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UTILIZATION OF METALLURGICAL WASTES AND IN CONCRETE A REVIEW

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ABSTRACT

Lowcost concrete production by replacement of fine sand with Metallurgical Waste Sand(MWS) is a new trend and makes effectively use of MWS as engineering material by reducingdisposal and pollution problem. MWS are by-products which appears to possess the potential topartially replace regular sand as a fine aggregate in concretes, providing a recycling opportunityfor them. This Project will identify a potential use of wastes from Metal industry for utilization inconstruction industry and represents the experimental investigation on utilization of MWS as apartial replacement of natural sand by 15%, 25%, 35%. Concrete mixtures were produced, testedand compared in terms of strength with the conventional concrete. These tests were carried out toevaluate the strength for 7 and 28 days. The project will review the utilization of metallurgicalwaste sand and as the concrete constituent and important results from the experiment will beanalyzedwithworksofvariousresearchers.Workability with different admixtures will beanalyzed during the project .After a careful study of large number of research papers on the topicit was felt by the authors to integrate all the important results for streamlining the potential of thisarea of research. This project will summarize the conclusions of experiments conducted for the properties like strength workability and durability.

Keywords: Metallurgical Sand, Compressive strength, Workability, Flexuralstrength.

I. INTRODUCTION

The worldwide consumption of sand as fine aggregate in concrete production is very high andseveral developing countries have encountered some strain in the supply of natural sand in ordertomeettheincreasingneedsofinfrastructuraldevelopmentinrecentyears.Toovercomethestressanddemandofriversand,researchersandpractitioners intheconstructionindustrieshaveidentifiedsomealternatives.Ferrousandnonferrousmetalcastingindustriesproduceseveralmilliontonsofby-productin the world. MWS is major by-product of metal casting industry and successfully used as a landfilling material for many years. But use of MWS for land filling is becoming a problem due torapid increase in disposal cost. In an effort to use the MWS in large volume, research has beingcarriedoutforitspossiblelargescaleutilizationinmakingconcreteaspartialreplacementoffineaggregate.

MetallurgicalWasteSand(MWS)isaby-productfromtheproductionofboth ferrousandnonferrous metal castings. It is high quality silica sand. Foundries use high quality size-specificsilica sands for use in their molding and casting operations. Normally raw sand is of a higherquality than the typical bank run or natural sands used in fill construction sites. In the castingprocess, molding sands are recycled and reused many times. Eventually, when recycled sanddegradestoa level that it can be no longer is reused the casting process. When it is not possible to further reuses and in the foundry,it is removed from thef oundry Metallurgical WasteSand. MWS is blackincolor and contain large amount offines.The typical physical and chemical property of MWS is dependent upon the type of metalbeingpoured,castingprocess,technology employed, type of furnaces (induction, electric arc and cupola) and type of finishingprocess(grinding, blast cleaning and coating). Concreteisamaterialwhichiscomposedofcoarseaggregate,fineaggregate,cement and water these each material in concrete contributes its strength.So,by partial or percentage replacing of material affects different properties of concrete. By usingsuchwastematerialwhichharmstheenvironment can be used for the development of low costandeco-friendlybuildingmaterials.

Inthisstudyanexperimentalinvestigationiscarriedoutbyvaryingpercentageoffineaggregatewith MWSto producelow cost and ecofriendly concrete.

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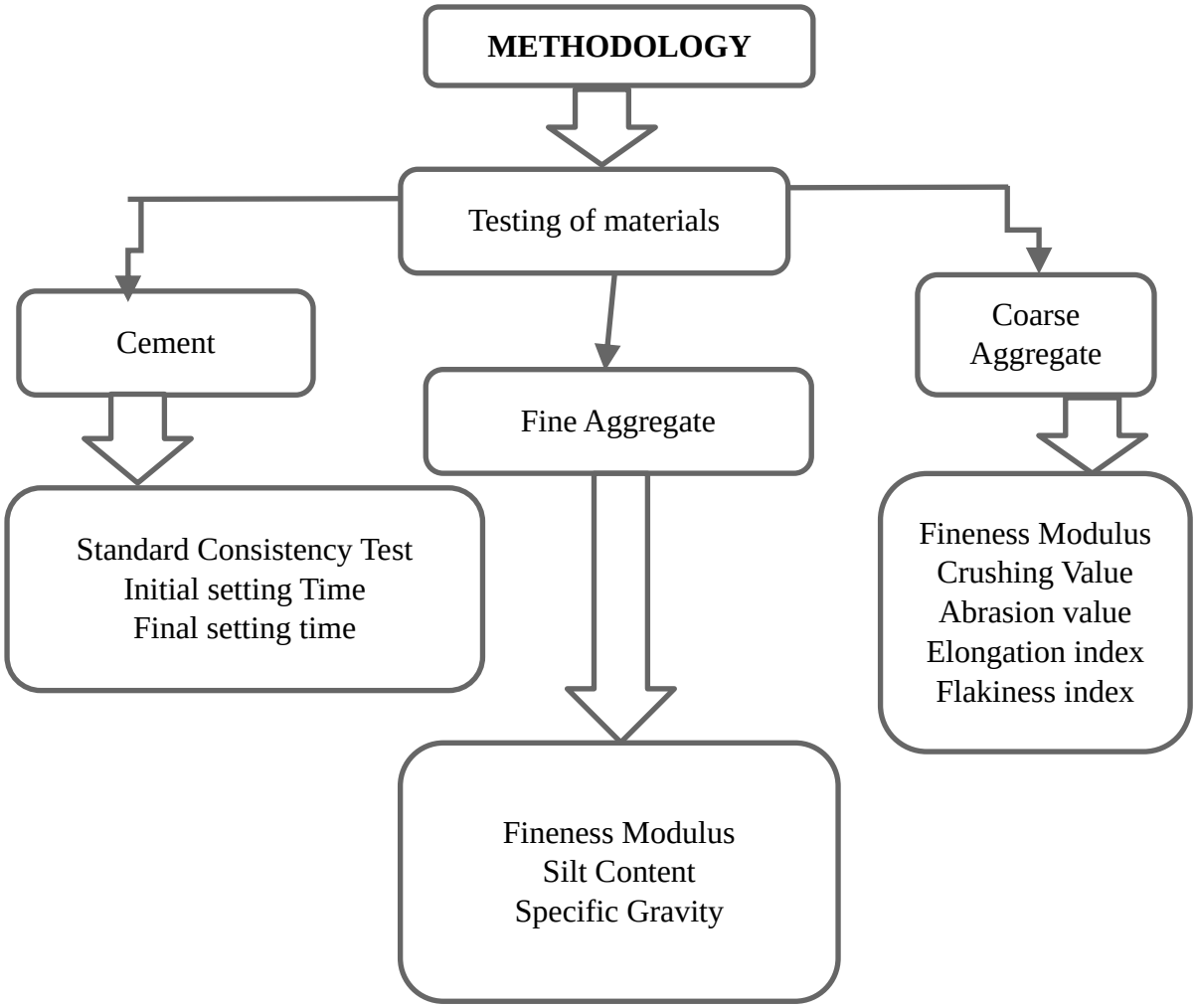
II. METHODOLOGY

1.Method In the present design work has been carried out in different stage, starting form identification of material.



III. LITERATURE REVIEW

Gurpreet Singh and Rafat Siddique;carried out an experimental investigation to evaluate thestrengthanddurabilitypropertiesofconcretemixtures,inwhichnaturalsandwaspartialreplacedwith (WFS). Natural sand was replaced with five percentage (0%, 5%, 10%, 15%, and 20%) ofWFS by weight. Compression test and splitting tensile strength test were carried out to evaluatethestrengthproperties ofconcreteattheageof7,28and91days.Testresultsindicateamarginalincrease in strength properties of plain concrete by inclusion of WFS as a partial replacement offineaggregate.Nelson, Shing Chai NGO;When the percentage of recycled aggregate increases, the slump testindicatesadecreasingtrendofworkability.Thecompactionfactortestindicatedthat,thecompacting factor ratio is decreases as the percentage of recycled aggregate increases. Thecompressiontestindicatedthat,theconcretespecimenwithmorereplacementofrecycledaggregatewillgetthelo weststrengthwhencomparedtotheconcretespecimenswithlessrecycledaggregate.tensiletestconcludedthat,thete nsilestrengthisgraduallydecreasesifmorepercentagereplacementofrecycledaggregateused intheconcrete specimen.Haliza Bite Mohd Jeffery Ong; The control mixture showed better results compared with themixture of using recycled aggregate. Research shows that more recycled aggregate is used, thecompressivestrengthofconcretedecreases.However,recycledaggregatecanbeusedforstructuresthat do not

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requireahigh specification.Patel Ankit; was reported generation of waste foundry sand as by product of metal castingindustries causes environmental problems because of its improper disposal. The xperimentalinvestigation was carryout on a concrete carrying waste foundry sand in the range of 0%, 20%,40% and 60% by weight for M-25 grade concrete (PPC). Material was produced, tested andcompared with conventional concrete in terms of workability and strength. The compressivestrengthincreaseson increasein %ofwaste foundry sandas compareto traditionalconcrete. Khatib;investigated some mechanical and fresh properties of concrete containing waste oundrysand(WFS).Withreferencetothepropertiesinvestigated,theyreportedthat(a)Thereissystematiclossinwor kabilityasthefoundrysandcontentincreaseswhichwasfoundbyobservingthepercentagedecreaseinslumpwithincr easeinWFS.(b)Allthemixes(withandwithoutWFS)show an increase in strength with curing time. (c) The compressive strength ofconcrete lsodecreaseswithincreasingamountsofWFS.(d)TheshrinkageincreasesastheWFSintheconcreteincreases.
YongjaeKim; (i) As the recycled aggregate replacement ratio increased the recycled aggregateconcreteshowedanincreasedworkability,thismaybeduetotheincreasedamountoffineparticlesfrom the recycling process; (ii) When the coarse aggregate was replaced with the recycledaggregate, compressive strength decreased. As the recycled fines amount increased the additionalreplacement of the fine aggregate reduced the strength; (iii) When we replace the fine aggregatemorethan 60%, the strength reduction became moresignificantlyV.R Ramkumar; et.al; The result shows that, the flexural strength of concrete with naturalaggregate is more than the concrete containing recycled aggregate. However by providing water&acid treatment thestrengthof recycled aggregateconcrete canbeimproved. Khatib and Herki;investigated the concrete produced by replacing the fine aggregates with 0%,30%, 60% and 100% WFS. The properties investigated at 7, 28 and 90 days curing times. Theresultsindicatethatthereissystematicincreaseinwaterabsorptionbycapillaryaction,adecreasein compressive strength and Ultrasonic pulse velocity withincreasing amounts of WFS inconcrete.Theyalsoreportedthatadequatestrengthcanbeachievedusinganappropriatereplacementlevel offoundrysand.

Ayed Ahmad Zuhud; (i) Due to light weight of recycled aggregate and bad compaction becauseof the nature of recycled aggregate and its texture, the density of recycled aggregate concrete islower than that of natural aggregate by5.5%; (ii) The absorption capacity of recycled aggregate ismore than two times of natural aggregates; due to this the workability of recycled concrete isreduced; (iii)Using the same quantity of cement, the recycled aggregate concrete can providestrengthalmost equivalent to acorresponding concrete withnatural aggregate.

IV. CONCLUSIONS

The concrete as time goes on through a process of hydration of the cement paste, producing arequiredstrengthtowithstandtheload.Theuseofmetallurgicalwasteasfineaggregateinconcretehasneverbeenaus ualpracticeamongtheaveragecitizens,particularlyinareaswherelightweightconcreteisrequiredfornon-loadbearingwalls,non-structuralfloors,andstripfootings.Althoughcoarse aggregate usually takes about 40% of the overall self-weight of concrete. The cost ofconstructionmaterialsisincreasingdaybydaybecauseofhighdemand,scarcityofrawmaterials,and high price of energy. From the standpoint of energy saving and conservation of natural resources,theuseofalternativeconstituentsinconstructionmaterialisnowaglobalconcern.
Forthis,theextensiveresearchanddevelopmentworkstowardsexploringnewingredientsarerequiredfor producing sustainable and environment friendly construction material. Metallurgicaldwasterepresentsmostlyinindustrial waste.Metallurgical waste which presents serious disposal problems for local environment, this will have the double advantage of reduction in the cost ofconstructionmaterial andalso as ameansof disposal of wastes.

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V. REFERENCES

[1] Nelson,ShingChaiNGOA.Aninvestigationofwastefoundrysandinasphaltconcretemixtures.WasteManage Res 2006;24:269–74.

[2] Eknath P. Salokhe, D. B. Desai, "Application of foundry waste sand in manufacture of concrete",IOSRJMCE,ISSN:2278-1684, PP:43-48.

[3] Mr.S.S.Jadhav,Dr.S.N.Tande,Mr.A.C.Dubal,"BeneficialReuseofWasteFoundrySandinConcrete"IJSRP,Volume 7,Issue 3,March 2017,ISSN2250-3153,PP:74-95.

[4] Recycled Aggregates, http://www.cement.org/for-concrete-books-learning/concretetechnology/concrete-design-production/recycled-aggregates.

[5] Md. Safiuddina, Ubagaram Johnson Alengaramb, Md. MoshiurRahmanb, Md. AbdusSalamb, andMohd. ZaminJumaatb, "USE OF RECYCLED CONCRETE AGGREGATE IN CONCRETE: AREVIEW"JCEM,http://mc.manuscriptcentral.com/scem.

[6] Abbas, A.; Fathifazl, G.; Isgor, O.B.; Razaqpur, A.G.; Fournier, B.; Foo, S. 2009. Durability ofrecycled aggregate concrete designed with equivalent mortar volume method, Cement andConcreteComposites 31(8):555–563.

[7] IS: 516-1959, Indian standard code of practice- methods of test for strength of concrete, Bureauof Indian Standards, NewDelhi,

[8] India. IS: 10262-1982, Recommended guidelines for concrete mix design, Bureau of IndianStandards,New Delhi, India.

[9] IS: 8112-1989, Specifications for 43-Grade Portland cement, Bureau of Indian Standards, NewDelhi,India.

[10] IS: 383-1970, Specifications for coarse and fine aggregates from natural sources for concrete,Bureauof Indian Standards, New Delhi, India.

[11] IS:10262-1982,Recommendedguidelinesforconcretemixdesign,BureauofIndianStandards,NewDelhi, India.

[12] IS: 1199-1959, Indian standard methods of sampling and analysis of concrete, Bureau of IndianStandards,New Delhi, India.

[13] IS: 516-1959, Indian standard code of practice- methods of test for strength of concrete, BureauofIndian Standards, NewDelhi, India