Turkish Online Journal of Qualitative Inquiry (TOJQI)
Volume 12, Issue 7 July 2021: 12358 – 12365

Research Article

Strength Of Concrete By Replacing Coarse Aggregate By Demolished Waste

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ABSTRACT:

Constructions and demolition activities was increased normally for the past two decades. With these type of construction activities going up, we are having short for these construction materials , mainly aggregates, therefore finding an other type resource is the need of time. Laboratory trials have conducted to investigate the possibility of using recycled aggregates as the replacement of natural coarse aggregates in the concrete. Large quantities of construction and demolition wastes were happened every year in developing countries like India. The disposal of this waste is a very big problem ,because it needs large space for its disposal and that too very little demolished waste is recycled . This study is a part of comprehensive program where in the experimental investigations have been carried out to assess the effect of partial replacement of the coarse aggregates by the demolished waste on workability and the compressive strength of the recycled concrete for study at 7,14& 28 days .In this study replacement of recycled aggregate was done in four proportions i.e. 0%,10%,20%&30%. Each sample was tested for compressive strength for 7, 14 & 28 days and compared with standard concrete.

Key Words: Demolished wastes, compressive strength, workability, fine aggregates, coarse aggregate, flexural strength , splitting tensile strength.

1. INTRODUCTION

Concrete is the mostly used construction material on this earth surface. Infact, concrete is used in virtually everything and there is still no substitute available for huge of its applications. Without this concrete, the community , society and many of these requirements cannot exist. Therefore, more of researches are going to find the new varieties of this concrete which are economical for these construction. All these researches are seen on the replacements of more number of ingredients of the concrete which makes the concrete cheap and even stronger too. Comparison with natural normal weight these aggregates, recycled aggregates are weaker, more porous. The concrete strength decreases when recycled concrete was used and the strength reduction could be low as 40% . However, no decrease in strength was reported for concrete containing up to 20 percent fine or 30 percent coarse recycle of concrete aggregates. but beyond all these levels, there was a sistematic decrease in strength as the content of recycled aggregates are increased .

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The strength characteristics of this concrete was not affected by the quality of recycled aggregate at high water-cement ratio, it was only affected when water/cement ratio is low . Higher the water-cement ratio lesser is reduction in compressive strength .

This paper will presents a recent study carried out locally to study the feasibility of using recycled aggregates in concrete. The effect of replacing the natural coarse aggregates with the crushed concrete and the natural fine aggregates on the properties of this concrete is reported.

2. MATERIALS

In the design of conventional concrete the selection of proper ingredients and evaluating their properties and understanding the interaction between different materials plays a huge role in performance of these concrete. The ingredients used in these study are cement, coarse aggregate, natural sand , demolished concrete .

2.1 Demolished waste:

The concrete gathered using demolished waste aggregatese satisfies the minimum requirements of the new bought aggregates. Concrete using the demolished waste aggregate results in acceptable strength required for the structural concrete. The Demolished wastecement composite is compatible and the no pre-treatment is required for that.
The demolished wastes was gathered from a construction site. They are dried for the few days before being crushed manually. The crushed materials are later transported to laboratory where they were washed and allowed to dry under ambient temperature for the several hours.

2.2 CEMENT :

The Ordinary Portland cement of Birla brand obtained from a single batch through out investigation was used. These ordinary cement content contains of mainly two basic ingredients named argillaceous and calcareous.

2.3 Fine aggregate:

Fine aggregate is obtained from locally available river ,which passed through the 4.75 mm sieve. The fineness modulus of these fine aggregate is 2.74 and specific gravity is 2.63.

2.4 Coarse aggregate:

Coarse aggregate was obtained from locally available crushed stone aggregates about 12 mm maximum of single lot size has been used trough out experiment. Sp gravity of the coarse aggregate is 2.64 and fineness modulus of coarse aggregate is 6.22.

2.5 Water:

Potable water is used for mixing and the curing.In addition of more percentage of demolished waste,requirement of water increases for same workability. Thus, a constant slump has been the criteria for water requirement, but these specimens having 0 percentage demolished waste, W/C of 0.50 has been used for these study.

2.6 Preparation of Specimens:

Concrete mix proportions with ratio 1:1.5:3 is used for these preparation of specimens. Conventional specimens were also casted. Recycled aggregate specimens is prepared where the coarse aggregates is replaced by the recycled coarse aggregate from concrete waste of about 0%, 10%, 20%, 30%. The specimens were cured by using tap water at room temperature and tested at the age of 7 , 14 and 28 days.

2.7 Recycled Aggregate:

Aggregate typically processed by the crushing of parent or the old concrete such as demolished waste concrete is regarded as recycled concrete aggregate . Generally RCAs are mixed with bricks, tiles, metals and other miscellaneous such as glass, wood, paper, plastic and other debris .

3. OBJECTIVES

The uses of demolished concrete as replacement to the coarse aggregate in concrete has benefits in terms of cost and reduction of pollutions from construction industries. These cost of concrete production will decrease considerably compared to conventional concrete produced by using newly obtained coarse aggregate. Since it was readily available at very cheap cost, its application will decrease the construction pollutions and enhances effective use of the construction waste which helps in the controlling of Solid Waste Management ("SWM"). With the above mentioned objectives, the following subsidiary laboratory investigations are also intended to be fulfilled.

1. Basic tests on concrete and the demolished waste ingredients.

2. Rebound hammer test to confirm grade of demolished concrete on existing column remains.

3. Compressive Strength, Split Tensile and Flexural Strength test for normal concrete and the concrete produced with demolished aggregates.

LITERATURE REVIEW

G. Murali et al, (March 2012) "Experimental investigation on concrete with partial replacement of coarse aggregate" .The study on effects of the shahabad stone and chemical admixture on concrete were investigated. Natural aggregate has been replaced with the waste shahabad stone in four different percentages namely 10, 20, 30 & 40 percentage.. A comparison was made between specimens of the partially replaced coarse aggregate and same set of the specimens admixed with supaflo. These effects on compressive strength, split tensile strength , modulus of rupture were also reported. Test results indicated that these replacement of coarse aggregate by 30% had attained a good strength.

MohdMonish et al,(2013 February)"Demolished waste as coarse aggregate in the concrete". This experiment study will be the part of a comprehensive program where in experimental investigations has been carried out to assess effect of the partial replacement of coarse aggregate by the demolished waste on workability and the compressive strength of recycled concrete for study at 7 ,14& 28 days. The compressive strength thus, observed was compared with strength of the conventional concretes. Test results showed that the compressive strength of recycled concrete up to 30 percentage coarse aggregate of replacement by the demolished waste at end of 28 days ,has been found tocomparable to be conventionl concrete.

Shivakumar et al, (June 2014)" Use of building demolished waste as coarse aggregate in porous concrete" . In this experimental study, using of building demolished waste in the manufacturing of Porous concrete as the replacement of a coarse aggregate. By these investigation it is found that porous concrete results are encouraging to use as the porous material for the drain-ability and has been found to be comparable to conventional concrete. Porous concrete may be an alternative to the conventional concrete because of these low density and high porosity.
JitenderSharma et al, (2014 July) "Study of the Recycled ConcreteAggregates" .This experiment describes introduction and production of the recycled concrete aggregates and its various applications in construction industry. When the water cement ratio is used , recycled aggregate mix is reduced, tensile strength and modulus of the elasticity are improved.
D. V. Prasada Rao et al, (November 2014)"Experimental investigations of coarse aggregate recycled concrete". The present work is directed towards evaluation of the concrete using full replacement of natural coarse aggregate with RCA. The experimental results of the mechanical and durability properties are also evaluated and compared with the NCA concrete. Firstly, main problem with RCA concrete is high percentage of water absorption. RCA has huge compressive strength comparable to the natural coarse aggregates concrete.
Preeti Saini et al, (April 2015)"A Review on Recycled Concrete Aggregates". This experiment will focuses on the coarse RCA which is coarse aggregate from the original concrete i.e. created after mortar is separated from rock which is reused. Use of RCA in the new construction applications is still a relatively new technique. Literature survey reveals that compressive strength primarily depends on the adhered mortar, type of aggregate, age of curing and ratios of replacement from new material to the aggregate and cement, water absorption, strength of parent concretes, interfacial transitions zone and moisturee content.

T.Subramani et al, (2015 May) "Experimental Investigation of the Using Concrete Waste and BrickWaste as a CoarseAggregate". This experiment was carried out to the study on concrete which incorporate Over Burnt Brick Ballast and the concrete waste partially due to their abundance. 25 percentage, 50 percentage (M15, M25) incorporation was used as partial replacement of the natural coarse aggregate in the concrete. As percentage of crushed concrete coarse aggregates and crushed brick fine aggregates are increased, Coarse aggregate is replacement level of 25 percentage & 50 percentage of brick waste in concrete mixes was found to be the level to obtain higher value of strength and durability at age of 28days. 25% & 50 % concrete waste in concrete mixe was found higher value of strength compared with brick waste used in concrete . Finally conclude the compressive strength, flexural & split tensile strength is high when containing concrete waste 50 % in concrete compared with M15 .

RahulMahla, et al, (2015 August)"Partial replacement of the coarse aggregate by its waste tires in cement concrete". In this experiment an attempt has been made to the identify the various properties necessary for design of concrete mix with coarse tyre rubber chips as aggregate in a systematic manner. In present experimental investigation, M20 grade concrete has been chosen as reference concrete specimen.Test results shows that the addition of rubber aggregate to the concrete at a lower percentages of 10 % and 25 % enhanced the impact resistance of concrete greatly and hence application of rubberized concrete can be of great help in structures which are exposed to vibrations and impact loads.

A.NaveenArasu,S.Vivek,J.Robinson,T.Thilakranjith[2017]:Test study features about utilization of waste found dry sand as in completes wap for fine total.These waste found dry sand is utilize

dasa halfway substitution of fine total in proportion of about 5%, 10% and15% in the different blend extent and different test is done ,result is resolved. From these result it is distinguished that compressive quality of concrete is expanded,all things considered,for the fractional supplanting of fine total with the squander foundry proportion at a level of about 20%.

N.Saitrinath Kumaretal,(October2015) "Utilization of development remodel and destructions quander in incomplete substitution of coarse total in m20 concrete." Test was completed in the research centre to investigate the concrete made of incomplete supplanting of coarse total with the development and destruction squander materials like fired tiles squander,plastic flotsam andjetsam and squashed blocks.The functionality of cement delivered with the development squander when contrasted and plain concrete cement isn't solid yet it created asignificant increment in the compressive quality.

RESULTS AND DISCUSSIONS

Properties of coarse aggregate : Coarse aggregates refer to the irregular and the granular materials such as the sand,crushedstone or gravel and are used for the making of concrete. In most cases, Coarse is naturally occurring and can be obtained by blasting quarries or crushing them by hand or crushers.

S.No	NAME OF TEST	RESULT
1	Size	20 mm
2	Sieve analysis	2.6
3	Water absorption	1.36 %
4	Specific gravity	2.68

Properties of cement: cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together.

S.NO	PROPERTIES	RESULT
1	Fineness	3 %
2	Specific gravity	2.71
3	Standard consistency	31.5 percentage
4	Initial setting time	31 min
5	Final setting time	420 min

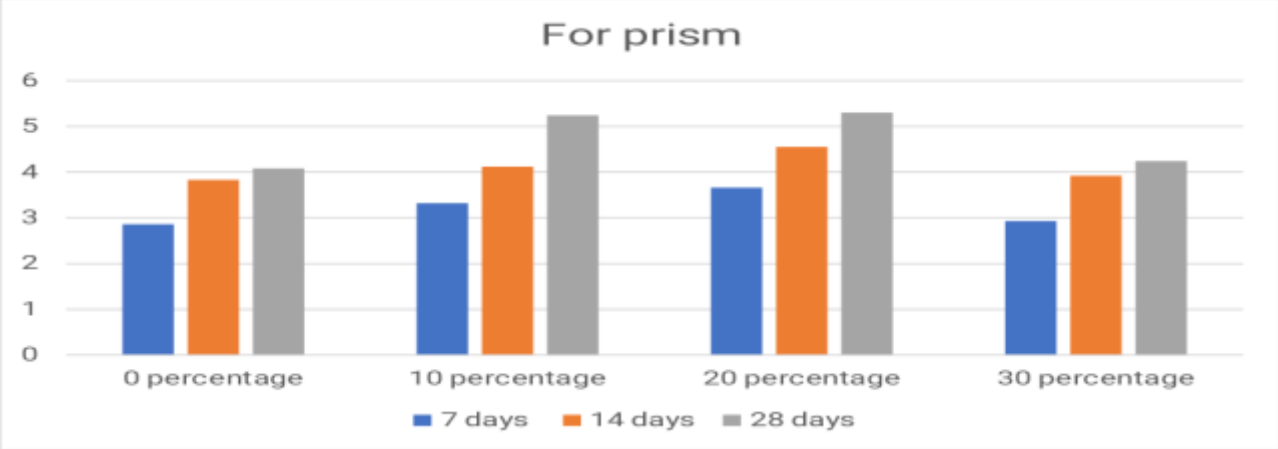
Properties of replaced coarse aggregate on demolished waste :

S.NO	REPLACED CONCRETE	Cube	Prism	Cylinder
1	0 %	0.145 kg	0.230 kg	0.12 kg
2	10 %	0.447 kg	0.663 kg	0.33 kg
3	20 %	0.894 kg	1.326 kg	1.86 kg
4	30 %	1.341 kg	1.981 kg	2.49 kg

Thermal Compressive strength : Compressive strength is the ability to carry loads of material or structure on its surface without any cracking or deformation.

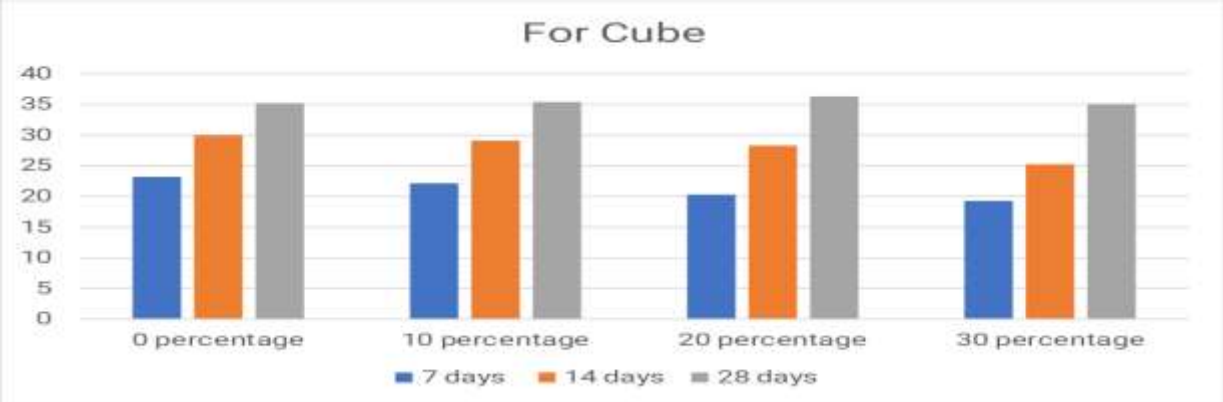
FOR PRISM:

S.NO	Replaced of concrete	Average strength(n/mm²)		
		7 days	14 days	28 days
1	0 %	2.86	3.83	4.08
2	10 %	3.32	4.12	5.24
3	20 %	3.66	4.55	5.3
4	30 %	2.93	3.92	4.24



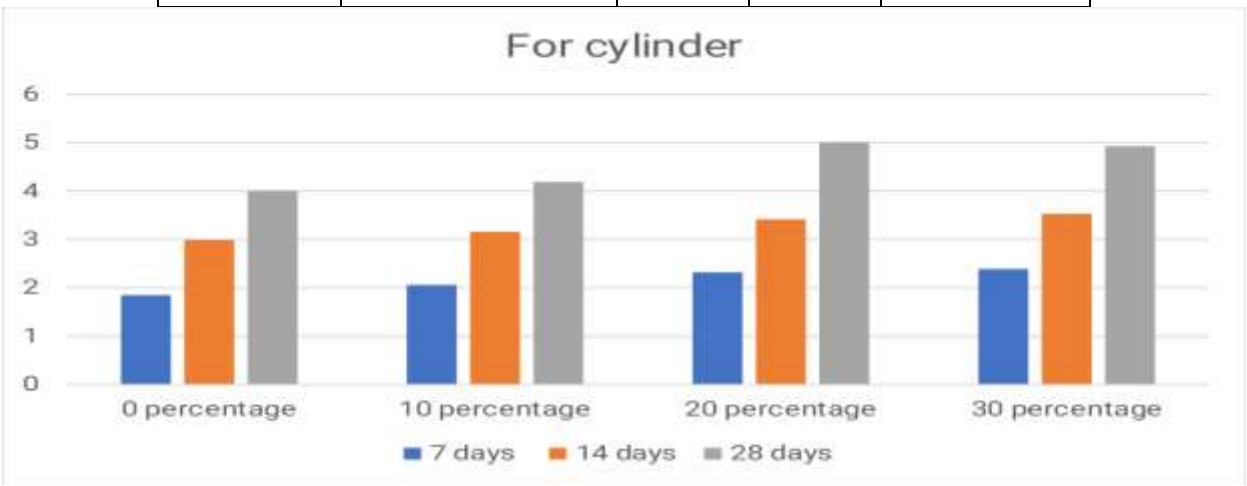
FOR CUBE :

S.NO	REPLACED OF CONCRETE	AVERAGESTRENGTH (n/mm²)		
		7 days	14 days	28 days
1	0 %	23.21	29.98	35.2
2	10 %	22.15	29.12	35.4
3	20 %	20.31	28.30	36.33
4	30 %	19.28	25.27	35.1



FOR CYLINDER :

S.NO	REPLACED OF CONCRETE	AVERAGESTRENGTH (n/mm²)		
		7 days	14 days	28 days
1	0 %	1.85	2.99	4.01
2	10 %	2.06	3.16	4.19
3	20 %	2.32	3.42	5.01
4	30 %	2.39	3.53	4.93



CONCLUSION

In this paper Recycled aggregate concretes may be alternative to the conventional concrete and Water required for producing same workability increases with increase in percentage of demolished waste. Almost Up to 30% replacement of coarse aggregate with recycled aggregate concrete was comparable to conventional concrete and Up to 30% of coarse aggregate replaced by demolished waste gave strength closer to strength of the plain concrete cubes and the strength retention is in range of 86.84 to 94.74% as compared to the conventional concrete.

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