Journal of Engineering and Applied Sciences 15 (4): 956-959, 2020
ISSN: 1816-949X

Recycling of Residues and Residues of Buildings to Produce Different Concrete Mixes Shapes and Sizes in Iraq

Noora Ayad Al-Harby
Department of Civil Engineering, Bilad Al-Rafidain University College, Baghdad, Iraq

Abstract: Concrete is the most important part of the construction, structuring of buildings and others with its important properties in addition to being a material that can be produced locally from primary materials at the lowest cost, so that, the accumulations resulting from the waste of concrete wastes give a lot of motivation to produce more environmentally friendly concrete, the use of a quantity of clean water which was examined in the water and soil laboratory of the Department of Water and Soil of the College of Science/University of Sulaymaniyah was done by mixing a mixture of 9 cubes with c15-15 (15-15) press and use the results of the study showed that 75% of recycled aggregates, residues of buildings and residues were used in the water tank at a temperature of 20±1 and then examined at several time intervals. The cement properties used in this study were within the limits of the standard required for the work of concrete from the remains of buildings and constructions in terms of the degree of flexibility and the degree of softness. The value of the absorbance ratio of the recycled aggregate is higher than it is in conventional aggregates but it is somewhat acceptable to the specifications of the finished concrete pieces. The study recommended that this type of recycled concrete can be used from the remains of buildings and concrete waste in road works, block manufacturing and in the work of concrete floors.

Key words: Recycling, residues and residues of buildings, concrete mixings, primary materials, cement properties, concrete floors

INTRODUCTION

The importance of building concrete in the forefront of the materials used for construction in addition to being a material that can be produced locally from raw materials at the lowest cost, the process of restoration or rehabilitation of buildings increased in the advanced ages when the movement began treatment in the beginning of the twentieth century to exploit the largest possible amount of rubble and debris, concrete is the largest part of it as well as from the environmental aspect it is treated as one of the causes of environmental pollution, the process of recycling and reclamation of a large part of the environmentally harmful waste, sustainable development globally in this regard recycling waste demolition and construction or (Gull, 2011), through which Iraq needs to recycle and recycle the remaining residues as these factors are available which can be achieved through economic development in the field of reconstruction and urban rehabilitation many countries are working on recycling these residues and residues and make them a useful material to use within the desired specifications after the introduction of treatment methods, whether physical, mechanical or mechanical and comes in the forefront of these New Zealand which has become a leader in the field of waste recycling and Fayat, as well as Poland and Denmark (Murali *et al*., 2012).

These countries have reached the treatment of millions of tons annually to produce materials of high importance and quality within the classification and standard specifications of the world. Many researchers have reached the properties of recycled materials for the production of concrete. However, the aggregate and round waste is different from the natural material due to the pores, shape, size, age and absorption of the recycled material. The density differences are relatively less, the water absorption is more in the old structures to be recycled they remain attached to the surface of the blocks (Akbari *et al*., 2011).

The production of the cement paste is especially, important for the production of various forms such as arches and concrete slabs. Many researchers have found several ways to remove the cement residues from the surface of the blocks to be treated including the use of chemical solutions (Paul, 2011), the studies on two important issues in the production of concrete from materials to be recycled and treated are resistance and humidity when it comes to resistance The mechanical effects such as pressure, tensile strength and elasticity of the concrete produced from the recycled aggregate are less when compared to the natural substance (NAC), depending on the ratio of the mixing of the natural materials and in all the mixing methods, many researchers found that the natural mixing rate was 30% recycled material and 70% natural material (Bashandy and Etman, 2014; Rashid and Mansur, 2009).

The study aims to know the efficiency and quality of concrete produced from waste, waste and re-agglomerated aggregate to be used in reconstruction in whole or in part by studying some of the properties of the dough used for the production of concrete including mechanical such as tensile, pressure and some physical factors.

MATERIALS AND METHODS

The use of Ordinary Portland Cement (OPC) from the production of the Mas cement plant in the city of Sulaymaniyah in the area of Bazian which is subject to the specifications of the Iraq S.S Table 1 shows the chemical properties of cement and some physical properties in Table 2.

Aggregate: Use recycled aggregates in the form of concrete blocks which were examined in the laboratories of the Faculty of Engineering, University of Sulaymaniyah after cleaning, washing and breaking the large pieces of them. Table 3 notes the characteristics and characteristics of the aggregates used.

Water: In this study, a quantity of clean water was examined in soil and water laboratory in the water and soil department of the Faculty of Science, Geological Department, University of Sulaymaniyah.

Natural sand: Use natural sand which meets the international specifications (source).

Concrete mixtures: The above materials have been used to produce concrete mixtures within the good specifications and from Table 4 quantities of materials used in these concrete mixtures of water and cement are pre-blended.

Samples and their treatment: A mixture of different shapes was made, casting 9 forms of cubes with c1515-15 cubes to determine their resistance to pressure and using the manual method for compressing and compressing them. The molds were then removed after 1 day (20±1) and then examined in several stages of time as shown in Table 5.

Table 1: Chemical properties of cement used

Chemical directory of elements	Chemical element code	Items (%)
Mono-calcium oxide	CaO	60.30
Silicon dioxide	SiO_2	18.00
Tricyclic dioxide	Al_2O_3	5.49
Iron trioxide	Fe_2O_3	4.11
Magnesium oxide	MgO	4.01
Total		91.91

Table 2: Characteristics of cement used

Property	Results	Limitations of the standard
Standard lenght (%)	27.00	.....
Primary cohesion time (min)	93.00	Not <45
Final cohesion time (min)	190.00	No more 600
Softness by blain (kg m^{-2})	283.00	Not <230
Compression resistance		
4 days old (MPa)	22.10	Not <17
Age 7 days (MPa)	27.60	Not <24
Age 10 days (MPa)	29.97	Not <28
13 days old (MPa)	32.77	Not <30

Table 3: Physical properties of natural and recycled aggregates

Type of aggregates	Natural aggregate	Recycled rubble
Specific weight Dry Saturated Surface (SSD)	2.63	2.41
Absorption ratio	1.14%	4.77%
Volumetric weight (kg m^{-3})	1330.00	1288.00
The weary	21.00%	28.30%

Table 4: Components and coding of research mixtures

		Mix ingredients (kg m^{-3})			
Symbol of the mixture	RA (%)	Water	Cement	Sandy	Recycled waste
A1	0	189	330	946	0.00
A2	25	189	330	961	390.00
A3	50	189	330	960	484.00
A4	75	189	330	959	621.80
A5	100	189	330	958	799.03

Table 5: Pressure resistors at different ages

Symbol of the mixture	Ratio (RA %)	Pressure resistance (N mm^{-2})		
		Day 7	Day 28	Day 56
A1	0	26	34	57
A2	25	21	32	39
A3	50	23	29	37
A4	75	25	27	36
A5	100	26	27	35

Tests: The testing process was conducted in conformity with US standards (ASTM., 2004). Sampling the size (c15-15-15) of 9 forms of cubes to determine its resistance to pressure and using the manual method of compressing and stacking and then lifting the molds after 1 day and then process the process by placing in the water tank at a temperature of 20±1 in several stages of time 28.7 days.

Tests: The test was carried out in conformity with US standards in soil and water laboratory in the Department of Water and Soil of the College of Science, Geological Department, University of Sulaymaniyah (ASTM., 2004).

RESULTS AND DISCUSSION

By examining the models prepared for the work of concrete from the remnants of buildings and recycling, the results obtained in the tables above were obtained and the results are explained below.

Cement used: As shown in Table 2 for the properties of the cement used, it was found that the degree of smoothness according to the kg (kg m^{-2}) was within the standard specifications where it registered (283). The degree of softness achieved a grade of 27 according to the specifications of the quarantine used for the work of concrete in addition to that it is within the specifications of cement prepared in the work of concrete from the remnants of buildings and constructions.

The time taken during the use of the cement properties in this is in the initial and final coherence time, respectively (93, 190) which is not less than within the limits of the standard (45, 600).

Recycled aggregates: The physical characteristics of recycled aggregates differed from those required in natural aggregates where it was found that the weight of the aggregate and the nominal size was lower than that of natural aggregates. The weight of the aggregate size of the aggregate (1288) which is less than in natural aggregates (1330) while the specific weight of recycled aggregates is (2.41) which is less than the natural aggregates (1.63). The percentage of absorption of recycled aggregates was higher than the natural aggregate (4.77%) while the natural absorption ratio was 1.14%.

It was also noticed in Table 3 that the wear loss was significantly affected by the loss of wear according to the test conducted in los angeles for natural aggregation (21%) while the recycled aggregate was 28.3%.

These results indicate that the change in these properties is due to the old cement residues attached to the surface of the aggregates to be recycled for the work of the concrete. This makes it denser and less absorbable to a higher degree of recycled aggregates and wastes more erosion than it does in natural aggregates. These results are consistent with the results of previous studies that support the results of this study.

Pressure resistance: Table 5 shows the pressure resistors at a range of ages for the research mix at the age of 7,28,56 days. The values of each resistance are obtained from the average value of the pressure resistance to 9 cubes for A1, A2, A3, A4, it was found that the percentage of pressure resistors for these mixtures in the specified ages that these values decrease as the proportion of recycled aggregates in these mixtures. And that these values meet the requirements of the Iraqi standard of mixing ratios (4: 2: 1) which must be not <14 MPa for the age of 7 days and 21 for the age of 28 days.

CONCLUSION

As can be seen from the results above, we can conclude the following: the cement properties used in this study were within the limits of the standard required for the work of concrete from the remains of buildings and constructions in terms of the degree of softness standard and degree of softness. The aggregate of concrete waste is characterized by a low specific weight and high absorption ratio compared with local aggregates. We also conclude that the weight of the recombinant size of the reused aggregate of concrete has a small volumetric weight compared to natural aggregates. The ratio of the absorption ratio of the concrete to the recycled aggregate is higher than it is in the conventional aggregates but it is somewhat acceptable to the specifications of the finished concrete pieces. Concrete can be used from rubble and recycled residues in concrete and walkway sidewalks in the work of road profiles and others. The use of 75% of the recycled aggregate, building residues and concrete waste gave values for the studied barometers close to the values given by the mixture with 100% recycled rubble, structural residues and concrete residues that matched the results with Olivito and Zuccarello (2010).

REFERENCES

ASTM., 2004. Standard specifications from American society for testing and materials. ASTM International, West Conshohocken, Pennsylvania, USA.

Akbari, Y.V., N.K. Arora and M.D. Vakil, 2011. Effect on recycled aggregate on concrete properties. Intl. J. Earth Sci. Eng., 4: 924-928.

Bashandy, A.A. and Z.A. Etman, 2014. Recycling of demolished building materials as concrete coarse aggregates in Egypt. Proceedings of the 8th Alexandria International Conference on Structural and Geotechnical Engineering (8AICSGE), April 14-16, 2014, Alexandria University, Alexandria, Egypt, pp: 1-11.

Gull, I., 2011. Testing of strength of recycled waste concrete and its applicability. J. Constr. Eng. Manage., 137: 1-5.

Murali, G., C.V. Vardhan, G. Rajan, G.J. Janani and N.S. Jajan *et al*., 2012. Experimental study on recycled aggregate concrete. Intl. J. Eng. Res. Appl., 2: 407-410.

Olivito, R.S. and F.A. Zuccarello, 2010. An experimental study on the tensile strength of steel fiber reinforced concrete. Composites Part B: Eng., 41: 246-255.

Paul, S.C., 2011. Mechanical behaviour and durability performance of concrete containing recycled concrete aggregate. MSc Thesis, Department of Civil Engineering, Stellenbosch University, Stellenbosch, South Africa.

Rashid, M.A. and M.A. Mansur, 2009. Considerations in producing high strength concrete. J. Civ. Eng., 37: 53-63.