A REVIEW ON STORMWATER MANAGEMENT USING PERVIOUS CONCRETE IN PAVEMENTS

Siddhant Khinvasara, Mr. Sagar Sonawane[2]

[1]Siddhant Khinvasara, Department of Civil Engineering, MAEER's MIT Polytechnic, Pune-4110038
[2]Mr. Sagar Sonawane, Lecturer,Dept. of Civil Engineering, MIT Polytechnic, Maharashtra, India

---

Abstract - *Permeable concrete could be a mixture of cement, water, and coarse combination, and small to no sand. It additionally ofttimes contains chemical admixtures. permeable concrete could be a terribly porous medium that permits water to run below the underlying soils. permeable concrete pavement could be a distinctive and effective technique of stormwater management.*

***Key Words*: Pervious Concrete, Chemical admixtures, Pavement, Porous medium, Stormwater**

1. INTRODUCTION

Kayhanian, M., D. Anderson, J.T. Harvey, D. Jones, and B. Muhunthan. 2012.

Pervious concrete was first investigated in the 1800s and was used for various structural purposes like pavement surfacing. Permeable pavement is a porous urban surface which catches rainfall and surface runoff, which is stored in the reservoir while slowly allowing it to seep into the soil below. This study will evaluate how well different types of permeable pavement reduce the amount of pollutants and runoff volume.

1.1 Application of pervious concrete in pavement

David K. Hein, 2009. Pratt, C. J., Newman, A. P., and Bond, C. P. (1999)

Pervious concrete can be used in parking areas, areas with less traffic, residential, footpath, and greenhouses. It is an important application for stabilised construction and has many eco-friendly techniques used by builders to protect water quality and increase the groundwater.

Pervious concrete is now in great demand, partly because of its porous qualities. The flow rate of water through a pervious concrete pavement allows rainfall to seep inside and to percolate into the ground, reducing stormwater runoff. This can be used as natural infiltration of rainwater whose quality remains unchanged so the water can recharge the water table. This avoids surface runoff that must be held in detention ponds. In many cases the pavement may alsobe designed with a layer of coarse granular material below the pavement to increase the storage potential of the system.

This has proven to be an effective tool to increase the area of pavement and recharge groundwater table to eradicate water scarcity.

2. Benefits of Permeable Pavement

Darrell F Elliot, FACI Buzzi Unicem, USA

Environmental Benefits:

- Eliminates runoff.
- Recharges groundwater.
- Traps suspended solids and pollutants.
- It helps in lowering the temperature for pedestrians and stray animals during summer.
- Eliminates the need for wet pond or stormwater management pond as rainwater directly seeps into the ground.

Financial Benefits:

- Eliminates costs for wet ponds, curbs, gutters etc.

- In winter conditions, since water lowers the temperature of pavements there is no need of deicing.
- Lower installation costs.
- Life of this type of Pavement is more than traditional one with less cost.

Table -1: Mix Design used for Permeable Pavement

Cementitious material(CM)	Aggregates (kg/m^3)	W/CM	Aggregate/CM ratio	Water (W)
340	1460	0.32	--	109
321-487	1373-1692	0.25-0.35	3.0-5.0	84-161
195-535	1500-1700	0.30	--	--
309	1525	0.30	4.9	93
315-415	1200-1400	0.28-0.40	4-6	125-154
180-380	1510-1820	0.24-0.30	4.0-10	50-100
287-345	1542-1620	0.30	4.5-5.6	87-105
300-413	1651-1800	0.37-0.42	4-6	125-154

There are high voids percentage present in the concrete, about 3-7.5% more than the ordinary one which are almost visible through naked eyes. Higher the void percentage in the pervious concrete, more the seepage of rainwater in the soil with typical flow rates ranging from two to 18 gallons per minute.

Fig.1: Seepage of water through Permeable Concrete

Pervious concrete can improve water quality by capturing the "first flush" of surface runoff, reduce temperature rise in receiving waters, increase base flow, and reduce flooding potential. The pavement creates a short-term storage detention of rainfall. In order to take full advantage of this concrete, the hydrological behavior of the pervious concrete system must be known.

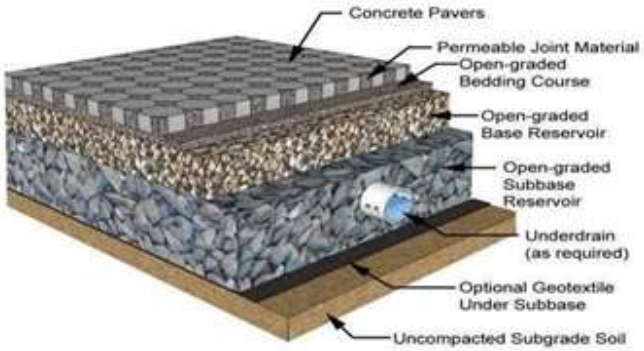

Fig -1: Layers in Permeable Pavement

Generally permeable pavement should not be placed above fill soils. Permeable paver blocks should only be placed above soil, when it is stabilized and has capacity tobear the loads coming on the paver blocks.

Geotextiles/Geocels - In the absence of full-depth concrete curbs or impermeable liners, geotextiles are recommended on the (vertical) sides of permeable pavements to separate the reservoir layers from the adjacent soil subgrade. Geotextile can be placed between aggregate and soil, according to design. Geotextile use should be carefully evaluated and selected.

Paver blocks and soil fill are considered as surface layer or topmost cover of the pavement which is exposed outside. By seeing at the top cover it can be identified which type of pavement is used.

CONCLUSION

Rushton, B. T. (2001)

Lifespan of Permeable pavement is upto 20 years. It is a very durable product and it retains the ability to handle rainwater for many years. Porous asphalt has been used successfully in parking lots, walkways, playgrounds and high-volume highways that carry heavy trucks. Permeable pavers solve problems and look good. Permeable pavers, provide stormwater management by reducing runoff volume and rate, filtering pollutants and keeping water on site without the necessity of retention ponds.

REFERENCES

- Kayhanian, M., D. Anderson, J.T. Harvey, D. Jones, and B. Muhunthan. 2012. Permeability Measurement and Scan Imaging to Assess Clogging of Pervious Concrete Pavements in Parking Lots. Journal of Environmental Management 95(1): 114- 123.
- Pratt, C. J., Newman, A. P., and Bond, C. P. (1999) Mineral oil bio-degradation within a permeable pavement.
- Rushton, B. T. (2001). Low-impact parking lot design reduces runoff and pollutant loads. Journal of Water Resources Planning and Management.
- Darrell F Elliot, FACI, Buzzi Unicem, USA. Slideshare on pervious concrete.