EXPERIMENTAL INVESTIGATION OF REPLACING CEMENT WITH CORN COB ASH POWDER

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Abstract: The possible of corn cob ash (CCA) powder as a substitute cementitious material was estimated in this study. The physical, chemical and mineralogical characteristics of CCA were considered and analyzed. The Compressive strength, Split Tensile strength and Flexural strength of the CCA mixed concrete was observed to check on the effect of CCA in concrete. The water to binder ratio of 0.45 is considered and concrete with five different dosage of CSA (OPC, 10%, 20%, and 30%) were casted. Results of Compressive strength, Split Tensile strength and Flexural strength exposed that CCA provides a positive effect in the strength development at later ages and in fact has higher percentage gain in strength than the later because of the excellent pozzolanic effect of CCA in the combined concrete.

Key Words: CCA, concrete, steel, compressive strength, flexural strength, split tensile strength.

1. INTRODUCTION

The history of cementing materials is as old as the history of engineering construction. Concrete is one of the most commonly used building materials today. The adaptability and plasticity of the materials, its high compressive strength and discovery of improved and harried techniques have been generally used. The properties of the concrete in the plastic/hardened state depend on the nature and type of the ingredients used. The alteration of building ingredients has an important impact on the construction engineering. A number of attempts have been made in the building materials industry to use waste products, such as additional cement, for useful and economical items. Some studies have focused on finding alternatives that can be used as alternatives to cement, such as industrial and agricultural disposable and less valuable wastes, and their potential benefits can be achieved through recycling, reuse and renewal programs. These wastes are created in huge quantities (millions of tons) and are wasted every year. They cause environmental problems and leaching of toxic chemical like arsenic, beryllium, boron, cadmium, chromium, cobalt, lead, manganese, mercury, molybdenum selenium, strontium, thallium when landfilled or dumped in lakes and oceans. It is shown in studies that waste materials can be successfully used to replace cement and providing environmentally safe, stable and more durable and low cost construction material.

In India, Corn is the third most important food crops after rice and wheat. According to advance estimate, it is cultivated in 12.7 m ha (2017-18) mainly during Kharif season which covers 80% area. Maize in India donates nearly 9 % in the national food basket and more than ₹100 billion to the agricultural GDP at current prices apart from the producing employment to over 100 million man-days at the farm and downstream agricultural and industrial sectors. The use of corncob ash in concrete with normal strength is a new dimension of concrete anxiety design, and if large-scale applications will reform the construction industry through cost savings. Pozzolana have been used to improve properties of cement mortar and concrete. Pozzolana, by their miscellaneous and varied nature, tends to have widely varying appearances. The chemical composition of Pozzolana varies considerably, depending on the source and the preparation technique. Normally, a Pozzolana will contain silica, alumina, iron oxide and a variety of oxides and alkalis, each in varying degrees.). Use corn cob ash (CCA) as a pozzolana, without considering this chemical CCA suitable for use as pozzolana. In this study, it is working to produce CCA mixed cement in a factory-controlled environment because it is an ordinary portland cement. The CCA used is produced by grinding the dried corn mandrel to a diameter of about 4.00 mm to enhance enough combustion and reduce the impact pozzolana properties of CCA.

2. EXPERIMENTAL INVESTIGATION

The commonly used mix of 20 MPa was used for this study. The concrete mix design was done as per IS 456:2000 and IS 10262:2009. The materials were tested for various properties wanted for the mix design. The cement used for the complete experiment is Ordinary Portland Cement of grade 53 cement. The coarse aggregates were of size 20 mm and downgraded and the fine aggregate used was M-sand.

Water to binder ratio (0.45) and three different replacement percentages (OPC, 10%, 20%, and 30% by weight of cement) were adopted. For each replacement percentage, three samples were casted for the experiments (3 specimens for 28 days) and results have been reported in this paper. The concrete mix was prepared to have a design compressive strength of 20 N/mm2 at 28 days. The waste of concern in this study is corn cob ash (CCA). Use corn cob ash (CCA) as a pozzolana, without considering this chemical CCA suitable for use as pozzolana. Use a local blacksmith furnace using charcoal as a fuel, burning ground coke in the open air.

URBAN SPRAWL AND IMPERVIOUSNESS MAPPING USING SATELLITE DATA

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Abstract: *Urban growth is a global problem majorly influenced by anthropogenic activities. Urban natural issues such as flooding, water quality disintegration, increase in air impurity. Urbanisation greatly influenced by population and transportation growth. Non green areas such asimpervious is imprint of development like rooftops, sidewalks, parking lots etc. Pervious surfaces to impervious surfaces are caused due to human activities like constructions. Sprawl ultimately leads to imperviousness. Impervious surfaces won't allow water to penetrate affecting humans and nature both flora, fauna. Impervious surface dynamics involves increase in surface temperature. In this paper we concentrate mainly on impermeable surfaces and urban developed areas so that future can be planned accordingly using remote sensing data. In temporal data there be changes in classes. Misclassification and misregistration are two main problems during extraction of classes using Landsat data. Therefore, future scenario prediction of these are considered as major benefits for controlled establishments and for future development planning accordingly. Most of people use indices and classification in recent studies for determining urban sprawl and imperviousness surface. Where we can reach maximum accuracy with visualization classification conforming with high resolution data by doing accuracy assessment. Future prediction using markov chain analysis is carried with available years of Landsat data.*

KEYWORDS: Urbanization, Classification, Indices, Markov chain analysis, Impervious surface, misclassification, misregistration, Future scenario.

1. Introduction

Urbanisation defined as increasing in population in cities creating suburban areas.Increase in population and industries creating demographic pressure.Natural and ecological issues increased byimperviousness. Impenetrable is the surface where water is invading into soil, like streets, garages, walkways, parking lots, housetops in urban areas. Impenetrable evaluation used to find numerous effects caused by condition impenetrable surfaces affecting most of the earth. Surface temperature increased by imperviousness and also effects climate

Methodology is prepared for finding development over different time periods. Urbanization is the cause of land consumption and change in land use status. Remote sensing strategies used to classify spatiotemporal patterns using multi-stage pictures and giving future urbanization forms urban land extension from the urban centre, and in recognizing land-use change in urban edges particularly in what concerns improvement has been occurred. Resulting open space reduction traffic blockage. Four land use classes are considered urban (developed) and street, Water body, Agricultural land, open land. Classification method gives from to change information. Growth and its direction and its future prediction is highly necessary to planners

An Alternate Aggregate & Metakaolin Blend In Concrete to Assess Compressive Strength

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Abstract — The current experimental investigation focuses on the influence of Quarry residues and Metakaolin on the compressive strength of concrete. Sand is partially replaced with Quarry dust and cement by Metakaolin in M25 grade of concrete. The present experimentations reveal that Metakaolin can replace cement, and quarry dust can substitute fine sand in concrete to some extent. At 30% replacement of fine sand with Quarry dust, increase in compressive strength was noticed. Simultaneously, 8% replacement of cement with Metakaolin, displayed better compressive strength. The test results were found to be satisfactory with the individual replacements but the combination of Quarry dust and Metakaolin did not yield positive results with respect to compression of concrete.

Keywords: Metakaolin, Quarry dust, Compressive strength, Partial Replacement

I. INTRODUCTION

One of the major achievements of cement and concrete industry during the last few years is the combined use of mineral admixtures and recycled or waste materials. Cement manufacture causes environmental impacts at all stages of the process. These incorporate discharge of airborne contamination as residue and gases, commotion and vibration while operating machinery during blasting operations in the quarries. Concrete generation contributes ozone harming substances straightforwardly through the creation of carbon dioxide when calcium carbonate is warmed and in a roundabout way using energy especially if the energy is sourced from petroleum derivatives. Concrete industry delivers about 5% of worldwide man made carbon dioxide emanations of which half is from synthetic procedure and 40% is from consuming fuel.

High reactive Metakaolin is made through the calcination of a highly pure kaolinite and grinding the products to a fine particle size. Metakaolin presents various advantages in concrete, such as increased strength, increased resistance to chemical attack, enhanced concrete finishes, reduced shrinkage, and reduced permeability. Due to these advantages, Metakaolin is widely used in producing high performance and high strength concrete [11].

Stream sand is most generally utilized fine total in cement yet because of intense deficiency in numerous zones: accessibility, cost and natural effect are the real concern. By substitution of quarry dust, the necessity of land fill region can be decreased and can likewise take care of the issue of common sand shortage. To defeat from this emergency, fractional supplanting of sand with quarry residue can be a financial option. Quarry dust fulfills the purpose for the elective material as a substitute for sand with ease. Concrete shows higher compression quality in the wake of supplanting fine total by stone residue. Stone residue can be utilized as an added substance in concrete preparation [7].

The main objective of the present experimental investigation is to obtain the influence of the combined application of Quarry dust and Metakaolin on compressive strength of M25 grade concrete. Utilizing distinctive extents of Quarry residue and Metakaolin, compressive quality tests were performed on 150 mm x 150 mm x 150 mm cubes and the outcomes were contrasted with conventional concrete.

II. LITERATURE REVIEW

D V Prasada Rao et.al performed a test examination on the utilization of Metakaolin and Nano-Silica on different properties of concrete. Metakaolin and Nano-Silica are utilized as halfway swap of cement for the preparing of concrete. In light of the test outcomes, it was seen that concrete arranged with a blend of 5% MK and 2% NS demonstrated expanded quality contrasted with the controlled concrete.

C K Kankam et al distributed aftereffects of concentrate on concrete utilizing quarry residue to supplant sand at dimensions of 0%, 25%, and 100% by weight. It was seen that the stress strain bends were comparable for all sand supplanting levels and that concrete with 100% quarry dust had the greatest strain esteems.

Xiao-Yong Wang examined and introduced an incorporated hydration-mechanical-toughness show for assessing different properties of Metakaolin mixed concrete. The proposed coordinated hydration-mechanical-toughness demonstrates was important for the material plan of Metakaolin mixed concrete.

Suzan S Ibrahim et.al carried out studies on blended pastes of partially replaced ordinary Portland cement with different Metakaolin proportions of 5%, 10% and 15%. Scanning electron microscopy micrographs showed the arrangement of denser microstructure for the solidified OPC-MK10 paste when contrasted with flawless OPC pastes after 28 days period of hydration.

P. Dinakar et.al published the effect of incorporating Metakaolin on the mechanical and durability properties of high strength concrete for a steady water/binder ratio of 0.3.
Metakaolin blends with cement substitution of 5, 10 and 15% were intended for target quality and slump of 90 MPa and 100 ± 25 mm. This examination has demonstrated that the Metakaolin can possibly deliver high quality and elite concretes.

J M Khatib et.al decided the compressive quality, density and ultrasonic pulse velocity of mortar containing high volume of Metakaolin as fractional substitution of cement. The results indicated that the maximum strength of mortar occurs at around 20% MK. Compressive strength

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Development & Assessment on Strength Properties of Concrete by Using Self Curing Agents

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ABSTRACT: Curing is the process by which the hydraulic cement concrete matures and develops the hardened properties over time as a result of continued hydration of the cement in the presence of sufficient water and heat. Curing in which prevents the loss of moisture from the concrete. There are different methods of curing like (water, steam, self-curing).we adopt the self curing for our project. If the evaporation of moisture from concrete are not prevented properly it may results in plastic shrinkage cracks. So curing is the important process to strengthen the concrete. Curing process is carried out by the self-curing agents.

In self – curing concrete mixed proportions of concrete is similar to normal conventional concrete but in addition to that we will add self-curing agents to the concrete while mixing. Cast the (cube) shaped moulds for determining the compressive strength for 7and 28 days. For determine the workability for the fresh concrete by using the slump cone test. In the present study, strength of concrete containing self- curing agents with various percentages to cement will be investigated and compared with those of conventionally cured concrete. Finally PEG-600 (2%), PEG-4000(0.5%, 1%) and PVA (0.5%) exhibited good results than the nominal concrete strength.

KEYWORDS: Self Curing Concrete, PEG-600, PEG-4000, PVA, Strength Properties.

I. INTRODUCTION

Concrete is the second most used material in the world after water. Ordinary Portland cement (OPC) has been used traditionally as a binding material for preparation of concrete. The world-wide consumption of concrete is believed to rise exponentially primarily driven by the infrastructural development taking place in China and India. 1 tone of carbon dioxide is estimated to be released to the atmosphere when 1 ton of ordinary Portland cement is manufactured. Also the emission by cement manufacturing process contributes 7% to the global carbon dioxide emission. It is important to find an alternate binder which has less carbon footprint than cement.

The desired properties in concrete can be obtained by proper curing if concrete is in the initial stages. Curing is the name given to the procedures used for promoting the hydration of the cement, and consists of a control of temperature and of moisture movement from and into the concrete. Curing allows continuous hydration of cement and consequently continuous gain in the strength, once curing stops strength gain of the concrete also stops. Proper curing of concrete structures is important to meet performance and durability requirements. In conventional curing this is achieved by external curing applied after mixing, placing and finishing. But, curing is not possible in all occasions because of some barriers and negligence. Water is maximum utilised commodity and because of this the day-by-day

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Compression and Split Tensile Characteristics of Concrete Containing Quarry Residues

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Abstract: Waterway sand and pit sand are the most normally utilized fine aggregates for concrete creation in many parts of the world. Huge scale extraction of these materials presents genuine ecological risk in numerous parts of the nation. Aside from the ecological danger, there still exists the issue of intense lack in many regions. In this way, substitute material in place of river sand for concrete production should be considered. The paper means to examine the compressive and split tensile qualities of concrete produced using quarry residue, sand, and a blend of sand and quarry dust. The experimentation is absolutely research facility based. A total of 60 concrete cubes of size 150 mm x 150 mm x 150 mm, and 60 cylinders 150 mm in diameter and 300 mm deep, conforming to M50 grade were casted. All the samples were cured and tested with a steady water/concrete proportion of 0.31. Out of the 60 blocks cast, 20 each were made out of natural river sand, quarry dust and an equivalent blend of sand and quarry dust. It was discovered that the compressive strength and split tensile strength of concrete produced using the blend of quarry residue and sand was higher than the compressive qualities of concrete produced using 100% sand and 100% quarry dust.

Keywords: Concrete, Quarry dust, Compressive Strength, Split Tensile Strength

I. INTRODUCTION

Concrete is a constituent made of cement, fine aggregates, coarse aggregates and water with or without different mineral additives. As indicated by Safiuddin[1] et al. (2007), it is a broadly utilized material in the world. In light of its worldwide utilization, concrete is put in runner up after water. Nature of concrete relies upon nature of its constituents. Fine and coarse aggregates are basic segments of concrete. They for the most part possess 60% to 75% of concrete volume. Thus, they impact the solidified properties, blend extents and economy of concrete (Sing[2] et al. 2012). The most regularly utilized fine aggregate is common waterway or pit sand. Research directed by Vijaya Kumar[3] et al. (2015) demonstrated that, quarry residue has the capability of being utilized as substitution of fine aggregate in concrete generation. Quarry residue is an unavoidable by-product in the method of extracting and preparing of aggregates. Now and again it is considered as waste in light of the fact that not many markets presently exist for them. Nonetheless, in contrast to numerous different wastes, they are commonly dormant and non-perilous. Quarry residue is commonly considered as a waste material, causing an ecological burden because of disposal issues. Thus, utilizing quarry dust as fine aggregates in concrete blends will diminish the interest for common sand as well as the environmental burden.

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As indicated by Saha and Sarker[4] (2017), fusion of modern industrial by-products, for example, quarry dust as aggregate may lessen the disposal cost of these by-products and creation cost of concrete. Accordingly, use of quarry dust as a halfway substitution of stream sand as fine aggregate in concrete will cause it an important resource. Some elective materials have been utilized as a substitution of normal sand. Vinay[5] et al. (2015) opined that materials, for example, fly ash, slag, limestone powder and siliceous stone powder have been utilized in concrete as a halfway substitution of regular sand. A few researchers have utilized manufactured quarry fine aggregate as a fractional substitution of regular sand, and researched its impact on concrete. As indicated by Safiuddin et al. (2007), waterway sand which has consistently been conveyed underway of ordinary concrete is before long getting to be costly and rare. It makes the interest for an elective material exceedingly basic.

As indicated by Priyanka and Dilip[6] (2013), worldwide utilization of characteristic sand is exceptionally high because of broad utilization of concrete. Specifically, the interest for characteristic sand is very high in creating nations attributable to fast infrastructural development. In perspective on this, some developing nations like India are confronting deficiencies in supply of characteristic sand in numerous pieces of the nation. Combined with this deficiency is the mind-boggling expense of the material and the genuine ecological danger it postures to human presence. It has put the construction business of developing nations under worry to discover substitute materials to diminish the interest for characteristic sand. Joel[7] (2010) states that few Asian nations, for example, India and Singapore are confronting serious deficiency of regular waterway sand to address expanding issues for infrastructural development.

The motivation behind this paper is to dissect the compressive and tensile qualities of concrete with quarry residue, sand, and a blend of quarry residue and sand as fine aggregates.

II. MATERIALS FOR CONCRETE GENERATION

Concrete is a composite material comprised of cement, aggregates (fine and coarse) and water. Now and then, mineral admixtures can be added to improve its properties. Kosmatka[8] et al., (2002) are of the view that Portland cement is hydraulic cement made basically out of calcium silicates. It sets and solidifies by responding chemically with water. During the response, which is called hydration, cement joins with water to shape a stone like mass.

Strength Analysis of Concrete Containing Crushed Rock Particles AS Partial and Total Replacement of Sand

Syed Afzal Basha, B Jayarami Reddy, C Sashidhar

Abstract- ***In recent past, the demand for natural river sand has rapidly increased for constructional purposes. This high demand led to extraction of sand from river beds. Depletion of natural sand creates the environmental issues and hence sand excavating is restricted by government which resulted in shortage and substantial increase in its cost. In this context, there is a need to recognize reasonable elective material from mechanical waste instead of stream sand. The usage of squashed shake sand which is a waste material has been acknowledged as building material in numerous nations for as long as three decades. In this paper, attempt is being made to replace natural river sand partially and completely with stone dust. The cube compressive strength test and split tensile tests were conducted. Experimental investigations have revealed that the mechanical properties of concrete using stone dust are almost similar to the conventional concrete. Hence the detrimental effects on environment caused due to excessive mining of river sand can be minimized.***

Key Words: Concrete, Compressive strength, Split tensile strength, Crushed rock powder

I. INTRODUCTION

Concrete is a composite material that comprises of a blend of cement, aggregates, and water, with or without admixtures, strands, or different cementitious materials. Aggregate is a general class obviously to medium grained particulate material utilized in construction, including sand, rock, squashed stone and geo-manufactured aggregates. Aggregates in concrete go about as auxiliary filler. Stream sand has been the most prominent choice for the fine total segment of concrete before, however abuse of the material has prompted ecological concerns. Because of extreme mining process, the accessibility of stream sand has gotten short in supply. This prompted to the search of alternate materials as ingredients of concrete that are in no way inferior to the conventional materials.

In any case, there has been broad research on the elective materials reasonable to supplant sand in concrete. The need to discover substitution for sand emerges from the way that in many parts of the world, there is developing worry about the exhaustion of sand stores, ecological and financial dangers related with extraction of sand from waterway banks.

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Some elective materials which have been utilized as fractional trade for sand incorporate fly ash, slag limestone, silica stone, furnace bottom ash and reused fine aggregate [1-3]. Among the numerous materials researched, squashed rock dust has all the earmarks of being the most appropriate on the grounds that it is accessible in huge amounts in many pieces of the world. The usage of squashed rock sand gives extra advantage to concrete. It is known to cause an expansion in the quality of concrete over that made with equivalent measure of ordinary waterway sand. Use of squashed rock powder alleviates pressure on sand as well as decreases the requirement for its dumping as quarry dust is viewed as a waste item in the quarries. Squashed rock sand is gotten during the devastating of large stone boulders into coarse aggregates. Around 20-25% of the crushed material squashed in a smasher unit for extraction of aggregates is left as fine residue and is viewed as waste. The utilization of quarry dust as a structure material has been acknowledged in the propelled nations in the previous three decades [4, 5]. The degree of usage comes from supported research work completed with respect to expanding use of quarry fine aggregate.

II. LITERATURE REVIEW

Several studies have been carried in the past to evaluate the impact of partial supplanting of river sand with crushed rock sand. Celik and Marar [6] reasoned that incomplete substitution up to 30% prompts decline in slump value. However, a critical improvement in the compressive, flexural strength and impact resistance was watched. A noteworthy decrease in the cost of concrete without influencing the strength property was accounted for in the examination led by Ilangovan [7]. Sahu et al. [8] noticed that concrete made with crushed rock sand accomplished the comparable compressive strength, tensile strength and modulus of rupture as the control concrete. Sahul Hameed and Sekar [9] deduced that the compressive strength, split tensile strength and the durability properties of concrete made of quarry rock dust are almost 14% more than the conventional concrete. Studies on the properties of fresh concrete have revealed that there is decrease in workability with quarry dust in concrete [10]. The decrease in workability is mostly attributed to high percentage of fines in the quarry dust and also the angular shape and rough texture of the dust particles which result in high water demand. Investigation into the durability of quarry dust concrete carried out by Ilangovana et al., [11]

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Comparative Seismic Analysis of RCC and Composite Building (G+7) Storey

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***Abstract*—** The use of Steel in construction industry is very low in India compared to many developing countries. Composite construction essentially different materials are completely compatible and complementary to each other, they have almost the same thermal expansion, they have an ideal combination of strengths with the concrete efficient in compression and the steel in tension, concrete also gives corrosion protection and thermal insulation to the steel at elevated temperatures and additionally can restrain slender steel sections from local or lateral-tensional buckling. Steel concrete composite construction means the concrete slab is connected to the steel beam with the help of shear connectors so that they act as a single unit. In the present work steel concrete composite with RCC options are considered for comparative study of (G+7) story commercial building which is situated in earthquake zone-IV and for earthquake loading, the provisions of IS: 1893(Part1)-2002 is considered. A three dimensional modeling and analysis of the structure are carried out with the help of ETABS 2013 software. All frames are designed for same gravity loadings. The RCC slab is used in all two cases. Beam and column sections are made of either RCC or COMPOSITE sections. ETABS 2013 software is used and results are compared. Comparative study of R.C.C with Composite Story building Comparative study includes Lateral Displacement, Story Drifts and Base Shear in composite with respect to R.C.C. Sections. Steel-concrete composite frame system can provide an effective and economic solution to most of these problems in medium to high-rise buildings.

Index Terms—Static Analysis, Lateral Displacement, Story Drifts, Mode shape, Base Shear, Seismic Analysis and ETABS 2013.

I. INTRODUCTION

In India most of the building structures fall under the category of low rise buildings. So, for these structures reinforced concrete members are used widely because the construction becomes quite convenient and economical in nature. Reinforced concretes frames are used in low rise buildings because loading is nominal. But in medium and high rise buildings, the conventional reinforced concrete construction cannot be adopted as there is increased dead load along with span restrictions, less stiffness and framework which is quite vulnerable to composite construction essentially different materials are completely compatible and complementary to each other; they have almost the same thermal expansion; they have an ideal combination of strengths with the concrete efficient in compression and the steel in tension; concrete also gives corrosion protection and thermal insulation to the steel at elevated temperatures and additionally can restrain slender steel sections from local or lateral-tensional buckling.

II. LITERATURE REVIEW

Shweta A. wagh (2014) conducted a research on solution of composite location in multi storey building. There are lots of literatures available to design and analyze the composite. In this paper, therefore, main focus is to determine the solution for both the composite and rcc location in multi-story building. An earthquake load is calculated and applied to a building of G+16 located in zone II (Nagpur). It was found to be Deflection, BM, SF and cost.

Mahbuba Begum, Md. Serajus Salekin, N.M. Tauhid Belal Khan and W. Ahmed analyzed the effect of various configurations of different storyes structure performed. It was found to be cost comparison for different time of (G+6) (G+12) (G+18) and (G+24).

Shashikala. Koppad, Dr. S.V.Itti considered steel-concrete composite with RCC options for analyzing a B+G+15 building which is situated in earthquake zone III and earthquake loading is as per the guidelines of IS1893(part-I): 2002.Their work suggested that composite framed structures have many benefits over the traditional RC structures for high rise buildings.

A. Earthquake Analysis And Design Procedure

The traditional codes gives us procedure attempts to satisfy implicitly objectives.

i) Negligible damage in once in a lifetime earthquake shaking demands having a return period of about 50 years. This can be achieved by elastic structural response and limiting the story drifts to minimize damage to non-structural components such as cladding and internal walls.

ii) The inelastic deformation demands are smaller than their deformation capacities taking approximate account of gravity loads, second order effects and deterioration of stiffness and strength due to cyclic loading. Deformations are the key parameter for performance based earthquake design rather than force or strength. Deformation can be classified in to three categories.

a) Overall building movements & Story drifts & other internal deformations.

b) Story drifts & other internal deformations.

c) Inelastic deformations for structural components and elements.

B. Objectives

Steel-concrete composite systems have become quite popular in recent times because of their advantages against conventional construction. Composite construction combines the better properties of the both i.e. concrete in compression and steel in tension, they have almost the same thermal expansion and results in speedy construction. The buildings are subjected to vertical loads as well as horizontal loads. The vertical loads consist of dead load of structural components such as beams, columns, slabs, etc. and live loads. The horizontal loads consist of seismic loads. Thus building is designed for a combination of dead load, live load and seismic load as per IS 875-1987 and IS 1983-2002. Since manual computations are huge and tedious, the help of design software

A Performance of Fine-Grained Concrete with Rice Husk Ash

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Abstract: Rice husk ash (RHA) is classified as a highly reactive Pozzolana cement. It takes very high silica content like that of silica fume. Using low cost and locally existing of rice husk ash as a mineral admixture in concrete carries advantagesin costs, the technical properties of concrete as well as to the nature. A new study of the effect of rice husk ash combination on workability, strength and durability of high-performance fine-grained concrete is presented. The results show the addition of ash to high performance fine-grained concrete improved significantly compressive strength, splitting tensile strength and chloride penetration resistance. Captivatingly, the ratio of compressive strength to splitting tensile strength of HPFGC was lower than that of ordinary concrete, especially for the concrete made with 20 % RHA. Compressive strength and splitting tensile strength of HPFGC containing RHA was similar and slightly higher than for HPFGC containing SF. Chloride penetration resistance of HPFGC containing 15–20 % RHA was comparable with that of HPFGC containing 15 % SF.

Keywords: High performance fine-grained concrete, rice husk ash, workability, compressive strength, splitting tensile strength, chloride penetration resistance.

1. INTRODUCTION

The use of locally presented materials as well as the use of manufacturing process and agricultural waste in building industry has become a potential solution to the economic and environ-mental problems of particularly developing countries. Coarse aggregate is considered as the core ingredient to produce Portland cement concrete. But, the resources of this material are depleting in many countries or in specific regions, therefore outcome of a probable take for the coarse aggregate is crucial. The use of sand as a substitute for coarse aggregate to produce sand concrete and studied it. This kind of concrete has strength comparable with predictable Portland cement concrete. By the definition of sand concrete is thus the defined as a fine aggregate concrete, in which the coarse aggregate is replaced by sand and fine aggregate is by filler material.

High performance of finegrained concrete is considered as a new generation of sand concrete, and it can be comparable with high performance concrete in strength and durability.

RHA is the residue of completely burned rice husk under proper conditions. Rice husk, the outer covering part of rice grains, is a farming of waste from the milling process of pady. Rice husk is ample in many parts of the world, especially in rice cultivating countries, like India. Each heap of paddy rice can produce approximately 200 kg of rice husk, which on burning produces about 40 kg of ash. Rice husk from paddy rice mills is disposed directly into the environment or sometimes is dumped or burnt in open fields. This results in serious ecological pollution, especially after it is disintegrated under wet conditions.

RHA is classified as a highly reactive pozzolan. It has a very high silica content like that of SF. Using less cost and locally existing RHA as a mineral admixture in concrete takes benefits to the cost and the technical properties of concrete and the atmosphere as well. RHA is a porous material. Pore structure is the most important representative of this material. The change of this representative results in a different specific surface area (SSA) and therefore a different pozzolanic reactivity and different water absorption of RHA. Rice husk ash has been studied to replace SF as a partial Portland cement additional, and the results show that RHA can fully addition of SF in terms of calcium hydroxide consumption, autogeneous shrinkage, compressive strength and durability of high-performance concrete and ultra high-performance concrete. However, the effect of Rice husk ash on properties of High performance fine- grained concrete needs to additional investigation.

The objective of this study is to examine effects imposed by RHA blending on properties of High performance fine- grained concrete. Blending percentages were varied. Slump, compressive and splitting tensile strength, abrasion resistance and chloride penetration resistance of concrete containing RHA were estimated. These properties were measured for the reference and SF containing samples as well. The knowledge obtained in this study can be helpful for optimizing strength and durability of mortar and concrete in future applications.

2 EXPERIMENTAL PROGRAMM

2.1 COLLECTING OF MATERIALS

Portland cement, RHA, SF, limestone powder (LSP) and two kinds of natural sand, i.e. fine sand and coarse sand stood used to study. RHA was produced by burning rice husk under proper temperature circumstances in a simple furnace prototype in India. It was designed based on the principle of the atmospheric bubbling fluidized bed. The obtained ash was ground in a ball mill. The physical properties and the chemical composition of the cement, RHA, SF, and LSP are takenin Table 1. The physical properties of fine and coarse sand are existing in Table 2. In addition, a polycarboxylate-based superplast- icizer was used

Performance of Steel Fibers in Polymer Concrete

Aditya Nayak, S. Vinay Babu, N. Venkata Ramana

Abstract: ***This article presents the effect of fibers in the polymer concrete. The concrete was designed with M25 grade concrete and 10% of Bisfenol - A was added to produce polymer concrete. Few mixes are planned with incorporation of steel fibers in the proportion of 1 and 2% by volume. In all the mixes manufacture sand was used instead of river sand. The tests are conducted to estimate compressive, split and flexural strengths. From the results it is noticed that, the strengths are increasing with incorporation of polymer and steel fibers.***

Key words: Bisfenol-A, Crimped steel fibers, M-Sand, Strength tests

I. INTRODUCTION

Cement combined with appropriate aggregates and mixed with water formed a product with higher mechanical strength. The characteristics of this product were noticed and this lead to revolution in the construction industry. In spite of the fact that cement has advantageous properties, it also has certain limitations, one such limitation is the rigidity upon curing. The best example for this is the cracks developed on the surface course of the rigid pavement. The past studies suggested that upon addition of polymers in cement based materials improved the disadvantages. In this experimental program it has been focused to studied the compressive, split tensile, flexural strengths of the concrete by addition polymer (Bisfenol-A) and steel fibers.

II. LITERATURE REVIEW

Recent studies are discussing herein to know the status of the present work. C. Vipulanandan et.al.[1] studied the temperature effects, void content, tension, content of resin and the flexural performance of polymer concrete. From their work it is observed that strength, modulus of elasticity are increased at normal temperature. But the strengths are decreasing by increasing the temperature. Polymer concrete possessed good strength than the concrete without polymers. D. W. Fowler [2] provided the information regarding the polymer concrete. Polymer concrete for repair works, laying of overlays have been successful. The future scope suggested by him was concrete polymer concrete has good growth in 3D printing polymer concrete which includes cladding and architectural materials. L. Czarneckiet et al.[3] are provided the information on polymer concrete as review and also they have mentioned many application in order to enhance the strengths and also gave the information as this material is good for retrofitting of existing structures. Sykes et al. [4] provided the behavior of different polymers when added to concrete to enhance the life period of the materials for the application in the flooring of commercial, industrial, as well as residential building were studied when subjected to UV exposure, temperature tests, impacts tests, vehicle loads. Their study concluded that by adding polymers to concrete improves the strength when compared with normal concrete. M. Barbuta et al. [5] Studied the effects of solid waste, silica fumes, the fillers used were fly ash into polymer concrete to analyze compressive strength, flexural strength, split tensile strength. The outcomes of their work showed that, utilization of fly ash, silica fume increased the strength properties of polymers concrete in comparison to polymer concrete without fillers. They also specified as compressive strength was influenced by fly ash filler content in polymer concrete

III. MATERIALS

Cement: In this study PPC cement was used to make concrete mix. The cement showed the specific gravity as 3.12 and the initial, finial setting times as 47 and 238 minutes respectively.
Coarse Aggregates: 20mm size of coarse aggregate was used for making concrete.
M-Sand: Locally procured manufactured sand has been used in this work.
Water: Potable water was used for making the mix of concrete and also for curing
Epoxy: The type of epoxy used in this experiment is Bisfenol-A which is of medium viscosity and unmodified epoxy.
Crimped Steel Fiber: The crimped steel fibers with aspect ratio of 50 were used.

IV. EXPERIMENTAL PROGRAM

S.Vinay babu and N.Venkata Ramana[6] have done the work on polymer concrete and the results shown as 10% of Bisfenol-A is effective for the concrete mixes. Hence here 10% dosage is taken for the concrete mixes. The concrete mix was designed for M25 grade (1:2.15:3.37 with water cement ratio 0.53). To study the effect of fibers to the proposed concrete the fibers are mixed in the concrete mix in the proportion of 1 and 2% by volume. Total four mixes are proposed for the experimental work. Among mixes one mix was prepared without polymer and it is named as NC. For other mixes the polymer used along with (1 and 2%) and without fibers (0%). For each mix there samples are prepared and tested in the laboratory. The study focused to evaluate cube compressive (150x150x150mm), split tensile (150mm diameter and 300mm height) and flexural strengths (150x150x750mm).The casted specimens are undergone wet and dry curing of 7 and 21 days respectively.

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WINGS TO YOUR THOUGHTS.....

Strength Evaluation of High Performance Concrete Slabs in Punching Shear

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Abstract: *This paper presents the punching shear behavior of high performance concrete slabs. M60 grade concrete was designed as per IS standards and treated as high performance concrete (HPC). The high performance concrete was prepared with admixture of silica fume and low water cement ratio. An attempt has been made to assess the strength of slab element in punching shear. For comparison purpose M25 grade concrete slabs (RCC) cast and tested. The results showed that the high performance concrete posses high performance than the standard concrete (M25). In addition to the slab specimens, cubes and cylinders are cast and tested in order to check the ACI and IS codes provisions. After applicability of the results to codes (ACI and IS), it is observed that IS code provisions shown more conservative than ACI code provisions.*

Key words: *Punching shear, slab element, high performance concrete, ACI and IS code provisions.*

1. INTRODUCTION

Nowadays flat system has been adopted and widely used for many structures such as supermarket, stores and underground garages, bridge decks etc. The designers are designing the slab elements with standard grade concrete; this leads large thickness to the structural system. To decrease the size of element some designer are proposing huge amount of steel instead of using large quantity of concrete, this type of approach leads to higher cost to the whole building or structure. In order to find new technology, research found that the utilization of various fibres and shear studs incorporation in the standard concrete is shown good performance than the ordinary concrete. A brief review is presenting herein to know the research in this arena. Kuang J.S and Morley C.T [1] proposed a model to estimate the punching shear of laterally restrained slabs and the proposed model shown good agreement with a wide range of experimental results.M.H Harajli ,D.Maalouf [2] conducted the experimentations on punching shear behavior of concrete containing hooked fibres. The results showed that the concrete with fibres have good ductility and high strength than the ordinary concrete. They also proposed some models to predict the strength of punching shear. Menetrey .Ph [3] conducted the research work on concrete to differentiate the flexure and shear

Global Journal of Trends in Engineering

Remediation And Improvement Of Concrete By Microbiologically Induced Calcium Carbonate Precipitation

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ABSTRACT: Natural processes, such as weathering, faults, land subsidence, earthquakes, and human activities create fractures and fissures in concrete structures which can reduce the service life of the structures. Although concrete technology has greatly developed in the past decades, fissures, cracks, and steel corrosion remain the Achilles heel of any concrete structure. Biologically modified construction materials become more popular for higher strength and long-term sustainability. One way to circumvent costly manual maintenance and repair is to incorporate an autonomous self - healing mechanism in concrete. One such an alternative repair mechanism is currently being studied, i.e. a novel technique based on the application of bio-mineralization of bacteria in concrete. The applicability of specifically calcite mineral precipitating bacteria for concrete repair and plugging of pores and cracks in concrete has been recently investigated and studies on the possibility of using specific bacteria as a sustainable and concrete-embedded self-healing agent was studied and results from ongoing studies are discussed. In the present study we have discussed how to enhance durability of building structures by microbiologically induced calcium carbonate precipitation (MICCP), use of bacterial protein powder in commercial fly ash pozzolana cements for high performance construction materials ,effect of different concentrations of bacteria on the serviceability of concrete and the efficiency of bacteria when suspended in different medium (water, phosphate- buffer and urea-CaCl2) on the serviceability of concrete.

Keywords: Microbiologically induced calcium carbonate precipitation, bacterial concrete, chemical process, construction

I.INTRODUCTION

Humans have the ability to precipitate minerals in the form of bones and teeth continuously. This ability is not only confined to human beings; even Bacillus Pasteruii, a common soil bacterium, can continuously precipitate calcite (Stocks-Fischer et al [1]). This phenomenon is called microbiologically induced calcite precipitation. Under favorable conditions Bacillus Pasteruii when used in concrete can continuously precipitate a new highly impermeable calcite layer over the surface of the already existing concrete layer. Calcite has a coarse crystalline structure that readily adheres to surfaces in the form of scales. In addition to the ability to continuously grow upon itself it is highly insoluble in water. Due to its inherent ability to precipitate calcite continuously bacterial concrete can be called as a "Smart Bio Material".

It is generally accepted that the durability of concrete is related to the characteristics of its pore structure. Degradation mechanisms of concrete often depend on the way potentially aggressive substances can penetrate into the concrete, possibly causing damage. The permeability of the concrete is depending on the porosity and on the connectivity of the pores. The more open the pore structure of the concrete, the more vulnerable the material is to degradation mechanisms caused by penetrating substances. The deterioration of concrete structures usually involves movement of aggressive gases and/or liquids from the surrounding environment into the concrete followed by physical and/or chemical reactions within its internal structure, possibly leading to irreversible damage [Claisse et al. 1997]. Therefore, transport properties and mechanical properties (compressive strength) are the important factors for concrete serviceability. The present study furnishes a performance analysis of the bacterium BKH1 and one of its secretary proteins (bioremediase) regarding compressive strength enhancement, tensile strength and self-healing attributes of Portland Pozzolana cement based specimens. Comprising with the observations of Ordinary Portland cement based specimens obtained earlier; we are trying to affirm the practical applicability of the bio-remediate protein in fly ash/slag based pozzolana cements as alternative approach to construction technology. Earlier it was reported that sand consolidation by B. pasteurii reduced porosity by up to 50% and permeability by up to 90% in the areas where the cementation took place (Kantzas et al [5], and Gollapudi et al [6]). Microbial calcite plugging was selective and its efficiency was affected by the porosity of the medium, the number of cells present and the total volume of nutrient added. The sand column loaded with bacteria was so tightly plugged that the column was fractured with a mechanical knife for examining. In a study conducted by Zhong and Islam [7], an average crack width of 2.7 mm and a mixture of silica fume (10%) and sand (90%) showed the highest compressive strength in the microbial remediation of granite. Concrete crack remediation by microorganisms was significantly different from that of granite remediation, mainly due to the fact that concrete maintained high levels of pHs An extreme alkaline environment of pH around 12 is the major hindering factor for growth of B. pasteurii, whose optimum pH for growth is around 9. However, B. pasteurii has the ability to produce end spores to endure an extreme environment (Ramakrishnan et al [8, 9]).

Strength evaluation of high performance concrete slabs in punching shear

S Vinay Babu , Syed Afzal Basha, A Vinod Kumar

Abstract—Not for a long time, there is growing interest in a new generation of concrete to make huge development in construction. A relatively new sophisticated construction material of cementations complex, ultra-high performance concrete (UHPC). The UHPC refers to a mighty generation of concrete whose compressive strength more than 150MPa, tensile strength greater than 5MPa. The benefits of UHPC is perceived as a revolutionary material that has high compressive strength, self-compacting, and ductile behavior. However, the UHPC is still limited to a few structural applications due to high cost, limited design codes, and the high factors of safety adopted in design. This paper describes the mixing design and procedures for UHPC and obtained experimental results that proposed an increase in information of slab-column connections against punching shear failure. The punching shear test of flat plate slab depends mainly on the tensile strength, fabrication method, and local synthesis. The experimental method was examined a punching shear strength of UHPC flat plates having dimensions 1350*1350*80mm. The test is performed under vertical loading, using various parameters on the punching shear strength. These parameters include concrete strength, column shape, column aspect ratio, and reinforcement ratio. The experimental setup is hydraulic press allows investigating the concrete shear strength under quasi-static loading regime.

Index Terms— Cracking pattern, Deflection, Flat plates, Experimental study, Interior column, Punching shear, Steel fibers, Ultra-High Performance Concrete (UHPC).

1 Introduction

Reinforcement concrete flat plate structure is widely used nowadays due to the vast advantages such as formwork is simplified, decrease floor heights in buildings, and its pleasant appearance. The slabs without column capitals or drop panels appeared in the 1950s[1].

However, the critical problem of this system is the failure region of column-slab connections known as punching shear failure. A punching shear failure means the column is essentially pushed through the slab due to the high stresses region of column-slab connections. The engineering designer must consider punching shear failure in a flat plate system which can become an increasingly critical section in the whole system that occurs suddenly without any warning. The failure of one joint in the system may lead to loss of structural solidity.

Recently, Designers are looking forward to increasing concrete compressive strength in a structure because it is one of the most effective methods to avoid punching shear failure. Besides, the increasing concrete compressive strength in a structure minimizes the deflections under load particularly with long spans, improves long-term properties, decrease the cross-section of the member with the same strength capacity and decrease the total weight of the structure that helps in earthquake resistance especially in a tall building that located in earthquakes zones.

This study was applied UHPC to increase concrete compressive strength. The UHPC has been demonstrated to have compressive strengths more than seven times and tensile strengths greater than three times that of conventional concrete[2].

Interesting is, that UHPC exhibits nearly linear behavior up to 90% of its compressive strength before diverging 5 % from linear elastic behavior (this value is 45 % for NSC)[3].

Investigated was punched four interior column slab connections are made of UHPC. The column aspect ratio, column shape, and flexural reinforcement ratio in slabs are chosen as test parametric. In the Concrete Research laboratory - Faculty of Engineering, Ain Shams University – Cairo – Egypt were made the experimental test.

2 UHPC Specimens and set up

The immense mechanical and durability properties of UHPC make all the world interesting and researching merely with different names. Various brand names are used to refer to cementitious composite materials with ultra-high compressive strength and improvement durability around the world like [4, 5] Ductal® is a common name in the USA, Ultra-High Performance Concrete(UHPC) prevalent in Europe, while Reactive Powder Concrete(RPC) rife in Asia. Also, there are common names around the world as Compact Reinforced Composite (CRC), Densified Small-Particle(DSP) concrete, Fiber-Reinforced High-Performance Concrete (FRHPC), Macro Defect-Free(MDF) concrete, Multi-Scale Fiber-Reinforced Concrete (MSFRC), Steel Fibrous Cement-Based Composite(SFCBC).

2.1 UHPC Material

Ultra-high performance concrete (UHPC) is a new generation of concrete imperturbable of very fine powder as portland

Global Journal of Trends in Engineering

Comparison of Conventional Structural Analysis And Linear Static Analysis Using ETABS

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ABSTRACT: The principle objective of this paper is to analyse and design single bay single storey using ETABS. ETABS features a state-of-the-art user interface, visualization tools, powerful analysis and design engines with advanced finite element and dynamic analysis capabilities. From model generation, analysis and design to visualization and result verification, ETABS is the professional's choice. Initially we started with the analysis of simple 2 dimensional frames and manually checked the accuracy of the software with our results. The results proved to be very accurate. ETABS has a very interactive user interface which allows the users to draw the frame and input the load values and dimensions. Advancement of finite element modelling accelerates the accuracy of finite element simulation by taking the consideration of construction sequential effects. The analysis outcomes will help to understand how the structural response against loads varies for construction sequential analysis and linear static analysis while highlighting the material property. Complicated and high-rise structures need very time taking and cumbersome calculations using conventional manual methods. ETABS provides us a fast, efficient, easy to use and accurate platform for analysing and designing structures. Our final work was comparison of linear static analysis and construction sequential analysis.

Keywords: Finite element method, ETABS, Linear static analysis and Construction sequential analysis

I. INTRODUCTION

Structural design can be defined as a mixture of Art and Science, combining the Engineer's feeling for the behaviour of structure with the sound knowledge of the principle of statistic, dynamics, mechanics of materials, and structural analysis, to produce safe economical structure that will serve its intended purpose. The design of high-rise buildings essentially involves a conceptual design, approximate analysis, preliminary design and optimization, to safely carry gravity and lateral loads. The design criteria are strength, serviceability, stability and human comfort. Any structure is made up of structural elements (load carrying, such as slabs, beams and columns) and non-structural elements (such as partitions, ceilings, doors). The structural elements put together, constitute the *'structural system'*. Its function is to resist effectively the action of gravitational and environmental loads, and to transmit the resulting forces to the supporting ground, without significantly disturbing the geometry, integrity and serviceability of the structure. A durable structure is one, which can safely carry the forces and can serve the deserved function satisfactorily during its expected service life span.

1. Basic Requirements of Conventional Structural Design

A creative sense, imagination, understanding and keen observation of structure in nature, scientific knowledge of various aspects of structures, understanding of various structural phenomenon on the basis of statistical and experimental data, and finally the backing of the vast practical experiences in the past are some of the qualities required for a structural engineer. So it is necessary that a structural engineer not having a back ground of long experience should try to acquire sound knowledge about the various basic aspects of engineering structures and the basic aspects of the structural design.

1.1 Engineering Structure and Structural Design

An engineering structure is an assembly of members or elements transferring the load (or resisting external actions) and providing a form, space, an enclosure and/or a cover to serve the desired function. The structural design is an art and science of designing, with economy and elegance, a safe, serviceable, and a durable structure. A durable structure is one, which can safely carry the forces and can serve the desired function satisfactorily during its service life span. The entire process of structural planning and design requires not only imagination and conceptual thinking (which form art of designing) but also sound knowledge of science of structural engineering besides knowledge of practical aspects, such as relevant design codes and bye-laws, backed up by ample experience, intuition and judgment.

The objective of structural design is to plan a structure, which meets the basic requirements of structural design. The objectives are as follows:

- ✓ Serviceability
- ✓ Safety
- ✓ Durability
- ✓ Economy

INFLUENCE OF GGBS ON THE STRENGTH & DURABILITY PROPERTIES OF FLYASH BASED SELF COMPACTING GEOPOLYMER CONCRETE

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ABSTRACT

Geopolymer is a supplementary potential binder to Portland cement. The production of geopolymer concrete can be done by using supplementary cementitious alternatives like silica fume, flyash, rice husk ash, ground granulated blast furnace slag (GGBS), etc., Self compacting geopolymer concrete (SCGC) can be considered as an appreciable and inventive construction material and can be noticed as a revolutionary development in the field of concrete technology. It is an innovative type of concrete that can achieve the combined advantages of both geopolymer concrete (GPC) and self compacting concrete (SCC). As the name implies, it does not need any compacting efforts to achieve full compaction and SCGC that is produced by a polymeric reaction of alkaline activator solution with a SCM's as a binder for matrix formation and strength.

In the present investigations, low calcium flyash based GPC replaced with GGBS in 20%, 40%, 60%, 80%, 100% proportions. The concrete specimens those are cured in oven curing as well as cured in ambient temperature will be investigated experimentally under different tests. The workability, mechanical& durability characteristics are studied for different mix replacements. The conclusions shown that the incorporation of GGBS in flyash based SCGC, accordingly it enhances the hardened properties in early age. The workability characteristics are decreased by the addition of GGBS with flyash as replacement & also the compressive strength increases with increase of binder content. The durability characteristics also shown that the SCGC specimens are more durable compared to specimens that are replaced when GGBS replaced with flyash.

INTRODUCTION

Concrete is the backbone for all the construction and development activities across the globe. Ordinary portland cement is the key component for the production of the concrete. The current concrete production practice can be considered as untenable to consume excessive quantities of natural sources such as stone, sand and water and about 3 billion tonnes of ordinary portland cement / year. The production of Portland Cement worldwide is increasing 13% annually, Portland cement production is under critical review due to high amount of corbondioxide (CO_2) gas released to the atmosphere and OPC is also one among the most energy – intensive construction material. The current contribution

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PERFORMANCE OF HIGH DENSITY POLYETHYLENE (HDPE) FIBRE CONCRETE

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ABSTRACT

In the present paper the results of some tests performed on concrete specimens reinforced with fibres made form high density polyethylene (HDPE) are reported. The fibres have been obtained from unused and destroyed cable, the fibres are then added to the mix concrete and they are used as discrete reinforcement of specimens and as substitution of high strength fibres. The HDPE fibre content for concrete mix taken as 1%volume of respective specimen and the specimens were prepared with different aspect ratios of 25,75,50 and100. The test results showed that as aspect ratio increases the strengths were decreased. The utilization of fibres can be acceptable upto aspect ratio of 75 without affecting the design strength of concrete.

Key words: HDPE fibre, concrete, compressive strength, split tensile strength, flexural strength, regression models