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Strengthening of RC Column using Synthetic Scrim Reinforced Ferro Cement Jacketing

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Abstract:
This study is aimed to strengthening of deficient columns incorporating with different methods to reduce stress concentration at corners. Comparative study is carried out with column jacketed with and without steel fiber in mortar mix. In total, a reinforced concrete column was loaded to ultimate loading. From the experimental investigation it is observed that improvement in ultimate load carrying capacity of the synthetic scrim reinforced ferrocement jacketed columns in comparison to non-jacketed columns.

1.INTRODUCTION

1.1 GENERAL:

Column is one the most important structural elements designed to support compressive load and transfer load to the foundation. The strengthening of reinforced concrete columns through ferrocement jacketing is a commonly used effective technique because of its availability of raw material and low cost. Retrofitting with ferrocement confinement is the oldest and cost effective technique used to strengthen the concrete structures. The unique properties of ferrocement such as fire resistant, durability, low self-weight, water proof and crack resistant makes it an ideal material for wider applications. Confinement for square column by ferrocement by different type of techniques to strengthening of corners has also been studied by researchers. Result shows that strengthening of corners are practically more effective.

1.2 FERRO CEMENT

This is a special form of reinforced concrete which exhibits uniform dispersion of reinforcement in matrix offers improved tensile and flexural strength, fracture, toughness, crack control and impact resistance.

1.3 SCRIM REINFORCEMENT

The technique of scrim as a reinforcement is commonly applied in the manufacture of glass fibre or carbon fibre composites, scrim layers may be used on exterior surface of the carbon fibre laminate for an improved protective surface.
Here, we have chosen **Synthetic scrim.**

MATERIAL TEST RESULT

FINE AGGREGATE

Specific gravity	2.64
Fineness modulus	2.89
Grading zone	II

COARSE AGGREGATE

Specific gravity	2.77
Fineness modulus	7.75
Water absorption	0.69%

CEMENT

Specific gravity	3.08
Consistency	28%
Initial setting time	30min
Final setting time	600min
Fineness	3

3.9 MIX DESIGN:

Cement = 438.13 kg/m^3
Water = 197.16 kg/m^3
Fine aggregate = 755.60 kg/m^3
Coarse aggregate = 1038.15 kg/m^3
Water-cement ratio = 0.45
MIX RATIO = 1 : 1.72 : 2.36

Table .1. Compression Strength Test Result

ID OF CUBES	SPECIMENS	LOAD (KN)
C1	(150x150x150) mm	866
C2	(150x150x150) mm	576
C3	(150x150x150) mm	663

Table.2. Flexural Test Results

ID OF BEAMS	SPECIMENS	LOAD (KN)
B1	(100x100x500) mm	3
B2	(100x100x500) mm	5
B3	(100x100x500) mm	3

COLUMN CASTING WORK

5.1 VOLUME AND QUANTITY ARRIVAL FOR CASTING COLUMN:

MIX DESIGN: 1: 1.72: 2.36 = 5.08

VOLUME OF COLUMN

0.125 x 0.125 x 0.75 = 0.0117

= 0.0117 x 1.57 (DVF)

= 0.0183mm^3

VOLUME OF FINE AGGREGATE

= (1.72/5.08) x 1680 x 0.018

= 10.409 kg

VOLUME OF COARSE AGGREGATE

= (2.36/5.08) x 1560 x 0.018

= 13.26 kg

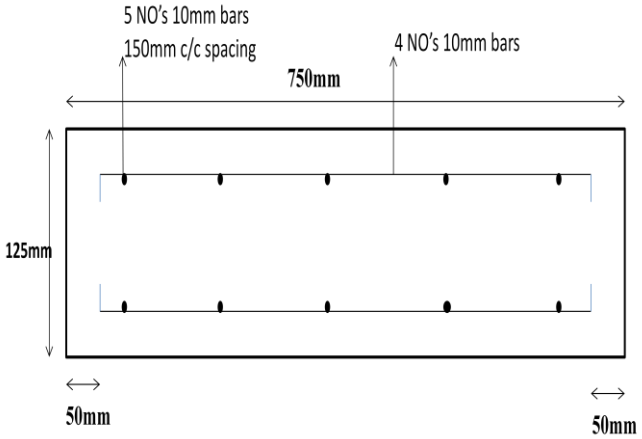

Figure .1. Detailing Of Conventional Column

Figure.2. Reinforcement Details

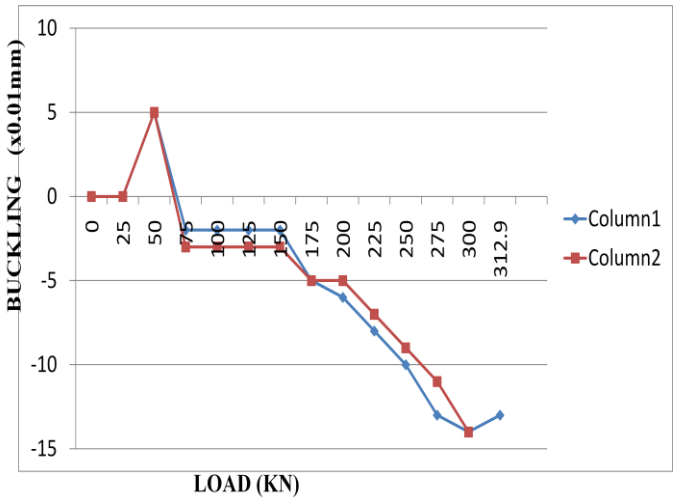

Table.3 .testing of conventional column:

LOAD (KN)	BUCKLING OF COLUMN 1 (x0.01mm)	LOAD (KN)	BUCKLING OF COLUMN 2 (x0.01mm)
0	0	0	0
25	0	25	0
50	5	50	5
75	-2	75	-3
100	-2	100	-3
125	-2	125	-3
150	-2	150	-3
175	-5	175	-5
200	-6	200	-5
225	-8	225	-7
250	-10	250	-9
275	-13	275	-11
300	-14	300	-14
312.9	-13	328.1	-15

Figure. 3. Testing Of Conventional Column

Figure.4. Failure of Conventional Column

5.2 SCRIM REINFORCEMENT COLUMN

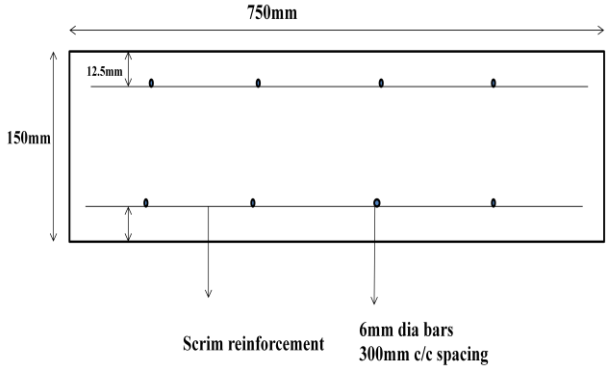

Figure.5. Detailing Of Conventional Column + Scrim

Figure.6. Casting Work Of Scrim Reinforced Column

Table.4. testing of scrim reinforced column:

LOAD (KN)	BUCKLING OF COLUMN 1 (x0.01mm)	LOAD (KN)	BUCKLING OF COLUMN 2 (x0.01mm)
0	0	0	0
25	-10	25	-12
50	-11	50	-10
75	-12	75	-10
100	-8	100	-9
125	-8	125	-9
150	-8	150	-9
175	1	175	1
200	0	200	2
225	4	225	4
250	18	250	16
275	27	275	29
300	36	300	40
413.3	48	425	51

The ultimate load obtained for scrim reinforced column 1 = 413.3KN

The ultimate load obtained for scrim reinforced column 2 = 425KN

LOAD Vs BUCKLING FOR SCRIM REINFORCED COLUMN

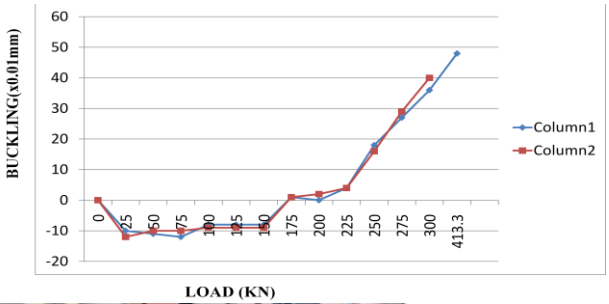

Figure.7. Failure of Scrim Reinforced Column

II. CONCLUSION:

- The load bearing capacity of the existing column has been increased by using synthetic scrim reinforced ferro cement jacketing.
- Resistance to corrosion is high and hence efficiently used in coastal areas.

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