International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 3 Issue 6, October 2019 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

To Study Characterstic Behaviour of Recycled Concrete Aggregate

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How to cite this paper: Nitin Jain | Ashish Verma "To Study Characterstic Behaviour of Recycled Concrete Aggregate" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-3 | Issue-6, October 2019, pp.1153-1157, URL: https://www.ijtsrd.com/papers/ijtsrd29348.pdf

IJTSRD29348

INTRODUCTION

Near about 30% of concrete is produce by concrete industry and it is calculated that in a year 165 million tonnes of concrete is used. Hence, to produce other total sources that are based on waste products, there are many significant incentives. Recycling products are used to produce aggregate Martials for unbound fills, pipe bidding and sub base as the (RCA) "Recycled Concrete Aggregate" or RCA is not suitable for concrete that is ready to mix because it is blended with another products. Many sites did trials with RCA that mix with ready mix concrete but it was not useful choice. Utilities organizations produce brick, containing stone, clay, Trench arising, asphalt, and concrete but that could be merged in low power concrete which were a cost effective trench product. IN trench reinstatement from RCA formed concrete is used that has <4mm fines and in formed concrete, it has ability to use burner bottom ash. BS 8500 concrete improved the potential for recycling as BS EN 12620. Presently recycled products for concrete is not available but it is a hope that they will be used in future.

Demolition waste

Recycling concrete is the mix concrete of wastes structures material of the concrete. The recycled aggregate is produced by cursing concrete .the recycled aggregate can be use again for many civil construction. When structures made of concrete are demolished or renovated, concrete recycling is an increasingly common method of utilizing the rubble. Concrete was once routinely trucked to landfills for disposal, but recycling has a number of benefits that have made it a more attractive option in this age of greater environmental awareness, more environmental laws, and the desire to keep construction costs down. Concrete aggregate collected from demolition sites is put through a crushing machine. Crushing facilities accept only uncontaminated concrete, which must be free of trash, wood, paper and other such materials. Metals such as rebar are accepted, since they can be removed with magnets and other sorting devices and melted down for recycling elsewhere. The remaining aggregate chunks are sorted by size. Larger chunks may go through the crusher again. After crushing has taken place, other particulates are filtered out through a variety of methods including hand-picking and water flotation. Crushing at the actual construction site using portable crushers reduces construction costs and the pollution generated when compared with transporting material to and from a quarry. Large road-portable plants can crush concrete and asphalt rubble at 600 tons per hour or more. These systems normally consist of a rubble crusher, side discharge conveyor, screening plant, and a return conveyor from the screen to the crusher inlet for reprocessing oversize materials. Compact, self-contained mini-crushers are also available that can handle up to 150 tons per hour and fit into tighter areas. With the advent of crusher attachments - those connected to various construction equipment, such as excavators - the trend towards recycling on-site with smaller volumes of material is growing rapidly. These attachments encompass volumes of 100 tons/hour and less.

Angular aggregate that is suitable for concrete

In the world, "Construction and Demolition" (C and D) waste established a main part of aggregate waste materials and mostly used in lands. With properly treating and using again

the waste products in new concrete is possible said by many researchers. These paper reviews different qualities of the beginning problem. Together with a short introduction on the engineering qualities of reused aggregates, the paper likewise provides a summary on the impact of utilization of reused aggregate on the attributes of hardened and fresh concrete. The paper concludes by determining several of the main obstacles to come down with a lot more prevalent utilization of RA within "Recycle Aggregate Concrete" (RAC).This analysis is part of extensive research whereby experimental investigations are performed to look at the impact of partial replacing of rough aggregate by demolished misuse on compressive power of the research during seven along with twenty eight d, water absorption and density of concrete (obtained by such replacement). Then strength of conventional concrete was compared to compressive strength. During the study coarse aggregate were replaced in various proportions 0%, 25%, 75%, 100%.

Sustainability

Recycling where possible concrete supplies sustainability in a number of different methods. The easy action of recycling where possible the concrete cuts down on the quantity of information which should be acreage loaded. The concrete itself gets aggregate along with being any kind of lodged metals are usually eliminated as well as reused also. The concrete is not only helpful in premium landfill but also it is an economically effective. With use of recycle concrete there is no need to use virgin aggregates. This particular within turn cuts down on the environmentally friendly effect of aggregate removal procedure. By taking away both misuse fingertips as well as brand new content output requires, transportation needs for the undertaking are considerably decreased. Besides the source managing factor, recycled concrete aggregates take in a huge amount of carbon dioxide through the encompassing atmosphere. The organic procedure for carbonation takes place in all of the concrete coming from the counter inward. Within the procedure of smashing concrete to produce recycled concrete aggregates, regions on the concrete which haven't carbonated are subjected to atmospheric carbon dioxide.

The "**LEED** Green Building Rating System" recognizes recycled concrete in its point structure. "Credit 4 (Materials and Resources)"says, "specify a minimum of 25 percent of building materials that contain in aggregate a minimum weighted average of 20 percent post-consumer recycled content material, OR, a minimum weighted average of 40 percent post-industrial recycled content material." Recycled content of concrete have to calculated on mass basis as % of recycled products. "Construction Waste Management" can also give some credits. It's given based upon diverting a minimum of fifty % by mass of building, demolition, and then acreage clearing waste materials from land fill fingertips. Concrete is essentially weighty building materials and it is often reused into aggregate for street bases or maybe building fill.

Characteristics of Recycled Aggregate Concrete

A clean waste concrete has a concrete that is minimum of 95 percent by weight with total contamination which is less than 1 percent of whole mass and also it has a good sound of crush. Category 1A RCA is a nicely graded RCA with not over 0.5 % brick articles. The smashing qualities of hardened concrete resemble all those of all-natural rock as well as aren't substantially influenced through the quality or maybe quality of first concrete. "Recycle Concrete Aggregates" made of everyone however the poorest quality initial concrete could be likely to successfully pass exactly the same assessments that are getting necessary for screening of standard aggregates. Although also hydrated cement paste, "Recycled Concrete Aggregates" have not just the initial aggregates. This paste cuts down on the certain gravity and also boosts the porosity as compared to corresponding virgin aggregates. Greater porosity of RCA results in a greater absorption.

Purpose of study

"Recycled Coarse Aggregate" has a less amount of mortar and needs small procedure used in method as shown in figure. Recycled aggregate production is differ from complete R and D. Because for making concrete, "Ordinary Coarse Aggregate" are mix with "Recycled Coarse Aggregate" in project methods. Quality of concrete can be by guaranteed when ratio of mixing is adjust. "Recycled Fine Aggregate" does not used in present methods. experiments was performed on these kinds of factors as being a design strategy to figure out the mixed proportion of recycle concrete, the caliber of the recycle rough aggregate, so the power attributes, structural performance, fire-resistant performance, durability, and then workability on the concrete which makes usage of all of the aggregate

LITERATURE REVIEW

Concrete Recycling

Recycling products quality was effected by purity and quality of waste material and ultimately commercial agreement of concrete with recycled materials. The proportion of various elements varies from one country to another based on the products that used for building and construction technology. Recycling processes vary in different countries such as closed loop system in Germany,

This recycling plant also uses a wet washing system called "Evo wash system" to extract pure sand from unprocessed soil.

USA – "Demolition and Construction" waste reports for near about 22 percent of the total waste produced in the United State of America.

1. Reuse as well as recycling where possible of Demolition and Construction waste is but one element of bigger alternative methods known as green or sustainable creating train.
2. Green creating building methods can include salvaging dimensional quantity, making use of "reclaimed aggregates" through "crushed concrete", milling drywall refuse, to make use of as dirt modification in the web site.

Tam (2014) examined the connection in between particular water and specific gravity absorption and was realized that a decline in the specific gravity of "RCA" resulted within a rise within the water absorption. A smaller specific gravity typically corresponds to a much better level of connected cement paste, consequently absorbs more water than all-natural aggregates. "

Vlastimir Radonjanin, Mirjana Malešev, **(2015)**, Something should be used to increase the modulus of

elasticity and shrinkage deformation of RA as compared to NA and Enhancing the Durability related properties of RAC should also be taken into consideration. The study of different types of the "recycled aggregate concrete" properties. Bulk density of hardened concrete, "Splitting tensile strength", Compressive strength, Modulus of elasticity, Properties of Natural and "Recycled

Asif Husain, and **Majid Matouq Assas (2018)**, CBR Test should also be perform for use of "Recycled Concrete" in granular sub base and study its suitability in various pavement components and using cement OPC grade 53e. The study on cube of concrete by water absorption of different percentage of recycled & fresh aggregates. Particle size distribution of coarse & fine aggregates has studied. Variation of slump with w/c ratio of different percentage of RC mixes. Reuse of dismantled concrete will help in overall environment of the region by reduction in mining and air pollution. Dismantled concrete is not a solid waste but useful material to be recycled to prepare fresh concrete.

Tam et al. (2016) for enhancing the caliber of "Recycle Aggregate Concrete". The analysis carried out concentrates on characterizing a number of (RCA)"Recycled Concrete Aggregate" resources, advancement of "Concrete Combination Ratios", and the result of reused rough aggregate qualities about the primary combination proportion. Wen et al (2015) evaluated the usage of recycled concrete as rough aggregate within innovative concrete pavements and concluded that high quality RCA may be utilized as an alternative for a percentage of rough organic aggregates in new cement concrete pavements.

Kenai and Debieb (2018) suggest the replacing prices for fine aggregate and coarse not over twenty five % as well as fifty % respectively. Concrete made out of hundred % of rough recycled aggregates requires excessive quantity of cement to attain a top compressive power as well as for that reason isn't an economic proposition as it's not economical. These recycled aggregates are recommended to be worn in concrete with low medium compressive strength (20 45MPa).Ann et al. (2008) realized the compressive strength of concrete that contains "recycle aggregate" is lower than that of the control concrete examples, but was recovered by changing for cement in deep binder with 30%(PFA) "Pulverized Gas Ash" as well as sixty five % of(GGBS) "Ground Granulated Blast Furnace Slag".

Fredrik Björk, P. Eng (2017) . Using "cement replacement materials" for example fly ash in concrete the replacement percentage also be taken care of structuring for taking responsibility of "life cycle analysis" of that constructed building must be studied. The study of Concrete technology for sustainable development and "replacement of cement" with fly ash or silica fume. When they've related abrasion values, "Brick Aggregate Concrete" offers better strengths as in comparison with "Stone Aggregate Concrete". For demolished concrete the power ranger should be 3000-4000 psi. According to

P.K. Mehta and Rakesh Kumar (2016) Use of many mixtures and its effect on various properties of concrete should be considered. "Compressive strength" of various % of "Coarse Aggregate" replacement then the Workability of various percentage of Coarse Aggregate Replacement. Reused aggregate concrete might be a substitute for typical concrete. About thirty % replacing of "coarse aggregate" with "recycled aggregate concrete" was much like traditional concrete. Toughness retention is located in the assortment of 86.84 to 94.74 % of situation of as much as thirty % replacing.

Khatib [2017]. The concrete's compressive strength decreased without "recycled fine aggregate" which was below 75 %. Elastic modulus and compressive strength will not be reduced when 30% "fine aggregate" exchange with "recycled fine aggregate" mentioned by researchers. Abrasion resistance will increase when "Fine Aggregate" exchange with "Fine Recycled Aggregate" given by L. Evangelista et al.

EXPERIMENTAL WORK

Test for soundness

Soundness of cement is determined by Le-Chatelier method as per IS: 4031 (Part 3) – 1988. Apparatus – The apparatus for conducting the Le-Chatelier test should conform to IS:5514 – 1969. Balance, whose permissible variation at a load of 400gm.

Table Table for soundness

S. No	Initial Reading(cm)	Final Reading(cm)	Expansion (cm)
1	1.4	1.5	0.1
2	1.2	1.4	0.2
3	1.1	1.3	0.2

Results – Final expansion of cement is 0.19cm

Conclusion – Since the expansion is less than 1 cm the cement is suitable for making concrete

Compressive Strength of cement

Strength of the cement is the most important of all the cement properties. Grades mentioned in the cement bags as 53/43 grade OPC/PPC in fact represent the strength of the cement. 53 Grade OPC Cement simply means that 28-day compressive strength of the cement – mortar cubes prepared out of that cement in a standard manner will be of 53 MPa. Strength test of cement is carried out on the cubes of hardened Cement-Sand mortar not a neat cement paste. Strength of cement is defined in three ways: Compressive, Tensile& flexural. Usually compressive test is carried out. ASTM C 109-92 prescribes a cement- sand mix with following specifications:

Table – Test for compressive strength of cement

Sample	Strength after		
	3 days	7 days	28 days
A	21	32	45
B	25	30	47
C	24	28	44

Results - Average Strength –45.33 N/mm^2

Conclusion – Since the average strength of cement is more than stated thus the cement is suitable for making concrete.

Abrasion test

This section presents the standardization of abrasion test or test method for abrasion resistance of concrete surface

subjected to the various uses. The test methods that are employed world over to evaluate the abrasion resistance of concrete have attempted with varied success to reproduce the typical forces detrimental to concrete surfaces. Currently, there are four standard ASTM test methods at International level and one standard Indian Code method for evaluating the resistance of concrete subjected to various types of abrasive actions. ASTM C 418 presents a test method to evaluate the abrasion resistance of concrete by sand blasting technique.

Table Table for abrasion test

S. No.	Weight of original sample (W_1)	Weight of Aggregate retained on 1.7 mm sieve (W_2)	Aggregate Crushing Value (W_2-W_1) X100/W_1
1	5 Kg	3.659 Kg	26.82 %
2	5 Kg	3.78 Kg	24.4 %

Results – Average Abrasion value of aggregate 25.61 %

Compressive Strength of cement

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Compressive strength of sample after replacement of aggregate

Compressive strength	Replacement Of Natural Aggregate			
	0%	10%	20%	30%
M30-3Days	20.56 N/mm2	16.38 N/mm2	19.34 N/mm2	18.45 N/mm2
M30-7 Days	33.13 N/mm2	23.54 N/mm2	31.93 N/mm2	28.34 N/mm2
M30-28 Days	47.54 N/mm2	42.28 N/mm2	43.92 N/mm2	40.23 N/mm2
M40-3 Days	31.59 N/mm2	28.32 N/mm2	27.34 N/mm2	25.65 N/mm2
M40-7 Days	56.34 N/mm2	53.69 N/mm2	51.69 N/mm2	49.45 N/mm2
M40-28 Days	64.54N/mm2	60.44 N/mm2	56.22 N/mm2	54.56 N/mm2

Table for sample results

Replacement	Cubes casted	Sample	Load (KN)	Strength after 28 days N/mm2	Average strength after 28 days N/mm2
0%	3	A	1390	61.68	61.38
		B	1410	62.67	
		C	1345	59.78	
25%	3	D	1350	60	56.44
		E	1240	55.11	
		F	1220	54.22	
50%	3	G	1210	53.78	50.07
		H	1180	52.44	
		I	990	44	
75%	3	J	970	43.11	42.08
		K	980	43.56	
		L	890	39.56	
100%	3	M	620	27.56	25.71
		N	580	27.78	
		O	490	21.78	

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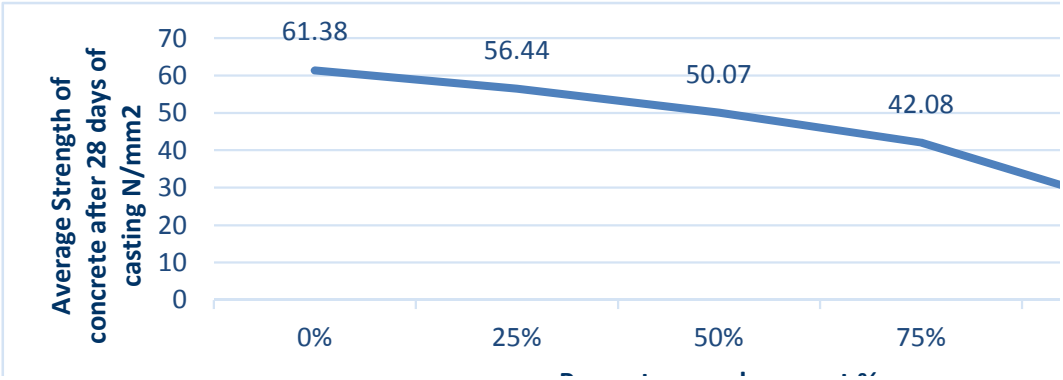
Graph for average Strength of concrete after 28 days of casting



CONCLUSIONS

After checking the "Compressive Strength" of the different batches of concrete which was set by replacing "coarse aggregate" with demolition waste it may be concluded that such concrete give power as compared to the normal concrete upto 75% replacement. Beyond 75% replacement the strength obtained is lower than required according to IS-456 2000 since the results of 100% replacement failed in criteria 1. Moreover since the test results for 100% replacement also fail in criteria 3 it shows that such concrete will show large variation in its strength. More over since the demolition waste have abrasion value more than 30% and impact value more than 30% these demolished waste should not be used in concrete pavement according to IRC guidelines. Thus demolished wastes are not suitable for road construction however the can still be used in building or other works.

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