ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 7, Issue 4, April 2021

AN EXPERIMENTAL INVESTIGATION OF RECYCLED AGGREGATE CONCRETE WITH SILICA FUME AS PARTIAL REPLACEMENT

NAVEENA N[1], RUBINI N[2], THANGAMANI M[3]

UG Students, Civil Engineering, Dhanalakshmi srinivasam Engineering college,Perambalur, India

UG Students, Civil Engineering, Dhanalakshmi srinivasam Engineering college,Perambalur India

UG Students, Civil Engineering, Dhanalakshmi srinivasam Engineering college, Perambalur, India

Abstract— **Concrete is a construction material that is extraordinarily used worldwide in most of constructions. Preparation of concrete involves the utilization of natural resources like sand, natural aggregates, water and so on this boom in day by day growing construction is resulting in excessive use of concrete, thereby leading to depletion of natural resources like sand and natural aggregates. In fact, there is acute shortage of natural aggregates and this drawback is faced by several countries within the world. On the other hand, because of demolition of Damaged and old structures, again and again it is terribly troublesome to seek out a filling place for such an enormous quantity of waste concrete. To beat such quite state of affairs it is going to be a far better approach to retrieve aggregates from the dismantled waste and use it once more within the preparation of concrete in any attainable manner. This method may additionally facilitate to preserve the natural aggregates to some extent and also in the reduction of price of material. Practically, the standard of recycled aggregate concrete is not comparable because of the low density, high water absorption ensuing low strength concrete.**

I. INTRODUCTION

Today the concrete industry consumes a lot of natural resources. This damages the environment and mother earth considerably. The less cement and natural aggregates used in concrete production, the lower the environment impact. The cost of landfill and the scarcity of natural resources for aggregates encourage the use of construction waste as an aggregate source. Sustainable building has become a major problem in building practice at the expense of the future of our planet. This is due to the fact that the construction industry is a massive consumer of natural resources and also a huge waste producer.

The high value of raw material consumption in the construction industry is becoming one of the main factors causing environmental damage and pollution to our mother earth and the depletion of natural resources and mineral resources.

The main aim of this project is to develop and test the properties of concrete by partially replacing natural resources coarse aggregates with recycled coarse aggregates as coarse aggregate in concrete and to investigate the influence of the use of additives (silica dust) and recycled coarse aggregate concrete.

II. OBJECTIVES

To investigate the mechanical properties of concrete produced with silica fume and recycled coarse aggregate. The aim of the experimental investigation is to obtain the compressive strength, split tensile strength, flexural strength and chloride permeability of RCA concrete

III. SCOPE

By using silica fume the strength can be increased major advantages is, it controls the emissions of Carbon dioxide.

IV. MATERIALS AND METHODS

A. *CEMENT*

Ordinary Portland cement was used for making concrete mixes. The cement used was fresh and without any lumps. Testing of cement was done as per IS 8112- 1989. The various testes that were be conducted on cement and the results obtained are reported.

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 7, Issue 4, April 2021

S. NO	Characteristics	Values obtained	Standard values
1	Specific gravity	2.84	2.7-3.16
2	Fineness	2 %	< 10 %
3	Soundness	3 mm	Less than 10 mm

B. SILICA FUME

Silica fume is an ultrafine material with spherical particles less than 1 µm in diameter, the average being about 0.15 µm. This makes it approximately 100 times smaller than the average cement particle. The bulk density of silica fume depends on the degree of densification in the silo and varies from

SiO2	DESCRIPTION
Purity	99.90%
Average Particle Size	30-50mm
SSA	130-1500m2/g
Molecular weight	231.533g/mol
Molecular Formula	sio2
Bulk Density	0.9 g/cm2
True Density	2.2 g/cm2
Physical form	Powder
Morphalogy	Spherical
Colour	White

C. FINE AGGREGATE

a. MANUFACTURED SAND

Manufactured sand (M-Sand) is a substitute of river sand for concrete construction. Manufactured sand is produced from hard granite stone by crushing. The crushed sand is of cubical shape with grounded edges, washed and graded as a construction material. The size of manufactured sand (M-Sand) is less than 4.75mm. Testing on fine aggregate was done accordance with IS: 383-1970.

S.No	Description	Values obtained
1	Specific gravity	2.56
2	Water absorption	0.75 %
3	Fineness modulus	1.27
4	Grading zone	II

V. PREPARATION OF SPECIMEN

A. CASTING OF SPECIMEN

The test specimens were cast in the steel moulds. Inside of the moulds was applied with oil to facilitate the easy removal of specimens. The size of the cube specimen is 150 x 150 x 150 mm and for the cylinder 150 mm diameter, 300 mm height and for the prism 100 x 100 x 500 mm. The raw materials were taken an accuracy of 5 grams. The concrete ingredients (cement, coarse aggregate and fine aggregate) were put in a mixer machine and mixed thoroughly in dry condition. Based on the mix design, amount of water and admixture was mixed with the dry mix concrete.

B. CASTING OF SPECIMENS

Concrete can be manufactured by adapting the conventional techniques used in the manufacture of Portland cement concrete in the laboratory. The following steps are involved in casting of concrete,

C. BATCHING

In batching of concrete, the quantity of cement, fine aggregate, coarse aggregate, water and admixture are taken by mass.

D. MIXING

Mixing can be done by following two processes in concrete using pan. Cement, coarse aggregate and fine aggregate were mix together. The mixing time shall be at least 3 min. Water and admixture was mixed with dry mix for 3 min.

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 7, Issue 4, April 2021

E. MOULDING

The test specimen was cast in steel moulds. Inside of moulds were oiled properly to facilitate the easy removal of specimens. After wet mixing, the moulding process was done by the following methods.

F. COMPACTION

Concrete was filled inside the mould and it was well compacted by using mechanical vibrator table.

G. SURFACE FINISHING

The Compacted mould surface was finished by using trowel.

H. DEMOULDING

The specimens were demoulded and it was kept in curing.

I. CURING OF SPECIMENS

Curing is the process of preventing the loss of moisture from the concrete while maintaining a satisfactory temperature regime.

J. STRENGTH TEST

Compressive test

Split tensile test

VI. RESULTS AND CONCLUSION

A. SLUMP CONE TEST

The slump test is the most simple Workability test for concrete. that provide immediate result. the slump is carried out as per produces mention in IS 1199:1959concrete slump value is used to find the Workability, which indicate the water cement ratio. The slump value of concrete is 70 mm

COMPRESSIVE STRENGTH TEST

Compressive strength of concrete using M Sand and silica fume for was tested and the results weretabulated. Compressive strength test on bricks are carried out to determine the load carrying capacity of bricks under compression with the help of compression testing machine. Bricks are generally used for construction of load bearing masonry walls, columns and footings. These load bearing masonry structures experiences mostly the compressive loads. Thus, it is important to know the compressive strength of bricks to check for its suitability for construction.

Compressive Strength = Load / Cross-sectional Area

Mix	**7 days**	**14**	**28**
NSF0	18.44	25.55	28.37
RSF5	20.60	28.53	31.70
RSF10	22.30	30.87	34.30
RSF15	19.734	27.32	13.30
RSF20	17.628	24.41	27.12

B. SPLIT TENSILE TEST

Tensile strength of concrete using M Sand and Silica fume was tested and the results were tabulated.The Spliting Tensile Strength of Specimen of the Concrete Calculated as

Mix	**7 days**	**14**
NSF0	1.55	1.98
RSF5	1.58	1.95
RSF10	1.49	1.94
RSF15	1.39	1.91
RSF20	1.69	2.00

VII. CONCLUSION

The properties of Recycled coarse aggregates are similar to the coarse aggregate. Fresh and hardened properties of concrete were tested as per Indian standard provision. Water required producing the same workability increases with the increase in the percentage of demolished waste. The Compression, split tensile, Flexural strength of concrete tends to increase gradually as increase in percentage of Recycled concrete aggregates and decrease when it reaches 30 percentages and it gives better strength. Overall, the performance of Recycled concrete aggregates was found to be satisfactory. Hence, recycled concrete aggregates can be used as a replacement to coarse aggregates in the construction work.

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 7, Issue 4, April 2021

REFERENCES

- IS: 10262-2009 Concrete Mix design, Bureau of Indian Standard, New Delhi – 2004.
- IS: 456-1978 Code of practice for plain and reinforced concrete, Indian Standard Institute, New Delhi.
- IS: 2386-1963 (part-3), Test For Coarse Aggregate in Concrete.
- IS: 2386-1963 (part-4), Mechanical Properties of Coarse Aggregate
- IS: 8112-1989, Specification of ordinary Portland cement.
- M.S.Shetty,"concrete technology"-Theory and practice,S.Chand and company Ltd,New Delhi 1986.
- seela and Dr.T.Baskaran, "Strength Analysis on concrete with M-Sand as a Partial Replacement of Fine Aggregate,International Journal Of Civil Engineering and Technology".
- S.Muralikrishnan,T.Felix Kala,P.Ash a& S.Elavenil,"The Properties of Concrete using Manufactured Sand as Fine Aggregate". Khaleel,H.Y.,et al.Feasibility of using recycled steel fibres to enhance the behaviour of recycled aggregate concrete,ACI Materials,Special Publication,Vol.310,2017.
- K.H.Yoinis,Nano-Silica Modified Recycled Aggregate Concrete:Mechanical Propertie and Microstructure,Eurasian Journal of science and Engineering.Vol.3,No.3,167-176,2018.