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A Review on Performance of Utilization of Granite Waste In A Fly Ash Based Self Curing Concrete

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Abstract
Concrete, in construction is a structural material consisting of a hard, chemically inert particulate substance, known as aggregate (usually sand and gravel), that is bounded together by cement and water. Concrete need a curing period for a minimum of 28 days to achieve its desired strength and mechanical properties. Curing is the maintenance of satisfactory moisture content and temperature in concrete for a period of time immediately following placing and finishing so that the desired properties may develop. Any negligence in curing will poorly affect its strength and durability. Self-curing concrete is one type of concrete, which cure itself by retaining water in it. Self curing concrete is mainly used in areas where there is an acute scarcity of water and the application of water curing is not possible for economic reasons .This study uses self curing agent (PEG)Polyethylene Glycol with fly ash as partial replacement of cement and granite waste as partial replacement of fine aggregates and to see the strength variations.
Keywords: *Polyethylene Glycol ,Self-curing concrete*

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I. INTRODUCTION

Concrete in which mixing water is restricted by means of some chemical compounds, to go out from the concrete body is known as "Self curing concrete". Self curing concrete is mainly used in areas where there is an acute shortage of water and the application of water curing is not possible for some reasons. It increases water retention capacity of mix. So many researchers have studied about the usage of Self curing concrete. Self curing concrete reduces the shrinkage , avoids micro-cracks in the concrete structure which increases the strength of concrete and reduces the permeability.

Fly ash in concrete is the fine powder formed from the mineral matter in coal , it improves workability of plastic concrete, and the strength and durability of hardened concrete. Fly ash use is also cost effective. When fly ash is added to concrete, the amount of Portland cement may be reduced. It improves workability, decrease water demand , reduce the heat of hydration etc.

Granite waste is an industrial side-effect obtained from crushing of granite stone and granite stone polish manufacturing in a powder form. It is also generated from recycling marble tops, terrazzo, granite pavers, and stone scraps . If left on its own and is not properly collected and stored, the fine granite powder can be easily be airborne and will cause health problems and environmental pollution. Recycling of granite waste will prevent these wastes from ending up in landfills and provides affordable, easy usable, eco-friendly, solid stone for various purposes. The highlight of using this is to reduce the cost ,and also to reduce the harmful impact to surrounding environment .By using granite waste, compressive strength of concrete is being improved.

II. LITERATURE REVIEW

Different studies were done in the field of self curing concrete and a few of them are listed below. Many researchers found that self curing concrete is an effective replacement to conventional concrete.

M.V.Jagannadha Kumar M. Srikanth , K. Jagannadha Rao [1],The present study involves the use of shrinkage reducing admixture polyethylene glycol (PEG 400) in concrete which helps in self curing and helps in better hydration and hence strength. In the present study, the affect of admixture (PEG 400) on compressive strength, split tensile strength and modulus of rupture by varying the percentage of PEG by weight of cement

from 0% to 2% were studied both for M20 and M40 mixes. It was found that PEG 400 could help in self curing by giving strength on par with conventional curing. It was also found that 1% of PEG 400 by weight of cement was optimum for M20, while 0.5 % was optimum for M40 grade concretes for achieving maximum strength without compromising workability.

Basil M Joseph [2], In this study self-curing concrete with PEG400 as self-curing agent. M20 grade of concrete was adopted for investigation , 0 – 1.5% of PEG400 by weight of cement was added and was found that 1% of PEG400 by weight of cement was optimum for M20 grade of concrete to obtain maximum strength. It was also found that with the increase in dosage self-curing agent PEG resulted in an increase in slump as well as compaction factor.

Mohammed Shafeeque , Sanofar .P.B , Praveen. K.P, [3], The aim of the study was to find about the strength properties of concrete using water soluble Polyethylene Glycol as the self-curing agent. The function of self-curing agent is to reduce the water evaporation from the concrete, and hence they increase the water retention capacity of concrete compared to the conventionally cured concrete. The use of self-curing admixtures is the very important from the point of view that saving of water is a necessity in every day .In this study, compressive strength and split tensile strength of concrete containing self-curing agent is investigated and compared with those of the conventionally cured concrete. The workability tests, it was found that self curing concrete has maximum workability at 1% application of PEG . Strength of self-curing concrete is on equal with conventional concrete.

Subrahmanya Pavan Kumar, T. Naresh Kumar , Dr. S. M. V. Narayana [4], In the study replacement of fly ash in cement with 10%,15%,20%,and 25%. It is found that replacement of fly ash by 20% gives more strength and durability when compared to other percentages. The present study self-curing agents such as polyethylene Glycol (PEG) and super absorbent polymer (SAP) are used individually with fly ash in concrete. And grade of concrete is M30 is used in this work. The main aim of this work is to study the mechanical properties of concrete with SAP&PEG. M30 grade of concrete is considered as reference mix and strength properties of reference mix are determined. The use of self-curing agents percentages of PEG (1%,1.5%,2%,2.5%) and SAP (0.2%,0.3%,0.4&0.5%) by weight of cement are added separately in the reference mix. Finally strength properties are studied and compared to normal concrete .As the percentage of self-curing agents is increased in concrete, its workability also increases. The optimum dosage of PEG for maximum strengths (compressive , split tensile, flexural)was found to be 1.5% for M30 grade of concrete. The optimum dosage of SAP for maximum strengths (compressive , split tensile ,flexural) was found to be 0.3% for M30 grade of concrete . Self-curing concrete gives more strength than normal concrete. And PEG gives slightly more better strength than SAP.

Jakkam Snehavi , A. Yashwanth [5],Self-curing concrete of M30 grade were cast by replacing fine aggregate with 50% quarry dust and by varying quantity of fly ash and silica fume by 5%, 10%, 15%, 20%,25%. In this study, compressive strength, split tensile strength of self-curing concrete with optimum were obtained. Compression strength of concrete test on cubes at different replacements of fly ash and silica fume for 28 days increased. Split tensile strength of concrete test on cylinders at different replacements of fly ash and silica fume for 28 days increased. Compare to silica fume the fly ash has more compression.

Supriya Tripathi, Chandni Patel, Rishabh Yadav [6], In this study review , the partial replacement of fine aggregate (River sand) with granite powder is made. A constant water cement ratio of 0.45 is used. M25 grade of concrete is used . Two control specimens are used ,one with 0% of granite powder , 0% of Super Absorbent Polymer(SAP) along with River sand, cement and another specimen with 5% of granite powder , 0% of Super Absorbent Polymer(SAP) along with river sand and cement. The granite percentage is varied in steps of 5% from 0% to 25% and their mechanical properties (compressive strength and split tensile strength) are found. The obtained result is compared with these control specimens .Compressive strength of concrete increases with increase in granite powder content from 5% to 25% .The Strength of concrete is achieved on 15% of granite powder which is higher than target strength of 31.6 N/mm2. So from this experiment, the strength parameters were improved in self cured concrete.

S.Sebastin , Chandni Patel, Rishabh Yadav [7], The concrete mix made utilizing granite powder as partial substitution of sand showed greater workability and smoothness compared to ordinary concrete mixes. Compressive strength of concrete increases with increase in granite powder substance from 5% to 25 . The Quality of concrete is accomplished on 15% of granite powder which is higher than target strength of 31.6 N/mm^2. Maximum tensile strength is accomplished at 20% of stone powder. Thus from the test, the strength parameters were improved in self cured concrete than that compared to water cured concrete.

R.Mugilan , Mrs S.Seyemala [8], They studied the effect of self curing material on concrete fly ash mixture and evaluated its results and concluded that , Fly ash increases the workability of concrete, last strength and robustness just as it solves other problems properly. Higher compressive concrete strength with a 1% PEG4000 level strength. The compressive strength can be achieved at 28 days with an added value of 0.5%, 1% and 1.5%, respectively PEG-4000, in conventional concrete, within 7 days , use of PEG-4000 often results in

increased working ability and flow ability of the concrete and is a better option to form an internally cured concrete which does not require any external curing water without compromising with its strength.

II. CONCLUSION

From the evaluation of the above literature review we conclude that , strength properties, such as compressive strength was evaluated. Compressive strength of self-cured concrete for dosage of 1% of PEG was higher than water cured conventional concrete. At the places of water scarcity, these types of agents will give a better result. The use of Fly ash as a partial replacement of cement increases the workability of concrete and also reduces the construction cost with efficient utilization of industrial waste The workability increased substantially with the increase of granite waste content in the concrete mixture as fine aggregate due to the low water absorption and glassy surface while compared with fine aggregate in concrete .Hence this concrete shall be effectively used in water scarce areas and can lead to good results.

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