Soil Infiltration Rates of Stormwater

USCS Soil Classification	Typical ranges for Coefficient of Permeability, k_v , in./hour (approx m/s)	Relative Permeability when compacted and saturated	Shearing Strength when compacted	Compressibility	Typical CBR Range
GW-well graded gravels	1.3 to 137 (10 -5 to 10 -3)	Pervious	Excellent	Negligible	30-80
GP-poorly graded gravels	6.8 to 137 (5x10-5 to 10-3)	Very Pervious	Good	Negligible	20-60
GM-Silty gravels	1.3x10-4 to 13.5 (10-8 to 10-4)	Semi-pervious to pervious	Good	Negligible	20-60
GC-Clayey Gravels	1.3x10-4 to 1.3x10-2 (10-8 to 10-6)	Impervious	Good to fair	Very Low	20-40
SW-well graded sands	.7 to 68 (5x10-6 to 5x10-4)	Pervious	Excellent	Negligible	10-40
SP-poorly graded sands	.07 to .7 (5x10-7 to 5x10-6)	Pervious to semi-pervious	Good	Very Low	10-40
SM-Silty Sands	1.3x10-4 to .7 (10-9 to 10-6)	Semi-pervious to impervious	Good	Low	10-40
SC-Clayey Sands	1.3x10-5 to .7 (10-9 to 10-6)	Impervious	Good to fair	Low	5-20
ML-inorganic silts of low plasticity	1.3x10-5 to .07 (10-9 to 5x10-7)	Impervious	Fair	Medium	2-15
CL-inorganic clays of low plasticity	1.3x10-5 to 1.3x10-3 (10-9 to 10-8)	Impervious	Fair	Medium	2-5
OL-organic silts of low plasticity	1.3x10-5 to 1.3x10-2 (10-9 to 10-6)	Impervious	Poor	Medium	2-5
MH-inorganic silts of high plasticity	1.3x10-6 to 1.3x10-5 (10-10 to 10-9)	Very Impervious	Fair to Poor	High	2-10
CH-inorganic clays of High plasticity	1.3x10-7 to 1.3x10-5 (10-11 to 10-9)	Very Impervious	Poor	High	2-5
OH-organic clays of high plasticity	NOT APPROPRIATE UNDER PERMEABLE PAVEMENTS				
PT-Peat, mulch, soils with high organic content	NOT APPROPRIATE UNDER PERMEABLE PAVEMENTS				

Notes: values per Unified Soils Classification System

for stormwater storage capacity values the void ratio of the compacted material will need to be determined