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Uses of Destructed Concrete in Establishing Simple Houses for Displaced People

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Abstract

The need in the construction sector continues to demand for destructed concrete, especially in times of war, and for low-income displaced people. Lack of natural resources to obtain scrap, is one of the biggest problems facing the concrete production. The environmental pollution is as a result of the building destruction. Waste collects and poses an environmental risk to human health, organisms and nature. Nowadays, great interest has been developed for the reuse of recycled destructed concrete aggregates which represent a very large proportion of the volume of destructive concrete resulting from the wars and the destructions in the Middle East. Low cost and acceptable quality, are also essential for low-income housing. The main goal of this research is to obtain concrete at low cost for this purpose. The experimental out comes indicated that the cubic compressive strength measured for the test specimens; the concrete compression was found to increase as the rate of replacement of the destructed concrete was reduced. The conventional concrete of 25 MPa specific strength at 28 days was used for comparison purposes. The importance of this study is to construct simple houses from recycled destructed concrete for emigrant low income displaced people, after the war and earthquake stopped. Also to study the efficiency of produced concrete as a replaced aggregate through evaluation of some physical and behavioral characteristics.

Keywords: *Destructed Concrete, Displaced People, Environmental Pollution, Compressive Strength, Recycled Aggregate.*

Introduction

The recycling of destructed concrete as a process in producing new concrete , is not used only to solve the waste disposal problems, but also to conserve the building materials from the natural resources, which are few in some places. Many concrete structures are destroyed for different purposes, producing huge amount of demolished concrete every year. The producing destructed concrete as crushed aggregates is used to prepare new concrete for the purpose of production new houses for displaced low income people.

Moreover, for a long time, since the source of the total sand and stone is large and expensive, it is produced costly. Effective handling of destroyed concrete and shortage of natural aggregates regarding the fact that destroyed concrete is inexpensive which is important for the progress of the building industry. In these days, recycled aggregate concrete process has become an effective means of using destroyed concrete resources. However, the sources of recycled coarse aggregates are wide, Coarse aggregates are mostly recycled from conventional concrete, while studies on the source of lightweight concrete structures are few. As a source of destroyed concrete, through recycling technology, the purpose of recycling aggregate destroyed concrete can be achieved.

Based on the compressive testing material , the uniaxial pressure and influence factors of the recycled concrete were analyzed to feed the research content of the structure of the recycled destroyed concrete, so the reference for further research and application was provided for the recycled concrete.

There are many benefits in low cost and capacity in concrete resulting from recycling rather than dumping or laying it in the landfill. These advantages include:

•Reduce transferring and removal costs.

•The cheapness of the cost of recycled debris compared to the new production.

•Increasingly, high-resistance aggregates are not available at the right price, which increases the economic and environmental cost associated with long transport distances versus the use of recycled aggregates.

Previous Researches

Corinaldesi, Valeria , Husain, Asif, Tabsh, Sami W., and Akmal S. Abdelfatah (2010) studied the Mechanical and Elastic Behaviour of Concretes Made of Recycled Concrete Coarse Aggregates. Husain, Asif, and Majid Matouq Assas (2013): studied the Utilization of demolished concrete waste for new construction. Tabsh, Sami W., and Akmal S. Abdelfatah (2009) studied the Influence of Recycled Concrete Aggregates on Strength Properties of Concrete.

Kawano, H.(2013) focused on the reuse of destroyed concrete in Japan, that is earning the concentration. European countries expend billion tons of aggregates annually . Poon, C.S., S.C. Kou, and L. Lam (2002) conducted the Use of Recycled concrete in Molded Concrete Bricks and Blocks .A lot of destructed concrete in many countries is more than tens million tons annually.

Akhtar, J.N., T. Ahmad, M.N. Akhtar, and H. Abbas (2014) studied the Influence of Fibers and Fly Ash on Mechanical Properties of Concrete, and they indicated that in several areas, different techniques for reusing destructed concrete have been improved, and some standards have been changed.

This issue considered different kinds of destructed concrete that were developed. Huda and Alam (2014) focused on the use of durable concrete, and how destructed aggregate affected the compressive strength of new recycled destructed concrete.

Kubissa, Wojciech, Roman Jaskulski, and Miroslav Brodnan (2016) studied the influence of SCM on the Permeability of Concrete with Recycled Aggregate. Sh. Ghannam (2017) indicated how Partial Replacement of Cement by Virgin Oil Shale Powder and Oil Shale Ash affected the Properties of Concrete mix**.** Ghannam, S., Najm, H., & Vasconez, R. (2016) focused on the experimental test of concrete made with granite and iron powders.

Experimental Tests and Materials

The rehabilitation of destroyed concrete is a high-quality collection, which is the product of many treatment processes of: Old building demolishing, crushing of concrete debris, sieving the crushed concrete (sizing and sorting), cleaning and Washing the aggregate, and mixing the concrete components. In order to prepare an aggregate of destructed old concrete, a mount of destructed concrete was collected from some old demolished buildings in Amman and in Irbid cities, as shown in Fig.(1).

Fig.(1). Old demolished buildings

After which some concrete debris were collected from destructed concrete of columns and beams of very old buildings as mentioned above , see fig (2).

Fig.(2). Concrete debris

Fig.(3). Crushing of Concrete debris

To have a suitable graded aggregate ,debris concrete was crushed using hammers as shown in Fig (3). After crushing of concrete debris , the small concrete pieces (of 240-250kg weight) were collected in bags as seen in fig (4) and transferred to the laboratory of building materials in order to do sieving, as in fig(5,6). Processes took about 4 days.

Fig. (4). collecting of small concrete pieces

Fig.(5). Sieving Process

Fig.(6). Sieve shaker

Then the samples were washed by water in order to remove the dust of aggregate surfaces. After which the samples were dried then collected in different sizes for mixing (sorting). The washing and drying of aggregates shown in fig (7).

Fig.(7). washing and drying of aggregates

The next step is Mixing : The process of mixing was according to American Institute method , by choosing the mix of type (b) with proportion mix as : 1:2:4 (I cement : 2 fine :4 coarse) , where fine size is 0.3 mm and 0.6 mm , while medium and coarse of size 12.5mm and 19mm, and the water to cement ration is 0.9 (it is high) for lubrication purposes.

Firstly the different materials (gradients) were mixed for 2 minutes dry, as shown in fig (8) below .

Fig.(8). Dry mixing

Then water was added and the mix was shaking for 3 minutes and finally the iron powder was added in its percentage (10%) to improve the strength of concrete , see fig (9) below .

Fig.(9). Wet mixing

Cubes Casting : Eighteen steel cubes (9 cubes for normal concrete mix , and 9 cubes for crushed aggregate concrete mix) were prepared and cleaned by oil , then concrete casting in three layers , in which each layer was compacted 25 blows using steel rod and each cube was named and casting date was mentioned. As shown in fig(10&11) below.

Fig.(10).The process of compacting

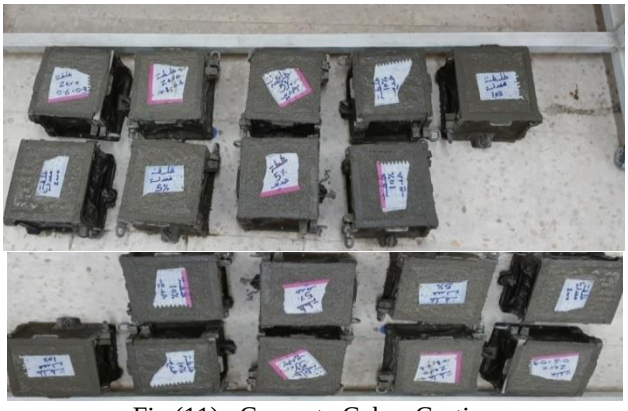


Fig.(11). Concrete Cubes Casting

After 24 hours , the cubes were dis assembles and the concrete cubes were weighed and there dimensioned were measured . After which the cubes were put in water tank (of 22^0c temperature). See fig (12) below.

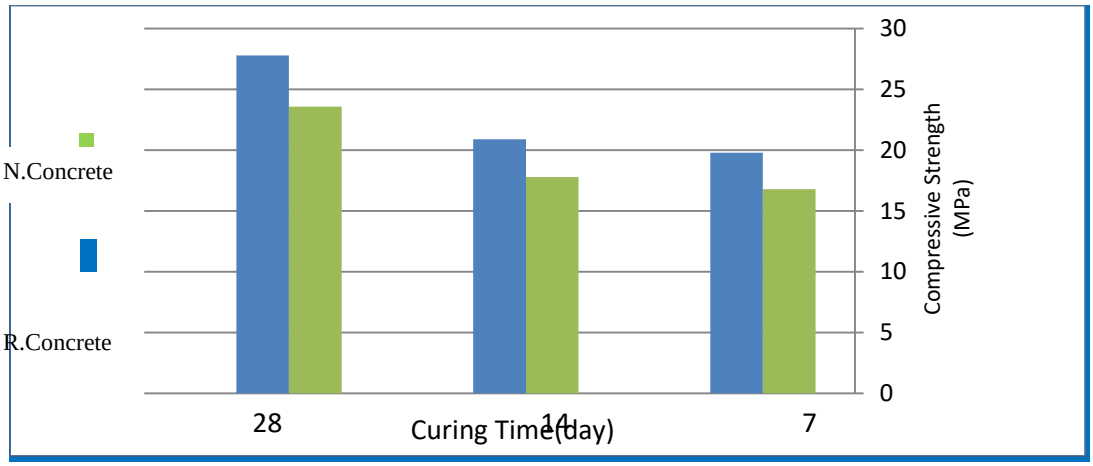
Fig.(12). Cubes Curing (Water Treatment)

Test Results and Discussion

The experimental tests were done by 2000 kN compressive testing machine at Arab Center For Engineering Studies . Eighteen concrete cubes (9 for each concrete type) were tested on 7days, 14 days and 28 day . The results were tabulated in table (1) and graph (1) below :

Table(1) Concrete Average Compressive Strength with Normal and Recycled Aggregate with 10% iron powder

Batch No.	Curing Time (day)	Compressive Strength (MPa)	
		Normal Concrete	Recycled Agg. Concrete
1	7	19.8	16.8
2	14	20.9	17.8
3	28	27.8	23.6



Graph (1) : Compressive Strength (MPa) of Concrete with Normal and Recycled Aggregate with 10% iron powder vs Curing Time (day)

Conclusions:

In this paper, experimental testing and analysis were performed on eighteen standard cubic test units of normal and recycled coarse aggregate concrete . The conclusion is summarized into :

(1) The compression of recycled aggregate destructed concrete was less than that for normal aggregate concrete.
(2) The produced new concrete is inexpensive , and simply produced for constructing new simple houses for displaced low income people at the time of war or earthquake .

Finally , it is good idea to consider that the crushed old concrete can be a good alternative concrete that can be used , as a new aggregate in new concrete buildings . It is good idea to eliminate the huge amount of the destroyed buildings and the resulted pollution , by manufacturing new buildings using recycled destructed concrete for displaced people with low in comes.

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