International Journal of Innovative Research in Engineering
Volume 4, Issue 1 (January-February 2023), PP: 106-109.
www.theijire.com ***ISSN No: 2582-8746***

Experimental Investigations on the Concrete Mix Design With Fly Ash

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How to cite this paper:
Dr. M. B. Chougule[1], Vaishnavi Chougule[2], "Experimental Investigations on the Concrete Mix Design With Fly Ash", IJIRE-V4I01-106-109.

Abstract: *The use of fly ash in Portland cement concrete (PCC) has many benefits and improves concrete performance in both the fresh and hardened state. Fly ash use in concrete improves the workability of plastic concrete, and the strength and durability of hardened concrete. Fly ash use is also cost effective. When fly ash is added to concrete the amount of Portland cement may be reduced. Mix design of concrete with fly ash for high rise building and to study the consideration while designing a concrete mix of high grades. Now a day's use of fly ash as a partial replacement of cement is a common. And the demand is increasing day by day particularly for making high strength and high-performance concrete. Many researches done for the use of fly ash as a supplementary cementitious material. High volume fly ash concrete as a subject of current interest all over the world. Thermal power stations are left with an undesirable by-product, fly ash, in large quantities which is not able to effectively utilize or dispose of. The utilization of fly ash in concrete making to control the environmental pollution as well as it will be economical. Analysis of how compressive strength is affected due to with various proportions of cement & Fly ash in a concrete.*

Key Word: *Fly ash, High rise building, concrete mix design*

I.INTRODUCTION

Fly ash, a waste generated by thermal power plants is as such a big environmental concern. The report is carried out to study the utilization of fly ash in cement concrete as a partial replacement of cement as well as an additive so as to provide an environmentally consistent way of its disposal and reuse and analysis of Mix Design. The use of fly ash in concrete has many benefits and improves concrete performance in both the fresh and hardened state. Fly ash use in concrete improves the workability of plastic concrete, and the strength and durability of hardened concrete. Fly ash use is also cost effective. When fly ash is added to concrete, the amount of Portland cement may be reduced.

The Modern high-rise concrete buildings are models of design skill in the use of materials. The trend toward buildings other than rectilinear in shape is producing some unusual structural members. All of these factor's spell placing problems unless a mix design is formulated that produces concrete of considerable flow ability and high quality. The problem of obtaining uniform, high quality concrete in this work hinges mainly on two basic considerations: (1) mix design; and (2) placing and curing procedures. The narrow, high forms often used for columns and shear walls aggravate the tendency of mixes to bleed and produce laitance. These problems are quite common in tall building construction field, but they can be prevented by close attention to two aspects of the mix design: (1) cement paste consistency and physical composition; and (2) characteristics of the aggregate. Air entrainment and minimum water content can also play and important role in halting bleeding, formation of laitance and segregation.

The main objective of using fly ash in most of the cement concrete applications is to get durable concrete at reduced cost. The selection of concrete proportions involves a balance between economy and requirements for workability and consistency, strength, durability, density and appearance for a particular application

II.SCOPE OF THE WORK

Now a days concrete is one of the most widely used construction material the global impact of buildings means that engineers and designers need to start creating more sustainable high-rise buildings. Currently, buildings account for 40% of global energy use, 15% of water use and 30% of the waste that is generated. Although the drive to deliver good, functional and economical designs for high-rise buildings is not changing fundamentally, the focus on produce energy efficient and sustainable designs is expected to increase at an accelerating pace. Tall buildings are proportionally more material- and energy-hungry than lower rise buildings. In high-rise buildings the structure is a large portion of the overall cost and embodied energy, and hence, the structural engineer can significantly influence the overall sustainable design outcome. Sustainable structural design goals can be achieved by addressing the following three objectives: reduce, reuse and recycle. Advanced analysis and design methodologies allow us to design increasingly more efficient structures (with just the required amount of material and no more). Also, new material technology is opening the way for the reduction of the embodied energy per unit of material (in terms of

transport energy, sustainable supplies, and the like). The use of industrial by products such as fly-ash, slag and silica fume as a cement substitute can drastically reduce the embodied energy of concrete. The scope of this work is explained with the help of methodology, research strategy and research design.

III.METHODOLOGY

The aim of present project is to study the performance of mix design with fly ash for high rise buildings. To Study how compressive strength is affected due to with various proportions of cement & Fly ash in a concrete. Design the concrete mix of concrete as well as to compare fly ash based concrete with ordinary Portland cement concrete according experimental analysis.

This project work is explained with the help of following points:

1)Use of Fly as based concrete for high rise building and its effects.
2)To study what is the change in compressive strength properties of concrete from partial replacement of cement with Fly ash?
3)Preparing the mix design for fly ash based concrete with different proportions.
4)Preparing blocks of concrete and testing for compressive strength
5)To study experimental analysis for best mix design of high rise building to find optimum proportion of fly ash and dust
6)To find out the optimum percentage of fly ash for particular grade of concrete by trial mix

The various factors affecting the choice of concrete mix design are:

1)Compressive strength of concrete

• Concrete compressive strength considered as the most important concrete property. It influences many other describable properties of the hardened concrete.
• The mean compressive strength (fcm) required at a specific age, usually 28 days, determines the nominal water-cement ratio of the mix.
• ISO 456-200, British Standard, and Eurocode utilize the term mean compressive strength which is slightly greater than characteristic compressive strength. However, ACI Code do not use such term.
• Other factors which influences the concrete compressive strength at given time and cured at a specified temperature is compaction degree.
• Finally, it is demonstrated that, concrete compressive strength of fully compacted concrete is inversely proportional to the water-cement ratio.

2)Workability of concrete

• Concrete workability for satisfactory placement and compaction depends on the size and shape of the section to be concreted, the amount and spacing of reinforcement, and concrete transportation; placement; and compaction technique.
• Additionally, use high workability concrete for the narrow and complicated section with numerous corners or inaccessible parts. This will ensure the achievement of full compaction with a reasonable amount of effort.
• ACI 211.1 provides slump test values for various reinforced concrete sections which ranges from 25 mm to 175 mm.

3)Durability of concrete

• The ability of concrete to withstand harmful environment conditions termed as concrete durability.
• High strength concrete is generally more durable than low strength concrete.
• In the situations when the high strength is not necessary but the conditions of exposure are such that high durability is vital, the durability requirement will determine the utilized water-cement ratio.
• Concrete durability decreases with the increase of w/c ratio.

IV LABORATORY INVESTIGATIONS

DIFFERENT TRAILS OF M40 grade

Trail No.	1	2	3	4
Grade	M40	M40	M40	M40
Date	22-07-2022	24-07-2022	25-07-2022	29-07-2022
W/C	0.3	0.29	0.29	0.29
Cement	385	395	400	410.00
FLYASH	125	130	134	140

20 mm		446	486	383	489
10 mm		556	541	581	522
Cr. Sand		822	850	824	835
Water		153	152	157	157
Admixture BASF Poly heed 8383		1.30%	1.28	1.18	1.25
Observation		Mix found cohesive and Pump able	Mix Cohesive& Pump able (Initial bleeding found)	Mix found cohesive and Pump able.	Mix found cohesive and Pump able
Workability	Initial	590 mm	590 mm	670mm	670mm
	60 min.	510 mm	570 mm	610 mm	600mm
	120 min.	490 mm	540 mm	580 mm	550 mm
	180 min.	400 mm	460 mm	540 mm	480 mm
Comp. Strength	7days	28.22	31.93	37.04	32.74
	28days	44.59	49.48	50.15	50.59

V. GRAPHICAL LABORATORY INVESTIGATIONS

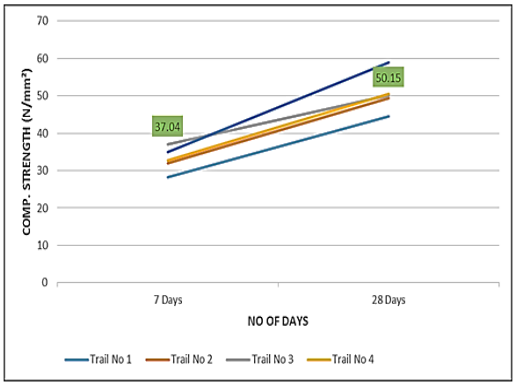

Fig 1: Laboratory Investigation graph

Fig 2: Laboratory Testing

VI. CONCLUSION

The report presents the results of the fly ash based concrete mix design for High rise building. In that the fly ash mixed concrete mix shows good strength, workability and various other parameters for optimum proportion of fly ash which is economical and it has many advantages. Based on analysis of test results there upon the following conclusion can be drawn: -

a) The use of fly ash in concrete resulted in increase in initial and final setting time of concrete.
b) Optimum use of fly ash saves cement cost and save environment.
c) For high rise building use of this concrete give extended initial and final setting time which helpful for pumping and finishing operation.
d) Fly ash concrete get maximum workability compared to ordinary cement concrete.
e) Use of fly ash reduce the water demand.
f) Use of fly ash increase the ultimate strength.

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