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EXPERIMENTAL STUDY ON FLY ASH AND STONE DUST BY PARTIALLY REPLACED IN REINFORCED CONCRETE BY CEMENT AND SAND

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Abstract –*In our country, the construction group requires a lot of materials such as sand, cement, aggregates and water. In every era of mankind development moving further and future development aspects of such great causes like buildings, irrigation canals, bridges etc. are basic needs for easier way of comfort and transportation of goods and medical supplies. More the development is obtained can be beneficial to humans in time saving and faster ways of reaching destiny of own choice. But everything which is consumed have some drawbacks such as excessive use of nature can cause global warming and vast environmental damages by using cement and river sand. To save the environment and reduce the price by alternative materials such as fly ash and Stone Dust an innovative idea for such further generation by partially replacing cement by fly ash and river sand by Stone Dust. Since the replacement Fly ash is used to replace cement in percentages of 6%, 12 percent, 18 percent,. Sand is replaced by Stone Dust in percentages of 8%, 18%, 28%, respectively. This experiment is carried out by flexural and compressive strength test are obtained.*

***Key Words*: Fly ash, Stone Dust, Compression Test, Flexural Test etc**

1. INTRODUCTION

Concrete is the most common material used in many construction fields. Concrete is required for all types of construction projects such as tunnels, bridges, high-rise buildings, and so on. Given the significance of concrete in construction, the replacement should be a comparable alternative. Each material has its own significance in terms of overall construction performance. Concrete requires ingredients such as cement, sand, aggregates, and so on. As natural resources are depleted at a faster rate, CO2 levels in the atmosphere rise. River sand, like cement, plays an important role in concrete strength. So, fly ash replaces cement and river sand, and Stone Dust artificially produced materials are partially replaced, and this study performance is carried out on

1.1 MATERIALS

1.1.CEMENT

As per IS 8112:1989 oridnary Portland cement 53 grade (OPC-53). Cement used was of ultra tech cement. The properties of cement are given table below.

Sr.No	Property	Unit	Value obtained	Value as IS 8112:1989
1	Normal consistency	%	30	-
2	Initial setting time	Min	55	Not less than 30 min
3	Final setting time	Hrs	8	Not more than 600 min
4	Fineness	%	8	Not more than 10% residue
5	Sp. Gravity	-	3.0	-

1.2. FINE AGGREGATE

As per code IS 383:1970 are referred for locally procured. Physical properties of sand is given table below.

Physical Properties of Fine Aggregate

Sr.No	Property	Value
1	Type	Natural sand
2	Sp. Gravity	2.60
3	Fine modulus	2.5
4	Zone	2

1.3. COARSE AGGREGATE

Maximum size of coarse aggregate is 20mm were used. IS 383:1970. Coarse aggregate properties are given table below.

Physical Properties of Coarse Aggregate

Sr.No.	Property	Value
1	Shape	Angular
2	Fine modulus	-
3	Sp. Gravity	3.0
4	Max. Size	20mm
5	Water absorption	0.7%

1.4. FLY ASH

Coal thermal plants produce fly ash, which is a fine grey powder in the shape of spherical or glassy bits. Fly ash has pozzolanic properties. It reacts with lime from cement compounds. Supplementary cementitious material is what it's called. 2.1 The specific gravity is discovered.

Properties of Fly ash

Sr.No	Property	Value
1	Color	Grey
2	Particle size	-
3	Specific surface	-
4	Sp. Gravity	2.1

1.5. STONE DUST

Stone dust is created when stones are crushed together. Also discovered in quarries during stone blasting. Stone dust is often a white sand kind that is obtained from M-sand and dust. Stone quarries collect stone dust, which is then supplied to construction projects. Stone dust is a naturally occurring substance that is readily available nowadays. Large amounts are used in the construction industry. It is preferred in all types of building because of its inexpensive cost. Stone dust resembles sand. The same strength as sand can be carried out. For this experiment, a 4.75mm sieve was used. The properties of Stone Dust are below table.

Properties of Stone Dust

Sr.No	Property	Value
1	Color	Grey
2	Form	Dust
3	Sp. Gravity	2.50

1.6. WATER

Water is the most important element in concrete and in construction. Water is responsible for hydration in cement concrete. The quality and quantity should be determined and carefully observed for helping in generating strength and durability in cement. Nominal consumption of water is suitable for cement concrete.

2. MIX DESIGN AND PROPORTIONS

As per provisions IS 10262:2009 Mix design of M25 are made. The process of mix by adding water cement ratio. Following table below is obtained in research.

Mix Design Proportions

	Cement	Water	FA	CA	W/C
Ratio	1	0.5	2.0	3.0	0.55

Proportions above are considered by using fly ash and Stone Dust as per code, the different proportions are obtained in research. Water cement ratio is considering 0.55 for each every proportion.

Mix Proportions

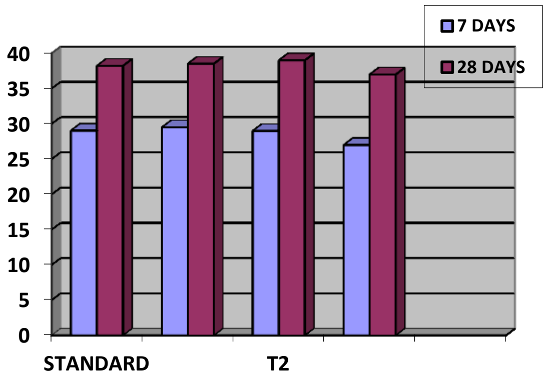
Material	Cement	Fly ash	Stone Dust	Fine aggregate	Coarse aggregate
Standard	100%	0%	0%	100%	100%
T1	94%	6%	8%	92%	100%
T2	88%	12%	18%	82%	100%
T3	82%	18%	28%	72%	100%

3. METHODOLOGY

3.1 COMPRESSION TEST:

The strength to resist deformation caused by external forces and measured as per IS code for compressive strength for materials. Casting cubes of 150x150x150mm size. Cubes are prepared and cured for 7 and 28 days for compressive strength. Samples were tested in compression machine of 200KN. Loads at which failures occurs

Mix % of FA & SD	7 days (N/mm^2)	28 days (N/mm^2)
0% of FA & 0%SD	29.04	38.23
6% of FA & 8%SD	29.50	38.53
12% of FA & 18%SD	29	39
18% of FA & 28%SD	27	37

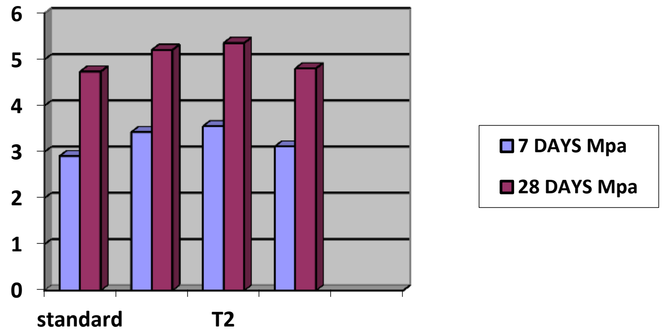


Total 30 cubes were examined for all proportions. 6 cubes were casted for standard proportions. For Each proportion 3 cubes were casted for following 7 and 28 days. Each cube were cured in water tank for respective days and dried for 2 hrs after taking out from tank. Test is carried out.

3.2. FLEXURAL STRENGTH

150X150X700mm size of beams was taken. Beams were properly cured for 7 and 28 days as per IS: 516-1959. 1 standard beam was casted and other 4 beams were compared for flexural strength. The test was conduct on universal testing apparatus. Below graph shows comparison between different mix for 7 and 28 days of beams.

Mix % of FA & SD	7 days (N/mm^2)	28 days (N/mm^2)
0% of FA & 0%SD	2.91	4.74
6% of FA & 8%SD	3.23	5.21
12% of FA & 18%SD	3.56	5.36
18% of FA & 28%SD	3.12	4.81



4. CONCLUSION

The investigations carried out as per research conclusion are;

Using fly ash can reduce weight of cubes. Thus, dead load of concrete can be reduced.

The price of fly ash is pretty low than cement up to 8% can be replaced.

Stone Dust can be alternative of river sand upto 12% and water consumption 24% is more

It affects workability, strength and durability.

Flexural strength gives low result when fly ash increased by 8% after replaced by cement.

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