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Comparison between New RCC Structure (Bridge) and Old RCC Structure (Bridge) By Using Load Tests and NDT Tests

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Abstract- Now a days, cement concrete plays a major role in constriction industries in which strength of concrete is given the at most importance. There will be depreciation in strength increases which leads to spalling of concrete. The spallings of concrete means leads to the reduction of the strength. In this case study, an old bridge & new bridge constructed in the same location are assessed. The load tests and NDT tests were conducted on new bridge pile foundations, where as NDT tests were conducted on old bridge and new bridge. After assessments if proper measures values were not achieved then accidents will be inevitable. Using this load tests and NDT tests we find out strength of concrete, finding cracks and voids, settlement ect. So these load tests and NDT tests is lowing the broad sense to refer the material of concrete and examined also. The load tests & NDT tests are carried out on new bridge, NDT tests were conducted on old bridge which are located at NH-16 (old NH-5) Ch.655+573. The type of load tests is vertical load test, lateral load test, dynamic load test, integrity testing is done on pile foundation and the NDT test are done i.e. Ultrasonic Pulse Velocity (UPV) test, Rebound hammer test, core cutter test, profometer test on various components of New and old Bridge. My ultimate aim is the comparison between new and old bridges by using load test and NDT test.

Keywords- bridges, load tests, NDT tests, core cutter test, UPV test, perfometer test.

I. INTRODUCTION

Bridge is constructed over an obstacle such as valley or water bodies to provide access from one side to other, design of bridges depends on the purpose of the bridge and soil conditions. Bridges are termed to be important structures largely used bridge types are cantilever bridges, suspension bridges, arch bridges, beam bridges and truss bridges.

Components of bridges

- Deck slab, girders, trusses
- Bearings
- Abutments
- Piers
- Foundations

II. LITERATURE SURVEY

Piyush k bhandaril etal advanced NDT methods for evaluation of bridges in the year September 2017 and he concluded Different NDT studied above have their specific applications and show structural flaws, some show corrosion extent and some are specifically for bridge foundations.

D.T. Rahane, etal investigated non-destructive test steel fibre reinforced Concrete with metakaolin in the year July 2017 and in this work we focused on the experimental results of steel fibre reinforced concrete (SFRC) with Metakaolin as admixture.. In this work M20 grade concrete with volume fraction of the Round Crimped Steel Fibre (RCSF) 1%, 2%, 3% & 4% increment, and 5%, 10%, 15% & 20% of metakaolin replaced with cement was used Non-destructive test as comparative to normal concrete. Normal concrete is found to be less compressive than metakaolin blended steel fibre concrete.

Costel chingalata etal assessment of the concrete compressive strength using non-destructive methods in the year may 2017. NDT methods for the assessment of concrete compressive strength, Each of the two methods has a high degree of applicability.

A.G more etal Condition Assessment of Bridges by NDT methods in the year April 2017, Condition rating is a suitable method for assessing the overall condition of concrete structures because the condition of each component can be monitored continuously. Rebound hammer test, Cover Meter, Half cell potentiometer and various other NDT methods are useful in evaluating the structural stability of structure. The ranking assessment of bridge considered here is carried out using rebound hammer, Cover meter, half cell potentiometer, which implies condition of bridge, is good but there is requirement of economic analysis of repair.

III. METHODOLOGY

Table 1: Old Bridge and New bridge details

Parameters	Old Bridge	New Bridge
Width of bridge	7m	16m
Length of bridge	330m	330m
No of spans	21	11
Longer span lengths	15	29.9m
Shorter span lengths	22.5	31
Abutments distance	15*19+22.5*2=330m	29.9*10+31*1 = 330m
Location of bridge	India ,AP,NH16(OLD NH5)At kilometres 655+573 location near natavalasa toll gate `	India ,AP,NH16(OLD NH5)At kilometres 655+573 location near natavalasa toll gate `

Table 2: Old Bridge Material Grades

Structure components	Old bridge
Foundation	Volume measure concrete (1:1.5:3)
Well cap pcc	
Well cap	
Pier	
Diaform wall	
Dirt wall	
Return wall	
Pier cap	
Abutment well	
Abutment well pcc	
Abutment well cap	
Abutment pier	
Abutment pier cap	
Pedestals	
Barings	75to120mt
Girder type	Volume measure concrete (1:1:2)
A. End grider	
B. Middle girder	
C.end cross girder	
D.middle cross girder	
Deck slab	
Approch slab	Nill
Rcc crash barrier/ Hand rails	Nill/Ms pipe

Figure1: Old Bridge and New Bridge at site

Table3: New Bridge Material Grades

Structure parts	**New bridge**
	Grade of concrete
Foundation	M35
Pile pcc	M10
Pile cap	M35
Pier	M35
Diaform wall	M35
Dirt wall	M35
Return wall	M35
Pier cap	M35
Abutment pile	M40
Abutment pile pcc	M10
Abutment pile cap	M35
Abutment pier	M35
Abutment pier cap	M40
Pedestals	M40

IV. OBJECTIVE OF PRESENT WORK

- The load test is carryout on foundations as per IS code to determine the concrete quality and detection of cracks, voids etc. and Assessment of existing structure for rehabilitation or repair.
- The load test is carryout on foundations as per IS code to determine the settlement Concrete quality and detection of cracks, voids etc. and Assessment of existing structure for rehabilitations or repair.
- To carry NDT tests i.e. UPV test, Rebound hammer test and core cutter as per IS code to determine the concrete quality and detection of cracks, voids etc.
- Monitoring changes in concrete with passage of time.
- Assessment of existing structure for rehabilitation or repair planning.
- To comparing between New and old Bridge by using load tests and NDT tests.

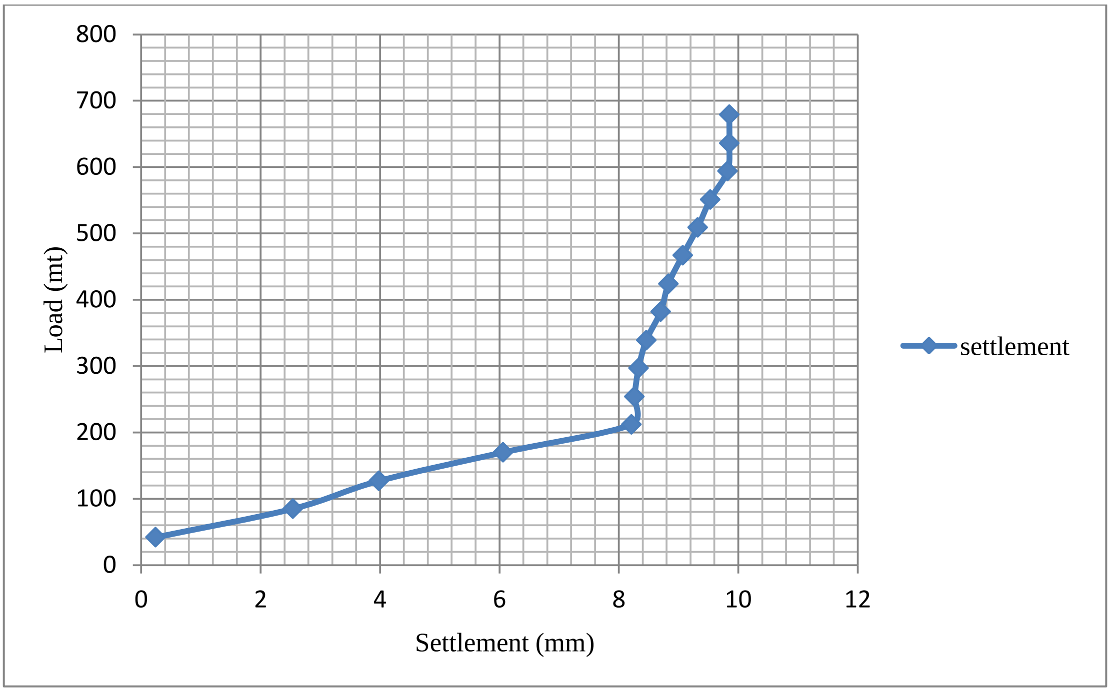
V. SCOPE OF PRESENT WORK

- The pile load test is carries out i.e. vertical pile load test; lateral pile load test, dynamic pile load test, and integrity test will be done on foundation of structure only.
- The NDT tests are Ultrasonic Pulse Velocity test (UPV), Rebound hammer test, core cutter, profometer is done on above foundation level.
- The comparison on foundation between old and new structure (Bridge) only integrity test is done.
- The comparison between old and new Structure (Bridges) is done by NDT tests (i.e.) UPV Test, Rebound hammer test, core cutter test.
- The grade of concrete tested by NDT and load tests is M20, M25, M30, M35, M40, and M45.

VI. RESULTS AND DISCUSSIONS

Table4: Load chart in vertical load test-1

Safe load	265MT
Test load	265x2.5 = 662.5= 665MT
Loading	831.25MT
Effective ram area of jack	706.9x3 = 2120.70 cm2
L.C of Pr. Dial Gauge	20kg/cm2
Load increment	@20% of safe load to be applied uniformly that is 20% of 265 = 53 MT
L.C of pressure gauge	20kg/cm2 = 2120.7cm2x20kg/cm2 42.414MT
Required load increment	53MT
So, Load increment	24.992 kg/cm2
Stages of loading @ 1.0 division	1x20 = 20kg/cm2 = 42.414

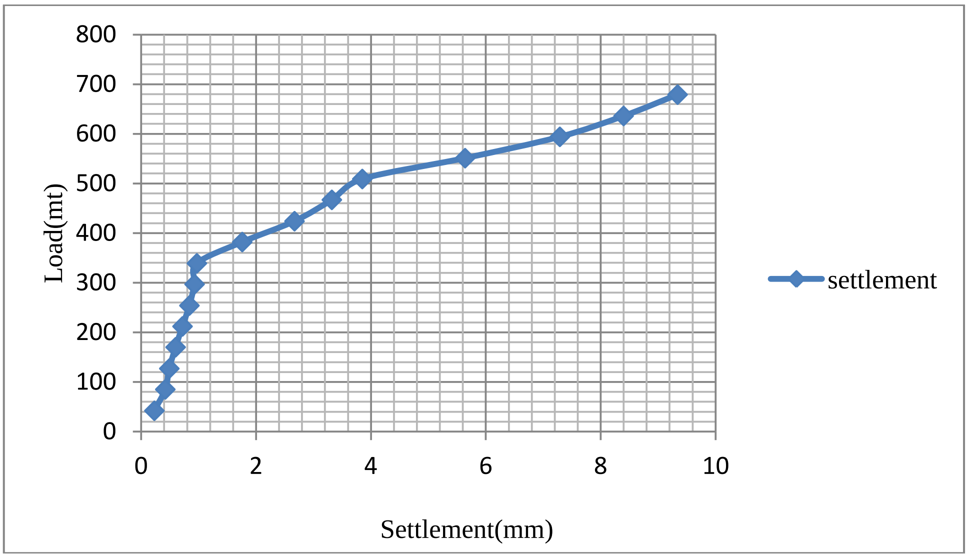


Load Vs Settlement in Vertical load test-1

Shows between load and settlement of vertical load test -1, in this graph load & settlement proposition to each other. As per test the final load is 679MT at which settlement is 9.85mm. The settlement of new bridge first test piles is 9.85mm settlements are below the acceptance criteria .so the vertical load test is satisfied as per code.

Table5- Load chart in Vertical pile load test-2

Safe load	265MT
Test load	265x2.5 = 662.5= 665MT
Loading	831.25MT
Effective ram area of jack	706.9x3 = 2120.70 cm2
L.C of Pr. Dial Gauge	10kg/cm2
Load increment	@20% of safe load to be applied uniformly that is 20% of 265 = 53 MT
L.C of pressure gauge	10kg/cm2 = 2120.7cm2x10kg/cm2 = 21.207MT
Required load increment	53MT
So, Load increment	24.992 kg/cm2
Stages of loading @ 1.0 division	1x20 = 20kg/cm2 = 42.414



Load vs Settlement in Vertical load test-2

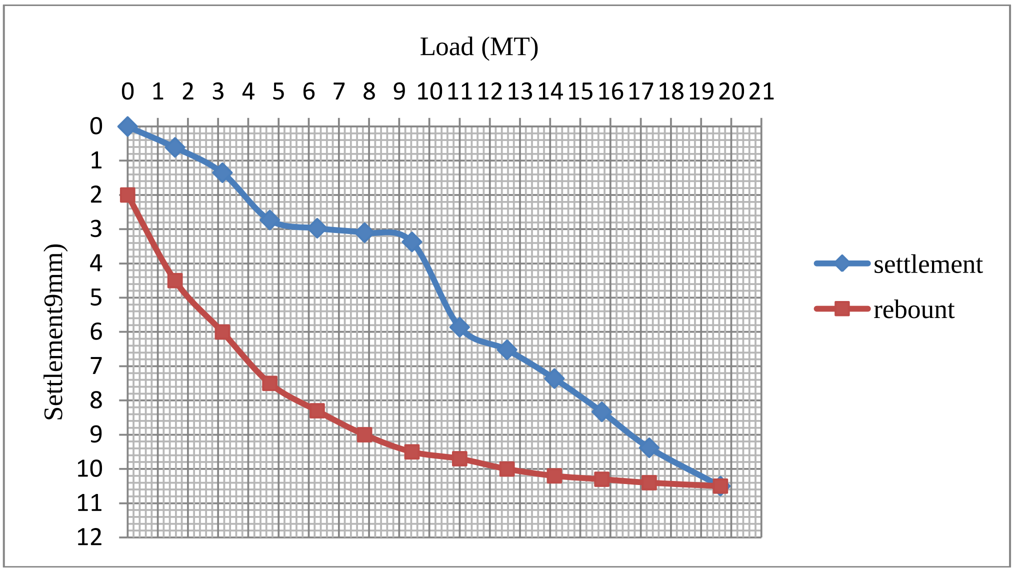
shows between load and settlement of vertical load test -2, in this graph load & settlement proposition to each other. As per test the final load is 679MT at which settlement is 9.34mm. The settlement of new bridge second test piles is 9.34mm settlements are below the acceptance criteria .so the vertical load test is satisfied as per code.

Table7- Details of equipments Tested in Lateral load Test-1

Hydraulic jack	50 MT (1 no's)
Hydraulic pump	1000MT(capacity) 1 No
Pressure dial gauge	700kg/cm2 (1 no.)
Deflection dial gauge	2nos.(0-25mm travels)
Magnetic stand	2 no.
Datum bar	1 no.
Distribution Block	1 no.
Least count of pressure dial gauge	10kg/cm2
Least count of def. dial gauge	`0.01mm
Ram dia of a jack	80mm
Effective ram area of each jack	78.54cm2

Table8: Load chart in Lateral load Test-1

Safe load	7.5MT
Test load	7.5X2.5 = 18.75 (say 19 MT)
Effective ram area of jack	78.54 cm2
L.C of Pr. Dial Gauge	10kg/cm2
Load increment	@20% of safe load to be applied uniformly that is 20% of 7.5 = 1.50 MT
L.C of pressure gauge	20kg/cm2 = 78.54cm2x20kg/cm2=1.57 MT
Required load increment	1.5 MT = ((1.5 X 1000)/78.54)
So, Load increment	19.1kg/cm2 (Not readable)
Stages of loading @ 1.0 division	2 X 10= 20kg/cm2 = 1.57 T



Load vs Settlement in Lateral load test-1

Chart shows between load and settlement of lateral load test -1, in this graph load & settlement proposition to each other. As per test the final load is 19.64MT at which settlement is 10.5mm. The displacement of new bridge pile is 10.5mm, the value 10.50mm is above acceptance criteria so the designer should be redesign pile.

Table9: Details of Pile Tested in Lateral load test-2

Pile Mark	Test Pile
Type of Pile	Cylindrical RCC cast in-situ bored pile
Dia of Pile	1000 mm
Cut – off – level	(+) 1.80 m
Founding Level	(-) 7.50 m
Design depth from C.O.L	9.30 m
Design Load	7.5MT
Test Load	19 MT
Grade of concrete	M – 35
Comp – strength 28 days	41.61 Mpa
Reinforcement used	25 mm & 12mm
Id no of pressure guage	013PG170043
Serial no of power packs	1980
Id no of dial guage	BJA 500529

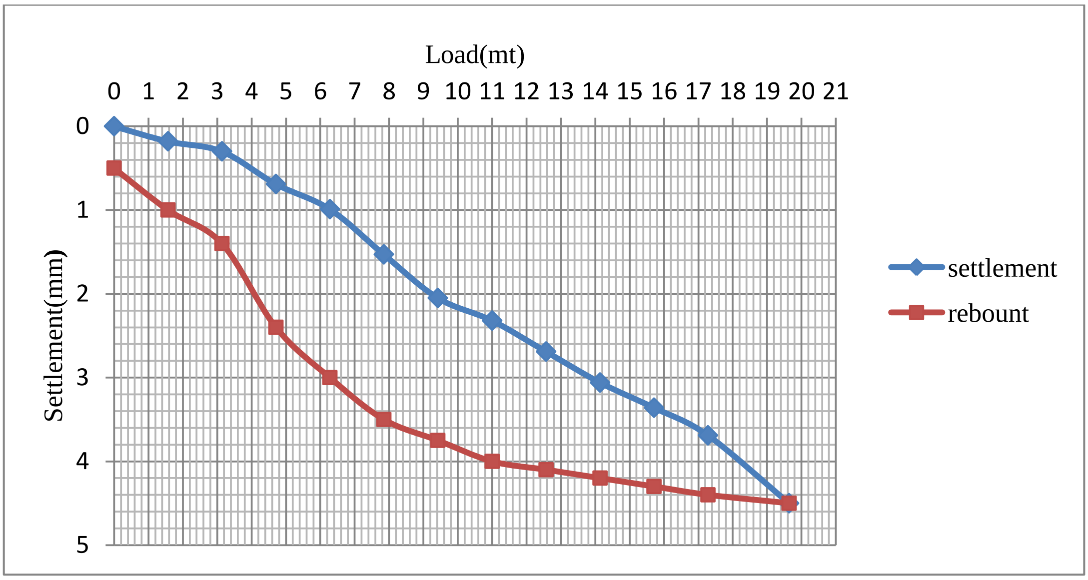


Chart: Load vs Displacement in Lateral load test-2

Chart shows between load and settlement of lateral load test -2, in this graph load & settlement proposition to each other. As per test the final load is 19.64MT at which settlement is 4.5mm. The displacement of new bridge pile is, 4.5mm, the value 4.5mm are below the acceptance criteria.

Table10: Integrity test on piles

Type of pile	RC Bored
Method of piling	Hydraulic Rig
Linear depth	13.75m
Pile diameter	1000mm
Pile depths from test level	21.85m-23.35m
Concrete grade	M35
Period of casting	24/03/18-16/04/18

Table11- Integrity test

Pile No	Toe response	Length of pile from test level (m)	Wave speed (m/s)	Shaft cross-section and soil changes (from test level)	Pile integrity
P3-1	Evident	21.85	3600	Fairly uniform pile shaft. Bulge/increase of soil resistance seems evident around 13m from test level	Ok
P3-3	Evident	21.85	3600	Fairly uniform pile shaft	Ok
P3-4	Evident	21.85	3600	Fairly uniform pile shaft	Ok
P3-5	Evident	21.85	3650	Fairly uniform pile shaft. Bulge/increase of soil resistance seems evident around 13m from test level	Ok
P3-6	Evident	21.85	4100	Fairly uniform pile shaft. Bulge/increase of soil resistance seems evident around 18m from test level	Ok
P4-1	Evident	22.33	3700	Fairly uniform pile shaft. Bulge/increase of soil resistance seems evident around 12.5m from test level	Ok
P4-2	Evident	22.33	4250	Fairly uniform pile shaft	Ok
P4-3	Evident	22.33	4300	Fairly uniform pile shaft. Bulge/increase of soil resistance seems evident around 14m from test level	Ok
P4-4	Evident	22.33	4000	Fairly uniform pile shaft. Bulge/increase of soil resistance seems evident around 14m from test level	Ok
P4-5	Evident	22.33	4250	Fairly uniform pile shaft	Ok
P4-6	Evident	22.35	3600	Fairly uniform pile shaft	Ok
P7-2	Evident	23.35	3500	Fairly uniform pile shaft	Ok
P7-3	Evident	23.35	4100	Fairly uniform pile shaft	Ok
P7-4	Evident	23.35	4000	Fairly uniform pile shaft	Ok
P7-6	Evident	23.35	3600	Fairly uniform pile. Bulge of soil resistance seems evident 12m	Ok

Table12: Pile Details in Dynamic load test -1

Pile no	A2-10
Pile length below gages	14.95m
Pile length below grade	14.65m
Concrete grade	M40
Pile diameter	1000mm
Hammer weight	4T
Drop height	0.5m
Working load	180T
Test load	270T
Soil data availability	Not available

Table13: Summary of field results for pile A2-10

Height of fall(m)	**RMX**	**RSU**	**Net settlement (mm)**	**Total settlement (mm)**
0.5	356	220	0.6	1.7
0.5	441	435	1.2	2.0

Table14: Summary of CAPWAP analysis results

Pile No.	A2-10	Permissible limits
Pile capacity	434.9 tons	1.5xDesign load
Skin friction	218.8 tons	-
End bearing	216.1 tons	-
Set per blow	0.6mm	3-4mm
Total displacement	3.7mm	-
Compressive stress	5.6N/mm^2	0.85fck
Pile integrity (below sensor level)	ok	(80%-99% classified as minor defect)

Table15: Pile Details in Dynamic load test -2

Pile no	P10-4
Pile length below gages	19.8m
Pile length below grade	19.5m
Concrete grade	M35
Pile diameter	1000mm
Hammer weight	4T
Drop height	1.5m
Working load	230T
Test load	345T
Soil data availability	Not available

Table16: Summary of field results for pile P10-4

Height of fall(m)	**RMX**	**RSU**	**Net settlement (mm)**	**Total settlement(mm)**
0.5	30	145	1.17	1.17
1.0	170	547	1.15	2.05
1.5	377	853	1.24	2.8

Table17: Summary of CAPWAP analysis results

Pile No.	P10-4	Permissible limits
Pile capacity	536.0 tons	1.5xDesign load
Skin friction	482.7 tons	-
End bearing	53.3 tons	-
Set per blow	1.24mm	3-4mm
Total displacement	4.8mm	-
Compressive stress	9.3N/mm2	0.85fck
Pile integrity (below sensor level)	ok	(80%-99% classified as minor defect)

Sub Structure Results of Old and New Bridges

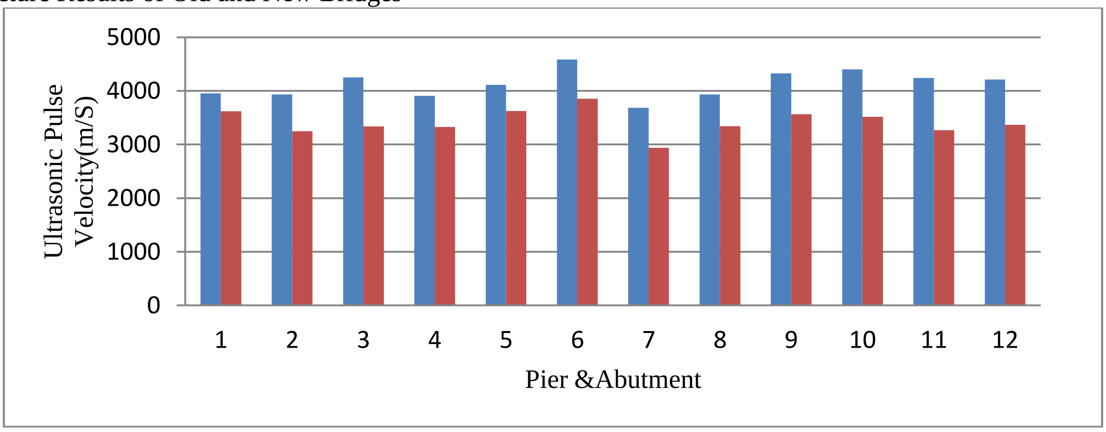


Chart1 -UPV results for old and new bridge

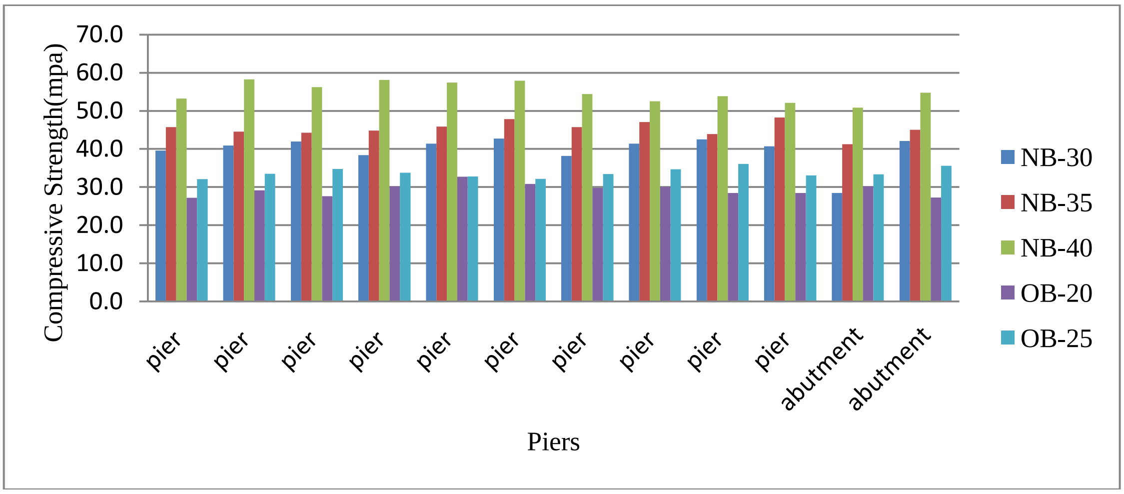


Chart2: Core cutter results for old and new bridge

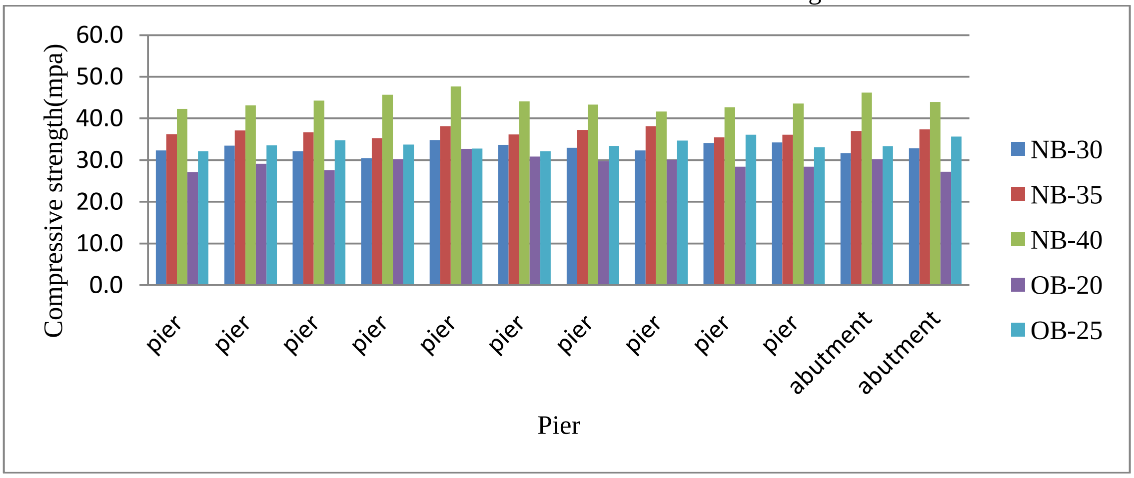


Chart3: Rebound hammer results for old and new bridge

Super Structure Results of Old and New Bridges

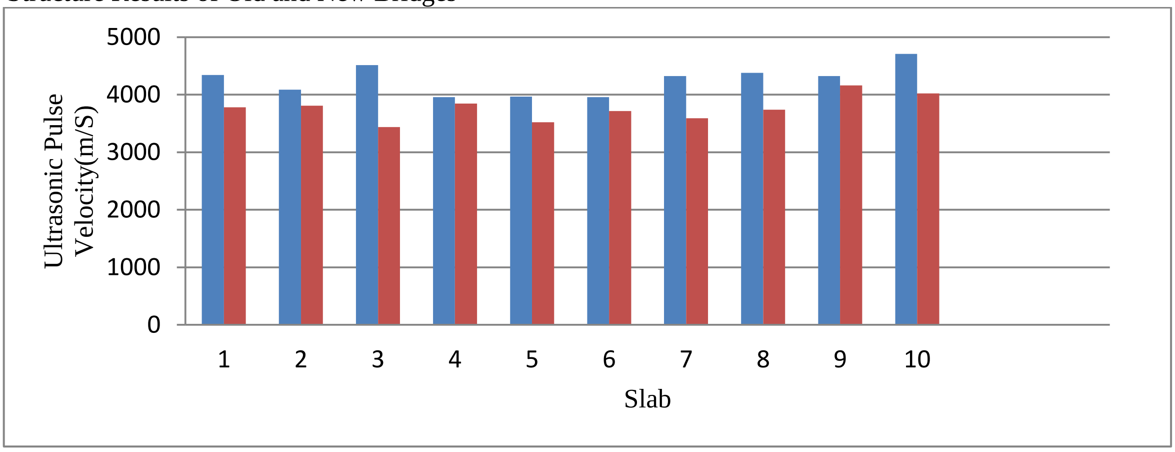


Chart4 - UPV results for old and new bridge

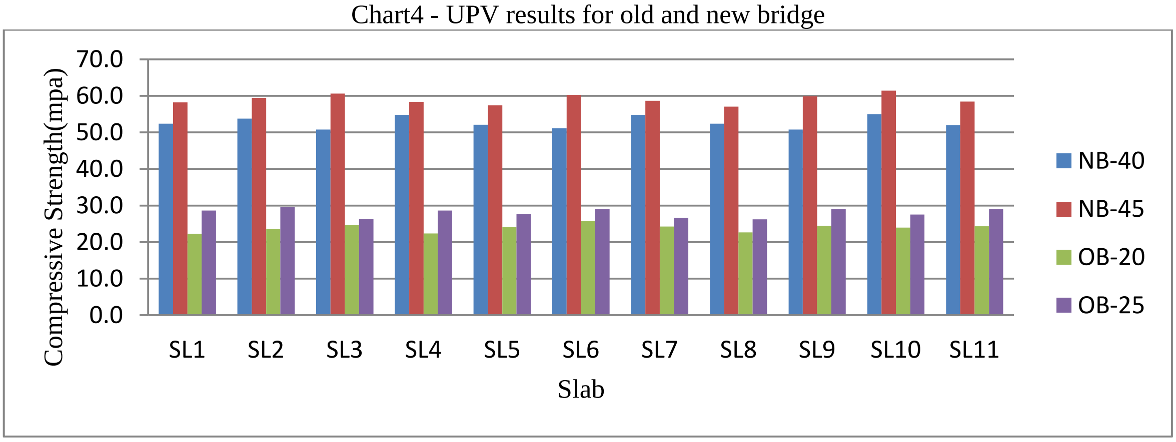


Chart5- Core cutter results for old and new bridge

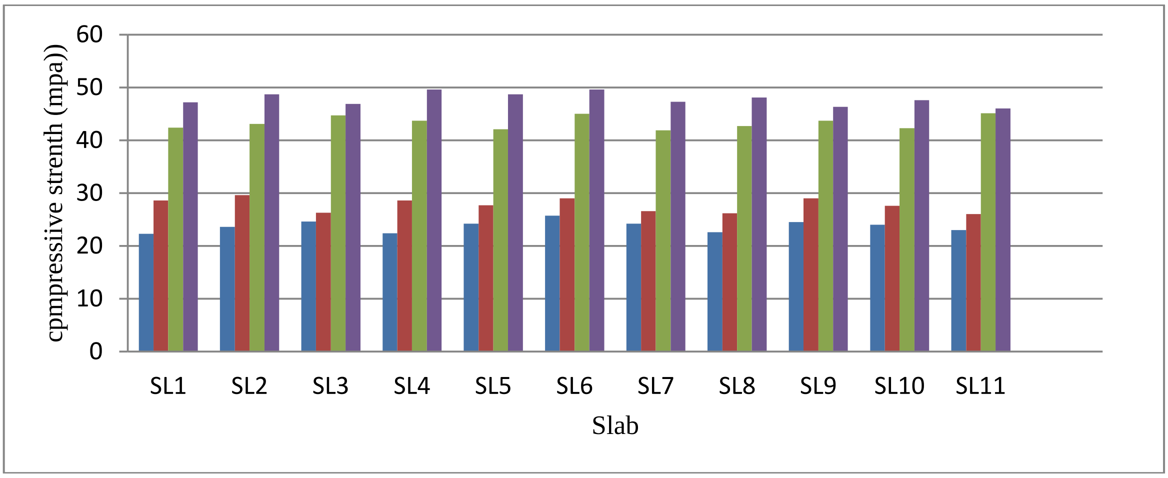


Chart6- Rebound hammer results for old and new bridge

Table18: UPV test for old and new Bridge sub structure

S.NO	New bridge sub structure Average pulse velocity	Old bridge sub structure Average pulse velocity	Remarks as per (IS:13311_1)	
			New bridge	Old bridge
1	3954	3621	GOOD	GOOD
2	3930	3245	GOOD	MEDIUM
3	4252	3337	GOOD	MEDIUM
4	3908	3326	GOOD	MEDIUM
5	4113	3623	GOOD	GOOD
6	4585	3854	EXCELLENT	GOOD
7	3682	2938	GOOD	MEDIUM
8	3931	3342	GOOD	MEDIUM
9	4325	3565	GOOD	GOOD
10	4397	3515	GOOD	GOOD
11	4240	3268	GOOD	MEDIUM
12	4210	3368	GOOD	MEDIUM

Table19 - UPV test for old and new Bridge super structure

S.NO	New bridge super structure Average pulse velocity	Old bridge super structure Average pulse velocity	Remarks as per (IS:13311_1)	
			New bridge	Old bridge
1	4341	3781	GOOD	GOOD
2	4085	3807	GOOD	GOOD
3	4515	3436	EXCELLENT	MEDIUM
4	3957	3847	GOOD	GOOD
5	3964	3518	GOOD	GOOD
6	3957	3717	GOOD	GOOD
7	4323	3589	GOOD	GOOD
8	4378	3736	GOOD	GOOD
9	4323	4158	GOOD	GOOD
10	4708	4023	EXCELLENT	GOOD

Table19 - UPV test for old and new Bridge super structure

S.NO	**New bridge super structure Average pulse velocity**	**Old bridge super structure Average pulse velocity**	**Remarks as per (IS:13311_1)**	
			New bridge	**Old bridge**
1	4341	3781	GOOD	GOOD
2	4085	3807	GOOD	GOOD
3	4515	3436	EXCELLENT	MEDIUM
4	3957	3847	GOOD	GOOD
5	3964	3518	GOOD	GOOD
6	3957	3717	GOOD	GOOD
7	4323	3589	GOOD	GOOD
8	4378	3736	GOOD	GOOD
9	4323	4158	GOOD	GOOD
10	4708	4023	EXCELLENT	GOOD

Table20: Profometer test for old and new Bridge sub structure

s.no	**New bridge**		**Old bridge**		**Remarks**	
	Depth of cover(mm)	**Diameter of bars(mm)**	**Depth of cover(mm)**	**Diameter of bars(mm)**	**New bridge**	**Old bridge**
1	52	32, 25	72	16, 10	Cover adequate	Cover adequate
2	47	32, 25	69	16, 10	Cover adequate	Cover adequate
3	43	32, 25	76	16, 10	Cover adequate	Cover adequate
4	44	32, 25	74	16, 10	Cover adequate	Cover adequate
5	50	32, 25	71	16, 10	Cover adequate	Cover adequate
6	52	32, 25	73	16, 10	Cover adequate	Cover adequate
7	48	32, 25	68	16, 10	Cover adequate	Cover adequate
8	45	32, 25	74	16, 10	Cover adequate	Cover adequate
9	50	32, 25	75	16, 10	Cover adequate	Cover adequate
10	53	32, 25	76	16, 10	Cover adequate	Cover adequate
11	43	32, 25	74	16, 10	Cover adequate	Cover adequate
12	47	32, 25	75	16, 10	Cover adequate	Cover adequate

Table21: Profometer test for old and new Bridge super structure

s.no	**New bridge**		**Old bridge**		**Remarks**	
	Depth of cover(mm)	**Diameter of bars(mm)**	**Depth of cover(mm)**	**Diameter of bars(mm)**	**New bridge**	**Old bridge**
1	53	32, 25	75	16, 10	Cover adequate	Cover adequate
2	49	32, 25	73	16, 10	Cover adequate	Cover adequate
3	50	32, 25	73	16, 10	Cover adequate	Cover adequate
4	51	32, 25	74	16, 10	Cover adequate	Cover adequate
5	55	32, 25	69	16, 10	Cover adequate	Cover adequate
6	52	32, 25	77	16, 10	Cover adequate	Cover adequate

7	50	32, 25	76	16, 10	Cover adequate	Cover adequate
8	49	32, 25	75	16, 10	Cover adequate	Cover adequate
9	48	32, 25	76	16, 10	Cover adequate	Cover adequate
10	51	32, 25	75	16, 10	Cover adequate	Cover adequate

Table22 - Rebound hammer test for old and new Bridge sub structure

S.No	**Old bridge**		**New bridge**			**Increase or decrease of concrete strength in percentage**				
	M20	**M25**	**M30**	**M35**	**M40**	**M20**	**M25**	**M30**	**M35**	**M40**
1	21.7	26.2	32.3	36.2	42.3	100%	100%	100%	100%	100%
2	22.1	27.5	33.5	37.1	43.1	100%	100%	100%	100%	100%
3	23.7	28.6	32.1	36.7	44.3	100%	100%	100%	100%	100%
4	24.3	26.9	30.5	35.3	45.7	100%	100%	100%	100%	100%
5	24.7	29.5	34.9	38.1	47.7	100%	100%	100%	100%	100%
6	22.6	27.5	33.6	36.2	44.1	100%	100%	100%	100%	100%
7	21.6	26.3	33.0	37.2	43.3	100%	100%	100%	100%	100%
8	23.6	27.9	32.4	38.2	41.6	100%	100%	100%	100%	100%
9	24.9	28.0	34.2	35.5	42.7	100%	100%	100%	100%	100%
10	21.7	26.2	34.3	36.1	43.6	100%	100%	100%	100%	100%
11	23.1	25.9	31.7	37.0	46.2	100%	100%	100%	100%	100%
12	25.0	29.5	32.8	37.4	43.9	100%	100%	100%	100%	100%

Table23: Rebound hammer test for old and new Bridge super structure

S.No	**Old bridge**		**New bridge**		**Increase or decrease of concrete strength in percentage**				
	M20	**M25**	**M40**	**M45**	**M20**	**M25**	**M30**	**M35**	**M40**
1	22.3	28.6	42.4	47.2	100%	100%	100%	100%	100%
2	23.6	29.6	43.1	48.7	100%	100%	100%	100%	100%
3	24.6	26.3	44.7	46.9	100%	100%	100%	100%	100%
4	22.4	28.6	43.7	49.6	100%	100%	100%	100%	100%
5	24.2	27.7	42.1	48.7	100%	100%	100%	100%	100%
6	25.7	29.0	45.0	49.6	100%	100%	100%	100%	100%
7	24.2	26.6	41.9	47.3	100%	100%	100%	100%	100%
8	22.6	26.2	42.7	48.1	100%	100%	100%	100%	100%
9	24.5	29.0	43.7	46.3	100%	100%	100%	100%	100%
10	24.0	27.6	42.3	47.6	100%	100%	100%	100%	100%
11	23	26	45.1	46.0	100%	100%	100%	100%	100%

Table24: Core cutter test for old and new Bridge sub structure

S.No	**Old bridge**		**New bridge**			**Increase or decrease of concrete strength in percentage**				
	M20	**M25**	**M30**	**M35**	**M40**	**M20**	**M25**	**M30**	**M35**	**M40**
1	27.2	32.1	39.6	45.8	53.2	100%	100%	100%	100%	100%
2	29.1	33.5	40.9	44.6	58.3	100%	100%	100%	100%	100%
3	27.6	34.7	41.9	44.3	56.2	100%	100%	100%	100%	100%
4	30.2	33.7	38.4	44.9	58.1	100%	100%	100%	100%	100%
5	32.7	32.8	41.4	45.9	57.4	100%	100%	100%	100%	100%
6	30.9	32.2	42.7	47.8	57.9	100%	100%	100%	100%	100%
7	29.8	33.4	38.2	45.8	54.4	100%	100%	100%	100%	100%
8	30.1	34.7	41.4	47.1	52.5	100%	100%	100%	100%	100%
9	28.4	36.1	42.5	43.9	53.8	100%	100%	100%	100%	100%
10	28.4	33.1	40.7	48.2	52.1	100%	100%	100%	100%	100%
11	30.2	33.3	28.4	41.3	50.9	100%	100%	100%	100%	100%

Table25 - Core cutter test for old and new Bridge super structure

S.No	Old bridge		New bridge		Increase or decrease of concrete strength in percentage				
	M20	M25	M40	M45	M20	M25	M30	M35	M40
1	27.5	34.3	52.3	58.2	100%	100%	100%	100%	100%
2	30.2	31.6	53.7	59.5	100%	100%	100%	100%	100%
3	27.9	33.3	50.7	60.6	100%	100%	100%	100%	100%
4	26.6	36.2	54.8	58.4	100%	100%	100%	100%	100%
5	30.2	35.0	52.1	57.4	100%	100%	100%	100%	100%
6	29.5	32.7	51.1	60.2	100%	100%	100%	100%	100%
7	29.7	33.4	54.8	58.7	100%	100%	100%	100%	100%
8	31.2	35.1	52.4	57.0	100%	100%	100%	100%	100%
9	30.3	35.8	50.8	59.9	100%	100%	100%	100%	100%
10	31.5	34.0	55.0	61.4	100%	100%	100%	100%	100%
11	27	32	52.0	58.4	100%	100%	100%	100%	100%

VII. DISCUSSIONS & CONCLUSIONS

1. The settlement of new bridge two test piles is 9.85mm, 9.34mm these two settlements are below the acceptance criteria .so the vertical load test is satisfied as per code.
2. The displacement of new bridge pile is 10.5mm, 4.5mm, the value 4.5mm are below the acceptance criteria, but the 10.50mm is above acceptance criteria so the designer should be redesign.
3. By using high strain dynamic testing new bridge piles settlement are 2.8mm, 2.00mm which is satisfied the acceptance criteria as per code.
4. By using pile integrity test on new bridge pile, the piles are fairly uniform piles.
5. The compressive strength of concrete of old bridge sub and super structure concrete not affected as after construction the bridge is nearly 36 years is confirmed by using core cutter test.
6. The compressive strength of concrete of new bridge sub and super structure is achieved full percentage as after constructed the bridge nearly 01 year is confirmed by using core cutter test.
7. The quality of concrete like existence of voids, occurring cracks, observing of honey combs is not present in old bridge substructure and super structure after constructed of 36 years is confirmed by using ultrasonic pulse velocity test.
8. The quality of concrete like existence of voids, occurring of cracks, observed of honey combs is not presented in new bridge substructure by using ultrasonic pulse velocity test, super structure after construction of 01 year by using ultrasonic pulse velocity test.
9. The compressive strength of concrete of old bridge sub structure and super structure is not effected as after constructed the bridge 36 years ago, is confirmed by using rebound hammer test.
10. The compressive strength of concrete of new bridge sub structure and super structure is achieved full percent as after constructed the bridge nearly one year, is confirmed by using rebound hammer test.
11. By using profometer test on old bridge the usage of steel bar is 16mm, 10mm dia and spacing of 200mm and there clear cover is 75mm, these bars are not affected.
12. By using profometer test on new bridge the usage of steel bar is 32mm, 25mm and spacing is 150mm and 120mm and there clear cover is 50mm, these bars are not affected.
13. By using load and NDT tests on new bridge and old bridge. The quality of concrete is good as per my observation of study. The old bridge is constructed 36 years ago but the quality of concrete is not affected. The bridge is used to passage of passenger vehicles, transporting vehicles where as the concrete strength will be satisfied.

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