

EVALUATION OF BOND MECHANISM OF HARDENED AND PLASTIC CONCRETE USING CONVENTIONAL AND IMPROVED TECHNIQUES

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Abstract – This paper presents the experimental investigation of bond strength of fresh concrete & old concrete using the various bonding mechanism & bonding agents. As a part of research work the objective of work is to determine the bond strength between old & fresh concrete for which RCC slab of size 1.5mx1mx150mm were casted. The specimen was half fill with concrete and remaining proportion was casted after 24 hours by implementing the various dowels action and applying the bonding agents of cement slurry & SBR LATEX after the curing period the three cube specimen of size 150x150x150mm & 1 beam was removed along the bond line & slant shear test & flexural test were performed on it. From this it was concluded that cement slurry + corrugated PVC pipe proves to be economical.

Key Words: Bond strength, corrugated PVC pipe, SBR LATEX, Cement slurry

1. INTRODUCTION

Delay in concreting can result in cold joints. To avoid the cold joint, placing should be resumed substantially before the time of initial set. A Cold joint will result and suitable preparation measure should be applied .when in practices either casting cannot be completed in one go or the time lapse between mixing and placing the strength of final product is affected. If for any reason the concrete placement is stopped for longer than the setting time, the joint should be treated as cold joints. Cold joint need additional surface preparation, dowel action & bonding agents.

The study was carried out to evaluated bond strength of old and fresh concrete.so as to try out the various dowel action along with the bonding agents .the surface preparation was done by chipping the main objective of work is to determine the bond strength of old and fresh concrete by using the slant shear strength and flexural test to evaluate the flexural strength .The study was carried out to evaluated which dowel action and bonding agents gives the better results.

2. MATERIALS

The basic materials for experiment used are cement, sand, aggregate, water, SBR latex, steel, PVC pipe

2.1 CEMENT

In this study, ordinary Portland cement of 53 grade of sidhee cement satisfying all the required specification of Indian standard IS 269 (1989) was used.

2.2 SAND

The sand is used for make the concrete was well graded sand and confirming to is IS 383 ; 1970

Table-I: Sieve Analysis of Sand

IS Sieve (mm)	Weight retained on each sieve (gm)	Cumulative weight			
		Retained (gm)	Retained (%)	Passing (gm)	Passing (%)
4.75	58.55	58.5	5.86	941.5	94.13
2.36	63.5	122	12.237	878	87.76
1.18	156.5	278.5	27.934	721.5	72.07
0.600	133.5	412	41.324	588	58.68
0.300	370	782	78.435	218	21.56
0.150	198.5	980.5	98.345	19.5	1.95
Residue	19.5	1000	--	0	--
Total	1000	--	265	--	--

F.M. = 2.65, Zone = II

Table II:-Summary Of Various Physical of Sand

	values
Bulk density(loose)	1510 kg/m ³
Bulk density(Dense)	1650 kg/m ³
Fineness modulus	2.65
Specific gravity	2.65

2.3 AGGREGATE

The aggregate was used for make the concrete was well graded aggregate and confirming to is IS 238;1963

TABLE-III Sieve Analysis of Aggregate

IS Sieve (mm)	Weight retained on each Sieve (kg)	Cumulative weight			
		Ret aine d (kg)	Ret aine d (%)	Pass ing (kg)	Passi ng (%)
40	0	0	0	10	100
20	0.396	0.39	3.96	9.60	96.0
10	9.515	9.91	99.11	0.09	0.9
4.75	0.090	10	100	0	0
2.36	0	10	100	0	0
1.18	0	10	100	0	0
0.600	0	10	100	0	0
0.300	0	10	100	0	0
0.150	0	10	100	0	0
Residue	0	10	--	0	--
Total	5		703.0		

F.M. = 7.03, Zone = II

TABLE IV Summary of Various Physical Properties Of Course Aggregate

Properties	Value
Fineness Modulus	7.03
Specific Gravity	2.65
ZONE	2

2.4 WATER

The portable water was used for the experiment.

2.5 SBR LATEX

In the experiment SBR latex of DR fixit was used.



Figure;1 SBR latex

2.5 STEEL

The steel of national was used of ultimate strength of $500N/mm^2$.

2.6 PVC PIPE

PVC pipe astral was used.

TABLE V Mix Proportion For Concrete Mix Design

Materi al	water	cement	Sand	aggregate
quanit y	186kg/ m^3	372kg/ m^3	698kg/ m^3	1170kg/ m^3

TABLE VI Result of Compressive Strength Of M20 Grade Concrete Mix At 28 Days

SAMPLE NO	RESULTS
SAMPLE NO 1	26.97 N/mm^2
SAMPLE NO 2	27.03 N/mm^2
SAMPLE NO 3	26.5 N/mm^2
AVG	26.833 mm^2

I.

3. EXPERIMENTAL STUDY

The main purpose of experiment was to evaluate the bond strength of fresh and old concrete using the various dowel action & using bonding agents such as cement slurry & SBR latex the test selected for study were slant shear strength and flexural test.

3.1 Casting of specimen

In this study total 9 RCC slab were casted of size $1.5m \times 1m \times 150mm$ for slant shear and flexural test .the slab was partially casted & dowel action were kept with slant joint after 24hours & the chipping was done on it and bonding agents was apply on it & concrete was poured.

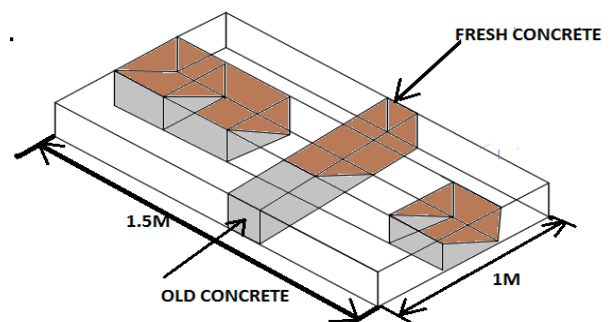


Figure 2: slab size of $1.5m \times 1m \times 150mm$

3.2 Casting of RCC slab, pre-defined 45 degree bond



Figure 3: half casted of slab

3.5 Placing the fresh concrete on harden concrete after 24 hours



Figure 6 :fresh concrete on old concrete

3.2 Application of various type of dowel action in slab



Corrugated PVC Pipes

dowel bar



S shaped shear key

Z shaped shear key

Figure 4: half casting of slab

3.3 Application the chipping on surface after 24 hours and bonding agents



Figure 5: applying the bonding agents

3.6 After the curing period the cubes and beam were removed along the bond line



Figure: 7 Cutting of concrete

3.7 Cubes were Tested under compression



Figure: 8 Slant shear Test

3.8 The flexural strength of beam was determined



Figure: 9 flexure test

4. RESULTS

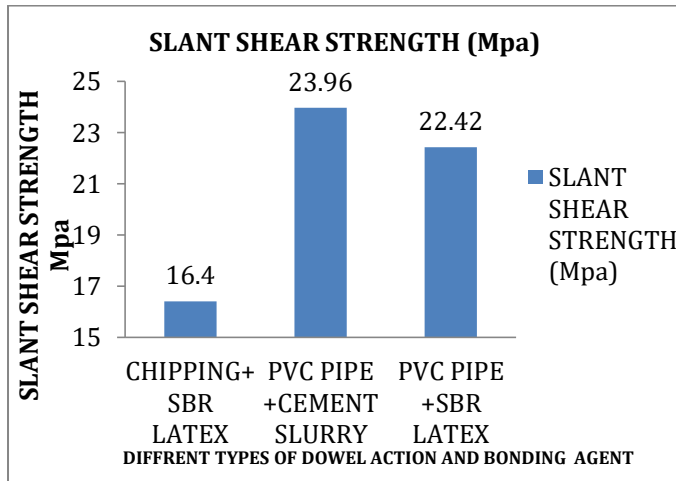


Figure 10 :slant shear strength result of chipping with SBR latex & pvc pipe with cement slurry and SBR latex

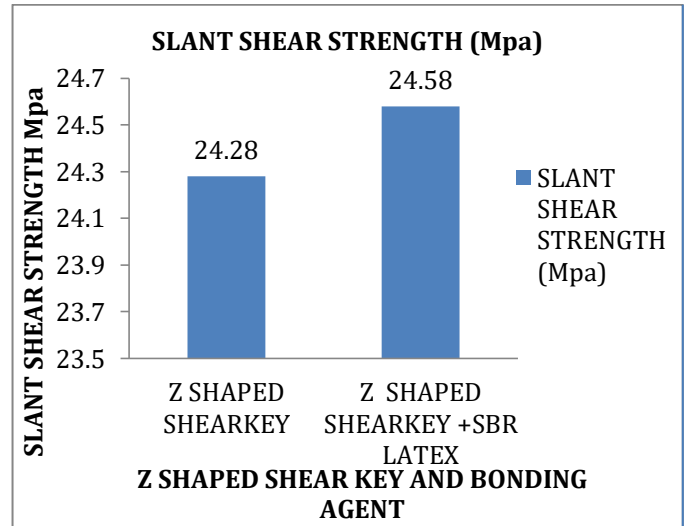


Figure 13 :slant shear strength result of Z shaped shearkey with cement slurry & SBR latex

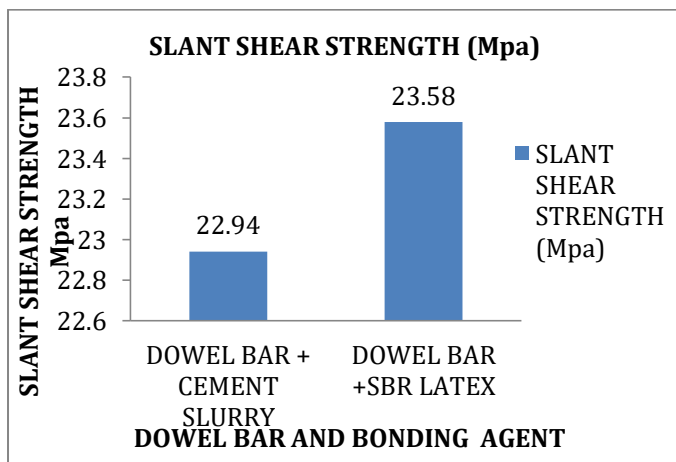


Figure 11 :slant shear strength result of dowel bar with cement slurry & SBR latex

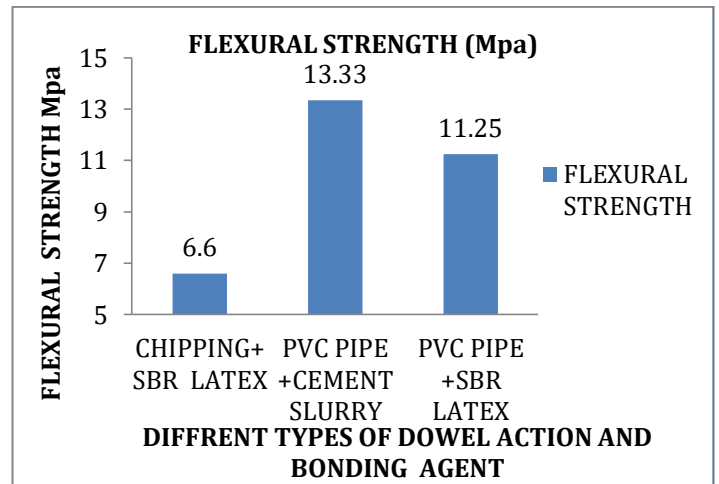


Figure 14 : flexural strength result of chipping with SBR latex & pvc pipe with cement slurry and SBR latex

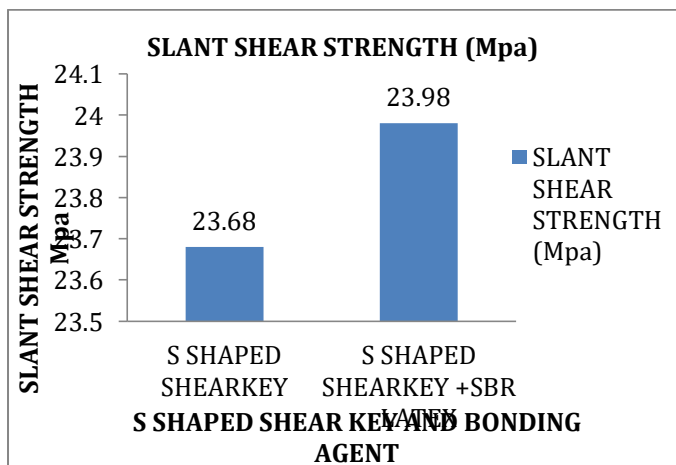


Figure 12 :slant shear strength result of S shaped shearkey with cement slurry & SBR latex

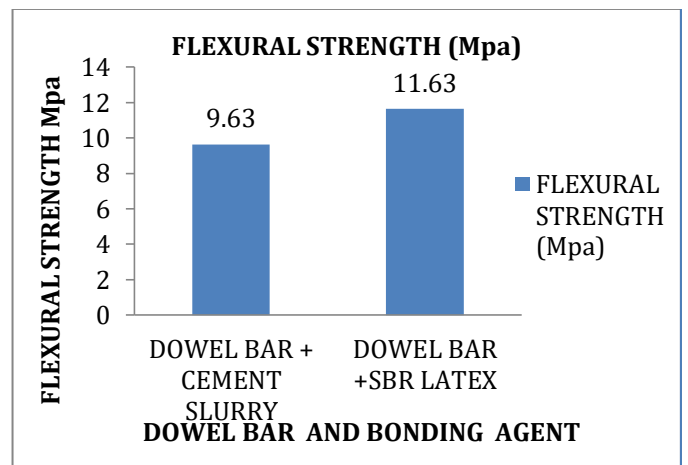


Figure 15 :flexural strength result of dowel bar with cement slurry & SBR latex

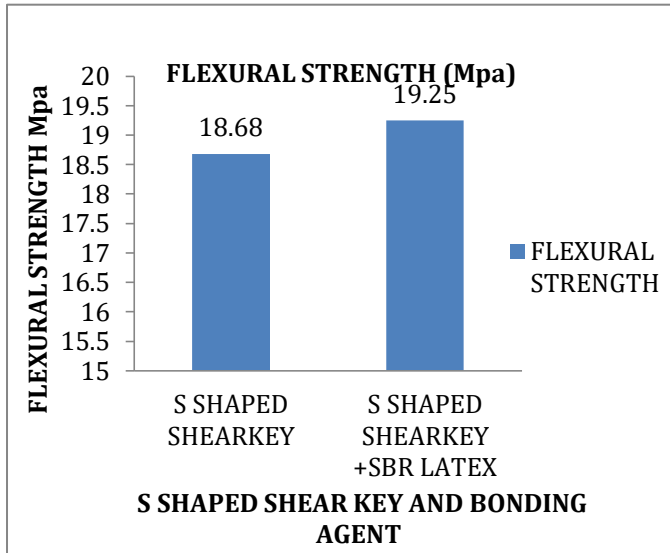


Figure 16 flexural strength result of S shaped shear key with cement slurry & SBR latex

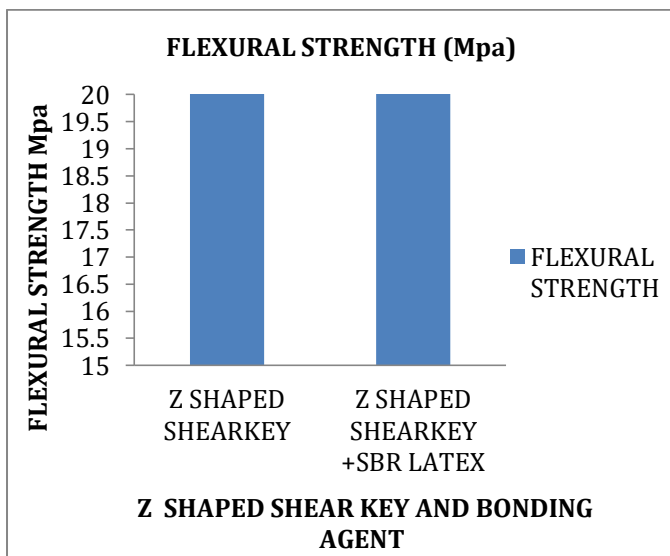


Figure 17 flexural strength result of Z shaped shear key with cement slurry & SBR latex

5. CONCLUSIONS

- However the chipping of surface when combined with the dowel action generated by insertion of the corrugated PVC pipes gives more bond strength.
- The slant shear strength test values for all the combinations were found to be on par with the combination of corrugated PVC pipes with cement slurry, which proves the latter to be an economical option for achieving the required bond strength

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