International Journal of Scientific Engineering and Applied Science (IJSEAS) – Volume-3, Issue-11, Nov 2018
ISSN: 2395-3470
www.ijseas.com

Comparative Study On Partial Replacement For Fine Aggregate By Using Steel Slag And Weld Slag In Concrete – Review Paper

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ABSTRACT:

This document studies the partial replacement of fine aggregate by steel slag and weld slag in concrete and improving the mechanical properties of the slag waste. Stainless steel is currently one of the most dynamic sectors of the manufactured industry due to a large increase of the use of these products in the construction and industrial sectors, and considerable amounts of waste are generated from the factories. it will cause the environmental problems. The flux is used to cover the weld joints and to protect welding operations from atmospheric contamination, and is converted into slag which is thrown out as waste. In this material are used to investigate the impact of fresh and hardened properties of the concrete when the natural coarse aggregate is replaced with steel slag and weld slag in concrete. mechanical properties are indicates to improvement of compressive strength, flexural strength, and modulus of elasticity of concrete at the age 28 days respectively.SEM analysis and rapid chloride penetration test, Sorptivity tests indicate dense microstructure and enhanced the durability.

Keywords: Scanning Electron Microscope, polypropylene fibre, Steel slag, Weld slag

1.0 INTRODUCTION:

Steel slag was existed as by product during melting of steel scrap from impurities and fluxing agents, which form the liquid slag floating over the liquid crude iron or steel in arc or induction furnance, or other melting units. In this investigation to determine the physical and chemical properties of steel slag and weld slag in concrete. Steel slag and weld slag could be used as a partial replacement for fine aggregate concrete mixture will be improved in the properties by addition of steel slag and weld slag in concrete is observed. The concrete has the ability to reuse the waste product, by replacing the aggregate with the industrial waste is the weld slag. It has a heavy weight concrete and it has a high density, which is the concrete have the density higher than 2600 kg per meter cube. in normal concrete density 2400 kg weld slag will have the greater density. In this greater density of

concrete will be used in offshore structure and pipe lines. The steel slag concrete density is decreased. The investigation of properties of concrete by replacing fine and coarse aggregate by steel slag and weld slag shows the strength increased and workability decreased .the properties of concrete by replacing natural sand by manufactured sand is higher .the higher level of fines in manufactured sand increases the workability decreases water content in concrete. The steel slag and weld slag used as a replacement for fine aggregate increases the strength and workability. The concrete formulations require the use of the appropriate release agents, in particular for concrete, which contains the chemical admixtures. The admixtures super plasticizer known as a "water reducer" is products that considerably reduce the water content, without modifying its fluidity. In addition, the super plasticizer improves the workability of fresh concrete at constant water content. Polypropylene fibre (PP) has been evaluated for the use as a cement content pavement material. The study focussed on laboratory evaluvation of various mechanical and durability properties of PP. It improved the compressive strength, split tensile strength, and flexural strength over that the concrete. There is no significant change s and reduction in resistance to durability as compared to normal concrete. There is also no reduction in the long term properties of PPF. it is concluded that the fibre are alkali resistance and PPF can be used in the pavement quality concrete, and as over lays, with no adverse effect concrete.

2.0 LITERATURE SURVEY

Shekhar saxena et al (2018) is carried out the impact of use of steel slag as coarse aggregate and waste water on fresh and hardened properties. This research is focussed on the replacement of ingredients of concrete with recycled material and wastewater to compensate the increasing demand of natural resource. The study was divided into phases. In first phase, basalt aggregates were used to prepare concrete with tap water as well as with domestic wastewater. The concrete prepared with basalt aggregate, tap water, natural sand, cement, and super plasticizer , designated as control concrete and when tap water was replaced by wastewater and keeping other materials same as in control concrete, it was designated as basalt waste water concrete. In the second phase, different proportion of steel slag aggregate were used to replace basalt aggregate and wastewater was used as mixing water and other materials were kept constant as in the first phase, this concrete was designed as SWC. Initial and final setting time of cement was determined. This research investigate the impact on fresh and hardened properties of the concrete when the natural coarse aggregate is replaced in rations of 15%,25%, 50%, 75% and 100%withs steel slag aggregate and wastewater is reduced during the making of concrete. Steel slag was collected from electric arc furnance of a medium scale steel industry, capacity of 360,000 tonnes per annum. Basalt aggregate was used as natural coarse aggregate. The particle size distribution curves of basalt aggregate and steel slag aggregate of the fraction 20 to 10mm and 10 -4.75mm were compared to

each other to minimize the possible effect of the change of gradation of the properties of concrete. The slag aggregate were found as light weight aggregate as compared to basalt aggregate as it was obtained from secondary stage of steel production. Steel slag abrasion value was very high because of it has very special crystalline microstructure. The major mineral present in the steel slag were determining through X-ray diffraction test. Compressive strength of concrete was found all the percentage replacements of ballast aggregate with steel slag used with wastewater at all the ages of concrete. Flexural strength was also found to be reduced when only wastewater was replaced by tap water with basalt aggregate but later on improvement in flexural strength was found when different ratios of steel slag aggregate were used with wastewater. The highest compressive strength and flexural strength was found at 50% replacement level. SEM analysis can be determined the voids and microstructure. Pulse velocity reduced by 4-9% wastewater was used with basalt aggregate.

Rosales.j et al (2017) in this document entitled effect of stainless steel slag waste as a replacement for cement in mortars. In this studies replacing cement by stainless steel slag waste and improving the mechanical properties of the slag waste by using different types of treatment. The cement was replaced with different substitution percentage of untreated stainless steel slag and waste slag that was proceed to the crushing, burning, and both treatment to determine the optimum replacement ratio according to the mechanical properties. In this case based on multivariate factor analysis was developed to compare these proceed waste according to their mechanical behaviour. A mortar sample with a mix proportion of 0.5:1:3(water; cement; sand) was designed as the control mix. To compare SW with cement made using common addition, three sets of cement with FA were manufactured with different substitution percentages (10%,20%,and 30%). samples with different substitution percentages for the manufacture of cement mortar were created to analyse the cement capacity of the stainless steel slag waste. The hardened mortar was characterised according to the six properties: bulk density, porosity, water absorption, compressive and flexural strength and dimensional instability. he shrinkage age was similar to or lowers than that of control OPC cement in mixes with a minimum substitution percentage in the manufactured of cement and concrete with steel slag. In cement mortar made with 20% and 30% SW, the shrinkage age value increased. Multivariate analyses were applied on compressive strength, flexural strength and shrinkage because they are main parameters to evaluate the possibility of using new cement. In this analysis were performed on the result of parameters used at 28 days of FS and CS and at 90 days for SH from cement mortar. The porosity of the material was observed using SEM analysis at 28 days. It indicates the high –resolution images of the fractured surfaces of different samples. The cement mortar with the addition of SW did not present large pores. The cursed and burned slag had lower values of loss relative to the control. Replacing cement with stainless steel slag waste for the manufacture of mortar improves the mechanical properties up to a certain degree of substitution. In these studies showed that replacing up to 20% of

cement with crusted SW recommended. Cement mortar mixes manufactured with

A.Anathi et al (2017) in this research entitled combined performance of polypropylene fibre and weld slag in high performance concrete the research has become very popular construction material in the recent decade structural engineering.

Mechanical properties like compressive strength, split tensile strength, flexural strength, and ultrasonic pulse velocity and bond strength were tested. Durability studies such as water absorption and Sorptivity test were conducted to check the absorption of water in HPC .weld slag 10% and fibre dosage of 0.3% in HPC attains the maximum strength. Fibre is one the adding material to increase the tensile strength and to reduce the shrinkage. Weld flux can be collected the submerged arc weld it produce the quality welds in ferrous, stainless steel and even some non ferrous metal. The weld slag as partial replacement of fine aggregate can be used in the non-structural members like compound wall, partition wall, etc. Silica fume was used as mineral admixtures. The range of the slump cone test 10 to 20mins using the slump cone. The increase in the replacement ratio of WS shows significant slump loss and decrease in the workability. The addition of fibre reduce the slump due to compactness at the rate of 5, 9 and 14% forSOF0.1, SOF0.3, SOF0.6 and SOF0.6 and the weld slag adsorb water due to the irregular shape and rough texture. Compressive strength of HPC mixture was tested and the specification at 7, 28, 56 and 90 days and it will be shows in four series. In series 1 addition of weld slag will increases in 11 mixtures also increase the mixtures at the rate of 12.53% is achieved. Addition of PP fibre0.1, 0.3, 0.6 20% SW –C value can be in of control obtain–OPC.

percentages can gradually increase the strength. Split tensile test and flexural test will increase the strength pp fibre will improves the tensile strength the composition of weld slag will be equal to adding the fibre and to give the increasing the strength. The SEM images of WS predict to consist of less cavity and microspores. The Sorptivity rate for S10 mixture in first series decreases whereas S20 and S30 mixture enhances the sorption rate. For series first, second, third, and fourth mixtures of fibre decreases the rate of sorption.

S.Geethapriya et al(2017) is carried out the durability characteristic of recycled aggregate and weld slag based high performance concrete in this paper focused on recycled aggregate, thee environmental rate is low due to insufficient strength and also to ensure that high porosity of the concrete. These investigations replaces with 0%, 10%, 20%, 30% recycled aggregate and cement aggregate and cement with weld slag. In this investigation based on the mixed recycled aggregate and demands for extension of recycled concrete and enhance with the current obstacles and porous nature reduced strength. Normal mixing approach the recycled aggregate tested by the several strength test experiments. Weld slag of a fine grain structure illustrative to the good physical properties. Weld slag obtained from weld industry were used. Recycled aggregate obtained from demolished building of 16mm was used. To investigate the addition of aggregate percentage ratios, 0%, 10%, 20% and 30% respectively and normal mixing approach and to determine the compressive strength,

tensile strength, flexural strength and modulus of elasticity. This test was carried out 28 days. From the test result has good strength compared with the other aggregate concrete. These properties of material good relative to the experimental analysis. By adding weld slag on concrete good bonding with the recycled aggregate used in the low level application. The highest strength occurred in 20% of replacement concrete with recycled aggregate. In future us e the result and stored avoiding the environmental defects. After cooled the weld slag water level will be increases the strength. The limit extent of recycled aggregate and weld slag to increase weight for highest adding percentages.In this investigation optimum parameter 20% and 30% obtain the maximum tensile strength and compressive strength. The replacement of weld slag and recycled aggregate very effectively and to overcome the wastage drawbacks SEM analysis will be designed of 0%, 10%, 20% and 30% microstructure. The recycled aggregate good bonding with high amount of reinforcement concrete normal mixing approach. Low amount of porosity accord due to the refinement grain structure. The oxide layer formation is low this standard analysis followed by the GI 586 guidelines. The magnification factor X200 pixel for the SEM analysis.

kutalmis recep akca et al (2015) in this research focused on properties of polypropylene fibre reinforced concrete using recycled aggregate are determine the recycling of rubble obtained during urban transformation and manufacturing new concrete using this material was experimentally studied. Different combinations were generated using the recycled concrete aggregates and polypropylene fiber. Natural aggregate were replaced by recycled concrete aggregate and volume of 0%, 1% and 1.5% fibre were introduced for each series. Although concretes physical and mechanical properties were affected negatively by RCA due to RCA's higher porosity and water absorption capacity, high strength concrete was eventually manufactured. Conventional structural concrete which is mostly used strength. For all specimens water cement ratio was chosen as 0.53. Desired workability which is the range of 10-14cm collapse was obtained by means of super plasticizer. properties of fresh concrete can be found on due to high water absorption capacity of RCA, workability of concretes which composed of RCA was determine to be lower than conventional concrete which is composed of NA. This result is confirmed by as well when the case of high water absorption capacity of recycled aggregates is taken into account, super plasticizer was used. Thus range of 10-14 slump value was kept constant for all series. Properties of hardened concrete, according to experimental result, it is observed that compressive strength decrease as the incorporation ratio of recycled aggregate is increased. When flexural tensile strength is considered, it is observed that RCA has a negative effect on the flexural and tensile strength. As the result of ANOVA which carried out on specimens containing fiber and recycled concrete aggregate, main factor on changes of compressive strength were determined as aggregate type, while fiber content were also influential on flexural and splitting tensile strength were found as aggregate type.

Samir bouharoun et al (2013) in their studies entitled effect of a super plasticizer

on the properties of the concrete in this investigation focussed on the release agents protect the internal surface of formwork against corrosion and also ensure easy removal of the concrete elements on the other hand, the super plasticizer are used to enhance the fluidity of the fresh concrete without adding water, improve the surfactants properties. The aim of the study is to identify the effect of a polycarboxylic either super plasticizer on the tribological behaviour of fresh concrete interfaces. Frictional test were performed using plane / plane purpose of the physicochemical study was to clarify the nature of the interactions between concrete pores solution and release agents. In this investigation will e carried in one ordinary concrete, two concretes with super plasticizer and oneself compacting concrete were formulated. To keep the same workability between the three concretes, the water ratio was adapted to obtain a consistency class. A slump test of each mix was conducted to check the workability of the concretes. GLENIUM 27 supplied by BASF was used in this study this super plasticizer, new generation, is a high range water reducing admixture, on the base of modified polycarboxylic either polymers. It reduces the water binder ratio with a long keeping workability. In trial two type of super plasticizer was determined by measuring surface tension according to its concentration in water, with a tensiometer GBX equipped with a platine plate. The CMC characteristic the ability of super plasticizer to form micelle and also to disperse a hydrophobic compound in water. Two release agents one of petrochemical origin and one of vegetable origin developed by CHRYSO were used in this study. The principle of this device was inspired by the box shear apparatus used in the soil mechanics. It can be reproduce the conditions generated by the sliding contacts between concrete, release agents and formwork it is only used for measurements of friction stress. The thickness of the oil film after of fresh concrete on the metal plate is a significant data to assess the evolution of reduction rate. To determine the amount of the oil film involved in the formation of emulsified medium close to the formwork surfaces, a weighted method is used. The result show that the oil content in the interstitial medium depends on the super plasticizer dosage and the quality of free water in fresh concrete. Moreover, an increase of contact pressure leads to an increase the oil content in an emulsified medium, due to the mechanical effect. The self compaction concrete, at high contact pressure, generates an interface richer in oil compared to the concrete.

3.0 Summary and Conclusion

Replacing cement with stainless steel slag and weld slag was determining the strength and durability of the concrete. Compressive strength and split tensile strength of the concrete has shows an increasing in strength and no strength loss in flexural strength till the replacement of aggregate and later strength decreases gradually. It has a more structural application since observed compressive strength more than days. Comparison and observed for the compressive strength, flexural strength and split tensile strength of normal concrete and concrete with steel slag as partial replacement the result shows the strength achieved in steel slag in concrete slightly lower than the weld slag concrete polypropylene fiber concrete has

found 10 % increase in strength, when compared to the normal concrete. Steel slag and weld slag increase water cement ratio of concrete mixtures caused decreased the strength values increase the penetration depth values and strength loss after being subjected to subsequent freeze thaw cycles. Steel has low cost compare to naturally available fine aggregate replacement is desirable. And also helps in reducing pollution of environment.

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