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STUDY ON DEVELOPMENT OF PERVIOUS PAVER BLOCK

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Abstract - *Pervious blocks, which is also known as Porous Concrete blocks, Permeable Concrete, Gap-Graded Concrete, No-Fines Concrete, Enhanced-Porosity Concrete etc. is nowadays gaining more popularity in storm water management. Pervious concrete paver blocks are permeable blocks that provide runoff control while serving as the wearing course for low-traffic volume roads, parking lots, walk/bike pathways and other applications like residential roads, alleys and driveways, shoulders & medians, under overpasses & bridges. Application of pervious concrete includes mainly groundwater purifier, heat reducer and sound absorber. This paper is an intended preliminary study on the characteristics and application of Pervious Concrete Paver Blocks.*

Key Words: (Size 10 & Bold) Key word1, Key word2, Key word3, etc (Minimum 5 to 8 key words)…

1.INTRODUCTION *(Size 11 , cambria font)*

Like regular concrete, pervious concrete also contains cement, sand, aggregate, and water, but it also lacks fine aggregates to some extent. Recent environmental and sustainable development concerns encourage the use of porous concrete. These concerns about the environment and sustainable development can be resolved by using old concrete. Porous concrete paver blocks (PPB), although having poor strength and great permeability, have a wide range of uses, including permeable pavement, groundwater purifiers, heat reducers, and sound absorbers. Pervious concrete paver blocks have been effectively used to filter groundwater, reduce pollutants entering natural water streams, rivers, and ponds, and are widely used for stormwater management. Large-scale reuse of old concrete paver blocks can also gradually raise the groundwater table over time. Compared to using regular concrete, using previous concrete has lower costs. When rain falls on the surface of impermeable concrete, a large portion of it will run off untreated into low regions, creeks, rivers, and storm drains, increasing the amount of water entering the drainage system and polluting the water in the streams and rivers. This water is collected and contained using pervious concrete pavement stones. This enclosed water naturally filters through the ground and recharges the groundwater system. Utilizing pervious concrete paver blocks hence reduces surface pollution. It does not include any oil, but it does minimize first. flush contaminants including oil, other automotive fluids, and different chemicals. By preventing contaminated water from percolating into the ground and allowing the percolated water to be naturally treated by soil chemistry and biology, the use of pervious concrete paver blocks treats pollutants in a natural way.

How Pervious Paver Blocks Made:.

Pervious paver blocks are typically made using a combination of aggregates, binders, and void spaces to create a porous structure that allows water to pass through. In this project, the materials are used. Combination of 12mm and 6mm Aggregate, Ordinary Portland Cement, GGBS, Superplasticizer, and Water.

Advantages of Pervious Paver Blocks:

• Stormwater Management: Pervious pavers enable surface infiltration of rainwater, lowering runoff and easing the burden on stormwater management systems. This lessens the effects of erosion, flooding, and water pollution.
• Water conservation: Previous pavers contribute to the replenishment of subsurface water sources by encouraging groundwater recharge. This is especially useful in regions with limited water supplies or where protecting water resources is a top priority.
• Better Water Quality: Rainwater travels through the porous surface of pervious pavers, acting as a filter to filter out pollutants and other contaminants.
• This aids in raising the water's quality as it enters natural water bodies. Pervious pavers are available in a variety of patterns, sizes, colours, and shapes, enabling the creation of imaginative and aesthetically pleasing designs. They offer the advantages of permeability while improving the aesthetic appeal of outdoor environments.

Disadvantages of Pervious Paver Blocks:

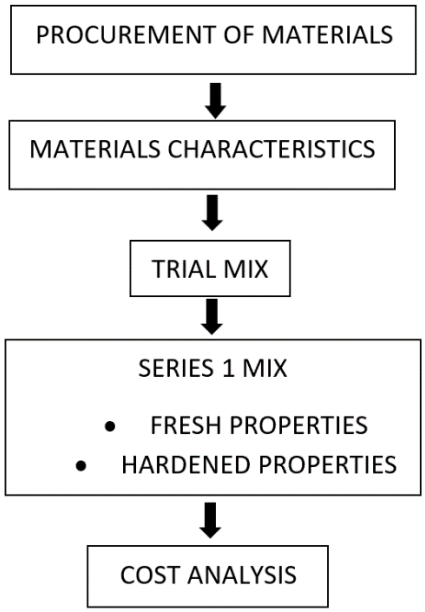
• Maintenance: To maintain the efficiency of previous pavers, regular maintenance is necessary. For permeability

maintenance and to avoid clogging, they could require routine cleaning. This may entail clearing the surface and the spaces between the paver joints of dirt, sediment, and vegetation.

• Limited Load-Bearing Capacity: When compared to solid or impervious pavements, previous pavers may have a lesser load-bearing capacity. They may not be appropriate for locations with large loads or places with significant vehicular traffic, thus careful attention is needed during the design and installation processes.

• Potential for Clogging: If previous pavers are not properly maintained, they have a chance of getting clogged over time, which would reduce their permeability. The empty gaps might get blocked by accumulated sediment, debris, or plant, which reduces their capacity to let water through.

METHODOLOGY



MATERIAL AND IT'S PROPERTIES

a) Cement
b) GGBS
c) Superplasticizer (Master Gelinium 8233)
d) Aggregates (12mm and 6mm)
e) Water

TESTS ON MATERIALS

CEMENT

- FINENESS TEST FOR CEMENT:

The size of cement particle size is a measure of cement fineness, which is defined in terms of the cement's specific surface.

Result: The Fineness of Cement = 8.96%

- PECIFIC GRAVITY TEST FOR CEMENT

In order to compare the density of cement particles to that of water, the specific gravity test for cement is performed.

Result: = SPECIFIC GRAVITY of CEMENT 3.08

GGBS

- FINENESS TEST FOR CEMENT:

The fineness test for Ground Granulated Blast Furnace Slag (GGBS) can also be conducted using the IS sieve method.

Result: The Fineness of GGBS = 8.96%

- SPECIFIC GRAVITY TEST FOR GGBS

Kerosene is used to perform a specific gravity test on ground granulated blast furnace slag (GGBS).

Result: = SPECIFIC GRAVITY of GGBS 2.95

COARSE AGGREGATES (12mm)

- IMPACT TEST

The impact test on 12mm aggregates is a test used to determine how well-suited the aggregates are for withstanding abrupt impacts or shock loads.

Result: = IMPACT VALUE OF AGGREGAYE = 29%

- SPECIFIC GRAVITY AND WATER ABSORPTION OF 12mm AGGREGATES

The density of the aggregates in relation to the density of water is referred to as the specific gravity of 12 mm aggregates.

Bulk Specific Gravity = 2.738

Apparent Specific Gravity = 2.735

Percentage Absorption = 0.10%

- AGGREGATE CRUSHING STRENGTH

The road aggregate used for road construction must be resistant to crushing under traffic wheel stresses. The stability of the pavement structure is negatively impacted by brittle aggregates. Low aggregate crushing value aggregates ought to be preferred.

Result: = AGGREGATE CRUSHING STRENGTH OF AGGREGAYE = 27.61%

- ANGULARITY NUMBER

The angularity number of 12mm size aggregate is derived from the results of these tests. It represents the degree of angularity or flatness of the aggregate particles. A higher angularity number indicates a higher proportion of angular or flaky particles, while a lower angularity number suggests a higher proportion of rounded or cubical particles.

Result: = ANGULARITY NUMBER FOR 12mm AGGREGATE = 2

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PROPORTANING OF MATERIALS

The proportion of cement, GGBS, Aggregates (12mm and 6mm), and Superplasticizer are being done by the following tests i.e

- PUNTKE TEST

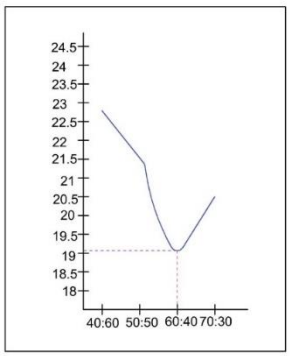
For determining the ratio of cement to GGBS/Fly ash, etc., Puntke test is employed. The primary ingredient to understand the indirect optimal dosage with void ratio is kerosene.

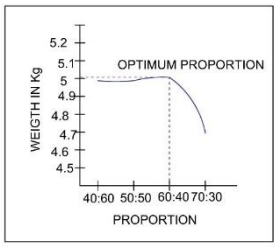
- AGGREGATE PROPORTION

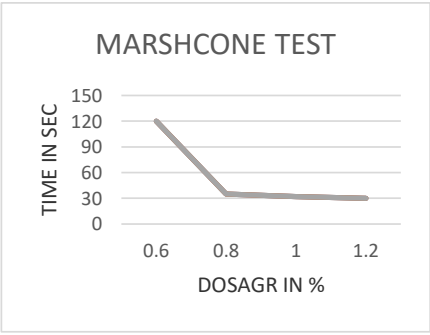
Gradation Analysis: Evaluate the particle size distribution of the available aggregates by performing a gradation analysis on them.

- MARSH CONE TEST

For various types of cement, the Marsh cone test is used to determine the ideal dosage of plasticizers and superplasticizers.







The Optimum Proportion for Specific Materials

- Cement to GGBS= 60:40.
- The Aggregate Proportion with 12mm and 6mm will be = 60:40.
- The optimum dosage of chemical admixture 0.8 % of water cement ratio.

PREPARATION OF MOULD

- DRY MIX
  - AGGREGATE
  - CEMENT AND GGBS
- WET MIX
  - PREPARATION OF SLURRY
- MIXING OF MATERIALS
- CASTING AND DE-MOULDING OF MOULD
- CURING

TEST CONDUCTION ON SPECIMEN

SIZE	AREA IN mm^2	VOLUME IN m^3	LOAD IN N	STRESS IN N/mm^2
6MM	28000	2.21x10^-3	213060	7.61
12MM	28000	2.21x10^-3	153720	5.49
6 & 12MM	28000	2.21x10^-3	209440	7.48

TABLE 6. 28 DAYS COMPRESSIVE STRENGTH TABLE

POROSITY

SL NO	SIZE	VOLUME OF WATER IN ML			POROSITY %
		POURED	PASSED	ABSORBED	
1	6MM	510	425	85	83.34
2	12MM	610	580	70	95.08
3	6 & 12MM	600	535	65	89.16

TABLE 7. POROSITY % TABLE

COST ANALYSIS

SL NO	DESCRIPTION	UNIT	QTY	RATE	AMOUNT IN Rs
1	CEMENT	KG	0.450	13	5.85
2	GGBS	KG	0.300	4	1.2
3	AGGREGATE 6MM	KG	1.6	2.3	3.68
	12MM	KG	2.4	0.8	1.92

4	CHEMICAL ADMIXTURE	ML	6	0.375	2.25
TOTAL AMOUNT FOR ONE BLOCK 14.9 = 15 Rs					

TABLE 8. COST ANALYSIS FOR 1 BLOCK TABLE

CONCLUSION

This essay examined the many traits, uses, and benefits of earlier paving stones. The breadth of research on PPB, including its advanced structural behavior, fatigue, and life cycle analysis, is discussed in the paper's conclusion. In fact, studies in this area will support expanding PPB's use in a variety of applications.

Stormwater management: Because pervious paver blocks have high porosity, rainwater can permeate the soil rather than flow off. They contribute to preventing localized flooding, lessening the load on stormwater drainage systems, and recharging groundwater.

Enhancement of Water Quality: These porous blocks allow for filtering by collecting contaminants and sediments as water travels through them. This procedure lowers the possibility of toxins contaminating water bodies and helps to improve water quality.

Controlling soil erosion: Pervious paver blocks lessen the effects of heavy rain and reduce soil displacement by enabling water to percolate into the underlying soil.

Maintenance-free and long-lasting, previous paver blocks are made to handle heavy loads and hold up over time. Their long-term function is ensured by routine maintenance, which includes clearing away dirt and performing occasional cleaning.

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