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### A REVIEW PAPER ON COMPACT RESERVOIR THROUGH IMPLEMENTATION OF PERMEABLE PAVEMENT

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**Abstract:** In several real-time situations, we observe many difficulties like water logging in places like Highway, Parking, Public places majorly during monsoon season due to the im-permeability of the road pavement. This happens because of weak water drain system and thus, results in significant cost investment in repairs and maintenance. Hence, to overcome this setback of impermeable road pavement, the best solution is to implement permeable pavement with an attached small reservoir that can store the stormwater and can be utilized as needed. The present paper outlines various studies, which have been carried out to satisfy the requirement of permeable road pavement.

**Keywords:** Porous Concrete, Permeable Road Pavement, Compact reservoir, Collection of Storm-Water, Sustainable Development, Nano Technology



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## **INTRODUCTION**

India is a developing country and the safety of the environment is one of the major issues of the country. Creation of a compact reservoir by the implementation of permeable pavement is a straightforward solution to this issue. Permeable pavement is a unique and effective solution to address the significant environmental issues through nanotechnology and sustainable development[1]. Permeable concrete is a methodological execution that helps the stormwater to directly flow inside the pavement and then carried to a compact reservoir and this reduces the stormwater runoff, pot holes, water logging to a very low level[2]. The main benefit of permeable pavement is that it reduces overall maintenance cost.

The porous concrete is a controlled mixture of cement and water that makes a binding paste over aggregate particles and no sand. By using the proper mix to coat and bind the aggregate particles; it creates a highly permeable, interconnected voids that drain the storm water quickly. Permeable pavement is one of the recommended technologies for both Low Impact Development (LID) in the United States of America (USA) and Water Sensitive Urban Design (WSUD) in Australia[3].

There are several benefits of implementing permeable pavement, which involves:

- The best management of stormwater
- Creation of the compact reservoir
- Reuse of storm water as the need[4].

## **OBJECTIVES**

The permeable pavement is the most-easy and best way to overcome many difficulties. Though there is a concern on efficiency loss during its design life. The environment is degrading day by day hence; to store the stormwater is the need. Thus to reach this need creation of small reservoir through the implementation of permeable pavement is possible.[3]

Objectives to attain this need:

- To determine the strength and durability of permeable pavement.
- To determine the tensile and compression test of the permeable pavement.
- To differentiate between the permeable pavement and the impermeable pavement.[1]

The stored water can be used for any purposes, and therefore this water can directly be obtained by the creation of small reservoir through the implementation of permeable pavement.

## METHODOLOGY

### Problem Statement

This part aimed to define the impact and significance of particular problem. This stage involved various phases like conducting brainstorming and in-depth discussions for the impact of particular project.

The problem definition is the first stage in which we define the problem that serves a considerable mass and observes the problems faced by the severity of the public.



Fig. 1. Methodology Chart

### Solution Generation

After the problem was defined, a solution was generated by a practical measure and observe results. This particular stage involves number of solutions to minimize the problems generated and the losses caused by the problems.



Fig. 2. Prototype

### 1. Solution Analysis

This particular process of solution analysis involves studying various numbers of solutions generated and to find a reliable solution that can solve difficulty faced by severity of public.

### 2. Recommended Plan

After going through some brainstorming sessions and in-depth discussions there came an output that by using this process, by the use of materials like geo-grid, geo-membrane, grit, aggregates, cement, coarse aggregates, water, and Pipe Mechanism. Thus, this plan gives advantages like a collection of water, sustainable pavement, less maintenance, good appearance and various benefits.

### 3. Implementation

After going through the stages like Problem statement, Solution generation, Solution Analysis, recommended plan and Implementation, a prototype was developed with the help of following layers.

**Table 1: Layers of Pavement**

Layer Name	Subgrade	Geo-Membrane	Geo-grid	Coarse Aggregate	Grit	Wearing Course	Total
<b>Thickness (mm)</b>	150	0.6	25	100	100	150	510
<b>Description</b>	It is a sand layer	Shallow permeable synthetic membrane liner	Is geosynthetic material used to reinforce soils and similar materials?	Is a layer of a coarse aggregate of size 6-8mm.	Is a layer of the grit of size 2-4mm.	A slab of porous concrete made up of grit, water, and cement paste.	

### Prototype Development

After observing the different types of pavements, a prototype was constructed which was fractioned into different layers such as Subgrade, Geo-Membrane, Geo-Grid, Coarse Aggregates, Grit and Wearing Coarse. Each layer was fractioned into different widths where Subgrade Soil layer was kept of 150 mm, Geo-membrane of 0.6mm, Geo-Grid of 25mm, Coarse Aggregate layer of 100mm, grit layer of 100mm and Wearing coarse of 150mm. Here, the

Subgrade Soil layer contains a pipe mechanism which assists the water flowing through the pavement to the compact Reservoir.

The current review study was carried out with the development of prototype, which shows the whole mechanism of the working process and also shows the method of collecting water. The current prototype involves 6 number of layers that includes elements like water, soil, pipe mechanism, cement, Coarse aggregates, grit, Geo-grid, and Geo-Membrane.

### **OBSERVATIONS**

By observing the working of prototype and comparing it with the current road conditions, an observation was made that creation of compact reservoir through implementation of permeable pavement there will be many benefits, like collection of stormwater with the help of compact reservoir, the water logging problems in monsoon season could be controlled, the maintenance problem could also be decreased, as well as Deciding multiple uses of collected water.

### **CONCLUSION**

Thus, through the above observations a review was created on construction of compact reservoir through implementation of permeable pavement, that it is the best option which provides primarily provides the needed strength to the road, as well as secondarily stores the stormwater for better purposes and also helps in decreasing waterlogging on road pavement, reduces the degree of potholes in monsoon season. The maintenance cost of the road pavement could be reduced to a low level. The life span of this pavement system is more prolonged than impermeable road pavement. Hence, it is concluded that the creation of compact reservoir through the implementation of permeable pavement is the best option to construct road pavements.

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