

“Concrete Mix Design With Soft Computing Techniques Using ACI And IS Codes”

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Abstract- in today's panorama of technical world, the requirement of increasing accuracy has been increased. Mix design is the basic step for any construction. Here is an attempt to use software using C language as well as Visual basic language for mix design. Also keeping in view the environmental hazards, an industrial waste named as flyash has been introduced in concrete mix design. The software not only helps to calculate proportions of mix design but also compares ACI and IS codes for mix design to facilitate the user in India as well as abroad.

Keywords- mix design, ACI code, IS code, C language, Visual basic

I. INTRODUCTION

Concrete is the basic engineering material used for construction. Concrete like other engineering material is considered to be design for properties like strength, durability, workability and cohesion. Many admixtures are been introduced to achieve high grades of concrete. Use of mineral admixture like fly ash has revolutionalized the concrete technology by increasing strength and durability of concrete by many folds. Computing techniques is considered throughout the work because it will be beneficial for improving the working standards in civil engineering field. Software is developed by considering all major and minor things in BIS codes.

II. OBJECTIVES

- 1) To introduce soft computing g techniques to improve working standard in Civil Engineering Field
- 2) Essential use of fly ash in concrete mix design
- 3) To make the concrete economical by introduction of fly ash
- 4) To study National & International code (ACI)

III. METHODOLOGY

Visual basic is found to be most easy to understand, printed results can be obtained. C language is basic of all languages also compares result from VB. Software also facilitates the mix design using ACI method as well as BIS

method. Laboratory test has been performed on fine aggregate, coarse aggregate, and cement for specific gravity, fineness, slump, consistency..etc. Calculations for mix design of grade M20, M25, M30, M35, M40 AND M45 were done using traditional method as well as using the developed software. Mix design is done using ACI as well as BIS code for each mentioned grade.5 cubes were casted for each grade with varying quantity of fly ash. All the cubes for tested for comprehensive strength after 7 days and 28 days.

III. RESULT

a) Mix design using software as per BIS

Grade (N/mm ²)	W/c	Cement (Kg/m ³)	F.A (Kg/m ³)	C.A (Kg/m ³)
20 Mpa	0.55	368.18	711.59	1137.82
25 Mpa	0.50	372.00	700.78	1116.86
30 Mpa	0.45	413.33	687.56	1091.23
35 Mpa	0.45	413.33	687.56	1091.23
40 Mpa	0.40	465.00	671.05	1059.20
45 Mpa	0.38	489.47	663.22	1044.02

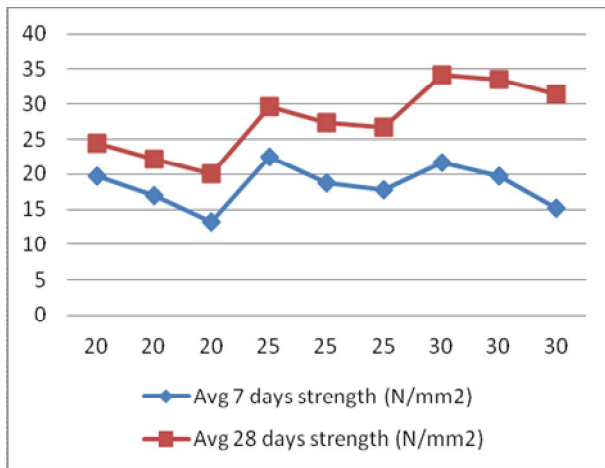
b) Mix design using software as per ACI

Grade (N/mm ²)	W/c	Cement (Kg/m ³)	F.A (Kg/m ³)	C.A (Kg/m ³)
20 Mpa	0.55	363.64	765.99	1056.00
25 Mpa	0.50	400.00	735.40	1056.00
30 Mpa	0.45	444.44	698.02	1056.00
35 Mpa	0.45	446.00	692.48	1056.00
40 Mpa	0.40	500.00	651.28	1056.00
45 Mpa	0.38	526.32	629.13	1056.00

c) Variation in strength by addition of fly ash

Grade	Flyash (%)	Avg 7 days strength (N/mm ²)	Avg 28 days strength (N/mm ²)
20	10 %	19.66	24.44
	20 %	16.88	22.20
	30 %	13.22	20.11
25	10 %	22.44	29.58
	20 %	18.66	27.34
	30 %	17.77	26.66
30	10 %	21.60	34.25
	20 %	19.77	33.45
	30 %	15.11	31.45

IV. GRAPH



Graph 1. Variation in strength by addition of fly ash

V. CONCLUSION

- With the help of software man effort for calculating the proportions of mix design is reduced
- Acquaintance with American method of designing is achieved
- With the decrease in W/c ratio strength is gained but further decrease affects the workability
- Fine aggregate content in ACI method is higher Prof. A. Sharma compared to new BIS method.
- Flyash slows down the strength development of hardened concrete resulting in higher ultimate strength due to formation of secondary hydration product
- Use of fly ash in mix design reduces the quantity of cement in construction, providing higher strength and improved workability

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