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COMPARISON OF DIFFERENT MIXED DESIGN METHODS OF SELF - COMPACTING CONCRETE

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Abstruct:- To compare the Compressive Strength of Self-Compacting Concrete(Okamura Method) and Normal Concrete. To Compare the Compressive Strength and Flexural Strength of Self- Compacting Concrete using different mixed design methods.

1. INTRODUCTION

Self Compacting Concrete is a very special type of concrete which can flow and fill in to every corner of form work, even in the presence of congested reinforcement purely by its own weight and without the need of vibrating compaction.

Self-Compacting Concrete (SCC) is characterized by a low yield, high deformability, and moderate viscosity necessary to ensure uniform suspension of solid particles during transportation, placement (without external compaction), and there after until the concrete sets.

1. MIXED PRAPOTION OF SELF -COMPECTING CONCRETE (OKAMURA METHOD

Water cement ratio	0.3	0.4	0.45	0.5	0.6
Water(kg/m3)	190	250	282	315	400
Cement(kg/m3)	480	480	480	480	480
Fly ash(kg/m3)	145	145	145	145	145
Fine aggegrate(kg/m3)	754	754	754	754	754
Course aggegrate(kg/m3)	950	950	950	950	950
S.P(L/m3)	4.50	3.20	2.70	2.15	1.14

2. MIXED PROPOTION OF NORMAL CONCTERE

Water cement ratio	0.3	0.4	0.45	0.5	0.6
Water (kg/m3)	138	184	207	230	280
Cement (kg/m3)	460	46	460	460	460
Fine aggegrate (kg/m3)	725	725	725	725	725
Course aggegrate (kg/m3)	833	950	833	833	833

Standardized mix design method of SCC

- Okamura's Method (Japan Research Method)
- Aggregate Packing Factor Method (Taiwan Research Institute)
- CBI Method (Swedish Cement and Concrete Research Institute)
- UCL Method (University College London Research)

Mixed Proportion of Okamura Method

Water cement ratio	0.3	0.4	0.45	0.5	0.6
Water(kg/m3)	190	250	282	315	400
Cement(kg/m3)	480	480	480	480	480
Fly ash(kg/m3)	145	145	145	145	145
Fine aggregate(kg/m3)	754	754	754	754	754
Course aggregate(kg/m3)	950	950	950	950	950
S.P(L/m3)	4.50	3.20	2.70	2.15	1.14

Mix proportion of CBI method

Water cement ratio	0.3	0.4	0.45	0.5	0.6
Water(kg/m3)	226	302	340	378	452
Cement(kg/m3)	564	564	564	564	564
Fly ash(kg/m3)	189	189	189	189	189
Fine aggregate(kg/m3)	676	676	676	676	676
Course aggregate(kg/m3)	840	840	840	840	840
S.P(L/m3)	6.53	3.76	3.00	2.3	1.15

Mix proportion of UCL method

Water cement ratio	0.3	0.4	0.45	0.5	0.6
Water(kg/m3)	198	264	297	330	396
Cement(kg/m3)	510	510	510	510	510
Fly ash(kg/m3)	150	150	150	150	150

Fine aggregate(kg/m3)	780	780	780	780	780
Course aggregate(kg/m3)	840	840	840	840	840
S.P(L/m3)	5.02	3.51	3.00	2.4	1.2

Mix proportion of Aggregate packing method

Water cement ratio	0.3	0.4	0.45	0.5	0.6
Water(kg/m3)	181	242	272	302	362
Cement(kg/m3)	430	430	430	430	430
Fly ash(kg/m3)	174	174	174	174	174
Fine aggregate(kg/m3)	862	862	862	862	862
Course aggregate(kg/m3)	830	830	830	830	830
S.P(L/m3)	4.46	3.65	3.00	2.65	1.33

RESULT

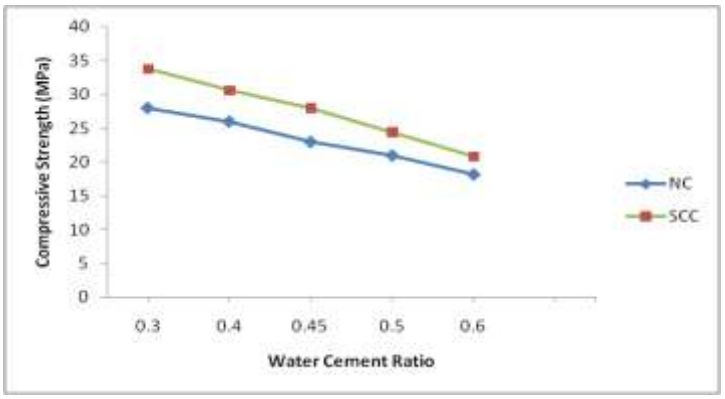
Typical acceptance criteria for self compacting concrete & Normal concrete.

W/C RATIO	SLUMP (mm)	SLUMP FLOW (mm)	V FUNNEL (Sec)	J RING (mm)	L BOX	U-TUBE (mm)
0.3	30	655	12	10	0.98	30
0.4	42	670	10	8	0.85	30.5
0.45	58	685	10	7	0.75	32
0.5	70	700	9	6	0.75	32
0.6	90	740	8	6	0.68	33

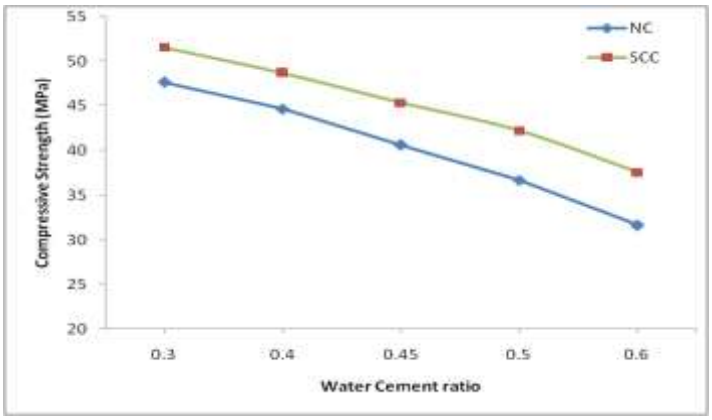
COMPRESSIVE STRENGTH AT 7 DAYS AND 28 DAYS

W/C RATIO	Normal Concrete (N/mm^2) at 7 days	OKAMURA (N/mm^2) at 7 days	Normal Concrete (N/mm^2) at 28 days	OKAMURA (N/mm^2) at 28 days
0.3	28.44	32.55	46.22	51.55
0.4	26.22	30.66	43.55	48.88
0.45	23.11	28.00	39.22	45.22
0.5	21.33	24.44	34.11	42.11
0.6	18.22	20.88	29.33	38.55

COMPRESSIVE STRENGTH at 7 days



Compressive strength in 28 days



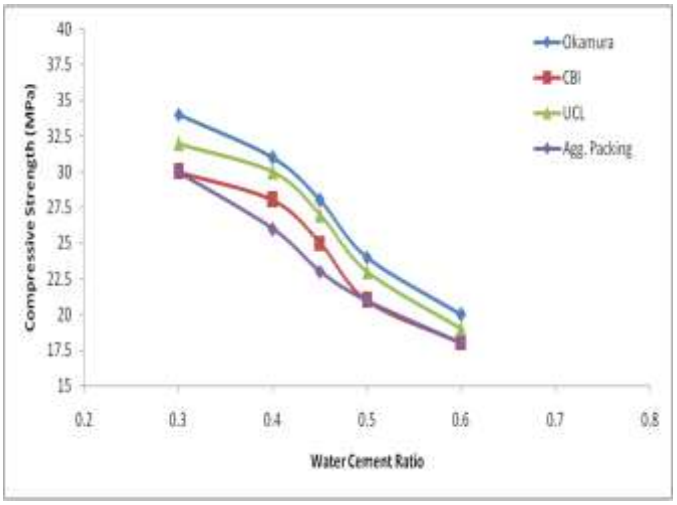
Flexural Strength at 7 days

W/C Ratio	OKAMURA (N/mm^2) AT 7 days	CBI (N/mm^2) AT 7DAYS	UCL(N/mm^2) AT 7 DAYS	AGG PACKING (N/mm^2) AT 7 DAYS
0.3	4.8	4.2	4.3	4.0
0.4	3.9	3.5	3.6	3.3
0.45	3.6	3.0	3.4	3.1
0.5	2.9	2.5	2.7	2.3
0.6	2.3	1.8	2.1	1.6

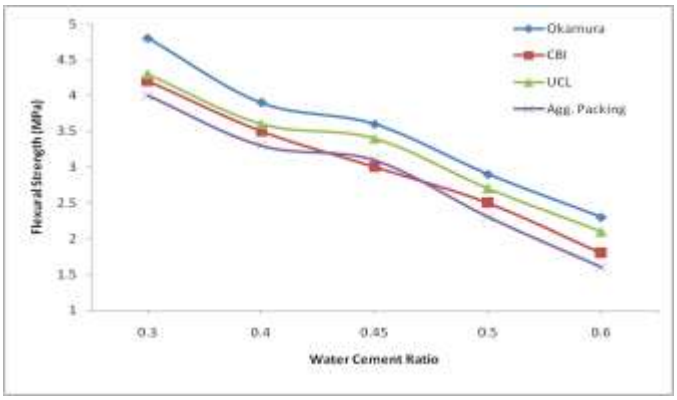
Flexural Strength at 28 days

W/C Ratio	OKAMURA (N/mm^2) AT 7 days	CBI (N/mm^2) AT 7DAYS	UCL(N/mm^2) AT 7 DAYS	AGG PACKING (N/mm^2) AT 7 DAYS
0.3	8.5	7.9	8.2	7.5
0.4	7.8	7.3	7.4	7.1
0.45	7.2	6.6	6.7	6.5
0.5	6.5	5.8	6.0	5.9
0.6	5.6	5.2	5.5	4.8

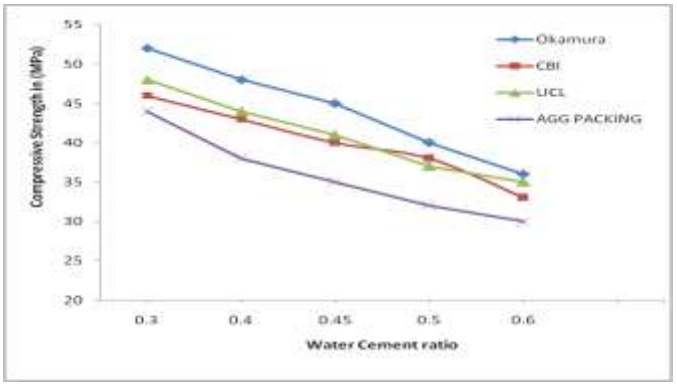
Compressive strength at 7 days



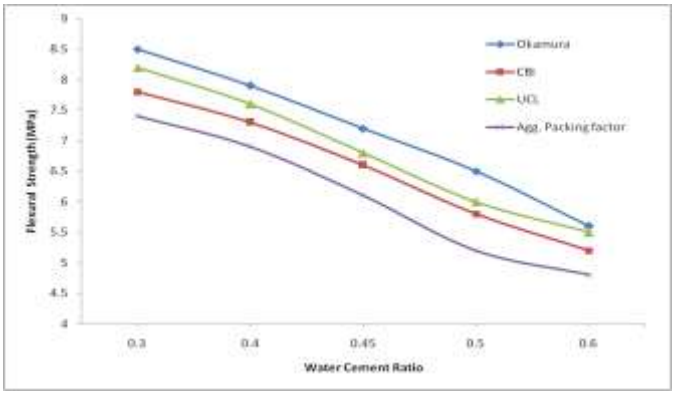
Flexural Strength at 7 days



Compressive Strength at 28 days



Flexural Strength at 28 days



3. CONCLUSIONS

- Okamura Method is best among the different Self Compacting Concrete mixed design methods as this method consumes least past volume and cement and utilize highest sand/mortar and coarse aggregate
- Okamura Method requires least number of trial mixes.
- For the same target strengths (Compressive and Flexural) the Self Compacting Concrete mix design methods are superior than the Ordinary Normal mix design method

The authors can acknowledge any person/authorities in this section. This is not mandatory.

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ACKNOWLEDGEMENT

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