

Study Of Strength Properties Of Concrete By Partial Replacement Of Fine Aggregate By Steel Slag

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Abstract- In this paper, study of strength of concrete by partially replacing fine aggregate with steel slag. This study is done because of scarcity of fine aggregate and it also reduces waste disposal. In this compressive strength, flexural strength and tensile strength. Steel slag were added in varying percentages of 10%, 20% and 30%. Six cubes were casted for compressive strength of concrete at age of 7 days and 28 days. Three cylinder and prism were casted for split tensile and flexural strength of concrete at age of 28 days. The results indicated that use of steel slag reduces usage of natural fine aggregates, waste disposal and also gives strength.

Keywords- steel slag, fine aggregate, flexural, tensile, compressive

I. INTRODUCTION

Steel slag is a by-product obtained from melting steel scrap from the impurities and fluxing agents, which form the liquid slag floating over the liquid steel in arc or induction furnaces or other melting units. Waste management is one of the most common and challenging problem in the world. The steel making industry has generated substantial solid waste. Steel slag is a residue obtained from steel making operation. Now-a-days using waste as an alternative for concrete mixtures. This is very helpful to reduce waste disposal, its area and environment pollution.

SALIENT FEATURES OF THE PROJECT:

- Reduces waste disposal
- Reduces usage of fine aggregate
- Low cost
- Increased strength
- Reliable quality

II. EXPERIMENTAL INVESTIGATION

Properties of materials used in this investigation were determined by testing of cement, fine and coarse aggregate. The detail of the test results are given below.

Cement:

Type	:	OPC
Specific gravity	:	3.15
Fineness of cement	:	2%
Consistency	:	26%

Fine aggregate:

Specific gravity	:	2.61
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Coarse aggregate:

Specific gravity	:	2.67
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Steel slag:

Specific gravity	:	2.93
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Table 1: Mix proportion for M30 grade concrete

Material for M30 concrete	Weight of materials for 1m ³ concrete
OPC	438 Kg
Fine aggregate	690.6 Kg
Coarse aggregate	1063.72 Kg
water	197 litres
Water cement ratio	0.5

III. RESULTS SLUMP VALUES FOR MIXES WITH ADDITION OF STEEL SLAG

Table 2: Slump values for various mixes

Grade of concrete	% of steel slag	Slump value
M30	0%	75mm
	10%	70mm
	20%	63mm
	30%	55mm

COMPACTION FACTOR FOR VARIOUS MIXES

Table 3: Compaction factor values

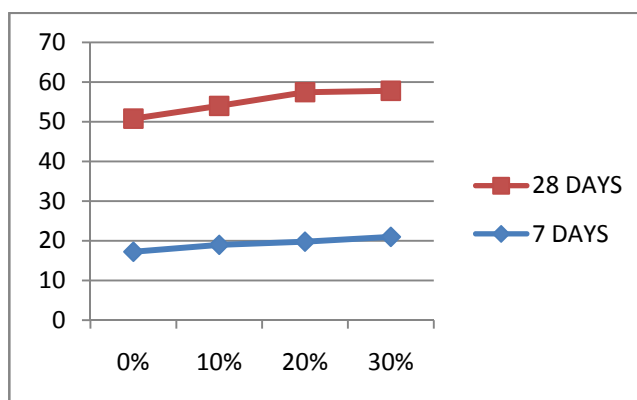
Grade of concrete	% of steel slag	Compaction factor
M30	0	0.81
	10	0.84
	20	0.85
	30	0.83

COMPRESSIVE STRENGTH FOR VARIOUS MIXES

Table 4 : Comparison of conventional mix vs steel slag mix

Grade of concrete	% of steel slag	Compressive strength (N/mm ²)	
		7 days	28 days
M30	0	17.23	33.55
	10	18.99	35
	20	19.78	37.67
	30	21	39.4

Graph 1: Compressive strength of conventional mix vs % of steel slag



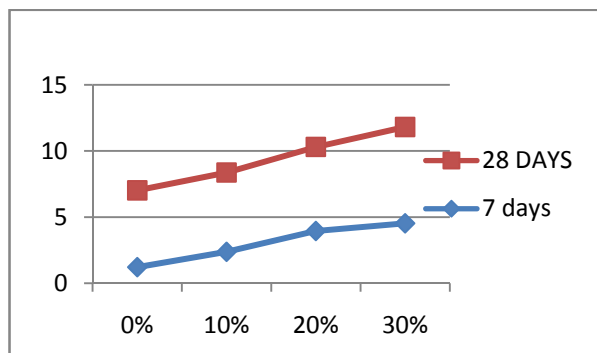
SPLIT TENSILE STRENGTH FOR VARIOUS MIXES

Table 5: Split tensile strength of conventional mix vs steel slag mix

Grade of concrete	% of steel slag	Split tensile strength (N/mm ²)	
		7 days	28 days
M30	0	1.22	5.8
	10	2.38	5.99

M30	20	3.96	6.35
	30	4.54	7.28

Graph 2: Split tensile strength of conventional mix vs % of steel slag

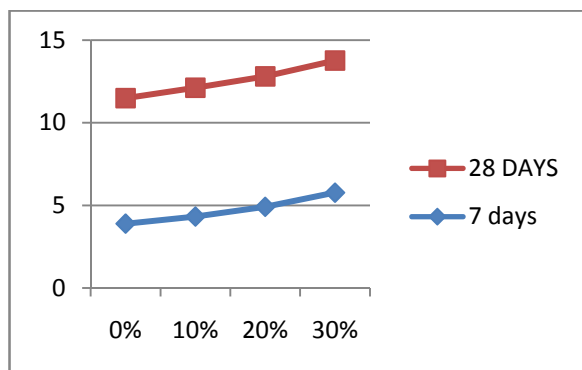


FLEXURAL STRENGTH FOR VARIOUS MIXES

Table 6: Flexural strength of conventional mix vs steel slag mix

Grade of concrete	% of steel slag	Flexural strength (N/mm ²)	
		7 days	28 days
M30	0	3.89	7.6
	10	4.32	7.8
	20	4.91	7.9
	30	5.77	8.0

Graph 3: Flexural strength of conventional mix vs % of steel slag



IV.CONCLUSION

The following conclusions are presented based on experimental results from the present investigation.

1. The compressive strength values are increase slightly with increasing of steel slag.
2. The split tensile strength values are increasing slightly with increase of steel slag.
3. From the result of compressive strength test, split tensile test and flexure test strength of M30 grade concrete increases by partially adding steel slag.

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