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Hypo Sludge as Construction Material

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Abstract: In order to make concrete industry sustainable, the use of waste materials in place of natural resources is one of the best approaches. Paper mill sludge is a major economic and environmental problem for the paper and board industry. An enormous quantity of waste paper sludge is generated all around the world. In India, 0.7% of total urban waste generated comprises of paper sludge. This project summarize the behaviour of concrete with the hypo sludge by replacement of cement in the range of 10%. 20% and 30% which may help to reduce the disposal problem of sludge and enhance the properties of concrete and other concrete product. A concrete mix of M25 proportion made with partial replacement of hypo sludge. Compression test and split tensile were carried out to evaluate the strength properties of concrete at the age of 7,14 and 28 days

Keywords: Reduce disposal cost and pollution problem, To develop profitable building material

I. INTRODUCTION

Introduction Human activities on the earth produces inconsiderable quantity of waste more than 2500 million tonnes per year including industrial and agricultural waste from rural and urban societies. There are various waste material like rice husk, quarry dust, crumbled rubber, sewage sludge ash fly ash, fly ash based geo polymer, ground granulated blast furnes slag, pumice fine aggregate and also concrete waste which can be used as a replacement to cement-concrete. This provides us the low cost light weight and eco-friendly construction product. Use of waste material also reduces the problem of land filling, environmental Health concern. This will also prove to be economical building material. In order to make concrete industry sustainable the use of waste material in place of natural material is one of the best approach. In our project we are going to use paper mill sludge and fly ash as a material which can be used as a replacement since it contain aluminum (Al), magnesium (Mg), silica (Si) and calcium (Ca) whose oxides are largely used in concrete industry. Thus to reduce disposal and pollution problem emanating from industrial waste, It is essential to develop profitable building material from this sludge

II. EXPERIMENTAL MATERIALS

Hypo sludge:- hypo sludge contains, low calcium and maximum calcium chloride and minimum amount of silica. Hypo sludge behaves like cement because of silica and magnesium properties. This silica and magnesium improve the setting of the concrete. Hypo sludge passing from 90u sieve was used.

Cement:- The most common cement used is an ordinary Portland cement. The ordinary Portland Cement of 53 grade conforming to IS: 12269 is used.

Course aggregate:- The fractions from 20 mm to 4.75 mm are used as coarse aggregate. The Coarse Aggregates from crushed Basalt rock, conforming to IS: 383 are used. Course a passing from 20mm and retained on 12.5mm sieve was used.

Fine aggregate:- The fractions from 4.75 mm to 150 micron are termed fine aggregate The river sand and crushed sand is use in combination as fine aggregate conforming to the requirements of IS: 383. Fine aggregate passing from 4.75 mm and retained on 2.36mm sieve was used.

Water:- Water is an important ingredient of concrete as actually participates in the chemical reaction with cement since it helps to from the strength giving cement gel, quantity and quality of water is required to be looked into very carefully.

III. METHODOLOGY

The exact amount of concrete ingredients were weighed and mixed thoroughly in laboratory concrete mixer till the consistent mix was achieved. The standard cube of 150*150*150 size of steel mould is used for Compression strength Test. Cylinder of diameter 150mm and height 300mm is used for split tensile Test compressive and split tensile strength were carried out on hardened concrete at 7,14 and 28 days. The average strength was calculated acceptance criteria using IS 456-2000 is followed and the average values are illustrated in tables.

TABLE I

Mix Design: - As per IS: 10262-2009 mix design was prepared for M25 grade. TABLE 1 shows mix design proportion.

Sr No.	Type of mix	w/c ratio	Fine aggregate	Course aggregate	cement	sludge
1	0%	0.5	1.38	2.25	1	0
2	10%	0.5	1.38	2.25	0.81	0.09
3	20%	0.5	1.38	2.25	0.72	0.18
4	30%	0.5	1.38	2.25	0.63	0.27

Compression strength Test: Compression strength Test was carried out on Compression testing machine of 3000KN. Three cubes of each batch were subjected to this test.

TABLE II

Type of mix	Weight of concrete cube (kg)			Compressive strength of concrete cube(N/mm ²)		
	7 days	14 days	28 days	7 days	14 days	28 days
0% sludge	8.80	8.76	8.90	18.88	22.66	25.09
10% sludge	8.32	8.44	8.53	12.84	15.77	22.17
20% sludge	8.14	7.94	8.01	5.27	8.64	11.04
30% sludge	7.44	7.40	7.44	0.8	1.58	3.12

A. Split tensile test

TABLE III

Type of mix	Weight of concrete cylinder			Split tensile strength of concrete cylinder		
	7 days	14 days	28 days	7 days	14 days	28 days
0% sludge	13.70	13.60	13.74	2.40	2.68	3.39
10% sludge	12.86	12.90	12.87	1.81	2.05	2.88
20% sludge	12.64	12.70	12.74	0.84	1.13	1.90
30% sludge	12.22	12.20	12.21	0.24	0.28	0.48

IV. CONCLUSION

Compressive strength reduces when cement replaced by hypo sludge. As hypo sludge % increases Compressive strength decreases but results are satisfactory. Use of hypo sludge in concrete can save disposal cost of paper industry. Split tensile strength reduces when cement replaced by hypo sludge. As hypo sludge % increases Compressive strength decreases but results are satisfactory.

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