

ECO-SOCIAL PAVEMENT

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Abstract

Due to the increasing population and its large use of vehicles the pollution and its effects on human being is increasing in the urban cities and hence this gave the idea of Eco-Social pavement to come into existence. With this pavement an attempt is being made to reduce this pollution and also an effective disposal of storm-water. In this project an experimental study is carried out for reducing vehicular pollution and storm water disposal. This study includes the step wise procedure for construction of Eco-Social pavement. The field survey consist the material selection for making of pavement and collecting samples for testing. The lab work consist testing of collected samples for proper selection of material for work as per the standard maintained in IS code. The constructed pervious concrete block of sizes 38cm×25cm×8cm by using aggregate of sizes 10mm, 6.3mm, and 4.75mm with TiO₂ coat on surface of pavement for making of Eco-Social pavement. Three pervious block of each aggregate is used for testing strength, infiltration rate and pollution control test. The test result for pollution control reveals that there is substantial reduction of air contaminants from vehicles, The test conclude that there is 84 % of CO removal and near about more than 50% nitrogen removal in the various form of gases.

To make this project 100% successful we are proposing the concept to construct the exhaust system of vehicles in such a way that, it will work automatically. For example when vehicle enter in to highly trafficked areas the exhaust system of vehicles will automatically come down a very few cm above the Eco-Social pavement so as to take the dual advantages of vehicles and Eco-Social pavement.

1. Introduction

1.1 Overview:

Moment is the period of industrialization, globalization, and modernization. Due to this 3 “ ization” the nature in 21 century is turning towards desolation. The green cover of earth is reducing hence the problems like global warming is arising. But it isn't dangerous yet. Still in forthcoming times these problems may arise more, hence proper way need to be taken moment. Some ecological and social problems in any metropolitan megacity are,

- . Adding population.
 2. Business and artificial pollution.
 3. Storm water and drainage problems.
 4. Road accident.
 5. Health condition.
 6. Living standard.
- 1.2 Vehicular Pollution:

The observed medium air quality trend in Pune is clearly veritably disturbing. This is because roughly new vehicles are introduced on Pune roads per month. (Source – Terrain Status Report – PMC). The formerly being large number of vehicles and a yearly addition of the high number of vehicles in Pune and touching areas affect in slow business movement with speed of the vehicles between 15 km/ hr to 35 km/ hr. This is farther compounded by acceleration and de-acceleration of the vehicles on the congested roads, which aggravates the situation. The direct effect of this situation is the increased air pollution in the megacity. The crucial business and transportation problems in Pune Municipal area and PCMC area can be astronomically linked as under-

A disproportionate rise in the number of vehicles during last few years, more particularly in the two wheelers.

2. Heterogeneous traffic conditions with limited road carriage capacities making segregation of traffic very difficult.

3. Insufficient road capacities in the congested area.

4. Crowded intersections leading to air and noise pollution.

Various encumbrances on roads such as encroachments, unauthorized constructions particularly of religious nature etc.

5. Absence of parking facilities at important locations leading to street parking and road congestion.

6. The inadequacy of footpaths and their diversion to other uses and joy walking leads to obstruction of vehicular traffic.

Storm Water Problem:

Unlike the air pollution the storm water pollution is also one of the problems in metropolitan cities. Our urban roads behave like river in rainy season. This rainwater accumulates on roads and percolates in the foundation of road resulting in the formation of pot holes. This conventional pavement creates many social as well as ecological problems. Our government is spending crores of rupees on these pot holes but there is no full stop to this money. This money is also percolating with rainwater through these roads. Today this rainwater has made one of the major causes in metropolitan cities. Urban runoff is a major cause of urban flooding, the inundation of land or property in a built-up environment caused by rainfall overwhelming the capacity of drainage systems, such as storm sewers. Triggered by events such as flash flooding, storm surges, overbank flooding, or snow melt, urban flooding is characterized by its repetitive, costly and systemic

impacts on communities, anyhow of whether or not these communities are located within formally designated floodplains or near any body of water. There are several ways in which storm water enters parcels by following way

1. Provisory through seamster pipes.
2. Toilets and cesspools of structures.
3. Seepage through structure walls and bottoms.

The accumulation of water on property and in public rights-of- way; and

5. The overflow of water from water bodies similar as gutters and lakes. Where parcels are erected with basements, civic flooding is the primary cause of basement flooding.

Flood flows in civic surroundings have been delved fairly lately despite numerous centuries of deluge events. Some experimenters mentioned the storehouse effect in civic areas. Several studies looked into the inflow patterns and redivision in thoroughfares during storm events and the recrimination in terms of deluge modelling. Some recent exploration considered the criteria for safe evacuation of individualities in swamped area.

Problem Statement :

Air and water are vital to the actuality of life on Earth. With their largely traded transportation systems, metropolises produce a significant quantum of air pollution due to vehicle emigrations, and they reduce the quantum of groundwater recharge due to the expansive use of impermeable pavements. Impermeable pavements also contribute to the civic heat islet effect. These problems aren't natural, and the larger the metropolises grow, the further they're dismembering the quality of life on Earth by contributing further to these problems. It's important to

keep the air clean and water charged to respectable natural situations so that the Earth can stay sustained for unborn generations without getting impoverished.

Need:

1. To reduce storm water accumulation on the roads.
2. To reduce vehicular pollution.
3. To produce healthy terrain on driveway.
4. To minimise the road accidents.

1.6 Objectives:

The ideal of this study is to estimate the effectiveness of TiO₂ treated porous concrete for their capability of pollutant reduction, maintaining the insinuating specific of the porous concrete, and opposing environmental damage.

TiO₂ distribution for each operation system was anatomized using a setup to estimate the contaminant junking effectiveness due to the photocatalytic effect of the TiO₂.

Because a major focus of this operation is in the transportation terrain, three different gassy adulterants that are present in machine exhaust were tested toluene, tri-methyl benzene, and NO. Infiltration was tested to insure the face treatments didn't reduce the insinuating specific of the porous concrete.

Applicability to the Field

This exploration will be helpful in working the vehicular pollution and storm water problem in metropolitan metropolises (Delhi, Pune, Mumbai, Chennai, Kolkata, etc.) The following applicable areas would be the crucial operation of ECI-SOCIAL Pavement

1. Business Signals-In business areas vehicle stops for staying for signals, during this period all the vehicles are in ON condition and maximum pollution come from exhaust due to indecorous combustion of energy, hence perpetration of porous concrete made with 10 mm livery graded total and face TiO₂ helps to neutralize the dangerous feasts and composites (NO₂, VOCS, CH₄, NH₃) and the same pavement also reduces the storm water accumulation. This pavement also helps to rain water harvesting by road pavement.
2. Risk forecourts-On risk forecourts vehicles stops for giving risk hence then also chances of attention of adulterants from vehicles. Therefore by enforcing this pavement Eco-social zones are created.
3. Parking areas-In parking areas the issues are accumulation of rain water and pollution by vehicles. These problems are controlled by operation of eco-social pavement.

Compass of the design work

The compass of this design work is substantially in metropolitan metropolises than the pastoral areas. This design is helpful in making eco friendly municipalities. This design is also helpful for achieving points for LEED instrument of structure in specific municipalities. This design reduces the vehicular pollution and storm water problem hence their significance is more in forthcoming times.

Figure of the report

This study is regarding the problems mentioned over. The design of porous road pavement gives answer to these ecological and social problems, hence our pavement is named as "eco-social pavement". Our main end is to minimise the business pollution and to reduce storm water problem.

LITERATURE REVIEW

General

This design is an innovative attempt to reduce vehicular pollution and storm water disposal on roads in metropolitan metropolises. Numerous attempts were carried out by colorful authors and experimenters in the field of terrain, construction of pavement to minimise the vehicular pollution and storm water disposal. For the purpose of this study, the literature related to the colorful operation of titanium dioxide, photocatalytic response of TiO₂, design of porous pavement, blend design etc. are studied. Out of vast literature check that has been appertained, many important bones are noted below which are worth in the design.

THE METHODOLOGY

Data Collection

- . Titanium dioxide

Titanium dioxide is a naturally being emulsion and is used in toothpaste, sunscreen, makeup, plastics, cosmetics, and other products. Because it's white, inoffensive, and affordable, TiO₂ maquillages were used for white colors in ancient times. It's used in sunscreen because it can absorb UV light without being consumed in the response.

3.1.2. Photocatalytic effect of TiO₂

In the sun, TiO₂ can have a photocatalytic effect, in which it turns into a “ print-bleach” and degrades fabrics and makeup when sun is present. A photocatalyst is “ a material that uses solar energy to accelerate chemical responses without being consumed or depleted in the process”. Photocatalysts actuated by UV lights decomposes the organic accoutrements like factors of dirt (soot, smut, canvas, and particulates), natural organisms (earth, algae, bacteria, and allergens), airborne adulterants (VOC, tobacco bank, NO_x, and SO_x), and chemicals that beget odours. Utmost inorganic adulterants, like rust stains, aren't catalyzed. The corruption products are oxygen, carbon dioxide, water, sulphate, nitrate, and other inorganic motes. There are numerous marketable products that use photocatalytic responses to make them tone- drawing accoutrements. Some successful exemplifications are spectacles, penstocks, and concrete. Titanium dioxide is used in concrete for structures and pottery for penstocks, but only the part at the face can be actuated. These products can tone-clean and reduce NO_x in the atmosphere. These operations are largely developed in Japan by Toto Company and also in Europe with the product, TX Active, from Italcementi. The Italian company, Italcementi, developed a type of cement with titanium dioxide on the face called TX Active (“ New kind of cement absorbs pollution”). Tests on a road have shown it to reduce the nitrogen dioxide and carbon monoxide by over to 65 percent. The photocatalysis process of the titanium dioxide worked stylish in bright sun.

Test on cement

The physical tests were conducted on ACC cement. The physical test was conducted by checking the expire date of cement, putting hand in to the cement which gives cooler sense if cement is fresh, checking the fineness of cement by taking the cement in the pinch of outlet, checking the lumps conformation etc.

3.3.2 Tests on aggregate

This is veritably important material needed to be tested in the lab for construction purposes, because the total isn't the packed plant product, it's the locally available natural material. Hence following test procedure have to be followed for testing of total attesting to IS law 2386.

Result

1. Road accident is minimized.
2. Health condition of people in civic metropolises is bettered.
3. Living standard of people is bettered.
4. Vehicular pollution in metropolises is reduced.
5. It helps for effective storm water disposal.
6. Global warming is minimized by enforcing this design in largely weakened areas.
7. It's aesthetically pleasing.

The heat islet effect on roads is minimized.

Conclusion: Because pavement has large face area that's in contact with defiled air, treating pavements with TiO₂ reduces dangerous emigrations at road position and profit a cleaner living terrain for the public. Unlike traditional non-pervious pavements, the high porosity and face roughness of porous concrete pavement allow further TiO₂ patches to have direct contact with UV lights and therefore ameliorate junking effectiveness. The open severance structure of porous concrete also protects TiO₂ patches from business lading and environmental riding. In addition to being a sustainable transportation installation for storm water runoff operation, porous concrete pavement, when carpeted with TiO₂ and extensively enforced in civic roads and trace shoulders, results in bettered air quality and therefore amulti-phase cleanser transportation terrain for unborn generations.

This design provides base for unborn eco friendly terrain in civic areas. There's need of constructing the flexible exhaust system of vehicles so as to take binary advantages of pavement and vehicle. There are certain advantages and disadvantages with the construction of Eco-Social pavement.

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