

# **Experimental Investigation on Properties of Self Compacting Concrete**

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**Abstract** – The Self Compacting Concrete is construction material which is used widely. The property of the concrete is good compaction without any vibrating equipment and good workability of concrete. This study shows the change of the Harden Self Compacting Concrete after the change in Cementitious content with Fly Ash. The result of the Compressive Strength shows that the Strength of the concrete having OPC53 Grade of cement is high as compared to that of the cementitious material replaced by the Fly Ash. The study also shows that as the Fly Ash content increases the strength of the compressive strength concrete decreases. The workability of the concrete is also being analysed in this study with the help of U-Box, L-Box, V-Funnel and Flow Table Test. The observation shows that as the Fly Ash Content increase the workability of the Fresh Concrete increases.

*Key Words*: Self-Compacting Concrete, Fly-Ash, Compressive Strength.

### **1. INTRODUCTION**

According to refer previous studies it is observed that the use of self-compacting concrete will be high in future construction as material. The Self Compacted Concrete was being firstly invented 1986. This Concrete can be used where there is high reinforcement and congested formwork. Improper Compaction of fresh concrete leads to the decrease in the compressive as well as the split tensile and flexural strength of the Concrete. So the special Self Compacting Concrete was introduced to reduce the compaction time and increase the strength of the concrete. Also the use of compaction equipment like compacting needle, form work vibrators etc. can be reduced and the cost can be decreased which can help the project to be economical. As compared to other concrete this Self Compacting Concrete is homogenous and good in workability. The homogeneity of the concrete gives it a good consistency throughout the larger spans while mass concreting. Also there is good surface leveling after the placing of this concrete as compared to the normal concrete. The high workability of the concrete makes it easy to flow through the high reinforcements and formworks. The chances of the Honey Combing also get decreased due to its property of selfcompaction. This are the ultimate reasons to increase in the compressive strength of the concrete. The change in

compressive strength after the change in the water cement ratio and the Fly Ash content is being study in this paper.

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### 2. Methodology

- Design of concrete mix
- Mixing of concrete
- Test on Samples

#### Table -2.1: Mix Design Ratio

Water Cement Ratio -0.35					
Fly Ash %	Cement	Fly Ash	Fine Agg	Coarse Agg	
0	1	-	1.91	2.04	
20	1	0.25	2.35	2.5	
25	1	0.33	2.49	2.65	
30	1	0.43	2.66	2.83	
Water Cement Ratio -0.37					

water Cement Ratio -0.37					
Fly Ash %	Cement	Fly Ash	Fine Agg	Coarse Agg	
0	1	-	2.02	2.15	
20	1	0.25	2.47	2.64	
25	1	0.33	2.63	2.8	
30	1	0.43	2.8	2.99	

Water Cement Ratio -0.39						
Fly Ash %	Cement	Fly Ash	Fine Agg	Coarse Agg		
0	1	-	2.2	2.34		
20	1	0.25	2.69	2.87		
25	1	0.33	2.86	3.05		
30	1	0.43	3.05	3.25		

# 3. Observations and Test Results Table 3.1 Compression Test Results-

Fly Ash%	0	20	30	40
w/c 0.35 Comp. Strength at 7days in MPa	38.06	35.00	34.87	33.40
w/c 0.35 Comp. Strength at 28days in MPa	62.21	55.00	52.03	51.47
w/c 0.37 Comp. Strength at 7days in MPa	36.81	34.87	33.45	32.17
w/c 0.37 Comp. Strength at 28days in MPa	54.64	52.70	52.03	50.58
w/c 0.39 Comp. Strength at 7days in MPa	33.78	32.03	30.66	29.61
w/c 0.39 Comp. Strength at 28days in MPa	50.62	50.43	50.30	49.55

## Graph 3.1 Compression Test-

# Compressive Strength Graph



It is observed that the as the water cement ratio decreased the compressive strength of concrete cubes increased. But as there was increasing change in the cement with Fly-Ash, the test results showed the decrease in the compressive strength simultaneously.

This Type of results were repeatedly observed for the mix ratios with increased water cement content.

Fly Ash%	0	20	30	40
w/c 0.35 Split Tensile Strength at 7days	3.62	3.30	3.05	2.88
w/c 0.35 Split Tensile Strength at 28days	5.51	5.23	4.94	4.67
w/c 0.37 Split Tensile Strength at 7days	3.61	3.05	2.80	2.75
w/c 0.37 Split Tensile Strength at 28days	5.51	4.94	4.92	4.55
w/c 0.39 Split Tensile Strength at 7days	3.20	2.89	2.61	2.48
w/c 0.39Split Tensile Strength at 28days	4.94	4.80	4.90	4.42

### **Table 3.2 Split Tensile Test Results**

### Graph 3.3 Split Tensile Test -

Split Tensile Strength Graph



It is observed that the as the water cement ratio decreased the Split tensile strength of concrete cubes increased. But as there was increasing change in the cement with Fly-Ash, the test results showed the decrease in the split tensile strength simultaneously.

This Type of results were repeatedly observed for the mix ratios with increased water cement content.

### **Table 3.3 Flexural Strength Test Results**

Fly Ash%	0	20	30	40
w/c 0.35 Flexural Strength at 7days	4.57	4.19	4.08	3.84
w/c 0.35 Flexural Strength at 28days	6.96	6.60	6.19	5.91
w/c 0.37 Flexural Strength at 7days	4.57	4.04	3.91	3.66
w/c 0.37 Flexural Strength at 28days	6.96	6.11	5.94	5.52
w/c 0.39 Flexural Strength at 7days	4.05	3.81	3.80	3.52
w/c 0.39 Flexural Strength at 28days	6.07	6.04	5.70	5.29

# Graph 3.3 Flexural Test -



It is observed that the as the water cement ratio decreased the Flexural strength of concrete cubes increased. But as there was increasing change in the cement with Fly-Ash, the test results showed the decrease in the Flexural strength simultaneously.

This Type of results were repeatedly observed for the mix ratios with increased water cement content.

### **3. CONCLUSIONS**

Based on above results the following conclusions have been studied that-

- For Compression test 0.35 water cement ratio 20% Fly-Ash gained higher Strength compared to the 25% and 30% Fly Ash content. For 0.37 water cement ratio 20% Fly Ash sample gained higher strength compared to the 25% and 30% Fly Ash content. For 0.39 water cement ratio 20% Fly Ash sample gained higher strength compared to the 25% and 30% Fly Ash content.
- For Split Tensile Test 0.35 water cement ratio 20% Fly-Ash gained higher Strength compared to the 25% and 30% Fly Ash content. For 0.37 water cement ratio 20% Fly Ash sample gained higher strength compared to the 25% and 30% Fly Ash content. For 0.39 water cement ratio 20% Fly Ash sample gained higher strength compared to the 25% and 30% Fly Ash content.
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sample gained higher strength compared to the 25% and 30% Fly Ash content.

### REFERENCES

- R. Karthika, Balamurugan S., "Studies on Strengthening of High Performance Self Compacting Concrete" *International Journal of Advance Research, Ideas and Innovations in Technology.* "Impact factor: 4.295 (Volume3, Issue5)
- Ramisetti.dln Swamy , M. K. M. V. Ratnam. "Effect of Mineral Admixture on Properties of Self Compacting Concrete." International Journal for Innovative Research in Science & Technology Volume 1 | Issue 11 | April 2015
- Mr. Bharath E, Dr. Prakash P, Dr. Prema Kumar W P, Mr. Srishaila J M. "Effect of Partial Replacement of Cement in Self-Compacting Concrete by Fly Ash and Metakaolin." International Journal of Engineering Research & Technology (IJERT). Vol. 4 Issue 07, July-2015.
- Mr. Mohammed Kamal Ali- "The Effect of Various Percentages of Fly Ash on the Fresh and Hardened Properties of Self Compacting Concrete." ISSN: 2319-7463 Vol. 3 Issue 10, October-2014
- H. Okamura and M. Ouchi, "Self-compacting concrete," *Journal of Advanced Concrete Technology*, vol. 1, no. 1, pp. 5–15, 2003.