iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 **Issue:** IV **Month of publication:** April 2018

DOI: http://doi.org/10.22214/ijraset.2018.4651

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 6.887
Volume 6 Issue IV, April 2018- Available at www.ijraset.com

Performance of Self Compacting Concrete with Partial Replacement of Coarse Aggregate by Coconut Shell: A Review

Arun Pandey[1], Dr. S. K. Jain[2]
[1]*P. G. Student,* [2]*Professor, Department of Civil Engineering, M.I.T.S. Gwalior, Madhya Pradesh, India*

Abstract: ***Different waste materials, for example, fly ash, silica flumes, copper slag, brick bat, crushed concrete have been effectively utilized to create different materials for construction development, for example, solid, flush door, plywood, jute board and so on. Aggregate is a noteworthy element for making concrete, possess very nearly 70-80% part of concrete [1]. Traditionally crushed rocks are utilized as coarse aggregate and river sand as the fine aggregate. Both are normally accessible material. Because of a quick development of construction exercises, ordinary aggregate sources are draining quick prompting noteworthy increment in the cost of construction. For sustainable development, these materials need to be utilized carefully and option materials should be looked to supplant ordinary aggregate. The Large number of studies has been done to scan elective materials for the creation of concrete. In the meantime because of fast industrialization, creation of the waste material is expanding step by step. Its disposal has turned into a genuine issue. The answer for this issue is to arrange disposal on landfill site or utilize this waste for some positive movement. Space for landfill site is turning into an expensive issue. In perspective of this, the choice is- it is possible that we ought to limit the waste at the creation level, or use it. India is the third biggest coconut creating nation on the planet [2]. A Huge measure of waste is created by coconut. The waste coconut shell might be utilized to supplant ordinary coarse aggregate. It might deliver concrete financially economical and in the meantime also help to reduce it disposal issue. The point of this paper is to deliver the issue identified with the deficiency of ordinary material, an issue of disposal of waste material and review the work done on the utilization of waste coconut shell for creation of self compacting concrete.***

I. INTRODUCTION

The innovation of advance technology in the construction material is increasing very rapidly. In past few decades, various research was carried out on concrete to maximize the qualities in both the aspect i.e. strength and durability qualities. Now concrete is not only a construction material which only consisting cement, aggregates and water only, but has become an innovative engineering material which mixes with other new material and makes quality superior in every aspect of requirement for construction. In today's world concrete is required for not only construction, It also deals with the aesthetical consideration of any structure. For making this type of structure various problems comes into act one of them is congested reinforcement, In congested reinforcement placing of concrete by vibration into formwork is almost not possible also at some places due to the aesthetical design of structure it is not always easy to reach that place and vibrate it..

In early 1980's durability aspect of concrete structure was the major serious problem in Japan because for durability adequate compaction is required in concrete for proper filling and placing in formwork by skilled labor and in same time due to gradual decrement of skilled labor led to similar reduction in quality of concrete durability. For overcoming to this problem One solution is arrives in such type of concrete which is self-compactable doesn't need any type of vibration and easily fill into formwork also in the availability of dense reinforcement without affecting its quality aspects. The necessity of such type of concrete is firstly explained by Okamura in 1986. However further work in this type of concrete is done by Ozawa and Maekawa at the university of Tokyo in Japan [3].

So finally the concrete which met solution to the above problem is known as self-compacting concrete. In simple language it is that that type of concrete which doesn't required any mechanical consolidation for placing into the formwork in presence of congested or dense reinforcement also. It is highly flow-able which spread and fills each corner of formwork.

Generally crushed stone of rocks are used as conventional coarse aggregates where as natural river sand use as fine aggregate, both are available naturally. As the concrete is 2nd most usable material behind water by human so due to their higher quantity usage leading to depletion of these naturally available material at faster rate results in increasing cost of construction. For sustainable development these material should be used smartly and also other alternatives in place of these material should be searched. In

today's world production of waste is increasing at very faster rate and from environmental point of view it should be disposed properly so that there should not be any type of pollution, But sometimes disposing it becomes very costly aspect. So for this generally two solution arrives i.e.

(1) To reduce the production of waste or

(2) To utilize waste material for any type of work.

So for these problem we have to reuse the waste, various research has been made on concrete by using waste material such as industrial waste, fly ash, silica fume, over burnt bricks, oil palm shell, coconut shell, waste rubber tires, marble waste dust, broken glass piece, glass powder, papercrete, recycled coarse aggregate etc. These waste material should be used as partial replacement of conventional ingredients. If waste product which is difficult to disposed will use as ingredients of concrete than it will not only to minimize the depletion rate of conventional natural ingredients, also it will help to environment clean and greener and saves us from lots of harmful diseases problem.

II. COCONUT SHELL

Coconut is developed in more than 93 nations. India is the third biggest, having development on a zone of around 1.78 million hectares for coconut generation. Yearly generation is around 7562 million nuts with a normal of 4248 nuts for each hectare [4]. The coconut business in India represents over a fourth of the world's aggregate coconut oil yield and is set to become facilitate with the worldwide increment popular. Be that as it may, it is additionally the principle supporter of the country's contamination issue as a strong waste as shells, which includes a yearly generation of approximately 3.18 million tons. It also presents serious disposal problems for local environment, is an abundantly available agricultural waste from local coconut industries. in developing nations, where abundant coconut waste is disposed, these waste can be used as potential material or replacement material for construction industry. This will have the twofold preferred standpoint of decrease in the cost of construction material and furthermore as a methods for transfer of wastes.

A. Properties of Coconut Shell

1) Coconut shell has high strength and modulus properties.

2) It has included favourable position of huge lignin content. High lignin content makes the composites more climate safe.

3) It has low cellulose content because of which it retain less dampness as contrast with other farming waste.

4) Coconuts being actually accessible in nature and since its shells are non-biodegradable; they can be utilized promptly in solid which may satisfy every one of the characteristics of the conventional concrete.

Table 1: Availability of Coconut shell

S.No.	Country	Coconut Production 2012 (metric tonnes)	% of World Total
1.	Indonesia	18,000,000 t	30%
2.	Philippines	15,862,386 t	26.4%
3.	India	10,560,000 t	17%
4.	Brazil	2,888,532 t	4.8%
5.	Sri Lanka	2,000,000 t	3.3%

Sources: FAOSTAT data, 2014 (last accessed by Top of Anything: January 2014).

III. COCONUT SHELL AS A PARTIAL REPLACEMENT OF COARSE AGGREGATE

Coconuts trees are widely cultivated in southern India, especially Kerala. The name Kerala is derived from a word “kera” meaning "coconut tree". The Kerala state is densely populated and major population uses coconut or its by-products in their daily activities. The tough coconut shells accumulated in the mainland get degraded in around 100-120 years. Therefore, there is a serious environmental issue of disposal of these coconut shells. If the waste cannot be disposed properly it will lead to social and environmental problems. With the quest for affordable housing system for both the rural and urban population of India and other developing countries, various proposals focusing on cutting down conventional building material costs have been put forward. Finding a substitute for the aggregates used today is a task that is worth studying because the quarrying of aggregates from rivers and mountains harms the environment. From the reviewed literatures the points were arrived. The density is varying in same ratio for coconut shell aggregate from conventional granite aggregate. For concrete the density is varying in fifty percentage variations from coconut shell aggregate concrete to conventional granite aggregate concrete. That is the density of coconut shell aggregate is 640 kg/m3 in compacted stage and 530 kg/m3 in loose stage [5]. There are lots of other benefits of using coconut shell in concrete such as it is not needed any type of pre treatment for using, beacause of smooth surface it helps to improve workability and provides good impact resistance.

IV. RESEARCH FINDINGS ON SCC WITH COCONUT SHELL

Shortage of traditional assets and coconut shell waste transfer issues made the specialists research and investigate the likelihood of using it for development exercises. A couple of studies are done on coconut shells and the results of the studies are as discussed below:-

R. Thenmozhi et al. (2014) in this experimental study self compacting concrete with 25% fly ash of total powder content is designed and then 10% replacement of coarse aggregate with coconut shell was used and checked for both fresh as well as hardened state properties of SCC. Final results were compare with SCC with 25% fly ash mix without coconut shell. It was observed that fresh properties were achieved even 10% replacement of coarse aggregate with CS but compressive strength was lower for around 40% at 7 days and 20% after 28 days respectively. The split compressive strength of concrete is also observed to be lesser than that of normal SCC with 25% fly ash.

Sivaraja Muthuswami et al. (2015) After effects of trial examination of the lightweight self-compacting concrete subjected to hoisted temperatures, with coconut shells added to the coarse aggregate, are exhibited in this paper. Varieties in the solid properties, for example, the compressive strength and weight reduction, were seen after the concrete was subjected to the temperature of 800 °C. The examination was completed on concrete specimens with differing extents of coconut shells. The rice husk fiery debris and silica smoke were utilized to create two reference concrete blends. The outcomes demonstrate that the properties of hardened concrete decline at temperatures of more than 400 °C.

G. Shyam et al. (2015) carried an experimental study to develop coconut shell as a self compacting concrete and to check the qualities of self compacted coconut shell concrete. In this study coconut shell of size 3mm to 12mm is taken as coarse aggregate. four trial mix is performed keeping cement, fine aggregate, coarse aggregate and water constant. Only superplasticizer and VMA had varied. It was observed that all four trial mixes were fail in fresh properties that is filling ability, passing ability, and segregation resistance as per acceptance criteria by EFNARC guidelines for self compacting concrete. Also the compressive strength is very less when compared to control concrete mix i.e. without any admixture.

Vijina V. V. et al (2015) does an study on self compacting concrete with fractional replacement of conventional coarse aggregate with crushed coconut shell. All the other ingredients of SCC were kept constant in this study except coarse aggregate. Crushed coconut shell was used in place of coarse aggregate upto maximum of 10% of total coarse aggregate. In this experimental work it concluded that at 2.5% fractional replacement of coarse aggregate with coconut shell helped in economy in construction with maintaining the fresh as well as harden properties of SCC.

T. C. Yazhini et al. (2016) carried an experimental setup to perform a study on self curing and self compacting concrete with coir and coconut shell. In this setup the ingredients that is cement, fine aggregate, coarse aggregate, water, superplasticizer, and coir is fixed and coconut shell is added at 2, 2.5, and 3% by weight of coarse aggregate is added and for self curing property, super absorbent polymer was used. In this experimental setup it concluded that 2.5% coconut shell gives in effective increase in compressive strength than other self curing self compacting concrete mixes.

V. SOME OTHERS RESEARCH FINDING ON SCC WITH WASTE MATERIAL

K.C. Panda et al. (2013) This paper displays the impact of various measures of recycled coarse aggregate (RCA) acquired from a devastated Town Club working of Banki, N.A.C of Cuttack district, around 25 years of age on the properties of self-compacting concrete (SCC) and compared the outcomes with normal vibrated concrete (NVC) containing 100% natural coarse aggregate (NCA).

Critical properties, for example, physical and mechanical properties of common and reused aggregate are carried out. NCA is fractional replaced with RCA by a sum 10%, 20%, 30% and 40%. The impact of RCA on the properties of SCC in the green state (e.g. slump flow test, V-Funnel test, and L-Box Test) and properties of concrete in a hardened state (e.g. compressive quality, flexural quality, and Split tensile strength) are considered. The mixture configuration was completed for the M25 review of concrete. The trial comes about demonstrate that the compressive strength, flexural quality and split tensile strength of the SCC with 100% characteristic aggregate is not as much as the regularly vibrated concrete (NVC) with 100% normal aggregate and the quality of SCC declines with an expansion in recycled aggregate (RA) substitution proportions. The present review prescribes SCC imperceptibly accomplishes required compressive strength up to 30% substitution of RCA.

Prashant O. Modani et al. (2014) In this review, recycled coarse aggregate (RCA) are utilized as a part of the generation of self-compacting concrete (SCC) in fluctuating rate substitutions of the natural coarse aggregate (NCA) from 0% to 100% with an augmentation of 20%. This examination is an endeavour to look at the impact of reused aggregate on quality, porousness, imperviousness to corrosive assault, chloride penetration, and alkalinity of self-compacting concrete. It is watched that recycled aggregate can be adequately utilized as a part of the creation of SCC with no noteworthy decrease in quality and durability.

Sija K. Sam et al. (2014) The review was done by replacing different rates (10%, 20%, 30%) of natural coarse aggregate in SCC with recycled coarse aggregate and the properties of SCC were assessed. A correlation of SCC with concrete compacted utilizing traditional technique was additionally incorporated into the review. The added substance utilized as a part of SCC for the review was Fly ash. The mix design was done for M30
grade. fresh properties including Slump flow test, T-500 test, V-funnel, and L-box test were completed for SCC. hardened properties of concrete like Compressive Strength, Flexural Quality, Split tensile strength and Water absorption test was completed for conventional concrete and SCC. By looking at the quality parameters of various mixes it was observed that SCC is a decent option of conventional concrete with and without utilizing reused aggregates.

S. Manimaran et al. (2015) In this review introduces the execution of Self-compacting concrete (SCC). Ordinary Portland cement was supplanted with fly ash(FA), and coarse aggregate (CA) was in part supplanted with class I bricks (BB), also steel fiber is added. By performing fresh and hardened tests on the specimen an endeavor has been made to concentrate the workability, compressive quality, split tensile strength, flexural quality and shrinkage attributes of SCC. In spite of the fact that the supplanting of CA with BB demonstrated an extensive lessening in the quality when contrasted with the control specimen (CA), the expansion of steel strands expanded the same. There was no real decline in the split rigidity and flexural quality. The expansion of steel strands had negligible impact on the workability of SCC. The test outcomes uncover that the BB alongside steel strands could be adequately utilized as a part of SCC which might be connected for occurrences which require the typical quality of the strength of 20N/mm2. Additionally, utilization of BB in SCC can fill in as a viable method for transfer of development wastes from building development and pulverization.

Y. V. Akbari et al. (2016) In this study the influence of different amounts of recycled coarse aggregate (RCA) obtained from a wrecked Cancer Hospital, Located at Rajkot, Gujarat, around 50 years of age, on the properties of self-compacting concrete (SCC) and contrasted the outcomes and normally vibrated concrete (NVC) containing 100% conventional coarse total (NCA). Vital properties, for example, physical and mechanical properties of characteristic and reused aggregates are done. NCA is somewhat supplanted with RCA by a sum 10%, 20%, 30%, 40% and 50%. The impact of RCA on the properties of SCC in the green state (e.g. slump flow test, V-Funnel test, and L-Box Test) and properties of concrete in the hardened state (e.g. compressive strength, flexural strength, and Split tensile strength) are carried out.

The mix configuration was completed for M30 review of concrete. The exploratory outcomes demonstrate that the compressive strength, flexural strength, and split tensile strength are high than the utilization of Recycled coarse aggregate and the quality of SCC declines with an expansion in reused aggregate (RA) substitution proportions. The present review prescribes SCC hardly accomplishes required compressive quality up to 30% substitution of RCA.

Sarkawt A. Saeed et al. (2016) In this experimental work comprises of casting and testing of 120 specimen separated into four gatherings to concentrate the impact of glass waste substance (0%, 15%, 25% and 35%) as coarse aggregate substitution, on mechanical conduct of SCC, for example, compressive strength, and flexural strength (modulus of rupture). Additionally, the impacts of hoisted temperature (room temperature, 200˚C, and 400 ˚C) on these qualities were considered. The trial comes about demonstrate that the ideal rate of glass waste substance in SCC as a coarse aggregate substitution is 25%. On the other hand, the expansion of temperature prompts diminish these qualities of SCC. Moreover, the properties of the fresh state of SCC demonstrate that the workability of SCC reductions somewhat with expanding glass waste content in the mixture.

VI. CONCLUSION

From the review of the above research work undertaken by the various researchers, it can be concluded that-

A. Coconut shell self compacting concrete can be characterised as light weight self compacting concrete. Because density of coconut shell is much less than normal aggregate.

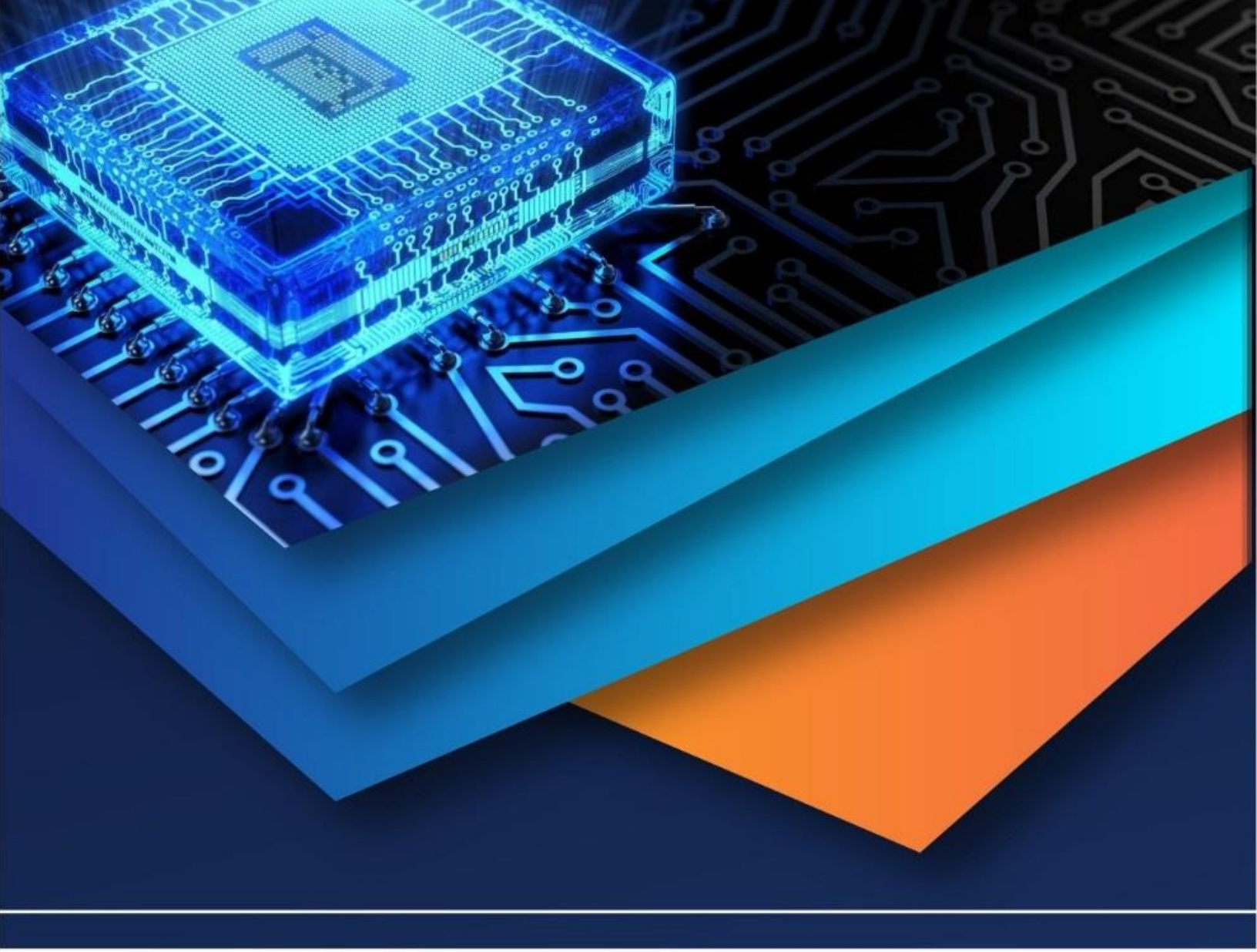
B. It was observed that fresh properties were achieved even 10% replacement of coarse aggregate, also the hardened properties is also in the desired limit.

C. The test results in referred journals provide significant understanding on basic Material properties, Mechanical properties, and Durability properties, of coconut shell aggregate concrete while comparing conventional granite aggregate concrete.

D. The amount of cement required may be more to compensate the loss of strength of self compacting concrete.

REFRENCES

[1] Shetty M.S." Concrete Technology Theory And Practice" Revised Edition 2005, S.Chand Company Limited, New Delhi
[2] FAOSTAT Data, 2014 (Last Accessed By Top 5 Of Anything: January 2014)
[3] Hajime Okamura And Masahiro Ouchi , "Invited Paper On Self Compacting Concrete" Journal Of Advance Concrete Technology Vol. 1, No. 1, 5-15, April 2003
[4] National Multi-Commodity Exchange Of India
[5] R. Ranjith " A Review Study On Coconut Shell Aggregate Concrete" Journal Of Structural Technology Volume 2 Issue 2, 2017
[6] R. Thenmozhi And N. Balasubramani " Experimental Study On Self Compacting Concrete (M25) With 25% Fly Ash Incorporating 10% Replacement Of Coconut-Shell As Coarse Aggregate" Nature Environment And Pollution Technology, An International Quarterly Scientific Journal, Vol. 14. No. 2, 2015
[7] 10.14256/JCE.1141.2014, 201
[8] G.Shyam Venkat , S. Ponkumar Ilango And M. Tamil Selvi " Study On Coconut Fibre Concrete To Develop As
[9] A Self Compacting Concrete" Two Day National Conference On Civil Structure And Environment Engineering, 2015
[10] Vijina V V, Alvin Varghese, Angitha N, Aswathy S, Keerthana Mohan, And Shighil C K " Study On Self Compacting Concrete By Partial Replacement Of Coarse Aggregate With Crushed Coconut Shell" International Journal Of Research In Advent Technology (E-ISSN: 2321-9637) Special Issue International Conference On Technological Advancements In Structures And Construction "TASC- 15", 10-11 June 2015
[11] T.C.Yazhini "A Study On Self Curing And Self Compacting Concrete With Coir Fiber And Coconut Shell As Coarse Aggregate" International Conference On Current Research In Engineering Science And Technology (ICCREST-2016)
[12] K C Panda And P K Bal "Properties Of Self Compacting Concrete Using Recycled Coarse Aggregate"Chemical, Civil And Mechanical Engineering Tracks Of 3rd Nirma University International Conference On Engineering (Nuicone 2012
[13] Prashant O. Modani And Vinod M Mohitkar "Self-Compacting Concrete With Recycled Aggregate: A Solution For Sustainable Development"International Journal Of Civil And Structural Engineering, Volume 4, No 3, 2014
[14] Sija K Sam, Deepthy Varkey And Elson John "Self Compacting Concrete With Recycled Coarse Aggregates" International Journal Of Engineering Research & Technology (IJERT) , Vol. 3 Issue 9, September- 2014
[15] S.Manimaran And K.Suresh Raja "Study Of The Influence Of Recycled Aggregate (Class-I Brick Bats) And Corrugated Steel Fibers In Self Compacting Concrete Beams" International Journal Of Scientific Engineering And Applied Science (IJSEAS) Volume-1, Issue-1, February 2015
[16] Y.V. Akbari, K.B. Parikh And Tejas H. Raviya A Critical Review On Self Compacting Concrete Using Recycled Coarse Aggregate"IOSR Journal Of Mechanical And Civil Engineering (IOSR-JMCE), Volume 13, Issue 1 Ver. V(Jan. - Feb. 2016)
[17] Sarkawt A. Saeed , Shler S. Qadir And Hamed M. Jassim "Strength And Behavior Of Self Compacting Concrete With Glass Waste As Partial Replacement For Coarse Aggregate Under Elevated Temperatures" International Journal Of Engineering Technology, Management And Applied Sciences, Volume 4, Issue 3,March 2016



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY