Surface Wear of Concrete Pavement

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Abstract – One of the most common forms of decomposition caused by concrete structures is surface wear. This carrier may serve as a catalyst for other forms of damage, such as, for example, steel cracks and corrosion. The purpose of the project is to discuss the most important aspects of concrete wear and tear. Common resources and grinding mechanisms have been identified. It takes into account the effects of the components, composition and strength of the composites and the practical construction of concrete wear resistance. This project identifies the usual test methods that determine the wear resistance of the concrete. Finally, this project highlights several key points for future work with concrete abrasion resistance.

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1. INTRODUCTION:

Abrasion is nothing but the wear and tear of concrete surface, it occurs due to roadway traffic or vehicular traffic, heavy rainfall, wind, sand etc.

Now a day due to wheels of vehicle abrasion of concrete road surface is occurred. As concrete is designed for resisting compressive forces it must have to sustained against the abrasive forces also. While construction of concrete road various test on material which is used in concrete are taken but the test on abrasion resistance of concrete has not given that much importance while testing which affects the durability and serviceability of concrete road.

In this project we were studied the effects of various materials and admixtures such as fly ash, steel slag, etc. on the abrasion resistance of concrete.

2. REVIEW OF LITERATURE

Papenfus N. (2003): Applying concrete technology to abrasion resistance. These include the various raw materials, their specific characteristics, and some manufacturing processes that contribute to abrasion resistance. They are also arranged in a flowchart to show how each relates to the other and ultimately to abrasion resistance.

Friedrich Franek, Ewald Badisch (2009): Advanced method for characterization of abrasion This paper gives an overview over a selection of relevant test equipment and procedures. In addition, some examples are given for advanced studies on materials behavior combining tribological test, material analyses respective materialography, and mathematical methods in order to support – for selected cases–the acquired correlation of materials properties and wear resistance under severe conditions.

Tarun R. Naik (2003): Abrasion resistance of high strength concrete Made with fly ash in this paper, all the concretes made with and without fly ash are tested as per the abrasion resistance requirements per ASTM C-779.

The accelerated test results showed that abrasion resistance of concrete having cement replacement up to 30% was comparable to the reference concrete without fly ash. Beyond 30% cement replacement, the fly ash concrete exhibited slightly lower resistance to abrasion relative to the no fly ash concrete.

G.B. Ramesh Kumar (2014): Standard Test Methods for Determination of Abrasion Resistance of Concrete There is no single test that adequately measures the abrasion resistance of concrete under all conditions. This paper covers the summary

Blesson Thomas, Sanjeev Kumar (2016): Abrasion resistance of sustainable green concrete containing waste tire rubber particles. In this paper, Analysis on the potential of waste tire rubber particles as a partial

substitute for fine aggregates in normal strength and high strength cement concrete and the resistance to abrasion has been measured. Statistical Analysis was carried out to strengthen the results obtained from experiments. The results show that the use of tire rubber particles can improve the abrasion resistance of concrete, and this can ensure its applications in pavements, floors and concrete highways, or in places where there are abrasive forces between surfaces and moving objects.

Zhen He, Xiaorun Chen (2014): In this paper the concrete containing slag silica had the highest compressive strength and modulus of elasticity.; the concrete containing SS combining RP had the highest abrasion resistance. Therefore, incorporation of NS or SS can both improve the abrasion resistance of concrete. Although incorporation of the rubber powder would decrease the compressive strength of concrete, it can be advantageous to the abrasion resistance. When SS combining RP are incorporated, the abrasion resistance of concrete will be significantly improved.

3. MATERIALS AND TESTING:

For testing Ordinary Portland Cement of grade 53, confirming to IS: 8112-1989 was used. crushed sand confirming zone 1 IS: 1542-1992. Crushed stone were used as coarse aggregate having specific gravity 2.63. The fly ash was used as an admixture while concreting retained on 45-micron sieve confirming to IS:3812-1981 part 1. The specific gravity of fly ash powder was 2.30. The percentage of fly ash used in concrete mixture is 25% that of cement. The steel slag having size passing through 12.5 mm IS sieve and retained on 10mm IS sieve. The steel slag is used in concrete mix with increasing order i.e. 0%,25%, 50%,75% and 100% replaced that of coarse aggregate. The mixed design for concrete is prepared as per IS: 10262:2010. The water cement ratio for concrete mixed was taken 0.40 and 0.46.

Abrasion Resistance test was conducted as per IS:1237-1980 on concrete cubes after 28 days, 56 days, 90 days (the cubes were oven dried at 110 +/- 5 degrees Celsius) of 70.6x70.6x35.

4. METHODOLOGY:

Testing on different ingredients used in concrete mix design such as cement, fine aggregates, coarse aggregates were conducted as per the standard IS codes. The Test taken on cement such as Fineness of cement, consistency of cement. On Fine aggregate such as Specific gravity, water absorption, bulking of fine aggregate. On coarse aggregate such as Impact value, specific gravity, crushing value After testing on ingredients the Mixed design were prepared as per IS: 10262-2010.In that the concrete cubes were casted having different proportions {i.e. 1:2.32:3.75, 1:2.1:3.97, 1:2.04:3.30, (1:2.04:3.30 cement is replaced by fly ash), (1:2.04:3.30 coarse aggregate is replaced by Steel slag)}. The Nine cubes were casted of each proportion respectively. Then the compression test on these concrete cubes were taken on Compression Testing Machine (CTM) after proper curing as per IS code. The tests were taken on each proportion after 3 days ,7 days and 28 days respectively

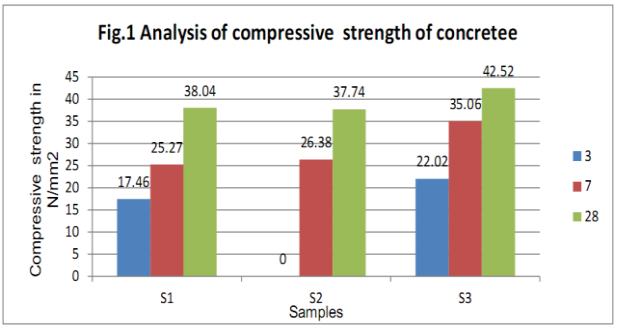
S1:- Proportion 1 - 1:2.32:3.75

S2:- Proportion 2 - 1:1.9:4.17

S3:- Proportion 3 - 1:2.1:3.97

Table 4.1: Comparison of Density and Compressive strength of tested Cubes

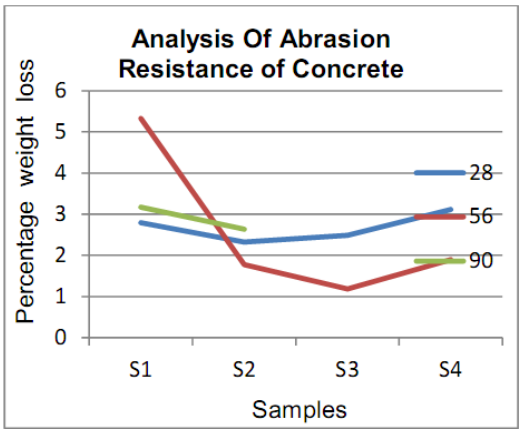
Age of specimen	density			Compressive Strength		
	S1	S2	S3	S1	S2	S3
3	26.99	0	27.21	17.46	0	22.02
7	26.63	27.16	28.01	25.27	26.38	35.06
28	27.01	26.96	27.78	38.04	37.74	42.52



Graph 4.1 Analysis of Compressive Strength of Concrete

Table 4.2: Abrasion Wear Depth of tested cubes

Sr. No	sample	Abrasion Wear Depth in mm		
		28 days	56 days	90 days
1	S1	0.97	1.86	1.09
2	S2	0.77	0.61	0.92
3	S3	0.83	1.15	-



Graph 4.2: Analysis of Average Wear Depth of Tested Sample

Fig .4.1: Abrasion Resistance Testing Moulds

Fig. 4.2: Abrasion Resistance Testing Machine

CONCUSION:

As different test are performed on the material. The Sample of different material proportion is use for testing. The Result is find out after the testing of sample and comparison of various abrasion parameter also done.

So we conclude from the tested sample that abrasion depth reduces up to the optimum level of compressive strength and after that it again increases.

From table 4.2. The abrasion wear depth decreases as the increase in Coarse aggregate in the concrete proportion.

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