EXPERIMENTAL STUDY ON SELF COMPACTING CONCRETE USING MINERAL ADMIXTURES

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ABSTRACT: Concrete has to be heavily vibrated for flow into very intricate forms or forms that have a lot of reinforcing bars. Hence to overcome these defects the self-compacting concrete is used.The self-compacting concrete flows easily at suitable speed into formwork without blocking through the reinforcement without being heavily vibrated. This paper deals with the self- compacting concrete where the cement is partially replaced with fly-ash and silica fume. Here Ordinary Portland Cement is replaced with 25% of fly-ash and 0 %, 5% and 10% of silica fume CHRYSO PLASTICIZER is used as Admixture for SCC to provide necessary workability.

Key words: Fly-ash, Silica fume, Chryso plasticizer.

I INTRODUCTION

Self-compacting concrete (SCC) represents one of the most significant advances in concrete technology for decades. Inadequate homogeneity of the cast concrete due to poor compaction or segregation may drastically lower the performance of mature concrete insitu.SCC has been developed to ensure adequate compaction and facilitate placement of concrete in structures with congested reinforcement and in restricted areas.

ADVANTAGES OF SELF COMPACTING CONCRETE:

It has proved beneficial economically because of a number of factors as noted below

- Faster construction,
- Reduction in site manpower,
- Easier placing,
- Uniform and complete consolidation,
- Better surface finishes,
- Improved durability,
- Increased bond strength,
- Greater freedom in design,
- Reduced noise levels, due to absence of vibration, and
- Safe working environment.

MINERAL ADMIXTURES:

1.FLY-ASH: Fly-ash is a bi-product of the combustion of pulverized coal in thermal power plants.Fly-ash can be effectively used as a partial replacement up to 30% by weight of cement without decreasing the strength and thus reduces the consumption of cement which in turn reduces the cost of concrete. So the fly-ash percentage is kept at a constant of 25%.

2. Silica fume: Silica fume is a by-product of producing silicon metal or ferrosilicon alloys. Silica fume can be effectively used as a partial replacement up to 12.5% by weight of cementwithout decreasing the strength and thus reduces the consumption of cement which in turn reduces the cost of concrete. So the silica content is replaced with 0%, 5% and 10%.

3.CHRYSO PLASTICIZER: It is used because it is essential component of SCC to provide necessary workability. It is based on Poly Carboxyl Ether and is supplied as dark brown liquid instantly dispersible in water and specially formulated to give high water reduction up to 40%without loss of workability.

A dosage between 0.3% and 0.5% of the product of the weight of cement is commonly used

II. MIX DESIGN:

With a trail mix of 1:1.5:1.47 of M30 grade of concrete with 10 to 20mm of coarse aggregate and zone-II river sand with a fine-ness modulus of 2.69 is used.

WORKABILITY TEST:

1. SLUMP FLOW TEST: The slump flow is used to assess the horizontal free flow of SCC in the absence of obstructions.The higher the slump flow (SF) value, the greater its ability to fill formwork under its own weight. A value of at least 650mm is required for SCC. There is no generally accepted advice on what are reasonable tolerances about a specified value, though ± 50mmis accepted.
2. V-FUNNEL TEST: The V-funnel test is used to determine the filling ability (flow-ability) of the concrete with a maximum aggregate size of 20mm. The funnel is filled with about 12 litres of concrete and the time taken for it to flow through the apparatus measured. After this the funnel can be refilled concrete and left for 5 minutes to settle. If the concrete shows segregation then the flow time will increase significantly.
3. L- BOX TEST: The test assesses the flow of the concrete, and also the extent to which it is subjected to blocking by reinforcement.

III. RESULTS AND DISCUSSIONS

WORKABILITY TEST RESULTS:

Table 3.1: Compressive strength of SCC mixes.

S.No.	Mixture		Slump flow test (secs)	V- funnel test (sec)	L-box (h_2/h_1)
	Fly ash	Silica fume			
1	0%	0%	720	8	0.89
2	25%	0%	760	10	0.86
3	25%	5%	750	9	0.82
4	25%	10%	740	8	0.80

COMPRESSIVE STRENGTH:

Table 3.2: Compressive strength of SCC mixes.

Mix		Compressive Strength In Mpa			Average Compressive Strength In Mpa		
Flyash	Silica Fume	7days	14days	28 Days	7days	14days	28days
0%	0%	12.9	25.7	37.1	13.7	26.0	37.33
		13.5	26.5	38.3			
		13.1	25.8	37.8			
25%	0%	13.2	26.1	38.9	13.5	26.37	38.87
		13.8	26.7	39.1			
		13.5	26.3	38.6			
25%	5%	13.7	28.1	41.8	14.0	28.4	41.9
		14.9	28.5	42.2			
		14.1	28.6	41.7			
25%	10%	11.9	23.6	33.3	11.77	23.2	34.37
		12.1	23.4	35.2			
		11.3	23.1	34.6			

Fig 1: Graphical Representation Of Compressive Strength:

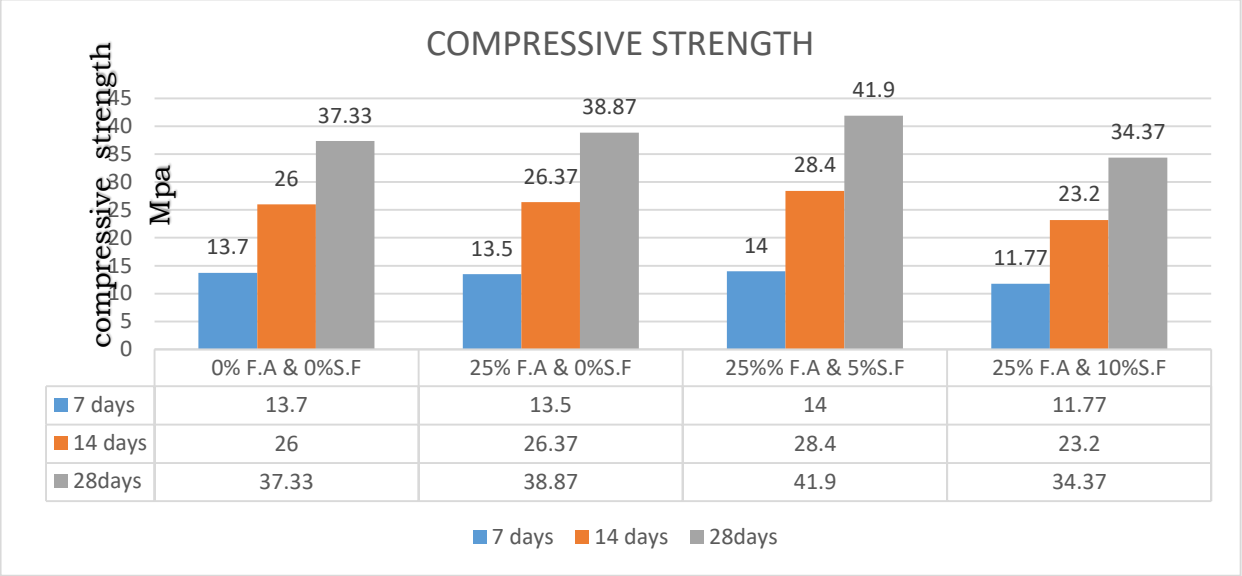


Table No 3.3 Flexure Test Results:

Mix		Flexure Strength For 28 Days In Mpa
Fly-Ash	Silica Fume	
0%	0%	4.32
25%	0%	4.35
25%	5%	4.52
25%	10%	4.12

Fig 2: Graphical Representation Of Flexure Strength:

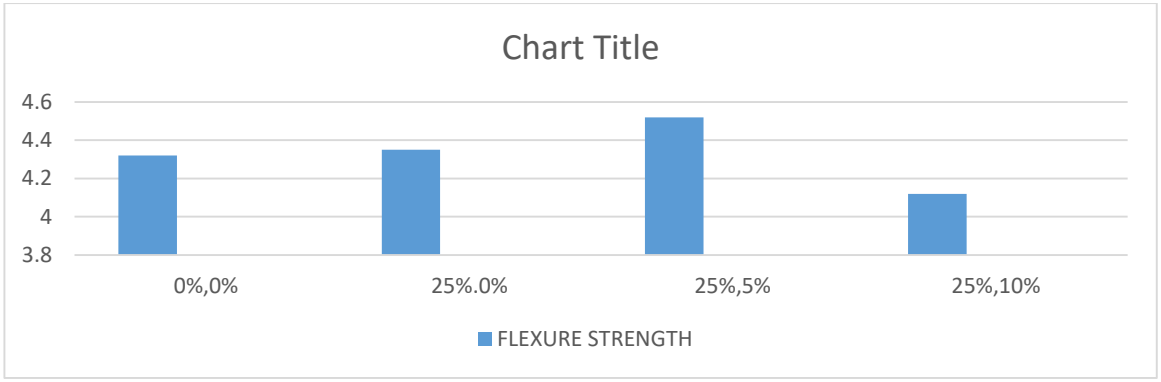
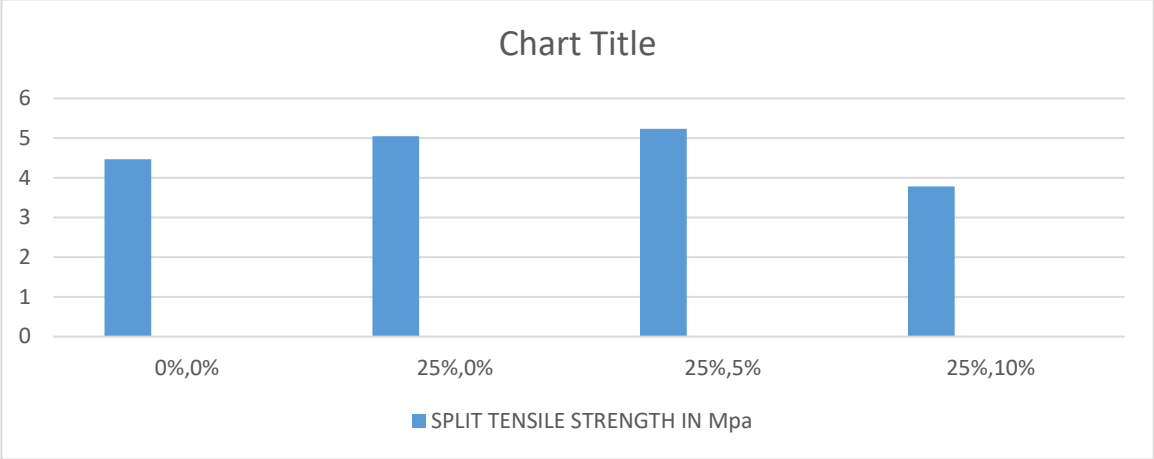


Table No 3.4 Split Tensile Strength:

Mix		Split Tensile Strength For 28 Days In Mpa
Fly-Ash	Silica Fume	
0%	0%	4.47
25%	0%	5.05
25%	5%	5.23
25%	10%	3.78

Fig No 3: Graphical Representation Of Split Tensile Values:



CONCLUSION

1. It is observed that with a replacement of 25% flyash and 5% of silica fume we are getting a compressive strength of 41.9 MPa. Which is quite more than the conventional concrete.
2. It is observed that with a replacement of 25% fly ash and 5% silica fume we are getting a flexural strength of a beam was 4.52 MPa which is more than the conventional concrete.
3. It is observed that with a replacement of 25% fly ash and 5% of silica fume we are getting a split tensile strength of 5.23 MPa which is quite more than the conventional concrete.

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