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INVESTIGATION ON PARTIALLY REPLACEMENT OF FLY ASH OR GGBFS IN PREPACKED AGGREGATE CONCRETE

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Abstract: Two-stage concrete is a simple method; it is made using the same basic as traditional concrete: cement, coarse aggregate, sand and water as well as mineral and chemical admixtures. The main advantage of the method are low heat of hydration, high compressive strengths, economic savings, practically no mass shrinkage and low coefficient of thermal expansion, excellent bond to existing structures. The Fly ash and GGBFS are the waste material which is produced in cement industry or thermal plant and steel plant. The waste creates many environment dust problem in now a day to day society. So, these waste materials are used to replace with cement that result to make economical cost. The preplaced-aggregate concrete is the unique method for use in the construction of structure to give the high strength and more workability by the use of polyheed plasticizer respectively .The plasticizer can use to reduce the water content in the concrete. It added a new dimension to the application of admixture for the production of high strength and flow able concrete. The Fly ash or GGBFS are the waste materials which are replacement with cement. The Fly ash or GGBFS replacement with cement.

Keywords: Fly Ash, GGBFS, Ordinary Portland cement (OPC), Coarse Aggregate, Fine Aggregate

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INTRODUCTION

The Preplaced Aggregate method was introduced in 1940 in an application for a U.S patent by Mr. L. S. Wertz. It is referred to generically as Preplaced Aggregate Concrete or PAC. The term describes a method of placing concrete, rather than a particular type of concrete. Conventional concrete is prepared by mixing together all the ingredients and pouring the mixture into a form. PAC is produced by placing clean, course gap graded aggregate into the form and injecting a flowable mortar of cement, fly ash, sand, water, and a non-shrink admix into the voids of the aggregate mass where it hardens to form concrete.

Normal cement /sand grout exhibits setting shrinkage which would result in the formation of pockets of bleed water beneath the aggregate particles or adjacent surfaces. To overcome this condition, a non-shrink admixture is required for PAC grouts which is generally known as a grout fluidifier. These admixes contain a specially selected aluminium powder which reacts with the alkalies in Portland cement to release hydrogen gas causing the grout to expand insuring intimate contact with the aggregate particles. The grout fluidifier also contains buffering chemicals to cause the properly timed expansion of the grout, all of which should occur within a maximum of about four hours at normal temperature and 70% to 80% at one hour. Maximum expansion is normally in the range of 8% to 12%.

Grout fluidifiers also normally contain a water reducing agent which tends to improve grout fluidity without increases in the water cement ratio.

The grout will also contain pozzolanic quality fly ash which reacts with the free lime released during the hydration of the Portland cement to form additional, insoluble, strength producing compounds. The pozzolan also acts as a retarder which tends to improve the grout fluidity.

Objectives

- By this method to eliminate the segregation problem.
- To improve the workability and strength of the concrete.
- To improve the workability of concrete with fix water/cement ratio and changing the Dosage of admixture content to get best results for the proportion of admixture.
- To check the relevance between cement and admixture, to find the optimum content Of admixture require for the cement. (OPC).
- Use of waste material such as Fly ash and GGBFS to reduce the cost.

Procedures

- The placement method is particularly well suited to use in areas heavily congested with reinforcing steel or embedded items. Even if complete filling with aggregate cannot be achieved, grout completely surrounds and bonds to these embedment.
- Frist we placed aggregate, then we replaced the fine aggregate partially coarse aggregate.

- Then we prepare the cement slurry.
- In the slurry, we took cement, add some water and then we add plasticizers here grade of cement is M25.
- Thus the slurry of cement is prepared.
- Grout is normally injected thought high pressure injections hoses. Vent pipes may be required to permit escape of air and water from the enclosed spaces. Grout may be injected either horizontally through the side of the sheeting or through vertical created by bush hammering or by removing surface mortar with the aid of water blast of sand blast to produce exposed aggregate concrete.

LITERATURE SURVEY

Modification of grout Properties in Prepacked Aggregate Concrete Incorporating Palm Oil Fuel Ash.

Prepacked aggregate concrete (PAC) is a type of concrete that is placed in two stages where the coarse aggregates are first placed inside the formworks and then the grout is pumped from underneath through a manual pump. Grout properties including density, grout consistency, bleeding, and compressive strength are of great importance in PAC. Such properties could be improved by application of pozzolanic materials like palm oil fuel ash. This paper is aimed at finding the most optimum percentage of POFA replacement by weight of cement. It was concluded that 30% POFA replacement yielded the most optimum results. It was concluded from this study that the packing effect of the cement paste with POFA increased with an increase in POFA fineness.

Therefore, the compressive strength of grout with POFA increases with respect to increased packing effect. Moreover, the grout properties including density, grout consistency, bleeding, and compressive strength were significantly improved using POFA where replacement of 30% POFA by weight of cement yielded the most optimum grout properties in addition to financial benefits in terms of reduced cement consumption.**(Reza Hodjati, Hossein Aslani, Iman Faridmehr, A. S. M. Abdul Awal, and ZibaKazemi et. al. June 2015)** Prepacked aggregate concrete is two stage placing method first coarse aggregate is placed and then cement slurry filled up. Here grouting process has advantages that there is no bleeding problem and there is no segregation problem. Palm oil fuel ash is a pazzolonic material which is a by-product of burning palm oil husk and palm kernel shell in palm oil mill boilers. Advantage of using the pozolanic material pofa is attributed to its environmental hazards. Super plasticizer is used which improves the workability of the grout along with reducing the water/ cement binder. Effect of this improves the durability by using palm oil fuel ash will result in improvement in packing effect. In this method density grout consistency, bleeding and compressive strength is improved .30% of palm oil fuel ash is used so it would be beneficial in cost wise. Reduced bleeding problem and also improved cracking resistance.

Use of preplaced casting method in lightweight aggregate concrete

This study addresses the use of preplaced casting method in lightweight aggregate concrete (LC) to provide a new perspective to solve the aggregate segregation. In casting preplaced lightweight aggregate concrete (PLC), the lightweight aggregates are cast into formworks and then fresh grout is injected to fill voids. PLC and conventional lightweight aggregate concrete (CLC) with three different mixtures are compared to observe the degree of segregation. The properties of PLC and CLC are characterized by means of cubic and axial compression, The increase of shrinkage is approximately 13% for the CLC and 6% for PLC when w/c ratio ranges from 0.4 to 0.5 due to effect pointer locking. PLC shows an increased tendency in elastic modulus by approximately 2.5% of 0.5 w/c ratio, 2.7% of 0.45 w/c ratio, and 3.3% of 0.4w/c ratio at the age of 28 days compared with CLC. In conclusion, PLC has significant reduction in the weight on the premise that it shows excellent mechanical properties. In this method casting procedure is held in two stage. Here first light weight aggregate is placed. Then grouting is done**(Qiang Du, Qiang Sun, Jing Lv, Jian Yang et. al. march 2017)**Here light weight aggregate are used which has low compressive strength. Aggregate irregular in shape which gives weak strength round shaped aggregate provide 20MPA strength Therefore this method can be applied for non-structural elements

Experimental investigation on partial replacement of coarse aggregate by ceramic

Natural sand is a standout among the most ordinarily utilized fine aggregate as a part of concrete. Owning to acute shortage of natural sand in many areas and keeping environmental and cost factors into consideration an alternative for the same is pondered. View of above discussion, **(Prashant Kumar Sharma[1], Dr. Shilpa Pal[2], Dr. Jaya Maitra[3] et.al. January 2018)** As per the work find at 20% replacement of fly ash with cement can be achieve highest compressive strength in 28 days as per design. By the replacement of fly ash with cement of 20% at 28 days give 6.93%more strength than conventional concrete. The replacement of 10 to 40% of fly ash with cement cam increase the workability of concrete. At 40% replacement of the fly ash can be achieved maximum workability .Fly ash can be replacement with cement can also reduce the bleeding problem and give good surface appearance. The Specific Grouting of ceramic waste is 2.15 which is 18.25% lower than the special gravity of coarse aggregate. So the use of ceramic waste can be reduced the dead weight of structure. Maximum compressive strength achieve when the 20% fly ash is replaced and 10% ceramic waste with coarse aggregate but if the use of more than 10% crushed ceramic it can reduce the strength. By usage of waste like fly ash & crushed ceramic can reduce the pollution in environment and it will be better for the sustainable development

Effect of Quantity of Sand on the Compressive strength of two stage concrete

Traditional concrete is made by mixing all the ingredients in a mixer. Then the mixed concrete is placed in a formwork. Two-stage concrete is constructed by first placing the course aggregate into 30 X 30 X 30 cm moulds and then grouting the voids of the course aggregate with a special grout mixture **(H. S. Abdelgader (Libya)*Dec1996)** this method super plasticiser type betoplast 1 (Product of Poland) was used for all mixes. Fine aggregate are used, here it is replaced with coarse aggregate. The main strength is transferred through coarse aggregate, using sand it will improve the packing effect. It's test in compression showed numerous cracks formed around the surface. It was also noted that large portion of failure occurred due to the aggregate portion.

CONCLUSION

Two stage (Pre-Placed aggregate) concrete is produced by placing coarse aggregate in a form and later injecting a cement-sand grout, to fill the voids between aggregate particles. For economical and technical reason two stage concrete is particularly used for construction and repair of mass structures, especially foundation, underwater constructions, and in all kinds of constructions with closely spaced reinforcement. In this study we are trying to replace cement and fine aggregate by the optimum replacement by fly ash by conducting compression and flexural tests.

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