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# BEHAVIOR OF PERVIOUS CONCRETE WITH RECRON FIBER & CRUMB RUBBER

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*Abstract-No fine concrete alone itself can't withstand with various Impact load. In This paper we added various substitute which can enhance overall physical parameter of pervious concrete. in First trail mix we added Racron 3S fiber in different Percentage and evaluate is effect with physical parameter and in second trail mix we added crumb rubber in different proportion for exploring if effect to no fine concrete. Both the additives are added as fine aggregate in very small amount so that the overall permeability of material will not affect badly. Our object is to find reliable and cheap substitute of fine aggregate in Pervious concrete mix*

***Index Terms - Pervious Concrete, No fine Aggregates, Racron Fiber, Crumb Rubber.***

## I. INTRODUCTION

Concrete is one of the important materials among the building materials in all types of civil engineering works. Since the adaptation of concrete as a building material, lot of researches and studies has been done to enhance the quality, strength and durability of it. at the same time efforts are also being made to economize concrete construction compared to other expensive materials. Plain concrete is excellent in compression but poor in tensile strength with very limited ductility and less resistance to cracking. Some Internal micro cracks may inherently present in concrete. Generally, in case of CC pavements cracks are formed due to the variation in temperature, shrinkage and heavy moving loads. Attempts have been made to reduce the cracks and impart improvements in tensile property of concrete members using conventionally reinforced steel bars and also by applying restraining techniques. Although both these methods provide tensile strength to concrete members, they however do not increase the tensile strength of concrete itself. Its well-known tendency of no fine concrete that it may easily degrade by impact load because its void ratio is comparatively high as compared to others mass concrete. By adding small amount of suitably kind of fine aggregate additive we can achieve high tensile strength and high permeability. In the case we added Polypropylene fibre and crumb rubber as sustainable fine admixture and study their various parameters

## II. OBSERVATION

To evaluate Compressive strength, flexural strength, Spilt tensile strength, permeability, void ratio & density of Pervious concrete with addition of Racron Fibre & Crumb Rubber.

## III. MATERIAL USED

### 3.1 Recrone 3s Fibre

Recrone 3s fiber are engineering micro fiber with a unique "triangular" cross section, used in secondary reinforcement of concrete. it complements structure steel in enhancing concrete's resistance to shrinkage cracking and improve mechanical properties such as flexural / Split tensile and transverse strength of concrete along with the desired improvement in abrasion and impact strength Recrone 3S fiber are manufactured in an ISO 9001:2000 facility for use in concrete as a "secondary reinforcement" at a rate of dosage varying from .1% to 0.4% by volume (.9kg/cu.M-3.60kgs/cu.M). Fibers comply with ASTM C 1116, type 111 Fibre reinforced concrete.

### 3.2 Crumb Rubber That Replaces Fine Aggregates

For the last some years, construction industry is taking up the challenge to incorporate sustainability in the production activities by searching for more environmental friendly raw materials or by the use of solid waste materials as aggregates in concrete. One of the possible solutions for the use of waste tire rubber is to incorporate into cement concrete, to replace some of the natural aggregates. It is manufactured in special mills that grind the tire rubber to granules of size ranging from 0.425–4.75 mm. Different sizes of rubber particles could be produced depending on the type of mills and the temperature generated.

### 3.3 Portland Pozzolana Cement

a) Specific Gravity of 53 grade Cement (Ultratech Company) – 3.09 ,{Specific gravity test conforming the IS 4031: 1988 (part 11)}

b) The consistency of cement is 33% by weight of cement, {Test is done with conforming IS 4031:1988 (part 4)}

c) The initial and final setting time test by conforming the IS 4031:1988 (Part 5),The initial setting time of cement is 35minutes&The final setting time of cement is 9 hours.

d) Soundness test is done by conforming the IS code 4031: 1988(part 3) & soundness of Cement is 4mm.

### 3.3 TESTS FOR 10MM ROUNDED SHAPE AGGREGATE

a) Specific Gravity – 2.91{conforming IS code 2386 (part 3)}\

b) Water Absorption – 0.2%{Conforming IS Code 2386: 1988 (Part 3)}

c) Crushing Strength – 4%{Conforming IS code 2386 (part 4)}

d) Impact Value – 6.55%{Conforming IS code 2386: 1988 (part 4)}

e) Table-3 Sieve Analysis for 10mm (Rounded) aggregate conforming IS 383:1970

| IS Sieve Size | Weight Retained (gm) | Cumulative Weight Retained(gm) | Cumulative Percentage Weight Retained(gm) | Cumulative Percentage Weight Passing |
|---|---|---|---|---|
| **12.5mm** | 0 | 0 | 0 | 100 |
| **10mm** | 45 | 45 | 4.5 | 95.5 |
| **4.75mm** | 910 | 955 | 95.5 | 4.5 |
| **2.36mm** | 40 | 995 | 99.5 | 0.5 |
| **Pass** | 5 | 1000 | 100 | 0 |
| **Total** | 1000 | - | 299.5 | - |

## IV. METHODOLOGY

### 4.1 Trail Mix-I

In this trial mix, the crumb rubber is added at the different percentage by the weight of the mix in the pervious concrete to enhance the strength of the pervious concrete with the W/C ratio = 0.35 keeping aggregate to cement ratio = 4:1 constant. Size of Aggregate is taken 10 mm chips type. As the percentage of rubber addition is increased the permeability of the pervious concrete is also increased, but the strength of the pervious concrete in decreased

### 4.1 Trail Mix-II

In this trial mix, the Recron Fiber is added at the different percentage by the weight of the mix in the previous concrete to enhance the strength of the pervious concrete. concrete with the W/C ratio = 0.35 keeping aggregate to cement ratio = 4:1 constant. Size of Aggregate is taken 10 mm chips type. As the percentage of Recron Fiber addition is increased the permeability of the pervious concrete is increased, and the strength of the pervious concrete increased.

**Table 4.1.a Compare results for different percentage of Rubber addition.**

| Different % of rubber addition | Compressive Strength (MPa) | Flexural Strength (MPa) | Split Tensile Strength (MPa) | Permeability (cm/sec) | Void Ratio (%) | Density (Kg/m3) |
|---|---|---|---|---|---|---|
| 0% | 23.53 | 5.73 | 2.82 | 0.635 | 9.228 | 2343.01 |
| 5% | 19.43 | 4.06 | 2.24 | 0.527 | 13.15 | 2321.67 |
| 10% | 13.67 | 3.1 | 1.99 | 0.65 | 17.68 | 2275.43 |
| 15% | 8 | 2.68 | 1.45 | 0.747 | 21.19 | 2249.37 |
| 20% | 6.66 | 2.43 | 1.22 | 0.802 | 28.31 | 2106.16 |
| 25% | 5.56 | 2.19 | 1.216 | 0.847 | 32.37 | 2054.12 |

**Table 4.1.a Compare results for different percentage of Recron addition in concrete Mix.**

| Different % of Recron | Compressive Strength (MPa) | Flexural Strength (MPa) | Split Tensile Strength (MPa) | Permeability (cm/sec) | Void Ratio (%) | Density (Kg/m$^3$) |
|---|---|---|---|---|---|---|
| 0.00% | 23.53 | 5.73 | 2.82 | 0.635 | 9.228 | 2343.01 |
| 0.25% | 23.65 | 5.82 | 2.86 | 0.630 | 9.315 | 2340.05 |
| 0.50% | 24.73 | 5.95 | 2.94 | 0.626 | 9.319 | 2340.01 |
| 0.75% | 25.15 | 6.03 | 2.98 | 0.618 | 9.324 | 2340.00 |
| 1.00% | 26.58 | 6.17 | 3.01 | 0.615 | 9.347 | 2339.95 |
| 2.00% | 26.60 | 6.24 | 3.128 | 0.611 | 9.350 | 2339.93 |

## V. Result

**Trail Mix -1**

In this mix, the crumb rubber is added by the weight of the mix of concrete at the different percentage. The Compressive strength, Flexure Strength and Split Tensile Strength of the concrete mix is reduced as the percentage of the crumb rubber mix is increased, because the thickness of the cement paste around the aggregate is reduced due to the additional crumb rubber in the mix. The permeability is reduced in the 5% rubber addition as the voids in control mix is filled by crumb rubber. Again the permeability is increase because the crumb rubber starts to replacing the aggregate, by reducing the density of the mix.

**Trail Mix-2**

In this mix, the Recron Fiber is added by the weight of the mix of concrete at the different percentage. The Compressive strength, Flexure Strength and Split Tensile Strength of the concrete mix is Increased as the percentage of the Recron Fiber mix is increased, because the thickness of the cement paste around the aggregate is increased due to the additional Recron Fiber in the mix. The permeability is reduced in the 2% Recron Fiber addition as the voids in control mix is filled by Recron Fiber. Again the permeability is increase because the Recron Fiber starts to replacing the aggregate, by reducing the density of the mix.

## VI. Conclusion

a. As the percentage of rubber increases in the mix the permeability of the pervious concrete is reduced for the 5% addition of the rubber after that the permeability of the mix increases with the further addition of the crumb rubber

b. The density of the pervious mix with the crumb rubber is decreased because the specific gravity of the crumb rubber is very less than the specific gravity of the aggregate.

c. The Strength of the pervious mix with the Recron fiber is increased because the specific gravity of the Fiber is very less is very less than the specific gravity of the aggregate.

d. Fibers Act as a reinforcements agent in mix and tends to bond aggregate to gather which result overall increment in strength of mix

## VII. References

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