EDUCATIONAL COMPUTER PROGRAM FOR DESIGN OF BUILDING COMPONENTS ACCORDING TO IS:456-2000

By

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Date Received: 07/08/2021 Date Revised: 17/08/2021 Date Accepted: 31/08/2021

ABSTRACT

The design of reinforced cement concrete is very important subject for students as well as engineers. Reinforced concrete design is very complex and repetitive in nature for neophyte students to understand practical aspects in construction. In order to overcome this problem, suitable tool is required. In this paper an educational software which is created in visual basic 6.0 is presented for students which is user friendly and robust in nature for day-to-day works in site. After using this educational software many students expressed their appreciation about their understanding in reinforced concrete design. The graphical user interface (GUI) of the programs developed in this software is also presented in this paper.

Keywords: Reinforced Cement Concrete Design, Visual Basic 6.0, Graphical User Interface (GUI).

INTRODUCTION

The 21st century has made life easier with the advancement of technology (Kumar & Reddy, 2020). The construction industry has also progressed tremendously. Many open source as well as proprietary applications (ETABS, 2015; SAP2000, 2016; CSI, 2006) have emerged from last two decades, but these softwares require some training to use. But in initial stages of their academic classes, it is very difficult to grasp the design-based subjects. Therefore, it is very essential to introduce a simple easy tool, which will be very interesting to students. Thereby the students will quickly grasp the essence of the design subjects like reinforced cement concrete and design of steel structures. From past many years, many graphical user interfaces-based tools have been developed to facilitate easy use for the students, academicians, and industry. The graphical user interface (GUI) developed for IDARC-2D as INSPECT (AlHamaydeh et al., 2016) is very useful for students as well as researchers by saving the time to input the data. To create GUI for IDARC-2D the author used C# programming language through Microsoft Visual studio 2013. Kourdey et al., 2017; Sheikh & Sanaul Haque, 2012 have developed civil engineering graphical user interface applications for design of footings and its settlements. Optimisation of design of steel structures was also performed by Patel et al., 2017 using visual basic 6.0, a Microsoft based programming language. In this paper authors have developed an application by name RCC solutions version 1.0 using Visual Basic 6.0. This facilitates the students to understand the reinforced cement concrete design in a better way. The authors made a survey on students on how this software helps them with a questionnaire. In Section 1 brief introduction of visual basic 6.0 is presented. The objectives of this software are explained briefly in Section 2. Outcomes of the software is represented in Section 3. The graphical user interface of this software is showcased in concluding section of this paper.

1. Graphical User Interface

Graphical user interface is the interface, where users can easily input the values and see the graphics. It is very popular from 1980's. This GUIs create a great look to applications written in programming languages. At initial

MANTECH Publications

Journal of Ceramics and Concrete Technology
Volume 6 Issue 3
ISSN: 2457-0826 (Online)

Impact of using SAP and Stone Powder in High Strength Concrete

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Abstract

In the current exploratory examination, an undertaking has been made to consider the properties of high strength concrete using the mix of stone powder and a super absorbent polymer (SAP) like sodium polyacrylate. In M60 evaluation of concrete, sand is supplanted with stone buildup and sodium polyacrylate is added while blending the constituents. Mechanical properties like compression, split tension and flexural strength have been surveyed and compared with the referral concrete. At later age, imperative upgrades in the mechanical properties of SAP intertwined concrete were taken note. SAP decreases the shrinkage in concrete and improves cement hydration which serves to increase the compressive strength. SAP retains pore solution during blending of concrete and conveys it when the relative humidity of pore framework gets diminished because of cement hydration. Expansion of SAP in concrete extends the speed of hydration of cement particles, which thusly adds to decrease in capillary porosity of the framework. Air relieving of concrete can accomplish a similar strength as that of regularly restored concrete; henceforth SAP is moreover sensible in water sparse zones.

Keywords: *- Super absorbent polymer, High strength concrete, Stone powder*

INTRODUCTION

High density concrete is of concrete with a density higher than normal 2300 to 2550 kg/m³ and is used for special purposes such as radiation shielding, counter weights, ballasts, safe walls and safe roofs. Thus the density of high density concrete is about 50% more than the density of customary concrete. However this concrete can be produced up to density of 5200

ISSN-1671-4512

Journal of Huazhong University of Science and Technology

Stability of ash dykes using finite element analysis

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Abstract:

Stability of slopes is one of the important aspects in the area of geo-technical engineering. In this study, the factor of safety of ash dyke, horizontal settlement, vertical settlement, effective pore water pressure of the model is determined in every construction stage. The slope stability analyze is done by using the finite element method. The ash dyke is created by keeping the cohesion value of starter dyke is 8 kPa and the cohesion value of raisings are 10 kPa ,15 kPa and 20 kPa respectively and the cohesion value of starter dyke is changed to 9 kPa and the raisings cohesion values 10 kPa ,15 kPa and 20 kPa respectively. Every model is being analyzed with the factor of safety value at different construction stage like starter dyke, first raising, second raising, third raising etc. The slope angle of starter dyke and raisings and angle of internal friction values are taken constant and the results are compared with varying cohesion values of starter dyke and raisings.

Keywords: factor of safety, finite element method, strength reduction technique, starter dyke

1. Introduction

The calculation of slope stability safety factors is a routine practice. In general, it involves two steps: First, calculate the factor of safety for a specified slip surface using the method of slices. Extensive studies have been undertaken in this area, and varieties of these methods are available for generalized slip surfaces. Second, find, among many potential slip surfaces, the "critical" surface that is associated with the minimum factor of safety [1]. The failure surface of a natural landslide usually exhibits a complex shape, often controlled by geological features. Failure surfaces are not necessarily spherical or log-spiral, as has been employed by some researchers

International Journal of Trend in Research and Development, Volume 8(6), ISSN: 2394-9333
www.ijtrd.com

Performance of Compressive Strength of Fly Ash Concrete with Crimped Steel Fiber

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Abstract: Fiber Bragg grating sensing technology is a new development direction in recent years. It has the advantages of simple and light structure, electromagnetic interference resistance, corrosion resistance, easy to form fiber sensing network and so on. It is widely used in aerospace, chemical medicine, material industry, water conservancy and hydropower, shipbuilding, coal mining and other fields. This paper introduces the principle of fiber grating sensor and its application in the above fields.

Keywords: *Fiber Grating Sensor, Principle, Application, Monitor*

I. PRINCIPLE OF FIBER GRATING SENSOR

The fiber Bragg grating (FBG)sensor is a kind of fiber optic sensor. The sensing process based on FBG is to obtain the sensing information through the modulation of the fiber Bragg wavelength by the external physical parameters [1]. It is a wavelength modulation type fiber optic sensor. The FBG sensor can measure temperature and strain directly. Because the wavelength of FBG is sensitive to temperature and strain at the same time, that is, the temperature and strain cause the coupling wavelength shift of FBGsynchronously, so the temperature and strain can not be distinguished by measuring the coupling wavelength shift of FBG [2]. Therefore, to solve the cross-sensitivity problem and realize the differential measurement of temperature and stress is the premise of sensor application [3].

Single FBG measurement mainly includes encapsulating single FBG with different polymer materials, using different FBG combinations and prefabricating strain method [4]. The method of encapsulating single FBG with polymer materials is to increase the sensitivity of FBG to temperature or stress by taking advantage of the different responses of some organic substances to temperature and stress, so as to overcome the cross-sensitivity effect. This method is simple, but difficult to select polymer materials. Using different FBG group method, the grating is written at the junction of two kinds of optical fibers with different refractive index and temperature sensitivity, or with different temperature response sensitivity and doping concentration. This method can demodulate to wavelength coding simply, also avoid stress concentration, but it has some problems, such as large loss, easy to break at the weld and small measuring range [5]. The prefabrication strain method is to apply certain pre-strain to the FBG firstly, and stick part of the FBG firmly on the cantilever beam under the pre-strain condition. After the stress is released, the unbonded part of the FBG deforms and its central reflection wavelength remains unchanged; while the deformation of the part stuck on the cantilever beam can not be recovered, resulting in the change of the central reflection wavelength of this part of the FBG [6]. Therefore, this FBG has two reflection peaks, one reflection peak (the part stuck on the cantilever beam) is sensitive to both strain and temperature; the other reflection peak (the unbonded part) is only sensitive to temperature, and the temperature and strain can be measured simultaneously by measuring the wavelength drift of these two reflection peaks.

II. APPLICATION OF LIGHT GRATING SENSOR

There are many kinds of optical fiber sensors, which can measure many physical parameters due to its high resolution. Optical fiber sensors have many advantages compared with traditional electromechanical sensors, such as intrinsic explosion-proof, anti-electromagnetic interference, anti-corrosion, high temperature resistance, small size, light weight, flexible and convenient, etc., so its application range is very wide, and it is especially suitable for application in harsh environment.

A. Real-time Monitoring of Bridge Cable Force Based on FBG Vibration Sensor

The FBG vibration sensor and real-time monitoring system of bridge cable force are applied to the long-term remote real-time monitoring of cable force of Nanjing Yangtze River No.2 Bridge [7]. The signals output by the FBG vibration sensor can be transmitted remotely in the fiber, and can work stably in any climate conditions for a long time. Cable is an important component of cable-stayed bridge. Real-time monitoring of cable force is the key to ensure the safe operation of cable-stayed bridge. The frequency method is simple and practical to measure the cable force, which is widely used in the practice of bridge cable force measurement. The so-called frequency method is to use the vibration sensor to indirectly calculate the cable force by measuring the characteristic frequency of cable vibration. Because the traditional electric sensors transmit weak current signals, the transmission distance is only tens of meters, and is not suitable for long-term work in various weather conditions, so this kind of sensors can only be used in the bridge site for regular detection of cable force, not suitable for long-term remote real-time monitoring [8]. In addition, the frequency spectrum of oblique cable vibration is complex, in which not only the self-resonance of the cable under the environmental excitation, but also the vibration of other vibration sources (such as bridge deck) are included. Due to the constant change of bridge load, the measured various frequency spectrum components of the cable are also in constant change, so it is difficult to automatically identify the inherent characteristic frequency of the cable. Optical FBG sensing is a new sensing technology, which adopts optical wavelength coding and transmits signals in optical fiber. It has the advantages of long transmission distance, long-term working stability, anti-electromagnetic interference, non-damp and so on. It can work reliably in outdoor climate conditions for a long time, especially suitable for long-term remote real-time monitoring of bridge cable force. The FBG vibration sensor and bridge cable force

Experiments with fractional Replacement of Cement with Eggshell Powder in Concrete

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Abstract –

***In current days, a common trend exists to decrease usage of normal sources* and recycle waste materials. Concrete plays the key position and a huge quantity of concrete in production. Eggshell waste is massive in global. And eggshell is made up with calcium so it is allowed to concrete as partial substitute of Portland cement. The purpose of this work is to observe the performance of waste eggshell powder (ESP) as partial alternative of Portland cement in concrete to improve the strength in addition to reuse of waste eggshell powder. Eggshell powder is used in numerous mixtures which can be replaced at 5% intervals from 0% to 20% through weight of cement in concrete. After curing period of 28 days, it is checked for its compressive strength, split tensile strength, flexural strength test and durability test are taken. These are in comparison with a normal mixture which is 0% of ESP and determine the best combination of replacing the material.**

keywords - **Eggshell powder, cement, concrete.**

I. INTRODUCTION

. In presence, concrete is broadly used for the shape of greatest of the buildings, bridges and so forth. Presently, the entire construction industry is in exploration of the precise and operative the wasted product that could significantly minimized the use of cement and in the end decrease the manufacture cost of concrete. Therefore, right exchange is needed to manipulate the wastes in. The intention of this investigation work is to use the egg shell powder as a limited additional of cement. Egg shell powder is changed with the aid of 5%, 10%, 15% and 20% of weight of cement. An investigational research determines the strength functions such as split tensile, compressive and flexural strength take a look at of egg shell based totally concrete were investigated. In addition of eggshell powder, enhancing the strength parameter of concrete.

Energy performs an important role in successful of growing nations like India. In the context of short availability of non- renewable energy sources fixed with the necessities of huge quantities of energy for Building materials like cement, the position of the usage of commercial waste cannot be underneath anticipated. During manufacturing of 1 tonne of OPC we need approximately 1.1 tonnes of earth sources like limestone, etc. Further throughout manufacturing of one tonne of OPC a same quantity of CO2 is released into the surroundings. The CO2 emissions act as a silent killer within the environment as various paperwork. In this Backdrop, the look for less expensive substitute to OPC is a considered necessary one.

International Journal of Trend in Research and Development, Volume 8(6), ISSN: 2394-9333
www.ijtrd.com

Assessment of compressive strength of Rice Husk Ash Concrete

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Abstract: Fiber Bragg grating sensing technology is a new development direction in recent years. It has the advantages of simple and light structure, electromagnetic interference resistance, corrosion resistance, easy to form fiber sensing network and so on. It is widely used in aerospace, chemical medicine, material industry, water conservancy and hydropower, shipbuilding, coal mining and other fields. This paper introduces the principle of fiber grating sensor and its application in the above fields.

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SQUARE FOOTING BEARING CAPACITY ON REINFORCED SAND WITH CEMENT INTERFACE MODEL STUDY

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Abstract— **Geosynthetic are used for reinforcements in many problem areas of civil engineering. It is mainly used to improve the bearing capacity and reduce settlement of the soil. Geogrids, geocells and geotextile are commonly provided as soil reinforcement which improves the bearing capacity and reduces settlement of foundation. The bearing capacity of square footing on sand reinforced with single layer geotextile reinforcement at different dimensions with cement interface is studied. A cement interface zone is created on the surface of geotextile to improve the friction and adhesion of sand and geotextile. Tests are also conducted on reinforced soil without cement interface and the results are compared to find out the variation on bearing capacity. Cement treated interface improves the bearing capacity and reduces the settlement. From the literatures referred depth and dimension of reinforcement affect the bearing capacity of the reinforcement. Test on unreinforced sand, reinforced sand and reinforced sand with cement interface of size 20cm, 25cm and 30cm geotextile at 0.5B depth from the base of footing. The result shows that size of the geotextile increase the bearing capacity considerably in both cases. When ordinary geotextile was treated with cement interface 10% to 40% increase in bearing capacity was observed. The cement treated geotextile improves the bearing capacity at lower size than ordinary geotextile.**

Keywords—geotextile, cement interface,

I. INTRODUCTION

The mechanical properties of soil as a granular material depend on its friction, cohesion, interlocking, and confinement. The inclusion of geosynthetic as a mechanical stabilization method improves the mechanical properties of soil. A number of researches are carried out on theoretical and experimental studies to understand the role of reinforcement materials in improving the bearing capacity of foundation soils. Geogrids, geotextile, geocells etc. are commonly used a soil reinforcement. Soil reinforcement is provided to improve the bearing capacity and reduce the settlement of the soil. The reinforcement mechanism may depend on the depth, length, width and number of reinforcement layers. Most of the studies are conducted on geogrid or geocell used as reinforcement. In this study effect of ordinary geotextile with cement treatment on the bearing capacity of a square footing resting on sand layer has to be conducted.

The ordinary geotextile does not provide much improvement as that of geogrid or geocells. So that when the geotextile with cement interface is provided it increases the friction and adhesion between the soil and geotextile. As a result the bearing capacity of the soil can be improved and the settlement can be reduced. The test is conducted by varying the depth and dimension of the reinforcement. The main advantages of this type of reinforcement is it provide higher amount of improvement at lower length of reinforcement and only single layer reinforcement is enough ,so that multilayer reinforcement can be avoided. The geotextile with cement interface can be used as an alternative for geogrid or geocells. **Farsakh,A,M.,Chen,Q.,Sharma,R(2013)** conducted study on the effect of geosynthetics on square and rectangular footing on sandy soil. The test was conducted by varying different parameters contributing to performance of footing. The results showed that the reinforcement configuration have very important role on behavior of reinforced sand foundation. **Ouaria,A.,Mahmoudi,A (2018)** under took a study on the effect of cement treatment of the interface between geotextile and sand on the bearing capacity of a foundation built on geotextile and sand on the bearing capacity of a foundation built on geotextile reinforced sand. A cement treated zone was created on the geotextile to improve the friction and adhesion of the interface zone. Test was also conducted on reinforced soil without a cement treated zone results were compared. The cent interface has significant effect on the bearing capacity of the strip footing. From the results in the journal required length of the reinforcement was reduced by approximately 40% when the interface zone of the land and reinforcement was cement treated. The effect of the cement treated zone on the bearing capacity was more evident in low settlement levels. **Ebadi,M et al (2013)** conducted a study on non-woven geotextile to investigate the effect of cement interface on soil layer. The result shows that when cement is introduced into the interface of soil and geotextile the shear strength of sol considerably increased.

II. MATERIALS

The test material involves uniformly graded sand and Portland cement. For reinforcing the foundation medium, geotextile has to be used.

A. Sand

Natural river sand is used for the study. The sample is air dried for conducting the test. According to Indian standard

Published by: Academic Research Reviews- AUG 2021

ISSN :7989-X456

Literature review on Water Quality Index

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Abstract— **Water is one of the precious natural resources present on the earth and it is very important for survival of flora and fauna. Quality of water is equally important to the quantity available. While considering of total percentage of water present on earth as 97% in ocean and 3% as a fresh water with considering glacier. Out of which 2 % as fresh water in the form of surface and subsurface water bodies and it usable for the human consumption. So when we consume water its quality measurements are necessary and management should be done in systematic path. Water quality is directly related to the physical, chemical, biological and radiological property of water [1]. These properties of water are affected because of the pollution of water due to various human activities. Depend on the activities; disposal of pollutant in the water bodies are done that changes the standard quantity of parameters in water. There are various parameters which can be assess for measurement of quality of water but when consideration of all parameters may be generates complexity towards quality. So, development of Water Quality Index (WQI) is the quite popular method in water quality assessment. This can be told whole story of water in single scoring number and it is calculated using different methods. It is helpful to decide appropriate treatment technique to meet the concern issue. In this paper, WQI and its development methods are discussed. Also advantages and dis advantages of WQI are elaborated.**

Keywords – Human activities, water parameters, Water Quality Index (WQI).

I. INTRODUCTION

Water is one of the earth's most important resources that use for human life and it's quality is totally depend on geological environment, recovery, utilization as per need and human activities like domestic, industrial or commercial, mining operations, agricultural etc.[1] In short freshwater directly linked with human welfare as it is vital concern for mankind. But today most of the surface and subsurface water bodies are unfortunately under the environmental stress. Stress are due to increase in population, urbanization and to fulfill their food demand advance agrochemicals are used. So there is a high risk of contamination of water by percolation, surface runoff. Human health is threatened by most of the agricultural development activities particularly in relation to the excessive application of the fertilizer and unsanitary conditions. According to WHO organization, about 80% of all the diseases in human being are caused by water. Once the water is contaminated, its quality can't be restored by stopping the pollutant from source. It therefore becomes imperative to regularly monitor quality of water and to device ways and means to protect it. There is certain way to find out quality of water in the form of index on the basis of following categories:

- Human well-being – includes health and population
- Ecosystem well-being – includes assessment of air and water quality

II. ENVIRONMENTAL WATER QUALITY INDEX

An "environmental water quality index" in its descriptive categorization of large quantity of environmental data. It is with primary purpose that can be useful to decision makers. This indices are used in impact studies. That all inclueds air quality index, water quality index, ecological sensitivity and divercity, noice index, visual quality and quality of life. Amonge those different Water quality Index that analyse mathamatically two main explain in deatil.

A. Ojectives

- To summarize existing environmental data.
- To communicate information on the quality of baseline environment
- To evaluate sustainability of environmental category to pollution.
- To focus attention on key environmental factors.

B. National Sanitation Foundation Water Quality Index

The "Water quality Index" (WQI), developed in 1970 by the U.S. National Sanitation Foundation will be described. The WQI was based on the Delphi approach, using a panel of 142 persons from all U.S. with expertise different aspects of water quality management. From which 101 are regulatory officers, 5 are managers local public utilities, 6 are consulting engineers, 26 Academicians and 4 from Others i.e. industrial waste control engineers and representative of professional organizations. The following steps are followed by

i-managers Journal on civil engineering ISSN -2277-5110
Vol. 2, Issue 2, pp: (12-23), Month: JAN 2022, Available at: www.researchpublish.com

Seismic analysis of multistory building with different positions of swaying pillars

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Abstract: **In present scenario buildings with Floating Column is a typical feature in the modern multi-storey construction in urban India. Such features are highly undesirable in building built in seismically active areas. This study highlights the importance of explicitly recognizing the presence of the Floating Column in the analysis of building. Alternate measures, involving stiffness balance of the first storey and the storey above, are proposed to reduce the irregularity introduced by the Floating Columns. FEM analysis carried for 2D multi storey frames with and without floating column to study the responses of the structure under different earthquake excitation having different frequency content keeping the PGA and time duration factor constant. The time history of roof displacement, inter storey drift, base shear, column axial force are computed for both the frames with and without Floating Column.**

Keywords: **Floating column, stiffness balance, FEM codes, earthquake excitation, time history, roof displacement, Inter storey drift, base shear, column axial force.**

1. INTRODUCTION

Many urban multistory buildings in India today have open first storey as an unavoidable feature. This is primarily being used to accommodate parking or reception lobbies in the first storey. Whereas the total seismic base shear as experienced by a building during an earthquake is dependent on its natural period, the seismic force distribution is dependent on the distribution of stiffness and mass along the height. The behavior of a building during earthquakes depends mainly on its overall shape, size and geometry, in addition to how the earthquake forces are carried to the ground. The earthquake forces developed at different floor levels in a building need to be brought down along the height to the ground by the shortest path; any deviation or discontinuity in this load transfer path results in poor performance of the building. Buildings with vertical setbacks (like the hotel buildings with a few storey wider than the rest) cause a sudden jump in earthquake forces at the level of discontinuity. Buildings that have fewer columns or walls in a particular storey or with unusually tall storey tend to damage or collapse which is initiated in that storey. Many buildings with an open ground storey intended for parking collapsed or were severely damaged in Gujarat during the 2001 Bhuj earthquake. Buildings with columns that hang or float on beams at an intermediate storey and do not go all the way to the foundation, have discontinuities in the load transfer path.

Conventional Civil Engineering structures are designed on the basis of strength and stiffness criteria. The strength is related to ultimate limit state, which assures that the forces developed in the structure remain in elastic range. The stiffness is related to serviceability limit states which assures that the structural displacement remains with the permissible limits. In case of earthquake forces the demand is for ductility. Ductility is an essential attribute of a structure that must respond to strong ground motions. Ductility is the ability of the structure to undergo distortion or deformation without damage or failure which results in dissipation of energy. Larger is the capacity of the structure to deform plastically without collapse, more is the resulting ductility and the energy dissipation. This causes reduction in effective earthquake forces. Most of the energy developed during earthquake is dissipated by columns of the soft stories. In this process the plastic hinges are formed at the ends of columns, which transform the soft storey into a mechanism. In such case the collapse is unavoidable. Therefore, the soft stories deserve a special consideration in analysis and design.

The International Journal of Emerging Technologies and Innovative ResearchJETTR
ISSN: 2277-3878, Volume-8 Issue-4, AUG 2021

Strength of Concrete with Fly Ash and Activated Fly Ash

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Abstract: This paper reveals mainly about the prime effects of using fly ash, and activated fly ash which is considered to replace cement in concrete, on the concrete strength. For this reason, proper experiments has been done in the lab to investigate the behavior of fly ash and activated fly ash ratio on the strength and workability parameters of concrete. The compressive strength of concrete specimens with replacement ratios of 30% and 40% 50%, and aged 7 and 28 days are measured for M30 as per IS 10262 2009 grade of concrete and are compared with those of the concrete specimens without fly ash. The results shown that strength of partially replaced cement by activated fly ash in concrete enhanced strength is observed and it is slow but strong and continuous process when compared to the concrete without fly ash. And optimum replacement of fly ash ratio can be found out at the maximum compressive tensile and flexural strength of concrete. The main aim of this paper is to study the strength properties of concrete with fly ash and activated fly ash. And compare the results and opt for the best replacement to eliminate more use of cement in concrete.

Index Terms: Activated Fly ash, Fly ash, CVC, CSH, SCM.

I. INTRODUCTION

Concrete is most ample used material in the construction process because of its flexibility in its use, and it consist of mainly three components cement fine and coarse aggregate. Among these cement is very important which a binding material. In construction, concrete is the only material which has properties such as Strength, Durability, and Resistant to Absorption. The development and use of mineral admixtures for cement replacement is vastly growing in construction industries due to achieve economy, energy saving, environmental protection and low consumption of available natural resource there by utilizing the by-product that are present. Mineral admixture usually used are Fly ash, rice husk ash, silica fumes etc. Several thesis are carried out on replacement of cement in concrete by these mineral admixtures to develop the concrete with required strength, durability and impermeability" Design & testing of Fly-ash based Geo Polymer Concrete" A.Siva Krishna [1].

Among the entire available mineral admixture, fly ash is available in large quantities which are the by-product of coal in thermal power plant. According to the government of India the estimated fly ash generated by power plant will be 600 million tons by the end of 2032"Experimental Study on Strength of Concrete by Partial Replacement of Cement by Nano Silica and Fly Ash" Tipraj [2].The utilization of fly ash in India is less than 25% of the total fly ash generated in power plants. Another important aspect is threat to the environment due to the emission of CO_2 in large quantity during the manufacturing of Portland cement. Emission of CO_2 can be reduced by replacement of Portland clinker with supplementary cementitious materials (SCM).Fly ash is used as a cementitious material during the manufacturing of cement called fly ash blended cement and countless research work have been published. "Performance analysis of Black Cotton Soil treated with Granite dust and Lime" Shaik Khader Vali Bab [3].

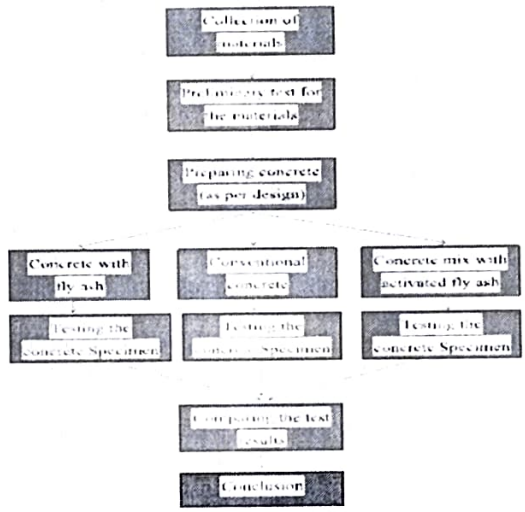

Fig: Flow Diagram of the project

II. MATERIALS

Fly ash closely pertains to volcanic ashes used in manufacturing of the in the olden times know by hydraulic cements about 2,300 years ago. It is because the cement was manufactured nearby an area of small town in Italy of Pozzuoli – hence the name is being given later as pozzolanic. A pozzolan is a siliceous/aluminous material that, when added with lime and water, react and gives rise to a new compound. Fly ash is the well-known, and most commonly used in the construction work. Rather than volcanoes, today's fly ash is obtained easily from thermal power plants. These power plants uses coal to generate electricity and huge amount of fly ash is originated from these plants as a end product.

Revised Manuscript Received on AUG 15, 2021
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ISSN 2394-9333

Volume 5, No. 8 DEC 2021

National Conference on Recent Innovations in Engineering and Technology

Review on Epoxy Based Polymer Concrete

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ABSTRACT

Construction industry is one of the contributing fator to the environmental crisis; the use of waste materials or industrial by-products from different industries as an alternative to conventional concrete materials would reduce this issue. The use of this material will contribute to sustainability in the building industry and protect natural resources. It can replace traditional concrete materials and use it. This study aims primarily to examine sand replacement to optimize the benefit of industrial by-products and other waste materials. Day by day, demand for sand is growing. Sand mining increases gradually as needed, with the impact from the mining of the river, water quality, and ecological effect generally affected. Therefore, it is very important to consider Sand Alternative in view of the need for sand in the future. Lack of sand affects construction work directly. The alternate material such as quarry dust and saw dust may be used in concrete to meet the need of fine aggregates. Quarry dust comes from the crushing of rocks, while sawdust refers to the fine size, powdery waste formed by sawing of wood. In this study, traditional mix 1:2.32:2.82 (M25) with water to binder ratio is maintained as 0.49 was used in this present study. Here the natural sand is replaced partly here by quarry dust (QD) and sawdust (SD) with different percentages i.e. is 50% of natural sand as constant and remaining 50% as the different proportions of Quarry dust and Saw dust. respectively by weight and effects of replacement on concrete is observed. The concrete was cast and their compressive, tensile strength and durability measured at 7, 14 and 28 days, respectively; the cubes of 150 x 150 x 150 mm, and the cylinders of 15 cm of diameter and of 30 cm of height were cast. The incorporation of 0.5 percent glass fibers into concrete as a mixture will increase the compressive and the tensile strength of the concrete dramatically.

Key words: Quarry Dust (QD), Saw Dust (SD), Slump cone test, Compaction Factor test (CFT), Compressive Strength, tensile strength and Durability test.

1. INTRODUCTION

In construction sectors, cement, sand and aggregate are essential needs. Natural sand deposits like India are being exploited and serious threats to the environment and society are caused by developing countries like India (the Authors native country) that facing a lack of sufficient natural sand content [1]. The rapid sand extraction from the beds of the rivers causes problems because the river beds are deeper, vegetation is lost on the banks of river, the aquatic life is disturbed as well as agriculture also due the water table in the well has been lowered etc. Building industries in developing countries are therefore emphasizing the need for alternative materials to offset the natural sand market [2].

We can overcome this problem by using two methods (a) concrete is replaced by another material which is very difficult or impossible at present, in terms of workability, durability and strength (b) partly or entirely substituting specific raw materials. It is possible to have second alternative option. Now a day's lot of invention in the area of concrete technology are being carried out by different researchers [3]. We are attempting to solve this problem by substituting various residues for which we have published numerous papers suggesting various materials that can be used as a component substitute for raw materials such as cement, fine and coarse aggregates.

Sand is an important material used to prepare mortar and concrete and plays a major role in the construction of concrete mixes. The primary use of cement and mortar is generally high in use of natural sand [4]. Hence in developing countries, the demand for natural sand has been very high to meet rapid infrastructure growth. Fine aggregate physical and chemical properties influence the durability, workability and also strength of concrete, because fine aggregates are the key components of concrete and cement mortar. Fine and gross aggregates together make up 75-80 percent of all concrete volume [5], so it is very important that the correct form of concrete and a good quality aggregate should be select from

Fibre-Reinforced Polymer Concrete: An Experimental Investigation

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Abstract

The current state of knowledge of cement hydration mechanisms is reviewed, including the origin of the period of slow reaction in alite and cement, the nature of the acceleration period, the role of calcium sulfate in modifying the reaction rate of tricalcium aluminate, the interactions of silicates and aluminates, and the kinetics of the deceleration period. In addition, several remaining controversies or gaps in understanding are identified, such as the nature and influence on kinetics of an early surface hydrate, the mechanistic origin of the beginning of the acceleration period, the manner in which microscopic growth processes lead to the characteristic morphologies of hydration products at larger length scales, and the role played by diffusion in the deceleration period. The review concludes with some perspectives on research needs for the future.

1. Introduction

Understanding the kinetic mechanisms of cement hydration intersects both academic and practical interests. From an academic standpoint, the chemical and microstructural phenomena that characterize cement hydration are quite complex and interdependent, making it difficult to resolve the individual mechanisms or the parameters that determine their rates. Fundamental study of hydration therefore offers significant scientific challenges in experimental techniques and multi-scale theoretical modeling methods. From a more practical standpoint, the drive to produce more sustainable concrete materials is leading to more complex mix designs that include increased amounts of secondary mineral additions, often originating as by-products of other industrial processes, and a wide variety of chemical admixtures that can enhance concrete performance. More complete knowledge of basic kinetic mechanisms of hydration is needed to provide a rational basis for mixture proportioning as well as the design and selection of chemical admixtures.

Several detailed reviews have been written about the mechanisms that are thought to govern the kinetics of hydration [1–4]. At the time they were published, several important issues – the mechanistic origin of the induction period, the rate-controlling mechanisms during the acceleration period, the most important factors responsible for the subsequent deceleration of hydration, etc. – were addressed but left unresolved due to either lack of data or seemingly equivocal evidence for different viewpoints. But significant strides have been made both in experimental techniques and in theoretical models in the intervening years. Our intention is to focus on these more recent developments, thereby providing an updated picture of the current state of knowledge and identifying the remaining controversies or gaps in understanding. Finally, we then propose a road map for future cement hydration research that targets the

EFFECT OF USING STONE DUST AND M-SAND ON PROPERTIES OF HIGH STRENGTH CONCRETE

By

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Date Received: 14/02/2022 Date Revised: 02/03/2022 Date Accepted: 02/04/2022

ABSTRACT

Stone dust is a byproduct obtained from the crushing process of quarrying operations and appears as an issue for effective disposal. Natural river sand, which is a common fine aggregate used in production of cement mortar and concrete, has become a costly and scarce material. In this paper, an endeavor is made to find a suitable and economical alternative of sand which serves as waste recovery and its minimization. In this context, an experimental program is being planned to assess the suitability of manufactured sand (M-sand) as finer aggregate content in high strength concrete. The influence of replacing M-sand with stone dust on mechanical attributes of high strength concrete are presented in this paper. Stone dust was incorporated in percentages varying from 0 to 40% as replacements for equal weight of M-sand. The impacts of different extents of dust content on attributes of fresh and solidified concrete are presented after undertaking an experimental probe. Test outcomes revealed that stone dust can be utilized productively to supplant manufactured sand in high strength concrete. No detrimental effects were noticed on long term and microstructural properties of the mix. The maximum strength gain was achieved at a replacement level of 20%, which is due to the acceleration of cement hydration at an early age with the addition of stone dust content.

Keywords: High Strength Concrete, Manufactured Sand, Stone Dust.

INTRODUCTION

Construction sector is facing a huge scarcity of natural river sand, which is prompting the civil engineers to search for an alternative material which is economical and easily available. In such a situation, manufactured sand (M-sand) qualifies itself as a suitable alternative to river sand, which is easily available as a byproduct of stone quarrying units. M-sand or machine-made sand has occupied a pivotal position in replacing natural river sand and has become a leading green building material in the present scenario (Joudi-Bahri et al., 2012; Li et al., 2009, 2011; Nanthagopalan & Santhanam, 2011; Xirouchakis & Theodoropoulos, 2009). M-sand has been progressively utilized as fractional and complete substitution for natural sand in concrete (Jadhav & Kulkarni, 2012; Rao et al., 2012). This artificial sand is also utilized in light weight concretes (Cui et al., 2010), engineered cementing composites (Sherir et al., 2015) and masonry mortar (Cortes et al., 2008). M-sand has special features like irregular particle shape, rough texture and angular edges which has some impact on workability and mechanical attributes of concrete. On comparing with natural river sand concrete, manufactured sand concrete was found

SIGNIFICANCE OF UTILIZING STONE DUST AND KADAPA MARBLE POWDER IN HIGH STRENGTH CONCRETE

By

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Date Received: 20/01/2022 Date Revised: 09/02/2022 Date Accepted: 10/03/2022

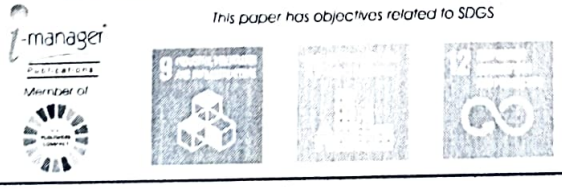
ABSTRACT

In the current research work, an attempt has been made to study the properties of high strength concrete using the blend of stone dust and Kadapa Marble Powder (KMP). In M60 grade mix of concrete, fine aggregates are partially supplanted with stone buildup and KMP is being added as a mineral admixture. Manufactured sand and stone dust are being used as fine aggregates in the experimentation. Mechanical properties like compression, split tension and flexural strength have been performed and contrasted with the referral concrete. The aim of the research is to study the impact of replacing natural sand with manufactured sand and stone powder and substitution of cement with KMP on the mechanical properties of high strength concrete. The test results showed clear improvement in the mechanical properties of concrete by using manufactured sand, stone dust and KMP together in M60 bend. The increment in the magnitude of strengths is comparable with conventional concrete. By using stone dust and KMP, additionally, one gets the green benefit of utilizing a characteristic material instead of engineered ones.

Keywords: Stone Dust, Kadapa Marble Powder, Manufactured Sand, High Strength Concrete.

INTRODUCTION

In view of volume, concrete is the primary generally utilized structural material in the world. High strength concrete is a kind of superior performance concrete by and large with a foreordained compressive quality of 40 MPa or more. Over the past decades, broad investigation effort has been spent on the utilization of industrial byproducts (fly ash, blast furnace slag, silica fume, zeolite, Metakaolin, etc.) and trademark resources (limestone, pozzolana, etc.) as replacement of Portland cement. Supplementary cementitious materials can be used for improved concrete performance in its fresh and solidified state. They are essentially utilized for further Improving workability, durability and strength. These materials license the substantial maker to plan and change the substantial combination to suit the best application (Scrivener & Kirkpatrick, 2008). Numerous studies analyze the chance of utilizing stone powder, limestone powder as fractional substitution of sand and incomplete substitution of cement. The test results show that stone powder of minimal quantity as fragmentary sand replacement favorably affects the mechanical properties like compressive strength, split tensile strength, flexural strength, and elastic modulus (Felixkala & Partheeban, 2010). The mark of this assessment is to mull over the effect of stone powder used as generally replacement of sand on critical mechanical properties of solidified concrete. The objective of this paper is to provide insight into the challenges of utilizing mineral additives like Kadapa marble powder in high strength concrete in order to increase its performance. The advancement of



Strength characteristics of Geo polymer Concrete

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Abstract. In the recent years, geopolymer concrete are reporting as the greener construction technology compared to conventional concrete that made up of ordinary Portland cement. Geopolymer concrete is an innovative construction material that utilized fly ash as one of waste material in coal combustion industry as a replacement for ordinary Portland cement in concrete. The uses of fly ash could reduce the carbon dioxide emission to the atmosphere, redundant of fly ash waste and costs compared to ordinary Portland cement concrete. However,the plain geopolymer concrete suffers from numerous drawbacks such as brittleness and low durability. Thus, in this study the addition of steel fiber is introduced in plain geopolymer concrete to improve its mechanical properties especially in compressive and flexural strength. Characterization of raw materials also determined by using chemical composition analysis. Short type of steel fiber is added to the mix in weight percent of 1 wt%, 3 wt%, 5 wt% and 7 wt% with fixed molarity of sodium hydroxide of 12M and solid to liquid ratio as 2.0. The addition of steel fiber showed the excellent improvement in the mechanical properties of geopolymer concrete that are determined by various methods available in the literature and compared with each other.

1. Introduction

Nowadays, the urge of using geopolymer concrete as green construction materials has increased parallel with infrastructure development besides increasing in awareness as a result of global warming.Therefore, the utilization of fly ash as waste material also improved and overcome a major problem for disposal [1]. However, plain cement concrete faced various imperfection such as brittleness, fracture resistance, and etc. [2]. Hence, the addition of steel fibres is an alternative to promote these problems such as toughness, flexural strength, and energy absorption improved.

Production of conventional concrete customarily used ordinary Portland cement (OPC) as the binder and the usage of OPC is on the increase to meet infrastructure developments [3]. However, the

calcination of limestone and combustion of fossil fuels during the manufacturing of OPC resulting the huge amount of carbon dioxide, (CO_2) released to the environment [4]. Geopolymer is said to be a newalternative material which the greenness of conventional concrete is improved besides having a better performance compared to concrete with OPC. Plus, the production of geopolymer does not emit carbon dioxide to the environment thus overcoming the global warming issue [5].

According to findings reported by other researcher, the term geo-polymer referred covering class ofsynthetic alumino-silicate materials with potential use in a number of areas, essentially as replacement for Portland cement and for advanced high-tech composites, ceramic applications or as a form of cast stone [4]. Besides, as the chemical compositions of geopolymer materials are similar to natural zeoliticmaterials (but it has amorphous microstructure) geopolymer is considered as members of the family ofinorganic polymers. The composition of zeolites is based on an aluminosilicate framework and a three-dimensional network of inorganic polymers that are made up of SiO_4 and AlO_4 tetrahedral that are linked by shared oxygen atoms into rings and cages [6].

In the present study, an experimental investigation on mechanical and physical performance of geopolymer concrete with addition of steel fiber has been carried out. Geopolymer concrete mixes were prepared with alkaline solution to fly ash ratio of 2.0 and short types of steel fiber is used with varying amount.

2. Materials and methods

Experimental work is designed to study the effect of addition short steel fibers on mechanical properties on geopolymer concrete. The main material used for making fly ash based geopolymer concrete composite specimen is fly ash along with other material such as coarse and fine aggregates, alkaline activator solution, steel fibers, and water.

2.1. Fly Ash

Low-calcium ASTM Class F dry fly ash obtained from local power station is used as the source material. In this

Experimental Investigation on the Combined Effect of Fly Ash and Eggshell Powder as Partial Replacement of Cement

Palla Charan Kumar, T. Shanthala, Kamarthi Aparna, and Sake Vinay Babu

Abstract The use of industrial products is the main confront in India since it causes environmental problems. In this aspect, this current work has been carried out to utilize the eggshell powder and fly ash as a partial replacement of cement. In this study, concrete mixtures were prepared with the replacement of cement with fly ash of 20%, and the eggshell powder varied from 0 to 15%. The effect of cementitious material has been evaluated with the parameters, namely compressive strength, split tensile strength, rebound hammer test and electrical resistivity test. The effect of fly ash and egg shell powder on above parameters has been evaluated at the ages of 1, 7 and 28 days. From the results, it has been observed that the replacement with cementitious material with eggshell up to 10% and the 20% fly ash shown better performance as compared to reference mixture.

Keywords Fly Ash · Eggshell powder · Mechanical properties

1 Introduction

Concrete adaptability, sturdiness and economy have made it the world's most utilized development materials. Concrete has played main role for binding the materials. At the present days, the raise in environmental pollution causes the decrement for the building life span [1]. However, the emissions from cement industry also contribute for the environmental pollution. In this view, most of the researchers [1–3] are searching for the alternative of cement, namely supplementary cementitious materials, industrial waste utilization, to decrease the cement production and thus reduces the pollution caused by carbon dioxide emissions [4].

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B. Kondraivendhan et al. (eds.), *Sustainable Building Materials and Construction*,
Lecture Notes in Civil Engineering 222,
https://doi.org/10.1007/978-981-16-8496-8_46

ISSN(Online) : 2568-5895

International Journal of Innovative Research in Science, Engineering and Technology

Volume 3, Issue 1

An Investigation into the Effects of Dolomite Powder and Crushed Tiles on the Compressive Strength of Concrete

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ABSTRACT: Concrete is made up of a number of different components, two of which being cement and coarse aggregate. A number of research have been carried out in an effort to identify an efficient alternative for these raw materials used in the production of concrete in order to achieve a variety of objectives, including cost reduction and increased strength. Both using waste material in place of coarse aggregate and replacing cement with a more environmentally friendly alternative will help to reduce the amount of carbon dioxide gas emitted into the atmosphere. Another way to help reduce environmental pollution is to use waste material in place of coarse aggregate. The compressive strength of the concrete is the primary focus of this research project, which intends to improve the quality of concrete at a lower cost. This will be accomplished by partly substituting cement with dolomite powder and coarse particles with broken tiles. The findings that were acquired are analysed, and the optimal mixture that has the highest strength is identified.

KEYWORDS: Dolomite powder, Crushed tiles, Compressive strength, Replacement, Cement, Coarse aggregates.

I. INTRODUCTION

Global consumption of concrete has increased with the developments and innovations in the construction industry. Increase in the use of concrete has led to the scarcity of natural aggregates. The demand for aggregates in the construction industry can be met to some extent with the use of construction and demolition wastes. These wastes not only meet the scarcity of aggregates but also help to reduce the solid waste that is dumped into the environment.This paper examines the suitability of crushed pieces of waste ceramic tiles in the concrete mix partially replacing coarse aggregates. Waste ceramic tiles can be obtained free of cost and they are used to partially replace the coarse aggregates.

Cement is another major component of concrete. It is manufactured by calcining calcareous and argillaceous compounds at high temperature. Large amount of carbon dioxide gas is released in to the atmosphere by this process. It was found that 0.8 tons of carbon dioxide gas is released into the atmosphere with the manufacture of 1 ton of cement. Dolomite is a carbonate material composed of calcium magnesium carbonate $CaMg(CO_3)_2$. Dolomite has good weathering resistance and is noted for its remarkable dispersibility and wettability. This paper examines the possibility of using dolomite powder as a partial replacement material to cement in the mix containing optimum amount of ceramic tile replacing coarse aggregates.

II. RELATED WORK

Preethi G, Prince Arulraj G (2015) studied the effect of replacement of cement with dolomite powder on the mechanical properties of concrete. Replacement of cement with dolomite powder isfound to improve the strength of concrete.

Hemanth Kumar Ch, Ananda Ramakrishna K, Sateesh Babu K, Guravaiah T, Naveen N, JaniSk (2015) studied the effect of waste ceramic tiles in partial replacement of coarse and fine aggregate of concrete. Study found that thereare minor increases in workability when crushed tiles are replaced in place of coarse aggregate.

International Journal of Advancements in Technology *ISSN: 2569-589S*
Volume 5, Issue 1

An Evaluation of the Split Tensile and Compressive Strengths of Silica Fume Cement Concrete

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Abstract –

Abstract - *Concrete is most widely used construction material today in any structure. Increase in construction activities has lead to an increase in demand for various raw materials in concrete. This led to researches on alternate materials as ingredients of concrete that are in no way inferior to the conventional materials. By partially replacing the normal aggregate with in different proportions, the strength of concrete can be determined. Natural river sand is one of the key ingredients of concrete, is becoming expensive due to excessive cost of transportation from sources. Also large scale depletion of sources creates environmental problems. Unfortunately, production of cement also involves large amount of carbon dioxide gas into the atmosphere, a major contributor for green house effect and the global warming. To overcome these problems there is a need of cost effective, alternative and innovative materials. These materials are stone quarry dust, silica fume, rice husk, recycled waste aggregate etc. some of them are industrial by products and are substantially available. Based on the proportion of ingredients used in concrete, its properties can also be changed. In most of the building works normal weight concrete is used. This project work concentrates on the effective use of Silica Fume and Quarry Dust in concrete mix.*

The main parameter investigated in this study is M20 grade concrete with partial replacement of cement by silica fume by 0, 10 and 15% and Quarry dust by 20, 30 and 40%. This paper presents a detailed experimental study on Compressive strength, split tensile strength and Ultrasonic pulse velocity test. On durability aspect, Water absorption test is studied.

This project presents the laboratory investigations and a comparative study on the feasibility of Silica fume and Quarry dust in determination of strength of concrete.

Key Words: Silica fume, Quarry Dust, Concrete, Fine aggregate, Coarse aggregate, Tests on concrete, Mix Design

1. INTRODUCTION

Concrete is one of the versatile heterogeneous materials, civil engineering has ever known. With the advent of concrete civil engineering has touched highest peak of technology. Concrete is a material with which any shape can be cast and with equal strength or rather more strength than the conventional building stones. It is the material of choice where strength, performance, durability,im-permeability,fire resistance and abrasion resistance are required.

Research Article

Study on Fly Ash Concrete by adding Admixture Investigating the Effects of GGBS and Recycled Concrete Aggregates on the Properties of Concrete

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Abstract

A number of experimental research are carried out in order to increase the durability of fly ash concrete. During these experiments, a durability increasing additive is used in order to minimise drying shrinkage and improve freezing-thawing resistance. In this article, the performance of fly ash concrete is analysed, and specific attention is paid to the factors of durability enhancing additive, air content, water-binder ratio, and fly ash replacement ratio. According to the findings, using an admixture that improves durability in nonair-entraining fly ash concrete can increase the compressive strength of the fly ash concrete by 10–20 percent, while also reducing the drying shrinkage by 60 percent. These improvements can be achieved by using the admixture. In general, the carbonation resistance of concrete is generally equal to the ratio of water to cement, and this holds true independent of the ratio of water to binder and the ratio of fly ash replacement. The resistance to freezing and thawing is significantly increased for the specimens that were cured in air for two weeks. In addition, the utilisation of a durability increasing admixture makes it much simpler to exercise control over the air content and transform fly ash concrete into a substance that does not entrain air. This results in an improvement in the quality of the concrete made from fly ash.

1. Introduction

Coal is widely used in China as fuel for power plants because of its dependability and economy. In 2009, more than 375 million tons of fly ash was generated from coal-fired power plants in China. How to effectively use fly ash is still a major social problem. In order to construct recycling society, researchers have found many ways to make efficient use of fly ash in civil engineering field [1–10], but in fact the use of fly ash in building construction is still limited. The main reasons are as follows. (1) The quality of fly ash is unstable because the quality of fly ash changes greatly with that of coals [11, 12]; (2) there is lower early age compressive strength of concrete due to lower activity of fly ash [13, 14]; (3) pozzolanic reaction of fly ash leads to decreased pH value of concrete, which results in a poor carbonation resistance [15–17]. In addition, in order to ensure the resistance of freezing-thawing action, it is necessary to entrain a certain amount of air in the concrete. However, air-entraining admixture is adsorbed by the unburned activated carbon in fly ash which reduces airentraining capability of fly ash concrete [18, 19]. Therefore, it is the key issue to keep serial and stable air in fly ash concrete. In other words, the air content control of fly ash concrete is difficult.

On the basis of the above mentioned background, this paper focused on the nonair-entraining concrete. The effects of durability improving admixture, air content, water-binder ratio, and fly ash replacement ratio on strength development, drying shrinkage, carbonation, and freezing-thawing resistance of fly ash concrete are to be investigated.

2. Experiment Overview

2.1. Materials Used and Concrete Composition. The characteristics of materials used and the properties of fly ash used are shown in Tables 1 and 2. Table 3 shows the experiment factors and ratios. Figure 16 shows the interpretation of marks. The

Table 1: Characteristics of materials used.

Cement	Density: 3.16 g/cm^3; specific surface area: 3280 cm^2/g
Binder	Fly ash
Fine aggregate	Mountain sand

An investigation on the effect on concrete's strength of partially replacing cement with ash derived from agricultural waste

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Abstract: This paper presents the studies conducted to know the strength characteristics of cement concrete made with Ordinary Portland Cement (OPC) and two agro wastes i.e. Rice Husk Ash (RHA) and Groundnut Husk Ash (GHA). Cubes were casted with percentage replacement of both ashes of 0, 2.5, 5, 7.5, 10 and 12.5%. The Chemical analysis was carried out to know pozzolana properties of GHA and RHA. It was observed that slump and density decreases from 70 mm to 27 mm and 2440 Kg/m^3 to 2237 Kg/m^3 respectively. Compressive strength also decreases with respect to control mix except for 10% replacement. Scanning Electron Microscopy (SEM) and Chemical analysis in micro areas Energy Dispersive X – ray Spectrometry (EDS) analysis was also done to track the phase changes and microstructure of mature concrete. It was found from the results and observations that 10% replacement of cement with GHA – RHA is suitable in concrete for construction.

Index Terms **- GHA – RHA, Scanning Electron Microscopy, Pozzolana, Cement, Energy Dispersive X – ray Spectrometry**

1. Introduction: The ever-increasing demand of cement-concrete in the construction field requires cheaper alternative materials in conventional construction methods. The environmental concerns also compel the designers to opt for green materials, feasible for use in construction. Research in the past brings out various green materials used like pozzolona as replacement of cement viz. fly ash, groundnut shell ash etc. The American Society of Testing Materials (ASTM) defines Pozzolana as Siliceous or Aluminous materials which possess little or no cementitious properties, which will react in the presence of moisture with lime [$Ca(OH)_2$] at ordinary temperature to form a Calcined material with pozzolana properties [ASTM 1981].

In India, more than 960 million tons of solid waste annually generates during the processes in industries, querying and in agricultural activities, which leads to an environmental problem of disposal. Several researches have been carried out on the use of agro waste ashes like Rice husk ash, oyster shell, groundnut shell, Corn Cob ash and Sunflower seed husk ash in concrete as partial replacement of fine aggregates and Cement [J.K Prusty et al, Raheem S B et al, N V Lakshami et al, M V Kumar et al, E N Ogork]. Such substitutions help to save energy, conserve natural resources and reduce cost of construction. The aim of present research is to introduce Groundnut and Rice husk Ash as Supplementary Cementitious Material in concrete.

2. Literature Survey

Latha et al. (2017) studied that the compressive strength and split – tensile strength by 10% replacement of cement with GHA and 15 % of Waste Marble Aggregate (WMA) with coarse aggregates is optimum. Lakshami et al. (2017) reported that mix design of 1:2:4 with w/c ratio of 0.6 and with 10% replacement showed the highest compressive strength and split tensile strength than flexural strength. Oseni et al. (2016) and Krishnan et al. (2016) concluded that GLSA could be used as partial replacement of OPC. Devinder Singh et al. (2016) compared the use of agro wastes and found that use of agro waste would be helpful in waste, pollution and cost reduction and increase the potential of natural resources. Mara Wazumtu et al. (2015) investigated that water absorption and workability decreased with increased GSA, but it increased the consistency and setting time of cement paste also therefore GSA would be used a retarder. Compressive strength and resistance increased up to 4% addition of GSA. Egbe – Ngu Ntui Ogork et al (2014) investigated the GHA could be used as retarder in hot weather in ready mix concrete. 10% GHA gave optimum structural strength for mortar and 20% and above could be used in non structural mortar while 15% replacement of cement with GHA – RHA concrete gives maximum strength while 10% RHA with GHA showed highest resistance against HCl and H_2So_4. Rao et al. (2014) studied and found that 5% replacement has highest compressive strength and flexural strength. Moulick et al (2015) investigated the Mix design for M10, M15, M20, M25 and M30 grade. Compressive strength and Cost analysis was also determined for these mixes. Jamil et al. (2013) determined the pozzolanic contribution of rice husk ash in cementitious system. Habeeb et al. (2009) studied the workability, fresh density, compressive strength and found RHA concrete showed improvement in strength for 10% replacement. Saraswathy et al. (2007) investigated the Corrosion performance of rice husk ash blended cement. By conducting compressive

International Journal of Engineering Applications
Volume 6–Issue 8,406-410, oct 2021, ISSN:-2319–7559

Bamboo Leaf Ash as a Replacement for Cement as a Compressive Strength Gainer

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Abstract: Due to the emission of harmful gas that pollute the atmosphere and rising cost of Ordinary Portland Cement (OPC), the use of waste material is considering as a replacement for cement. In this research, the use of agricultural waste on experimental investigation on the use of Bamboo Leaf Ash (BLA) as a partial replacement for cement. The content of percentage replacement of OPC with BLA from 0%, 5%, 10% and 15% by weight with 0.4 and 0.5 water-cement ratios. The compressive strengths were tested with a total of 72 (150 x 150 x 150) mm concrete cubes according to American Concrete Institute (ACI) provisions at 7 days, 14 days and 28 days respectively. In this study, local product of 'Apache' brand Portland cement, 'wanet' bamboo leaves, crushed stones and river sand were used. The chemical composition of BLA are tested by Energy Dispersive X-ray Fluorescence Spectroscopy (EDXRF) method. Research findings have carried out that the workability and strength of the concrete depend on the percentage of the ash, water-cement ratio, mixing time and age of the curing days. In this research, 5% and 10% BLA was optimum for medium grade concrete. As a conclusion, BLA have a high silica content and good supplementary cementitious properties and so it can be used for partial replacement of concrete for reducing environmental wastes and emission of carbon dioxide (CO_2) in production of cement and reducing costs.

Keywords: Bamboo Leaf Ash (BLA), Ordinary Portland Cement (OPC), Energy Dispersive X-ray Fluorescence Spectroscopy (EDXRF), water-cement ratio, agricultural waste, carbon dioxide (CO_2), compressive strength

1. INTRODUCTION

Cement is an essential part of binding material to become concrete in the construction industry. To produce the cement, not only consume a lot of energy and high temperature (about 1500 °C) but also emits harmful gas such as CO_2, NO_3 and CH_4 to the atmosphere. By solving this problem, researchers are considered for a partial replacement for cement using waste materials.

There are two types of waste materials for replacing of cement ; (i) industrial waste and (ii) agricultural waste. And then these wastes are subdivided into natural and recycled. Some agricultural waste by-products like peanut shell ash, sawdust ash, sugarcane bagasse ash and bamboo leaf ash and so on are now considered for a partial replacement of cement mixed with OPC. Utilization of bamboo leaf ash provided as an effective way for reducing environmental wastes, saving energy and impact of greenhouse gas emission to the environment. Reusing agro-wastes for producing panels, plaster, blocks suitable for passive houses. Thus, it should be considered for the solving problem of the disposal of agro-wastes.

Bamboo is used as scaffolding for construction, paper production and household products. In Myanmar, bamboo is abundantly growing and used for variety of purposes so generating high volumes of solid waste.

There are 1250 bamboo species in the world and 102 species in bamboo diversity in Myanmar. But 18 species are commercial used in the country. Depending on the bamboo species, the chemical and physical compositions may be different. Among them, "wanet" bamboo leaves are used in this research. Because of these bamboo species are growing abundantly in research area.

Bamboo leaf ash is made up of inorganic minerals, Silica, Calcium, Potassium and Magnesium. Silica content is the highest among the minerals. When calcium hydroxide ($Ca(OH)_2$) is react with silica to form calcium silicate hydrate (C-S-H), the main secondary cementitious compound is obtained.

Thus, both economical and environmental point of view, BLA should be used for a partial replacement of cement with the optimum percentage for mortar and concrete.

2. AIM

The objective of this research is to investigate the effect of bamboo leaf ash and to save the environment from disposing waste.

3. METERIALS AND METHODS

The materials used in this research were cement, aggregates (fine and coarse), water and bamboo leaf ash (BLA). Both physical and chemical properties were tested for cement and bamboo leaf ash. And only physical properties was tested for both aggregates and water.

International Journal of Engineering Techniques

(ISSN: 2589-5478)

Vol. 8, No. 02, July, 2021

An Investigation into the Effects of Partially Substituting Waste Marble Powder for Cement in Concrete

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Abstract

This research evaluates concrete using WMP as a cement alternative. WMP was selected as a cement alternative due to its high calcium oxide concentration. WMP is a pollutant from the marble industry. Cement production emits greenhouse gases, making it ecologically dangerous. WMP recycling in concrete has two environmental benefits. WMP's specific gravity is 2.6 compared to 3.15 for cement, reducing end product weight. Five concrete mixes with 0, 5, 10, 15, and 15% replacement were developed based on prior investigations. Samples were tested destructively and nondestructively. Non-destructive testing included Ultrasonic Pulse Velocity (UPV) and rebound hammer. WMP's greater water absorption hinders cement particle lubrication, reducing workability. Finer WMP and un-hydrated cement particles operate as hard inclusions to densify concrete up to a 10% cement replacement level. Beyond 10%, concrete strength declines owing to inadequate cement matrix binding WMP particles. Schmidt rebound figures prove compressive strength. Beyond 10% replacement, the number declines. UPV shows that WMP content boosts velocity. Finer WMP particles enhance composite compactness.

Keywords: Concrete, Cement, Waste Marble Powder, Destructive Testing, Non-destructive Testing, Optimum Value

1. Introduction

Mankind has continuously used natural resources to fulfil its basic requirements. The depletion rate of natural resources exceeds the earth's refill rate by 30 percent [1]. The construction industry is the main user of natural resources. In present and past centuries, the development in industrial production plus the resulting rise in the equivalent consumption has directed to a speedy decrease in existing natural resources. After water, concrete is the second largest consumed material on earth [2]. All raw ingredients used for concreting are directly or indirectly acquired by quarrying the earth's crust. Comprehensive use of concrete has increased the worldwide depletion of its raw materials. During the past few decades, researchers have proposed several agricultural and industrial wastes that could partially replace concrete ingredients, saving natural resources to a large extent. Jalil et al. (2019) used industrial steel slag as partial replacement of cement in ordinary concrete [3]: They have reported that fine slag powder (passing through sieve #200) could lead to better mechanical properties than those of the control specimens. Khan et al. (2020) used waste rubber tire particles as partial replacement of sand in ordinary concrete [4]: Their study revealed that uniform dispersion of fine and rough rubber particles at low dosage (5%) could lead to enhanced adhesion with surrounding cement paste and increase the compressive strength. Munir et al. (2016) used rice husk ash as partial replacement of cement in concrete [5]: They have reported that 10-40% partial replacement of cement by rice husk ash could be sufficiently helpful in minimizing the alkali-silica reaction in concrete. Abubakr et al. (2019) used waste ceramic powder as partial replacement of cement in ordinary concrete samples [6]: Their study reports that 10-20% fine ceramic powder leads to enhancement in workability, density and flexural strength.

Stones played a vital part in the development of mankind's history since the day first [7]. Marble is one of the most important and widely used stone. It is calcareous in nature and is the metamorphic form of limestone [8]. Among all the other stones, Marble production has jumped to 50 percent of the natural stone production all over the world. A huge amount of waste marble powder is produced through process of mining, cutting and sawing. The industrial process of quarrying marble produces twenty percent of waste. Millions ton of waste are produced globally during quarrying of marble. If left open, this waste will cause adverse impact on the surroundings [9]. If dumped in landfill, it may result in poor soil structure: In addition, it can reduce the fertility of the soil. Pakistan stands sixth in the quarrying of marble worldwide. Therefore, the recycling of this waste is crucial for the safety of the environment. Among the other usage of WMP, one of its use is in concrete as partial substitute of cement or fine aggregates. In this way, waste generated from industries can be reduced in a reasonable way. As the construction industry is flourishing in Pakistan, it increases the demand for cement and other materials like coarse and fine aggregates. The method of producing concrete generates greenhouse gases, possibly a reason for global warming. The reuse of commercial waste like marble powder as replacement of cement can be very effective regarding ecological construction.

PAVEMENT BLOCKS EXPERIMENTED WITH USING WASTE BOTTLE CAPS AS FIBRE IN THE LAB

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ABSTRACT:- As India is still a growing nation, road and building construction plays a significant role. Compared to traditional concrete, paver blocks are constructed from semi-dry mixes of concrete with zero slump and smaller stone particles. In addition to being used for outdoor applications, paver blocks may also be used on street roads and in other building projects. A broken paver brick may be simply replaced with a fresh one, requiring little to no ongoing upkeep. This research is required to improve the strength and other properties of paver blocks. Compressive strength, flexural strength, and water absorption of paver blocks were tested in this study by adding shredded bottle caps to M40 grade concrete in various quantities (1.5% to 6%). By using recycled bottle caps as a fibre for the creation of paver blocks, this idea aims to be both environmentally friendly and practical.

KEY WORDS:- Steel Fibre reinforcement, compressive strength, flextural strength, and water absorption.

1. INTRODUCTION

Concrete block pavements are formed from individual solid blocks that fit closely next to one another to form a pavements surface. A typical concrete block pavements is placed on a thin bed of sand overlaying a sub base. Concrete block pavements can be placed with a variety of shapes and patterns. There are joint spaces between blocks. These spaces are filled with sand having suitable grading. The blocks are restrained from two sides by edge restraints. Concrete paver blocks are manufactured from semi-dry mixes. Concrete paver blocks has several advantages they are available in different shapes, sizes. Color and patterns. So we can create beautiful pavements with more strength. Maintenance is very easy, easily replaceable in very short time. Laying of paver blocks pavements has very less time. Before laying of road it gets its own strength by proper curing. Its life span is more. Easy to transport.

2. LITERATURE REVIEW

G.C. Behera[1], R.K, Behera[2] (1) Advances in technology enhance human comforts and in the same time damages the environment. Metals used as cap for containers preserve liquids in the bottles very well, but the disposal of caps particularly soft drink bottle caps is a headache to environmental engineers. On the other hand concrete, the most popular construction material, second highest consumed material after food is very strong in compression. Out of all these drawbacks low tensile strength is the important one and to counteract this problem some fiber like material can be added to concrete to increase its tensile strength. Hence an attempt has been made in the present investigations to study the influence of addition of waste material like soft drink bottle caps from workshop at a dosage of 0.25%, 0.5% and 1.0%, of total weight of concrete as fibres

Shivkumar Hallale[1], Shinde Swapnil[2] (2) The individual cellular structure is narrow and hollow, with thick walls of cellulose. It is pale in colour at immature stage but with age becomes hardened and yellow with deposition of lignin layer. Each cell is about 1mm long with diameter 10-20 µm. lignin content also imparts longevity to outdoor applications. Coir fibre nearly Generally length of fibre is found between 10 to 30 cm. Coconut coir has about 48% of lignin which adds strength and elasticity to the cellulose based fibre walls. Since lignin resists bio-degradation, high takes more than 20 years to decompose.

Sarang Shashikant Pawar[1], Shubhankar[2] (3) Use of concrete paver block is now a day becoming popular, they are used for paving of approaches, paths and parking area and also the pre-engineering building and pavements. This paper discusses the result of an experimental study conducted on fly ash, plastic sag strip and wire plastic. The concrete for paver block which is made up by adding plastic in concrete help to reduce plastic bag and also improve the tensile properties of the paver block. Using this type of the plastic and fly ash will reduce the cost of the paver block.

R. Thirukumara Rajavallapan[1], T. Dhamotharan[2] (4) The main objective of this project is to increase the compressive strength and to avoid the cracks that are developed to impact loading on the pavement blocks and thereby increasing the durability of the pavement blocks. Concrete pavement blocks are manufactured using cement, fine aggregate and coarse aggregate. In this project the steel fiber are added in 0.5%, 1.0%, 1.5% and