JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

" EXPERIMENTAL STUDY OF MECHANICAL AND DURABILITY PARAMETERS OF SUSTAINABLE CONCRETE"

- **Niranjan Hajare**
- **Niraj Bhoite**
- **Abhishek Dawbhat**
- **Shrihari Lande**
- **Mr. Pravin Gorde**

ABSTRACT :

- Our projects aim to make sustainable concrete. To alleviate the scarcity of drinking water, sea water can be used in the construction for mixing and curing, with sea sand replacing river sand, and GGBS and Fly ash as supplementary cementitious materials, resulting in a sustainable concrete that can be used in societies where fresh water is scarce. In this research, the mechanical properties such as Compressive strength, Flexural strength, Split Tensile strength of the specimens were investigated. This study also looked at the specimens' durability properties, such as the Rapid Chloride Penetration Test. Fromprevious literature reviews, the use ofsea water is likely to enhance the strength growth of the concrete at early stages due to the high chloride content in sea water.According to most research, seawater concrete has a much higher 7-day compressive strength, a comparable 28-day compressive strength, and a later drop in long-term compressive strength than regular concrete. In this research, the specimen comprised of Ordinary Portland Cement (OPC 43 grade) with other binding materials like Ground Granulated Blast Furnace Slag (GGBS), Fly Ash, sea sand and river sand which were subjected to wetting drying cycles. The concrete specimen consists of 50% cement, 25% GGBS, 25% Fly Ash as binding material, 50% river sand and 50% sea sand as fine aggregates and gravels as coarse aggregate. The specimen was casted and cured in both tap water and sea water for 7 days, 28 days, 56 daysand the results for the tests were noted.

KEY WORDS :

- Fly Ash , Sustainable Concrete , Ground Granulated Blast Furnace Slag

INTRODUCTION:

- The demand of concrete has increased rapidly due to robust growth in construction industry. More recently, construction activities have expanded to coastal areas as a result of land reclamation projects in countries having limited land. θ In this connection, immense amounts of concrete ingredients, especially sand and freshwater, are consumed which can eventually lead to gradual

resources depletion unless new sources are found. Furthermore, these material resources are not locally available and the necessary transportation cost has incurred extra project expenses. A more economical and innovative solution is to use marine sand and seawater as replacing materials, since they are abundant in coastal region.)

- Demand for manufactured sand as fine aggregates for making concrete is increasing day by day as river sand cannot meet the rising demand of construction sector. Because of its limited supply, the cost of Natural River sand has sky rocketed. Under this circumstances use of manufactured sand becomes unavoidable. Therefore studying the differences in properties of both river and sea sand will give an idea whether sea sand can be altered in such a way that it can be used as a substitute for the depleting river sand. The discussions presented in this paper have clearly indicated that sea-sand and sea-water structures are most attractive in marine/coastal construction, where steelcorrosion is a major concern and access to river sand and freshwater is limited while sea-sand and sea water are locally available. Most existing research has focused on the effect of chloride ions in sea-sand and seawater on the properties of the resulting concrete, but there has been very limited research on the effects of other chemicals on the short- and long-term properties of concrete, such as the effect of SO42- in sea water on the performance of SSC. Much more research is needed in this area. More research is needed to gain a fuller understanding of this durability enhancement mechanism in SSC which has a much higher chloride ions content than ordinary concrete.
- Sand is a resource which needs to be mined, be it within the ocean or on land. Sand and gravel are regarded as the most extracted materials in the world. The large demand for sand has led to illegal sand mining practices by the 'sand mafia', which remains unregulated as governing bodies fail to enforce environmental policies .The earth's surface is covered by approximately 71% water, of which 96.5% of this water is within the oceans and only 2.5% is considered freshwater, with less than 0.8% of the freshwaterconsidered accessible drinking water .The recent increase in urbanisation has contributed to Climate Change. Climate changes are evident by the rise in the average global land and sea temperature), which has resulted in risingsea levels, widespread reduction of snow and ice cover, changes in atmospheric and ocean circulation, and changes to regional weather patterns, influencing seasonal rainfall conditions
- Demand for manufactured sand as fine aggregates for making concrete is increasing day by day as river sand cannot meet the rising demand of construction sector. Because of its limited supply, the cost of Natural River sand has sky rocketed. Under this circumstances use of manufactured sand becomes unavoidable. Therefore studying the differences in properties of both river and sea sand will give an idea whether sea sand can be altered in such a way that it can be used as a substitute for the depleting river sand. The discussions presented in this paper have clearly indicated that seasand and sea-water structures are most attractive in marine/coastal construction, where steel corrosion is a major concern and access to river sand and freshwater is limited while sea-sand and sea water are locally available. Most existing research has focused on the effect of chloride ions in sea-sand and seawater on the properties of the resulting concrete, but there has been very limited research on the effects of other chemicals on the short- and long-term properties of concrete, such as the effect of SO42- in sea water on the performance of SSC. Much more research is needed in this area. More research is needed to gain a fuller understanding of this durability enhancement mechanism in SSC which has a much higher chloride ions content than ordinary concrete.

➢ LITERATURE:

TITLE - Mechanical and durability performance of marine sand and seawater concrete incorporating siliconmanganese slag as coarse aggregate.

AUTHOR: Matthew Zhi Yeon Ting, Kwong Soon Wong , Muhammad Ekhlasur Rahman, Meheron Selowara Joo.2020

- Demand for manufactured sand as fine aggregates for making concrete is increasing day by day as river sand cannot meet the rising demand of construction sector. Because of its limited supply, the cost of Natural River sand has sky rocketed. Under this circumstances use of manufactured sand becomes unavoidable. Therefore studying the differences in properties of both river and sea sand will give an idea whether sea sand can be altered in such a way that it can be used as a substitute for the depleting river sand. The discussions presented in this paper have clearly indicated that seasand and sea-water

structures are most attractive in marine/coastal construction, where steel corrosion is a major concern and access to river sand and freshwater is limited while sea-sand and sea water are locally available. Most existing research has focused on the effect of chloride ions in sea-sand and seawater on the properties of the resulting concrete, but there has been very limited research on the effects of other chemicals on the short- and long-term properties of concrete, such as the effect of SO42- in sea water on the performance of SSC. Much more research is needed in this area. More research is needed to gain a fuller understanding of this durability enhancement mechanism in SSC which has a much higher chloride ions content than ordinary concrete

- Amry Dasar , Dahlia Patah , Hidenori Hamada , Yasutaka Sagawa , Daisuke Yamamoto , investigated that in some cases, seawater may be the only mixing/curing agent available; as a result, conditions for its use in concrete constructions must be optimised. The suitability of saltwater as a mixing and curing agent in 4-year-old mortar cement specimens is investigated in this study. Unlike earlier research, the long-term performance of reinforced mortar specimens exposed to seawater was the focus of our research .Ordinary Portland cement (OPC) and big granulated blast furnace slag (GGBFS), were among the samples as well as reinforced concrete with plain steel, epoxy-coated, or stainless-steel bars, were tested. In the laboratory, wetting–drying cycles (mimicking tidal/splash zones), and corrosi on Electrochemical techniques were used to assess it .The results indicate that the effect of s eawater on corrosion activity is considerably higher as a curing agent than that as a mixing agent. Further, GGBFS exhibited better performance than OPC; similarly, epoxy-coated an d stainless-steel bars exhibited better corrosion resistance than plain steel bars. The results o btained in this study highlight the need to study the application of seawater in concrete mixing.
- Tina Jose , Basil Mathew , Geena Johny, Melvin Paul Benny, Sharon Rejiin their paper highlights the study of using sea-sand and sea-water in concrete construction in replacement of fresh water and river sand. Presence of chloride and sulphate in sea sand and sea water was compromised by using a combination of fly ash, blast furnace slag cement and chemical admixture, which in turn helps to increase the strength, workability and durability of concrete. In recent years, due to the increasing scale of engineering construction and the increasing shortage of river sand resources, people have turned their attention to abundant sea sand resources. However, sea sand are not allowed to be used directly without any treatment because of the excessive chloride ions they contain. This project includes studies on the effects of using sea-sand and seawater as raw materials of concrete on the properties of the resulting concrete, including its workability, short and long-term strength as well as durability. From the existing research, the concrete made with sea-sandand seawater evelops its early strength faster than ordinary concrete, but the former achieves a similar long-term strength to the latter. The combination of mineral admixtures for the concrete and reinforcement with anticorrosive measures can effectively solve the durability problem associated with the abundance of chloride ions in sea-sand seawater concrete (SSC)

➢ CONCLUSION:

- We have reviewed above literature and as per design we are going to cast beams.

➢ REFERENCE:

- Tanaz Dhondy, Alex Remennikov & M. Neaz Shiekh, Benefits of using sea sand and seawater in concrete: a comprehensive review
- Matthew Zhi Yeon Ting, Kwong Soon Wong , Muhammad Ekhlasur Rahman, Meheron Selowara Joo ,Mechanical and durability performance of marine sand and seawater concrete incorporating silicomanganese slag as coarse aggregate
- Shanmuganathan.N , Akbar Basha.S , Sheikibrahim.K , Mohammed fahad.A.S , Ground Granulated Blast Furnace Slag (Ggbs or Ggbfs) and Fly Ash (Fa) in Concrete – A Study Report
- ASTM C150, Standard specification of Portland cement. 2012, American Society for Testing and Materials: West Conshohocken, PA.
- ASTM C39, Standard test method for compressive strength of cylinderical concrete specimens. 2012, American Society for Testing and Materials: West Conshohocken, PA.

- ASTM C496, Standard test method for splitting tensile strength of cylindrical concrete specimens. West American Society for Testing and Materials 2012 Conshohocken, PA
- ASTM C642, Standard test method for density, absorption and voids in hardened concrete.2012, American Society for Testing and Materials: West Conshohocken, PA.
- ASTM C1585, Standard test method for measurement of rate of absorption of water by hydraulic-cement concrete. 2012, American Society for Testing and Materials: West onshohocken, PA.