Experimental analysis of Interfacial shear of Cold formed steel sheet with different Embossments using Pull out Test

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Abstract—The aim of this paper is to understand the slip mechanism between the cold formed sheet and concrete, to predict the shear pull out test is used. In this paper cold formed sheet of 3mm thickness is used and a small stud is welded in top of sheet to reduce the shear. The cold formed sheet is given three different shapes which were not available in the market (v-shape, rectangle, trapezoidal) and without embossment. And the cylinder specimen is setup for the pull out test. And the specimen are tested in 7,14,28 days of curing and the results are noted.

Index Terms— Cold formed steel sheet, shear, slip, pull out test, with embossment, without embossment, M sand.

1INTRODUCTION

COLD formed steel (CFS) is the common term for steel products shaped by cold working processes carried out near room temperature. The use of cold formed steel members in building construction began in the 1850's in United States and Great Britain. But one of the first documented uses of cold formed steel as a building material is in the Virginla Baptish Hospital, constructed around 1925 in Lynchburg Virginia.

The longitudinal slip between the steel sheet and concrete in composite slabs is usually an inefficient failure mode. So the main aim of this project is to improve the longitudinal shear strength of the cold formed steel sheet by embossment pattern, shapes and size of the composite slab.

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to measures the interfacial shear of cold formed profiled sheeting. The size of the CFS selected is 250mm length and 120 mm width and 3 mm thick using 3 different shape of embossment that is not available in the market. The grade of concrete selected is M25 for this experiment and cylinder of size of 300 x150 mm, material parameters such as steel and cement are selected as 16 mm TMT bars and cement of OPC 53 grade and M-Sand is used. After giving the shape to the CFS sheet the length of the sheet will reduce. The CFS sheet as been placed at 100mm from the bottom of the cylinder and the cement concrete mix is surrounded by it.

Fig .1. Cold formed sheet

2 EXPERIMENTAL STUDIES ON COLD FORMED SHEETS

The cold form profiled sheet thickness used in this experimental investigation is 3 mm. The main aim of this project is

Fig.2.Rectangle profiled sheet

Fig.3. V-type profiled sheet

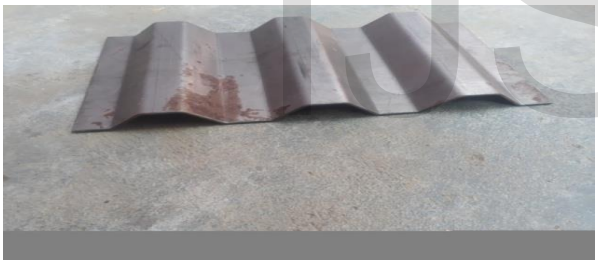

Fig.4. Trapezoidal type profiled sheet

Fig.5. Welded rectangular profile sheet for experimental setup

3.RESULTS AND GRAPHS

3.1 V-Shaped Embossment (50mmx20mm)

TABLE 1

Load (KN)	Slip (mm) 7 Days Curing	Slip (mm) 14 Days Curing	Slip (mm) 28 Days Curing
35	9	7	6
30	8	5	5
25	6	4	4
20	4	4	3
15	3	2	1
10	1	1	0
5	0	0	0
0	0	0	0

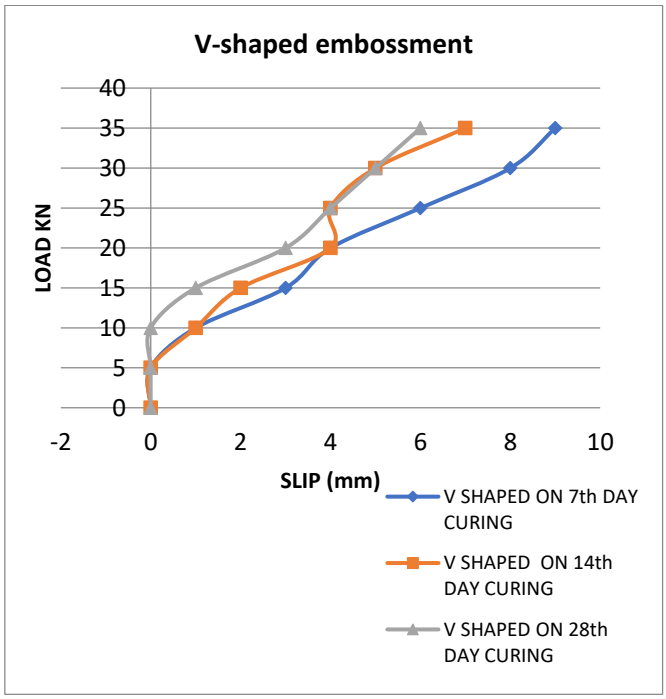

Fig.6. Load (KN) vs. Slip (mm)

3.2 Rectangular shape Embossment (20mmx15mm)

TABLE 2

Load (KN)	Slip (mm) 7 days curing	Slip (mm) 14 days curing	Slip (mm) 27 days curing
35	17	14	13
30	15	11	10
25	12	10	7
20	11	7	6
15	9	4	3
10	6	3	2
5	3	1	0
0	0	0	0

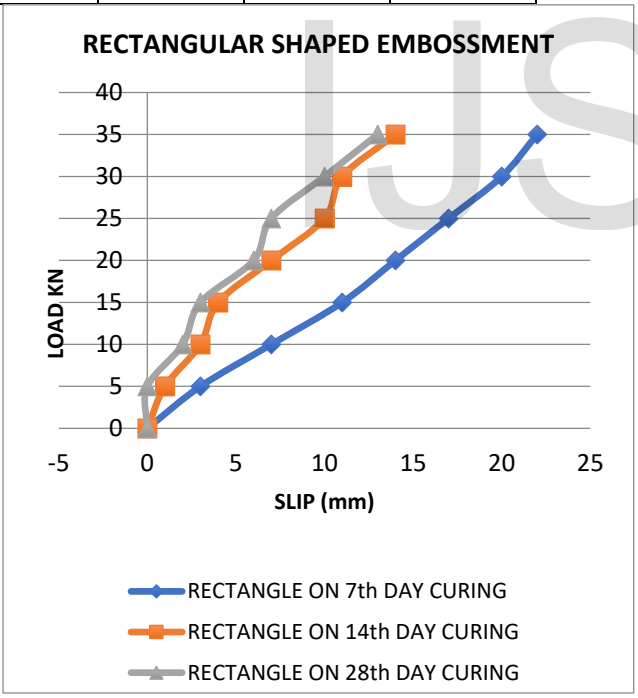

Fig.7. Load (KN) vs. Slip (mm)

3.3 Trapezoidal shape Embossment (20mmx15mm)

TABLE 3

Load (KN)	Slip (mm) 7 days curing	Slip (mm) 14 days curing	Slip(mm) 28 days curing
35	19	16	14
30	17	13	11
25	15	11	9
20	11	10	8
15	7	8	7
10	4	6	3
5	3	2	1
0	0	0	0

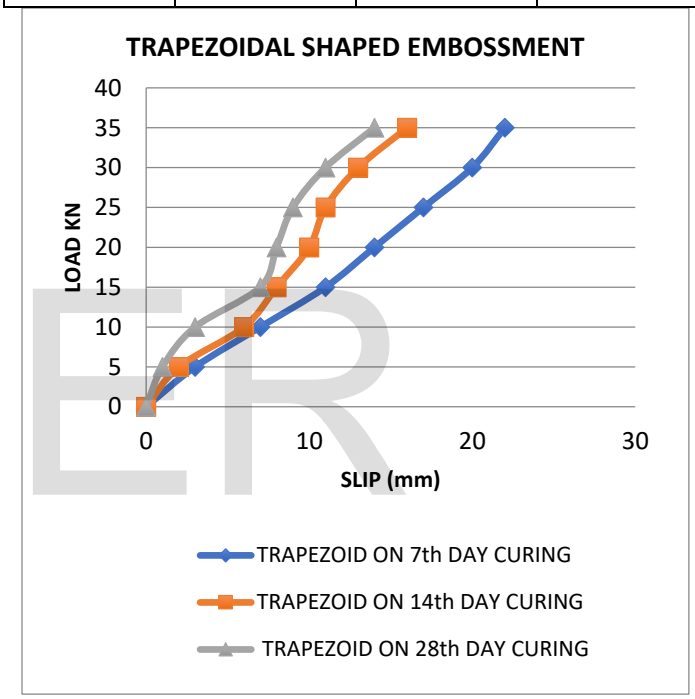

Fig.8. Load (KN) vs. slip (mm)

3.4 Without Embossment

TABLE 4

Load KN	Slip (mm) 7 days curing	Slip (mm) 14 days curing	Slip (mm) 28 days curing
35	22	17	16
30	20	15	13
25	17	14	12
20	14	11	9
15	11	8	8

10	7	6	5
5	3	2	2
0	0	0	0

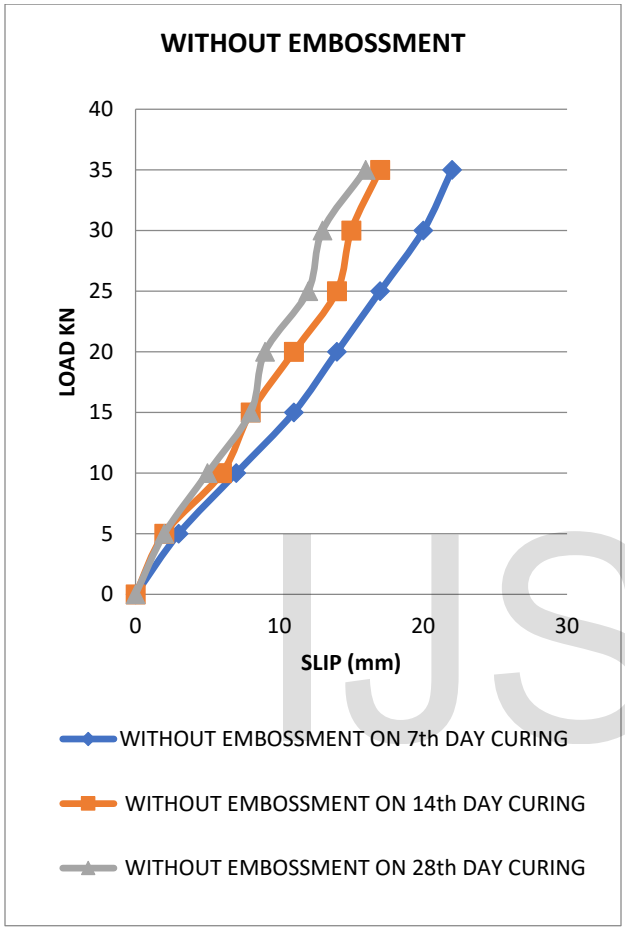

Fig.9. Load (KN) vs. Slip (mm)

4. Conclusion

- Specimens are casted with cold formed sheet at the middle of the cylinder such as with embossments (v-shaped, rectangle, trapezoidal), and without embossment they are tested for 7, 14, 28 days of curing.
- Then the casted specimens are tested by pull out test method in UTM and the results are plotted through graph for load vs slip for failure mechanism of composite structure for various cold formed sheets.
- From the experimental results it has been clear that the maximum slip was resisted by v-shaped embossment because of its maximum shear key action.

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