CONTENTS

A STUDY ON SUGARCANE BAGASSE ASH AND GGBS BLEND GEO-POLYMER CONCRETE

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ABSTRACT: The present study aims to investigate the various combination of Sugarcane bagasse ash (SG) and GGBS as a source material to produce geopolymer under ambient curing. In geopolymer, GGBS and sugarcane ash acted as binder and NaOH and Na_2SiO_3 were alkaline activators. The mix was designed for molarity of 10M, and 12M and alkaline ratio of 3 and 3.5. The compressive strength of mixes was determined at 7 days and 14 days. The test result show that geopolymer mortar made with 75% sugarcane bagasse ash and 25% GGBS has resulted higher compressive strength with sodium hydroxide concentration 10M and alkaline ratio 3.5 at early age under ambient curing

KEYWORDS: *Geopolymer, Alkali, Sugarcane bagasse ash, compressive Strength*

INTRODUCTION

For all types of construction, supplementary materials in concrete are preferable to enhance the strength properties and serviceability requirements. Such supplementary materials are blast furnace slag, fly ash, silica fume, steel fibers, glass fibers, rice husk, crushed stone dust etc. Every 1 ton of concrete leads to CO_2 emissions which vary between 0.05 to 0.13 tons into the atmosphere. About 95% of all CO_2 emissions from a cubic yard of concrete are from cement manufacturing. It is important to reduce CO_2 emissions through the greater use of substitute to ordinary Portland cement (OPC) such as fly ash, clay and others geo-based material. In the recent decade, geopolymer concrete is emerged as a promising material to advocate waste materials and reduce the use of raw materials with environment friendly.

Davidovits [1991] has proposed that an alkaline liquid could be used to react with the silicon (Si) and the aluminum (Al) available in a source material of geological origin or in by-product materials such as fly ash and rice husk ash to produce binders. Because the chemical reaction that takes place in this case is a polymerization process, he coined the term geopolymer to represent these binders. Geopolymer concrete does not utilize any Portland cement in its production. Geopolymer concrete is being studied extensively and shows promise as a substitute to Portland cement concrete. Research is shifting from the chemistry domain to engineering applications and commercial production of geopolymer concrete.

Geopolymer concrete is used extensively as they have low greenhouse gas emissions in the production and has similar applications like Portland cement concrete in the construction field (Hardjito *et al.* 2004). Geopolymer utilizes silica and alumina rich industrial waste material and alkaline activators.

There are two main constituents of geopolymers, namely the source materials and the alkaline liquids. The source materials for geopolymers based on alumina-silicate should be rich in silicon (Si) and aluminum (Al). These could be natural minerals such as kaolinite, clays, etc. Alternatively, by-product materials such as fly ash, silica fume, slag, rice-husk ash, red mud, etc could be used as source materials (Duxson et al, 2007). The choice of the source materials for making geopolymers depends on factors such as availability, cost, type of application, and specific demand of the end users. The alkaline liquids are from soluble alkali metals that are usually sodium or potassium based. The most common alkaline liquid used in geopolymerisation is a combination of sodium hydroxide (NaOH) or potassium hydroxide (KOH) and sodium silicate or potassium silicate(Revathi et al, 2014).

In this background, the present study aims to study the geopolymer concrete using sugarcane bagasse ash and GGBS.

2. EXPERIMENTAL PROGRAM

Materials

The materials used in this study includes Sugarcane bagasse ash, GGBS, sodium hydroxide (98% purity in pure form), sodium silicate solutions (10M, 12M), coarse aggregate (12.5 mm & 20 mm) and fine aggregate (fineness modulus 2.6 — 2.8). Sugarcane bagasse ash was obtained from **Sivagiri, Erode.** Ground Granulated Blast Furnace Slag (GGBS) was purchased from JSW Cement Company. Sodium silicate (Na_2SiO_3) mixed with sodium hydroxide (NaOH) are used as alkaline. NaOH was in pellet form with 97% purity. Na_2SiO_3 consists of Na_2O=9.4%, SiO_2=30.1% & H_2O=60.5%, with weight ratio SiO_2/Na_2O = 3.20-3.30).

EXPERIMENTAL INVESTIGATION ON PLASTIC SAND AGGREGATE AS A PARTIAL REPLACEMENT FOR COARSE AGGREGATE IN CONCRETE

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ABSTRACT
The attempt is made on using plastic-sand aggregate as a partial replacement for coarse aggregate in concrete. In this project work, conventional aggregate is replaced by 5, 10 & 15percentage of plastic-sand aggregate in M20 grade of concrete. The compressive strength and split tensile strength of concrete mix at 7th, 14th and 28th day of curing period is determined along with the workability property of fresh concrete and results are analyzed and compared with the conventional mix.

KEYWORDS: plastic-sand, partial replacement, compressive strength, split tensile strength

1. INTRODUCTION

Concrete is a composite material composed of coarse and fine aggregate bound together with fluid cement and harden over time. Most concrete used are Portland cement based concrete made with other hydraulic cements.
Besides, abundant raw materials are exhaustively utilised in cement production and their availability becomes challenging in near future. The river sand used as fine aggregate is being met huge demand in construction industry. Good quality coarse aggregate is also not available everywhere. Further, enormous quantities of solid wastes are generated in the world. According to the "Swachhata Sandesh Newsletter" by the MoHUA, as of January 2020, 147,613 metric tonnes (MT) of solid waste is generated per day. Among various solid wastes, it is noticed that plastics wastes are about 8% by weight of the total solid wastes. Being a non-biodegradable, the disposal of plastic wastes is a big concern in the world. Reuse of plastic could be a solution in effective way instead of land filling[1].One of the ways is to use it as coarse aggregate in concrete. Several works were attempted to use plastics as aggregates in concrete[2-8].
In this work, the waste plastic bags are taken as partial replacing material for coarse aggregate for construction practices. The waste plastic product is named as PLASTIC SAND AGGREGATE (PSA) which is having similar characteristic like coarse aggregate. The study leads about strength and behaviour of partially replaced plastic sand aggregate in concrete.

Plastic Sand Aggregates

Plastic-sand aggregates (PSA) are obtained by mixing the fine aggregate (sand) with the molten waste plastic bags to get a hard aggregate like substance. The plastic bags are heated at the range of 90ºC-110ºC to get a molten gel like substance.

Preparation of Plastic Sand Aggregate

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Fig1.1PlasticSand aggregate

Waste plastic bags are collected and unwanted waste is removed from it. River sand used for the construction is used in the manufacturing of the aggregate. River sand should be free from impurities and any organic matters. A

STUDY ON QUALITY MANAGEMENT IN CONSTRUCTION

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ABSTRACT

The Quality Management System (QMS) in construction industry refers to quality planning, quality assurance, quality control. The main goal of construction industry is to ensure that construction projects are successfully completed within the constraints of best quality, stated period and at minimum possible cost. The research based on QMS recommended that construction companies should create a flexible and conducive organizational atmosphere which encourages the development of quality management system in all aspects of their work.The questionnaire survey has been carried out in the present study by taking interviews of participants of project. The participants of project include owner/builder, project management consultant, contractor, various consultants and suppliers. The questionnaires have been prepared by authors based on quality aspects in construction project for builder / contractor, consultants and customers / occupants of buildings. This paper describes the analysis of data collected during interviews & questionnaires with builder /contractor.

INTRODUCTION

Quality is one of the critical factors in the success of construction projects. Quality of construction projects, as well as project success, can be regarded as the fulfilment of expectations (i.e. the satisfaction) of the project participants. The construction industry in India has been struggling with quality issues for many years. A significant amount of the budget is spent each year on infrastructure and other development projects. Since the quality outcomes of the projects are not according to required standards, faulty construction takes place. Consequently, additional investments are required for removal of defects and maintenance work. A construction project in its life span goes through different phases. The main phases of a project can be described as: conceptual planning, feasibility study, design, procurement, construction, acceptance, operation and maintenance. For the implementation of quality management in construction

projects, the concepts of quality planning (identification of quality standards), qualityassurance (evaluation of overall project performance) and quality control (monitoring of specific project results) in the quality management processes were defined by Project Management Institute (2000). Several tools and techniques were identified as part of the implementation process, like benefit-cost analysis, benchmarking, flow-charting, design of experiments, cost of quality, quality audits, inspection, control charts,pareto diagrams, statistical sampling, flow-charting and trend analysis.

LITERATURE REVIEW

David Arditti, et al (1997) stated that there is capacity for improvement of quality in the field of construction and author explained total quality management (TQM). Total quality management (TQM) aims at best team work and co-operation, and not only for the meeting and dispute, it is long life for the construction industry.

Peter Hoonakker, et al (2010) discussed the difficulties in construction industry for define quality, determined benefits quality implementation, and at barriers to implementation of quality in construction. They collected data with the help of questionnaire.

H. James Harrington, et al. (2012) defined the quality and productivity problems, and main aim of this paper is, improvement of quality most is needed to remove waste in the construction industry. Author stated that there is not enough research on better approach for managing quality.

P.P.Mane, et al (2015)explained the role of quality management fora construction company. Author mentioned that Quality Management System (QMS) can be applied either at the size of organization or at the project size. The paper described about the rating characteristics

RISK MANAGEMENT IN BUILDING CONSTRUCTION

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Abstract

This paper is about the various types of risk faced by the construction site and the assessment by Analytic Hierarchy Process give the control measures. Construction risks are generally the events that influence the project objectives of cost, time and quality. Some of the risks are associated with the construction process are fairly predictable or readily identifiable. Identify the key factor that causes the risk in the construction industry. Collecting the data by questionnaires survey. Analysis the collected data by Analytic Hierarchy Process (AHP) by ms excel using this method.

INTRODUCTION

The construction industry is subjected to the more risk and uncertainty than the many other industries. The process of taking a project from the initial investment appraisal of completion and use is complex. It requires a multitude of the people with different skills and interests and the co-ordination of the wide range of disparate. Such complexity is the further compounded by the many uncontrollable external factors. The construction industry has the poor reputation in the risks, many projects failing to meet the deadlines and cost targets. Clients, contractors and the public and others have suffered as the result.

In project management terms, the most serious effects of risk can be summarized as follows

- failure to keep within the cost estimate
- failure to achieve the required completion date
- failure to achieve the required quality and operational requirements

RISK MANAGEMENT

An organized way to understand risk, identifying of sources of risk, analyzing and management of that risk through the process of risk management is known as risk management. It may affect the risk through the process of risk management is known as risk management.

Risk are mainly classified into two types they are

- Internal risk
- External risk

INTERNAL RISK

- It refers to the risk arising from the events within the business organisation.
- It can be controlled by appreciable extent.

EXTERNAL RISK

- It refers to the risk arising due to the events occurring outside the organisation.
- These events are generally uncontrolled and results in risk.

SCOPE OF THE STUDY

- To reduce the risk in construction project
- To reduce the delay in construction and cost of the project.
- To identify the preferences of risk management in building construction.

OBJECTIVE OF THE STUDY

- Identify the various type of risk faced in the construction project
- Analysis using Analytic heirarchy process

STUDY AND ANALYSE OF DELAY IN COMMERCIAL CONSTRUCTION PROJECT

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ABSTRACT

This project deals with the study of various delays incurred in project life cycleandalsoanalyzetheconstructionproject.Forthisstudy,Iprepareadetailedinvestigation report on delay which is collected from various firm located around theSalem district by conducting questionnaire survey. This survey helps of study of delayandtheireffectsinconstructionprojectcycle.FromdetailedanalysisofdelayIsuggestthe solution for delay causes. This study also focuses on that cost planning of projectthrough MS-Project software analysis to find the cost and schedule performance. Itidentifies the delay experience in project leads to unusual cost and schedule variationrelation.Estimatesofconstructioncostsandschedulerepresentthesustainable development of the firm. The economic impact of a construction cost overrun is possible tolossventureofproject.

INTRODUCTION

Delay is generally acknowledged as the most common, costly, complex and risky problem encountered in construction. Comes due to the dominant importance of your time for each the Owner (in terms of performance) and also the Contractor (in terms of money), it's the supply of frequent disputes and claims resulting in lawsuits. To regulate this case, a contract is developed to spot potential delay things beforehand and to outline and fix obligations to preclude such controversies. A considerable variety of General Condition's clauses address this subject in a method or another. Construction delays are important factors to be considered as time lag in completion of activities in the project. It create undefined schedule ms communication between contractors and owners. It leads to increase the expenses of project, wages of labour rise the rate of interest if the project established with loan amount.

1. TYPES OF DELAYS

1. critical and non – critical delays
2. excusable and non – excusable delays
3. concurrent and non- concurrent delays

- ✓ **Critical delays**
  A delay responsible for extending project duration is called Critical delay
  Example; Extended overhead cost
- ✓ **Non – critical delays**
  Non extending project duration is called non -Critical delay
  Example; Ideal equipment cost
- ✓ **Excusable delays**
  Contractor does not have any control on the activity.
  Example; Natural acclimates, approvals
- ✓ **Non – excusable delays**
  Contractor is fully responsible for activity does not getting delayed.
  Example; improper planning and scheduling, delayed procurement.
- ✓ **Concurrent delays**
  It affects more than one activity at same time of project.
- ✓ **Non- concurrent delays**
  It affects only one activity.

2. CAUSES OF DELAYS

There are two kinds of causes for delays in construction projects: external and internal reasons. Internal causes delay causes, which include four parties involved in the project come from. These parties include the owners, designers, contractors and consultants. Other delays, which do not come from these four parties, for example, material supplier, are based on extraneous reasons from the Government or whether the followings are some of the possible delay of the construction industry is

PERT ON EXPERIMENTAL STUDIES OF FLOATING COCONUT SHELL LIGHT WEIGHT AGGREGATE CONCRETE WITH VARIOUS ADDITIVES

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ABSTRACT*:*
Behavior of the Coconut Shell Concrete Ceiling was formulated from the parameters of heat flow and heat exchange with air. At the Heat insulation, the effects of different Coconut Shell Ceiling materials on the outdoor air temperature (Tao) and indoor air temperature (Tai) were measured at 150cm above floor level. Thermal comfort is possible when Cement-Lime-Sand with Over Burnt Clay, Coconut Shell and natural additive soap nuts with foaming agent can be used as our innovative and invention concrete mix. Various foaming agents will be effectively used to attain high quality of floating Crete. Finally, efficient foaming agent with suitable additives of Coconut Shell Concrete will be recommended to protect our Nation. Due to these experiments, we will attain thermal insulated floating coconut shell concrete ceiling. Thus, we can attain our goal which is about comfort ceiling. Eco-friendly products will be made powerful environment in economical way. Heat flow of building will be reduced and good ventilation can be gained. To maintain our economy, we will utilize our quality Coconut Shell as main ingredient to manufacture Floating Coconut Shell Concrete which can used as statue in Amusement Park on the top of water. Carbon sink is possible because we use coconut shell with soap nuts as additives. the utilization of coconut shell (CS) as a substitute for natural gravel aggregate in concrete is an effective way for a sustainable concrete construction @ 40% replacement ratio was to be necessary criteria for thermal insulating concrete according to codal provisions. Various color cement will be used to change outlook of the Floating Coconut Shell Crete to attain aesthetic appearance. To attain floatable Light Weight Coconut Crete products by using coconut shell as a light weight aggregate with soap nut as a natural additive. Floatability of coconut shell concrete, Light weight coconut shell concrete, Coconut shell Crete, Sustainable foam concrete are the novelty of this concrete. Thermal insulation behavior is our main aim in our concrete work. Due to global warming, day by day, we tackle more type of phycological and ecological problems in our body as well as in our environment. To improve human comfort in our routine life with help of Coconut Shell Crete falls ceiling and to make healthy environment to ensure safety of future generations. At different environmental situations, we can make all our dwellings with Coconut Crete falls ceiling for Modernization.
KEY WORDS*:* *Thermal insulating concrete, Carbon sink, Thermal comfort, Human comfort*

INTRODUCTION

The utilization of coconut shell with soap nut additive as a substitute for natural gravel concrete is an effective way for a sustainable concrete construction practice and it acts as a carbon sink. In the present study, the thermal properties of coconut shell with soap nut additive analysed. The most relevant thermal properties such as thermal conductivity, specific heat and thermal diffusivity found at 0%, 10%, 20%, 30% and 40% replacement of coarse gravel. Experimental investigation on mechanical properties and fracture toughness of eco -friendly concrete produced, using coconut shell as coarse aggregate, blast furnace slag as a partial replacement for cement and manufactured sand as fine aggregate. The stress-strain behaviour of coconut shell concrete incorporating ground granulated blast furnace slag and manufactured sand was obtained and it was in good fit with popovics mode. (Mo et d., 2015). (1)Coconut shell concrete of grade M20 was achieved using 401Kg/m3 of cement by conceal curing. The flexural behaviour of under reinforced and over reinforced coconut shell concrete designed by limit state method using the actual stress-strain behaviour is analogous with the experimental values. The deflection and crack width of coconut shell concrete is comparable with the permissible values given by IS456:2000, ACI-318 and EC 2: 1992(2) The bond properties were determined through pull-out test. Coconut shell concrete can be classified under structural lightweight concrete. The results showed that the experimental bond strength as estimated by BS 8110 and IS 456:2000 for the mix selected.(3) Foamed concrete possesses characteristics such as high strength-to-weight ratio and low density. Foamed concrete reduces dead loads on the structure, saves energy and lowers the labour cost during construction. The foaming agent used to generate foam is sodium lauryl ether sulphate. (4) Foam concrete can have 10% to 70% air, which results in a material that is light weight but may compromise the compressive strength and durability properties.(5) The thermal conductivity of foamed concrete varies from 0.021 –

STUDY ON BEHAVIOUR OF PERMEABLE CONCRETE IN THE UTILIZATION OF CHEMICAL PROCESSING OF ASH

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ABSTRACT

Permeable concrete is a distinctive kind of concrete with excessive porosity used for concrete flat work functions that enable the water from precipitation and different sources to ignore without delay through, thereby decreasing the runoff from a web page and permitting floor water recharge. This porosity is attained via a surprisingly interconnected void content. Typically permeable concrete has little or no pleasant mixture and has simply adequate cementing paste coat the coarse combination particles whilst maintaining the interconnectivity of the voids. Permeable concrete is historically used in parking areas, areas with excessive traffic, stroll methods in parks and gardens, residential streets, pedestrian walkways and inexperienced houses, basketball and volley ball courts etc. Porous concrete is an essential utility for the sustainable building and is one of many low affect improvement methods used via builders to defend waterquality.

KEYWORD: Silica Fume, Permeable Concrete, Fly Ash, Compressive Power

1. INTRODUCTION

Permeable concrete is additionally a special and fine skill to tackle essential environmental troubles and sustainable growth. When it rains, permeable concrete robotically acts as a drainage system, thereby placing water again the place it belongs. Permeable concrete is tough textured, and has a honeycombed surface, with reasonable quantity of floor ravelling which happens on closely travelled roadways. Carefully managed quantity water and cementitious substances are used to create a paste. The paste then types a thick coating round combination particles, to stop the flowing off the paste for the duration of mixing and placing. Using ample paste to coat the particles hold a device of interconnected voids which enable water and air to bypass through. The lack sand in permeable concrete consequences in a very harsh combine that negatively influences mixing, Delivery and placement.

2. MATERIAL USED FOR PERMEABLE CONCRETE

2.1 CEMENT

Cement is a key to infrastructures industry and is used for various purposes and also made in many compositions for a wide variety of uses. Cements may be named after the principal constituents, after the intended purpose, after the object to which they are applied or after their characteristics property.

2.2 AGGREGATES

Aggregates were first considered to simply be filter for concrete to reduce the amount of cement required. However, it is known that the type of aggregate used for concrete can have considerable effects on the plastic and hardened state properties of the concrete. They can form 80% of the concrete mix so their properties are crucial to the properties of the concrete.

2.3 WATER

Water is a key in the manufacture of concrete. Water used in concrete mixes has two functions: the first is to react chemically with the cement, which will set and harden, and the second function is to lubricate all other materials and make the concrete workable. Although it is an important ingredient of concrete, it has little to do with quality of concrete.

2.4 SILICA FUME

Silica fume is one of the artificial pozzolanas, commonly used as mineral admixtures. Micro silica is very fine non-crystalline silica, produced in electric arc furnaces, as a by-product of the production of the elemental silicon or alloys containing silicon also known as condensed silica fume or micro silica.

2.5 FLY ASH

Fly ash closely resembles volcanic ashes used in production of earliest known hydraulic cement. The reason to use in concrete is the increased life cycle expectancy and increased in durability. Concrete designers use as a partial replacement for Portland cement up to 30% of the total cementitious composition.

EXPERIMENTAL STUDY ON PERFORMANCE OF METAKAOLIN IN PERVIOUSCONCRETE

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Abstract
Lately, part of examination center around growing new Supplementary cementitious material to fortifying the solid. These materials are utilized as a piece of concretes. Metakaolin is one of the beneficial cementitious materials which are part of the way traded for concrete. Properties of cement with metakaolin are generally favored added substances in concrete.
Pervious cement is an uncommon kind of cement with a high porosity utilized for solid flatwork applications that permits water from precipitation and different sources to go straightforwardly through, in this manner diminishing the spillover from a site and permitting groundwater re-energize. It likewise called as Porous concrete, Permeable concrete, No fines concrete and Porous asphalt. Pervious cement is generally utilized in stopping zones, territories with light traffic, Residential roads, Pedestrian walkways and nurseries. It is a significant application for manageable development. Metakaolin will be added at various rates or percentages such as 1%,1.5%,2%,2.5% by the heaviness of concrete.
To make concrete cubes and cylinders at every percent. The effect of metakaolin at various percents in pervious concrete will be finding by conducting compression test.

***Key Words*-Metakaolin, Porous Concrete or Pervious Concrete, Compression Strength.**

1.INTRODUCTION

Pervious cement is a unique sort of cement with a high porosity utilized for solid flatwork applications that permits water from precipitation and different sources to go straightforwardly through, consequently decreasing the spillover from a site and permitting groundwater re-energize. It likewise called as permeable concrete, penetrable concrete, no fines concrete and permeable asphalt. Pervious cement is made utilizing huge totals with almost no fine totals. The solid glue at that point covers the totals and permits water to go through the solid chunk. Pervious cement is generally utilized in stopping territories, regions with light traffic, private roads, passerby walkways, and nurseries. It is a significant application for reasonable development and is one of many low effect improvement methods utilized by manufacturers to ensure water quality.

1.1 Aim

To find the strength behavior of pervious concrete at various percents of metakaolin and compare with the unmodified pervious concrete.
1.2ResearchObjectives
- To achieve economy in concrete construction and to utilize metakaolin in an effective environment friendly manner.
- To meet the scarcity of cement and fine aggregates in future.
- To meet the strength improvement in pervious concrete.
- Todeterminetheeffectofmaterialproportionontheengineeringpropertiesoftheperviousconcrete.
- Investigatetheperformancecharacteristicsofthepervious concretesuchasporosity,compressivestrength,andinfiltrationrate.

2 .LITERATURE REVIEW

2.1Effect of Fly Ash and MetakaolinOn Pervious Concrete Properties- Nikhil Saboo, ShekharShivhare, Krishna Kumar Kori,AnushK. Chandrappa(2019*)*

The literature is reviewed on effect of fly ash and metakaolin on pervious concrete properties. In this study, supplementary cementitiousmaterials are the byproducts of productions which processes all from industries, several environment concerns and it is imperative toutilize for partial replacement. The research was done by the author to determine the porosity, density, compressive strength, andpermeabilitybydoingvarioustests.Thereplacementofflyashwasfoundtobebetween5and15%.Andasresult,cement canbepartialreplaced by SCMs, which not only increases the workability but as well aid in achieving higher strength with lesser cement contentsrendering optimal solution for usage of industrial by-products. Different method were performed like specimen preparation and curing,determinationofdensityandporosity,permeabilityandcompressivestrength.withincreaseinporosity,densityreducedandpermeabilityincrease.
The following are result researched by the author to explore the discussion to find the improvements by replacing with fly ash andmetakaolin.

STUDY ON KEY DETERMINANTS OF CONSTRUCTION DELAY

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ABSTRACT

The aim of this study was to investigate the causes of construction delay and its impact on client dissatisfaction. The factors were recognized from literature and using these factors questionnaire was organized and it consists of total of 40 factors causing delay. In order to collect data from the respondents, questionnaire method was adopted. The structured questionnaire form was sent to various construction companies through email. This study had been conducted in and around Erode district. The study recognized six dimensions of construction delay. These were design, human, finance, machinery, operation, practice. From the identified dimensions, proposed model had been generated and hypothesis had been assumed. Using the proposed model and hypothesis, statistical analysis had been administered. The statistical analysis includes Correlation, Multiple regression, Factor analysis, Reliability statistics. By identifying the most influential factors causing delay from the statistical analysis, would help the construction industry, suitable remedial measures may be given to minimize the delay in construction.

INTRODUCTION

GENERAL

Delay factors are considered to be significant role in the delivery of a construction project on time, within budget and at the required quality (Shebob et al, 2007). The success of the construction project requires sound strategies, good practices and careful judgement for completion of project on schedule and with estimates cost (Adnan Enshassi et al, 2016). Delays are the most common and costly problem encountered on construction projects. Construction delays are significant part of the project's construction life. Even with present advanced technology, and management understanding of project management techniques, construction delay projects continue to suffer in case of delays and project completion dates. The major reasons for delay includes strikes, rework, deficit organization, shortage of materials, machinery failure, change orders. Delays are costly to all parties involving in the construction industry and often result in litigation. The time and expense incurred to produce a claims document in itself is substantial. There is room for improvement in present practices for keeping track of delays. Therefore, introducing aexible and more accurate delay analysis technique can be valuable.

Delays adversely affect the project stakeholders including owners, design professionals and other users and professionals. The main objectives of construction projects are time, cost, quality and safety, which are jeopardized by delays. Delays result in extension of project time, which leads to extra overheads that increase the cost. Delay is an adverse problem that has to be dealt with in any construction project. Hence it is significant to measure the significant causes of delay and find remedial ways to avoid them and mitigate their impact **(**ArshiShakeelFaridi et al, 2006).

Delay could be stated as the time overrun either beyond date of completion specified by a contract, or by delivery of a project. It means that the project is running over its planned schedule and is recognized as potential disputes in construction projects. By owner, delay can be defined by capital loss through improper production facilities and rent-able space on present facilities. By means of contractor, delay defines high costs due to overheads because of long time work, higher cost of materials by inflation and due to increase labor costs.

Completion of projects on scheduled time is an indicator of efficiency, but the construction process is subjected to different variables and factors, which results from many sources. It includes the performance of parties, availability of resources, environmental factors, other party's involvement, and contractual relations. The main objectives include identification of delay causes in construction, to analyze the importance of the causes of delay, to mitigate the differences in perceptions of owners, contractors and consultants (Sadi A. Assaf and Sadiqi Al-Hajji, 2006).

With these studies, we conclude that delays in construction can cause a number of changes in a project such as late completion, lost productivity, acceleration, increase in costs and contract termination. However, in general delay situations are complex in nature.

A STUDY ON DURABILITY CHARACTERISTICS OF PERVIOUS CONCRETE USING MARBLE POWDER AS PARTIAL REPLACEMENT OF CEMENT

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ABSTRACT

This project represents a study on durability characteristicsof perviousconcrete made with marble powder as partial replacement of Portland PozzolonaCement (PPC) with different coarse aggregate sizes for sustainable pavementconstruction. The size of coarse aggregate (CA) ranging from 6.3 mm to 12.5 mmwas used in this study. Aggregate to binder ratio and water to binder ratio wasconsidered as 3.3 and 0.35. Durability properties such as oil resistance, mud water resistance, water absorption test, Abrasion resistance testhave been carried out for PPC binderand Partial replacement of marble powderwith PPC binder pervious concrete. In this projectthe durability results are to becompared with pervious concrete made out of PPC binder and partial replacementofmarble powderwithPPC binderperviousconcrete.

1.INTRODUCTION

Pervious concrete is a special type of concrete with high porosity usedfor concrete flatwork applications that allows water from precipitation andother sources to pass directly through, thereby reducing the runoff from a siteand allowinggroundwaterrecharge. Themarble has been commonlyused as a buildingmaterial sinceancienttimes.Disposalofthemarblepowderfrommarbleindustry,consistingofveryfinepowder,isoneofthe environmentalproblemsworldwide today. The marble powder is obtained as a by-product of marblesawing and shaping process. It is rather confirmed as a waste, and is thereforethe cause of certain serious problems such as the waste of natural resourcesandenvironmentalpollution.Utilizationofmarblepowderinconcreteproductionwillpreserve the cleanEnvironmentandnaturalresources.

2. MATERIALS USED

a). PortlandPozzolonaCement

Table2.1 PropertiesofPPCbinder

Properties	Results
Specific gravity	3.13
Consistency	35%
Fineness test	300
Soundness test	10
Initialsetting time	30
Finalsettingtime	600

b). Marble Powder

Table2.2.Physical properties of marble powder

S.No	Property	Result

INVISTIGATION OF FACTORS INFLUENCING COST ANALYSIS ON COMPLETION OF THE PROJECT

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ABSTRACT

Delays in the construction industry are a universally observable fact, which effects the construction participants. The project mainly spotlights on determining the prevailing postponement issues in the central Tamil Nadu, depending on the scrutiny of the construction participants namely the client, consultant, and the contractor. Based on the study from the literature, the questionnaire was framed, obtained, shortlisted to know about their perception on the causes of delays which are categorized into 4 groups say Improper project planning, Design related issues, Finance related issues and Resource related issues and are analyzed using the SPSS software tools. Hence the dominant factors will be found. This research investigates the critical factors that affect cost performance across both the preconstruction and construction phases of projects and also the factors that affect the profit and success of the construction industry.

INTRODUCTION

GENERAL

Large scale development activities are taking place in Indian construction industry and are closely associated with nation's economy. Cost overruns have become the hallmark of construction projects in India. It has become a global concern amongst the practitioners and academic researchers because the construction projects are very rarely completed within the estimated cost limit. Cost is amongst the major considerations throughout a project management life cycle and is considered as prime factor of success. However, it is uncommon to see project completed within the estimated cost. The magnitude and causes behind these cost overruns remain understudied.

Cost is a major concern in every part of the construction project. Cost overrun is the total increased value compared to the budgeted cost. Cost overruns have become the basic factor for determining the success in the construction project. The construction activities are rarely completed within the estimated cost limit and so it has become a global concern. The cost overrun concerns the quality and success of the overall nation's economy.

In general, cost overruns reduce the productivity of available economic resources, edge the development potential and diminish the effectiveness of the economy. Despite the importance and the significance of the construction sector in India, it is noted that the owners, consultants, and contractors don't give its importance to evaluate the time and cost overruns at the end of project. It is therefore essential to identify actual causes of time overruns to minimize and avoid delays and increasing cost in any construction project.

It was felt that a survey into the causes of cost overruns in the construction processes might provide some insight into their solutions. It was also felt that it would be beneficial for the study to investigate the viewpoints of the contractor, the consultant and the client.

METHODOLOGY

This research includes 7 phases. The first phase of the research is to identify the problem and objective of the study. The second phase of the research includes collecting necessary data from the previous literature reviews. The third phase of the research is the questionnaire design through which includes demographic data of the respondent and the factors for cost overrun. The fourth one is the questionnaire distribution through which the data will be collected. The fifth phase of the research includes Response Collection. The sixth phase is the analysis using Statistical Package for Social Sciences (SPSS) software used to statistical analyses of the questionnaire. The seventh and last phase of the research is to conclude.

REPLACEMENT OF COARSE AGGREGATE WITH CONSTRUCTION DEBRIS IN PPC CONCRETE

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Abstract

The disposal of this waste is a very serious problem because it requires huge space for its disposal and very little demolished waste is recycled or reused. Huge quantities of construction and demolition wastes are generated every year in developing countries like India. The cost of concrete production will reduce considerably compared to conventional concrete produced by using freshly obtained coarse aggregate. Since it is readily available at very low cost, its application will reduce the construction pollution and enhances the effective use of construction waste which helps in controlling Solid Waste Management. This study is a part of comprehensive program wherein experimental investigations have been carried out to assess the effect of fully replacement of coarse aggregate by demolished waste on workability and compressive strength of recycled concrete for the study at 7 and 28 d. In this experiment use of construction debris instead of coarse aggregate with mix of 1:1.5:3 in M20 concrete. Test results showed that the compressive strength of recycled concrete fully replacement of coarse aggregate by demolished waste at the end of 28 d has been found to be comparable to the conventional concrete.

1. INTRODUCTION

Concrete is the most widely used construction material on this earth. In fact, concrete is used in virtually everything and there is still no substitute available for many of its applications. Without concrete, the community and society cannot exist. Therefore, lots of researches are going to find the new varieties of concrete which are economical for the construction. All these researches are focused on the replacements of different ingredients of the concrete which makes the concrete cheaper and even stronger too.Worldwide, cities generate about 1.3 billion tones of solid waste per year.Building materials account for about half of all materials used and about half the solid waste generated worldwide. The waste, generated in the construction, maintenance, repair and disposal phases of a building, is called Construction and Demolition (C&D) Waste.

1.1 Demolition Waste

Demolishing the old building produces large amount of waste products. When structures made of concrete are demolished or renovated, concrete recycling is an increasingly common method of utilizing the rubble. Concrete once routinely trucked to landfills for disposal, but recycling has a number of benefits that have made it a more attractive option in this age of greater environmental awareness, more environmental laws, and the desire to keep construction costsdown.Concrete aggregate collected from demolition sites is put through a crushing machine. Crushing facilities accept only uncontaminated concrete, which must be brick debris, free of trash, wood and other such materials. Metals such as rebar are accepted, since they can be removed with magnets and other sorting devices and melted down for recycling elsewhere. The remaining aggregate chunks are sorted by size. Larger chunks may go through the crusher again. After crushing has taken place, other particulates are filtered out through a variety of methods including hand-picking and water flotation.Crushing at the actual construction site using portable crushers reduces construction costs and the pollution generated when compared with transporting material to and from a quarry. These systems normally consist of a rubble crusher, side discharge conveyor, screening plant, and a return conveyor from the screen to the crusher inlet for reprocessing oversize materials. Compact, self-contained mini-crushers are also available that can handle up to 150 tons per hour and fit into tighter areas. With the advent of crusher attachments - those connected to various construction equipment, such as excavators - the trend towards recycling on-site with smaller volumes of material is growing rapidly.Smaller pieces of concrete are used as gravel for new construction projects. Recycling concrete can create more employment opportunities.

2.MATERIALANDMETHODS

2.1 GENERAL

The construction waste material is also very suitable for replacing the coarse aggregate in concrete. It contains mostly the demolished building pieces like a portion of slab, beam, column & masonry elements.Moreover, some materials are wasted while construction works like bricks pieces, stone pieces, etc., those materials will perform well with concrete.

EXPERIMENTAL INVESTIGATION ON GEOPOLYMER BRICKS AND ITS APPLICATIONS

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ABSTRACT

The purpose of the present study is to investigate the behaviour of Fly ash based Geopolymer Bricks, the size of the brick adopted was 230mm x 230mm x 100mm. The brick were cast with fly ash to river sand, M-sand and eco-sand (silica sand) with the ratio of 1:2.5 and 1:3 by weight. Sodium hydroxide and Sodium silicate solution were used as the alkaline activators. The binder solution consists of a combination of NaOH and Na2SiO3 solution in the ratio of 1:2.5. The optimum water/ binder ratio of 0.416 was selected as per available literature. The water/binder ratio is the ratio of solution (NaOH, Na2SiO3 and water) to fly ash. Ambient curing was adopted in this study. Ten bricks were prepared for ambient curing. The bricks were cast with different types of sand with river sand, M-sand and eco-sand (silica sand). The experimental results obtained were compared with locally available bricks like Clay bricks and Flyash bricks.

1.INTRODUCTION

Fly ash is generally captured by electrostatic precipitators or other particle filtration equipments before the flue gases reach the chimneys of coal-fired power plants, and together with bottom ash removed from the bottom of the furnace is in this case jointly known as coal ash. Fly ash is generally stored at coal power plants or placed in landfills. About 43 percent is recycled, often used to supplement Portland cement in concrete production. From laboratory experiments, it was revealed that concrete made of stone powder and stone chip gained about 15% higher strength than that of the concrete made of normal sand and brick chip [1]. The concentration of alkaline activator increases, the compressive strength of Geopolymer mortar also increases. Specimens cured at temperature of 65oC for 1 day showed the highest 28 days compressive strength. The mass ratio of activator/fly ash of 0.4 produced the highest 28 days compressive strength for the specimen [2,3]. Specimens cured at temperature of 65^{o}C for 1 day showed the highest 28 days compressive strength. The mass ratio of activator/fly ash of 0.4 produced the highest 28 days compressive strength for the specimen [4,5]. Concrete of stone powder and brick chip gained about 10% higher strength than that of the concrete normal sand and stone chip concrete. The highest compressive strength of mortar found from stone powder which is 33.02 Mpa, shows that better mortar can be prepared by the stone powder. The compressive strength of concrete from stone powder shows 14.76% higher value than that of the concrete made of normal sand. On the other hand, concrete from brick chip and stone powder produce higher compressive value from that of brick chip and normal sand concrete [6-8].

2. MATERIAL AND METHODS

In this chapter the materials which are used to make Geopolymer brick and their physical and chemical properties where explained.The materials used for making fly ash-based Geopolymer brick specimens are low calcium fly ash as the source material (Class 'F ') , fine aggregates (river sand, M-sand, eco sand), alkaline such as sodium hydroxide solution, sodium silicate solution were as binders and water as workability measure.

2.1 Fly Ash

In this Geopolymer bricks, fly ash is obtained froMettur power plant, their physical and chemical properties are given below in table 1.

Table. 1 Physical properties of fly ash

Properties	Value
Finesses modulus (Passing through 45 micron sieve)	7.86
Specific gravity	2.30

ANALYSIS OF FACTORS AFFECTING PRODUCTIVITY IN CONSTRUCTION PROJECT

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Abstract

Worldwide the construction industry faces the lot of challenges associated with the productivity of the labour and the equipment and problems linked with the productivity of the same in the industry. In the construction industry, the changes are the most common thing to occur in any level of the project. It is important to look on the things which changes the productivity and losses in the project. The main factors which are associated with productivity are the labour and the equipment. The main objective of this study is to find and analyze the factors which affects the productivity of the construction project. A questionnaire survey is made on the construction companies and the contractors to identify the factors affecting productivity. A set of questions are prepared on the factors involving the labour and equipment productivity. The collected data is used to analyze and the ranking is done with the relative importance index(RII) method. The results from this review can be used as a reference for the future researches in this field and the construction projects and contractors can also make use of this in their projects.

Keywords: *Productivity, labour, equipment, Relative Importance Index.*

INTRODUCTION

The construction industry is one of the largest industries in the world, it is the largest contributor of gross domestic product in the developing countries. Among the various construction sectors, building construction sector is the important and it is gaining momentum in the recent years. In the most of countries, the labour and the equipment costs comprises from 30 to 50% in all over cost of the project and that is regarded as the true reflection of economic success in the operation and the satisfaction of the clients. Despite of the technical and the technological advancements in the industry, the availability of the construction materials, labour, tools, and the financial power of the contractors, the cost of the construction is increasing in a rapid manner. The time taken for the completion of the construction is also increasing so that the most of the project are irregular. To achieve the objectives, a questionnaire survey was conducted among the construction companies and the contractor, comprising with the set of 25 questions on the labour productivity and 20 questions in the equipment productivity respectively. After the data collection the data are analysed using Relative Importance Index method.

Productivity

Productivity = Output / Input

1.1 NEED OF THE STUDY

- To analyze and know about the economical and the statistical conditions of the country
- To ensure the safety and the health conditions of the construction labours involved in the project.
- To educate the labours about the importance of the project an train them to the project work.
- To improve and reach the dynamic economic growth in the industry.

1.2 IMPORTANCE OF THE STUDY

The productivity is the one of the greatest feature in the labour and the equipment in the construction industry. There are many internal and external elements in the construction industry which are different from each other and they are never a constant one. Because of this the construction industry faces the changes in the productivity of the projects and it also affects the development of the total construction industry. So it is important to learn and know that there will be no loss in the plan and the schedule while reducing the productivity in the construction project.

1.3 SCOPE OF THE STUDY

The main scope of the study are,

EXPERIMENTAL INVESTIGATION ONPARTIAL REPLACEMENT OF FLYASH INSTEAD OF CEMENT IN INTERLOCKING BRICKS

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ABSTRACT
Cement is a significant material that is used in building. The production of cement which, due to combustion, emits high concentrations of carbon emissions.The scope of this present study fly ash as a partial replacement of cement in interlocking bricks.This study is part of a research project in which the production of interlocking mortar-free bricks. The mix ratio is 1:4, and 1:5with water-cement ratio 0.45and addition of 1% of steel fibers. The cement is replaced by fly ash in different percentages such as 5%, 10%, 15%, and 20% respectively. It is a good binding material for the replacement of cement on the interlocking bricks.The major focus of this investigation to develop manually compressed interlocking bricks. The interlocking bricks are tested atthe age of 7 days and 28 days for compressive strength, water absorption, and bulk density and physical tests such as hardness test and efflorescence test.

Keywords– *Interlocking bricks, Fly ash, steel fiber, Compression strength test, Mortar free joints.*

1. INTRODUCTION
Brick masonry is an ancient material and one of the most important building materials in the world. The traditional brick-making technique has unmistakable drawbacks. A brick is a masonry building material used to create walls, pavements, and other components[1]. The most basic building material for the design of buildings is nominal brick [2].Civil engineers are searching for new building materials that are robust, cost-effective, and reliable due to the construction industry's exponential development [3]. Since the blocks are constructed dry and piled on top of one another, it necessitates the use of less-skilled staff. The blocks may be manufactured directly on the construction site or on a larger scale in a factory yard [4]. The interlocking mechanism is a modern and revolutionary way to make masonry structures [5]. Soil interlocking blocks and concrete interlocking blocks are two kinds of interlocking blocks [6, 7]. Interlocking blocks are produced in special moulds, in which compaction can be done mechanically or by hand depending on the type of block, the material used, required quality, and available resources [8]. Interlocking blocks differ from traditional blocks in that there is no mortar to be filled between the layers of the blocks during the construction process [9]. Building walls and partitions are being built at a faster rate [10].Semi interlocking masonry has reduced stiffness and allows relative sliding of brick courses in a plane of a wall and prevents out-of-the plane relative movement of bricks [11, 12]. Due to the strong demand for traditional masonry work elements such as brick, there will come a period when some practical obstacles such as inadequate raw source, high cost material, jointing and cracking, and environmental effects such as high hydration while manufacturing and its applications must be overcome [13, 14]. The variation of sizes for these innovative bricks/blocks makes them suitable for loadbearing or non-load bearing wall structures [15, 16]. Moreover, the interlocking mechanism improves the stability of the brick unit, which enhances the constructed wall alignment horizontally and vertically to withstand loads like the non-mortared wall system [17]. Thus, developing a new type of innovative bricks from different types of waste materials, such as coconut fiber-reinforced concrete, geo polymer, soil cement, fly ash, alkali-activated fly ash, and stabilized mud-fly ash, has been attempted in masonry production [18]. In addition, the interlocking arrangement enhances the stability of the brick assembly, enabling the constructed wall to be horizontally and vertically balanced to support lots equivalent to a non-skinned wall frame [19, 20]. Water absorption in interlocking blocks is lower than in standard brick [21]. Hooked end steel fiber is used to strengthen the post-crack arresting function of bricks [22, 23].The main objective of this research is toalternate materials for bricks.Find the interlocking bricks' physical and strength testsand compare the results with control specimen.

2. EXPERIMENTAL WORK
Ordinary Portland Cement (OPC) of grade 53 is used. The cement test was performed under IS 12269:1987. The physical properties of cement as obtained by the test are shown in table 2.1. M-sand is used in the production of bricks. It is made by grinding hard granite stone.The fine aggregate test as per IS 2386 (Part 1-6):1963. The physical properties of the M-sand as obtained by the test are shown in table 2.2. Class F fly ash is used in our study to prepare the test specimen as per IS 3812(Part-1):2013 code. Fly ash was obtained from Mettur's thermal power station. The physical properties of Fly ash as obtained by the test are shown in table 2.3. Steel fiber with a hooked end is used in this phase. These fibers are less expensive and easier to work with. It will stop the forming of cracks after post-curing. They are hooked at both ends and can fill air voids. The physical properties of fly ash obtained by the test are shown in table 2.1.

EXPERIMENTAL INVESTIGATION ON GEOPOLYMER MORTAR USING RHA AND GGBS

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ABSTRACT
The main objective of this project is to the compressive of strength of RHA and GGBS based Geopolymer mortar. The Geopolymer mortar is a mixture of Rice Husk Ash, Ground Granulated Blast-furnace Slag, and alkaline solution. The rice husk ash is replaced by Ground Granulated Blast-furnace Slagin different percentages such as 0% 10%, 20%, 30% and 40%. As an alkaline solution, sodium hydroxide – sodium silicate is used. Themolarity of alkaline solution is16M. Test specimens (mortar cubes) of various proportion of RHA and GGBS with alkaline solution were casted and tested for28 days compressive strength under both ambient and heat condition. For heat curing, specimens were kept at 70^{o} C for 1 day and kept at room temperature until testing. The test result indicates that the increase in molar concentration increases the compressive strength of Geopolymer mortar. Also the increase in the percentage of GGBS increases the compressive strength of Geopolymer mortar. Compressive strength of Geopolymer mortar made using Sodium activators. The maximum compressive strength of rice husk ash replacement as Ground Granulated Blast-furnace Slag is 45% than that of the normal specimen.

Keywords:*Rice Husk Ash (RHA), Ground Granulated Blast-furnace Slag (GGBS),Compressive strength, split tensile strength.*

1. INTRODUCTION

Waste materials such as industrial and agricultural wastes can be used in the production of concrete which eventually reduces the environmental impact due to its improper disposal[1].The production of Portland cement causes emission of greenhouse gas CO2 [2]. These Portland cement based conventional concretes are found to be less durable in severe environmental conditions [3]. The contribution of ordinary Portland cement production worldwide in the emission of greenhouse gas is approximately 7% to the total greenhouse gas emission to the atmosphere [4, 5]. Therefore, to preserve the global environment from the impact of cement production, it is essential to replace Portland cement with new binders.Similarly, the disposal of waste materials also poses another serious environmental problem [6]. Geopolymer is an inorganic alumino-silicate polymer, synthesized from predominantly silicon and aluminium material [7]. From a tonne of paddy, about 200 kg of rice husk can be obtained constituting about one fifth of the total rice produced. During the combustion, rice husk yields 22% of rice husk ash [8, 9]. Hence Rice Husk Ash can be referred as a cementitious material by using partial replacement of Ground Granulated Blast-furnace Slag [10, 11]. Thus, the addition of RHA as cementitious material is a promising solution to extenuate the environmental impacts due to cement manufacturing process [12]. The reaction of RHA with an aqueous solution containing alkaline activators in their mass ratio, results in a material with three-dimensional polymeric chain and ring structure bonds [13]. Water is not involved in the chemical reaction of Geopolymer mix and instead, water is expelled during curing and subsequent drying [14]. The commonly used alkaline liquids are Sodium hydroxide or Potassium hydroxide with Sodium silicate or Potassium silicate [15]. Thus, an alternative method is needed to reduce the emission of CO_2 and making the path for solid waste management system as well effect on the properties of the mortar [16]. The main objective of this study was

- Rapid development of mechanical strength.
- Shows high resistance to acid and other chemical attack.
- Excellent adherence to aggregates.
- Better ability to immobilize contaminants.
- Significantly reduced energy consumption and greenhouse gas emissions during production.
- Widespread availability of raw material inputs.

2. EXPERIMENTALWORK

Ground Granulated Blast-furnace Slagis a by-product from the blast-furnaces used to make iron.The specific gravity of the GGBS is 2.55. The chemical composition of Ground Granulated Blast-furnace Slag is shown in table 2.1. M-sand is used in this project. Tine aggregate test as per IS 2386:1963. The physical properties of the M-sand are shown in table 2.2. The rice husk ash is used as binder material by replacing the Ground Granulated Blast-furnace Slag. The properties of Rice husk ash are shown in table 2.3. The Sodium

STRENGTHENING OF REINFORCED CONCRETE BEAM WITH POLYESTER RESINBONDEDBASALTFIBERFABRIC

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ABSTRACT
The objective of this paper is to investigate and compare the compressive, flexural and split tensile strength of basalt fiber reinforced concrete with M30 grade concrete. Fiber reinforced concrete is a most widely used solution for improving tensile and flexural strength of concrete. Basalt fiber adding provides improved properties to reinforced concrete beam and the addition of basalt fiber provides the change mode of brittle to ductile nature of concrete beam. So it will choose as an alternative material for strengthening of beams. Basalt can be used in tubes, bars ,pipes fittings, internal heat and sound insulation of floors, walls, frame walls, boiler shells, tanks, chimneys, fire protection structures, etc due to its strong applications in construction materials. The properties which are considered for the selection of a material in construction sector are good hardness, high mechanical properties, corrosion resistance, extended temperature range and very good insulation properties.

Keywords:*Retrofitting,ReinforcedConcreteBeam,BasaltFiberFabric*

1. INTRODUCTION
Concrete as the most commonly used construction material that is going towards high performance, i.e., high strength, hightoughness, high durability and good workability. Shrinkage and permeability resistance of concrete are two important propertiesrelatingtodurability. Concrete can be modified to perform in a more ductility form by the addition of randomly distributed discrete fibersin the concrete matrix.[2] Specialized technique of strengthening, stiffening and repair are needed to deal with damaged produced byunusual events such as fire, earthquake, foundation movement impact and overload. In this research various tests were conductedto detect the structural behavior of beam with basalt fiber fabric. Fibers are usually used in concrete to control cracking due to plastic shrinkage and to drying shrinkage. They also reduce the permeability of concrete and thus reduce bleeding of water. Some types of fibers produce greater impact, abrasion, and shatter–resistance in concrete.[1]

Basalt is a type of igneous rock formed by a rapid cooling of lava at the surface of planet. BasaltasafiberusedinFRPsandstructuralcompositeshashighpotentialandisgettingalotofattentionduetoitshightemperature and abrasion resistance. Basalt fiber is 3 times lighter &2.5 times stronger in tensile strength than steel.[5]Addition of basalt fiber improves the engineeringproperties of concrete. It is also found to be economical due to its low cost which has resulted in its application in manufacturing a large assortment of high strength, fire-resistant structures. And also it has better properties than other fibers As mentioned below.,15-20% higher elastic power and modulus, Nature-friendly and based on naturally occurring material that starts worldwide and no biological danger, Recyclability, Production cost is very low as a comparison with the other types of fibers. [3]

2. MATERIALSANDMIXPROPORTION
A.Materials: Raw materials required for the concreting operations of present work are cement, fine aggregate and coarseaggregate

B.Cement:Cementisusedasbindingmaterialintheconcretewherethestrengthanddurabilityaresignificantimportant.

C.The ordinary Portland cement of 53 Grades conforming to IS 12269-1987 is used to manufacture the concrete. Also some tests werecontentsuchasconsistencytest,settingtime test and Specific Gravitytest.[4]

Table1:PropertiesofCement

Sno.	Properties	Observed
1	StandardConsistencyTest	31%
2	FinenessTest	6%
3	SpecificGravity	3.17
4	Initialsettingtime	32min
5	Finalsettingtime	582min

STUDY ON APPLICATION OF EVA IN TIME AND COST OPTIMIZATION IN CONSTRUCTION EQUIPMENTS AND MATERIALS

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ABSTRACT

This study examines previous literature on construction projects cost and schedule overruns, with the specific aim of identifying the causes and effects of cost schedule overruns in construction projects in India and optimize those.The primary findings factors from the study revealed that empirical studies have identified a number of important factors which causes projects cost overruns, such as fluctuation of prices of material, cash flow and financial difficulties faced by the contractor, poor site management and supervision, lack of experience and schedule delay. This study further revealed that delay in progress payments, poor communication and financial difficulties by the contractor are among the identified causes of construction projects schedule overruns by previous scholars. Literature also revealed that extension of project, additional cost, budget short fall, adversarial relationship between participants of the project, delayed payments to contractors, poor quality workmanship and dissatisfaction by project owners and consequently by end users as the major effects of cost overruns. This project explores the causes and effects of construction projects cost and schedule overruns and presents background on the theories of construction project cost and schedule overruns and it should be taken care to optimize those cost using EVA (Earned Value Analysis).

INTRODUCTION

Infrastructure projects in India are infamous for delays and cost overruns. Delays in project implementation mean that the people and the economy have to wait for infrastructure facilities longer than is necessary. This in turn limits the growth potential of the economy at large. Services provided by infrastructure projects serve as input for many other sectors of the economy. Therefore, cost overruns lead to an increase in the capital-output ratio for the entire economy. Simply put, delays and cost overruns reduce the efficiency of available resources and limit the growth potential of the entire economy. Therefore, inadequacy of research on the subject is somewhat surprising.

Earned Value analysis is a method of performance measurement. Earned Value is a program management technique that uses "work in progress" to indicate what will happen to work in the future. Earned Value is an enhancement over traditional accounting progress measures. Traditional methods focus on planned accomplishment (expenditure) and actual costs. Earned Value goes one step further and examines actual accomplishment. With clearer picture, managers can create risk mitigation plans based on actual cost, schedule and technical progress of the work. It is an "early warning" program/project management tool that enables managers to identify and control problems before they become insurmountable. It allows projects to be managed better – on time, on budget.

2. EARNED VALUE ANALYSIS –CONCEPT

Earned Value is a program management technique that uses "work in progress" to indicate what will happen to work in the future. EVA uses cost as the common measure of project cost and schedule performance. It allows the measurement of cost in currency, hours, worker-days, or any other similar quantity that can be used as a common measurement of the values associated with project work. EVA uses the following project parameters to evaluate project performance:

- Budgeted Cost of Work Scheduled (BCWS) or Planned Value (PV) – The sum of budgets for all work packages scheduled to be accomplished within a given time period.
- Budgeted Cost of Work Performed (BCWP) or Earned Value (EV) – The sum of budgets for completed work packages and completed portions of open work packages.

Actual Cost of Work Performed (ACWP) or Actual Cost (AC) – The actual cost incurred in accomplishing the work performed within a given time period

STUDY ON MANAGEMENT OF BITUMINOUS ROAD PAVEMENT CONSTRUCTION

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ABSTRACT

The aim of this study was to investigate the MANAGEMENT OF BITUMINOUS ROAD PAVEMENT CONSTRUCTION. The factors were recognized from literature and using these factors questionnaire was organized and it consists of total of 40 factors causing road work. In order to collect data from the respondents, questionnaire method was adopted. The structured questionnaire form was sent to various construction companies through email. This study had been conducted in and around Nammakal district. The study recognized causes of management of bituminous pavement construction . These were design, human, finance, machinery, operation, practice. From the identified dimensions, proposed model had been generated and hypothesis had been assumed. Using the proposed model and hypothesis, statistical analysis had been administered. The statistical analysis includes Correlation, Multiple regression, Factor analysis, Reliability statistics. By identifying the most influential factors causing delay from the statistical analysis, would help the construction industry, suitable remedial measures may be given to minimize the cause and delay in construction.

INTRODUCTION

GENERAL

SuoZhi et al (2012),Conclude that Fatigue crack has been recognized as one of the main forms for structural damage in asphalt concrete pavements. Under the action of repeated vehicular loading, deterioration of the asphalt concrete (AC) materials in pavements, caused by the accumulation and growth of micro and macro cracks, gradually takes place.

P. J. Gundaliya (2016) This paper studied the viability of utilizing lignin as an antioxidant for arresting the aging of the bituminous binder. Oxidation is the primary cause of long-term aging in asphalt pavements. As a pavement oxidizes, it stiffens and can eventually crack. The use of an antioxidant as a performance enhancer in an asphalt binder could delay aging, thus increasing the life of an asphalt pavement. Lignin is highly available and well-studied antioxidant.

K. Aravind, Animesh Das conclude that Mix design for recycled asphalt mix has been performed through Marshall, creep and fatigue tests. The parameters obtained are used in pavement design and the economy in alternative designs has evaluated considering the material cost towards constituent proportion as well as design thickness. Thus, the paper has presented an integrated mix-design-structural-design system for hot recycled asphalt mix.

Rajeev Chandra et al (2012) , They have evaluated the use of two mix design procedures for designing bituminous pavement mixes with foamed bitumen. Mix design was carried out following the South African and Caltrans guidelines. The RAP materials used for mix design were collected from the NH-5, Chennai-Tada section. Using foamed bitumen produced from Wirtgen WLB 10 foaming equipment, a mix with RAP material, virgin aggregate and active filler were produced in the pug mill mixer. Marshall Compaction effort was used for fabricating the samples. Using the indirect tensile strength test on dry and wet specimens, the optimum binder content was determined. It was seen that the two mix design procedure adopted showed different mix constituents despite using the same RAP source.

Montepara A.et al (2012), shows the first results of a research activity undertaken on a test track specifically constructed with the aim to analyze the effect on pavement performance of a sub-base layer mixture with 50% of natural aggregates and 50% of RAP. The investigation is based on LWD and FWD analysis, comparing results with those obtained on the subsequent section of the test track made by only natural aggregate

The above literatures deals about how the bituminous concrete pavement was constructed . Some of the important factors causing bituminous concrete pavement are clearly identified in the above literatures. It is helpful in identifying the factors causing bituminous concrete pavement construction at site.

METHODOLOGY

The methodology of this study is described and explained based on the objectives of the project. This research commenced by reviewing the relevant literatures. This study started by reviewing the literature reviews and interviews from various sites supervisors. From the literature study the factors causing delay in bituminous road construction projects are identified. The factors that are prone to affect companies' productivity are identified from literature reviews and interviews. Based on these factors questionnaire is prepared and survey is conducted to find the top factors that affect the profitability of construction industries.

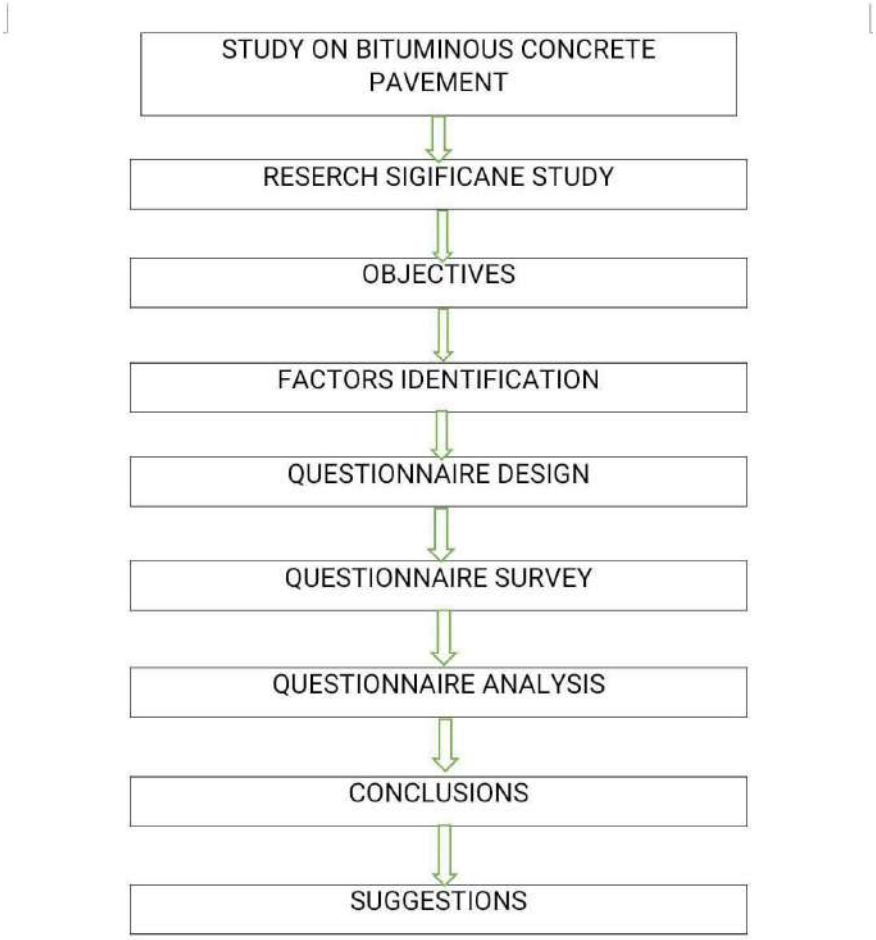

Fig 3.1.Methodology flow chart

FACTORS IDENTIFICATION

GENERAL

Firstly, from in-depth literature studies, fourty causes of delay were identified, grouped into thirteen heads namely Design related delay factors, Financial related factors, Material related factors, Plan related factors, Manpower related factors, Equipment related factors, Contractor related factors, Owner related factors, Government action related factors, Operation related factors, Engineer related factors, Scheduling and controlling related factors, External related factors

IDENTIFICATION OF DELAY FACTORS

Measures for the Optimization and Management of Construction Safety Based on BIM Technology

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Abstract

BIM technology is a kind of new technology application that runs through all kinds of engineering design, construction and follow-up management, and in the course of popularizing and applying the relevant application technology in the past two decades, it has played an important supporting role in promoting the development of China's construction industry. With the continuous improvement of the development depth of related software, BIM technology has also played a great role in the construction safety management of construction. Based on the advantages of BIM technology application, combined with steel structure construction and assembly concrete construction, this paper puts forward the optimization measures of construction safety management, and makes due contribution to the improvement of quality control level in China's construction industry.

1. INTRODUCTION

BIM technology is called building information model technology, its practical application in the field of construction has a long history. With the improvement of its application technology level, BIM technology will fully replace the traditional CAD technology and is widely used in various fields of architecture. In the construction safety management, it is a very necessary work to optimize the construction safety management measures by applying the specific processes such as the preparation and optimization of safety management plan, safety activity monitoring, early warning of safety hazards and evaluation of overall safety work, combined with the actual characteristics of BIM technology. In the process of practical application, BIM technology has the function of visualization, simulation and excellent optimization, which can provide detailed technical support for construction safety management, and deepen the theoretical analysis in this field, which is the inevitable requirement of practical work.

2. THE BENEFITS OF BIM TECHNOLOGY IN SECURITY MANAGEMENT

In the construction safety management work, there are problems in the traditional management mode, such as lack of prediction, poor overall controllability. And the overall work level is more dependent on human factors. There are also shortcomings in the detail, the lack of science and the lack of systematicness in carrying out the work. All of these lead to the overall management inefficiency, safety management accidents are frequent and other phenomena. BIM technology itself has 3D visual function, can simulate the construction link, use the collision function of the software internal to check the construction design plan, the specific application of these functions, can be targeted to solve the shortcomings of the traditional management scheme, effectively avoid the hidden dangers in the construction process, comprehensively improve the level of safety management, better reflect the "people-oriented" safety management concept requirements, but also can better improve the efficiency of construction safety management, improve the economic and social benefits of construction enterprises.The application of BIM technology to various types of construction projects has become an inevitable trend in the development of China's construction industry, from January 2018, China's first detailed national standard of rules applied to the field of construction engineering "Application Standards for Construction of Building Information Models" began to be formally implemented, which also established the guiding direction for the practical application of BIM technology in all construction links of construction.

3. THE OPTIMIZATION OF THE SAFETY MANAGEMENT OF BIM TECHNOLOGY IN STEEL STRUCTURE CONSTRUCTION

3.1. Analysis of the type of steel construction accident

Steel structure is an important type of building construction, under the support of the great potential of industrial and logistics industry development, the steel structure construction market will continue to expand, the construction type is constantly complex, and the resulting construction safety hazards will be more prominent.[1].According to the technical analysis, there are usually several safety hazards in the construction of steel structure. First, the overall support system will collapse or dump, in the steel structure self-weight beyond the temporary support system design load value or support system by external forces, there will be a safety hazard in this regard. Second, the lifting accident, in the building process of steel structure construction, lifting operation is a dynamic process, for the operator's comprehensive quality requirements are higher, in the case of improper operation or processing is not in place, there will be an accident lifting accident.Third, the collision accident, which is also the more common type of accident in the construction process of steel structure construction, the seriousness of the consequences of

EXPERIMENTAL STUDY ON INVESTIGATION OF SAW DUST ASH AND GLASS POWDER AS PARTIAL REPLACEMENT OF CEMENT IN CONCRETE

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ABSTRACT:

The consumption of cement in concrete industries growing day via day. Concrete is the most extensively used development fabric in civil engineering enterprise due to the fact of its excessive structural power and stability. The most vital phase of concrete is the cement. Use of cement on my own as a binder fabric produces massive warmness of hydration given that the manufacturing of this uncooked cloth its large quantity of CO2. The CO2 emission from cement is very unsafe to the environmental changes. The concrete enterprise is searching for supplementary cementitious cloth with the goal of decreasing the CO2 emission which is damaging to environment. The nice way of lowering CO2 emissions from the cement enterprise is to use the industrial via merchandise or use of supplementary cementing cloth such as fly ash, silica fume, noticed dirt ash and met kaolin.

1. INTRODUCTION

There is need for affordable building materials in providing adequate housing for the increasing population of the world. The cost of conventional building materials continues to increase as the majority of the population continues to fall below the poverty line. Thus it is necessary to use a supplementary local material as alternative for the construction of low cost buildings in both rural and urban areas. A huge amount of concrete is consumed by the construction industry. The production of Portland cement is not only costly and energy intensive but it also produces large amount of carbon emissions, the production of cement poses environmental problems due to emissions of gaseous pollutants. The emissions of poisonous gases like CO2, NO etc. by cement production companies have developed the natural environmental pollution and global warming due to the depletion of ozone layer.

2.MATERIALS

In general, concrete is made up of four main ingredients namely coarse aggregate, fine aggregate, cement and water. All of them perform a specific role for making concrete strong and durable.

2.1 CEMENT

Ordinary Portland cement (OPC) was used have Compressive Strength 53 MPa. The cement to be used in construction must have certain given qualities in order to play its part effectively in a structure. When these properties lie within a certain range, the engineer is confident that in most of the cases the cement performance will be satisfactory.

2.2 FINE AGGREGATE

Natural sand with maximum size of 4.75 mm was used (zone II) with specific gravity 2.6 and fineness modulus 2.89.

2.3 COARSE AGGREGATE

Natural aggregates with maximum size of 40 mm were used with specific gravity of 2.7 and fine modulus 7.51. The properties of the coarse aggregate used in a concrete mixture affects the modulus for a few reasons. One property is the modulus of elasticity of the coarse aggregate. A higher aggregate modulus will result in a concrete having a higher modulus.

2.4 SAW DUST

Fine particles of wood made by sawing wood, the small particles of wood or other material that fall from an object being sawed. They are burnt and made as Saw Dust Ash.

2.5 GLASS POWDER

Glass Powder is made by crushing of waste glass materials. The replacement of glass powder decreases the unit weight as well as the porosity as indicated by the decrease in water absorption.

2.6 WATER

Water is an important ingredient of concrete as it activity participates in chemical reaction with cement to form the hydration product, calcium-silicates-hydrate gel. The strength of concrete depends mainly from the

STUDY ON BEHAVIOR OF CONCRETE WITH ARTIFICIALSUBSTANCEANDMETALLURGICALSLAGS

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Abstract

Constructionindustrydesiresgreatermaterialandelectricityresources. Amongall,concreteoccupies70%ofthesubstancesandsuggestsasizable impact. With increasing scarcity of river sand and natural aggregate throughout the country, construction quarter is underneathhigh-quality pressuretodiscoverchoicetothesebasicconstructionclothtomeetthe developingneedsofinfrastructuredemands.Mortaristheregularbinding fabric used in construction field for masonry and plastering works. The utilizationofsandalternativesubstancesisproperlyaccepted,seeingthatit leadstoseveralfeasibleimprovementsintheconcretecomposites,asproperly as the overall economy. Fayalite slag is one of the substances which isregardedasaby-productinthemanufacturingtechniqueofFayaliteSlag.The foremostgoalofthispaperistouseFayaliteslagasapartialreplacementof sandduetothefactitresemblesthecharacteristicsofsandandalsowehave found an alternative approach to dispose the waste generated in the industries.

KEYWORD:*Fayalite slag, Mortar, polypropylene fibers*

1. INTRODUCTION

InIndia,nowadayitisverychallengingtroubleforhandyof pleasantaggregate.Naturalsourcesaredepletingglobal whilst at the equal time the generated wastes from the enterprise are growing sustainability. The sustainable development for development entails the use of non-conventionalandprogressivesubstancesandrecyclingof wastesubstancesinordertocompensatethelackofherbal sources and to discover choice methods conserving the environment.Fayaliteslagisoneofthesubstancesthatis regarded as a waste cloth which could have a promising futureinthebuildingenterpriseaspartialorreplacementof either cement or aggregate. It is a derivative bought throughoutthemattesmeltingandrefiningofFayalite.To produceeachandeverytonofFayaliteabout2.2-3.0lotsof Fayaliteslagisgeneratedasaspinoffmaterial.Concreteis regarded to be a surprisingly brittle material, so it is susceptible to cracking. Many investigations have been carriedoutinordertoovercomethisproblem.Theinclusion ofsufficientfiberswillenhancetensilepowerandductility. Someoftheimportantconsequencesoffibersinconcrete are: growing the tensile strength, preventing the crack improvementandgrowingthesturdinessofconcrete.

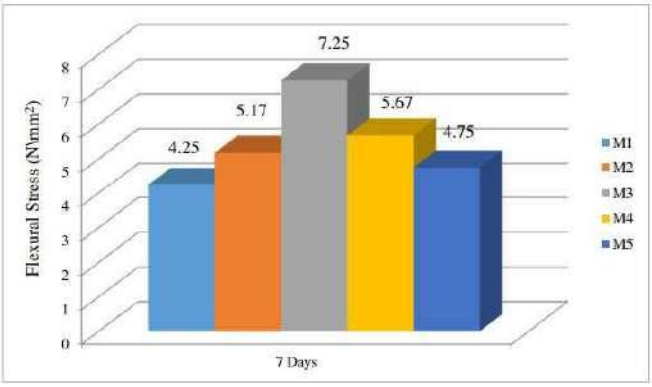
2. MATERIALPROPERTIES

Table 2.1 Fineness Modulus of Coarse Aggregate

S. No	Size of Sieve (mm)	Weight of % Retained (kg)	Cumulative % of Weight Retained	Percentage of Finer
25	0.220	11.3	88.7	
2	20	0.985	61.9	38.1
3	16	0.490	87.1	12.9
4	12.5	0.095	92	
5	10	0.075	95.9	4.1
6	4.75	0.08	100	0

Graph 2.1 Size Distribution of Coarse Aggregate

4.4 FLEXURAL STRENGTH OF CUBES



5. RESULTCOMPARISION

Thestrengthparametersobtainedforeachmixesattheend of 7, 14, 28 days were compared with conventional specimens strength and the strength differences were tabulated. Theresultsrevealedthattheuseoffayaliteslagandfibreleadstotheenergysustainableproductwithhigherstrength and thus reduces the cracks while applying the load gradually.

6. CONCLUSION

Based on the analysis of experimental results and discussions there upon the following reasons are made. For40%replacementoffineaggregatewithfayaliteslagat watercementratioof0.45,thereplacementoffineaggregate withfayaliteslagincreasesthestrengthuptoanoptimumof 40%andbeyondthispercentagethestrengthdecreases. Whileaddingthefayaliteslagthecompressivestrengthis increasetothemaximumof50%.

Normally the concrete is brittle in nature. In order to overcomethatthefibersareaddedindifferentproportions like0.5%,1%,1.5%forthevolumeofcementwith40%of fayaliteslag.

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INVESTIGATION OF STRENGTH OF PARAMETERS OF FIBER REINFORECD GEOPOLYER CONCRETE USING BOTTOM ASH

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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 bottom ash as one of waste material in coal combustion industry as a replacement for ordinary Portland cement in concrete. The uses of bottom ash could reduce the carbon dioxide emission to the atmosphere, redundant of bottom 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 has been 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. Keywords: Bottom Ash, NaOH, Na_2SiO_3.

INTRODUCTION

Concrete is a major resource made by human kind for a developing civilization and has become the necessity for today's world. The main component of concrete being used is cement. Cement carries an important role since it is the binding material and its hydrating formula holds the concrete to give the desired strength. Although it has advantages in most of the parameters, it carries a huge disadvantage of carbon emission. In recent years carbon emission due to cement production released around 8% of the global total where more than half was from calcinations process. Meanwhile, the growth of the coal-fired power plant industries produce greater amount of flue gases such as fly ash and bottom ash as waste products. Subsequently the use of such supplementary products along with silica fume, rice husk ash, granulated furnace slag and metakaolin etc. in Portland cement is a step towards sustainability which reduced carbon emission over the last few years. This transition is now evolved into Geopolymer it is a binder with no cement. One such natural fibre used in this research is Sisal Fibre. It is a renewable, easily available and cheap. It has also exhibited good tensile strength and can significantly improve the performance of concrete. It is easily cultivated. Sisal is a hard fibre extracted from the leaves of the sisal plant (Agave sisalana). These fibres have a good tension resistance. They have good resistance against heat. The chicken mesh is usually used same as the reinforcement of the concrete. It strengthens against the additional external force that gives a risk for shrink and movement cracks. Thus, using mesh here is to plaster around the fiber ropes which are confined around the cracked members. Mesh is being selected because of its reinforcement property and wide usage as plasters. This system of confinement and plastering over the cracked members acts as retrofitting.

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 bottom ash based geopolymer concrete composite specimen is ash along with other material such as coarse and fine aggregates, alkaline activator solution, steel fibers, and water.

2.1 BOTTOM ASH

Bottom ash is part of the non-combustible residue of combustion in a power plant, boiler, furnace or incinerator. In an industrial context, it has traditionally referred to coal combustion and comprises traces of combustibles embedded in forming clinkers and sticking to hot side walls of a coal-burning furnace during its operation. The portion of the ash that escapes up the chimney or stack is, however, referred to as fly ash. The clinkers fall by themselves into the bottom hopper of a coalburning furnace and are cooled. The above portion of the ash is also referred to as bottom ash.

2.2 ALKALINE SOLUTION

The laboratory grade for sodium hydroxide (NaOH) is in the flakes form and sodium silicate (Na2SiO3) solution is used as alkaline activators. With about 98% purity, NaOH flakes are dissolved in water before it mixed together with the activator solution. The concentration of sodium hydroxide is fixed at 12M also the ratio of NaOH/Na2SiO3 at 2.5.

2.3 AGGREGATE

The formulation of geopolymer concrete also need aggregates that consists of fine and coarse aggregates to occupy the largest volume about 75% to 80% by mass. Available fine aggregates from river sand are used and the coarse aggregates came from crushed stones with nominal size of 5 mm and the maximum