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CONTENTS

CONTENTS

Experimental Investigations on Flowable Fly ash Bricks

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Abstract— **This paper presents an experimental study on flowable fly ash bricks. In this study, an attempt has been made to examine the feasibility of adopting flowable slurry concept in bricks production. The flowable fly ash bricks produced from fly ash, cement and crushed sand. The essential properties such as compressive strength, water absorption, density and efflorescence of flowable fly ash bricks were determined. Further, compressive strength and flexural bond of flowable fly ash brick masonry prism are evaluated. The test results reveal that flowable fly ash brick fulfilled the requirements of bricks.**

Key words: Flowable, fly ash bricks, crusher sand, efflorescence.

I. INTRODUCTION

There is a continuous demand in construction activities and so also the demand for construction materials. Typically, the use of brick is inevitable in the construction. The traditional bricks depend on good quality clay. Huge amount of clay are extracted and used in the production of red bricks. However, the availability of raw material for red bricks is not sufficient to meet the present construction activities. Thereby, fly ash bricks as an alternative to red brick are emerged in the construction industry especially in India. Fly ash brick made from fly ash, lime and gypsum is introduced in the year 1991. The manufacturing process of fly ash bricks does not require the thermal treatment and also the combustion of any fuel. The technologies are eco friendly, reduces solid waste and dust in the nature. The cost of fly ash brick is comparable with red brick. India consume about 200 billion tones bricks, exhausting approximately 340 billion tones of clay every year and about 5000 acres of top soil land is made unfertile for a long period. The Government is seriously concerned over soil erosion for production of massive quantities of bricks, in the background of enormous housing needs. The excellent engineering property and durability of fly ash brick enlarges its scope for application in building construction and development of infrastructure, construction of pavements, dams, tanks, under water works, canal lining and irrigation work etc. Enormous quantities of fly ash are available in and around thermal power stations in all the states. The demand of bricks could be met by establishing small units near thermal power stations and to meet the local demand with less transportation costs. Therefore laboratory investigation and field applications are attempted using different industrial by-products in the global scenario. Further Duggal & Srivastava (1994) attempted to develop Fly ash-Lime-Soil bricks with a mix proportion of 60% to 80% of fly ash, 15% to 40% of lime and 5% to 20% of soil. Ritwik Sarkar et al (2007) developed bricks using washed clay with pond ash and fly ash. Fly ash up to 80% can replace clay in brick with properties superior to conventional red clay brick. Pond ash, up to 40% replacement can also be made without compromising the quality of brick. Sengupta (1993) developed Fly ash-Lime bricks with major quantity of fly ash, lime and an accelerator and a catalyst. Sunil kumar (2002) suggested that FaL-G brick could be used as filler media for walls. In other aspect, self-compacting concrete (SCC) is being popularized due to its numerous inherited benefits. SCC technology is considered as an energy conservation technique in construction industry as it eliminates electricity requirement for compaction of concrete. Similar to self-compacting concrete, if self compacting brick is manufactured without adopting hydraulic/mechanical presses over fly ash bricks for compaction, it could save electricity power. In this viewpoint the proposed work aimed to develop flowable fly ash bricks using fly ash, cement and crushed sand and to assess the feasibility of flowable slurry concept in brick production.

II. MATERIALS

Class F Fly ash, ordinary Portland cement (OPC), crushed sand and water was used in the present study. The fly ash is obtained from Mettur thermal power plant. The fly ash is in conformity with the general requirements of pozzolana. Ordinary Portland cement (OPC) 53 grade satisfied IS: 8112 – 1989. Crushed sand with a fineness modulus of 2.49 and specific gravity 2.74 is used as filler material.

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CONTENTS

Experimental Study on Flexural Behaviour of Chemically Activated High Volume Fly Ash Reinforced Concrete Beam

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Abstract: **In the present study an attempt has been made to investigate the flexural behaviour of chemically activated high volume fly ash concrete (AHVFAC) with crushed sand as fine aggregate. Three series of mix proportions were made with different cement content. In each series, the optimum percentage of fly ash to replace cement was determined based on the compressive strength of high volume fly ash concrete (HVFAC). NAOH was used as an activator to boost up the strength of HVFAC at earlier age. Flexural behaviour like load, defection, ductility, stiffness and energy absorption was studied and the results are compared with control beam and HVFAC beam. The test results indicate that the flexural behaviour of AHVFAC has a significant spectacle over HVFAC.**

Index Terms:- Activated high volume fly ash, crushed sand, flexural behaviour, defection ductility, energy absorption.

I. INTRODUCTION

Concrete is known as high volume fly ash concrete (HVFAC) when fly ash is used more than 50% for replacement of cement by mass. High volume fly ash concrete leads to minimise the cement content and reduce the demand of virgin materials. Additionally, use of fly ash reduces the land pollution due to land filling. Fly ash concrete attains the required compressive strength at later age only. Being pozzolanic material it takes longer time to reach the desired strength as compared to conventional concrete. This can be overcome by using alkaline activators with fly ash to increase the rate of hydration of high volume fly ash concrete at earlier stage. Several studies were made on activation of fly ash concrete with different activators. Palomo et al (1999) mentioned that utilization of alkaline soluble silicate activator will accelerate the rate of reaction [1]. Fan et al (1999) carried out studies on the activation of fly ash using Ca(OH)2 and Na2SiO3. It is found that addition of calcium hydroxide corrode the protective glassy layer on the surface of the fly ash particle and thereby expose the reactive portion of the particle. Also, corrosive action of the Ca(OH)2 is found to be higher at the ratio of 1:3 of Ca(OH)2 and fly ash. The addition of Na2SiO3 (3.91%) breaks the silica - alumina glassy chain. It increases pH value due to hydrolysis and also produces NAOH. This method of activation considerably increased the reactivity of the fly ash and reduced the setting time when mixed with ordinary Portland cement [2]. Further, the effect of CaCl2 and Na2SO4 was examined on the pozzolanic reaction in a blend of lime-pozzolana (80% of volcanic ash and 20% of hydrated lime [3]. Manjit Singh, and Mridul Garg, (1995) carried out investigations on the preparation of cementations binder using fly ash and other industrial wastes. It has been noticed that high volume fly ash concrete (FA: 75, OPC: 25) with CaCl2 as an activator exhibited early strength gain but strength after 28 days was not affected appreciably contradicting the findings of Caijun Shi, (1998) [4]. Activated fly ash concrete gave 50% higher compressive strength than to fly ash concrete at 28 days of curing. The reason for higher material strength is due to the formation of C-S-H gel by virtue of chemical activation of fly ash. Stable glass beads of fly ash particles are destroyed by alkaline chemicals resulting in closer link between particles resulting in confinement leading to higher strength [5]. The compressive strength can be improved by addition of small amount of NAOH with cementitious material [6]. In fact, extensive studies were carried on strength properties and hydration of chemically activated fly ash. However, flexural behaviour study on HVFAC using chemical activators is necessary to check the structural performance. On the other hand, several studies on flexural behaviour of fly ash concrete were carried by many researchers. Inclusion of fly ash up to 20% in concrete has shown good improvement in flexural strength. The crack width under service load was within the permissible limit as per Indian standard (IS 456:2000). Load deflection study gave similar post crack behaviour in comparison to control reinforced cement concrete (RCC) beams. In case of fly ash concrete beams, ductility values were found to increase while the inclusion of fly ash had a minor effect on the beam stiffness [7]. No flexural cracks were appeared on the surface of the reinforced cement concrete beams with 50% fly ash [8]. Besides, it was demonstrated that the ultimate moment capacity of fly ash concrete beam is 16% less than the ordinary concrete beam when tested at 28 days. But it was observed that 23 % of increase at 75 days compared to 28 days [9]. From the several reviews it is understood that HVFAC can be activated by alkaline activators to increase the earlier strength of concrete. While substantial research work was carried out on chemical activation of fly ash cement system, flexural behaviour of AHVFAC are found a quite few. Further, use of

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TABLE OF CONTENTS

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BOTTOM ASH BASED GEOPOLYMER CONCRETE PAVER BLOCKS

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Abstract— A study on bottom ash based geopolymer concrete (BAGPC) for paver block was attempted in the present work. Bottom ash was used as the source material. The alkaline liquid was a combination of sodium silicate and sodium hydroxide. Optimum mix design for M30, M35, M40, M50 and M55 grade were arrived based on alkaline liquid to solids ratio, molarity of sodium hydroxide and curing mode. Properties such as compressive strength, split tensile strength, flexural strength, water absorption and abrasion resistance of BAGPC paver block was determined. Further, durability studies on bottom ash geopolymer mortar were carried out against chemical resistance. The results showed that lower grade BAGPC paver block had attained required strength at the age of 3 days under ambient curing mode while higher grade BAGPC paver block achieved at the age of 28 days under heat curing mode. The water absorption of BAGPC paver block was lower for all the grades. It was also found that BAGPC paver block had excellent resistance against abrasion and chemical environment.

Index Terms— bottom ash, geopolymer concrete, paver blocks, abrasion resistance, chemical resistance

I. INTRODUCTION

Cement manufacturing is an energy intensive process and releases a large amount of greenhouse gases into the atmosphere. As per the statistical data, cement industry contributes about 7% weight of the total carbon dioxide emissions [1-2]. Therefore, meticulous attempt is being taken by several researchers to develop alternative cementing materials instead of Portland cement. Geopolymer binder is one such alternative binder to cement which is synthesized by mixing aluminosilicate material and high alkali solutions. It utilizes pozzolanic materials such as fly ash, GGBS, metakaolin etc., as aluminosilicate source to react with high alkali solutions of sodium or potassium based. Geopolymers have many advantages such as good compressive strength and resistance to aggressive environment and long term durability [3-4].

Fly ash and bottom ash produced during the burning of coal in thermal power plant causes severe environment pollution in its disposal. Fortunately, coal fly ash is well acknowledged for several applications in construction industry owing to its beneficial properties.Use of fly ash as a supplementary material in cement concrete and in geopolymer concrete is abundantly available. While fly ash is extensively used by-product in the

construction field, ample utilization of bottom ash is very much limited.

Bottom ash possesses almost similar chemical composition of fly ash especially rich in silica and alumina content However, bottom ash is a porous, glassy, dark gray material with a grain size similar to that of sand (5-12). Being coarser, bottom ash as such cannot be used directly as a source material in geopolymer concrete. Fine bottom ash produces good strength than medium and coarse bottom ash. The strength of bottom ash geopolymer mortar progresses with the addition of small amount of flue gas desulfurization gypsum. Larger particle size reduces the dissolution of bottom ash in activator solution for this reason it does not take part in the reaction [13-16].

The concentration of NaOH solution is directly affecting the dissolution of the aluminosilicate material and thereby it affects the formation of the geopolymer framework. To attain a better dissolving ability in aluminosilicate particulates, a higher concentration of NaOH solution is required [17-19]. Higher concentration of sodium hydroxide seems to favor the corrosion of the glassy membrane and lead to higher compressive strength (20). Longer curing period and higher temperature improves the strength of the geopolymer concrete [21-24]. In contrast, few researchers mentioned that geopolymer concrete cured under ambient temperature is also feasible to produce the desirable compressive strength [25-28].

In the meantime, geopolymer precast concrete products such as culvert, sewer pipes, railway sleepers and wall panels are commercialized]29-33]. Moreover the study on geopolymer concrete paver blocks is very few. Paver blocks are widely used construction material. They are primarily investigated for low traffic volume to heavy volume traffic. A combination of bottom ash -GGBS geopolymer paver blocks for M30 and M35 grade revealed that compressive strength was achieved under ambient mode curing at 3 days [34]. The mixture of red mud - fly ash geopolymer concrete paver blocks

CONTENTS

EXPERIMENTAL STUDY ON STRENGTH AND DURABILITY OF CONCRETE WITH PARTIAL REPLACEMENT OF CEMENT BY CERAMIC WASTE MIXTURES

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ABSTRACT: Tile powder is one of the most active research areas that encompass a number of disciplines including civil engineering and construction materials.In the tile industry, about 15%-30% production goes as waste. This waste has been thrown to land fill create problem in present day. In this study the ordinary Portland cement has been replaced by crushed tile powder accordingly in the range of 0%,10%, 20%,30%,40%,50%by weight for M20 grade of concrete. For this purpose the tile concrete are tested and compared with conventional concrete .the following test are carried our i.e,compressive strength and durability test called acid attack and alkaline attack test.From the experimental result we have observed that compressive strength was increased in 30%,compared to conventional concrete.so the replacement of cement in concrete by ceramic waste will have major environmental benefits.

KEYWORDS: Tile powder, strength, compressive strength, durability performance

1. INTRODUCTION

The advantage of concrete technology can reduce the consumption of natural resources, which can be reused and find other alternatives. In India numbers of waste materials are produced by different manufacturing companies, thermal power plant, municipal solid wastes and other wastes. Solid as well as liquid waste management is one of the biggest problems of the whole world. Disposal of waste in to the land causes serious impact on environment. In India ceramic production is 100 million ton per year. The tile industry has about 15%30% waste material generated from the total production. This waste is not recycled in any form at present. The tile waste which is dumped in land filling and pit or vacant spaces causes the environmental and dust pollution which is dangerous for human health. Ceramic waste can be used in concrete to enhance its strength and other properties of concrete.

2. EXPERIMENTAL MATERIALS

2.1 Cement

Ordinary Portland cement of grade 53 was used for preparation of the concrete production. The properties of the cement is tested according to Indian Standard is shown in table 1.

Table.1.Properties of Cement

S.No	Test Conducted	Properties
1	Specific Gravity	3.26
2	Fineness Test	3.8
3	Standard Consistency Test	33
4	Initial Setting Time	32mins
5	Final Setting Time	375mins
6	Compressive Strength at 7 days	44.6N/mm^2
7	Compressive Strength at 28 days	54.8N/mm^2

2.2 Fine Aggregate

River sand passing through IS sieve of size 1.18 mm was used. The particle size distribution of fine aggregate was determined by sieve analysis. Indian standard code books of IS 2386:1963 part I, part II and part III were used to find the properties of sand. Table 2 shows the properties of fine aggregate.

2.3 Coarse Aggregate

The coarse aggregate is the strongest and least porous component in the concrete. Crushed coarse aggregate of maximum size of 20 mm is used. The properties of aggregate used in this work was carried out as per IS codes and reported in the table 2.

STRENGTHENING OF REINFORCED CONCRETE BEAM USING BASALT GEOGRID

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ABSTRACT: This paper presents the results of an experimental investigation on strengthening of reinforced concrete beams using Basalt Geo Grid. A total of three beam specimens of size 150*350mm and 700mm long were cast. Many reinforced concrete and masonry buildings are constructed annually around the globe. Infrastructure development is raising its pace. With this, there are large numbers of them which deteriorate or become unsafe to use because of changes in use, changes in loading, change in design configuration, interior building material used or natural calamities. Thus repairing and retrofitting of these structures for safe usage has a great market. There are several situations in which civil structure would require strengthening or rehabilitation work due to lack of strength, stiffness, ductility and durability. Beams, columns, plates may be strengthened in flexure through the use of Basalt Geo Grid bonded to their tension zone using epoxy resin as a common adhesive. An experimental study is carried out to study the changes in the structural behavior of R.C.C. beams wrapped with Basalt Fiber of different thickness, orientation and length to enhance the flexural and shear capacity of the beams along with the existing practice of doing the repair work. Experimental results indicates that substantial increase in ultimate strength of strengthened beams as compared to the control beam specimen. The shear span-to-depth ratio (L/d) is an important factor that actively controls the shear failure mode of beam and consequently influences on the shear strength enhancement.
KEYWORDS: Basalt Fiber, epoxy, retrofitting, rehabilitation

INTRODUCTION

Strengthening of structural elements such as beams and columns has become vital role now-a-day due to many unavoidable circumstances such as revised loading conditions, change in occupancy conditions and deterioration of existing structure due to environmental effects. Strengthening of structural elements by externally wrapped Basalt Geo Grid is very effective technique adopted successfully worldwide. Continuous Basalt fiber Geo Grid is made by impregnating Woven basalt fiber scrim with asphalt and then drying to be made. This basalt fiber concrete has the excellent resistance to deformation, the elongation at break is about 3.1%. It is the excellent construction material for reinforced cement and concrete, and it has the outstanding penetration resistance. It is reckoned for its excellentsound as well as heat insulation properties. It can be used under super-low temperature and prevents asphalt road surface from cracking. It have high tensile strength and low elongation. Basalt geo grid has no long-term creep, good thermal stability, good physical and chemical stability and has strong resistance to biological erosion and climatic changes.

LITERATURE REVIEW

Arul Gnanapragasam (2016),have used basalt(natural fiber) as monolithic composite and as hybrid composite along with glass (artificial fiber) for strengthening of beam. They have been with different such as control, strengthened, repaired specimens at the joints for the upgrading the shear strength and ductility of exterior beam. From the test result, it was found that the hybrid of Basalt were found to be more effective in the treatment of beam.

Ganesh kumar (2015), has carried out an experimental investigation to study the effect of hybrid fibers on the strength and behavior of high performance concrete beam subject to cyclic load. Crimped steel fibers and Glass fibers were used in hybrid from. The combination of 0.75% volume fraction of steel fibers and 0.33% volume fraction of glass fibers gave better performance with respect to energy dissipation and stiffness degradation than the other combination.

Chaohua Jiang (2014), the paper deals with mechanical properties of Basalt Fiber (BF) were analyzed. The results show that addition of Basalt Fiber significantly improves the tensile strength and flexural strength of the concrete. A good bond between the Basalt Fiber and the matrix interface is observed in the early age. However, this bond shows degradation to a certain extent at 28 days.

Alsayed (2010), epoxy-bonded CFRP sheets have been used with different scheme such as control, strengthened, repaired specimens at the joints for the upgrading the sh0-ear strength and ductility of exterior beam. The author compared the results of different scheme through hysteretic loops, load-displacement envelopes, joint shear distortion, ductility, and stiffness degradation and found that CFRP

RETROFITTING OF RC BEAM-COLUMN JOINT USING WRAPPING TECHNIQUE

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ABSTRACT: Reinforced Concrete (RC) buildings have been found to be weak in adequate seismic design provisions, capacity design considerations and detailing for ductile behavior which is designed as per IS 456-2000 code. In buildings, the major part that fails is the beam-column joint connections. In order to evolve new retrofitting strategies the up gradation to higher seismic zones of several cities and towns in the country is significiant. From various research papers it has been found that externally wrapped FRP could enhance the capacity of RC elements efficiently. The external wrapping of concrete by high strength fiber reinforced polymer (FRP) composites can extensively enhance the strength, ductility and other important parameters of a structural members.FRP materials such as basalt, glass, carbon and hybrid fiber, which available in the form of sheets, are being used to strengthen a variety of RC elements to enhance the structural behaviour of elements.This paper presents the structural performance of failure control specimen of reinforced concrete (RC) exterior beam–column joints which is rehabilitated using Basalt Fiber Fabric and Basalt Geogrid. The program consists of a total of 4 specimens with overall dimensions of beam equal to (110 x 240 x 625-mm) and column equal to (110 x 250 x 750-mm). The beam-column joints are to be tested under cyclic seismic loading up to failure to examine its behaviour.

KEYWORDS: Retrofitting, beam – column joint, seismic activity, Wrapping, Basalt Fiber Fabric, Basalt Geogrid

1. INTRODUCTION

In the last few decades, reinforced concrete (RC) structures get damaged and collapsed due to moderate and severe earthquakes struck in different places around the world. Retrofitting and rehabilitation of existing structures affected by earth quakes are the foremost challenges for the civil engineers. In RC buildings, beam-column joints is defined as that a portions of columns that are common to beams at their intersections. Since their essential materials have partial strengths, which means that the joints have only limited force carrying capacity. When forces larger than these are applied during earthquakes, joints are severely damaged. in a reinforced concrete moment resisting frames it have been found that Beam column joints are crucial zones for transfer of loads effectively between beam and column which is commonly known as the connecting elements in the structure

FRP composites have become more popular in the last two decades due to the reduction in their cost, combined with newer understanding of the versatility and benefits of the material properties. Strengthening with fiber-reinforced polymeric composite applications is one of the recent retrofitting and strengthening techniques.

Basalt Fiber Fabric and Basalt Geogrid were used as wrapping material for retrofitting of beam column joint. Basalt fiber was formed by melting the Basalt rock at high-temperature (1450 ° C) and rapidly drawn into a continuous fiber and it made as an fabric. It is commonly known as Basalt Fiber Fabric. It has high strength, excellent fiber/resin adhesion and ability to be easily processed using conventional processes and equipments. In addition, the basalt fibers do not contain any other additives and it belong to natural fiber. Because of the higher performance and lower potential cost of basalt fibers, they have the potential to cost effectively replace GFRP and carbon fiber products in many applications. Figure 1 and 2 shows the Basalt Fiber Fabric and Geogrid.

The main objective is to study the strength behavior of retrofitted exterior beam column joint after wrapping using fabric. To compare the performance characteristics such as ductility, stiffness, energy absorption capacity and energy index value of the basalt fiber fabric, geogrid wrapped and combination of both fabric wrapped beam-column joint.

EXPERIMENTAL STUDY ON PARTIAL REPLACEMENT OF FINE AGGREGATE WITH SCRAP RUBBER TYRE WASTE FROM TYRE RE-BUILD INDUSTRIES

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ABSTRACT: As most of the waste tyres from tyre industries are disposed by means of burning, as it causes air pollution and other useless ways. In alternate recycling is used. For recycling waste tyres from the tyre industries, we are using the waste scarp rubber tyres for the partial replacement of fine aggregate in concrete mixture to create rubberizing concrete. This experiment will suggest a safe and environmentally consistent method of disposal of scarp tyre waste materials. The blends are prepared by replacing 0%,5%,10%,15%,20%,25%,30% of fine aggregate by scrap rubber particles of size 3mm by weight in M30 grade of concrete. These replaced rubber concrete are taken for compressive strength test and split tensile strength test. The rubberized concrete strength is compared with the strength of normal concrete. The results showed that there is decrease in all types of strength for scrap rubber mixture. It is useful in making light weight concrete. These rubberized concrete is recommended to use for non-structural applications.
KEYWORDS: Re-Build tyre industries waste, Scrap rubber waste, Eco-friendly, Compressive Strength, Split Tensile Strength.

I.INTRODUCTION

Every year, over 77% of the annual production of scrap tires, about 188 million tires per year, were landfilled, stockpiled or illegally dumped. Tires are bulky, and 75% of the space a tire occupies is void, so that the landfilling of scrap tires has several difficulties. Environmental problems associate with waste tire are mosquitoes disease and fire hazards. Tire piles are excellent breeding grounds for mosquitoes. Because of the shape and impervious or hermetic of tires, they may hold water for long periods of time providing sites for mosquito larvae development. Waste tires and waste tire stockpiles are difficult to ignite. However, once it ignited, tires burn very hot and very difficult to extinguish. The air pollutants from fires include dense black smoke which impairs visibility and soils painted surfaces.

2. MATERIALS PROPERTIES

A. Cement

Ordinary Portland cement of grade 53 was used for the preparation of concrete. The properties of cementis tested to the Indian standard code book for IS 269: 2015 is shown in table 1.

Table1. Properties of cement

Sl. No	Test conducted	Properties
1	Specific gravity	3.26
2	Fineness test	3.8
3	Compressive strength at 28 days	55.3 N/mm^2

B. Fine Aggregate

Here manufactured sand is a substitute for river sand which is produced by crushing rocks, quarry stones into sand sized particles. From which the physical properties of m-sand and natural sand are tested to the Indian standard code book of IS 2386-3 (part 3): 1963

Table 2 Comparison between Natural sand and m-sand

Sl. No	Properties	Natural sand	m- sand
1	Specific gravity	2.47	2.78
2	Bulk density (kg/m^3)	1443	1680
3	Fineness	2.72	2.91
4	Water absorption	1.15%	1.6%

AN EMPIRICAL RESEARCH ON QUARTZ STONE POWDER AND WASTE PLASTIC IN FLEXIBLE PAVEMENT

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ABSTRACT: Present days discarded plastic is a major problem. This may cause more effect to an environmental pollution. In the present paper, developed techniques to use plastic waste for construction purpose of flexible pavements and deals with investigations of use of waste plastics for coating of aggregate in bituminous mix has reviewed. Plastic wastes consists of Polyethylene, polypropylene plastics can be used as a coating over aggregates and this coated stone can be used for road construction. This mix polymer coated aggregate have shown higher strength, Plastics are user friendly but not eco-friendly as they are non-biodegradable. Generally, it is disposed by way of land filling or incineration of materials which are hazardous. Softening vary between 110°c to 140°c and they do not produce any toxic gases during heating but softened plastics have tendency to form a film like structure over aggregates, when it is sprayed over the hot aggregate at 160°c. Plastic coated aggregates (PCA) are a better raw material for construction of the flexible pavements. PCA mixed with hot bitumen of different types and mixes used for road construction. The bitumen is heated and mixed with the quartz stone powder waste as a filler material up to 45% in the bituminous mix. Plastic roads would be a boon for India's hot and extremely humid climate. In this paper, we have done a thorough study on the methodology of using waste plastic and the quartz stone powder in bituminous mixes and presented the tests to be performed.

KEYWORDS: Waste Plastics, Bitumen, Aggregate, Quartz stone, plastic road

INTRODUCTION

Flexible pavements are one of the most important infrastructures. Any damage to this may cause lots of inconvenience to the traffic, which ultimately affect future scenario of countries. At the same time, Thread of disposal of waste plastic is extremely severe nowadays. In order to, improve the performance of the road surface. The plastic will be used for aggregate coating in order to increase road performance and durability. Due to the excessive usage of the plastic materials, the availability of waste plastic is enormous, as the plastic waste become part and parcel of daily life. Plastic wastes like Low Density Polyethylene, Polypropylene, polyethylene Terephthalate, Polystyrene are used. These waste plastics are shredded into small pieces. Dry process is followed here. Aggregates are heated to a certain temperature, and the shredded plastics are spread over these heated aggregate. This plastic gets softened and forms a coating as a layer over these aggregates. Aggregates are coated with waste plastics up to 45% and tested. A property of aggregates gives good response to these coating. It shows better resistance to abrasion, Crushing, Impact, Water absorption test. Bituminous mix is prepared and stirred well in order to get uniform mix, then quartz stone powder is weighted and added to the hot bitumen in different percentages. This quartz stone powder is used as a filler material. Until now, various fillers like cement, fly ash, eggshell powder, coconut shell powder, etc., are used. In the present study, an attempt has been made to use waste plastics as coat over aggregate and as quartz stone powder filler in bituminous mix. This mixture is laid on the road surface like a normal tar road. One of the major concerns amongst these is safe and sound disposal of solid wastes. Bituminous mix is prepared with quartz stone powder waste up to 50% and plastic coated aggregates. Marshall Method is adopted for the mix design. India consumption of plastics grew every year and is set to be the world third largest consumer of plastic in this world.

Modified bitumen acts as multi grade due to their low susceptibility to daily and seasonal temperature variations.

✓ Higher resistance to deformation at elevated pavement temperature and resistance to brittle cracking at low pavement temperature.

A STUDY ON EMPLOYEE RETENTION IN CONSTRUCTION INDUSTRIES

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ABSTRACT: Construction Industry is famous for its rigid work structure. Since the industry involves multiple tasks to be performed on daily basis, it is difficult to manage people from distinct backgrounds. Human resource is focused less in construction industry but it is the most influential parameter to decide success of any type of project. Hence, the main objective of the research is to analyse retention parameters of employees working within construction industry to regulate migration probability.A questionnaire is prepared after going through detailed survey listing personal parameters and twelve factors which can retain employees. This questionnaire is distributed to various employees in construction industry of this samples are collected. SPSS (Statistical Package for Social Sciences) is used to interpret the data so collected.

KEYWORDS: Construction Industry, Retention, Questionnaire, SPSS.

I. INTRODUCTION

India is a promising country as per its economy is concerned. In such a country if one of the prime sector i.e. construction sector gets aggravated, then development of the country gets disturbed. Construction industry is the second largest industry next to agriculture sector. As per 14th Engineering congress on human capital development is concerned, in time to come India will face curtailment in its workforce even to take some basic infrastructure works. This is just because of increasing migration rates in the industry due to its scanty organizing structure. Hence to understand migration rates a retention analysis is mandatory so that it can be minimized. After referring research papers, it is observed that most of the authors have restricted themselves to all other sectors except construction sector. This designates the importance of study on employee retention. Initially twelve factors which can retain an employee in the construction industry are identified after going through diverse research papers. A survey is performed to review the possible existence of additional factors. With these factors a questionnaire is prepared containing two parts. Part A contains personal details of respondents like: gender, designation, marital status, size of the respondent's family, experience of the respondent, age of the respondent, salary of the respondent per month, number of companies worked in so far. Part B contains twelve factors which can retain an employee working in the current construction company. Factors for employee retention are given below:

Talent based assignments- F1, Flexible work structure-F2, Good work environment-F3, Even distribution of workload-F4, Provision of recreations-F5, Addressing grievances on time-F6, Good salary package-F7, Good communication within the organization-F8, Provision of childcare/adult care facilities-F9,

Displaying employee achievements-F10, Proper training before allocation of any work-F11 and Provision of free medical treatment-F12. Here "F" indicates factor. 35 questionnaires are admitted finally giving a response rate of 80%. SPSS (Statistical Package for Social Sciences) V.23 is used to interpret the data obtained.

II. RESEARCH ANALYSIS

First analysis done in the research work is finding out Relative Importance Index (RII) for all the twelve factors which promote employee retention. This index gives weight scores to the corresponding factors. The formula used for the analysis is shown in Equation 1.

$$RII = \frac{\sum W}{A*N} \quad \text{.....Eq. 1}$$

Here, W is weightage given to individual factors by the respondents in a range from 1 to 5. A is the highest weightage given to the respective factor and N is the total number of respondents. In a five point likert scale 1 indicates very low, 2 indicates low, 3 indicates moderate, 4 indicates high and 5 indicates very high. If the index value is less, it indicates slighter importance and more index value symbolizes massed importance. From frequency analysis minimum and maximum points on likert scale is obtained and is represented in table 1. For all the twelve factors the maximum point preferred is very high i.e. 5. The minimum point on likert scale is 2 for factor 1 (talent based assignments), factor 8 (good communication within the organization) and factor 10 (displaying employee achievements). For the remaining factors the minimum point on likert scale is 1. So,

EXPERIMENTAL INVESTIGATION OF LACED REINFORCED CONCRETE BEAMS UNDER STATIC LOADING

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ABSTRACT
This paper presents the results of an investigation to study the influence of lacing reinforcement on the flexural performance of reinforced concrete beams under static load. Two numbers of reinforced concrete beams one with and the other without lacing reinforcement are tested under four points bending loading with load control. The parameters of the lacing steelare the diameter of lacing bar (8mm) and inclination angle of lacing bar with longitudinal beam axis (45^0). Flexural capacities of laced reinforced concrete (LRC) beams are founded to be more than the reinforced concrete (RC) beams. The results show that the flexural capacity of the LRC beam is found to be more than the Reinforced Concrete beams.

KEYWORDS: RC beams, LRC beam, Static loading, Crack behavior.

INTRODUCTION
Reinforced concrete with its properties like high compressive strength, fire resistant, durability etc., is considered as most widely accepted construction material in construction industry. By altering the reinforcement's pattern, the properties of the flexural elements seems to be changed. With the increasing developments in technology, there are so many techniques emerging to enhance the structural properties.
Out of it, Laced Reinforced Concrete (LRC) is most adaptable method in which the shear reinforcements are altered such that lacings are provided instead of stirrups. By introducing these inclined laced bars the concrete confinement area increases and this maintains structural integrity. By providing these inclined bars perpendicular to thedirection of propagation of crack, formation of cracks are arrested. RC element incorporated with LRC can resist impact loads, earthquake loads and blast loads. This dissertation work deals with two types of structural elements and describes the behavior of parameters like ultimate load carrying capacity, deflections, and crack width by adopting the RC elements with LRC. LRC promisesimproved ductility, high member strength, reduced crack width and deflection.

LITERATURE REVIEW
With the increasing terrorist attacks and accidental explosions, which may lead to a large number of casualties and great economic losses, many of researchers and scientists have turned their focus on the response analysis of Reinforced Concrete (RC) members and structures under blast loading to provide guidance for protective designs. Such concern initially arose in response to air attacks during World War II. For structures located in such area, blast protection has the modest goal of containing damage in the immediate vicinity of the explosion and the prevention of progressive collapse.
Anandavalli N. et al (2012)stated new method for the reduction of separation distance between the explosive storage structures with the use of earth covered laced reinforced concrete (LRC) which resulted in the saving of land cost. Details of blast resistant design of 75T (NEC) storage structure based on unit risk principle was also presented. Generally, the separation distance for the conventional concrete is $2.1w^{1/3}$, whereas by using LRC, it is greatly reduced to $0.7w^{1/3}$. The storage structure was found to be reusable after the blast trial.
Abbas abdulmajeed Allawi and Hussain Askar Jabir (2016)tested eight reinforced concrete one way slab with lacing reinforcement to study the effect of the lacing reinforcement on the flexural behavior of one way slabs. The specimens were casted with 30 MPa and tested under two equal line loads applied statically at third part up to failure.They considered lacing steel ratio, flexural steel ratio and span to effective depth ratio. The specimens showed increase in the load carrying capacity as a result of increasing the lacing steel ratio and decreasing the span to effective depth ratio respectively with respect to the control specimen. Ductility of the specimen is also increased with the use of lacing steel reinforcement. Four point bending test were carried out by load increment of (3.5 kN) applied statically by using a hydraulic jack of (500 kN) capacity. At each loading stage, the test measurements included the magnitude of the applied load, deflection of the slab at three locations, cracks width, strain in steel reinforcements (flexural and lacing), and strain in compressive face of slab were recorded also. At the end of each test, the cracks propagated were marked and the crack pattern and mode of failure for each specimen were carefully examined.
Abbas abdulmajeed Allawi and Hussain Askar Jabir (2016) tested nine reinforced concrete one way slab with and without lacing reinforcement. Four point bending test were carried out, one of the specimens was tested under the static load applied gradually up to failure and the other specimens were tested under

EXPERIMENTAL STUDIES ON PPC CONCRETE USING FOUNDRY SAND AS A PARTIAL REPLACEMENT FOR FINE AGGREGATE

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ABSTRACT: Good quality natural sand is facing great demand now a days and it is not readily available. So there is a need to find a replacing material for natural river sand. Manufactured sand (M-Sand) is a substitute of river sand for concrete. This paper deals with the experimental investigation on replacing fine aggregate with Foundry sand. Foundry sand is high quality silica sand. It is the waste material which is the by-product of metal casting industries at the time of casting of ferrous and non ferrous metals. Metal foundries use large amount of sand, as a part of the metal casting process foundries successfully recycle and reuse the sand many times after a certain point the sand can be no longer used for casting process and hence it can be used as better replacement for fine aggregate. The fine aggregate has been replaced by foundry sand accordingly in the range of 0%, 20%, 40%, 60%, 80%,100% by weight for M20 grade of concrete. Concrete mixtures were produced, tested and compared in terms of strength with the conventional concrete. Compressive strength test, Splitting tensile strength, Flexural strength and young's modulus tests were carried out to evaluate the strength properties of concrete at the age of 7 and 28 days. Test result indicates that 20% foundry sand replacement produced higher strength than conventional concrete made with OPC.
KEY WORDS: Concrete, Compressive strength, Split tensile test, Young's modulus value, Flexural Strength, Foundry sand.

1. INTRODUCTION

Concrete is a major construction material that is used worldwide because of its considerable durability than other construction materials. But, there is a greater demand for the natural river sand which is used as a fine aggregate in the construction activities due to the unavailability of natural sand. Manufactured sand produced from quarries is widely used for mass production of concrete. Sooner in the future there will be a scarcity for manufactured sand also. So it is advisable to use the recycled product that fit for the right purpose. Here waste foundry sand is used as an replacing material for fine aggregate foundry sand is high quality silica sand. Metal foundries use large amount of sand as part of the metal casting process. Foundries productively recycle and reuse the sand many times in casting process. When the sand can no longer be reused in the foundry, it is removed from foundry and is termed as foundry waste sand.

Vema Reddy Chevuri et al. (2015) made an attempt to use waste foundry in concrete. Investigations were performed such as compressive strength test, split tensile strength test, flexural test on the concrete containing 0%, 5%, 10%, 15% and 20% replacement of foundry waste sand in place of fine aggregate. Results showed that foundry waste sand satisfies the compressive strength requirement for M20 & M25 grade concrete at 28 days and increase of compressive strength was observed in 10% replacement of foundry sand.

Preethi Pandey et al (2015) conducted a study on utilization of waste foundry sand as partial replacement of fine aggregate for low cost concrete. In this investigation fine aggregate has been replaced by foundry sand accordingly in the range of 10-60% at interval of 10%.It was observed that at 10% replacement of fine aggregate by foundry sand compressive strength was higher compared to conventional mix. Deepak Chaursiya et al (2016) found that the compressive strength was increased up to 20% with the addition of used foundry sand for M-30 grade concrete.

In the continuation of above reported work, the present work aims to carry out experimental study on PPC concrete using foundry sand as a partial replacement for fine aggregate.

2. EXPERIMENTAL WORK

2.1 Raw materials Used:

The materials used were cement (OPC and PPC), Fine aggregate (M-Sand, Foundry Sand), Coarse aggregate and water.

2.1.1 Cement

Ordinary Portland Cement (53 grade) with specific gravity of 3.16 and Portland Pozzolana cement with specific gravity of 3.15 were used in this present work.

2.1.2 Fine aggregate

M-Sand

Manufactured sand (M – sand) is a substitute of river sand for concrete. Manufactured sand is produced from hard granite stone by crushing. M-Sand of specific gravity 2.62 and of Zone III as per Indian standard specifications was used in this work.

EXPERIMENTAL STUDIES ON HEAT CURED BAGASSE ASH – GGBS GEOPOLYMER MORTAR

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ABSTRACT: The disposal of waste material is difficult in every field and its effective utilization need of the hour. A lot of researches are under way all over the world to exploit these waste materials in an effective manner to save the environment from the carbon dioxide emission and global warming. When compared with ordinary Portland cement, geopolymer reduces the green house gas effect. In the present work, the effective use of Sugarcane Bagasse Ash (SBA) and Ground Granulated Blast Furnace Slag (GGBS) in geopolymer mortar mix was studied. Trial mixes were made to find the potential mix in Sugarcane SBA-GGBS combination in geopolymer mortar. The obtained results reveals that the mixes prepared with 25% SBA and 75% GGBS and 100% GGBS as binder content yielded higher compressive strength.

KEYWORDS: GGBS, Sugarcane Bagasse Ash, NaOH, Geopolymer Mortar.

1. INTRODUCTION

In India, Ministry of External Affairs reports that nearly 425 million tonnes (MT) of cement is produced by July 2017. Our country is the second largest cement producer in the world and accounts for 6.9 per cent of world's cement output. By the year 2020 the cement production capacity is estimated to touch 550 MT by 2020. Concrete is widespread construction material. Due to the development of infrastructure, the demand for the concrete as a material increases, so the demand for all its ingredients is gradually increased. However, the cement production causes several environmental issues including raw material depletion and global warming effect. Besides, industrial waste material creates several problems in its disposal. Looking into both the issues in cement production and industrial waste disposal, various efforts are being made sensibly to address it. Hence, usage of supplementary cementing materials like fly ash, silica fume, ground granulated blast furnace slag, rice husk ash and metakaolin as an alternative binder to cement are suggested and well accepted [1]. Subsequently, the geopolymer technology proposed by Davidovits (1998) shows considerable promise for application in concrete industry as an alternative binder to the Portland cement (2). In terms of global warming, the geopolymer technology could significantly reduce the CO_2 emission to the atmosphere caused by the cement industries as shown by the detailed analyses of Gartner (3).

Geopolymer material production involves the implementation of alumina-silicate materials and alkaline activators as the main ingredients (4) Geopolymers are inorganic by-product materials, which are rich in silicon (Si) and aluminium (Al) that react with alkaline activators in order to activate this by product source binder to form three dimensional polymeric chains of sialate and poly (sialate) (Si-O-Al-O). The source binders are either natural or by-product material which can be chosen based on its availability, material cost, application. Alkaline liquids are either sodium or potassium based (5). The geopolymer concrete strength is affected by factors such as chemical activator composition and dosage, raw materials, and curing conditions (6). According to Pradip Nath (7) the variation of the amount of alkaline activator affects the compressive strength of mix. Due to the strong chemical base reaction with high amount of sodium hydroxide and sodium silicate, the temperature of freshly prepared mix is also high [4]. Several waste materials that have been investigated in the production of alkali-activated binders. In some developing countries, it could be interesting to combine selected ashes such as blast furnace slag or fly ash from industrial wastes as typical precursors. In such way, sugarcane bagasse ash is one of these options. Its application will depend on the combustion conditions of sugarcane bagasse, it means, on the physical and chemical properties of SBA(8). Comparing to OPC binders, alkali-activated materials present greater resistance to acidic attack due to higher alkalinity of the pore and lower CaO/SiO_2 ratio in the alkali-activated systems.From the previous studies, the source materials like fly ash, silica fume, GGBS, high calcium wood ash, bagasse ash were attempted in the geopolymer concrete. Bagasse ash is rich in SiO_2 and Al_2O_3 content and act as an excellent alternative to cementitious material and source material enabling this ash to use as supplementary cementitious material in blended cement system. However bagasse ash in geopolymer is not focussed so far. Consequently, in this present study, an attempt has been made to study the feasibility of using bagasse ash and GGBS as the source binder in geopolymer mortar.

FLY ASH BASED GEOPOLYMER MORTAR MADE WITH SEA WATER

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ABSTRACT
The present study describes the properties of fly ash based geopolymer concrete made with sea water. The combination of sodium silicate solution and sodium hydroxide solution was chosen as alkaline liquid. The various molarities of NaOH and liquid ratios are used. The molarities of mortar mould were chosen as 8M, 10M, 12M and 14M. The specimens were heat-cured at 60°C for 24 hours. The various tests like compressive strength of geopolymer mortar were determined. From the results, it was found that curing temperature and molarity of alkaline liquid plays a major role in the compressive strength of fly ash based geopolymer concrete made with sea water.

KEYWORKS: fly ash, geopolymer concrete, alkaline activators, oven curing, sea water

INTRODUCTION
The production of Portland cement not only consumes the significant amount of natural resources but also liberates a considerable amount of carbon dioxide and other greenhouse gases. It is estimated that one ton of CO_2 is released into the atmosphere for every ton of OPC produced. In view of this, there is a need to develop sustainable alternatives to conventional cement utilizing the cementitious properties of industrial by-products such as fly ash. Joseph Davidovits born on the new technologies attempted to reduce the use of Portland cement in concrete. Geopolymer binder is one of such alternative binder to cement which is synthesized by mixing aluminosilicate material and high alkali solutions. Geopolymers are made from source materials with silicon (Si) and aluminium (Al) content and thus cement can be completely replaced by marginal materials like fly ash(1). Fly ash reacts with alkaline solutions to form a cementitious material which does not emit carbon dioxide into the atmosphere and enhances the mechanical properties of the geopolymer concrete is an innovative material and real alternative to conventional Portland cement for use in transportation infrastructure, construction and offshore applications(2-3).

2. EXPERIMENTAL WORK
2.1 Materials
Fly ash obtained from Mettur thermal power plant was used as source material in this study. Other materials like alkaline solution, fine aggregate, were used in making of geopolymer mortar. Alkaline solution comprised of sodium hydroxide and sodium silicates. Specific gravity of fine aggregate was 2.61.
2.2 Mix Proportioning of Mortar
The ratio of fly ash to sand was selected as 1:3. In the present study on fly ash geopolymer mortar, the alkaline liquid to binder ratio was selected as 0.35, 0.4 and 0.45. The molarity of the sodium hydroxide solution was kept as 8M, 10M, 12M and 14M. Sodium hydroxide is available in pellets form. To make it solution according to the concentration, potable water is used. However, to study the effect of sea water, all the mixes were prepared with potable water as well as with sea water. In addition, the ratio of Na_2SiO_3/NaOH was considered as 1.5. Liquid to binder ratio 0.35 was used. A total of 24 mixes were proportioned in this work.
2.3 Preparation and curing of Geopolymer Mortar
Mixing of all materials has been done in the laboratory at room temperature. First, fly ash and fine aggregate were mixed with dry condition for three minutes. Then, the liquid component was added to the dry material. The mixing of total mass was continued until the binding paste covered all the aggregates and mixture become homogeneous and uniform in colour. The fresh geopolymer mortar was cast and compacted in the moulds. Each specimen was cast in three layers by compacting manually as well as by using vibrating table. Oven curing was made. After casting the specimens were kept in oven curing at 60°C for next 24 hours. The test specimens were demoulded and the specimens were kept open atmosphere until the day of testing.
2.4 Compressive strength of Geopolymer Mortar
Mortar cubes of 70.6x70.6x70.6 mm size were cast for compressive strength. The strength of geopolymer mortar was tested at the age of 7, and 28 days using compression testing machine. A total of 180 cube specimens were cast and tested for compressive strength of M 20, M 25 and M 30 grades of control mixes and HVFA concrete. Further, 36 cube specimens were cast and tested for the compressive strength of activated HVFAC mixes. For each mix, three cubes were tested at each age and the average compressive strength was taken**.** The cube specimens cast were tested at the age 7 and 28 days. The cube specimens

REMOVAL OF AMMONIA IN AQUARIUM BY USING AQUAPONICS

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ABSTRACT: Aquaponics is the integration of recirculating aquaculture and hydroponics in one production system. The aquaculture system is used for production of fishes and other aquatic organisms in controlled conditions. Catfish (Clarias sp.) is one of fisheries commodity that is much demand for aquaculture since it has high economic value, the organic substance decomposition of uneaten fish food, feces, and urine of fishes are called as ammonia and is dangerous to fish. SolanumLycopersicum (Tomato) absorbs the ammonia that is released from the fishes and it treats the water and recirculates back into the fish tank. In this project we have discussed about the survival rate of catfish, plant growth, ammonia level and concentration and treatment of water using soil less cultivation method.

KEY WORDS: Ammonia, Catfish, SolanumLycopersicum.

INTRODUCTION

Populations around the world face questions of food security today on a scale that has not been seen in recent human history. The evolution of how we feed our populations and the technologies we use to do it have created a unique set of circumstances that bring with them unique challenges, and despite significant advances in food production and our knowledge of food nutrition and food safety, hunger continues to millions of people around the world. It is thought that over a billion people in the world are currently undernourished (World Food Programme, 2010). Agriculture's dependence on healthy soil presents another problem in food production, as current estimates are that 38% of global agricultural land is degraded. Soil degradation is the change induced by the natural decrease in the soils' potential for productive use, and normally results in reduced yields due to lack of or insufficient nutrients or water availability.

Aquaponic systems is the combination of two recirculating aquaculture and hydroponics. Aquaponics provides a solution to the main issues these two systems face; the need for sustainable ways of filtering or disposing of nutrient-rich fish waste in aquaculture and the need for nutrient-rich water to act as a fertilizer with all of the nutrients and minerals needed for plants grown through hydroponics. Combining these two systems provides an all-natural nutrient solution for plant growth while eliminating a waste product which is often disposed of as wastewater (Aquaponics: Innovative farming). The main process of this aquaponic system is that the water from one tank (fish tank) is transferred to another tank which is filled with coarse aggregate and plants through pumping motor. When the water falls on the coarse aggregate then the ammonia content water is converted into nitrite and nitrate which are the two forms of ammonia. The nitrate gets absorbed by the plants and the nitrite is absorbed by the coarse aggregate, after this process the water gets purified and the water is then transferred back into the fish tank as circulating process.

Catfish (Clarias sp.) is one of fisheries commodity that is much demand for aquaculture since it has high economic value. Catfish farming is performed not only to meet the needs of the domestic market, but also for the export. Catfish can be cultivated with a relatively easy cultivation technique and a relatively low venture capital. The farmers often face problems in the management of organic matter from the rest of the feed or feces that settles in the water bottom. Water that has been mixed with organic wastes in aquaculture will affect the survival of cultured organisms. The existence of organic materials that are not treated properly will produce ammonia.

At the other end of the spectrum are plants with high-nutrient demand, sometimes referred to as nutrient hungry. These include the botanical fruits, such as tomatoes, eggplants, cucumbers, zucchini, strawberries and peppers. Other plants with medium nutrient demands are: cabbages, such as kale, cauliflower, broccoli and kohlrab. The vgetables are preferred here because it can able to meet one house needs rather than cultivating by other methods as the water gets wasted from the tank.For this method the provided media bed units areneed to be the right depth of atleast 30cm,(Small-scale aquaponic food production. Integrated fish and plant farming)so it is possible to grow all the vegetables mentioned in the categories above. Here we are using SolanumLycopersicum (Tomatoes) whose growth rate is high compared to other plants. Solanum Lycopersicum grows to about 1m and it takes nutrient for their growth as nitrate in this method and it removes the ammonia level of recirculating water from the fish tank.

The purpose of this study was to process organic liquid waste of catfish culture usingaquaponics in the reciculation system. Ideal phytoremediator is a species that creates a large biomass, grows quickly with an extensive root system and can be easily cultivated and harvested. The palnt used for phytoremediation process should have high uptake of both organic and inorganic pollutants, grow well in polluted water and can be easily controlled in quantitatively propagated dispersion. SolanumLycopersicum (Tomatoes) has

BEHAVIOUR OF CEMENT CONCRETE PARTIALLY REPLACED WITH CHICKEN EGGSHELL POWDER

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ABSTRACT: This research paper presents the experiments the result of behavior of cement concrete partially replaced with eggshell powder (ESP). The cement in the concrete mix can be replaced by 10%, 20% and 30% of raw ESP and incineration ESP. the fresh concrete test and durability test are undertaken. By this test results the workability and durability of concrete can be determined.

KEY WORDS*:* Egg shell powder, workability, durability.

1. INTRODUCTION

Concrete is the composite material which has high compressive strength and less tensile strength. The major component of concrete is cement and it has large amount of greenhouse gas will be emitted in manufacturing process of cement. Hence we go for replacement of cement. The alternate material used in our project was powdered Eggshell. The result was arrived successfully.

2. MATERIALS USED

- Cement is a binder material. In this paper the OPC (Ordinary Portland Cement) 53 grade cement is used.
- Egg shell are part of poultry wastes the litter the environment. It is rich in calcium same as that of limestone.
- Fine aggregate consists of natural sand and crushed stone with particles passing though 4.75mm sieve. The code to be referred to understand the specification for fine aggregate is: IS 383:1970
- The aggregate size which is not passing through the 4.75mm sieve is called coarse aggregate. To avoid segregation in concrete we mix aggregate with it.

Fig 1: Raw Egg shell powder

Fig 2 : Incineration Egg shell powder

PROPERTIES OF MATERIALS

Table 1: Chemical composition of ESP, IESP & Cement

S.NO	Chemical	ESP	IESP	Cement
1	CaO	50.7%	51%	60 – 67%
2	SiO2	0.09%	0.05%	17 – 25%
3	Al_2O_3	0.03%	0.02%	3 – 8%
4	Fe_2O_3	0.02%	0.02%	0.5 – 6.0%
5	MgO	0.01%	0.01%	0.1 – 4.0%

3. DESIGN AND TESTS

3.1 Design Mixing Proportion

The mix design M20 is calculated based on IS10262 – 2009. The cube specimen of 150 x 150 x 150 mm was molded. After 24hours the concrete was settled and the mould was removed. Then the cubes undergo curing for 28 days. The mix ratio is 1:2.29:4.21 and water cement ratio is 0.45.

3.2 Workability

Workability of fresh concrete is to determine the degree of ease with which a concrete mixture can be handled, placed and compacted a dense solid mass. It is the amount of work required to achieve full compaction of concrete.

Slump test: The mould is placed on a smooth, horizontal, rigid and non-absorbent base plate. The given concrete mix is poured into the mould and compacted each layer. The mould is removed from the concrete vertically. The slump is measured immediately with the help of measuring scale.

Compaction factor test: The concrete mix is gently placed and leveled in the upper hopper using the hand scoop. The trap is opened so that the concrete falls into the lower hopper. The excess concrete remaining above the level of the top of the cylinder is removed with the trowel. The weight of the cylinder was noted before and after compaction.

A PRELIMINARY STUDY OF PSEUDO STEM JUICE AND POWDER AS A PLANT-BASED COAGULANT FOR TREATMENT OF DYE INDUSTRY EFFLUENT

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ABSTRACT: The effectiveness of pseudo stem juice and powder as a natural coagulant for treatment of dye industry effluent was investigated Five main parameters were studied, namely, Total solids(TSS), suspended solids (SSS), pH ,COD, BOD, Chloride and turbidity of effluent. Coagulation experiments using jar test were performed with a flocculation system where the effects of dye industry wastewater pH as well as pseudo stem juice and powder dosage on coagulation were examined. The highest recorded Turbidity, TSS, TDS, COD, BOD and Chloride removal percentages by pseudo stem juice were calculated and compared with other chemical coagulant dosages.
KEYWORDS: Pseudo Stem, Natural Coagulant, Coagulation, Dye industry effluent

1. INTRODUCTION

A Dye is a colored substance that has an affinity to the substrate to which it is being applied. These dyes are made from petroleum, sometimes in combination with mineral-derived components. Dyes are used for the coloring of clothes and nowadays used for printing in clothes. In properly printed fabrics the color is bonded with the fiber, so as to resist washing and friction. They are largely based on water-soluble oils: synthetic, metal complex, reactive, substantive, semi-synthetic and biodegradable. The main problem with dyes, is that they can easily become polluted over long use, losing their effectiveness and properties, and may develop odors and cause soil and water pollution due to the presence of complex chemicals and biocides. Thus, a large amount of dye industry wastewater generated from printing operations which is generally high in COD has become a great pollutant of soil [2]. Due to its composition and organic pollutant, this waste creates a serious danger to the environment. It is estimated that over 10,000 different dyes and pigments are used industrially and over $7x10^5$ tons of synthetic dyes are produced worldwide annually[4].

There are several treatment methods are used to treat waste from the dye industry, they are chemical coagulation, adsorption and microfiltration, as well as biological (aerobic and anaerobic) process. Due to the application of variety of chemicals, this would decrease the processing efficiency and increase cost of process. For biological treatment, large area requirement, high maintenance, long retention time, and odor problems are usually associated with treatment methods.

Coagulation is a common process in the treatment of both industrial wastewater and surface water. Its application includes the removal of dissolved chemical species and turbidity by the addition of widely used chemical-based coagulants such as alum ($AlCl_3$), ferric chloride ($FeCl_3$), and poly aluminium chloride (PAC)[3]. Also many disadvantages are associated with the usage of these coagulants such as relatively high procurement costs as well as cause effects on human health and environment. It is therefore, the use of natural organic coagulant from plant-based like pseudo stem juice and powder which is cost effective may be an interesting alternative.

Banana is a herbaceous plant of the of the family Musaceae. Banana is one of the most widely grown tropical fruits because of its high food value and an important addition to the diet. In Malaysia, the production of commercial varieties of banana has increased by 24–27% over the decades giving an amount of 27,453 hectares in 2009 with Johor, Pahang, and Sarawak as the largest banana-producing states [3]. The stem from which the fruit bunches have been taken should be cut off because it will never again grow fruit. The stem will be left abundantly in the plantation and normally will just rot or be used as fertilizer.

According to the research, waste banana pith can be used effectively as an adsorbent for the removal of 87% impurities from textiles wastewaters at pH 4. Another research also on color removal showed that the pith of banana stem can effectively remove the direct red color and acid brilliant blue from aqueous solution through adsorption. Other than that, banana pith also could be a useful bio absorbent. The usage of banana stem juice as a natural coagulant in COD, TS, SS and turbidity removal, however, is known to be limited in the published literature.

This paper reports on the potential of juice produced from banana stem as a natural coagulant for the removal of COD, SS, TS and turbidity from spent coolant waste water. Jar test with a flocculation system was used and the effects of spent coolant wastewater pH on coagulation effectiveness were examined. The coagulation/flocculation effectiveness of the banana stem juice was compared with the chemical coagulants.

EXPERIMENTAL INVESTIGATION ON FIRED CLAY BRICK AS A PARTIAL REPLACEMENT OF RICE HUSK ASH IN CLAY

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ABSTRACT: This paper reports on the investigation on fired clay brick as a partial replacement of rice husk ash in clay. A study was undertaken to investigate the effect of Rice Husk Ash(RHA) on the burnt properties of the clay brick. 5% to 35% RHA was blended with Clay. Atterbergs limits, Specific gravity, Compressive strength and water absorption test were conducted on each admixture. Higher RHA addition required a higher water content to ensure the right dry density. All test specimens were produced by uniaxial hydraulic press method and fired at 1050˚C .The compressive strength and water absorption attained a optimum value of 6.3N/mm^2 and 15.5% respectively at 25% RHA. Test results indicate that use of rice husk ash and clay in bricks gives very high strength. As the percentage of RHA increased, water absorption of RHA-clay bricks also increased.

KEYWORDS: *Rice husk ash , clay, compressive strength.*

1. INTRODUCTION

Shelter is a basic human need and owning a house becomes a life long struggle as majority of Indians find housing cost prohibitively expensive. This problem becomes even more acute when considering the low income families who accounts for about 60-70% of Indian population. This brings out the need to reduce the cost of the housing and make it affordable for the booming population. burnt clay bricks are being used extensively and the most important building material in construction industry. In India the building industry consumes about 20000 million bricks and 27% of the total natural energy consumption for their production. In addition to this clay bricks available in certain region are poor in quality and have lower compressive strength, higher water absorption, high efflorescence, and higher wastage during transportation and handling, uneven surface etc. which have forced engineers to look for better materials capable of reducing the cost of construction. Clay brick is the first man made artificial building material and one of the oldest building materials known. Its wide spread uses mainly due to the availability of clay in most countries. Its durability and aesthetic appeal also contribute to its extensive application in both load bearing and non-load bearing structures.

2. EXPERIMENTAL MATERIALS

2.1 Clay

Clay was obtained from Kokarayanpet, Tiruchengode. The physical properties of the clay were studied. Specific gravity of clay is 2.74.

2.2 Rice husk ash

Rice husk was collected from Devanankurichi and this husk were finely powdered and grained in the rice milling industry. Optimum properties can be obtained when rice husks are burnt at 500 -700˚C. When combustion is completed, grey to whitish ash is obtained. Specific gravity is 2.14, size passing through 4.75mm sieve.

2.3 Water

Portable water available in K.S.R.College of Engineering, Tiruchengode was used in this study.

Table 1: Physical properties of clay soil

S.No	Test on soil	Observed value
1	Specific gravity	2.74
2	Water absorption	1.95%
3	Bulk density	1.68 gm/cc

3. EXPERIMENTAL METHODOLOGY

Rice husk ash is mixed with clay in different properties ranging from 5% to 35%, and the basic properties of bricks like compressive strength and water absorption. High percentage of silica can be observed in the RHA that taken from Kiln, which is like silica obtained from the control burning system. The loss on ignition (LIO) in the RHA may possibly the existece of free carbon. It indicates that the RHA is an excellent

DURABILITY ASSESSMENT ON CONCRETE IMPREGNATED WITH EGG SHELL POWDER IN RAW AND INCINERATED FORM USING SORPTIVITY AND RAPID CHLORIDE PERMEABILITY TEST

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ABSTRACT: This experimental study aims to access the performance of concrete with respect to the durability investigations on which cement ie. the binder was partially substituted with eggshell powder which are a known considered residue from egg products production industries. The chemical composition of Egg Shell powder and Incinerated Egg Shell powder is evaluated. In the concrete mix, the cement is partially replaced with egg shell powder (ESP) and Incinerated Egg Shell powder (IESP) as about 10%, 20%, 30% by weight of cement. After 28 days of curing, the compressive strength of concrete is determined. Then the durability aspects where analysed in terms of Sorptivity tests and Rapid Chloride Permeability Test (RCPT). A new principle for Solid waste management was formulated in turns can be able to create a conductive environment.

KEYWORDS*: Egg Shell powder (ESP), Incinerated Egg Shell powder (IESP), Sorptivity, Rapid Chloride Permeability Test (RCPT).*

1. INTRODUCTION

Now - a - days, Concrete plays an important role in the construction industry. Due to the presence of engineering characteristics and properties, concrete is most widely used as a construction material. The major element of concrete is cement, which is the primary producer of carbon di-oxide and green house gas. During the production of 1000 Kg of cement, approximately about 900 Kg of CO_2 is emitted in the atmosphere. The CO_2 produced in the cement industries is the silent killer of the environment and may cause environmental pollution and global warming. In order to reduce this impact on production of cement, the waste by- products can be utilized as the partial replacement of cement. Hence, the Egg Shell Powder is used as a cementing material, which is impregnated to a concrete. Egg shell is a common waste product, which is generated from poultry farms, restaurants and hotels. Egg Shell which is comprised of a network of protein fibers and also associated with the crystals of Calcium Carbonate($CaCO_3$), Magnesium Carbonate($MgCO_3$), Calcium Phosphate($Ca_3(PO_4)_2$) and also of organic substances. The main component of Egg Shell contains $CaCO_3$ and the chemical composition of Egg Shell waste is nearly same as that of Limestone. Incineration is a process of waste treatment that involves the combustion of organic substances contained in the waste materials. Therefore, Egg shell Powder and Incinerated Egg Shell powder is used as replacing material for cement on concrete.

Fig 1 Raw Egg Shell powder

Fig 2 Incinerated Egg Shell powder

INCINERATION PROCESS OF RAW ESP

The fine grained Egg shell powder is calcinated in the muffle furnace under the air atmosphere at various temperature from 300°C to 900°C for 1hour. So the optimum conditions for proper calcinations are the Egg shell powder (which has CaCO3), heating at 900°C for 1 hour may gives the pure Calcium Oxide[1] .

$$CaCO_3 \xrightarrow{\text{Calcination}} CaO + CO_2$$

CONCRETE USING RUBBER WASTE AND STEEL SLAG AS FINE AGGREGATE FOR SUSTAINABLE BUILT ENVIRONMENT

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ABSTRACT: As a construction material, concrete is the largest production of all other materials. Aggregates are the important constituents in concrete .The increase in demand for the ingredients of concrete is met by partial replacement of materials by the waste materials which is obtained by means of various industries. Steel slag is a waste product generated during the production of steel and worldwide production of tyre increases due to increase of automobile industry. The huge amount of waste tyre needs to be dispose. These wastes are disposed in the form of landfills causes an enormous amount of land pollution. So for the increasing demand to protect the normal environment, especially in build up areas, the needs to use these wastes are very important. Therefore, replacing some portion of natural aggregates with steel slag and scrap rubber waste would lead to considerable environmental benefits. The present work is to use steel slag and rubber waste as replacement for fine aggregate.

KEYWORDS: Scrap Rubber waste, Steel slag, Compressive Strength, Split Tensile Strength

1. INTRODUCTION

A large variety of waste materials are considered feasible and even much valuable additives for concrete. Every year, over 77% of the annual production of scrap tires, about 188 million tires per year, were land filled, stock piled or illegally dumped. Tires are bulky, and 75% of the space a tire occupies the void, so that the land filling of scrap tires has several difficulties. A scrapped tyre is considered as the most recent materials that have been examined because of its vital use in the construction field and Slag is a by-product generated during manufacturing of pig iron and steel. The original scope of this research was to investigate the properties of concrete with steel slag and rubber waste. This reduces the cost and usage of sand. For this research the percentage of the volume of natural aggregates normally used in concrete was replaced by steel slag and rubber waste. Eco-friendly and Mass utilization of waste material is possible in construction by using steel slag and rubber waste as partial replacement material for partial replacement in concrete.

2. MATERIALS

Cement

Ordinary Portland cement of grade 53 was used for the preparation of concrete. The properties of cement are tested to the Indian standard code book for IS 269: 2015 is shown in Table 1.

Table 1 Properties of cement

Sl. No	Test conducted	Properties
1	Specific gravity	3.26
2	Fineness test	3.8
3	Initial setting time	32 minutes
4	Final setting time	375minutes
5	Compressive strength at 7days	45.7N/mm^2
6	Compressive strength at 28days	55.3N/mm^2

Fine aggregate

In this work the manufactured sand is a substitute for river sand which is produced by crushing rocks, quarry stones into sand sized particles. From which the physical properties of m-sand and natural sand are tested to the Indian standard code book of IS 2386-3 (part 3): 1963.

INNOVATIVE TECHONOLOGIES IN CONSTRUCTION INDUSTRY

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ABSTRACT: Construction industry is one of the most essential element in nations development . In order to meet out the rapid nations growth a huge infrastructure development is needed. For the infrastructure development, the construction industry plays a major roll. Throughout the world construction industry is one of the most hazardous industry. Nowadays, some research is going to increase the safety in construction industry. This research paper investigates and provides some new innovative protocols for the construction safety. This innovative protocol reduces the construction on site accidents up to 50%. Because in the construction industry, the most of the accidents are occurred due to the carelessness and misunderstandings of workers. The innovative protocols which are implementing in this research are done by the use of recent trending technologies. Such as sensors, microcontrollers, smart phones, cloud computing , IOT- concepts, wireless internet connections, small cameras, scanners and some safety equipments. In this research we are going to implement the concept of IOT (internet of things) and cloud computing in construction industry for the development of technology in our field. By using cloud computing the data are get stored in online. The whole project is carried through wireless. Finally, the result of this project is to provide a safety of worker in construction industry and also to provide an conducive environment to overcome from the misunderstanding due to un education of labours.

KEYWORDS: sensors and micro controllers, IOT- concepts, cloud computing, construction safety, innovative technology.

I.INTRODUCTION

Throughout the world the construction area is one of the most hazardous industry. The major cause of accidents are related to the unique nature of the industry, human behaviour , difficult work – site conditions and poor safety management , which resulted in unsafe work method , equipments and procedures. However safety is not a luxury, may be considered an important function to be used against unnecessary loss of property, injury or death. Preventing occupational injuries and illness should be a primary concern of all employers. In recent years the concept of safety culture has attracted considerable attention especially in the dangerous industries. The construction industries are regarded as a dangerous industry due to two characteristics. Primarily, employees are separated and lag in the communications so they make the decision themselves when facing some specific problems. Secondly, employees in the construction industry move among the companies, sites and positions more frequently then other industries which Leeds to carelessness and lagging in safety practices. Because of these two above mentioned characteristics, the construction industry is said as very hazardous industry.

It is estimated that about 50% of our plan investment goes to the construction sector. India's construction industry that is providing livelihood to almost 10% of its population is the second largest occupation after agriculture. The construction industry is statically one of the most hazardous occupation in this country, and ranks low in safety performance among the industrialized countries of the world. Safety in the construction industry has always been a major issue. Wherever reliable records are available, construction is found to be one of the most dangerous on safety and health criteria. Though much improvement in construction safety has been achieved, the industry still continuous to lack behind most other industries with regard to safety. In developing countries, safety rules usually do not exists; if any exists, the regulatory is usually very weak in implementing such rules effectively. Further, work hazards at the construction work place or either not received at all, or received to be less dangerous then what they actually are.

To overcome from the above stated problems , this project is to develop a innovative protocol for the construction safety by using the new technologies. With the use of these proceedings safety in the construction industry is hiked up to 50% and reduce the accident rate and death rate in the construction industry. And also ignore the carelessness and misunderstanding between the high level management to worker

MANUFACTURING OF FLY ASH BRICK BY UTILIZING STEEL SLAG AND MARBLE WASTE

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ABSTRACT*:* Fly ash bricks can be extensively used in all building constructional activities similar to that of common burnt clay bricks. The fly ash bricks are comparatively light in weight and stronger than common clay bricks. Since steel slag and marble waste is being accumulated as waste material and creating serious environmental pollution problems, its utilization as raw material in the manufacture of fly ash bricks will help in proper and useful disposal but also help in environmental pollution control to a greater extent. The above problems can be reduced some extent by replacing these materials in bricks.The objective of this project is to represent the information regarding bricks manufactured using waste raw material, their properties and their uses. In this project various laboratory experiments were carried out on bricks samples. Some of them are Compressive strength test, water absorption test, hardness test, soundness test. The brick will be manufactured and testing is done and compared with the conventional brick. The test was carried out for 7, 14, 21, 28 days. These bricks are low in cost and gives more strength compared to conventional Brick.

1. INTRODUCTION

The fly ash brick can be used for construction work as well as for making pavement block etc. For improving compressive strength the amount of cement should be more (5% to 10%). This paper will show that the different type of fly ash brick with different proportions of steel slag and marble powder. The water absorption of brick is less as compared to conventional brick. Slag material also contains some cementitious properties. This properties help slag for more easy binding with the help of fly ash.

2. EXPERIMENTAL PROCEDURE

The work is mainly focused on fly ash brick, in order to achieve more compressive strength and less water absorption than the conventional fly ash brick. By changing the material proportion, 9 different proportion of steel slag as replacement for fly ash and marble powder as replacement for manufactured sand were made, in order to achieve the best result. After manufacturing of bricks some experimental test like Compressive strength test, water absorption test, hardness test, soundness test were carried out on it.

3. MATERIALS USED

In our brick, materials used are

- Fly Ash
- Steel Slag
- Marble Powder
- Manufactured Sand
- Lime
- Gypsum

Fly Ash

Fly ash is the by-product of coal combustion collected by the mechanical or electrostatic precipitator (ESP) before the flue gases reach the chimneys of thermal power stations in very large volumes. All fly ash contain significant amounts of silicon dioxide (SiO_2), aluminium oxide (Al_2O_3), iron oxide (Fe_2O_{3s}), calcium oxide (CaO), and magnesium oxide (MgO) however, the actual composition varies from plant to plant depending on the coal burned and the type of burner employed. Fly ash also contains trace elements such as mercury, arsenic, antimony, chromium, selenium, lead, cadmium, nickel, and zinc. The burning of harder, older anthracite and bituminous coal typically produces Class F fly ash. This fly ash is pozzolanic in nature, and contains less than 7% lime (CaO). And Class C fly ash hardens and gets stronger over time. Class C fly ash generally contains more than 20% lime (CaO).

Steel Slag

Steel slag is a by-product of steelmaking, and is typically produced either through the blast furnace oxygen converter route or the electric arc furnace ladle furnace route. To flux the silica produced during steelmaking, limestone and/or dolomite are added, as well as other types of slag conditioners such as calcium aluminate or fluorspar. The major components of steel slag include the oxides of calcium,

CONCEPTS AND REQUIREMENTS FOR THE DESIGN OF SMART HOMES USING BUILDING AUTOMATION SYSTEM

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ABSTRACT
The Building Automation System (BAS) core functionality is to keep building climate within a specified range, light rooms based on an occupancy schedule, monitor performance and device failures in all systems and provide malfunction alarms. Automation systems reduce building energy and maintenance costs compared to a non-controlled building. Typically they are financed through energy and insurance savings and other savings associated with pre-emptive maintenance and quick detection of issues. The legacy stand-alone security systems are transforming into intelligent-computerized-network based Building Automation Systems. This paper presents the concepts that aims to develop working pilot models for security as well as for complete automation of a building and complex respectively, based on wired networking technology. The paper describes design and implementation of wired security system and wired building automation system along with necessary theoretical background. Development of web-based virtual instrument to run-time couple local/remote monitoring and control of the building has been major outcome. The presented designs have been re-usable with need based customization, simple AND user-friendly.

KEYWORDS: Building Automation System, Smart Home, Sensors and Actuators.

1. INTRODUCTION

In modern contexts, automation and management of a building has been rapidly growing phenomenon. Emerging communication technologies have been expected to transform the present partially networked houses into Smart, Intelligent and Adaptive Homes. Several control systems with Higher and higher penetration of automation will lead to increased device intelligence and they would be performing their routine tasks in vivid situations autonomously and without much human intervention. Such smart homes will provide high level of energy optimization, security, communication and entertainment facilities as explained in fig 1.1.

Fig 1.1 Building Automation and Control Systems

Home Area Network (HAN) is the network within the premises of a house or building enabling devices and loads to communicate with each other and dynamically respond to externally sent signals (i.e. price). This type of network, characterized by a low data rate requirement, provides the communication infrastructure behind the meter. As a result, Smart Grid applications are extended into the home premises and Energy Management Systems (EMS) capabilities are enabled.

2. MATERIALS

2.1 HARDWARE

(A) SENSORS AND ACTUATORS

Passive Infra Red (PIR) detectors that works on principle of obstruction of infrared beam are employed for detecting occupancy and instantaneous daylight. Such sensors works on 12 V DC power supply and generate potential free contact output for alarm panel along with LED based indication as local alert.

AN EXPERIMENTAL STUDY ON STABILISATION OF SILT AND CLAYEY SOIL

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ABSTRACT: Generally clay and silt soil has undesirable engineering properties like low bearing capacity and high compressibility. Thus, the improvement of soil is necessary. Soil stabilization is a process to treat a soil to maintain and improve the performance of the soil. There are many stabilizers to improve the strength of soil like jute, gypsum, fly ash, rice husk ash, cement, lime, etc .In this study, we added polypropylene fiber as stabilizer and lime as additive to improve the properties of clay and silt soil. Locally available soils are used in this study. The main objective of this study is to investigate the use of waste fiber materials in addition with lime on geotechnical application and to evaluate the effect of polypropylene fibre and lime on soil by making soil and soil-polypropylene fiber - lime mixture.

KEYWORDS: clay and silt soil, polypropylene fiber, lime, stabilization

1. INTRODUCTION

A proper understanding of geotechnical properties of soils is a pre-requisite for its use in engineering construction works. Studies on the engineering properties of these materials have made geologists and engineers aware of the wide range of properties. However the relative abundance of soil notwithstanding its suitability for various purposes can be enhanced through the modification of its properties stabilization. Soils containing significant levels of silt or clay, have changing geological characteristics: they swell and become plastic in the presence of water, shrink when dry, and expand when exposed to frost. Soil stabilization became necessary for the engineers to look at means to improve soils other than replacing the poor soil at the building site. Hence, stabilization emerging as a popular and cost effective method for soil improvement. Here, in this project, soil stabilization has been done with the help of randomly distributed polypropylene fibers obtained from waste materials along with this lime content is also mixed thoroughly. The improvement in the shear strength parameters has been stressed upon and comparative studies have been carried out using different methods of shear resistance requirement. With the use of polypropylene fiber for stabilization which improves the strength of the soil, thus, increasing the soil bearing capacity and is more economical both in terms of cost and energy to increase the bearing capacity of the soil rather than going for deep foundation o raft foundation. If the soil treated with lime, such soil can be used to create embankments or sub-grade of structures, thus avoiding expensive excavation works and transports. Use of lime significantly changes the characteristics of a soil to produce long-term permanent strength and stability, particularly with respect to the action of water and frost. The polypropylene fiber and lime is also used to provide more stability to the soil in slopes or other such places. Sometimes soil stabilization is also used to prevent soil erosion or formation of dust, which is very useful especially in dry and arid weather.

2. LITERATURE REVIEW

2.1 Soil Stabilization

Soil stabilization is the process of altering some soil properties by different methods, mechanical or chemical in order to produce an improved soil material which has all the desired engineering properties. Soils are generally stabilized to increase their strength and durability or to prevent erosion and dust formation in soils. The main aim is the creation of a soil material or system that will hold under the design use conditions and for the designed life of the engineering project. The properties of soil vary a great deal at different places or in certain cases even at one place; the success of soil stabilization depends on soil testing. Various methods are employed to stabilize soil and the method should be verified in the lab with the soil material before applying it on the field.

2.2 Soil properties

2.2.1 Atterberg Limits

Shrinkage Limit:

This limit is achieved when further loss of water from the soil does not reduce the volume of soil. It can be more accurately defined as the lowest water content at which the soil can still be completely saturated. It is denoted by wS.

Plastic Limit:

This limit lies between the plastic and semi-solid state of the soil. It is determined by rolling out a thread of the soil on a flat surface which is non-porous. It is the minimum water content at which the soil just

EXPERIMENTAL INVESTIGATION ON PARTIAL REPLACEMENT OF FINE AGGREGATE AND CEMENT BY QUARRY DUST AND FLY ASH IN CONCRETE

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ABSTRACT: Present era is the era of concrete because it is highly demanded material today. In this experimental study an attempt will be made to find the effect of partial replacement of fine aggregate by quarry dust and cement by fly ash. The reduction in the sources of natural sand and the requirement for reduction in the cost of concrete production has resulted in the increased need to identify substitute material to sand as fine aggregates in the production of concretes. In such a situation the quarry dust can be an economic alternative to the river sand. The project deals with the study of durability condition of concrete. Natural sand is replaced by quarry dust with 0%, 5%, 10%, 15%, 20%, and in combination natural sand is replaced by quarry dust with its highest strength & cement replaced by fly ash with 0%, 10%, 20, 30%, 40%. The specimen is produced and tested as an alternative to traditional concrete in terms of strength and durability aspects. The experimental investigation is concern to know the behavior, mechanical properties and durability aspects of concrete. The binding material used for the concrete is 53 grade cement. The cube compressive strength test at 7 days, 14 days, 28 days was being conducted. The result shows that the strength development of fly ash concrete was less in early ages and increased at the higher ages.

KEYWORDS: OrdinaryPortland cement, Fine aggregate, Coarse aggregate, Fly ash & Quarry dust.

1. INTRODUCTION

In today's era, concrete is the widest building material which is used in the whole world. The constituents of concrete are coarse aggregate, fine aggregate, binding material and water. River sand is mostly used as fine aggregate component of concrete, but due to overuse of the material, led to depleting of securable river sand, creates environmental problems and thus increases in the cost of the same. Moreover, to maintain economy without interfering the strength the reuse of waste material has been emphasized. Fly ash is also used extensively as a partial replacement of cement. However, though the inclusion of fly ash in concrete gives many benefits, such inclusion causes a significant reduction in early strength due to the relatively slow hydration of fly ash. This paper presents the viability of the usage of quarry rock dust and fly ash as percent substitutes for conventional M30 grade concrete. Mechanical properties such as compressive test, split tensile test and flexural test were performed on cubes, cylinders and beams of concrete in various percentages and compared with conventional concrete. Mix design for concrete proportion has been developed as per IS 10262-1982. The characteristic strength of hardened concrete specimen was tested as per IS 456-2000.

2. RAW MATERIALS USED

2.1 Cement

Ordinary Portland cement (OPC) of 53 grade of cement conforming to IS: 12269 standards has been procured and various tests have been carried out according IS: 8112-1989 from them it is found that

a) Specific gravity of cement is 3.11
b) We get initial setting time of 50 min and final setting time of 480 min
c) 6% is the fineness of cement

Table 2.1 Physical Properties of Cement

S.No	Properties Cement	Result
1	Specific Gravity	3.11
2	Fineness	6%

2.2 Fine aggregates

Thenatural river sand is taken from the usual place and it is confirmed to grading zone-III of IS 383-1970. Some of the tests have been voted for out as per the technique given in IS 383-1970

a) Fine aggregate specific gravity is 2.62
b) Fineness modulus of fine aggregate is 3.05

Table 2.2 Properties of Fine Aggregate

S.NO	Description	Value
1	Specific Gravity	2.62
2	Fineness modulus	3.05

PROPERTIES OF PREWETTED RICE HUSK ASH AGGREGATE IN CONCRETE

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ABSTRACT: This paper summarizes the experimental studies on strength characteristics of concrete in which Rice husk ash (RHA) is used as a partial replacement of fine aggregate. As river sand is a meager material day- by-day, there is an urgent need to investigate in saving of river sand. Now a day's artificial aggregate are popular as a substitution of fine aggregate to make better concrete. In India, every year an average of 120 million tonnes of rice husk are produced. The RHA contains nearly about 85% to 90% of amorphous silica. The concrete made by partially replacing fine aggregate with prewetted RHA aggregate under self curing process. At that, maximum of 20% (by volume) was replaced. Self curing is the solution to inadequate curing for today's water scarcity. Workability and mechanical properties are analyzed. Test results indicate the concrete mix with 15% RHA aggregate exhibited better results under self curing condition, when compared to the control mix and other mixes.

KEYWORDS: RHA aggregate, self curing, mechanical properties

1. INTRODUCTION

Concrete is a mixture of cement, aggregates and water with or without suitable admixtures. To attain desirable strength and other properties, curing is necessary. Naturally, sand has universal characteristics like rough texture, well drained characteristics and effective strength parameters may be given opportunities to engineers to be used as a constructional material. In recent times, due to scarcity of sand and its cost engineers have been searching for alternative material [1]. One such material is Rice husk ash which is obtained by burning of rice husk. Rice husks are the coating of seeds, or grains of rice RHA can be used as an economical substitute for silica fume as SCM having almost the same properties as that of micro silica. It is estimated that 1,000 kg of rice grain produced 200 kg of rice husk ash, after burning about 20% or 40 kg would become RHA [2]. Rice husk ash reduced after burning of rice husk (RH) has high reactivity and pozzolanic property. Indian Standard code of practice for plain and reinforced concrete, IS 456 2000, recommends use of RHA in concrete but does not specify quantities [3]. Researchers are using agricultural and industrial waste to improve the strength properties of concrete and to lead sustainable development [4]. The rice husk is an active pozzolans and it contains 85 to 90% of amorphous silica [5]. The project is aimed at putting into effective use of RHA a local additive which has been investigated to be super pozzolanic in good proportion to reduce the high cost of structural concrete [6]. The use of agricultural and industrial waste to compliment other traditional materials in construction provides both practical and economical advantage Rice husk is an agricultural waste [7]. Disposal of husks is a big problem that leads to the idea of substituting RHA for silica in cement manufacture. Natural materials are environment friendly and have proved to be a competitor for glass fibre/polyester in terms of strength performance and cost [8]. India was the second largest rice producing country. Every year an average of 120 million tonnes of rice husk are produced by paddy field [9]. In India where there is abundance of rice husk, rice husk can be effectively used as a building material and it improves the sustainability and eco-friendly in construction [10].

Curing is the process of controlling the rate and degree of moisture loss from concrete during cement hydration. The need for adequate curing of concrete cannot be overemphasized because curing has a strong influence on the properties of hardened concrete; proper curing will increase strength, durability, water tightness, abrasion resistance, volume stability, and resistance to freezing and thawing effect. The concept of self-curing is to reduce the water evaporation from concrete and hence increase the water retention capacity of the concrete compared to ordinary concrete. Scarcity of potable water increases day by day [11]. Self-curing or internal curing is a technique that can be used to provide additional moisture in concrete for more effective hydration of cement and reduced self-desiccation [12].

2. MATERIALS AND METHODS

Ordinary Portland Cement (53 grade) conforming to IS 12269-2013 was used. The physical properties of cement are presented in Table 1. Locally available M-sand was used as one of the constituent in the present work. The properties of the sand were studied in accordance with IS 2386-1963 and the results are given in Table 2. Locally available coarse aggregate having size 20mm was used in the present work. The physical properties of coarse aggregates were measured in accordance with IS2386-1963

PROPERTIES OF PREWETTED SUGARCANE BAGASSE ASH AGGREGATE IN CONCRETE

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ABSTRACT: As river sand is a meager material day- by-day, there is an urgent need to investigate in saving of river sand. Now a day's artificial aggregate are popular as a substitution of fine aggregate to make better concrete. Sugarcane bagasse ash (SCBA) aggregate derived from sugarcane which is available abundantly. The concrete made by partially replacing fine aggregate with prewetted SCBA aggregate for self curing purpose is described in the paper. At that, maximum of 20% (by volume) was replaced. Workability and mechanical properties are analyzed. Self curing is the solution to inadequate curing for today's water scarcity. Test results indicate the concrete mix with 15% CFA aggregate exhibited better results under self curing condition, when compared to the control mix and other mixes.

KEYWORDS: *SCBA aggregate, self curing, mechanical properties*

1. INTRODUCTION

This study is focused on utilization of industrial or agricultural waste as raw materials. Bagasse ash mainly consists of aluminium and silica. It has been partially replaced in the ratio of 0%, 10%, 20%, 30% and 40% by volume of fine aggregate [1]. The strength increases upto 15%. The concrete with SCBA has higher compressive strength than concrete without SCBA. The maximum limit of replacement is 15%. It increases the workability of fresh concrete and therefore usage of super plasticizer is not essential [2]. Close relations were predicted among compressive strength, flexural strength, tensile strength and elastic modulus. It increases the resistance of chloride penetration. It reviewed different properties of fresh and hardened concrete, their durability, thermal conductivity when admixed with agro-wastes [3]. It is economical because it reduces the consumption of cement. It increases the workability of fresh concrete and therefore usage of super plasticizer is not necessary [4]. The compressive strength increases and 5% SCBA in concrete increases the strength by 12% than normal strength concrete in M20 grade of concrete. This is the maximum strength can be attained [5]. Cement can be replaced upto 10%. It increases the workability of fresh concrete and therefore usage of super plasticizers is not essential [6]. When the combined percentage of micro silica and nano silica increases, the concrete becomes more cohesive and bleeding and segregation is prevented [7].

2. MATERIALS AND METHODS

Ordinary Portland Cement (53 grade) conforming to IS: 12269 was used. The physical properties of cement are presented in Table 1. Locally available river sand was used as one of the constituent in the present work. The properties of the sand were studied in accordance with IS 2386-1963 and the results are given in Table 2. Locally available coarse aggregate having size 20mm was used in the present work. The physical properties of coarse aggregates were measured in accordance with IS.2386-1963 and the results are presented in Table 2. SCBA aggregates are prepared by 15:85 (cement: sugarcane bagasse ash) ratio in the concrete mixer which cured 7 days and allowed to dry. Before applying in concrete the SCBA aggregates are prewetted (Saturated surface dry condition) for self curing purpose. The physical and chemical properties of SCBA as shown in Table.3 and Table.4. Water used for the study is the potable water available in K.S.R College of Engineering campus, Tiruchengode.

Table.1 Physical properties of Cement

S.No	Properties	Result
1	Standard consistency	29.5%
2	Fineness (retained on 90-μm sieve)	2940 cm^2/gm
3	Specific gravity	3.15
4	Initial setting time	75 min
5	Final setting time	370 min

Table.2 Properties of Fine aggregate and Coarse aggregate

S.No	Properties	Fine aggregate	Coarse aggregate
1	Fineness modulus	2.12	6.86
2	Specific gravity	2.64	2.83
3	Bulk density	1428 kg/m^3	1363 kg/m^3

RISK MANAGEMENT IN CONSTRUCTION SITE

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ABSTRACT: Risk management approach requires a proper and systematic methodology and more important knowledge and experience. Risk identification and analysis phases of the risk management process are considered the most important,for they can have a big impact on the accuracy of the risk assessment exercise.Currently it is assumedthat construction site managers rely largely on experience to identify projects risks. These decisions,influenced by individual perception and attitudes which are made primarily under conditions of uncertainty. Most of the individuals assess the situation they perceive, before expressing a response of risk. Risk has to consider in the different types of risk management techniques applied to alleviate risk, to identify the use of implementation of the risk management, wherein to categorize the principles adopted in Risk Management. Many companies often establish a risk management procedure in their projects for improving the performance and increase the profits.

KEYWORDS: Risk management, Risk identification, Risk assessment, Risk response.

INTRODUCTION

Risk management has become an essential part of 'firms and regulators' activities.This may include a synchronized and cost effective way of using the materials and resources in an order to minimize the hazards that may arise along with monitoring and controlling the unfortunate events that may occur. Risk can happen due to uncertainty in financial market, accidents, failures in the project, natural factors, legal issues, risk associated with credit etc. Different methods can be applied to manage risk which may range from transferring of the risk to subsequent party, avoiding the risk factor, minimizing the consequences of risk and accepting the effect of risk in few cases. Project requires a special mission which is used by the client to get a viable edge in the market to operate. The past projects do not match the subsequent project due to its uniqueness which ultimately increases the chances of hazards. The characteristics of each project keeps on changing which make it difficult to be imitated. This requires unique skills to manage and accomplish the process.

In order to accomplish any project the project manager settles the complexities that may arise in the project which mayarise due to hazards, uniqueness, need of the project and the environment in which it is executed. The objective of the investigation is to have a view of the risk management process from the perspective of different participants of the project. From the bases of analysing them, required questionnaire was prepared appropriate to the research methodology. A survey was done which ranged from clients, experts, consultants to contractors. Among these participants a few were chosen who had experience in risk management projects in particular. At individual firms level, this poses an increasing threat to their ability to keep control over their exposure to risk in a diverse environment. At an aggregate level, there has been some fears that default by one firm could spread out to others in the same country or even cross-borders, and become a financial crisis of huge proportions. This is a major concern not only for regulators, but also for markets participants altogether. In this context, risk management has become an essential part of firms activities. A risk management system is a valuable instrument for assessing the exposure to risk that participants in the financial sector in general are subject to. Using such systems, managers can measure risk across markets in terms of their potential impact on profit and loss, quantify capital allocation to markets and dealers.

Risk impact establishthemeaningful risk limits and supervise performance.Risk systems also provide a measure of projects vary with the course of development, planning, realization and operating. Despite their uniqueness, recurrent processes of these phases can serve for the recognition of risks in order to consider project-specific and known risks more closely. In this, particular importance is attached to the implementation and realization phase. While in the past claims for damages were regularly presented subject to the precondition that an actual or rather obvious damage or loss at the structure had occurred, in the meantime the claim is increasingly asserted in the case of defects that have not led to damage or loss at structures. The claims for damages for resulting costs and other prejudices incurred by the contractor are increasing.

It is found that the on average 20% of construction workers are exposed to harmful chemicals during half the working hours. Due to this, most contractors indeed to take Management health and safety control measures on the construction site. This affects the output of their work and works are not generally Completed on schedule leading to loss of confidence in them, poor Quality work and huge financial losses.Due to improper planning and control, the more expensive the project becomes risky

EXPERIMENTAL INVESTIGATION ON PARTIAL REPLACEMENT OF FLY ASH BY RICE HUSK ASH IN FLY ASH BRICK MANUFACTURING

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ABSTRACT: Construction industries are the backbone for infrastructure development in India. The various by-products produced from industries causes havoc & pollution in India. It has a major impact in the healthier environment of the Nation. Various by-products such as Fly Ash (FA), Rice husk ash (RHA), Quarry Dust (QD) and Gypsum (G) are produced millions of tons every year. These by- product causes environmental problem. In order to reduce the waste by-product, a study was made to evaluate the technical possibilities of incorporating fly ash, rice husk ash, quarry dust and gypsum in the construction bricks. Various mixtures were prepared by incorporating these industrial wastes with different weight proportion. The suitable mix proportion has been identified and the physical and mechanical properties of that specimen such as unit weight, compressive strength, water absorption and efflorescence values has been compared with conventional building material types shows utilization of these waste additives is not only for conservation of clay resources but also an alternative solution to difficult and expensive waste disposal problems.

INTRODUCTION

Brick is the basic material used in construction from ancient times generally we are using clay burnt bricks and fly ash bricks which is producing environmental threats during burning and curing processes. In India industrial by-products like fly ash- 50 million tons, gypsum-5 million tons, rice husk ash- 24.6 million tons and quarry dust-7 million tons are produced each year which causes serious storage and environmental problem. Also, the emission of Co_2 into the atmosphere should be administered to reduce global warming.

The percentage of Co_2 emission from the cement industry is about 6% which can be minimized by choosing a different binder material. The main aim of this project is to resolve the problems of disposal and health hazards caused resources. Both fly ash and rice husk ash are the materials that are considered as a waste material thus they are cheaply available and also reduce the cost of disposal. The unit weight, compressive strength, efflorescence test, water absorption test of the bricks will be investigated and compared with the conventional bricks.

II. INDUSTRIAL BY-PRODUCTS

A. Rice Husk Ash

Rice husk ash (RHA) is obtained by burning rice husk. Physical properties of RHA are greatly affected by burning conditions. Optimum properties can be obtained when rice husks are burnt at 500 - 700°C.The pozzolanic activity of rice husk ash is effective in improving the strength.

EXPERIMENTAL INVESTIGATION ON PARTIAL REPLACEMENT OF QUARY DUST BY COPPER SLAG IN FLYASHBRICK MANUFACTURING

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ABSTRACT: Construction industries are the backbone for infrastructure development in India. The various by-products produced from industries causes havouc & pollution in India. It has a major impact in the healthier environment of the Nation. various by-products such as Fly Ash(FA), Copper Slag(CS), Quary Dust(QD) and Gypsum(G) are produced millions of tons every year. These by- products cause environmental problem. In order to reduce the waste by-product, a study was made to evaluate the technical possibilities of incorporating fly ash, copper slag, quary dust and gypsum in the construction bricks. Various mixtures were prepared by incorporating these industrial waste with different weight proportion. The suitable mix proportion has been identified and the physical and mechanical properties of that specimen such as unit weight, compressive strength, water absorption and efflorescence values has been compared with conventional building material types shows utilization of these waste additives is not only for conservation of clay resources but also an alternative solution to difficult and expensive waste disposal problems.

INTRODUCTION

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INDUSTRIAL BY-PRODUCTS

A.COPPER SLAG

Copper slag is a by-product obtained during the copper smelting and refining process. During smelting impurities become slag which floats on molten metal. Slag that is quenched in water produces angular granules.

Which are disposed of as waste or utilized as below.

COPPER SLAG

QUARY DUST

B. FLYASH

Fly ash also known as " pulverized fuel ash" in the united kingdom is a coal combustion product that is composed of the particulates that are driven out of coal fired boilers together with fuel gases. Flyash is used in the manufacture of the bricks and concrete . The flyash waste material used for the lightweight and more strength for the buiding materials.

C. QUARY DUST

Quarry dust is a byproduct of the crushing process which is a concentrated material to use as aggregates for concreting purpose, especially as fine aggregates. In quarrying activites , the rock has been crushed into various sizes. During the process the dust generated is called Quarry dust and it is formed as waste.

EXTRACTION OF METHANE FROM FOOD WASTE USING A SINGLE STAGE DIGESTER: A REVIEW

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ABSTRACT: Due to present day energy crisis, one has to find the alternate way of energy production. Bio gas is the alternative energy source which is economically compact and environmentally safe to use. A single stage bio reactor is designed economically to be utilized in the residential buildings. This reactor can effectively reduce the waste at its source level. The various properties of the waste sample are taken and studied comparatively. The digested slurry can also be used in agricultural field as bio-fertilizer.

KEYWORDS*:* Alternate energy, anaerobic process,bio-reactor.

INTRODUCTION

Biogas is 60-80% methane and is created by a process termed Anaerobic digestion,leaving behind a nutrients–rich substance. It is produced by thebreakdown of organic matter in the absence ofoxygen. It is renewableenergy with less carbon footprint. Biogas mainlycontains methane (CH_4), carbon dioxide (CO_2) and rarely a small amount of hydrogen sulphide (H_2S).Methane is the simplest alkane and itsrelative abundance makes it as an attractive fuel.

Anaerobic digestion (AD) is a complex Biochemical process for the utilization of organic materials, which involved a series of metabolic reactions such as hydrolysis, acidogenesis and methanogenesis. Co-digestion is the simultaneous digestion of a homogenous mixture of two or more substrates.Traditionally; anaerobic digestion was a single substrate, single purpose treatment. Recently, it has been realized that AD as such became more stable when the variety of substrates applied at the same time is increased.Methane on combustion produces a heatenergy of55.5MJ/KG. Natural methane is produced by the methanogenesis process.

$$CO_2 + 8\ H+ + 8\ e- \rightarrow CH_4 + 2\ H_2O$$

In this paper an attempt is taken to design a single stage bio-reactor for the extraction of methane from the organic municipal wastes. The various characteristics of waste and the extraction of biogas were summarized below.The anaerobic digestion depends on the following parameters such aspH, temperature, carbon and nitrogen content, quantity of waste and moisture content. One can identify the anaerobic digestion process through figure 1

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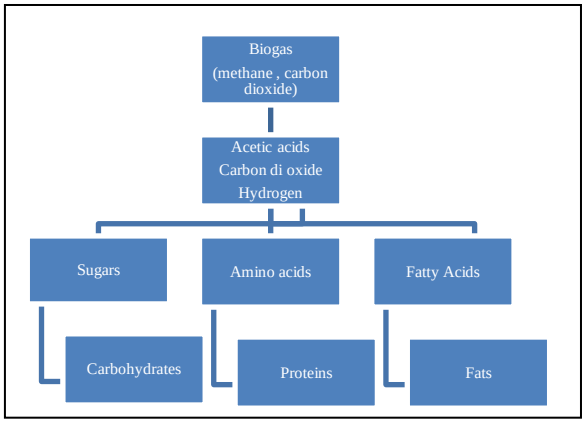

Fig 1: Anaerobic digestion process

MATERIALS AND METHODS

Reactors

There are two types of reactors used for anaerobic digestion. They are single stage reactors and two stage classified based on its function.

Single stage reactors are simple in construction where the hydrolysis, acidogenesis,acetogenesisand methanogenesis occurs at the same place. There may be acidification of the digester due to shock loading.

COMPARATIVE STUDY ON SELF COMPACTING GEOPOLYMER CONCRETE BY AMBIENT AND STEAM CURING

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ABSTRACT: This project deals with the self compacting geo-polymer concrete where the cement is replaced with bottom ash and GGBS. Self compacting Geo-polymer concrete is a flowing concrete mixture that is able to consolidate under its own weight. Here OPC is replaced with 75% and 50% of GGBS and 25% and 50% of bottom ash, where the bottom ash and GGBS has high silica and alumina content which act as a binder content. Based on the European guidelines EFNARC the fresh properties of SCGPC were assessed through slump flow, $T_{50\ cm}$ slump flow, V-funnel, L-box and J-ring test methods. The alkaline liquid to binder content ratio was fixed as 0.5 and the ratio of sodium silicate to sodium hydroxide was taken as 2, the sodium hydroxide concentration of 8M was fixed. The dosage of 3% of binder content of super plasticizer (Glenium sky 8233). Both ambient and steam curing methods were adopted. The fresh properties of SCGPC values obtained are within the acceptance criteria. The hardened properties (compressive strength, split tensile strength and flexural strength) of the SCGPC with Mix GB_{25} increases with decrease in the percentage of bottom ash. Similarly the hardened properties increase with increase in GGBS. High compressive strength is obtained during steam curing and maximum compressive strength is obtained for GB_{25}compared to GB_{50}.

KEYWORDS: Self Compacting geo-polymer concrete, bottom ash, Workability, Hardened properties.

INTRODUCTION

The cement industry is responsible for about 6% of all CO_2emissions. However, at present Portland cement is still the main binder in concrete construction and the search for more environmentally friendly materials is essential. The most common industrial by-products used as binder materials are bottom ash (BA) and ground granulated blast furnace slag (GGBS). GGBS has been widely used as a cement replacement material due to its latent hydraulic properties, while bottom ash has been used as a pozzolanic material to enhance physical, chemical and mechanical properties of cements and concretes. Geopolymer binder can be used in applications to fully replace OPC with environmental and technical benefits. Geopolymer binder is made from alumina and silicon, and not from calcium and silicon. The sources of aluminum which is present in nature are not as carbonates. When aluminum made active for use as geopolymer binder, it do not release vast quantities of CO_2. Low calcium bottom ash is preferred because high calcium poses the risk of fast setting. The main parameters affecting the bottom ash geopolymer mixtures are the composition of the raw materials, the concentrations of alkaline solutions used, and the curing method. Hence low-calcium bottom ash-based geopolymer is proposed as the binder, instead of ordinary OPC paste, to produce concrete. Self compacting geopolymer concrete is the combination of both self compacting concrete and geopolymer concrete.

M. Fadhil Nuruddin et.al (2011) in this paper parameters studied were SP dosage and molarity of NaOH solution. It is identified that low Superplasticizer content 3, 4 and 5% had poor filling and passing ability and the workability results were not satisfied the limits of SCC. Author found that 6% of SP dosage and 12M of NaOH concentration could produce concrete compressive strength up to 51.52MPa tested at 28-days. As the concentration of NaOH solution increased from 8M to 12M, the compressive strength of geopolymer concrete was increased.

Srishaila & parvez ahamed (2014) made the experimental study on durability and strength characteristics of flyash & GGBS based SCGC. This project reports in the attempt on the study of longer curing duration improves the process of Geo-polymerization resulting in higher compressive strength (56 days). The GGBS SCGPC at ambient temperature will have higher compressive strength rather than fly ash based SCGPC.

Sashidhar & Guru Jawahar (2015) made the fresh and hardened properties of SCGPC using manufactured sand. This project results in an attempt that the contribution of GGBS helps the mix to attain early and rapid strength development at ambient room temperature curing and no adverse effect have been observed when SCGPC mixes prepared with manufactured sand. The increase in the NaOH molarity increases the compressive strength of SCGPC.

Elavenil (2017) made a review on fly ash based SCGPC has got high compressive strength in heat curing. The specimens were cured at 70^{o}C had produced higher compressive strength. Whereas the

5.2. Split Tensile Strength Test

In order to find the split tensile strength of concrete 7 days and 28 days of cylinder (150 X 300 mm) specimen are cast. For each combination, three specimens were tested as per IS 516:1959. The following table shows the split tensile strength of SCGPC.

Table 4 Split Tensile Strength of SCGPC

MIX ID	Split tensile strength test results (MPa)			
	Ambient curing		Steam curing	
	7-days	28-days	7-days	28-days
GB_{25}	2.66	2.96	2.87	3.30
GB_{50}	2.3	2.80	2.51	2.66

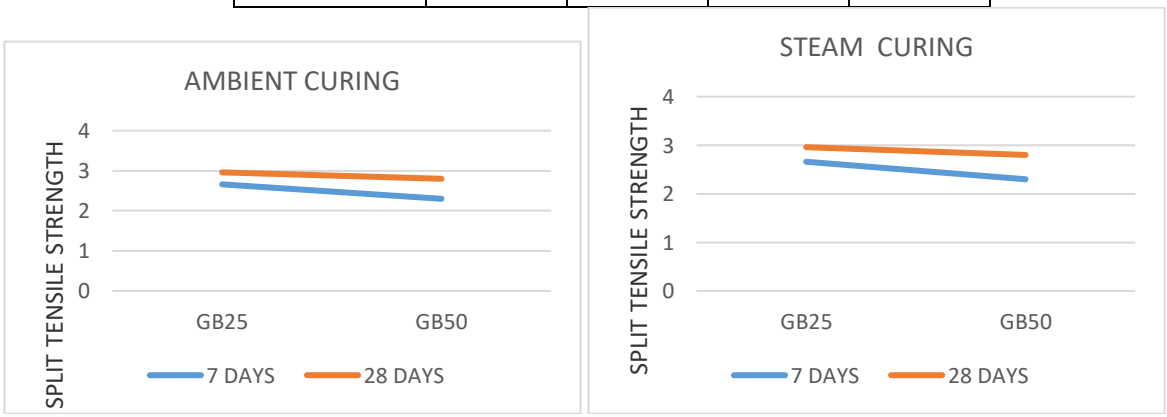

Fig 2. Split tensile Strength

The split tensile strength obtained in GB_{25} at 7 days is 2.3 MPa were as at 28 days it is 2.8 MPa. Hence the obtained values are rapidly increasing for ambient curing. The strength obtained for 7 days in steam curing is 2.87 MPa were as at 28 days it is 3.30 MPa. On comparing both the curing process, the steam curing has high split tensile strength. The similar result is obtained for GB_{50}.

5.3. Flexural Strength Test

In order to find the split tensile strength of concrete 28 days of prism (500 X 100 X 100 mm) specimen are cast. For each combination, three specimens were tested.

Table 5: Flexural Strength of SCGPC

MIX ID	Split tensile strength test results (N/mm^2)	
	Ambient curing	steam curing
	28-days	28-days
GB_{25}	6.0	6.85
GB_{50}	5.6	6.1

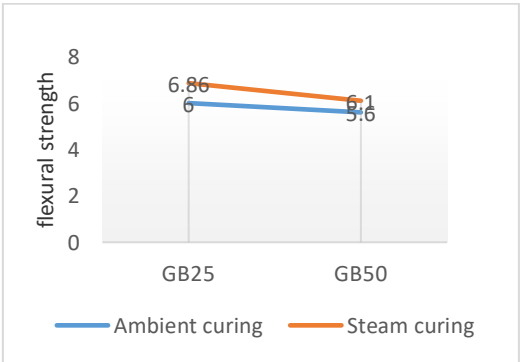

Fig. 3 Flexural Strength

STUDY ON MECHANICAL PROPERTIES OF STEEL SLAG AS A FINE AGGREGATE

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ABSTRACT: As a construction material, concrete is the largest production of all other materials. Aggregates are the important constituents in concrete. They give body to the concrete, reduce shrinkage and effect economy. The increase in demand for the ingredients of concrete is met by partial replacement of materials by the waste materials which is obtained by means of various industries. Slag is a by product of metal smelting and hundreds of tons of it are produced every year all over the world in the process of refining metals and making alloys. Like other industrial by products, slag actually has many uses, and rarely goes to waste. It appears in concrete, aggregate road materials, as ballast, and is sometimes used as a component of phosphate fertilizer. In appearance, slag looks like a loose collection of aggregate, with lumps of varying sizes. It is also sometimes referred to as cinder, in a reference to its sometimes dark and crumbly appearance. This substance is produced during the smelting process in several ways. Firstly, slag represents undesired impurities in the metals, which float to the top during the smelting process. Secondly, metals start to oxidize as they are smelted, and slag forms a protective crust of oxides on the top of the metal being smelted, protecting the liquid metal underneath. When the metal is smelted to satisfaction, the slag is skimmed from the top and disposed of in a slag heap to age. Aging material is an important part of the process, as it needs to be exposed to the weather and allowed to break down slightly before it can be used. In this experimental investigation an attempt is made to study the effect of partial replacement of fine aggregate by steel slag in the mechanical properties of M_{40} grade concrete.

KEYWORDS: Concrete, Steel slag, Fine aggregate, Coarse aggregate, Cement.

1. INTRODUCTION

Since aggregates occupy 70-80 percent of the volume of concrete, their impact on various characteristics and properties of concrete is undoubtedly considerable. All along in India, we have been using natural sand and gravel in concrete manufacturing. Availability of natural aggregates is getting depleted and also it becoming costly. Hence, there has to be an emphasis on the use of wastes and by-product in all areas including construction industry. As 75% of concrete is composed of aggregates it is imperative that we look to maximize the use of waste as aggregate input in concrete making. This research work determines the effect of partial substitution of fine aggregates by steel slag on the mechanical properties of concrete.

A comprehensive study of the health risks associated with the environmental applications of iron and steel making slag was performed using characterization data for samples of slag collected from blast furnaces, basic oxygen furnaces and electric arc furnaces. Characterization data were compared to regulatory health based screening bench marks to determine constituents of interest. The risk assessment found no significant hazards to human health as a result of the environmental applications of steel-industry slag.

The successful incorporation of steel slag as aggregates in construction products requires the consideration of certain issues. Firstly, as steel slag is an industrial by-product until recently disposed in landfills, the question is whether it is suitable for use in construction. Then the technical characteristics of the material are examined because due to its physicochemical properties steel slag requires special care, but can also provide maximum value if used for specific applications. The utilization of by-product in suitable applications mainly where it is advantageous compared to traditional materials, but also where it is most economical can give a higher added value to the product.

The research was intended to study the effectiveness of using steel slag aggregate in improving the engineering properties of locally produced asphalt concrete mixes. The research started by evaluating the toxicity and physical and chemical properties of the steel slag. Then 0%, 20%,40%,60%, 80% and 100% of the fine aggregate is replaced by steel slag aggregate. The results showed that the 60% replacement was the optimal replacement level.

The durability performance of both steel slag aggregate was evaluated by assessing water permeability, pulse velocity, dimensional stability and reinforcement corrosion. The results indicated that the durability characteristics of steel slag cement concretes were better than those of crushed aggregate concrete. Similarly, some of the physical properties of steel slag aggregate concrete were better than those of crushed aggregate concrete, though the unit weight of the former was more than that of the later.

EVALUATING PERFORMANCE OF SUBCONTRACTOR IN CONSTRUCTION INDUSTRY

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ABSTRACT:
In the construction industry, subcontractor's performance is a crucial factor in their awards of a new job by a general contractor. Main contractors have shifted their attitudes about subcontract procurement to more strategic and long-term partnering philosophies. A case study was conducted to evaluate the framework with subcontracting strategy, performance weighting, evaluation of subcontractor performance data, and feedback methods. The objective of this study is to select an efficient subcontractor by comparing them in various ways. The subcontractor's overall rating can be determined by placing the overall percentage score calculated on the score card within the numerical ranges. The research results obtained can be useful as a guideline of subcontractor management to enhance overall productivity.

KEYWORDS: comparing, efficient, overall rating, productivity, score card.

INTRODUCTION

Main contractors have shifted their attitudes about subcontract procurement to more strategic and long-term partnering philosophies. Subcontracting is probably most prevalent in the construction industry, where builders often subcontract different activities and produce a substantial portion of construction work under the supervision of general contractors. The contribution of subcontractors to the total construction process can account for as much as 90 percent of the total value of a construction project. In the construction process efficient subcontractor to be beneficial to all parties involved, including the owner, general contractor, and the subcontractors themselves. In the past two decades, subcontracting has been utilized extensively in the construction industry. An efficient subcontractor always acts for a hassle-free execution of the activities giving no headache to the prime or main contractor. Most of the subcontractors keep a long term relationship with the main contractor when there is an opportunity for growth in the organization. In order to improve subcontractor productivity, subcontractors should be familiar with modern construction/ production methods are expected to reduce the duration and cost of construction projects. Productivity can also be improved by effective quality management. There also seems to be an agreement between the parties that subcontractor's familiarity with modern management techniques and their efforts to reduce accident and motivate workers constitute secondary measures for improved productivity.

NEEDS OF THE STUDY

Several Construction industry reports have pointed out that a decline in construction quality and productivity could be attributed to the performance of subcontractors yet subcontractor performance appraisal is a much neglected subject in construction. Performance evaluation of subcontractors provides a base for selection of subcontractors based on the importance of work and capability of subcontractor.

LITERATURE REVIEW

Thomas, S.N.G., (May 2007) mentioned that to determine the structure of the balanced scorecard model for subcontractor performance appraisal, a major literature review was first conducted to identify the decision criteria and quantitative indicators to be considered. Based on the previous research of Chung and Ng (2006), a list of ten decision criteria and seventeen quantitative indicators were identified. This information was used for the development of a questionnaire for capturing the necessary data for model development. The questionnaire consisted of two sections. In the first section, respondents were asked to provide their personal particulars, i.e. their job titles, number of years experience in the engineering industry, type of organization they are working for, and the size of their companies. The second section required the respondents to express their opinions on the quarterly evaluation of large –scaled skilled subcontractors.

LIGHT WEIGHT PANNEL USING NATURAL FIBRE

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ABSTRACT: Natural fibers are emerging as low cost, lightweight and apparently environmentally superior alternatives to glass fibers in composites. We review select comparative life cycle assessment studies of natural fiber and glass fiber composites, and identify key drivers of their relative environmental performance. Natural fiber composites are likely to be environmentally superior to Areca leaf fiber composites in most cases for the following reasons: (1) natural fiber production has lower environmental impacts compared to glass fiber production; (2) natural fiber composites have higher fiber content for equivalent performance, reducing more polluting base polymer content; (3) the light-weight natural fiber composites improve fuel efficiency and reduce emissions in the use phase of the component, especially in auto applications; and (4) end of life incineration of natural fibers results in recovered energy and carbon credits. The technique of producing lightweight structural elements is now growing at fast rate. This plays a vital role in the development of infrastructures such as industrial structures and other miscellaneous structures. Lightweight structures are widely used in mass rapid constructions as it is meant for easy manufacturing, handling and transportation. The structural elements such as Beam, column, panel etc., Most importantly, it is produced with cost effective materials.
KEYWORDS: Natural fibres, Areca leaf fibre

1. INTRODUCTION

Lightweight panels are playing predominant role in nowadays constructions. Technological advances have recently made it possible to improve the performance of panels. The use of lightweight panel offers reduction in breakage during transportation, an opportunity for market diversification, reducing the burden of timber resources. Based on density, panels may be grouped into four categories such as heavy materials (þ>500kg/m^3), lightweight materials (þ<600kg/m^3), extra-lightweight materials (þ<300kg/m^3) and ultra- lightweight materials (þ< 200kg/m^3).The quality of Lightweight panel is determined by its physical and mechanical properties as its ability to resist deterioration. The strength of the mortar is most important, as it has strong relationship with quality. The technique of producing lightweight structural elements iS now growing at fast rate.Lightweight structural elements such as beam, column, wall panel and other miscellaneous structures.The project involves the addition of Areca leaf as a natural fiber.Natural fibres and wood composites are used to produce door panels is already investigated, but it is the first experimental investigation about manufacture of Lightweight panels using ,Areca leaf, used as a plate for eating.It is recycles and reused for light weight pannel production.

2. LITERATURE REVIEW

Shaobin and Hongwei (2006), In this study, chemical treatment of Sugarcane bagasse ash will make conversion of Sugarcane bagasse ash into more efficient adsorbent for gas and water cleaning in wastewater treatment plants. It is estimated that 349million tonnes of Sugarcane Baggase ash was produced worldwide in 2000.while, most are disposed in landfills. The effective use of Sugarcane bagasse ash, for removal and adsorption capacities, its conversion into zeolite has widely attempted. The unburned carbon in Sugarcane Baggase ash is converted into activated carbon.

Anil, et. al (2007), In this study, the sintering of class F sugarcane bagasse ash was investigated including sintering temperature (1050^{o}c-1200^{o}c) and sintering time (0-90min). Sugarcane Baggase ash is an industrial by-product recovered from the flue gas of coal burning electric power plants. Class F Sugarcane bagasse ash is generally produced from burning high rank carbon content coals

Christopher, (2009), investigated thatModcell panels are an innovative way of using straw bales in a prefabricated wall system. This panel consists of timber frame, braced with steel rods, in-filled with straw bales and surfaces are rendered with lime render. These panels are used for cladding on framed buildings. The render on panel protects it from weather, fire, pests and accidental damage. Finally, from the results of test such as shear resistance, load-bearing and rendering test, the Modcell panels are used in load – bearing construction up to three storey structures. The above tests are carried out at 28 days.

Padkho, (2011),This research presents the production of light wallboards from agricultural waste such as Areca Leaf and shell corn as raw material. Adhesives and synthetic urea fort Thomas aldehyde 13% act as adhesives. Manufacture of light wallboard by heat compression at temperatures 120^{o}c with pressure of 150kg/m^3.This work highlights the Thermal insulation property means material capable of

USE OF PLASTIC WASTE AS PARTIAL REPLACEMENT OF FINE AGGREGATE IN CONCRETE MIXTURE

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ABSTRACT: The increase in population and the changed the changed lifestyle has resulted in a significant rise in the quantity of plastic waste.This work aimed to investigate of using plastic waste as partial replacement of fine aggregate. The use of plastic is increasing day by day, steps were taken to reduce its consumption. This creates substantial garbage everyday which is unhealthy. Concrete with various proportions of plastics are tested for specific gravity, fineness ,sieve analysis .The standard mechanical properties like compressive strength , split tensile strength , flexural strength test, impact test are tested and compared with the results of standard specimen. Mix design using Is code method is done and cubes , cylinders and prisms are cast for M25 grade concrete with and without plastic tests

KEYWORDS: *plastic waste: polyvinyl chloride pipes, a plastic water containers.*

INTRODUCTION

Polyvinyl chloride (PVC) is one of the most used plastics in the world. Global polyvinyl chloride use exceeds 35 million tonnes per year, and demand is growing. At a global level PVC use grows by an of 5% per year, with higher growth rates in developing countries. In everyday life, they are all around us.The another important plastics used is the plastic water containers. These are the one which have been used in most of the houses for their everyday use.The waste of these kind of plastics also taken for the consideration . So the plastic waste is one of the major problems faced by every country due to health hazards and difficulty for land filling.By replacing these kind of plastics in concrete,it helps to decrease the pollution of the environment and it also helps to save and recycle energy production processes. As a possible solution to the problem to the plastic waste of pvc,and plastic waste containers, an experimental study was conducted to examine the potential of using it as sand replacement in the concrete buildings. The plastic waste from PVCand plastic waste containers were studied as alternative replacement of a conventional fine sand of concrete. Five replacement levels, 5%, 10%, 15%, 20% and 25%of sand replacement of aggregates were used for the preparation of the concretes.

MATERIAL USED

OPC-53: ordinary Portland cement grade 53

Cement is one of the binding material in this project . cement is the important building material in todays construction world . 53 grade Ordinary Portland Cement (OPC) conforming to IS : 8112- 1989.

Table 1 Properties of cement

Sl. No	Test conducted	Properties
1	Specific gravity	3.26
2	Fineness test	3.8
3	Initial setting time	32 minutes
4	Final setting time	375minutes
5	Compressive strength at 7days	45.7N/mm^2
6	Compressive strength at 28days	55.3N/mm^2

Coarse aggregate

Crushed angular coarse aggregates of 20mm size were used. The specific gravity was 2.74.

Fine aggregate (M- sand)

M sand is mainly used for concreting purposes. Its granule thickness / sieve size is 150 microns - 4.75mm and it adheres to IS code – 383 : 1970. Specific gravity for M sand is 2.61.

Table 2 Properties between Natural sand and m-sand

Sl. No	Properties	Natural sand	M- sand
1	Specific gravity	2.47	2.78
2	Bulk density (Kg/m^3)	1443	1680
3	Fineness	2.72	2.91
4	Water absorption	1.15%	1.6%

INVESTIGATION ON SILICA FUME AND CLAY AS A PARTIAL REPLACEMENT OF CEMENT IN CONCRETE

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ABSTRACT: This paper reports on the investigation on silica fume and clay as a partial replacement of cement in concrete. Cement is the most important material of concrete and it is a high cost material. This may cause environmental problems and depletion of natural resources. The main parameter investigated in this study is M40 grade concrete with partial replacement of cement by silica fume of 0% to 25% with an interval of 5%. Clay is also an available material in construction field. Clay is partially replaced as 10% by weight of cement content. This paper presents an experimental study on compressive strength, split tensile strength, flexural strength test at the age of 7, 14 and 28 day. Test results indicate that use of silica fume and clay in concrete gives very high strength.

KEYWORDS: Silica fume, clay, compressive strength, split tensile strength, flexural strength.

1. INTRODUCTON

Concrete is a construction material which is composed of cement, water and aggregate [1]. Cement is very commonly used construction material. It is most essential ingredient in construction field and it affects the overall cost of the project. The production of cement involves emission of large amount of carbon dioxide gas into the atmosphere [2]. Silica fume and clay provide a high strength concrete. The use of silica fume as a pozzolana has increased worldwide attention in recent years [3].Silica fume is the by product in the production of silicon alloys such as ferro chromium, ferro manganese, etc. [3]. Its particles are approximately 100 times smaller than average cement particles [4]. Cement replacement with silica fume leads to increase in strength. It has high tensile flexural strength and modulus of elasticity. Clay is a good blending material easily combine with concrete with respect to cement. Clay has the important property of shape stability and shape holding property. These particles are smaller than 0.004mm. Clay has the ability to withstand greater load with respect to its size and shape [5].

Fig 1 silica fume

2. MATERIAL PROPERTIES

2.1 Material used

Ordinary Portland cement one of the most conventionally used cement. The most commonly available OPC53 are used in this investigations of specific gravity 3.15. Coarse aggregate of size 20mm is used in this project. The specific gravity of coarse aggregate was 2.7. Fine aggregate (Grading zone III conforming to IS: 383-1987) was used as fine aggregate. The specific gravity of fine aggregate is 2.63. Silica fume is the byproduct of producing silicon metal or ferro silicon alloy. The specific gravity of silica fume is 2.2. Clay is the natural material composed of fine grained minerals. The specific gravity of clay is 3.25. As per IS 3025, water to be used for mixing and curing should be free from the injurious or deleterious materials.

2.2 Specimen Preparation

The effect of compressive strength of the concrete with the partial replacement of the silica fume and clay, mixes were prepared in the ratio of 1:1.81:2.9 and W/C ratio is 0.45. The cement, fine aggregate and coarse aggregate is mixed in dry condition and then the water is added and mixed again. The resulting mix was cast into the mould of cube (150mm x 150mm x 150mm), cylinder (150mm x 300mm) and beam (500m x 150mm x 150mm) were casted. The fresh concrete mix was filled in the steel moulds in three layers and each layer is compacted using the tamping rod. Before the initial setting time of the mortar all top surface of the specimen were levelled using trowel. After 24 hours all the specimens were de-moulded and immersed in water for curing.

FLEXURAL STUDY ON CHARACTERIZATION OF STEEL CONCRETE COMPOSITE STRUCTURES

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ABSTRACT: An experimental investigation of the ultimate strength and behaviour of a new type of composite beam called SCC beam (Steel Concrete Composite Beam) is a concrete beam shuttered with cold formed steel sheet which acts as a composite beam by means of shear connectors and bracings. Stud shear connectors are used to take up the bond between sheet and concrete. The passive confinement by the cold formed sheet in the sides and bottom influences the strength and ductility of the system. These beams are provides very good confinement of concrete. Totally eight SCC beams are tested and the entire behaviour of the beams are monitored to predict the physical response of the beams under three different types loading such as pure bending, pure torsion and combined bending and torsion. Two points loading was obtained for pure bending. The deformation criteria (deflection, moment and flexural rigidity) are also included in the investigation throughout the entire load history experimentally. The results obtained by the experimental values which are found to be in good agreement.

INTRODUCTION

Steel concrete composite structure is too made on the combination of two materials. The two materials are steel section and concrete section. Concrete is the versatile construction material. Steel is the ductile property. Ductility is an important characteristic of resisting the earth quake, impact and blast loading. Steel concrete composite beam is consisting of steel beam over which a reinforced concrete slab is cast with shear connector. The basic concept of composite section is lie in fact that concrete is strong in compression than steel and steel is stronger than tension. It is the advantages of the composite beams have higher stiffness, thus it is large deflection that steel beam. Composite structure is made on concrete of used in grade of cement M40 and reinforced steel yield strength of Fe415. Concrete materials are cement, sand, water and admixture of super plasticizer. The admixture of super plasticizer is CERAPLAST300. In this super plasticizer of reducing the water cement ratio. Steel concrete composite structure is the main thing of connection between the steel and concrete section. The shear connection of different types of connections is here available. The different types of "T" section, "I" section, helical section, "C" section, etc... So therefore in this composite section is used "T" section for shear connection. In design of a building, the choice was normally between a concrete structure and a masonry structure. But the failure of many multi-storeyed and low-rise R.C.C. and masonry buildings due to earthquake has forced the structural engineers to look for the alternative method of construction. Use of composite or hybrid material is of particular interest, due to its significant potential in improving the overall performance through rather modest changes in manufacturing and constructional technologies.

As per IS 11384 the composite construction consists of the use of prefabricated structural units like steel beams, precast reinforced or prestressed concrete beams in combination with in-situ concrete. The construction should ensure monolithic action between the prefabricated and in-situ components so that they act as a single structural unit. These essentially different materials are completely compatible and complementary to each other; they have an ideal combination of strengths with the concrete efficient in compression and the steel in tension.

In composite construction, composite slab is defined as a slab system comprising normal weight or lightweight structural concrete, placed permanently over cold-formed steel deck in which the steel deck performs dual roles of acting as a form for the concrete during construction and as positive reinforcement for the slab during service. A composite beam is formed by a reinforced concrete slab attached to the upper flange of a hot-rolled or welded steel beam by shear connectors so that they act together as a single section. A steel-concrete composite column is comprising of either a concrete encased hot-rolled steel section or a concrete filled tubular section of hot-rolled steel and is generally used as a load bearing member in a composite framed structure. With the use of composite column along with composite decking and composite beams, it is possible to erect high-rise structure in an extremely efficient manner.

In the present work, for the design of each building component a separate software is developed with pre-, main- and post- processing facilities in based on IS code (1985, 2000) and Euro code (2004). The calculation of the limit state of different types of composite structural elements is considered. All principal design checks are incorporated in the software. The full and partial shear connection and the

INVESTIGATION ON STRENGTH CHARACTERISTICS OF CEMENT MORTAR AS A REPLACEMENT ANDADDITIVE OF CEMENT BY BENTONITE AND CLAY

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ABSTRACT: This paper reports on the investigation of bentonite as a partial replacement and clay used as an additive material of cement in cement mortar of the strength characteristics has been carried out. The cement is replaced by bentonite with the replacement level of 0 to 20% with an increment interval of 5%. The specimen was prepared using the mix ratio of 1:3 with the Water/Cementitious ratio of 0.42. The investigation on cement mortar such as, compressive strength, split tensile strength, saturated water absorption, porosity and density at the age of 7 and 28 days. From these results, maximum strength obtained cement is replaced by bentonite10%, compare to control and all other mixes. The clay is heated at 800 C at a two hour and it's used in additive material in cement. The specimen preparation was 10% Bentonite as a cement replacement material and clay used as an additive material in cement with different dosage level of 0 to 30% with interval of 5%. The mortar is tested the compressive strength, split tensile strength, density and porosity at the age 28 days

KEYWORDS: Bentonite, Compressive strength, Split tensile strength, Saturated Water absorption, Porosity, Density.

1. INTRODUCTION

Cement is the most essential ingredient of the construction industry and directly affects the overall cost of the project. The economy in the prevailing environment will remain a key feature in all engineering activities (3). Manufacturing process of cement is a significant contributor to greenhouse gases. The worldwide production of cement account for almost 7% of the total world carbon dioxide production and from the projection made by the cement manufacturers this trend is expected to remain steady in the next decade (20, 21). To cater for the said problem the low cost natural pozzolan, bentonite with the beneficial properties such as low heat of hydration, high ultimate strength, low permeability, high sulphate resistance and low alkali - silica activity is used as a partial replacement of cement (1).

The term bentonite was first proposed by Knight in 1898(2). Bentonite is a geological material composed from volcanic ashes altered in shallow sea and lagoons area and generally formed by phyllosilicates such as a smectite types, which is a 2:1 mineral consist of two tetrahedral sheets separated by an octahedral sheets (10). Bentonite is purified by removing the associated gangue minerals or treated with acids to produce acid activated bentonite (bleaching agents) or treated with organic to produce organoclays (14). Bentonite as a partial replacement of OPC provides a high amount of siliceous and aluminous compound after the pozzolanic reaction as compared to a convectional mixture with OPC (17). The durability and physical chemical interaction of the bentonite and cement blend used as cut- off walls are important factor in determining their potential service life. Firstly, it will provide a cost effective solution to construction industry, secondly it will help in reducing greenhouse gases and thirdly it would have a positive impact on the durability of the system (3).

The purpose of this research is to identify the strength characteristics of cement mortar as compressive strength and split tensile strength, several papers have been published on the performance of bentonite cement mortar. The objective of the investigation is to evaluate the replacement of cement with the reference to strength levels and optimal levels of OPC with bentonite. Its use in the prevailing environment will provide the best possible solution having multiple benefits. Towards this end, the investigation on the experiment was carried out as per standard test procedures. This included tests on compressive strength, splitting tensile strength, saturated water absorption, porosity and density.

2. MATERIAL USED AND EXPERIMENTAL PROGRAM

2.1 Materials Used

Ordinary Portland cement (OPC) conforming to ASTM C 150 (7) was used. Graded river sand passing through 2.36 mm and retained in 300 micron with fineness modulus of 2.7 and specific gravity of 2.63 was used as fine aggregate. Ordinary potable water with reference to IS 456- 2000 (11) mixing, casting and curing of specimen was done. Bentonite having resulting specific gravity of 2.5 was used for producing different mixes.

DURABILITY STUDY ON HIGH CALCIUM FLYASH GEOPOLYMER CONCRETE WITH SILICA FUME

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ABSTRACT*:* The present study deals with an experimental investigation of geopolymer concrete made with high calcium fly ash and silica fume. The alkaline liquids used in this study are sodium hydroxide (NaOH) and sodium silicate (Na_2SiO_3). The molarity of sodium hydroxide solution was 14M. The ratio of Na2SiO3/NaOH 2.5 with liquid binder ratio 0.5 was used. Naphthalene based super plasticizer was used to improve the workability in geopolymer mixes. Ambient curing was chosen for all the specimens. Durability properties such as salt, sulphate, acid resistance, sorptivity, corbonation were determined. Further, Test results depict that by adding silica fume with high calcium fly ash, enhanced the durability characteristics.

1. INTRODUCTION

Manufacturing of Portland cement is an energy intensive process and releases a large amount of green house gases into the atmosphere. Recently, another form of pozzolanic material using silicon and aluminum activated in a high alkali solution was developed The material is usually based on fly ash as a source material and is termed geopolymer or alkali-activated fly ash cement. Geopolymers was first developed by Davidovits, consist of SiO_4 and AlO_4 tetrahedral networks [1-3]. The prepared mixture can be subjected to curing at room temperature or at a given temperature. Alumina silicate reactive materials dissolve in strong alkaline solutions and free SiO_4 and AlO_4 tetrahedral structure forms. However, the reaction of the fly ash in the production of geopolymers is low at ambient temperatures [4]. It is also well known that geopolymers possess excellent mechanical properties [5]. Class C fly ash had higher compressive strength than that with Class F fly ash. The mixture of fly ash with 10 molarity(M) of NaOH is suitable for the geopolymer synthesis [6-8]. Through the geopolymerization process material can achieve high compressive strength at given temperatures between 40 and 95°C [9, 10]. Incorporation of silica fume into fly ash can be expected to improve the properties of resulting geopolymers in terms of strength and durability [11-13]. The compressive strength of geopolymer depends on the type of starting material and its fineness. The fine particles induce higher leaching of silica and alumina in the alkali environment and leads to a higher strength geopolymer [14]. The present study aims to develop high calcium fly ash geopolymer concrete partially replaced with silica fume.

2. EXPERIMENT DETAILS

2.1 Materials

High calcium fly ash used in this project was collected from Neyveli Lignite Corporation in Cuddalore district of Tamilnadu. The silica fume used in this study is purchased from Coimbatore. The chemical composition of high calcium fly ash, silica fume are shown in table 1. Other materials like alkaline solution, coarse aggregate of size 12 mm and 6 mm and fine aggregate were used in making of geopolymer concrete. The physical properties of fine and coarse aggregate are shown in table 2. Alkaline solution comprises of sodium hydroxide and sodium silicates were used. To improve workability of the fresh geopolymer concrete, water reducing naphthalene based super plasticizer was used in all of geopolymer mixes.

Table 1: Chemical composition of Fly ash & Silica Fume

S.NO	Chemical composition	Fly Ash	Silica Fume
1.	Silica (Sio2)	63.11%	93.67%
2.	Calcium Oxide (CaO)	17.13%	0.31%
3.	Magnesium Oxide (MgO)	0.24%	0.84%
4.	Iron Oxide (Fe2O3)	5.03%	1.30%
5.	Aluminium Oxide (Al2O3)	19.58%	0.83%
6.	Sodium Oxide (Na2O)	0.29%	0.40%
7.	Potassium Oxide (K2O)	0.84%	1.10%
8.	Loss of Ignition (L.O.I)	1.55 %	2.10%

EXPERIMENTAL STUDY ON MECHANICAL PROPERTIES OF HIGH CALCIUM FLY ASH GEOPOLYMER CONCRETE WITH ADDITIVE

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ABSTACT: The present study aims to carry out the mechanical properties of high calcium fly ash geopolymer concrete with silica fume. Sodium based alkaline was used as a chemical activator. The molarity of sodium silicate solution was 14M. **The ratio of Na_2SiO_3/NaOH as 2.5 with liquid binder ratio 0.5 was used.** Ambient curing mode was adopted. Concrete specimens with two different mixes were casted. Among them one mix was the fully replacement of cement from fly ash and another mix was partial replacement of fly ash by 40% silica fume. The mechanical properties of high calcium fly ash geopolymer concrete were evaluated. Test results depict that in geopolymer concretewith high calcium fly ash, silica fume yielded better mechanical properties

KEYWORDS: Compressive strength, Split tensile strength, Flexural strength, Modulus of elasticity

1.INTRODUCTION

Manufacturing of Portland cement is an energy intensive process and releases a large amount of green house gases into the atmosphere. Recently, another form of cementations' materials using silicon and aluminum activated in a high alkali solution was developed. This material is usually based on fly ash as a source material and is termed geopolymer or alkali-activated fly ash cement . Geopolymers was first developed by Davidovits, consist of SiO_4 and AlO_4 tetrahedral networks [1-3]. The prepared mixture can be subjected to curing at room temperature or at a given temperature. Alumina silicate reactive materials dissolve in strong alkaline solutions and free SiO_4 and AlO_4 tetrahedral structure forms. However, the reaction of the fly ash in the production of geopolymers is low at ambient temperatures [4]. It is also well known that geopolymers possess excellent mechanical properties [5]. Class C fly ash had higher compressive strength than that with Class F fly ash. The mixture of fly ash with 10 molarity(M) of NaOH is suitable for the geopolymer synthesis [6-8]. Through the geopolymerization process material can achieve high compressive strength at given temperatures between 40 and 95°C [9, 10]. Incorporation of silica fume into fly ash can be expected to improve the properties of resulting geopolymers in terms of strength and durability [11-13]. The compressive strength of geopolymer depends on the type of starting material and its fineness. The fine particles induce higher leaching of silica and alumina in the alkali environment and leads to a higher strength geopolymer [14]. In the above background, the present study focuses on the use of high calcium fly ash with silica fume as a geopolymer binder for making concrete.

2. MATERIALS AND METHODOLOGY

2.1 Materials

High calcium fly ash used in this project was collected from Neyveli Lignite Corporation in Cuddalore district of Tamilnadu. The silica fume used in this study is purchased from Coimbatore. Chemical composition of high calcium fly ash, silica fume are shown in table 1. Other materials like alkaline solution, coarse aggregate of size 12 mm and 6 mm and fine aggregate were used in making of geopolymer concrete. The physical properties of fine and coarse aggregate are shown in table 2. Alkaline solution comprises of sodium hydroxide and sodium silicates were used. To improve workability of the fresh geopolymer concrete, water reducing naphthalene based super plasticizer was used in all of geopolymer mixes.

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5.	Aluminium Oxide (Al_2O_3)	19.58%	0.83%
6.	Sodium Oxide (Na_2O)	0.29%	0.40%
7.	Potassium Oxide (K_2O)	0.84%	1.10%
8.	Loss of Ignition (L.O.I)	1.55 %	2.10%

Table 2: Property of Fine and coarse Aggregate

EXPERIMENTAL STUDY ON HIGH CALCIUM FLY ASH GEOPOLYMER CONCRETE WITH DOLOMITE POWDER

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ABSTRACT*:* Geopolymer concrete is such one and in the present study to produce the geo-polymer concrete. The portland cement is fully replaced with high calcium fly ash& dolomite powder. Dolomite powder is replaced with 0%, 10%, 20%, 30% and 40% by the weight of fly ash. The alkaline liquids used in this study for the polymerization is sodium hydroxide (NaOH) and sodium silicate (Na_2SiO_3). Concentration of sodium hydroxide solution 8M, 10M, 12M & 14M, liquid to binder ratio 0.5 and sodium hydroxide to sodium silicate ratio 2.5 are selected to prepare different mixes. Ambient Curing mode was used to cure mortar. Test results indicated that the mix with 20% dolomite powder by the weight of high calcium fly ash yielded higher compressive strength. Based on trials on compressive strength of high calcium geopolymer mortar, optimum mix combination was chosen for the further study on concrete. Upon the optimum mix combination, strength and durability properties were evaluated. Test results suggest that high calcium fly ash with dolomite powder could be used in geopolymer concrete.

1. INTRODUCTION

Manufacturing of portland cement is an energy intensive process and releases a large amount of green house gas to the atmosphere. Recently, another form of cementations materials using silicon and aluminum activated in a high alkali solution was developed This material is usually based on fly ash as a source material and is termed geopolymer or alkali-activated fly ash cement . Geopolymers was first developed by Davidovits, consist of SiO_4 and AlO_4 tetrahedral networks [1-3]. The prepared mixture can be subjected to curing at room temperature or at a given temperature. Alumina silicate reactive materials dissolve in strong alkaline solutions and free SiO_4 and AlO_4 tetrahedral structure forms. However, the reaction of the fly ash in the production of geopolymers is low at ambient temperatures [4]. It is also well known that geopolymers possess excellent mechanical properties [5]. Class C fly ash had higher compressive strength than that with Class F fly ash. The mixture of fly ash with 10 molarity(M) of NaOH is suitable for the geopolymer synthesis [6-8]. Through the geopolymerization process material can achieve high compressive strength at given temperatures between 40 and 95°C [9, 10]. Dolomite (CaMg(CO3)2) is abundant and generally inexpensive natural minerals. Dolomite was used as a replacement to the main raw materials (e.g. metakaolin) in the synthesis of geopolymers. [11]. Replacement of cement with dolomite powder is found to improve the strength of concrete [12]. The workability and strength characteristics of self compacting concrete containing fly ash and dolomite powder reduces the possibility of bleeding and segregation, and increases the filling and passing ability of concrete, where as dolomite powder imparts viscosity to the concrete and improves the segregation resistance of the concrete mix [13]. The present study aims to develop high calcium fly ash geopolymer concrete partially replaced with dolomite powder.

2. Experiment Details

2.1 Materials

High calcium fly ash used in this project was collected from Neyveli Lignite Corporation in Cuddalore district of Tamilnadu. The dolomite powder collected from Veppadai, Erode. The chemical compositions of high calcium fly ash, dolomite powder are shown in table 1. Other materials like alkaline solution, coarse aggregate of size 12 mm and 6 mm and fine aggregate were used in making of geopolymer concrete. The physical properties of fine and coarse aggregate are shown in table 2. Alkaline solution comprises of sodium hydroxide and sodium silicates were used. To improve workability of the fresh geopolymer concrete, water reducing naphthalene based super plasticizer was used in all of geopolymer mixes.

Table 1: Chemical composition of Fly ash & Dolomite Powder

S.NO	Chemical composition	Fly Ash	Dolomite Powder
1.	Silica (Sio2)	63.11%	0.63%
2.	Calcium Oxide (CaO)	17.13%	17.20%
3.	Magnesium Oxide (MgO)	0.24%	37.1%
4.	Iron Oxide (Fe2O3)	5.03%	0.04%
5.	Aluminium Oxide (Al2O3)	19.58%	0.19%
6.	Sodium Oxide (Na2O)	0.29%	0.39%
7.	Potassium Oxide (K2O)	0.84%	0.01%
8.	Loss of Ignition (L.O.I)	1.55 %	44.47 %

PERFORMANCE ASSESSMENT OF CONCRETE IMPREGANTED WITH EGG SHELL POWDER

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ABSTRACT: Concrete is one of the essential materials in construction works.In order to meet out this rapid infrastructure development a huge quantity of concrete is needed. For the production of concrete, the major binder is cement. This paper investigates the eggshell as a replacement material for cement by conducting compressive strength and durability test over the concrete mixes. The concrete mixes are prepared with different percentage of eggshell replacement as 10%, 20% and 30%. Raw and incinerated eggshell are used to be investigated.Incinerated egg shell powder which it is used to make it as a fine ash and analysed it further test. Finally, the result indicates ESP can be used as a partial replacement of cement. The data presented covers strength development and durability properties. With respect to the results, at 10% ESP replacement the strengths were higher than control concrete and indicate that 20% RESP and 30% IESP is an optimum content for maximum strength.

KEYWORDS: Eggshell powder,incinerated egg shell powder, compressive strength, durability test.

1. INTRODUCTION

The principal binder in concrete is Portland cement; its production mainly contributes to global warming and climate change. Recycling of waste components contributes to energy savings in cement production. Hence, currently, the entire construction industry is in search of a suitable and effective waste product that would considerably minimize the use of cement and ultimately reduce the construction cost. Some industrial and other products that would otherwise dump the environment as waste or at best be put into only limited use could gainfully be employed as building material. This paper analyses the Egg Shell Powder which can be utilized as alternative materials to substitute cement in the building industries, in order to evaluate and affirm the suitability of replacing cement with egg shell powder in concrete Structures. According to AnandBabuet.al [2], Eggshell have almost same chemical composition as cement. Bandhavya [3] described that the egg shell usually which are disposed, is used as an alternate for the cement since the shell is made up of calcium, from this work it investigates the strength properties for replacing of egg shell powder with cement.

2. MATERIALS AND METHODS

2.1 Materials Used

Egg shell waste was collected from SKM Animal Feeds and Foods Ltd., Such waste is collected and implemented in our project. Fig 2.1 shows Raw Eggshell Powder. And incinerated egg shell powder also used, in which its processed by raw egg shell powder is placed in oven for 900°C to make fine ash and considered it as a incinerated egg shell powder shown in Fig 2.2. Cement is a binder, proceeded with ordinary Portland cement of grade 53. Locally available river sand was used as fine aggregate in this work.And a coarse aggregate with maximum size of 20mm was used.Water is a key ingredient in concrete production. It helps in binding the mixture of cement and aggregate together to form a cementitious paste. Further properties for cement, fine and coarse aggregate is shown in table 2.1.

Fig 2.1 Raw Eggshell Powder

Fig 2.2 Incinerated Eggshell Powder

EXPERIMENTAL STUDY ON FLY ASH AGGREGATE IN CONCRETE

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ABSTRACT: The fine aggregate (M-sand) is partially replaced by Fly ash aggregate at various proportions from 10% to 100%.Trial mix of varied proportion shown above which compared to conventional concrete mix (M20) and find the optimum mix of Fly ash aggregate in concrete and to investigate the compressive strength of concrete using Fly ash aggregate.Trial mix made of M-sand and Fly ash aggregate in the ratio of 40:60 achieved more strength, compared to other combinations hence utilization of Fly ash aggregate which enhanced the strength in the concrete.

1. INTRODUCTION

Fly ash aggregate is a type of artificial aggregate which is prepared by mixing of cement, Fly ash and water. Fly ash is a waste material which can be used as supplementary cementations materials to produce strengthen artificial Fly ash aggregate. Fly ash aggregate is an alternative material for natural aggregate because of scarcity of natural aggregate. Fly ash is a preliminary source for Fly ash aggregate. The ash produced at thermal power stations by burning of coal is known as Fly ash.

2. MATERIALS USED

Cement: Ordinary Portland cement (53 grade) is conforming to IS 12269:1987 and test are conducted on cement as per IS 4031:1987

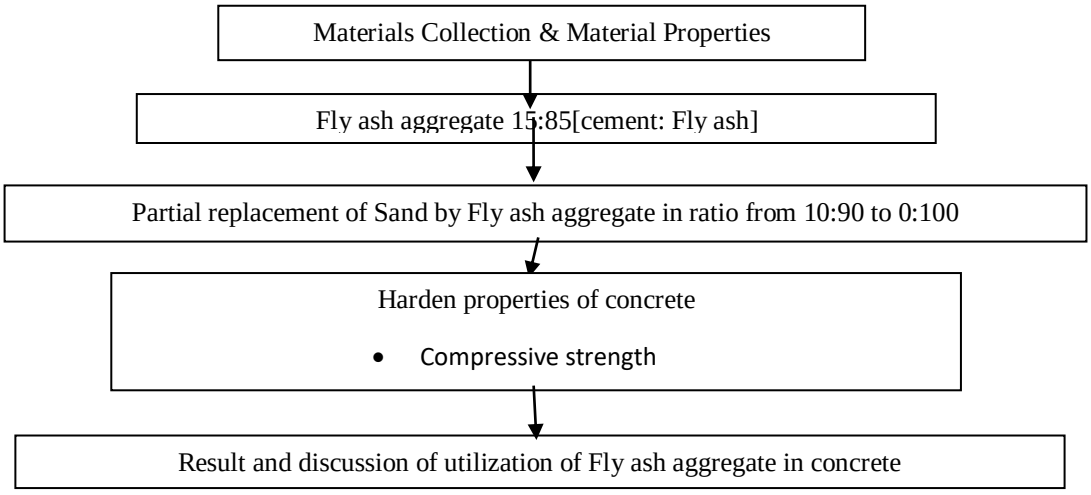
Fine aggregate: M-sand is partially replaced by Fly ash aggregate. Fly ash aggregate preparation by 15:85 proportions (Cement: Fly ash) with water.

Coarse aggregate: The size of coarse aggregates generally used is 20mm. Well graded cubical or rounded aggregates are desirable. Aggregates should be uniform quality with respect to shape and grading.

Fly ash: The Fly ash purchased from Mettur thermal power plant. In this project, Fly ash F class used for manufacture the Fly ash aggregate. Specific Gravity of Fly ash is 2.5

Water: Mixing water quality is required in accordance with the quality standards of drinking water and forming to IS 3025

3. PROPOSED WORK METHODOLOGY



STRENGTH PROPERTIES OF SELF COMPACTING GEOPOLYMER CONCRETE BY AMBIENT CURING

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ABSTRACT: SCGC (Self-Compacting Geopolymer Concrete) is an most revolutionary development in concrete construction, and does not require any additional compaction of concrete. Geopolymer concrete materials are free from Ordinary Portland Cement (OPC). In this paper, the cement has been replaced by GGBS & Bottom Ash as binder material and study its effect on SCGC. GPC (Geopolymer Concrete) comprises of GGBS (Ground Granulated Blast furnance Slag) and Bottom Ash (BA) as an binder material. These binders are the by-product of steel power plant and thermal power plant. These are possessing good cementitious property and very high silica and alumino content. The source binders are activated by means of NaOH (Sodium Hydroxide) and Na_2SiO_3 (Sodium Silicate) ratio of 2 and liquid/binder ratio of 0.5. The workability properties of SCGC such as filling ability and passing ability are assessed using slump flow, T_{50cm} slump flow, L-box, J-ring, V-funnel test. The mixes areprepared according to EFNARC specifications. The mechanical properties like compressive strength, split tensile strength and flexural strength are also evaluated.Different mixes are prepared with binder ratio of GGBS(100%):BA(0%), GGBS(75%):BA(25%), GGBS(50%):BA(50%) and exhibit its properties to achieve the high mechanical properties.

KEYWORDS: Self-Compacting Geopolymer Concrete, Sodium Hydroxide, Sodium Silicate, GGBS, BA, Workability, Compressive strength, Split tensile strength, Ambient curing.

1. INTRODUCTION

In the developing world, the concrete is one of the important materials to construct the structure. Due to the excess usage of cement for concrete work, it leads to the release of excess carbon-dioxide into the atmosphere. To overcome this problem many researchers introduced the concept ofgeopolymer concrete [1]. In this aspect, GPC is one of the revolutionary development as an alternative to Portland cement. To activate the geopolymerization process, an alkaline mixture of NaOH and Na_2SiO_3 combined with the binding materials likeflyash, silica fume, GGBS, Bottom ash, Baggase ash to get same cementitiousproperty in the same range as OPC [2].

Self - compacting concrete (SCC) was first introduced in the late 1980's by Japanese researchers, which is highly workable concrete that can flow under its own weight through restricted sections without segregation and bleeding. SCC is a high performance concrete and self-consolidates without any mechanical vibration. SCC represents one of the most outstanding advances in concrete technology during the last decade. The growing use of concrete in special architectural configurations and closely spaced reinforcing bars have made it very important to produce concrete that ensures proper filling ability, good structural performance and adequate durability. SCGC (Self-Compacting Geopolymer Concrete) is one of the most innovativedevelopment in concrete technology. SCGC does not need any additional compaction. Hence this SCGC is more suitable in the congested reinforcement areas.

The cementitious materials are activated by using NaOH and Na_2SiO_3 provide good bindingnature.Alkaline Solution, Super-plasticizer (SP), Retarders & water plays an important role in both Fresh and Hardened concrete properties [2]. Workability property gets increased by increasing the super-plasticizer dosage. The compressive strength gets increased when increasing the Molarity concentration [1]. The highest compressive strength obtained at 28days cube cured at 70^0C of oven curing compared to60^0C, 80^0C and 90^0C.

An attempt has been made to investigate the experimental study on self-compacting geopolymer concrete. This process involves the analyses of fresh and hardened concrete properties of SCGPC with different mix proportions. The fresh concrete workability test includes slump flow, T_{50cm} slump flow, L-box, J-ring, V-funnel test and hardened property like compressive and split tensile strength are evaluated.

2. MATERIALS AND MIX PROPORTIONS

2.1 Materials Used

2.1.1Bottom Ash

In this research work Bottom ash (BA) was collected from Mettur thermal power plant, Salem. It has large percentage of alumina and silica similar to cement. The specific gravity of BA is 2.50.

LABOUR SAFETY MANAGEMENT

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ABSTRACT: Construction safety management has improved significantly following the Occupational Safety and Health Act of 1970. In response to this legislation, contractors began implementing safety programs to reduce occupational safety and health hazards on construction sites. Researchers recently found that the current process of selecting specific elements for a safety program is informal. This paper describes the results of a recent study designed to determine the relative effectiveness of safety program elements by quantifying their individual ability to mitigate construction safety. In order to determine the effectiveness of individual safety program elements, the following research activities were performed: (1) An appropriate safety risk classification system was created using an aggregation of relevant literature; (2) Highly effective safety program elements were identified in literature; and (3) The ability of each safety program element to mitigate a portion of each of the safety classes was quantified using the Delphi method. The results of the research indicate that the most effective safety program elements are upper management support, commitment ,strategic sub-contractor selection and management, the least effective elements are record keeping, accident analyses and emergency response planning. It is expected that the data presented in this paper can be used to strategically select elements for a safety *program, target specific safety, and influence resource allocation when funds are limited.*

KEYWORDS*:* Construction management; Safety management

1. INTRODUCTION

Construction Industry is an unorganized sector and it is the least researched industries even today. The system of reporting data about internal working and safety is also minimal. The man power driven industry is facing regular accidents in daily working, which cause heavy losses in terms of men, money and time. The past studies show that on an average, 60 to 80 accidents conditions at the construction sites is the lack of exclusive legislations applicable to the construction industry. In developing country like India, there must be an effort to raise the level of awareness among both the employers and employees of the importance of safety at work sites. But construction in everyday life comprises of large number of small scale projects which are local contractors undertakings occur per 1000 workers in the manufacturing sector while, construction sector averages around 160 to 250 per 1000 workers. The main cause of the low safety standards and working lacking in compliance of safety requirements and labour laws. It is the high time that the awareness regarding the present scenario of safety and labour conditions should spread adequately.

MATERIALS AND STUDY:

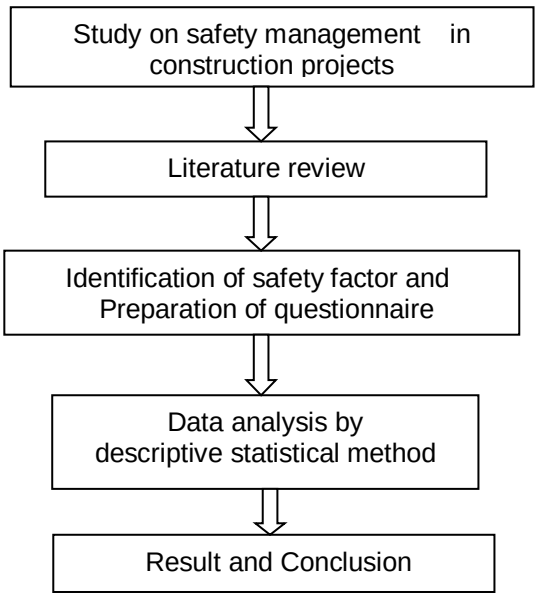

Fig.1 Methodology of the Study

STRUCTURAL PROPERTY ANALYSIS IN RC BEAM USING NATURAL FABRIC

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ABSTRACT: In last few decades, Fiber reinforced polymer materials are continuing to show great promise for enhancing the strength of reinforced concrete structures especially in seismic zones. These materials are an excellent option that can be adapted as an external reinforcing material because of their properties such as light weight,resistantto corrosion and high strength. In this present study, Basalt Fiber Fabric which is a natural fiber is used a wrapping material to enhance the strength of RC beam. The structural behavior of beam is found out by experimental investigation and it has been observed that the strength of beam get improved when compared to conventional beam by observing various structural parameters.

KEWWORDS: Basalt fiber fabric, epoxy resin,wrapping technique, seismic activity

INTRODUCTION

A structure is designed for a specific period and depending on the nature of structure and its design life varies.As complete replacement or reconstruction of the structure will be cost effective, strengthening/ retrofitting is an effective way to strengthen the RC structures. Basalt fiber fabric which is composed of the minerals plagioclase and olivine .it is similar to carbon fiber and glass fiber .Basalt fabric fiber also a natural fiber and having good mechanical property and thermal property.it is also enhance the strength of RC structures. In these fibers are using in the breaking structure in earthquake zone to improve the strength of structure.

MATERIAL USED

The materials usually used in the concrete mix are cement, fine aggregate , coarse aggregate.
Cement The binding material used in this experimental study is 53 grade ordinary Portland cement. All properties of cement tested by referring IS 12269-1987.

Fine Aggregate

Fine aggregate are the aggregates whose size is less than 4.75mm. sand is generally considered to have a lower size limit of about 0.07mm.material between 0.06and 0.002mm is classified as silt .and still smaller particles are called clay.in this project clean and dry river sand available locally used .
The properties of fine aggregate

SI NO	Property	Value
1	Specific Gravity	2.8
2	Fineness modulus	3.1
3	Water absorption	0.5%
4	Surface texture	Smooth

Coarse Aggregate

The aggregate most of which are retained on the 4.75mm IS sieve are termed ass coarse aggregate. In this project coarse of maximum size used .
The properties of coarse aggregate

SI NO	Property	Value
1	Specific gravity	2.8
2	Fineness modulus	7.5
3	Water absorption	0.5
4	Particle shape	Angular
5	Impact value	15.2
6	Crushing value	18.6

Water

Water fit for drinking is generally considered for making concrete

Reinforcement

The longitudinal reinforcements are used in the diameters 12mm&16mm. the spacing is 50mm and separated into two zones.one is compressed zone and another tension zone.

STRENGTH IMPROVEMENT OF EXPANSIVE SOILS AND RED SOIL BY BITUMINOUS ADMIXTURES

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ABSTRACT: In civil engineering, soil is only material whose behaviour is very typical to predict, and depends on various factors. The most important part of a road pavement is sub grade soil and its strength. If strength of soil is poor, then stabilization is normally needed. Sub grade is sometimes stabilized or replaced with stronger soil material so as to improve the strength. Increase in sub grade strength may lead to economy in the structural thicknesses of a pavement. Expansion and contraction, in wet and dry condition consecutively, is one of the biggest problems with expansive soils. That is how expansive soil becomes very problematic to engineers to work upon. Various techniques and admixtures are used to improve quality of expansive soils. Bitumen is one of those admixtures. It is different from other admixture, as it is non-traditional; also not alter chemical properties of soil. The use of bituminous binder as modifier not only makes soil waterproof but also increases its strength by binding soil particles. Waterproofing is very important, to eliminate breathing of soil. Presence of bitumen in soil also provides elasticity, by which soil change volume without cracking. These are the qualities, how bitumen becomes preferred choice among other admixtures, although having high cost. The present paper enlightens some of important works on bitumen and expansive soils. This will also suggest scope of future works and other important aspects in the field of 'quality improvement of expansive soil by bituminous admixtures'.

KEYWORDS: Soil Improvement, Soil Stabilization, Waterproofing, Bitumen Admixture.

INTRODUCTION

Expansive soil is the soil which changes its volume at very high rate on change of water content. Work on this kind of soil always is a challenge for civil engineers. It is always recommended for engineers to alter the property of soils by mixing some admixture or by any other way so that soil can become fit for construction work.

The construction cost of the pavements will be considerably decreased if locally available low cost materials are used for construction of lower layer of pavements such as sub grade, sub base etc. If the stability of local soils is not adequate for supporting the loads, suitable methods to enhance the properties of soil need to be adopted. Soil stabilization is one such method. Stabilizing the sub grade with an appropriate chemical stabilizer (such as Quicklime, Portland cement, Fly Ash or Composites) increases sub grade stiffness and reduces expansion tendencies, it performs as a foundation (able to support and distribute loads under saturated conditions).

Bitumen admixtures, although little costly, works great for in soil stabilization. The use of bitumen, tar, and asphalt in ground modification is collectively referred to as bituminous stabilization. Bitumen is the byproduct of crude petroleum, whereas, the tar is the byproduct of coal or other carbonaceous material. The bituminous admixtures, generally used to waterproof soils or occasionally reduce water absorption and add cohesion to granular soils, are most suitable for sandy gravels, sands, clayey and silty sands, and fine crushed rock (Winterkom et a!. 1991). Having its great performance with sand and waterproofing quality in expansive soil it can be used as a suitable admixture with sand in cohesive soil, mixing sand in cohesive soil also improve its quality. It does not alter chemical property of soil, so problem of contamination of nearby soil also not rise. By this it is also proved as environmental sustainable material of soil stabilization.

OBJECTIVES

- To determine the properties of the expansive soil and red soil.
- To evaluate the performance of expansive soil and red soil when stabilized with bitumen emulsion as an admixtures and its suitability for the pavement subgrade.
- To evaluate the performance of stabilized expansive soil and red soil with an optimum of bitumen emulsion and their suitability for the pavements

EXPERIMENTAL INVESTIGATION

To achieve the whole project some experimental investigation is needed in laboratory. The experiments conducted for soil sample includes specific gravity of the soil sample, grain size distribution of soil sample and Atterberg's Limits such as liquid limit, plastic limit test to identify the material and Standard Proctor test to obtain maximum dry density and optimum moisture content of soil sample, CBR test of soil sample mixing with emulsion.

To stabilize or improve the soil sample taken, the considered additives to be added in percentages to soil so that at what point does the soil given its best results to additive percentage. The tests required to be done again with added additive percentages to the soil.

EXPERIMENTAL INVESTIGATION ON FERRO CEMENT PANEL USING STEEL FIBER

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ABSTRACT : The ferro cement has been widely used in construction of various structural elements in the construction industry, apart from being used as hulls of ship in the ship building industry. It is possible to achieve considerable improvements in various properties of this Ferro cement slabs and wall by substituting regular materials. This project main aim of this project is to expand the applications of Ferro cement using steel fibers with improved strength characteristics. The Ferro cement in mixing with steel fiber increases the compression, tensile and flexural strength in cement mortar.The Ferro cement slabs and wall are made by using cement mortar and steel fibre with constant layers of welded meshes. Performance of the tested slabs and wall are presented and discussed in this project. Normally for a Ferro cement slab and wall is made with wire mesh of 2 mm diameter and also closely spaced at 20 mm. In this study, welded wire fabrics, steel fibre and reinforcement (steel bar) are used in order to increase the tensile, flexural and impact strength properties of Ferro cement. The flexural properties of these Ferro cement slabs and wall are tested and evaluated by four point static loading system using specific test setups. Comparative study of the test results confirm that Ferro cement slabs made of steel fibre are more effective in flexural strength. Impact strength of slab and wall is evaluated and it is found that as the kinetic energy of steel fibre content is increased. Bending strength of slab is evaluated and it is found that as the bending strength of steel fibre content is increased.

KEYWORDS *– Steel fibre, Wire mesh, Ferro cement slab and wall panel, Flexural Strength, Impact Strength, Bending strength.*

1. INTRODUCTION

Ferro cement is a wire mesh, reinforcement embedded with mortar [(1)]. This is durable and efficient material[(2)]. Due to their thickness, Ferro cement elements can be used as roofing / flooring and wall elements to cover large spans. "Ferro cement is a type of thin wall reinforced concrete commonly constructed of hydraulic cement mortar reinforced with closely spaced layers of continuous and relatively small size wire mesh[(3)]". The Endeavour looked as a better idea to prevent shrinkage cracking and control of early thermal contraction right after placing the fresh concrete in the formwork. Concrete is characterized by brittle failure, the nearly complete loss of loading capacity, once failure is initiated. This characteristic, which limits the application of the material, can be overcome by the inclusion of layers of steel meshes[(4)]. The main objective of this experimental work is to study the behaviour of Ferro cement panels under flexural loading in which welded square mesh has been used as reinforcement, steel fibre and river sand is also used replacing M sand. The various parameters considered in this study are as follows -:

- Effect of using steel fibre.
- Effect of using river sand instead of M sand.
- Effect of using various mix proportions for cement mortar (1:2) with steel fibre.

2. MATERIALS

2.1 Cement

Ordinary Portland Cement (OPC) of 53 grade is used for the construction purpose. It is a powdery substance made by calcining lime and clay. It is mixed with water to form mortar or mixed with sand, gravel and water to make concrete.

2.2 M sand

It is a substitute of river sand for concrete construction. The river sand is also used replacing M sand. It is produced from hard granite stone by crushing. The specific gravity test is one type of fine aggregate test. The specific gravity for using M sand is 2.399.

2.3 Wire meshes

The wire mesh is usually of 2.0 mm diameter wire at 20 mm spacing. Steel mesh reinforcement is broadly used as the main and characteristic reinforcing for industrial concrete floor slabs, shortcrete[(5)]. It is also measured for structural purposes in the reinforcement of water tanks, tunnel segments, concrete cellars, meshes help to develop the compressive strength, tensile strength, flexural strength, post peak

EXPERIMENTAL INVESTIGATION ON PARTIAL REPLACEMENT OF FINE AGGREGATE BY GRANITE WASTES IN CONCRETE

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ABSTRACT: Concrete plays a vital role in construction industry irrespective of scale of construction. An average in India 450 million cubic meter of concrete is used annually, approximately 1 tone for each person in Indian. Due to scarcity of sand we are far behind the global consumption of concrete. Enormous amount of granite dust and granite waste materials are produced by graniteindustry. The wastes that are disposed after polishing granite units are being disposed into environment. Instead, this waste granite powder can be used for preparing concrete as partial substituent for sand, so that the natural sand mining with environmental damage can be avoided. Now days the natural sand became costlier due to its abundant usage. The main objectives of this work is to find out the optimum adaptability of granite fines as replacement for fine aggregate. In this regard, a mix of M30 grade of concrete were proposed with the replacement of fine aggregate by granite waste up to 50% with an increment of 10%. The mechanical properties of concrete specimens were determined. From the test results it has been evident that 40% replacement of granite fines explicit promising results for this study**.**

KEYWORDS: Ordinary Portland cement, Fine aggregate, Coarse aggregate & Granite waste.

1. INTRODUCTION

Sand is an essential material for concrete. The global consumption of natural river sand is very high due to extensive use of concrete. In particular, the demand for natural river sand is quite high in developed countries owing to infrastructural growth. [1] In this situation some developing countries are facing a shortage in the supply of natural sand. The non-availability of sufficient quantity of ordinary river sand for making cement concrete is affecting the growth of the construction industry in many part of the country. [3] Therefore, the construction industries in developing countries under stress to identify alternative materials to reduce the demand on river sand. Some alternative materials have already been used in place natural river sand. For example, fly ash, flag and lime stone, siliceous stone powder, rock dust and quarry waste were used in concrete mixture as a partial replacement of natural sand. [4] Hence the assumption in granite powder aggregate could be alternative to natural sand in preparation of concrete. Granite powder, one of the by-products in granite stone crushing process, not being used for any applications other than filling-up low lying areas is identified as a replacement materials for river sand in concrete. [5] The utilization of granite powder in high performance concrete could turn this waste material into a valuable resource with the added benefit of preserving environment.

2. MATERIAL PROPERTIES

2.1 Material Used

Ordinary Portland cement one of the most conventionally used cement. The most commonly available OPC53 are used in this investigations of specific gravity 3.15. Coarse aggregate of size 20mm is used in this project. The specific gravity of coarse aggregate was 2.86. Fine aggregate (Grading zone III conforming to IS: 383-1987) was used as fine aggregate. Granite fines is the waste product produced from granite industries. As per IS 3025, water to be used for mixing and curing should be free from the injurious or deleterious materials.

2.2 Specimen Preparation

The compressive strength of the concrete with the partial replacement of the granite wastes, mixes were prepared in the ratio of 1:1.49:2.97 and W/C ratio is 0.44. The cement, fine aggregate and coarse aggregate is mixed in dry condition and then the water is added and mixed again. The resulting mix was cast into the mould of cube (150mm x 150mm x 150mm), cylinder (150mm x 300mm) and beam (500m x 150mm x 150mm) were casted. The fresh concrete mix was filled in the steel moulds in three layers and each layer is compacted using the tamping rod. Before the initial setting time of the cement all top surface of the specimen were levelled using trowel. After 24 hours all the specimens were de-moulded and immersed in water for curing.

DURABILITY STUDIES ON CONRETEUSING BAGASSE ASH AND GGBS WITH HEAT CURING

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ABSTRACT: The present study aims to investigate the applicability of GGBS and Bagasse ash blend geopolymer concrete on performance of durability aspects. Sodium based alkaline activators were used for polymerization process. In the blended mix, 75% of GGBS and 25% of bagasse ash by total weight of the dry source materials were planned. Curing mode adopted was heat curing. Preliminary study on mechanical properties of blended geopolymer concrete was made on 10, 12 and 14 molarities. Based on the mechanical behaviour, durability aspects such as acid, sulphate and salt attack test were carried out. Also, other test includes sorptivity and carbonation was also carried. From the test result it is observed that, the weight loss and strength loss are very minimal when the period of immersion prolonged to extend. Also, the sorptivity and carbonation test n these concrete samples shows a promising result.

KEYWORDS: Geo-polymer concrete, GGBS & Bagasse ash (sodium hydroxide and sodium silicate).

INTRODUCTION

Geo polymer is a new concept, which does not utilise cement in concrete production. It greatly reduces the pollution due to the release of carbon dioxide in the manufacture of cement. Geo polymer utilises pozzolanic materials as prime source materials. Subsequently several research works are being carried out on using different source materials. The source materials and alkaline activators perform a key role to prop up the geo polymeric reactions. It is stated that the molarity concentration of sodium hydroxide had greater effects on the concrete compressive strength of fly ash based geo polymer concrete. Curing process, sodium silicate to sodium hydroxide ratio and NaOH concentration plays important role in strength and porosity of the mix.

Geo-polymer binder can be used in applications to fully replace OPC with technical benefits. In our work, we made an attempt to replace OPC. Here, the cement replacement done by the materials such as GGBS and Bagasse ash, which are obtained from the steel industry and sugar factories. When GGBS & Bagasse ash mix made active for use as geo-polymer binder only when it is mixed with the sodium hydroxide and sodium silicate. Hence it do not release vast quantities of CO_2.This binder performs a similar function to Ordinary Portland Cement. Geo-polymer binder is activated with the help sodium hydroxide and sodium silicate. The temperature during curing is very important. The industrial oven should be maintained with temperature of 60 degree Celsius. Geo-polymers can achieve their significant maximum strength within 24 hours.Geo polymer concrete is a flowing concrete mixture that is able to consolidate under its own weight. This type of concrete will be manage to any type of situation and climatic condition with fast setting time. Geo-polymer concrete is the high durability concrete with the reuse of industrial waste material to replace the cement there by reduce the CO_2 emission. This work summarizes the durability behaviour of geopolymer concrete with GGBS and Bagasse ash under heat curing condition.

MATERIALS USED &METHODOLOGY

2.1 Methodology

Concrete sample are prepared using various mix proportion of industrial waste materials and chemicals. Heat curing process will be carried out in the industrial oven with particular temperature. Weight of each sample with various proportion can be analysed before and after the application of the samples in Salt attack test, Acid attack test & Sulphate attack test.The strength of the concrete will be tested after 28th day.

2.2 Materials Used

2.2.1 GGBS: Ground Granulated Blast Furnace Slag:

Fig 1.1 shows GGBS, which isan industrial waste obtained as a by-product from the steel industries, which are made to powder by grinding. The main components of GGBS are CaO (30-50 %) SiO_2 (28-38 %), Al_2O_3 (8-24 %), MgO (1-18 %)

Fig 1.1GGBS

STORMWATER MANAGEMENT BY PERMEABLE PAVEMENT IN CHENNAI CITY

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ABSTRACT: This paper is going to give detailed method of controlling storm water in city areas. Our study area is CIT NAGAR in CHENNAI CITY. The 2015 flood made a huge impact on Chennai people by flood water accumulation in road. There is no area for infiltration of water to ground due to total area is covered by pavement and buildings. We visit the study area and made detailed investigation on soil condition and permeability of soil. The challenges we have to face was underground drainage and electric cable line in that area. We decided to adopt a new methodology for storm water control by POROUS PAVEMENT BY CRUMB RUBBER MODIFIED BITUMEN. The raw materials are waste tires during recycling process and normal bitumen. The methodology is collecting water by permeable pavement by duct pipes and water is taken to nearby recharge wells and tanks. The separate cable and drainage duct is provided for electrical lines and sewage water under pavement. A non-permeable geo-membrane is provided on bottom in order to prevent direct percolation of water to soil which may cause instability to pavement if soil is clay. The various tests are conducted regarding pavement strength, durability, permeability which gave better results.

INTRODUCTION

Now-a-days, in modern world, people need safe and fastest transportation which requires a road system apt for that. As we know that there is vast improvement in pavement design construction and maintenance. But for our developing country (India), we need a road system which is more economical. While coming to another point of view, that is, behavior of pavement in rainy seasons; lot of problem arises. Rain water stagnation on road surface is the major problem in normal pavement because there is no possibility for penetration of water. Also there is possibility for accidents due to water logging on roads. In city areas, most of the rain water enter into nearby drainage and it is wasted. In 2015, Chennai suffered a lot by floods. The main reason for that was construction of buildings in lakes and lack of infiltration of rain water because the whole area is covered by buildings and pavements. In order to prevent storm water stagnation on pavement, we adopt "POROUS PAVEMENT BY CRUMB RUBBER MODIFIED BITUMEN (CRMB-60)". We choose our study area as CIT NAGAR in CHENNAI.

POROUS PAVEMENT

Porous pavement provides a way to percolate rain water and prevents water stagnation on roads. Lot of porous pavements and designs are there. Our idea is using crumb rubber as admixture with bitumen. The strength and rutting resistance of pavement is more than the conventional pavement. As crumb rubber is the waste material from tire recycling process in industries, it reduces the volume of waste in disposal yards.

MATERIALS

Aggregate

THE SIZE OF COARSE AGGREGATES VARY FOR DIFFERENT LAYERS. THE FOLLOWING ARE THE VARIOUS SIZES OF AGGREGATES USED FOR DIFFERENT LAYERS.

Binder

Crumb rubber modified bitumen (CRMB-60). Initially, both bitumen and crumb rubber is weighed. After that, bitumen is heated at 125℃ for 1 to 2 hours and then crumb rubber is added about 15% of bitumen by weight with that and heated for 30 minutes to 1 hour.

Impermeable Geotextile

It is used in order to resist the direct infiltration of water into soil.

Perforated Pipe

The perforated pipe of 8 cm diameter is used to collect water from reservoir layer.

DESIGN OF PAVEMENT

Surface Coat

The top or surface coat is of 5-10 cm thickness. CRMB-60 is mixed with aggregates of size 10-12 mm in ratio of 5% of aggregate by weight. The top coat contains 15-18% of voids.

CHOAKING LAYER

First layer

It is of thickness 2-3 cm of aggregate size 16 mm with 20-25% of voids

Second layer

EXPERIMENTAL INVESTIGATION OF CONCRETE WITH HIGH DENSITY POLYETHYLENE AS PARTIAL REPLACEMENT IN FINE AGGREGATE

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ABSTRACT: This paper presents study on strength investigation on partial replacement of fine aggregate as high density polyethylene (HDPE). Scarcity of river sand is one of the major problems in construction industry. Studies were conducted to find out the feasibility of using ceramic waste to partially replace sand in concrete. In this industrial world, recycling construction material plays an important role to preserve natural resources. These studies seek to greener environment since it seeks to develop recycle waste material for construction. The use of high density polyethylene from construction and demolition waste is showing a prospective application in construction and alternative to primary and natural aggregate. It conserves natural resources and reduces the space required for land fill disposal. In the laboratory the crushed high density polyethylene has been tired as partial replacement substitute to convectional fine aggregate high density polyethylene in concrete making of cube. These were cast and tested for compressive strength after a curing period of 7, 14, 28 days. The results indicate effectiveness of crushed ceramic waste as partial indicate effectiveness of crushed high density polyethylene as partial replacement of conventional fine aggregate up to 0%, 5%, 15%, 25%, without affecting the design strength.

UTILIZATION OF INDUSTRIAL WASTE IN FLY ASH BRICK: A REVIEW

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ABSTRACT: This paper summarizes the over review of the glass powder and copper slag is used in various percentage with raw materials. In our project, glass powder and copper slag is used as a partial replacement of fly ash and fine aggregate. Glass powder is the by-product of glass waste like recycled glass culets. The glass powder is partially replaced with 20% to the fly ash. Copper slag is a by-product of copper extraction by smelting. During smelting, impurities become slag which floats on the molten metal. Slag that is quenched in water produces angular granules. Chemical composition of copper slag presents a high Fe, Si, and Al oxide content makes a pozzolanic material. From the results, it is concluded that the increased replacement level of copper slag. Now a day's many artificial aggregate are popular as a substitution of fine aggregate to make better concrete and brick. Test results indicate the fly ash and glass powder with 20% exhibited better results under curing condition, when compared to the control mix and other mixes.

KEY WORDS: glass powder, copper slag, industrial waste, durability tests.

INTRODUCTION

Brick is a mixture of Fly ash, M.Sand, Lime, Gypsum and water. To attain desirable strength and other properties, curing are necessary. Naturally, sand and m. sand has universal characteristics like rough texture, well drained characteristics and effective strength parameters may be given opportunities to engineers to be used as a constructional material. In recent times, due to scarcity of sand and its cost engineers have been searching for alternative material. Brick is belongs to the wide family of construction materials, since it is mainly used for outer and inner walls of the buildings. The solid wastes are replaced in to the raw materials such as fly ash and M-sand. One such material is glass powder. Million tons of glass waste is being generated annually all over the world. Glass is composed by silica. Use milled waste glass powder in brick as partial replacement of fly ash. Glass powder is one of the most by-products abundantly available in India and is manufactured from the glass waste. A considerable amount of glass waste remains in the environment as waste, so utilization of these materials for construction will be important step to improve sustainability and eco-friendly construction. Glass powder is replaced as 20% with fly ash. And another material is copper slag which is obtained by smelting and refining process of copper. Million tons of copper slag is generated annually all over the world. A considerable amount of copper slag remains in the environment waste, so the copper slag is replaced with 0%-45% in M-sand. The review highlights the effects of glass powder and copper slag on the bricks property like durability properties.

DEVELOPMENT OF FLY ASH BRICKS FROM GLASS POWDER AND COPPER SLAG

Hocine Siad[(8)] studied the strength characteristics by incorporating recycling glass powder (RGP). For enhanced material sustainability composites containing 15, 30, 45 and 60%.RGP is replaced for fly ash to cement. It improves the intrinsic properties. Although results were in the same penetrability ranges, rapid chloride permeability test (RCPT) values are increases slightly. With increased RGP content at 28 days. In 2005, Caji Shi[(6)] examined the properties like morphology, fineness and pozzolanic activity of the glass powders. This paper is containing four types of glass powder. The mortar cube strength results C ASTM (109) indicated that curing temperature has a greater a great influence on the glass powder than on fly ash. The rapid mortar bar expansion test is done as per C ASTM (1260). The results indicates that the replacement of Portland cement with ground glass powder, also reduces the expansion due to alkali-aggregate isn't as effective as coal fly ash. N.A.Soliman[(17)] investigated the micro structural properties, mechanical properties, fresh properties and compressive strength (f_c). The compressive strength is up to 220Mpa. They will prepare a green ultra high performance glass concrete (UHPGC). And it's provide technological, economical and environmental advantages compared to the traditional ultra high performance concrete (UHPC). The UHPGC has been developed through the use of glass powder. Glass powder content results in greater workability.

Shazim Ali Memon[(22)] is proposed the feasibility of using soda-lime waste glass powder for latent heat storage application was investigated. The composite PCM can be used for thermal energy storage

MICROSTRUCTURAL INVESTIGATION OF DIFFERENT TYPES OF COARSE AGGREGATE USED IN CONCRETE

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ABSTRACT: As an important component of concrete, aggregate has significantly influence on normal and high performance concrete. In this paper, the effect of aggregate types on the strength properties of normal and high performance concrete with target compressive strength of 20,40,60 MPa were investigated. Concrete specimens were prepared with four different types of aggregates, namely limestone, pink granite, grey granite and anthorsite. Tests conducted include compressive strength, split tensile strength and flexural strength. For enriched considerate of the crack initiation and propagation in concretes with different coarse aggregate, a microstructural examination using petrographic studies are also presented. The result obtained help to explain how the coarse aggregate type and strength of concrete affect the compressive strength. The test result exposes that strength of grey granite was higher than other types of aggregate studied. This work suggested that normal and high performance concrete can be made by evaluating sources of aggregate and it could be used for the preferable grade of concrete.

KEYWORDS: *Aggregate type, Mechanical behavior, Concrete*

1. INTRODUCTION

In concrete structures coarse aggregate play an important role in strength parameter. Aggregate are essential in making concrete into an engineering material. They give concrete its necessary property of volumetric stability. Aggregates exhibit an important influence on concrete by providing rigidity to the material that is necessary for engineering use. Significant improvements in the workability of the fresh concrete are contributed by proper choice of aggregates and that aggregate influences highly important properties of the hardened concrete as well, volume stability, unit weight, resistance to destructive environments, strength, thermal properties etc. Aggregate properties have profound influences which need to be realized and acknowledged.

1.1 LITERATURE REVIEW

The effect of using crushed quartzite, crushed granite, limestone, and marbles coarse aggregate on the on the mechanical properties of high-performance concrete. The study revealed that the strength, stiffness, and fracture energy of concrete for a given water/cement ratio depend on the type of aggregate (4). Meanwhile, effect of three types of coarse aggregate, quartzite, granite, and river gravel on the compressive strength of concrete were. The outcome of the study indicated that highest compressive strength at all ages was noted with concrete made from quartzite aggregate followed by river gravel and then granite aggregate(5). Besides, an attempt was made to use basalt, limestone and gravel as coarse aggregate to produce normal and high-performance concrete. The research work demonstrated that for high performance concrete at 28 days, basalt produced the highest strength, whereas gravel gave the lowest compressive strength. Normal strength concrete made with basalt and gravel gave similar compressive strength while the concrete containing limestone attained higher strength (6).Further, the effects of quantity and particle size distribution of coarse aggregate on the compressive strength of concrete. Three types of coarse aggregates were mixed in four different proportions for concrete production. The result exhibits that for strength varied depending upon the sources of the aggregates, especially high strength concrete can be made by evaluating new sources of aggregate with beneficial strength & stiffness(7).In the study of using low quality aggregates calcareous, dolomitic and quartzite limestone and steel slag in concrete revealed that strength of steel-slag aggregate concrete was more than that of crushed lime stone aggregate. Whereas lowest strength was noted with calcareous limestone aggregate concrete. Three modes of failures were identified within the paste matrix, at the paste-aggregate interface and within the aggregate. Moreover, the quality of aggregate

DURABILIYT TEST ON GEOPOLYMER CONCRETE USING GGBS AND BAGASSE ASH IN AMBIENT CURING CONDITIONS

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ABSTRACT: *This paper reviewed the durability behaviour of geopolymeric concrete prepared with Ground Granulated Blast Furnace Slag and Bagasse Ash as source materials. GGBS was obtained as by product from steel and iron manufacturing plants and Bagasse ash also obtained as by product from sugarcane industries. It has good binding property and also enhances the strength and durability of mix. The geopolymeric concrete was made with liquid / binder ratio of 0.5, Sodium hydroxide concentration of 10M, 12M & 14M and Sodium Silicate to Sodium Hydroxide ratio of 3 was taken. The Durability performance have to be checked at the intervals of 14 and 28 days. The results showed better strength when compared with nominal mix. This durability test result also predicted that the strength of GPC mix depends on the curing room temperature and NaOH molarity.*

KEYWORDS: NaOH, Molarity, GGBS, Bagasse Ash, Ambient, Geopolymer Concrete

1. INTRODUCTION

The needs of human society and development of infrastructure ever increase. The cement production is also increased due to the increase of infrastructure. However, the cement production releases the excess amount of carbon dioxide into the atmosphere. It may cause the environmental pollution including the global warming. The disposal of waste is a considerable problem nowadays due to increased human population and large amount of waste production. Every day, there are large amount of researches going on all over the world to reduce the waste materials or how to make use of this waste materials in effective manner for the new purpose.

Geo polymer is a new concept, which does not utilise cement in concrete production. It greatly reduces the pollution due to the release of carbon dioxide in the manufacture of cement. Geopolymer have the tendency to become low cost and eco-friendly building material. Geo polymer utilises pozzolanic materials as prime source materials. Subsequently several research works are being carried out on using different source materials. The source materials and alkaline activators perform a key role to prop up the geo polymeric reactions. It is stated that the molarity concentration of sodium hydroxide had greater effects on the concrete compressive strength of fly ash based geo polymer concrete. Curing process, sodium silicate to sodium hydroxide ratio and NaOH concentration plays important role in strength and porosity of the mix. However, longer curing time improves the geo polymerization process. Also, Mohammed Haloob et al noticed that increase in GGBS percentage from 10 to 50% in the mix have more compressive strength at 28 days under ambient curing.

In persistence of several research works, the present work made an attempt to utilize GGBS and bagasse ash as source material for geo polymer. This work summarizes the durability behaviour of geopolymeric concrete with GGBS and Bagasse ash under ambient curing condition.

2. MATERIALS AND ITS PROPERTIES

2.1 Materials Used

- Ground Granulated Blast Furnace
- Bagasse Ash
- Fine Aggregate
- Coarse aggregate
- Water
- Alkaline liquids
- NaOH
- N_2SiO_3

2.2 Materials Properties

2.2.1 GGBS

It is an industrial by product obtained from Iron or Steel Industries, which is used as the source material (Figure 2.1). The current study uses GGBS with specific gravity of 2.69.

A FACTUAL RESEARCH ON STONE DUST AND PLASTIC COATED AGGREGATE IN FLEXIBLE PAVEMENT

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ABSTRACT: In the present paper, an approach made to understand the improved properties of flexible pavement materials by introducingwaste plastic and stone dust. Plastic recycling is the process of recovering scrap or waste plastic and reprocessing the material into useful products. Since the vast majority of plastics arenon-biodegradable, recycling is a part of global efforts to reduce plastics in the waste stream, especially the approximately eight million tonnes of waste plastic that enter the Earth's ocean every year. This helps to reduce the high rates of plastic pollution. A large amount of stone dust waste is dispose into landfills every year. This waste was obtained as a by-product during the production of aggregates through the crushing process of rocks in the rubble crusher units. The coating of waste plastic over aggregates was done and blending of bitumen with both waste plastic and stone dust was done. MarshallStability experimentations was done to get the improved values. The enhancement in the impact value along with specific gravity and water absorption of the aggregates was recorded. Also, enhancement in the bituminous properties like penetration value, softening, viscosity and ductility was observed. It was seen that about accumulation of waste plastic and stonedust shows highly anticipated results.

KEYWORDS: Waste Plastics, Bitumen, Aggregate, Stone dust powder.

INTRODUCTION

Flexible pavements are one of the most important infrastructures. Any damage to this may cause lots of inconvenience to the traffic, which ultimately affect future scenario of countries. At the same time, Thread of disposal of waste plastic is extremely severe nowadays. In order to, improve the performance of the road surface. The plastic will be used for aggregate coating in order to increase road performance and durability. Fillers modify the properties, accelerate the performance, and offer greater durability to composites, polymers, rubbers, adhesives and coatings. Hence rubber and fillers are mixed with various proportions to increase the quality of road and whether it can be used for construction at low cost.Due to the excessive usage of the plastic materials, the availability of waste plastic is enormous, as the plastic waste become part and parcel of daily life. Plastic wastes like Low Density Polyethylene, Polypropylene, polyethylene Terephthalate, Polystyrene are used. These waste plastics are shredded into small pieces. Dry process is followed here. Aggregates are heated to a certain temperature, and the shredded plastics are spread over these heated aggregate. This plastic get softened and forms a coating as a layer over these aggregates. Aggregates are coated with waste plastics up to 40% and tested. A property of aggregates gives good response to these coating. It shows better resistance to abrasion, Crushing, Impact, Water absorption test.Bituminous mix is prepared and stirred well in order to get uniform mix, then stone dust powder waste is weighted and added to the hot bitumen in different percentages. This stone dust powder is used as a filler material. Until now, various fillers like cement, fly ash, eggshell powder, coconut shell powder, etc., are used.In the present study, an attempt has been made to use waste plastics as coat over aggregate and stone dust powder as filler in bituminous mix. This mixture is laid on the road surface like a normal tar road.One of the major concerns amongst these is safe and sound disposal of solid wastes. Bituminous mix is prepared with stone dust powder up to 50% and plastic coated aggregates. Marshall Method is adopted for the mix design. India consumption of plastics grew every year and is set to be the world third largest consumer of plastic in this world. Stone dust waste is dispose into landfills every year.This is a very effective step towards eco friendliness compared to conventional and traditional techniques of the flexible pavement constructions. One of the important ways to control environmental pollution is waste management. If we use industrial waste in more innovative and contributing in reduce negative impacts of wastes on environment.

STRUCTURAL BEHAVIOUR OF REINFORCED CONCRETE BEAMS USING DIFFERENT TYPES OF COARSE AGGREGATE

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ABSTRACT: Test were carried out to study the structural behaviour of concrete on the Compressive strength, First crack load, ductility factor, stiffness, energy absorption and energy index of concrete produced at different levels with 28days target compressive strength of 30, 50, and 80 MPa. Concrete considered in this paper were produced using Grey granite, Anarthosite, Biotitegneiss, Limestone and Charconite. The result shows that the strength, stiffness, energy absorption capacity, ductility factor and energy index of concrete for a given water cement ratio depend on the type of aggregate, especially for high strength concrete. The beams with grey granite aggregate are used to make structure efficient and to restore stiffness and strength values greater than 20% of other types of aggregates.

KEYWORDS: Mechanical properties, Grey granite, Charconite, Limestone, Anorthosite, Biotite gneiss, ductility behaviour, energy absorption.

INTRODUCTION

In concrete structures coarse aggregate play an important role in strength parameter. Strength performance remains the most important property of structural concrete. The strength of the concrete is determined by the characteristics of the mortar, coarse aggregate and the interface. The limitation of water cement ratio concept is becoming more apparent with the development of high performance concrete in which the aggregate plays an important role.

High strength Concrete is a term used to describe concrete with special properties not attributed to normal concrete. High strength concrete resist loads that normal strength concrete. Once the high strength concrete is placed, the hardened concrete properties can be predicted in addition to its special characteristics. Aggregate particles should be clean and free of any materials that would degrade such as organic matter, clay lumps and soft particles. Aggregate binding is the process of intermixing two or more aggregates to produce an aggregate with different set of properties. For high strength concrete which is usually made with a water cement ratio less than 0.4 the strength of mortar and the bond at the interface may be similar to the strength of the coarse aggregate. At the same time, with the strength improved, the brittleness of the concrete is also increased which limits the use of concrete. This paper reports the result of a study undertaken to investigate the behaviour of five different types of coarse aggregate on the compressive strength, stiffness, ductility factor, energy absorption capacity and energy index of the concrete designed to achieve at different strength levels.

LITERATURE REVIEW

The experimental study on strengthening of Reinforced Concrete Beams using Mineral Based composites. And, also using this mineral repairing and rehabilitation of the structures. Glass reinforced polymer sheet used for binding materials. This type of concrete is giving the more strength and life for the structures. Using this materials to avoid the flexure difficient, shear deficient and also retrofitted preloaded reinforced concrete beams. [1] The Strength and Stiffness of Damaged Reinforced Concrete Beams with deficient reinforcements through retrofitting was experimentally and numerically studied. Three beams are used as reference beam whereas the other three cast as shear deficient beams and loaded up to first few cracks. The damaged beams were repaired, cured and retrofitted. Flexure test is carried out to find the average ultimate load, maximum deflection, maximum moment, stiffness, energy absorption and crack pattern of reference and preloaded retrofitted beams. It is concluded that the ultimate load and moment carrying capacity were restored.[2] The strengthening of reinforced concrete beams using steel fibre at different depth of the beam. This paper presents the result of an experimental investigation for enhancing the shear and ultimate strength capacities of RC beams using steel fibres at different depths. From the test results, it was found that incorporation of steel fibre in RC beams have shown to be effective in enhancing the shear capacity. It has also been observed that the strength increases with the use of varying depth of steel beam strengthened using this scheme has shown 20% increase in shear strength and ultimate load in comparison to controlled beam. [3] The Flexural strengthening of reinforced concrete beams using Reinforced Polymer Laminate Review Several researches have been carried out on reinforced concrete beams strengthened wit reinforced polymer composites. A few works has been focused on strengthening of rectangular beams with different type and different thickness of reinforced polymer. Finally, this paper attempts to address an

EXPERIMENTAL STUDY IN AMBIENT CURED GGBS GEOPOLYMER CONCRETE

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Abstract: Nowadays, The waste material disposal is a great problem all over the world. There are lot of scientific researchers are going on to reduce the waste disposal and also its efficient use in other works. At the same time, concrete is an essential material in construction. As the concrete production increases, it leads to the increase in the cement content. It releases excess amount of carbon-di-oxide in atmosphere. Hence, an innovative technology Geopolymer totally replaces the cement in concrete production in order to save from environmental pollution and global warming. Geopolymeric concrete produces more strength when compared with Ordinary Portland Cement. In the present study, Granulated Blast Furnace Slag was used as the source binder in geopolymer mortar mix, and its strength properties were studied under ambient curing condition. Trial mixes were made to find potential mix in Ground Granulated Blast Furnace Slag in geopolymer mortar. Mortar was made with Liquid / Binder ratio of 0.5, Sodium Hydroxide Concentration of 10M, 12M & 14M and Sodium Silicate to Sodium Hydroxide ratio of 3. The Strength was calculated at the intervals of 3, 7 and 28 days. This test result showed that the GPM mix strength totally depends on the Curing temperature and NaOH Molarity.

KEYWORDS: *GGBS, Sugarcane Bagasse Ash, Molarity concentration, NaOH, Sodium Silicate, GPM*

1. INTRODUCTION

Concrete is the most consuming construction material. It involves the principal binder material of Cement in its production. According to B.V. Rangan that the cement production will increase from about 1.5 billion tons in 1995 to 2.2 billion tons in 2010. It will increase the emission of carbondioxide into atmosphere. Several efforts are made to reduce the utilisation of Portland cement in concrete in order to address the global warming problems. Geopolymer is an new one, which completely replaces cement in concrete production and also reuse the waste ash as source binder instead of cement.This involves the usage of supplementary cementing materials like fly ash, silica fume, ground granulated blast furnace slag, rice husk ash and metakaolin as an alternative binder to cement. A few systems are in advancement for supplementing the utilization of portland cement in solid so as to illuminate the a worldwide temperature alteration issues. In such manner, the progressive improvements is the geopolymer concrete identified with novel materials bringing about easy and naturally neighbourly material as distinct option for portland cement.

Subsequently, the geopolymer technology proposed by Davidovits (1998) shows considerable promise for application in concrete industry as an alternative binder to the Portland cement (Duxson et al, 2007). Geopolymer material production involves the implementation of materials that are really rich in Silica and Alumina and alkaline activators as the main ingredients [15]. The source binders are activated by alkaline activators to form three dimensional polymeric chains of sialate and poly (sialate) (Si-O-Al-O). The source binders are either natural or by-product material. Alkaline liquids are either sodium or potassium based. The geopolymerisation process involves the usage of alkaline liquid is in the combination of sodium hydroxide (NaOH) or potassium hydroxide (KOH) with sodium silicate or potassium silicate.Several waste materials that have been investigated in the production of alkali-activated binders. From the previous studies, the source materials like fly ash, silica fume, high calcium wood ash, bagasse ash were attempted in the geopolymer concrete. In this present Study, Material like GGBS as the Source binder in mortar mix with the alkaline activators like Sodium hydroxide and Sodium Silicate under ambient Curing. The present paper work is aims to study the compressive strength characteristics of geopolymer concrete using GGBS which are producing at Ambient temperature conditions without water curing.

2. MATERIALS USED& MIX PROPORTIONING

2.1 Materials Used

2.1.1 Ground Granulated Blast Furnace Slag

GGBS is a materialobtained from steel and iron furnace. Initially, it is obtained as a glassy, granular products that is dried and finally grounded into a fine powder which is shown in Figure 2.1. The specific gravity was determined as per IS 4031(Part: II): 1988 and found to be 2.7. The chemical properties of GGBS is displayed in Table 2.1.

AN EXPERIMENTAL STUDY ON OPTIMUM REPLACEMENT OF CEMENT AND COARSE AGGREGATE BY MARBLE MATERIAL

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ABSTRACT: Marble is one of the important materials used in the construction industry. The waste materials were left directly to the environmental which cause environmental problem. The present study is aimed at utilizing waste marble powder as cement, coarse aggregate in concrete, replacing cement, natural aggregate investigate replacement is done partially with level of 0% to 30% with an interval of 10% and its effect on properties of concrete were investigation. Marble powder is produced from processing plants during the sawing and polishing of marble blocks and about 20- 25% of the processed marble is turn into powder form. The chemical composition and the mechanical properties of marble are reported with that of aggregate for comparative analysis, such as compressive strength carried out for 7, 14 and 28days with the concrete mix of M20 grade is prepared for various concrete mixes.

KEYWORDS; Waste Marbles, marble powder, Marble aggregate, Waste marble dust.

I.INTRODUCTION

Since aggregates occupy 70-80 percent of the volume of concrete, their impact on various characteristics and properties of concrete is undoubtedly considerable. All along in India, we have been using natural sand and gravel in concrete manufacturing. Hence, there has to be an emphasis on the use of wastes and by-products in all areas including construction industry. As 75% of concrete is composed of aggregates it is imperative that we look to maximize the use of waste as aggregate input in concrete making. The industry's disposal of the marble powder material, during the cutting process about 25% the original marble mass is lost in the form of dust. The utilization of the marble dust in various industrial sectors especially the construction, agriculture, glass and paper industries would help to protect the environment. Generally, in literature waste marble dust has been replaced with either all of the fine aggregate (0 - 4 mm) or passing 1 mm sieve.2 However, not a single study on the performance of the concrete prepared by replacing very fine sand (passing 0.25 mm sieve) with WMD. The studies concerning the utilization of marble dust, which is obtained as a by-product of marble sawing. Therefore, the aim of this current study is both to avoid the environmental pollution and to investigate the usability of the marble dust as 20%, 40%, 60%, 80% and 100% by weight of conventional concrete. In this way, we will help to protect the environment by consuming the waste marble dust obtained as a by- product of marble sawing and shaping processes in the factories those operating in our region.

According to pilus aggregate composed 60-75% of production of concrete. The workability and the 8 strength of concrete and two types such as coarse aggregate that have a size more than 5mm and fine aggregate with a size less than 5mm (1). Amit kumar is opc cement as beam replaced by marble waste powder accordingly in range of 0% to 50% by weight for M25 grade of concrete (5). Pranli as in future we will be experimenting on replacing coarse aggregate and fine aggregate by recycled aggregate and marble sludge powder by 5%,10%,15%,20% are provided (10). Swathi as compression strength, the maximum strength is 58.54Mpa at 28 days at 40% copper slag replacement compared to normal M40 grade of concrete (4). Baboo rai marble granules reveals that increased waste marble powder (WMP) or waste marble granule (WMG) ratio in result increased workability and compressive strengths of the mortar and concrete with partial replacement of marble granules conform to the standard of IS : 8112 – 1989 (7).

II. MATERIAL USED & MIX PROPORTIONING

2.1 Material Used

2.1.1 Cement

Cement is the most important and the costliest ingredient of concrete. Selection of proper grade and quality of cement is important for obtaining high strength concrete. Some of the important factors, which play a vital role on the selection of the type of cement, are compressive strength at various ages, fineness, heat of hydration, compatibility admixtures etc. ordinary Portland cement is available in three grade namely 33, 43, 53 grades, the number indicating the compression strength of standard cement sand mortar cubes in N/mm^2 at 28 days.

2.1.2 AGGREGATE

Aggregate are the important constituents of concrete. They give body to the concrete, reduces shrinkage and effect economy. Aggregate occupy 70% to 80% of the concrete. The aggregate