e-ISSN:2319-9873
p-ISSN:2347-2324

RESEARCH AND REVIEWS: JOURNAL OF ENGINEERING AND TECHNOLOGY

Investigate Effect of Fine-Grained And Coarse-Grained Mixtur Design on the Concrete Compressive Strength.

H Azizian[1]*, and F Riahi[2]

[1]Young Researchers and Elite Club, Mahabad Branch, Islamic Azad University, Mahabad, Iran
[2]Young Researchers and Elite Club, Sardasht Branch, Islamic Azad University, Sardasht, Iran

Research Article

Received: 12/05/2014
Revised: 21/06/2014
Accepted: 28/06/2014

*For Correspondence

Young Researchers and Elite Club, Mahabad Branch, Islamic Azad University, Mahabad, Iran

Keywords: concrete, coarse grained, fine grained, national methods of Mixture Design, compressive strength, mechanical properties.

ABSTRACT

The process of taking strength in the concrete , depends on several factors, that the most important ones can be mentioned as stone materials for forming concrete . stone materials ratio is always as one of the most critical parameters in determining the compressive strength of concrete . Therefore, in this study, with a fixed Mixture Design and changes in the ratio in fine and coarse aggregate , We have covered the vitro evaluation of the changes of compressive strength in the samples in each On days 7, 28 and 90 days according to ASTM standard , and the rate of changes in the compressive strength of the samples were studied . From results revealed that at the age of 7 days compressive strength changes in two Mixture Design is about 10 percent, and in the older ages this will change less than 5% .

INTRODUCTION

Identification of suitable grain size and determination of aggregation regarding construction works, especially in the concrete construction are of prime importance . Because in the amount of water and cement and their relative ratio, however be careful, if you have not a suitable grading, then strength of concrete will not be fine . Thus, depending on the type of work and grading stone materials consumption, some curves for different materials are presented. According to Iran Concrete Regulations (ABA) for aggregate gradation curve for concrete Mixture Design, the curves are referred to using from the regulations of the ASTM, ACI . Considering the fact that the aggregate gradation in sand mines of the country are not mostly in good agreement with the design of the concrete , And partly for making gradation limits specified in the available recipe such as ASTM, BS, ACI required to spend a lot of expenses , that Itself increases the cost of concrete, or concrete grade or will reduce the resistance.presentation of Concrete mix design, with specifications of aggregate grading curve range that are available in the country, leading to low cost and the good quality of the concrete . Concrete Mixture Design as possible should be based on experience or experiment on materials used. When such information is not available, the proposed method of mixing national plan can be used In this method , the computational method is in combination with the test that required amounts of water, cement, sand and gravel for the construction of a cubic meter of concrete is estimated . In the absence of empirical information, to estimate the unknown values , presented tables are used. After that weight values are determined by testing, correctness check and if necessary plan amendments required to be made . in this study we have tried to provide a security margin of resistance to calculate an average compressive strength to preparing concrete mix design from concrete regulations national .

e-ISSN:2319-9873
p-ISSN:2347-2324

Specification of materials Consumed

Consumed cement

Portland cement of type 425-1, Urmia Cement Factory for Mixture Design is used. Properties of concrete are presented in the table below.

1-425	Type of cment
3/1	Cement particle density gr/cm^3
325	The standard 28-day compressive strength of the mortar kg/cm^2
250	The minimum allowable cement kg/cm^3

Table 1 - Mechanical properties of cement

Consumed Sand

Consumed sand is a type of crushed and consumed gravel is a river type . Also optimum particle size distribution curve for the maximum nominal size of stone materials Consumed aggregate mixtures were prepared and drawn , and finally curves modified for optimal grading of aggregates in concrete mixtures were developed . the Curves based on the maximum size of the aggregate 5/12 mm is provided . Given that by drawing different gradation curve, an ideal range of materials for high-strength concrete Mixture Design can be offered . Consequently, the proposed curves and the regulations curves were compared and then analyzed and finally presented in following graph . The advantages of this scheme could be ideal for creating a range of fine grading curve that increases the solid concrete and reduce the pores in concrete .

Percentage of %fracture	Aggregate %moisture	Water absorption capacity	Saturated surface dry densitygr/cm^3	.15	.3	.6	1.19	2.38	4.75	9.5	12.5	19	25	38	Mm sieve size Type of / aggregate
0	1	2.6	2.7	0	0	0	0	14	36	64	100	100	100	100	sand
0	1	3.2	3	0	13	35	63	85	97	99	100	100	100	100	gravel

Table 2: Mechanical properties of aggregate Consumed

Characteristics of Mixture Design

Concrete Mixture Design involves the following steps :

Select the appropriate slump depending on the duration and volume of concrete, etc. shall be determined and we're designing for a specific slump .

Choosing water to cement ratio necessary to provide optimal resistance to the resistance of the 28-day compressive strength of cylindrical samples in the wet conditions and in the temperature of 23 degrees is taken. in the estimating the amount of mixing water and air, these amounts according to the aggregate size of the table we derive the desired slump.The amount of cement required due to previous steps in the water-cement ratio and the water content per unit volume of concrete obtained.We determine the amount of cement per unit volume . Determination of modulus of sand based on soft sand can be used.The last parameter is the remaining amount of sand per unit volume of concrete with other parameters of a unit volume and subtracting the total amount of gravel needed in the unit volume of concrete is determined. To determine this amount From weight and volumetric methods are used.After all the parameters needed determination the failure rate per unit volume, considering an aggregate rate of Consumed is achieved. Summary results and data are presented in the the table below .

e-ISSN:2319-9873
p-ISSN:2347-2324

Table 3 - Characteristics Mixture Design based on the National method

Mixture Design Characteristics based on national method	
Free water weighs 194 Kg/cm3	Average strength of cylindrical 36.9 MPa
Total water weight Kg/cm3243	Water to cementitious material ratio 0.41
Water weighs 226 Kg/cm3	Weight of cementitious materials $468\ \mathrm{kg/cm^3}$
Concrete gravity 2442 Kg/cm3	Cement weight $468\mathrm{kg/cm^3}$
2.4% of inadvertent weather	Chemical additives 0 $\mathrm{kg/cm^3}$
Planning mixed aggregate modulus 4.75	The maximum aggregate size mm 12.5

Table 4 - fresh and hardened concrete Characteristics based on national method

Information on fresh and hardened concrete	
Desired slump concrete () 90	. The sample cylinder (30 x 15 cm)
Maximum water to cementitious materials ratio of 0.45	Characteristic strength of concrete (30)
The maximum allowable size of the largest aggregate mm 9.5	Resistance characteristic age (days) 28
Inadvertent weather concrete () 2.4	Site grading, in the terms of quality control of concrete A

#200	#100	50 #	#30	#16	#8	#4	/83"	sieve
–	–	–	–	–	%33	31 %	%36	sand
%13	%22	28 %	%22	%15	–	–	–	gravel

Table5 - Percentage of stone materials in the concrete mixture desig

Concrete Construction

In the concrete construction, the most important issue uniform distribution of scattering material in the concrete mix. For this reason, the best method is selected based on the recommendations of the ABA regulations. Samples for each Mixture Design were selected as follows

gravel	sand	Grouping Mixture Design
%40	%60	Coarse Mixture Design (A)
%60	%40	Coarse Mixture Design (B)

Table 6 - Grouping Mixture Design

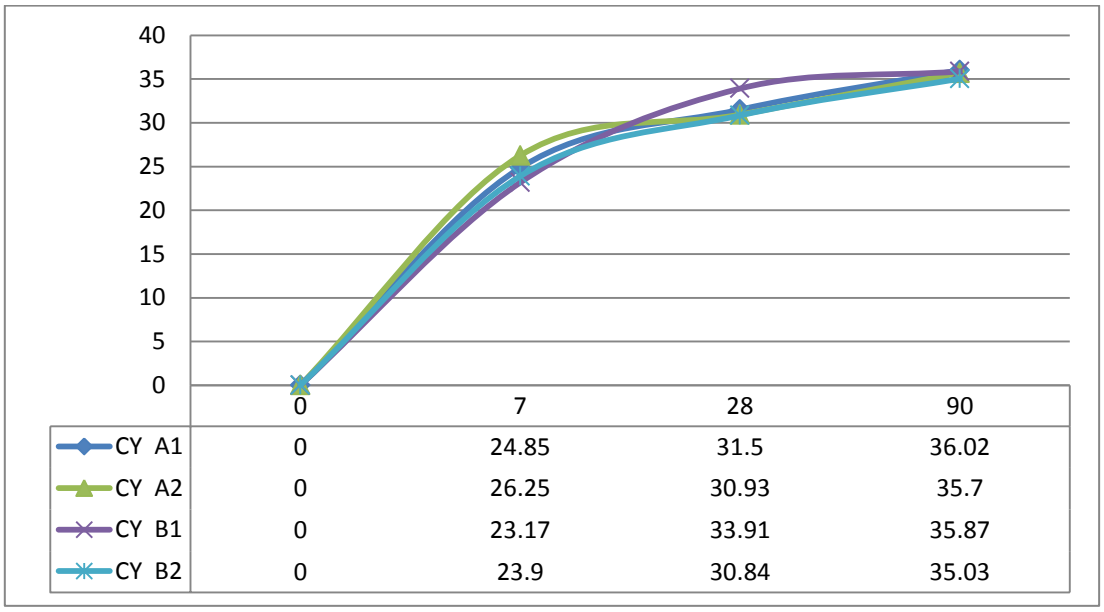
Figure 2: Sample CI A2 under the 28-day compressive strength

e-ISSN:2319-9873
p-ISSN:2347-2324

in the coarse grain Mixture Design (A) baseline, 60% coarse grain and 40% fine grained materials is considered. While mixing coarse grain Plan (B) 60% base fine grained and 40% coarse grain material . in the this study a total of 12 samples were used to test for mold. Grouping is done for both is the same Mixture Design .

A - Three cylindrical samples (30 x 15 cm.) To test the compressive strength at the age of 7 days.
B - two cylindrical samples (30 x 15 cm.) To test the compressive strength at 28 days.
C - a cylindrical sample (30 * 15) cm for testing compressive strength at 90 days of age.
All specimens were subjected to compressive strength tests. Following table presents the results of experiments .

Figure 3: Sample CY A2 before compressive strength testing



	0	7	28	90
CY A1	0	24.85	31.5	36.02
CY A2	0	26.25	30.93	35.7
CY B1	0	23.17	33.91	35.87
CY B2	0	23.9	30.84	35.03

Figure 4: Graph comparing the compressive strength results 7-28 -90 days samples

e-ISSN:2319-9873
p-ISSN:2347-2324

CONCLUSION

- Increase of the compressive strength of samples aged 7 days to 28 days compared to coarse grain fine grained Mixture Design ,indicates increasing 49/1 . While the increase in compressive strength at 28 days to 90 days in the coarse grain fine grained Mixture Design ,indicates increasing 54/1.
- When testing samples how to failure of a fine grained Mixture Design mostly found along this stretch until the end of the sample. If the coarse grain samples along with their failure was more limited.
- Finally in the the age of 90-day compressive strength of the samples will be nearly identical.
- In the a sense, a hypothesis can be stated that the need for this early strength concrete members plan more suited to fine grained seems to be.

REFERENCES

1. Khandaker M., and Hossain A., (2002), Properties of Volcanic Pumice based Cement and LightweightConcrete, Department of Civil Engineering, Ryerson University, 350 Victoria Street, Toronto, Canada,M5B2K3.
2. ACI 213R, (2003), Guide for Structural LightweightAggregate Concrete, American Concrete institute.
3. ASTMC330, (2004), Specification for Lightweight Aggregates for Structural Concrete, American Society of Testing Material.
4. Naderi M., (2007), New Method for the Evaluation of In Strength of Concrete ASTM Journal of Testing and Evaluation, Volume 35, ISS 6.
5. ASTM-C332, (1999), Standard Specification for Lightweight Aggregate for Insulting Concrete, AmericanSociety of Testing Material.
6. ACI-211.2, (1998), Standard Practice for Selecting Proportion for Structural Lightweight Concrete, American for Structural Lightweight Concrete Institute.