Experimental Parametric Study On High strength Concrete M-50 by Incorporating Alccofine & Fly ash as partial Replacements

Palapongu.anusha[1], k. geetha [2],

[1]M. Tech Student & lingaya's institute of management & technology
[2]Assistant professor & lingaya's institute of management & technology
Department of civil engineering, LIMAT, vivkea nagar, VIJAYAWADA-521212

---***---

Abstract: Present urbanization required a huge variety of concretes and minimized effects of newly developed composite materials. This development leads to adverse effects on the surrounding environment. As a part of environmental concern, we have to minimize the negative effects. In my present research paper, I prepared M-50 grade of concrete by using Indian standards
The development of High Strength Concrete has been a great breakthrough in Concrete Technology. High strength concrete (HSC) may be defined as concrete with a specified characteristic cube strength between 40 and 100 N/mm2, although higher strengths have been achieved and used. Strength levels of 80 to 100 N/mm2and even higher are being used for both precast and insitu works. High Strength Concrete is specified where reduced weight is important or where architectural/considerations require smaller load carrying elements. After the preparation of specimens, I conducted the mechanical experiments after the curing periods at regular intervals, the output was correlated with the specified Indian standards and interpreted.

Introduction:

1.0overview of the high strength concrete

The definition of HSC has evolved with its gradual development and usage over the years. According to the latest achievements in concrete ingredients and the technology of production the following cement-based concrete classification is made
(i) Conventional concrete (CC), up to grade 60 MPa;
(ii) High strength concrete (HSC), grades 60 – 90 MPa;
(iii)very high strength concrete (VHSC), grades 90 – 130 MPa;
(iv) Reactive powder concrete(RPC), grades 200 – 800 MPa;
(v) High performance lightweight concrete (HPLC) greater than55 MPa.
The notion of high performance concrete (HPC) was introduced to ensure the needs to other high parameters in certain civil engineering branches apart from its compressive strength

MATERIALS USED:

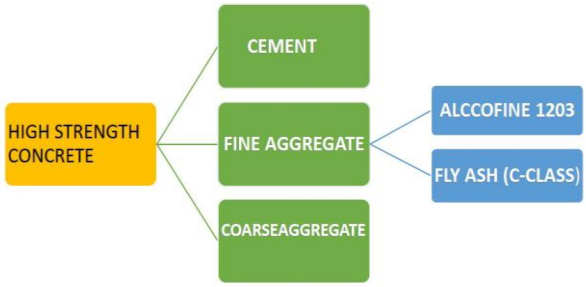


FIG :1 DIAGRAMATIC REPRESENTAION OF HSC

Scope of high strength concrete:

High Strength Concrete is required in engineering projects that have concrete components that must resist high compressive loads. HSC is typically used in the erection of high rise structures. It has been used in components such as columns (especially on lower floors where the loads will be greater, shear walls and foundations. High strengths are also occasionally used in bridge applications as well. In high rise structures, high strength concrete has been successfully used in many countries across the globe. High Strength Concrete is occasionally used in the construction of highwaybridges.HSC also permits reinforced or restressed concrete girders to span greater lengths than normal strength concrete girders. High Strength Concrete enables to build the super structures of long span bridges and to enhance the durability of bridge decks. Other structural members in which High Strength Concrete is used are dams, grand stand roofs, marine foundations, heavy duty industrial floors and parking garages.

2.0 LITERATURE REVIEW ON HIGHSTRENGTH CONCRETES

Chang and Su (1996) showed that there is a good correlation between the compressive strength of aggregates and some of the engineering properties of concrete. For an optimum compressive strength with a high cement content and low w/b ratio, the maximum aggregate size should be kept to a minimum of 9.5 mm (ACI Committee 363,2001).

Beshr et al. (2003) studied the effect of four types of coarse aggregates namely calcareous, dolomitic, quarzitic limestone and steel slag on the compressive and tensile strength of HSC. The results showed that the steel slag aggregate.

Chen and Liu (2004) studied the effect of aggregate size distributions and the volume fraction of aggregate on the fracture parameters of concretes with strength 50 – 89 MPa under three-point bending test. For this purpose, three various maximum aggregate sizes of 10, 15 and 20 mm were employed. They also investigated the influence of coarse aggregate volume fraction on the fracture parameters of HSC. For this purpose, three various volume fraction of aggregates named 40 %, 60 % and 80 % were employed. They concluded that HSC with lower brittles could be made by aggregate with greater size. The maximum fracture energy and fracture toughness were achieved at 60 % of aggregate volume.

Al-Oraimi etal. (2006) evaluated the effect of crushed limestone coarse aggregate size on the compressive strength of HSC. Two aggregate sizes (10 and 20 mm maximum size) were collected from five different areas. Cement was partially replaced with 10 % SF, w/b ratio was 0.32 and superplasticizer was 12 l/m3. The 28 days' compressive strength results varied between 81.3 MPa and 85.6 MPa for the 10 mm maximum aggregate size, and ranged between 72.5 MPa and 77.5 MPa for 20 mm maximum aggregate size.

Shahid Iqbal et.al found out that by varying in the addition of micro steel fibers from 0 to 1.25% the concrete increases its compressive strength in the beginning and then reduces but the split tensile strength is gradually increased till final. Saurav andAshok Kumar Gupta found that by addition of a supplementary cementitious material alccofine the compressive strength can be increased by varying the percentages from 0 to 18% the optimum was found to be 13% for M50 grade.

3. 1 SYSTEMIC HIERARCHY OF EXPERIMENTAL PROGRAM

When a project has complete output only we follow the particular hierarchy of steps with the limited/unlimited resources in my present research paper I followed certain steps to complete within stipulated time i.e. following

- Selection of problem
- Collection of data/ references collection
- Selection of materials
- Laboratory tests Conducting
- Correlation of data with IS codes
- Conclusions
- References
- Bibliography

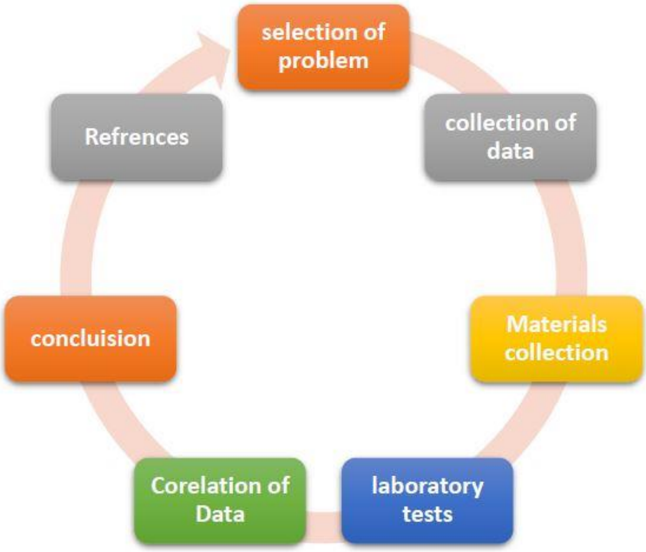


FIG: 4 CYCLIC PROCESS OF EXPERIMENTAL PROGRAM

4.0 PROPERTIES OF USED MATERIALS

a)cement

S.NO	PROPERTY	VALUE
1	FINENESS	8%
2	CONSISTENCY	29 %
3	INITIAL SETTING TIME	100 MINUTES
4	FINAL SETTING TIME	480 MINUTES
5	SPECIFIC GRAVITY	3.14

b)fine aggregate

S.NO	PROPERTY	VALUE
1	SPECIFIC GRAVITY	2.65
2	TYPE OF ZONE	III
3	FINENESS MODULUS	3.7
4	WATER ABOSROPTION	0.7 %

c)coarse aggregate

S.NO	PROPERTY	VALUE
1	SPECIFIC GRAVITY	2.71
2	SIZE	12mm
3	FINENESS MODULUS	7.7
4	WATER ABOSROPTION	1%

d)alccofine

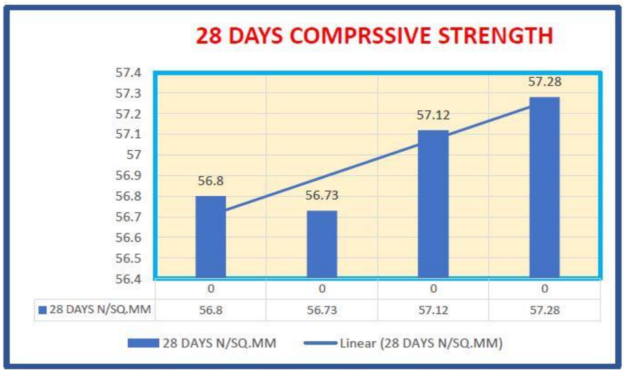
S.NO	PROPERTY	VALUE
1	SPECIFIC GRAVITY	2.9
2	BULK DENSITY	700-900 kg/m^3
3	FINENESS [CM^2/Gram]	12000

Mix design : according to is-10262 -2009 design was followed and got suitable proportions for m-50

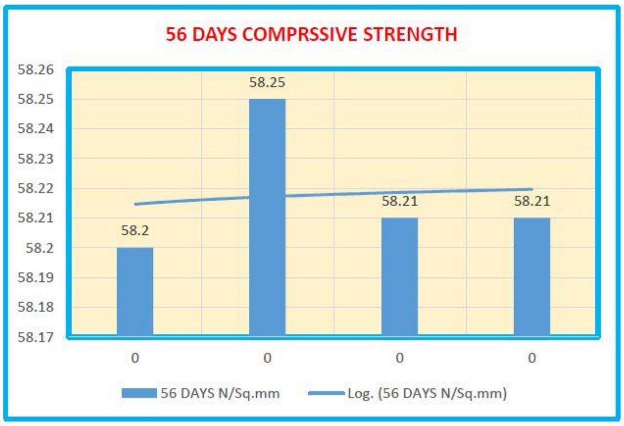
RESULTS :

We conducted mechanical tests like compressive, flexural, RCPT, UPV on casted specimens, The results as follows

S.NO	CUBE ID	% OF REPLACEMNT(%)	28 DAYS N/mm^2
1	NM-X	NORMAL MIX	56.8
2	NM-X	NORMAL MIX	56.73
3	NM-Y	NORMAL MIX	57.12
4	NM-Y	NORMAL MIX	57.28

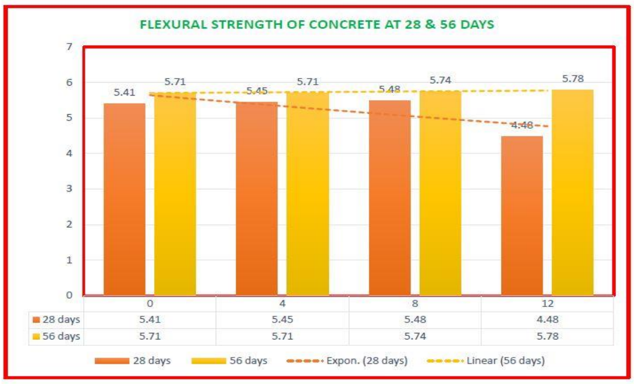


S.NO	CUBE ID	% OF REPLACEMNT(%)	56 DAYS N/mm^2
1	NM-X	NORMAL MIX	58.2
2	NM-X	NORMAL MIX	58.25
3	NM-Y	NORMAL MIX	58.21
4	NM-Y	NORMAL MIX	58.21



S.NO	BEAM ID	% OF REPLACEMNT	28 DAYS (MPa)
1	B-I	0 %	5.41
2	B-II	4%	5.45
3	B-III	8%	5.48
4	B-IV	12%	5.48

S.NO	BEAM ID	% OF REPLACEMNT	56 DAYS (MPa)
1	B-5	0 %	5.71
2	B-6	4%	5.71
3	B-7	8%	5.74
4	B-8	12%	5.78



S NO	% REPLACEMENT OF	Obtained average velocity(m/s)	Quality of Concrete
1	0	3598	Good
2	4	4212	Good
3	8	4298	Good
4	12	4345	Good

After results interpreted with the referenced documents the obtained outputs are satisfactory. The objective of the present work is to Check the possibility of producing HSC with an economic rate for cement consumption while giving as close as possible the desired properties.

The reduction in cement consumption is believed to reduce the cost, and give a rational solution to some concrete disadvantages like cracking due to thermal changes and drying. From theresults achieved for the workability, compressive strength, tensile strength, the following conclusions are drawn:

Based on compressive strength Results we can depict the following conclusions, All the casted cubes are successfully passed in all aspects and directions,

- From Normal Mix The average compressive strength of all the cube specimens at 28 days are 57.32 N/mm2
- From Normal Mix The average compressive strength of all the cube specimens at 56 days are slight increase 2% of the 28 days' strength
- Replacement with 30 % fly-ash and zero percentage of Alcoofine at 28 days is 56.21N/mm2
- Replacement with 30 % flyash and 12 % percentage of Alcoofine at 28 days is 59.91N/mm2 which is increase in overall replacements
- Based on the flexure strength it shows 1.8 % increment compared to referenced values
- Obtained satisfactory results in Non-destructive Testing & RCT on the specimens
- The only durability checks like permeability, water absorption are not conducted and correlated with the Indian standards are yet to be discussed.
- Now in this concrete advancements Ultra high strength concretes & UHPC are in form compared to conventional concretes like M25, M30 etc..

AUTHOR 1 : PALAPONGU.ANUSHA

M.Tech Student ,

LIMAT,

Department Civil engineering ,

AUTHOR 1 : KALE.GEETHA

Assistant professor ,

LIMAT,

Department Civil engineering