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HIGH PERFORMANCE CONCRETE USED FOR HIGH CONSISTENCY

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Abstract
It is well known that fire still remains as the most serious to most buildings or structures. High strength concrete is known as result of ongoing research to optimize concrete mixing and to make important contributions to enhanced quality and efficiency in the construction. This study has been carried out to understand more briefly the effect of high strength concrete. Changes temperature can produce stresses in concrete structures. The stresses are produced only when thermal expansion or contraction is restrained and this will affect the strength of concrete. When concrete is exposed to high temperature, the main problem which will encounter is spalling.

Keywords: High Performance Concrete, fly ash, mix proportions, spalling

INTRODUCTION

Most of the attention in the 1970s and 1980s was directed toward high strength HPC; today the focus is more on concretes with high durability in severe environments resulting in structures with long life. Concrete is one of the most common material and widely used in construction work. Concrete production is estimated to increase from about 10 billion tons in 1995, to nearly 16 billion tons in 2010 (E.Gjorv and Koji Sakai, 2004). But such increase brings serious implications to the environmental. Today the emerging awareness to reduce the impact it had, through a sustained effort to make concrete. Concrete that has these properties is High Performance Concrete (Sobolev, K.G. and Soboleva, S.V.1998). In the Strategic Highway Research Program (SHRP), HPC was initially defined by three requirements: maximum water-cementitious material ratio of 0.35, minimum durability factor of 80%, as determined by ASTM C 666 method and 21 MPa within 4 hours after placement, 34 MPa within 24 hours and 69 MPa within 28 days. (Caijun Shi dan YL Mo, 2008). As well as time, concrete mixing, process and ingredients has changed. In this new era the increasing complexity of material specification, typified by the wide range of permissible cement types, admixtures and aggregates, reflects the advances in concrete material technology and the commercial pressures of a competitive construction industry. Concrete is one of the most uses in building materials. In the past decades it has explain into a strong and durable construction material. High strength concrete seems to have become the key word in today's concrete technology. In the early 1940s, 30 N/mm2 (at 28 days) was considered to be the representative of high strength concrete. This level jumped to 50 N/mm2 in the late 1950s and early 1960s. Concrete strengths of 100 N/mm2 to 130 N/mm2 is now being viewed as the criteria for high strength. In this study the proportion of the mixture which was developed for f'c 60 MPa, and f'c 80 MPa using local materials that have generally been used ready mix producers. Basic development of High-Performance Concrete on aspects of concrete compressive strength and durability.

I. EXPERIMENTAL PROGRAM

COMPRESSIVE STRENGTH

The heart of concrete lies in the cement. Several tests should be performed to determine the characteristics of cement and its compatibility with other materials in the concrete mix design. Compressive strength testing of mortar cubes at 3-days, 7-days and 28-days of aging are used to observe the development of the strength gain of the mortar over time. A chemical analysis of the cement will provide a reasonable estimate of the composition of the cement. Cement is usually subjected to compressive stresses when used in the form of concrete or mortar. Mortar is a mixture of cement and sand in a specified ratio on which the strength of the mortar depends. If the mortar is weak then also its compressive strength is very low but if the mortar is a strong one then its compressive strength is also very high.
The mixture of sand and cement in water is generally weak in tension and is strong in compression that is why when the concrete is subjected to tensile forces then it is provided with steel rods in area of tension that is why it is then called as reinforced concrete. Therefore it is obvious the mortar will be strong in compression as compared to tension. Mortar is generally used for brick masonry and plastering. In first case the mortar is subjected to very high compressive loads such as the load of the wall above it, therefore it is very much necessary to test the mortar for its compressive strength. For this purpose required cement-sand mixture is prepared before its use and after certain period of curing it is tested. The strength of the mortar depends upon the fineness of cement, the gradation of sand and the most important factor which water-cement ratio.The strength tests, generally carried out the tension on samples of neat cement, are of doubtful value as an indication of ability of the cement to make concrete strong in compression. Therefore these are largely superseded by the mortar cube crushing tests and concrete compression tests. Cement mortar cubes (1:3) having an area

of 5000mm2 are prepared and tests in compression testing machine. For ordinary Portland cement the compression strength at 3 to 7 days curing shall not be less than 16 MPa and 22MPa, respectively. (As per IS: 650-1991)

SPECIFIC GRAVITY

Specific gravity is defined as the ratio of unit weight of a given material to the unit weight of water at room temperature, (21°C)

Table-2 specific gravity

TYPE OF FINE AGGREGATE	SPECIFIC GRAVITY
Natural sand	2.64-2.67
Silt sand	2.67-2.70

TEST PROPORTIONS		7 DAYS In MPa	14DAYS In MPa	28 DAYS In MPa
CEMENT-SLAG	CRUSHERDUST-SAND			
60-40	100-0	9.55	14.22	20
		10	14.44	19.55
		12.22	16.23	21.34
AVERAGE		10.6	14.96	20.45
50-50	100-0	11.55	12.88	20.67
		10.89	13.56	20.23
		10.45	13.78	19.12
AVERAGE		10.96	13.40	20

II. RESULT AND DISCUSSION

Replacement of sand with crusher dust

Compressive Strength Concrete with Fully Replacement of Sand

Table – 2 Compressive strength concrete with fully replacement of sand

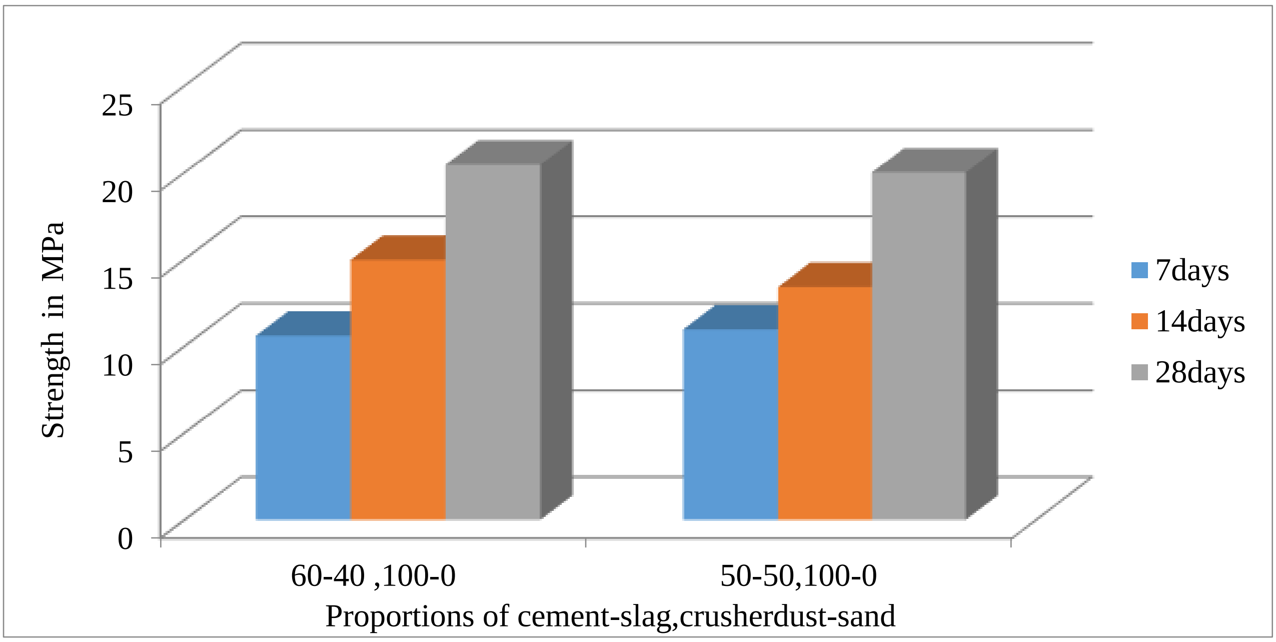

Fig – 1 Compressive strength concrete with fully replacement of sand

Here we take only 2 proportions of cement and slag and then sand is totally replaced by crusher dust. From this we got that by fully replacing the sand with crusher dust we cannot achieved the target strength of the cubes.

III. CONCLUSION

The pattern crack at the cubes is different between two types of this concrete and depends to the temperature. More high temperature gave more cracks for concrete. The concrete containing 15% fly ash after elevated at different temperature is more than cracks compared to concrete containing 10% fly ash

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