ISSN XXXX XXXX © 2018 IJESC

Research Article Volume 8 Issue No.4

Limited Restoration of Fly ash with Cement in Rigid Pavement

Siva Ranjani .S[1], Jothi .G[2] , Abbas .R[3], Mohamed Ibrahim .M[4], Imthiyaz Ahamed .K[5], Ajith Kumar .A[6]
Assistant Professor[1, 2], BE Student[3, 4, 5, 6]
Department of Civil Engineering
Dhaanish Ahmed College of Engineering, Tamil Nadu, India

Abstract:
This paper discuss about the use of fly ash in the concrete rigid pavements. There is a vast area covered by industrial waste such as fly ash, so using this waste in road construction can dispose this waste and also beneficial in minimize pollution in environment due to this waste The partial replacement does not affect the properties of concrete. Fly ash contains reactive constituents and un reactive crystalline matter. Reactive matter gives hydrated strength and un reactive materials give packing strength. Properties of fly ash and cement are compared which are used as sub grade.. It is good if common industrial wastes like fly ash can be considered as an alternative option to mix in concrete materials for highway construction with economical solution.

Keywords: Fly ash, Concrete, Crystalline, Hydrated strength, packing strength

1. INTRODUCTION

Every ton of cement production releases approximately 7% of CO_2 to the environment. Fly ash being one of the largest produced by product and disposal of it is an major issue even with present technology [1]. Fly ash also contains reactive constituents and uncreative crystalline matter [2]. So we have used fly ash as partial replacement for cement also the reactive constituents reacts with lime and offers hydrated mineral to impart strength and un reactive crystalline in fly ash give packing effect to concrete [3]. By considering all its strengthening nature towards concrete we have used fly ash as partial replacement for cement in concrete [4]. By partial replacement of cement with fly ash reduces the binding nature of concrete and also it increases the setting and curing time of concrete [5]. So we have added accelerating admixture to reduce the initial setting time and curing time and also increase the binding nature of the concrete. The accelerating admixture is calcium chloride which would be efficient when added in 2 or below percentage.

1.1 CONCRETE

Concrete is composed of fine and coarse aggregate bonded together with a fluid. Most concretes used are lime-based concretes such as Portland cement other hydraulic cements such as calcium aluminates cements asphalt concrete is frequently used for road surfaces. It is a type of concrete where the cement material is bitumen, and polymer concretes are sometimes used where the cementing material is a polymer.

1.2 FLYASH

Fly ash, otherwise called "pummeled fuel cinder" in the United Kingdom, is a coal ignition item that is made out of the particulate (fine particles of fuel) that are driven out of coal-let go boilers together with the vent gases. Fiery debris that tumbles to the base of the kettle is called base powder. In present day coal-terminated power plants, fly fiery remains is for the most part caught by electrostatic precipitators or other molecule filtration hardware before the vent gases come to the fireplaces. Together with base fiery debris expelled from the base of the kettle, it is known as coal powder. Contingent on the source and cosmetics of the coal being scorched, the segments of fly slag differ significantly, yet all fly fiery remains incorporates considerable amounts of silicon dioxide (SiO2)both undefined and crystalline, aluminum oxide (Al2O3) and calcium oxide(CaO), the primary mineral mixes in coal-bearing rock strata.

2. OBJECTIVE

This technique is halfway substitution of fly ash in bond with quickening admixtures in concrete in a situation well disposed path accomplished by typical concrete cement. Since fly cinder is non-biodegradable substance and no proficient strategies accessible to arrange them, so we pick fly fiery remains as elective substitution for bond in concrete. On considering past investigations and examination on fly cinder we pick class C fly fiery debris as a result of lower misfortune on start than class F fly powder and it increments compressive quality of cement.

3. METHODOLOGY

For fly ash concrete, materials are collected and their physical properties also defined by conducting experiments. Materials are weighted in proper way and as required for mixing. Calcium chloride powder is added about 1.5% by the weight of cement and fly ash is replaced with cement of about range 25%-30% by the weight of cement. Concrete mixer moulded in cube sized 150*150*150mm^3.Then fly ash concrete mixer is prepared and casted for testing it on compressive strength and tensile strength. After 24hours moulds were removed. And then concrete cubes were cured normally in fresh water for 7 to 28 days at room temperature. After curing process concrete cubes are tested in laboratory. Totally, 6 cubes were moulded in which 3 cubes tested after 7 days and rest 3 cubes tested after 28 Chloride powder is added about 1.5% by the weight of cement and fly ash is replaced with cement of about range 25%-30% by the weight of cement. Concrete mixer moulded in cube sized 150*150*150mm^3.Then fly ash concrete mixer is prepared and casted for testing it on compressive strength and tensile strength. After 24hours moulds were removed. And then concrete cubes were cured normally in fresh water for 7 to 28 days at room temperature. After curing process concrete cubes are tested in laboratory. Totally, 6 cubes were moulded in which 3 cubes tested after 7 days and rest 3 cubes tested after 28 days.

4. EXPERIMENTAL STUDY

4.1 MIX DESIGN

In this design M20 grade of concrete is used and water cement ratio of 0.47 is mixed with the coarse aggregate and fine aggregate. Fly ash is also included in the design and ratio is obtained. IS10262:1982 code book is used.

4.2 Fresh Concrete Test

Fresh concrete tests like slump cone test and flow table test is conducted and results are obtained. The values obtained are as per IS code.

4.3 Hardened Concrete Test

As per IS CODE 456:2000 the hardened concrete test for compressive strength and tensile strength were taken. Results are given below.

Table.1. Compressive strength of concrete

Percentage of Materials Added	Specimen	7DAYS Strength N/mm²	14 Days Strength N/mm²	28 Days Strength N/mm²
20%	Cube	19.25	26.18	31.12
25%	Cube	18.675	23.62	28.585
30%	Cube	18.10	21.06	26.05

Table 1 describes compressive strength of concrete after the partial replacement of cement with fly ash and depicts the strength attained by the cube for 7 days, 14 days & 28 days. The percentages are 20%, 25% & 30%.The strength obtained for 20% cube on 7 days is 19.25 N/mm^2, 14 days is 26.18 N/mm^2, and 28 days is 31.12 N/mm^2. The strength obtained for 25% cube on 7 days is 18.675 N/mm^2, 14 days is 23.62 N/mm^2, and 28 days is 28.585 N/mm^2. The strength obtained for 30% cube on 7 days is 18.10 N/mm^2, 14 days is 21.06 N/mm^2, and 28 days is 26.05 N/mm^2.

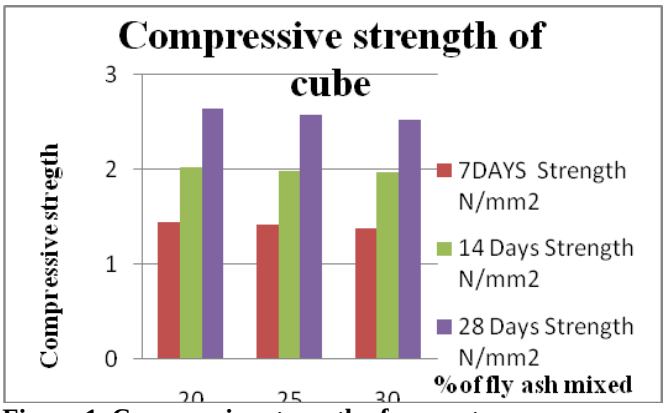

Figure.1. Compressive strength of concrete

The above figure shows the percentage of Fly ash added in concrete. It represents compressive strength of concrete for 7 days, 14 days and 28 days strength.

Table.2. Tensile strength of concrete

Percentage of Materials Added	Specimen	7DAYS Strength N/mm²	14 Days Strength N/mm²	28 Days Strength N/mm²
20%	cylinder	1.45	2.02	2.64
25%	cylinder	1.42	1.99	2.58
30%	Cylinder	1.38	1.97	2.53

Table 2 describes the tensile strength of concrete after the partial replacement of cement with fly ash and depicts the strength attained by the cylinder for 7 days, 14 days & 28 days. The percentages are 20%, 25% & 30%.The strength obtained for 20% cylinder on 7 days is 1.45 N/mm^2, 14 days is 2.02 N/mm^2, and 28 days is 2.64 N/mm^2. The strength obtained for 25% cube on 7 days is 1.42 N/mm^2, 14 days is 1.99 N/mm^2, and 28 days is 2.58 N/mm^2. The strength obtained for 30% cube on 7 days is 1.38 N/mm^2, 14 days is 1.97 N/mm^2, and 28 days is 2.53 N/mm^2.

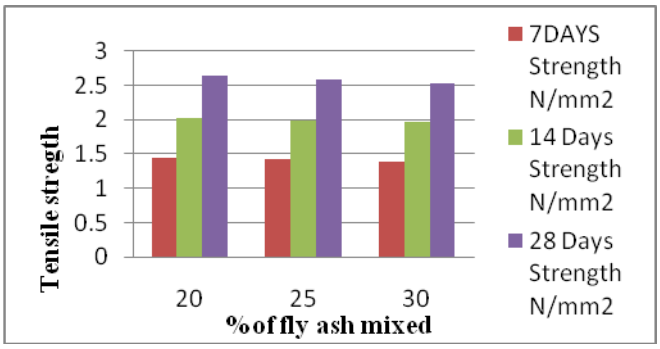

Figure.2. Tensile strength of concrete

The above figure shows the percentage of Fly ash added in concrete. It represents compressive strength of concrete for 7 days, 14 days and 28 days strength.

5. CONCLUSION

Fly ash takes longer time to settle down as compare to ordinary Portland cement. Cement paste settle down in 45 to 50 minute. On other hand as amount of fly ash increased its settling time also increased. Fly Ash minimizes the greenhouse gases and lead to sustainable construction. It helps the concrete mixture achieve its maximum strength faster. This shows that fly ash can be used effectively as material in concrete road pavement.

REFERENCES

[1]. Tara Sen and Umesh Mishra, "*Usage of Industrial Waste Products in Village Road Construction"* International Journal of Environmental Science and Development, Vol. 1, No. 2, June 2010, ISSN:2010-0264.

[2]. International Journal of Engineering Trends and Technology (IJETT) – Volume 12 Number 5 – Jun 2014.

[3]. International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 4, Issue 10, October 2014).

[4]. Jordan Journal of Civil Engineering, Volume 5, No. 2, 2011 by A. A. Elsayed .

[5]. Rakesh soni, International Research journal of Engineeering and Tecnology (IRJET) Volume:2 Issue :05, August 2015.

[6]. Tapeshwar Kalra & Ravi RanInternational Journal of Latest Research In Engineering and Computing (IJLREC) Volume 3, Issue 2 . VOLUME: 3 APRIL- 2015

[7]. Anjali Yadav, Nikhil Kumar Yadav SSRG International Journal of Civil Engineering (SSRG-IJCE) – volume 4, Issue 1 – January 2017

[8]. Tomas U. Ganiron Jr International Journal of Advanced Science and Technology Vol.60, (2013).

[9].Alok Kumar, Shubham Jain, Shubham Gupta, Sonaram, Sanjay Merawat SSRG International Journal of Civil Engineering (SSRG-IJCE) – volume 3 Issue 5 – May 2016

[10]. Afaf Ghais, Duaa Ahmed, Ethar Siddig, Isra Elsadig, Samah Albager International Journal of Geosciences, 2014.

[11]. IS 10262:2009 for Mix Design Calculation.

[12]. IS 456:2000 (Plain Concrete and RCC Concrete).