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High Performance(m50) And Ultra High Performance Concrete(m150) By Using Polycarboxylic And H.R.Johanson Admixture

Satpute Amol[#1], Pardeshi Amol[#2], Sonawane Sachin [#3]

[1]amolsatpute70@gmail.com
[2]pardeshiamol11@gmail.com
[3]sachinsonawane2011@rediffmail.com

[#123]H.S.B.P.V.T's COE, kashti.
Department of Civil Engineering,
Savitribai Phule Pune University, Pune..

ABSTRACT

This paper presents a two admixture as polcarboxylic ether (PC base) and H.R.Johanson by which the various test are conducted as flowability and compressive test by which the different grade of concrete is used as (M50) and (M150) as high performance concrete and ultra high performance concrete respectively. Mixing was done in layers to ensure a uniform mix is obtained.' During the mixing only the desired quantity of water was added and special emphasis was on the reduction of water quantity as much as possible to control the water cement ratio and hence improve strength. The admixture proportion was perfectly added as no segregation and separation of concrete is held, various materials as fly-ash, GGBS, 10 and 20mm aggregate, river sand, crush sand etc. this paper helps to consider a best admixture is used for local concrete to increase the strength and various properties, this is used for various high rise buildings and flyovers which is constructed now a days.

Keywords— a Ultra high performance concrete, Normal strength concrete, polycarboxylic base.

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I. INTRODUCTION

Ultra High performance concrete (UHPC) exceeds the properties and constructability of normal concrete. Normal and special materials are used to make these specially designed concretes that must meet a combination of performance requirements. Special mixing, placing, and curing practices may be needed to produce and handle high performance concrete. Ultra High-performance concrete has been primarily used in tunnels, bridges, and tall buildings for its strength, durability, and high modulus of elasticity. It has also been used in shotcrete repair, poles, parking garages, and agricultural applications.

Ultra High-performance concretes are made with carefully selected high-quality ingredients and optimized mixture designs; these are batched, mixed, placed, compacted and cured to the highest industry standards. Typically, such concretes will have a low water-cementing materials ratio of 0.15 to 0.20.

High performance concrete (HPC) is a specialized series of concrete designed to provide several benefits in the construction of concrete structures that cannot always be achieved routinely using conventional ingredients, normal mixing and curing practices. In the other words a high performance concrete is a concrete in which certain characteristics are developed for a particular application and environment, so that it will give excellent performance in the structure in which it will be placed, in the environment to which it will be exposed, and with the loads to which it will be subjected during its design life.

It includes concrete that provides either substantially improved resistance to environmental influences (durability in service) or substantially increased structural capacity while maintaining adequate durability. The term high-performance concrete (HPC) is used to refer to concrete of required performance for the majority of construction applications.

II. LITRATURE REVIEW

The current trend of use of superlatives in concrete technology may strike as somewhat disconcerting to many .We had high strength concrete, hyperplasticiser, and superplasticisers, very reactive Pozzolana, and now ultra high performance concrete. It is difficult to imagine any concrete being manufactured and used, which is not

intended to perform to the extent; ultra high performance concrete is not a new material of construction. It is difficult to imagine any concrete being manufacture and used, which is not intended to perform. The only difference is the level of performance, which is higher than ordinary. Conventional Portland cement concrete is found deficient in respect of:

- Durability in severe environs (Shorter service life and require maintenance)
- Time of construction (longer release time of forms and slower gain of strength)
- Energy absorption capacity (for earthquake-resistant structures)
- Repair and retrofitting jobs

Ultra High performance concrete (UHPC) successfully meets the above requirement. UHPC is an engineered concrete possessing the most desirable properties during fresh as well as hardened concrete stages. UHPC is far superior to conventional cement concrete as the ingredients of UHPC contribute most optimally and efficiently to the various properties.

Ultra High Performance Concrete (UHPC) is more homogeneous than normal strength concrete (NSC). Initial flaws like pores, cracks and interfacial delaminating in HPC are smaller and less numerous than in NSC. This makes UHPC more stiff and elastic as compared to NSC. The non-linear part in the ascending branch of the stress-strain diagram and the post-peak softening part are reduced which is a sign of brittleness. However, if UHPC is confined by lateral compression or reinforcement it becomes ductile.

III. PROBLEM STATEMENT

- Now a days the mixing of silt in river sand increases so why crush sand is best option to use in concrete which gives best result or a proper grade of concrete.
- A specific admixture is not available in local area as costumer get confused what to take so a require admixture is to get for concrete work.
- A specific constituent are not available easily as 10mm and 20mm aggregate ,GGBS, mixing is carried in fly-ash, so properties of concrete is varied.
- segregation or separation of concrete material is occurs when percentage or type of admixture is changed or get faulty.

3.1 Existing Concrete :

In Existing concrete the admixture is rarely used so the strength is not achieved and constituent are not properly used as, silty sand is used in existing concrete so why the of concrete is less and durability also decreases in which high rise buildings and big structure is not to be constructed. The proper materials is also not available and composition is also not known by which grade is also not achieved

Drawback of our existing system:

- Limited Access Only.
- No use full in high rise buildings, flyovers and for big construction projects.
- Time Delay.
- No proper methodology

3.2 Proposed Concrete :

As using high performance concrete the strength comes due to using admixture like polycarboxylic ether, H.R.Johanson .the proper proportion and neat materials is used to make the concrete most durable and very much tough. Various new constituents are added as fly-ash and GGBS,microsilica to improve the hardness and strength of concrete as the time loss becomes minimum and construction becomes fast.

Advantages of proposed system:

- To minimize the lack of time and ease in construction.
- Reduces manpower and easy access.
- Admixture increases the strength and durability of concrete.

IV. OVERVIEW OF UHPC

4.1 Mechanism Of Ultra High Performance Concrete-

Ultra High strength and low permeability are logical development of presence of silica fume and super plasticizers in concrete the dual requirements of high strength and low permeability are linked to each other through the need to reduce the volume of relatively larger capillary pores. As pointed out earlier, this is achieved by low water-cement ratio as well as dense packing of fine particles.

The role of super plasticizers, long chain molecule organic compound, is to get adsorbed on to cement grain, impart a negative charge to them, which repel each other and get deflocculated and disperse. The resulting improvement in workability of concrete could be either to flowing concrete for same water & cement contents as in the control mix. Alternatively, it enables water content to be reduced by 20% or more and results in high strength, because of low water- cement ratio.

4.2 Methods For Achieving High Performance-

Two approaches to achieve durability through different techniques are as follows.

1. Reducing the capillary pore system such that no fluid movement can occur is the first approach. This is very difficult to realize and all concrete will have some interconnected pores.
2. Creating chemically active binding sites which prevent transport of aggressive ions such as chlorides is the second more effective method

4.3 The Criteria For Material Selection Of Ultra High Performance Concrete.

The following six criteria are important for material section mixing, placing and curing procedures for producing high performance concrete.

1. Ease of placement
2. Long-term mechanical properties
3. Early age strength
4. Toughness
5. Life in difficult service environment
6. Volumetric stability

The above mentioned requirements can be grouped under the following three attributes.

a. Attributes that benefit the construction process such as workability
b. Attributes that leads to enhanced mechanical properties such as strength
c. Attributes that enhances durability and long-term performance
The performance requirement for concrete will be different for different applications.

V. APPLICATION

5.1 High Performance Concrete In India-
5.1.1 Infrastructure Projects
(A) Bandra-Worli Sea link:-
M60 grade performance concrete for superstructure was specified
Target 28-days compressive srength-74N/mm^2
Slump obtained was 120mm; 28-day compressive strength in the field was 75.16N/mm^2.

(B) JJ Flyover, Mumbai
M70 grade was supplied from a readymade mix concrete plant,
Target strength-83.2Mpa
Slump required was 130 to 180 mm at the RMC plant, and 80 to 120mm at the site of placement after 150mm.
Field strength obtained were -79.6Mpa at 28 days and 94 Mpa at 365days. Chloride ion permeability (ASTM 1202)-100 Coulombs (very low)

5.1.2 Nuclear power projects:
- Kaiga Atomic Power Project (Kaiga -unit-1 and 2)
- Rajasthan Atomic Power Plant (RAPP-unit-3and 4)
- Tarapur Atomic Power Project (TAPP-unit 3 and 4)

VI. MIX DESIGN

6.1 Mix Design For (M50) Grade Concrete-

Material W/C	SSD.Mix for 1m^2 0.30	Moisture	Absorption	Corrected mix	For 0.025m^2
Cement	510			810	12.750
River sand	414	2%	2.80%	411	10.267
Crush sand 10 mm aggregate	414 444	1.20% 0.30%	3.24% 1.24%	406 440	10.139 10.996
20 mm aggregate	566	0.40%	1.24%	561	14.031
Water	153			174	4.342
Admixture (0.8%)	4.08			4.08	0.102

6.2 Mix Design For (M150) Grade Concrete-

Material	SSD.Mix for 1m3	Moisture	Absorption	Corrected mix	For 0.025m3
W/C	0.15				
Cement	810			810	21.06
Micro silica	90			90	2.34
Flyash	150			150	3.9
GGBS	150			150	3.9
River sand	1120	2%	3%	1108.8	28.82
Water	180			191.2	4.97
Admixture	12			12	0.312

VII. FUTURE ENHANCEMENT

Developments in admixtures and mixing and placing methods have made it possible to produce concrete with much higher strengths.

During the last decade, developments in admixtures and mixing and placing methods have made it possible to produce concrete with much higher strengths 70-150 MPa. The ingredients of ultra high strength concrete are the same as those used in conventional concrete with the addition of one or two admixtures, both chemical and mineral. However, there are two crucial aspects to be considered while deciding on the ingredients to be used. The first relates to the use of extremely low water-cement ratio and the second to the use of proper mix in order to produce concrete with minimum or no voids. For affecting this, water reducing admixtures are used. The mix requires high paste volume, which leads to shrinkage and heat evolution during manufacture besides increasing the cost. The substitution of cement by supplementary cementitious materials such as mineral admixtures partially introduces favorable behavior with respect to above mentioned problems and incidentally reduces the cost. The materials that are commonly used are fly ash, ground granulated blast furnace slag, silica fume, rice husk ash and metakiolin. The use of such materials enhances long- term durability.

VII. CONCLUSION

On the basis of the studies carried out, it can be concluded that in the binary system, silica fume increases the superplasticizer demand at a constant workability due to its high surface area and its strong affinity for multi-layer adsorption of super plasticizer molecules. Poly-carboxylic Ether (PCE base) admixture makes more efficient use of the large amount of cementations material in high-strength concrete and help to obtain the lowest practical water to cementing materials ratio. Fly ash decreases the content of water demand by replacing cement and also makes the concrete more economical. It also controls the heat of hydration of concrete. Dose of admixture also plays an important role. Use of admixture such as Poly-carboxylic based plasticizer reduces the consumption of water in concrete and also makes the concrete workable. Increase in the dose will reduce eater cement ratio and contributes in gaining strength.

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