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Experimental Study on Pervious Concrete

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Abstract: *The pervious concrete is an environment friendly advanced pavement material as it is helpful for storm water management. Studies indicate that such concrete has lower compressive strength than conventional concrete and only allows light traffic loadings. This project conducted experimental studies on the compressive strength on pervious concrete on various water-cement ratio, aggregate-cement ratio, and aggregate size. Definitely Voids reduced the strength of concrete but the goal is to achieve a balance between water, aggregate, and cement in order to increase strength and permeability. This experimental study was conducted for five different combination of maximum size of aggregate and water cement ratio. The test results indicate that strength and permeability of pervious concrete mixture was increase by the decreasing of maximum size aggregate and water-cement ratio. This project confirms that pervious concrete provide a lower compressive strength than that of conventional concrete, the compressive strength of acceptable mixtures only reached about 9 MPa for 7 days testing. We concluded that as the strength and other properties mainly depend on aggregate size and proportion of the materials therefore if smaller sized aggregate, lowering in Water-Cement ratio etc. adopted it can enhance the strength of pervious concrete greatly.*

Keywords: *Pervious Concrete*

I. Introduction

Pervious Concrete is developed as an environmental friendly material in pavement construction. Pervious pavement either concrete or bituminous is a unique and effective means to meet growing environmental demands. In Pervious Concrete water is intentionally allow passing through the surface of a pavement and becomes key in recharging groundwater and reducing storm water runoff. This advanced pavement system creates more efficient land use by avoiding provision of retention ponds and other storm water management devices. In pervious concrete, precise mixture of water and cementitious materials are made to create a paste and this that forms a thick coating around aggregate particles for binding. This mixture contains little or no sand, results in high voids. Though there is a high void the paste is design in such a way that it coat and bind the aggregate particles together and creates a system of highly permeable, interconnected voids that drains quickly. In Pervious Concrete void content usually ranges from 15% to 25% with compressive strength of 2.8MPa to 28MPa (however strength of 2.8 to 10 MPa is common). The draining rate of pervious concrete pavement depends on Maximum size of aggregate, but will generally fall within the range of 81 to 730 L/Min/m2.

II. Brief History Of Pervious Concrete

Pervious Concrete is not a new technology it has been used from hundreds of years. During World War ll European soldiers didn't mind walking on pervious roads because their feet would keep dry. The U.S. Environmental Protection Administration (EPA) came out with the Clean Water act in 1990. As per EPA runoff from storm water is generated when rain precipitations and snowmelt flow over impervious land without percolating into the ground. The runoff flowing over the land contains debris chemicals, and other pollutants that adversely affect water quality as it directly goes into natural streams. Therefore the primary method to control the storm water is to provide pervious surface and boost the concept of pervious concrete. In practice it was first used in 1852. In Kansas' city metro area first pervious concrete was laid into sugar creek, in November 2005 and from that time about 30+ pavements have been placed and many lessons learned about what makes pervious concrete "good".

III. Advantages And Disadvantages

Advantages:

- Suitable for discharging water at heavy rainfall areas.
- Recharge ground water.
- Controlling pollution and disease due to water pollution.
- Less risk of chances of accidents as compare to other asphalt roads.
- Storm water management and avoiding of flooding.

- Ideal for places where inadequate rainfall and hot climate to save water.
- No chances of soil erosion.
- Ideal for low traffic roads, parking lots, fire station...etc.
- Reducing evaporation of water.
- It has long life and not need of continuous maintenance.
- No requirement of special equipment and machineries.
- Collecting RWH and impervious pavements as well as the permeable paving itself.

Disadvantages:

- Initial cost is comparatively high.
- Materials are not easily available.
- Maintenance is difficult.
- Skill labor required.
- Cannot be used where water table is high.
- Expert supervision required during construction.

IV. Trial Mixes (M20) For Various size Aggregate

Sr. No	Ingredients (KG/m^3)	Trial 1	Trial 2	Trial 3	Trial 4
1	Water	0.45	0.45	0.45	0.45
2	Cement	1	1	1	1
3	Fine Aggregate	1.310	1.6	4.2	1.28
4	Course Aggregate	2.68	2.6		2.15
Compressive Strength For 7 days N/mm^2		7.5	7.25	8.4	9
Permeability $L/Min/m^2$.		227	189	291	351

Fig.1 Casting & testing of Pervious concrete in lab

V. Conclusion

The experiment shows results pertaining to the key properties of pervious concrete made of locally available materials. As such, the test results could be useful for others working in the same area. The test result shows that the compressive strength of pervious concrete is depends on well grading of aggregate and The strength of the aggregate seems to be a limiting factor in the further strengthening of pervious concrete. On the other hand the permeability is solely depends on maximum size of aggregate present. After the experimental study on pervious concrete we got trail 4 gives satisfactory results as comparing to others all with results i.e. 9 MPa at 7 days of permeable concrete and permeability is 351 L/Min/m2.

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