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Experimental Study on Strength of Concrete with Partial Replacement of Fine Aggregate by using Steel Slag

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***Abstract*- Concrete is a important building material in construction industry. It is a homogeneous mixture of cement, fine aggregate and coarse aggregate along with the water, the strength of concrete is mainly depends upon the cement content. Now a day there is the chastity in the availability of aggregate. In same time is lots of wastage is produced day by day specifically steel wastes are produced in large scale. So that we planned our project towards replacement of fine aggregate partially with the crushed steel slag with the percentage of 5%, 10%, 15%,20% added on concrete In this project we are prepared cubes , cylinder using normal concrete and there are tested in concrete using steel slag.**

***Keywords:* - Industrial waste, steel slag, compressive strength, split tensile strength, flexural strength.**

I. INTRODUCTION

Concrete is a mixture of cement, aggregates and water with or without suitable admixtures. To attain desirable strength, curing is necessary. Curing is the process of maintaining the proper moisture content to promote optimum cement hydration immediately after placement. Proper moisture conditions are critical because water is necessary for the hydration of cementations materials.

As a result, adequate curing is essential for concrete to obtain advanced structural and durability properties and therefore is one of the most important requirements for optimum concrete performance in any environment or application [1-3]. Aggregates include sand, crushed stone, gravel, slag, ashes, burned clay. Fine aggregate (fine refers to the size of aggregate) is used in making concrete slabs and smooth surfaces. Coarse aggregate is used for massive structures.

II. STEEL SLAG

The steel slag occurs as a molten liquid melt and is a complex solution of silicates and oxides that solid upon cooling virtually all steel is now made in integrated steel plants using version of basic oxygen process using electric arc furnace.

III. MATERIALS

The materials used in the experimental investigation are:

- **Cement:** Ordinary Portland Cement (OPC) 53grade
- **Fine aggregate:** Locally available clean river sand Zone II of IS 383-1970.
- **Coarse aggregate:** Locally available well crushed Granite course aggregate of normal size 20mm is used.
- **Water:** Locally available portable water obtained from source of college campus bore well is used to mixing and curing of concrete for normal conditions conforming to the require water for concreting and curing as per IS:456-2000.
- **Steel slag:** Steel slag is received from Perambalur local available Lethe.

IV. METHODOLOGY

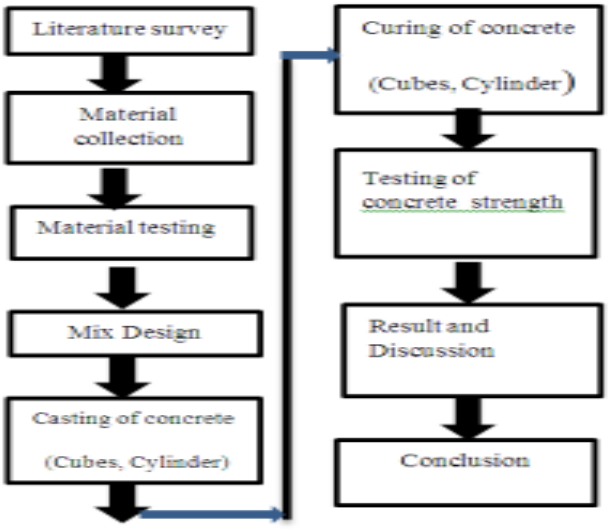

Fig.1 Proposed work block diagram.

V. RESULT AND DISCUSSION

Table 1. Compressive strength for 7days curing

Percent of Mix /Duration	Sample1	Sample 2	Sample 3	Avg.
0%	12.4	13.1	12.6	12.7
5%	13.47	14.4	13.55	13.81
10%	13.65	14.6	13.70	14.0
15%	16.8	16.9	16.85	16.9
20%	17.87	18.0	17.90	17.92

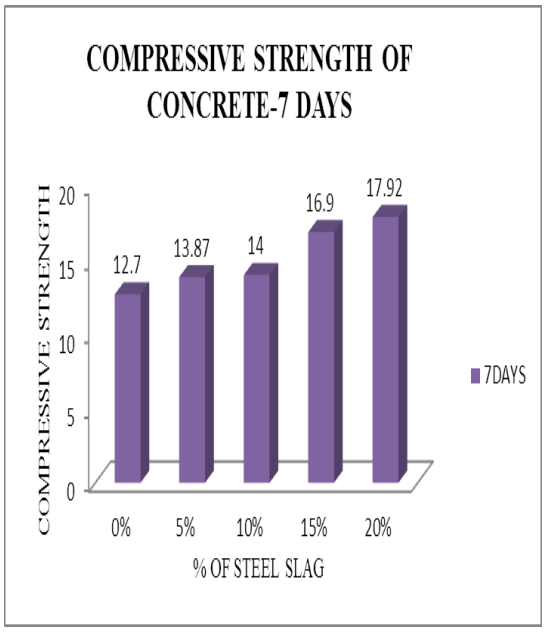

Fig. 2 Comparison of compression strength for 7 days.

Table 2. Compressive strength for 14 days curing

Percent of mix /duration	Sample1	Sample2	Sample3	Avg.
0%	16.6	17.2	16.9	16.9
5%	17.68	18.4	17.9	17.99
10%	18.75	19.5	19.3	19.2
15%	18.91	19.6	19.5	19.32
20%	19.95	20.1	20.0	20.01

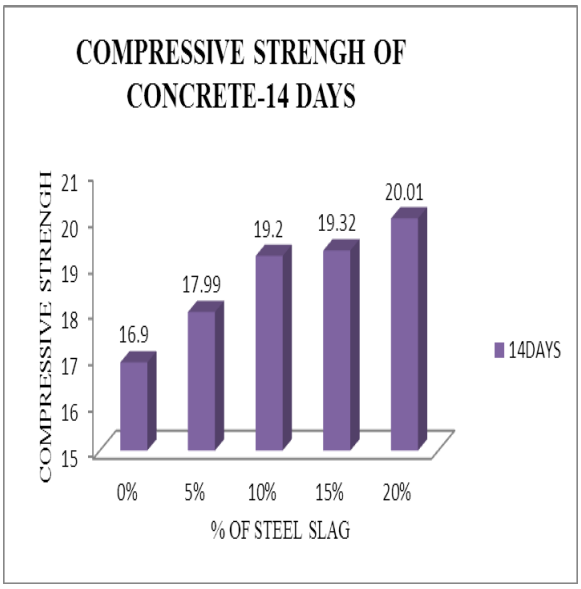

Fig. 3 Comparison of compression strength for 14 days.

Table 3. Compressive strength for 28 days curing

Percent of mix /duration	Sample1	Sample2	Sample3	Avg.
0%	22.5	21.7	22.4	22.2
5%	22.45	21.8	22.3	22.18
10%	23.12	21.95	22.95	22.67
15%	23.65	23.1	23.3	23.35
20%	24.78	23.98	24.2	24.32

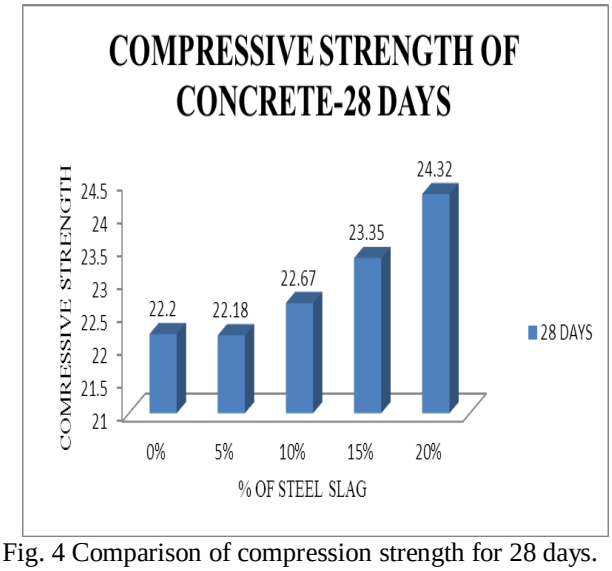

Fig. 4 Comparison of compression strength for 28 days.

Table 4. Percent Mix for various sample.

Percent of mix /duration	sample1	sample2	sample3	Avg.
0%	2.51	3.20	2.65	2.78
5%	2.73	3.28	2.70	2.90
10%	3.16	3.90	3.50	3.52
15%	4.12	4.90	4.15	4.72
20%	5.56	5.45	5.82	5.61

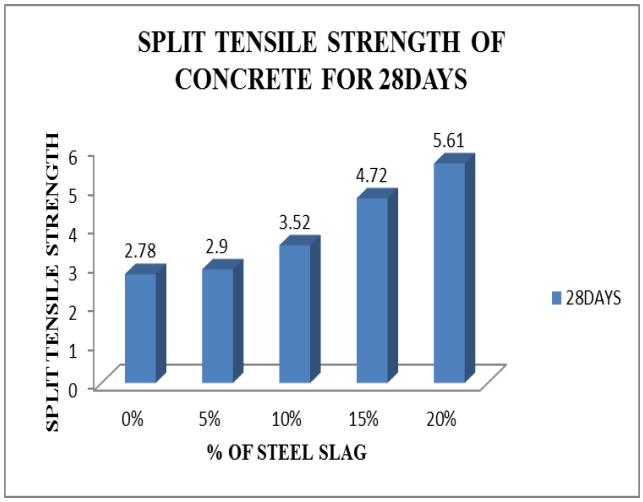

Fig. 4 Comparison of compression strength for 28 days.

VI. CONCLUSION

From the test result the following conclusions were drawn It included that, when the steel slag added to the sand in different percentage (5%, 10%, 15%, 20%), the strength of concrete will increase depend upon the steel slag added. When percentage of steel slag added to the concrete increases the strength of concrete gradually increases. Steel slag concrete increases the compressive strength & tensile strength effectively. But availability and crushing cost is high for waste steel slag. So we cannot use steel slag as the replacement material for fine aggregate effectively.

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