

# Permeable Pavers

**Matthew TM CHAN**

MBA, MHKIS, PFM

**Danny PM CHENG**

FHKIS, RPS(BS), AP(Surveyor)

## BACKGROUND

Due to concerns over environmental sustainability, eco-friendly and green products have been receiving more public attention. BEAM Plus encourages the use of pervious materials for hard-landscaped areas. Permeable paving is the most popular material for this purpose. It is a term used to describe paving methods for roads, parking lots, and walkways that allow for the movement of water and air through the paving material into the subsoil.

## TYPES OF PERMEABLE/PERIOUS PAVING

There are three main types of permeable paving used outside of Hong Kong:

(a) In-situ-cast homogeneous porous pavement



Porous Asphalt (PA)



Porous Concrete (PC)

(b) Grass pavers



Open Cell type



Open Joint type

(c) Porous block pavers



## CHARACTERISTICS OF DIFFERENT PERMEABLE PAVINGS

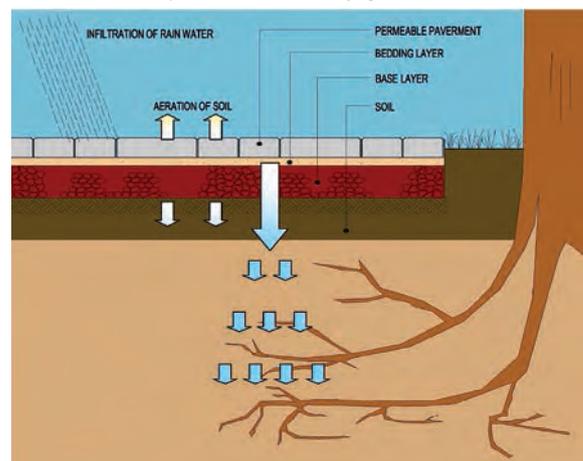
In Hong Kong, only the grass pavers and porous block pavers are available in the market at present. The following table compares the characteristics of the different types of pavers:

System	Grass Pavers		Porous Block Pavers
	Open Cell Pavers	Open Joint Pavers	
Construction	Pre-cast or poured in-situ concrete blocks (e.g. 'grasscrete') filled in with soil & grass	Pre-cast solid block with wide joints	No-fines concrete block
Principle of infiltration	Through voids within blocks	Through wide joints between blocks	Through internal voids of blocks
Initial cost	Several times higher than ordinary concrete block pavers	Several times higher than ordinary concrete block pavers	About twice that of ordinary concrete block pavers
Loading	Vehicular traffic	Light vehicular traffic	Pedestrian traffic
Maintenance	Regular maintenance for grass	Regular maintenance for grass	Low maintenance except cleaning

## POTENTIAL ADVANTAGES OF THE PERMEABLE PAVERS

According to various foreign publications, the permeable pavers system possesses the following benefits:

- Allows for vital water and air to penetrate to the rooting zones of trees/plants for healthy growth.



- Eliminates standing water/ponding from the pavement.
- Reduces excessive run-off during heavy rainfall.
- Traps pollutants in the soil for their gradual degradation while avoiding direct wash-off to seas/streams, which would cause pollution problems.

- Reduces the stress to a city's drainage system.
- Relieves the heat island effect.
- Maintains an ecological-environmental balance.

### DESIGN CONSIDERATIONS FOR PERMEABLE PAVERS

- For the permeability to properly function, the surface should be free of contamination by organic materials to avoid clogging.
- For best maintenance practices, periodic vacuuming and low-pressure washing is recommended to clear out voids in order to extend the pavers' functional life. However, this maintenance method is not common, if available, in HK
- According to suppliers, the infiltration rate of permeable pavers will decrease annually, but should stabilize with age (3-6 yrs).
- Some areas are not suitable for applying this type of paving, for instance, roads for heavy traffic, sloping areas, places with subgrades of low permeability, and places with a high probability of grit/soil blocking the pavers' pores.
- When applying permeable pavers to certain types of subgrade base, the construction of a storm water disposal system may be required.

### SPECIAL PRECAUTIONS IN USING PERMEABLE PAVERS

#### (A) Porous Block Pavers

- To ensure that the subgrade is permeable enough (California Bearing Ratio  $CBR > 5\%$  & infiltration rate  $> 13\text{mm/hr}$ ), it is recommended to excavate trial pits to test the permeability unless the supplier has the expertise to advise on the suitability of the subgrade.
- In principle, installing subsoil drains may solve the problem mentioned in Sub-paragraph (a), but this may make the project not viable in terms of cost.
- The supplier may recommend laying a geotextile under the block pavers to minimize uneven settlement. It is important to ensure that the permeability of the geotextile and that of the pavers are compatible and similar; otherwise, the permeability of the system is defeated by the less impervious geotextile layer.
- The problem of staining or interstitial blocking of the pavers may occur. The specialist maintenance equipment for porous pavers, like a vacuum (suction) brushing machine, is not yet common, if it is available, in HK now.



Dirty staining

#### (B) Grass Pavers

- It is recommended to apply the open cell grass pavers to low/light vehicular traffic roads.
- It is prudent to provide a flat pedestrian route alongside the grass paver area for the safe passage of pedestrians. An uneven surface will cause discomfort and perhaps injury to them. If the pavement develops many holes because grass cannot grow in a healthy manner, there is a genuine danger of pedestrians, especially the young and the elderly, twisting their ankles and hurting themselves.



A flat pedestrian route along a 'grasscrete' estate road

- Pavers with smaller slots for grass infills would likely create smaller problems than those with larger slots. Apart from the above, warning signs alerting people of uneven paving should be displayed.
- Noise nuisances are likely to be generated when vehicles pass through the grass pavers. If the road is close to a residential area, the tenants living on the lower floors will be more affected by the noise. For drivers, they may complain that the road is not smooth enough for their vehicles.
- Surface water drainage discharge, if not quick enough, would drown the grass areas with water and mud after periods of inclement weather.

#### (C) All types of Permeable Pavers systems

- Generally speaking, it is not advisable to lay pavers on those surfaces near the top of slopes/retaining walls, as excessive subsoil water pressure behind may have an adverse effect on the stability of the slopes/retaining walls unless a geotechnical assessment is done to confirm that there would be no safety problem.
- A longer warranty period guarding against premature staining, discoloration, and other functional deficiencies is recommended.

### CONCLUSION

In conclusion, permeable pavers do have specific environmental merits. However, the abovementioned technical considerations/limitations must be considered thoroughly before pavers are applied in a project. ■