

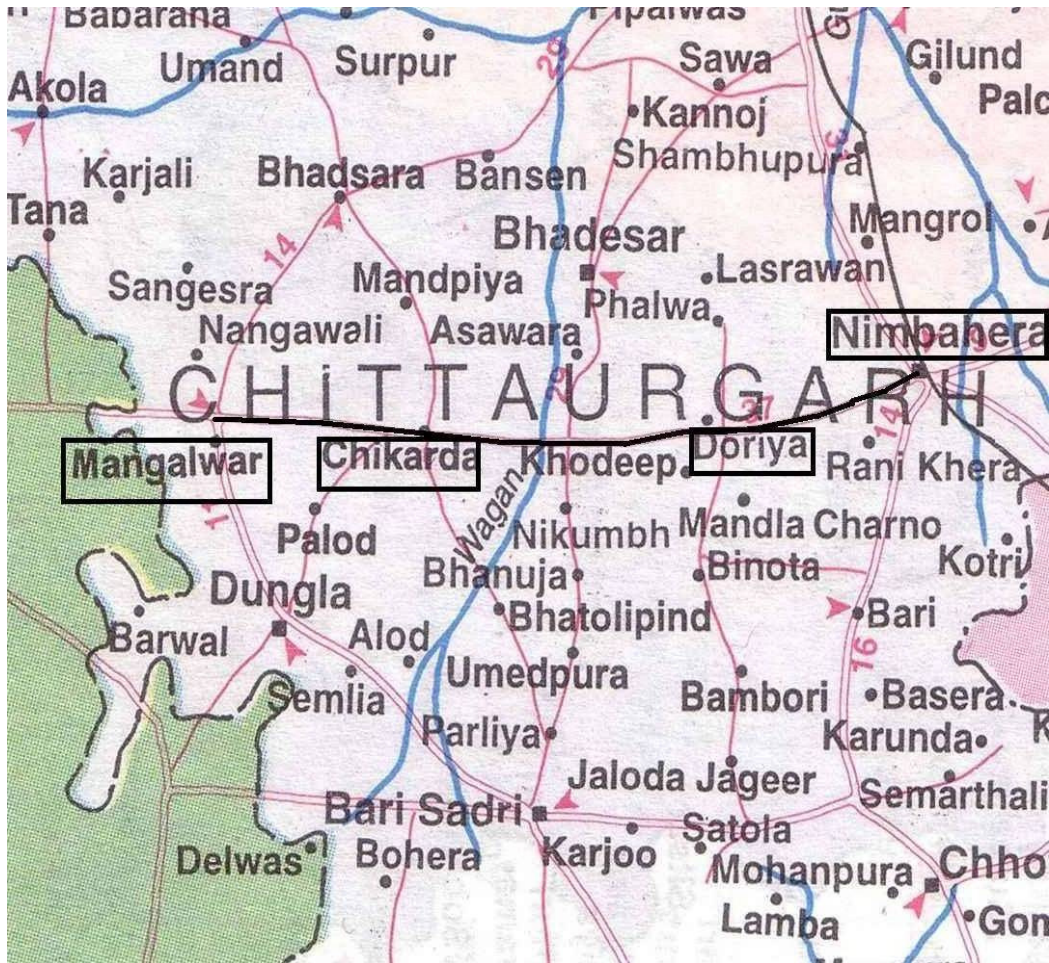
Government of Rajasthan
Rajasthan State Road Development Corporation



Draft Detailed Project Report Under
(BOT) Annuity Project

for

Strengthening and widening Mangalwar - Nimbahera at MDR-11A
km 0/000 to 40/000



Estimated Cost :- Rs. 87.39 Crores

Construction Period : 1 Year 6 Months

Concession Period : 20 Years 0 Months 0 Days

Submitted to :-
RSRDCC Ltd.
Unit, Udaipur.

VOLUME - III
MATERIAL, FIELD & LABORATORY DATA

Consultant :-

 <p>Meridian Constructions</p> <p>Space for Planning & Creativity</p> <p>Off: B-38, Jawahar Colony, near Satnam Honda Showroom, Tonk Road, Jaipur, Raj. - 18. Ph.: 0141-3280725 Mob.: 93145 06054, 94143 87954, 98875 54401. Fax No. 0141- 2703149 e-mail: mohit@meridianengg.com</p>	 <p>Services: Architectural, Structural, Interior, Valuation, Highways, Railway, Survey, Project Management, Testing, Real Estate, Construction</p>
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Traffic Census Data

OD Survey (~ 10%)

Material Field & Laboratory Data

Investigations

1. CBR & Soil Gradation Analysis Report
2. Benkelman Beam Deflection Results

CBR Test Report

of
Mangalwar - Nimbahera, MDR-11A
from km 0/000 to 40/000 at

Submitted To:

RSRDCC Unit, Udaipur

Submitted By :

Meridian Constructions

(Space for planning and creativity)

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SOIL INVESTIGATION REPORT

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CBR TEST RESULTS

Mangalwar - Nimbahera, MDR-11A

from km 0/000

to 40/000 at

1. INTRODUCTION

California bearing Ratio (CBR) test is a type of test developed by the California Division of Highways in 1929. The test is used for evaluating the suitability of subgrade and the materials used in sub-base and base courses. The test results have been correlated with the thickness of the various materials required for flexible pavements.

It is therefore necessary to have sufficient information about the arrangement & behaviour of the underlying materials and their physical properties, for adopting and designing of flexible pavement. Soil exploration through field investigation and relevant laboratory testing of the soil are essential to arrive at required parameters for designing of pavement.

1.1 LOCATION AND CHARACTERISCS OF THE SITE

The Road site is at SH-61 km 2/00 to 122/00 for BOT (Annuity) Project for RSRDCC Ltd., Jaipur.

1.2 SCOPE OF WORK

Field investigations at the site were planned to determine the CBR of the underlying soil, for design the flexible pavement for construction of new road. The data obtained from these investigations have been analyzed to arrive at the required parameters for design.

2. FIELD INVESTIGATIONS

The subsurface investigations in the field involve three basic operations:-

- Core of a underlying soil sample
- Collection of soil.

3.0 CALIFORNIA BEARING RATIO TEST

The test may be conducted on a prepared specimen in a mould or on the soil in-situ condition. The test consists of causing the plunger to penetrate the specimen at the rate of 1.25 mm per minute. The loads required for a penetration of 2.5 mm and 5.0 mm are recorded by a proving ring attached to the plunger. The load is expressed as a percentage of the standard load at the respective deformation level, and is known as the CBR value. Standard load values are for crushed stone and are given in Table.

The CBR value is determined corresponding to both 2.5 mm and 5.0 mm penetration, and the greater value is used for the design of flexible pavement. The load-penetration curve is drawn. The load corresponding to 2.5 mm and 5.0 mm penetration values are taken from the plot curve and the value of CBR determined using

Standard Load Values :-

S. No.	Penetration (mm)	Standard Load (kN)
1	2.5	13.44
2	5.0	20.16
3	7.5	25.80
4	10.0	31.20
5	12.5	35.32

The load-penetration curve is drawn. The load corresponding to 2.5 mm and 5.0 mm penetration values are taken from the plot curve, and the value of CBR determined using Equation :-

$$\text{CBR value} = \frac{\text{Penetration load X 100}}{\text{Standard load}}$$

To simulate worst conditions in the field, the soil specimen is kept submerged in water for about 4 days before testing. If the test is to be conducted on an un soaked specimen, the moulding water content should be equal to the equilibrium water content which the soil is likely to attain after the construction of the pavement. To simulate the effect of overlying materials, the specimen is covered with surcharge mass in the test.

4.0 EQUIPMENTS

- 1 CBR mould, inside diameter = 150 mm, total height = 175 mm, with detachable extension collar, 50 mm high, and detachable base plate, 10 mm thick.
- 2 Spacer disc, 148 mm diameter, 47.7 mm high.
- 3 Rammers, light compaction, 2.6 kg, drop 310 mm; heavy compaction, 4.89 kg, drop 450 mm.
- 4 Slotted masses, annular, 2.5 kg each, 147 mm diameter, with a hole of 53 mm diameter in the centre.
- 5 Cutting collar, steel, which can fit flush with the mould both outside and inside.
- 6 Expansion measuring apparatus, consisting of a perforated plate, 148 mm diameter, with a thread screw in the centre and an adjustable contact head to be screwed over the stem, and a metal tripod.
- 7 Penetration piston, 50 mm diameter, 100 mm long.
- 8 Loading device, capacity 50 kN, equipped with a movable head (or base) at a uniform rate of 1.25 mm/minute.
- 9 Two dial gauges, accuracy 0.01 mm.
- 10 IS sieves, 4.75 mm and 20 mm size.

5.0 PROCEDURE

- 1 Sieve the sample through 20 mm IS sieve. Take the material passing 20 mm IS sieve for the test. However, make allowance for large size material by replacing plus 20 mm size material by an equal amount of material which passes 20 mm IS sieve, but is retained on 4.75 mm IS sieve.
- 2 Shake about 4.5 to 5.5 kg of the material, as obtained in step (1). Mix it thoroughly with the required quantity of water.

If the sample is to be compacted at optimum water content and the corresponding dry density, as found by compaction test (light compaction or heavy compaction), take exact quantity of water and the soil to make sure that the water content is equal to the optimum water content.
- 3 Fix the extension collar to the top of the mould. Also fix the base plate to the

- 4 Insert the spacer disc over the base, with the central hole of the disc at the lower face. Place coarse filter paper disc on the top of the displacer disc.
- 5 Take the soil sample in the mould. Compact it using either the light compaction rammer or the heavy compaction rammer, as desired. For light compaction, the soil is to be compacted in 3 equal layers, each layer is given 56 blows by 2.6 kg rammer with drop of 310 mm. For heavy compaction, the soil is compacted in 5 equal layers, each layer is given 56 blows by 4.89 kg rammer with drop of 450 mm.
- 6 Remove the extension collar. Trim even the excess compacted soil carefully with a straight edge with the top of the mould. Any hole that may form on the surface of the compacted soil by the removal of the coarse particles should be patched with small size particles and leveled.
- 7 Loosen the base plate. Remove the base plate and the spacer disc.
- 8 Weigh the mould with the compacted soil.-
- 9 Place a filter paper disc on the base plate. Invert the mould with the compacted
- 10 Place annular masses to produce a surcharge equal to the mass of the base material
- 11 Immerse the mould assembly in a tank full of water. Allow free access of water to
- 12 Mount the tripod of the expansion measuring device on the edge of the mould, and
- 13 Keep the mould in the tank undisturbed for 96 hours. Take the readings of the dial gauge every 24 hours, and note the time of reading.
- 14 Maintain water level constant in the tank. Take the final reading at the end of 96
- 15 Remove the tripod. Take out the mould from the tank. Allow the specimen to drain off for 15 minutes. Remove all the free water on the mould, without disturbing the surface of the specimen.
- 16 Weigh the mould with the soaked specimen.
- 17 Place the mould containing the specimen, with the base plate in position but the top face exposed, on the lower plate of the loading machine. Place the required surcharge masses on the top of the soaked specimen.
- 18 Set the load dial gauge and the displacement dial gauge to zero. The initial load already applied to the plunger should be considered as zero.
- 19 Apply the load on the plunger. Keep the rate of penetration as 1.25 mm/minute.
- 20 At the end of the test, raise the plunger, and remove the mould from the loading machine.

Summary of CBR

S. No.	Chainage	Liquid Limit	Plasticity Index	CBR
1	3000	32.14	7.99	4.29
2	8000	32.33	10.99	3.85
3	13000	34.29	11.35	3.47
4	18000	31.54	10.05	4.33
5	23000	30.37	10.27	3.97
6	28000	33.08	11.04	3.46
7	33000	35.67	11.39	4.31
8	38000	34.24	11.91	4.37
17	CB-1	34.29	11.25	4.41
18	MB-2	32.61	12.32	4.26
19	DB-3	33.08	11.99	3.95

Sieve Analysis & CBR

Soil Type:- **Silty Sand**

For Chainage:- **3/000**

Total mass of Dry Soil:- **300 Gm**

Seive Size	Retained mass of soil	% of Retained	Cum. % Retained	% Finer	Remarks	
10.00mm	0	0.00	0.00	100.00	0.00	Gravels
4.75mm	0	0.00	0.00	100.00		
2.36mm	0	0.00	0.00	100.00	0.00	Coarse Sand
1.18mm	0	0.00	0.00	100.00		
1.00mm	0	0.00	0.00	100.00		
600μ	0	0.00	0.00	100.00	0.00	Medium Sand
425μ	0	0.00	0.00	100.00		
300μ	0	0.00	0.00	100.00		
180μ	20	6.67	6.67	93.33		
150μ	21	7.00	13.67	86.33		
90μ	81	27.00	40.67	59.33	40.67	Fine Sand
75μ	97	32.33	73.00	27.00		
Pan	81	27.00	100.00	0.00	59.33	Clay & Silt
	300	100.00			100.00	

Liquid Limit :- 32.14

Plastic Limit :- 24.15

CBR Value:- 4.29

Sieve Analysis & CBR

Soil Type:- Silty Claysh Sand

For Kilometer:- 8/000

Total mass of Dry Soil:- 300 Gm

Seive Size	Retained mass of soil	% of Retained	Cum. % Retained	% Finer	Remarks	
10.00mm	0	0.00	0.00	100.00	0.00	Gravels
4.75mm	0	0.00	0.00	100.00		
2.36mm	0	0.00	0.00	100.00	0.00	Coarse Sand
1.18mm	0	0.00	0.00	100.00		
1.00mm	0	0.00	0.00	100.00		
600μ	0	0.00	0.00	100.00	0.00	Medium Sand
425μ	0	0.00	0.00	100.00		
300μ	0	0.00	0.00	100.00		
180μ	28	9.33	9.33	90.67		
150μ	38	12.67	22.00	78.00		
90μ	43	14.33	36.33	63.67	36.33	Fine Sand
75μ	81	27.00	63.33	36.67		
Pan	110	36.67	100.00	0.00	63.67	Clay & Silt
	300	100.00			100.00	

Liquid Limit :- 32.33

Plastic Limit :- 21.34

CBR Value:- 3.85

Sieve Analysis & CBR						
Soil Type:- Silty Claysh Sand (taken for						
For Kilometer:- 13/000						
Total mass of Dry Soil:- 300 Gm						
Seive Size	Retained mass of soil	% of Retained	Cum. % Retained	% Finer	Remarks	
10.00mm	0	0.00	0.00	100.00	0.00	Gravels
4.75mm	0	0.00	0.00	100.00		
2.36mm	0	0.00	0.00	100.00	0.00	Coarse Sand
1.18mm	0	0.00	0.00	100.00		
1.00mm	0	0.00	0.00	100.00		
600μ	0	0.00	0.00	100.00	0.00	Medium Sand
425μ	0	0.00	0.00	100.00		
300μ	0	0.00	0.00	100.00		
180μ	37	12.33	12.33	87.67		
150μ	21	7.00	19.33	80.67		
90μ	40	13.33	32.67	67.33	32.67	Fine Sand
75μ	94	31.33	64.00	36.00		
Pan	108	36.00	100.00	0.00	67.33	Clay & Silt
	300	100.00			100.00	

Liquid Limit :- 34.29

Plastic Limit :- 22.94

CBR Value:- 3.47

Sieve Analysis & CBR

Soil Type:- Silty Sand

For Kilometer:- 18/000

Total mass of Dry Soil:- 300 Gm

Seive Size	Retained mass of soil	% of Retained	Cum. % Retained	% Finer	Remarks	
10.00mm	0	0.00	0.00	100.00	0.00	Gravels
4.75mm	0	0.00	0.00	100.00		
2.36mm	0	0.00	0.00	100.00	0.00	Coarse Sand
1.18mm	0	0.00	0.00	100.00		
1.00mm	0	0.00	0.00	100.00		
600μ	0	0.00	0.00	100.00	0.00	Medium Sand
425μ	0	0.00	0.00	100.00		
300μ	0	0.00	0.00	100.00		
180μ	36	12.00	12.00	88.00		
150μ	25	8.33	20.33	79.67		
90μ	34	11.33	31.67	68.33	31.67	Fine Sand
75μ	89	29.67	61.33	38.67		
Pan	116	38.67	100.00	0.00	68.33	Clay & Silt
	300	100.00			100.00	

Liquid Limit :- 31.54

Plastic Limit :- 21.49

CBR Value:- 4.33

Sieve Analysis & CBR

Soil Type:- Silty Sand

For Kilometer:- 23/000

Total mass of Dry Soil:- 300 Gm

Seive Size	Retained mass of soil	% of Retained	Cum. % Retained	% Finer	Remarks	
10.00mm	0	0.00	0.00	100.00	0.00	Gravels
4.75mm	0	0.00	0.00	100.00		
2.36mm	0	0.00	0.00	100.00	0.00	Coarse Sand
1.18mm	0	0.00	0.00	100.00		
1.00mm	0	0.00	0.00	100.00		
600μ	0	0.00	0.00	100.00	0.00	Medium Sand
425μ	0	0.00	0.00	100.00		
300μ	6	2.00	2.00	98.00		
180μ	10	3.33	5.33	94.67		
150μ	14	4.67	10.00	90.00		
90μ	66	22.00	32.00	68.00	32.00	Fine Sand
75μ	97	32.33	64.33	35.67		
Pan	107	35.67	100.00	0.00	68.00	Clay & Silt
	300	100.00			100.00	

Liquid Limit :- 30.37

Plastic Limit :- 20.10

CBR Value:- 3.97

Sieve Analysis & CBR

Soil Type:- Silty Sand

For Kilometer:- 30/000

Total mass of Dry Soil:- 300 Gm

Seive Size	Retained mass of soil	% of Retained	Cum. % Retained	% Finer	Remarks	
10.00mm	0	0.00	0.00	100.00	0.00	Gravels
4.75mm	0	0.00	0.00	100.00		
2.36mm	0	0.00	0.00	100.00	0.00	Coarse Sand
1.18mm	0	0.00	0.00	100.00		
1.00mm	0	0.00	0.00	100.00		
600μ	0	0.00	0.00	100.00	0.00	Medium Sand
425μ	0	0.00	0.00	100.00		
300μ	0	0.00	0.00	100.00		
180μ	21	7.00	7.00	93.00		
150μ	27	9.00	16.00	84.00		
90μ	24	8.00	24.00	76.00	24.00	Fine Sand
75μ	109	36.33	60.33	39.67		
Pan	119	39.67	100.00	0.00	76.00	Clay & Silt
	300	100.00			100.00	

Liquid Limit :- 33.08

Plastic Limit :- 22.04

CBR Value:- 3.46

Sieve Analysis & CBR

Soil Type:- Silty Clay

For Kilometer:- 33/000

Total mass of Dry Soil:- 300 Gm

Seive Size	Retained mass of soil	% of Retained	Cum. % Retained	% Finer	Remarks	
10.00mm	0	0.00	0.00	100.00	0.00	Gravels
4.75mm	0	0.00	0.00	100.00		
2.36mm	0	0.00	0.00	100.00	0.00	Coarse Sand
1.18mm	0	0.00	0.00	100.00		
1.00mm	0	0.00	0.00	100.00		
600μ	0	0.00	0.00	100.00	0.00	Medium Sand
425μ	0	0.00	0.00	100.00		
300μ	0	0.00	0.00	100.00		
180μ	29	9.67	9.67	90.33		
150μ	33	11.00	20.67	79.33		
90μ	34	11.33	32.00	68.00	32.00	Fine Sand
75μ	107	35.67	67.67	32.33		
Pan	97	32.33	100.00	0.00	68.00	Clay & Silt
	300	100.00			100.00	

Liquid Limit :- 35.67

Plastic Limit :- 24.28

CBR Value:- 4.31

Sieve Analysis & CBR

Soil Type:- Silty Clay

For Kilometer:- 38/000

Total mass of Dry Soil:- 300 Gm

Seive Size	Retained mass of soil	% of Retained	Cum. % Retained	% Finer	Remarks	
10.00mm	0	0.00	0.00	100.00	0.00	Gravels
4.75mm	0	0.00	0.00	100.00		
2.36mm	0	0.00	0.00	100.00	0.00	Coarse Sand
1.18mm	0	0.00	0.00	100.00		
1.00mm	0	0.00	0.00	100.00		
600μ	0	0.00	0.00	100.00	0.00	Medium Sand
425μ	0	0.00	0.00	100.00		
300μ	2	0.67	0.67	99.33		
180μ	29	9.67	10.33	89.67		
150μ	31	10.33	20.67	79.33		
90μ	29	9.67	30.33	69.67	30.33	Fine Sand
75μ	88	29.33	59.67	40.33		
Pan	121	40.33	100.00	0.00	69.67	Clay & Silt
	300	100.00			100.00	

Liquid Limit :- 34.24

Plastic Limit :- 22.33

CBR Value:- 4.37

Sieve Analysis & CBR

Soil Type:- Silty Clay

For Kilometer:- Chikadra By Pass - CB-1

Total mass of Dry Soil:- 300 Gm

Seive Size	Retained mass of soil	% of Retained	Cum. % Retained	% Finer	Remarks	
10.00mm	0	0.00	0.00	100.00	0.00	Gravels
4.75mm	0	0.00	0.00	100.00		
2.36mm	0	0.00	0.00	100.00	0.00	Coarse Sand
1.18mm	0	0.00	0.00	100.00		
1.00mm	0	0.00	0.00	100.00		
600μ	0	0.00	0.00	100.00	0.00	Medium Sand
425μ	0	0.00	0.00	100.00		
300μ	0	0.00	0.00	100.00		
180μ	30	10.00	10.00	90.00		
150μ	31	10.33	20.33	79.67		
90μ	23	7.67	28.00	72.00	28.00	Fine Sand
75μ	94	31.33	59.33	40.67		
Pan	122	40.67	100.00	0.00	72.00	Clay & Silt
	300	100.00			100.00	

Liquid Limit :- 34.29

Plastic Limit :- 23.04

CBR Value:- 4.41

Sieve Analysis & CBR

Soil Type:- Silty Clay

For Kilometer:- Minana By Pass - MB-2

Total mass of Dry Soil:- 300 Gm

Seive Size	Retained mass of soil	% of Retained	Cum. % Retained	% Finer	Remarks	
10.00mm	0	0.00	0.00	100.00	0.00	Gravels
4.75mm	0	0.00	0.00	100.00		
2.36mm	0	0.00	0.00	100.00	0.00	Coarse Sand
1.18mm	0	0.00	0.00	100.00		
1.00mm	0	0.00	0.00	100.00		
600μ	0	0.00	0.00	100.00	0.00	Medium Sand
425μ	0	0.00	0.00	100.00		
300μ	0	0.00	0.00	100.00		
180μ	21	6.95	6.95	93.05		
150μ	22	7.28	14.24	85.76		
90μ	46	15.23	29.47	70.53	29.47	Fine Sand
75μ	101	33.44	62.91	37.09		
Pan	112	37.09	100.00	0.00	70.53	Clay & Silt
	302	100.00			100.00	

Liquid Limit :- 32.61

Plastic Limit :- 20.29

CBR Value:- 4.26

Sieve Analysis & CBR

Soil Type:- Silty Clay

For Kilometer:- Dhoria By Pass - 3

Total mass of Dry Soil:- 300 Gm

Seive Size	Retained mass of soil	% of Retained	Cum. % Retained	% Finer	Remarks	
10.00mm	0	0.00	0.00	100.00	0.00	Gravels
4.75mm	0	0.00	0.00	100.00		
2.36mm	0	0.00	0.00	100.00	0.00	Coarse Sand
1.18mm	0	0.00	0.00	100.00		
1.00mm	0	0.00	0.00	100.00		
600μ	0	0.00	0.00	100.00	0.00	Medium Sand
425μ	0	0.00	0.00	100.00		
300μ	0	0.00	0.00	100.00		
180μ	21	7.00	7.00	93.00		
150μ	31	10.33	17.33	82.67		
90μ	38	12.67	30.00	70.00	30.00	Fine Sand
75μ	89	29.67	59.67	40.33		
Pan	121	40.33	100.00	0.00	70.00	Clay & Silt
	300	100.00			100.00	

Liquid Limit :- 33.08

Plastic Limit :-21.09

CBR Value:- 3.95

Investigations

Benkelman Beam Deflection Results

TEST RESULT FOR DEFLECTION TEST BY BENKELMAN BEAM

- Name of Work :-** Improvement of Mangalwar - Nimbaheda Road km
0/00 to 40/000 (MDR-11A) under BOT Annuity
Scheme (Mangalwar - Nimbaheda)
- 1
- 2 Stretch : Km 0/000 to 40/000
- 3 No. of traffic lanes : Two lanes
- 4 Climatic Conditions : Summer
- 5 Date & Time of Observation : 04/07/2010 Morning & Evening

S. No.	Location of Test (in km)	Mean Deflection (mm)	Standard Deviation (mm)	Characteristic Deflection (mm)
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
1	2.000	0.780	0.093	0.97
2	6.000	0.920	0.127	1.17
3	11.000	0.810	0.053	0.92
4	16.000	1.200	0.102	1.40
5	21.000	0.820	0.049	0.92
6	26.000	0.670	0.047	0.76
7	31.000	0.570	0.057	0.68
8	36.000	0.810	0.058	0.93
Characteristic Mean Deflection =				0.97



Meridian
Constructions Space for Planning & Creativity

Site Name : MDR - 11A, Mangalwar to Nimbahera

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Agency : BSRDC

Services:

Architectural, Structural, Interior, Valuation,
 Highways, Railway, Survey, Project Management,
 Testing, Real Estate, Construction



Temp. Range - 25° - 35°

Date : 04-07-10

Km. 2L

BANKELMAN BEAM DEFLECTION

S. No.	At Km	Readings				Final Delection (X)	(X-X̄)²	
		Initial		Final				
	Point	Small Dial	Large Dial	Small Dial	Large Dial	Difference		
1	1	23	85	23	35	0.50	1.00	0.05
	2	18	30	18	5	0.25	0.50	0.08
	3	0	25	0	5	0.20	0.40	0.14
	4	0	85	0	15	0.70	1.40	0.38
	5	24	20	23	85	0.35	0.70	0.01
	6	2	65	2	25	0.40	0.80	0.00
	7	1	35	1	5	0.30	0.60	0.03
	8	4	15	3	75	0.40	0.80	0.00
	9	16	80	16	40	0.40	0.80	0.00
	10	23	35	22	95	0.40	0.80	0.00
Mean Deflection (x̄)						0.78	0.70	

Standard Deviation (o) 0.09

Characteristic Deflection (Dc) 0.97

For Meridian Constructions

For Client



Meridian
Constructions Space for Planning & Creativity

Off.: B-38, Jawahar Colony, Near Satnam Honda Showroom, Tonk Road, Jaipur Raj. - 18.
Ph.: 0141-3207725 Mobile.: 93145 06054, 94143 87954 • Fax No. 0141-2703149
e-mail: mo@meridianengg.com

Site Name : MDR - 11A, Mangalwar to Nimbanera

Agency : RSRDC



Services:

Architectural, Structural, Interior, Valuation,
Highways, Railway, Survey, Project Management,
Testing, Real Estate, Construction

Temp. Range - 25° - 35 °
Km. 6R

Date : 04-07-10

BANKELMAN BEAM DEFLECTION

S. No.	At Km	Readings				Final Delection (X)	(X-X-)2	
		Initial		Fianl				
	Point	Small Dial	Large Dial	Small Dial	Large Dial	Difference		
2	1	24	35	23	85	0.50	1.00	0.01
	2	4	10	3	80	0.30	0.60	0.10
	3	1	15	0	85	0.30	0.60	0.10
	4	4	95	4	2	0.93	1.86	0.88
	5	6	15	5	75	0.40	0.80	0.01
	6	21	55	21	5	0.50	1.00	0.01
	7	24	32	23	90	0.42	0.84	0.01
	8	5	40	5	15	0.25	0.50	0.18
	9	24	55	24	5	0.50	1.00	0.01
	10	1	70	1	20	0.50	1.00	0.01
Mean Deflection (\bar{x})						0.92	1.31	

Standard Deviation (o) 0.13
Characteristic Deflection (Dc) 1.17

For Meridian Constructions

For Client



Meridian
Constructions Space for Planning & Creativity

Off.: B-38, Jawahar Colony, Near Satnam Honda Showroom, Tonk Road, Jaipur Raj. - 18.
Ph: 0141-320725 Mobile: 93145 06054, 94143 87954 • Fax No. 0141-2703149
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Site Name : MDR - 11A, Mangalwar to Nimbanera

Agency : RSRDC



Services:

Architectural, Structural, Interior, Valuation,
Highways, Railway, Survey, Project Management,
Testing, Real Estate, Construction

Temp. Range - 25° - 35 °
Km. 11.00 L

Date : 04-07-10

BANKELMAN BEAM DEFLECTION

S. No.	At Km	Readings				Final Delection (X)	(X-X̄)²	
		Initial		Fianl				
	Point	Small Dial	Large Dial	Small Dial	Large Dial	Difference		
3	1	24	55	24	10	0.45	0.90	0.01
	2	4	50	4	20	0.30	0.60	0.04
	3	0	45	0	15	0.30	0.60	0.04
	4	19	55	19	15	0.40	0.80	0.00
	5	0	80	0	30	0.50	1.00	0.04
	6	1	15	0	80	0.35	0.70	0.01
	7	4	85	4	35	0.50	1.00	0.04
	8	25	15	24	80	0.35	0.70	0.01
	9	2	45	2	5	0.40	0.80	0.00
	10	1	60	1	10	0.50	1.00	0.04
						Mean Deflection (x̄)	0.81	0.23

Standard Deviation (o) 0.05
Characteristic Deflection (Dc) 0.92

For Meridian Constructions

For Client



Meridian
Constructions Space for Planning & Creativity

Off.: B-38, Jawahar Colony, Near Satnam Honda Showroom, Tonk Road, Jaipur Raj. - 18.
 Ph: 0141-320725 Mobile: 93145 06054 94143 87954 • Fax No. 0141-2703449
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Site Name : MDR - 11A, Mangalwar to Nimbanera

Agency : RSRDC



Services:

Architectural, Structural, Interior, Valuation,
 Highways, Railway, Survey, Project Management,
 Testing, Real Estate, Construction

Temp. Range - 25° - 35 °
 Km. 16.00 R

Date : 04-07-10

BANKELMAN BEAM DEFLECTION

S. No.	At Km	Readings				Final Delection (X)	(X-X) ²	
		Initial		Fianl				
	Point	Small Dial	Large Dial	Small Dial	Large Dial	Difference		
4	1	19	50	19	0	0.50	1.00	0.04
	2	2	20	1	80	0.40	0.80	0.16
	3	11	90	11	10	0.80	1.60	0.16
	4	2	40	1	95	0.45	0.90	0.09
	5	16	70	16	0	0.70	1.40	0.04
	6	24	85	24	0	0.85	1.70	0.25
	7	4	75	4	30	0.45	0.90	0.09
	8	6	80	6	15	0.65	1.30	0.01
	9	6	95	6	35	0.60	1.20	0.00
	10	5	85	5	25	0.60	1.20	0.00
Mean Deflection (\bar{x})						1.20	0.84	

Standard Deviation (o) 0.10
 Characteristic Deflection (Dc) 1.40

For Meridian Constructions

For Client



Meridian
 Constructions Space for Planning & Creativity

Site Name : MDR - 11A, Mangalwar to Nimbahera Agency : BSRDC
 Off.: B-30, Jawahar Colony, Near Sahani Police Showroom, Tonk Road, Jaipur Raj. - 302001
 Ph.: 0141-3290725 Mobile : 93145 06054, 94143 87954 • Fax No. 0141-2703149
 e-mail: mohit@meridianengg.com



Services:
 Architectural, Structural, Interior, Valuation,
 Highways, Railway, Survey, Project Management,
 Testing, Real Estate, Construction

Temp. Range - 25° - 35°

Date : 04-07-10

Km. 21.00 L

BANKELMAN BEAM DEFLECTION

S. No.	At Km	Readings				Final Delection (X)	(X-X̄)²	
		Initial		Fianl				
		Small Dial	Large Dial	Small Dial	Large Dial			Difference
5	1	5	90	5	50	0.40	0.80	0.00
	2	7	75	7	25	0.50	1.00	0.03
	3	7	55	7	25	0.30	0.60	0.05
	4	10	80	10	35	0.45	0.90	0.01
	5	5	95	5	55	0.40	0.80	0.00
	6	4	45	4	10	0.35	0.70	0.01
	7	7	40	7	0	0.40	0.80	0.00
	8	10	70	10	35	0.35	0.70	0.01
	9	2	90	2	35	0.55	1.10	0.08
	10	4	95	4	55	0.40	0.80	0.00
						Mean Deflection (x̄)	0.82	0.20

Standard Deviation (o) 0.05

Characteristic Deflection (Dc) 0.92

For Meridian Constructions

For Client



Meridian
Constructions Space for Planning & Creativity

Off.: B-38, Jawahar Colony, Near Satnam Honda Showroom, Tonk Road, Jaipur Raj. - 18.
Ph: 0141-3207725 Mobile: 93145 06054, 94143 87954 • Fax No. 0141-2703149
e-mail: mo@meridianengg.com

Site Name : MDR - 11A, Mangalwar to Nimbanera

Agency : RSRDC



Services:

Architectural, Structural, Interior, Valuation,
Highways, Railway, Survey, Project Management,
Testing, Real Estate, Construction

Temp. Range - 25° - 35 °
Km. 26.00 R

Date : 04-07-10

BANKELMAN BEAM DEFLECTION

S. No.	At Km	Readings				Final Delection (X)	(X-X) ²	
		Initial		Fianl				
	Point	Small Dial	Large Dial	Small Dial	Large Dial	Difference		
6	1	4	50	4	15	0.35	0.70	0.00
	2	4	60	4	35	0.25	0.50	0.03
	3	7	55	7	20	0.35	0.70	0.00
	4	0	60	0	20	0.40	0.80	0.02
	5	5	5	4	65	0.40	0.80	0.02
	6	4	50	4	5	0.45	0.90	0.05
	7	6	30	6	0	0.30	0.60	0.00
	8	9	50	9	25	0.25	0.50	0.03
	9	6	45	6	10	0.35	0.70	0.00
	10	24	45	24	20	0.25	0.50	0.03
Mean Deflection (\bar{x})						0.67	0.18	

Standard Deviation (o) 0.05
Characteristic Deflection (Dc) 0.76

For Meridian Constructions

For Client



Meridian
Constructions Space for Planning & Creativity

Off.: B-38, Jawahar Colony, Near Satnam Honda Showroom, Tonk Road, Jaipur Raj. - 18.
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e-mail: info@meridianengg.com

Site Name : MDR - 11A, Mangalwar to Nimbahera

Agency : RSRDC



Services:

Architectural, Structural, Interior, Valuation,
Highways, Railway, Survey, Project Management,
Testing, Real Estate, Construction

Temp. Range - 25° - 35 °
Km. 31.00 L

Date : 04-07-10

BANKELMAN BEAM DEFLECTION

S. No.	At Km	Readings				Final Delection (X)	(X-X) ²	
		Initial		Fianl				
	Point	Small Dial	Large Dial	Small Dial	Large Dial	Difference		
7	1	5	30	5	5	0.25	0.50	0.00
	2	4	60	4	40	0.20	0.40	0.03
	3	0	70	0	40	0.30	0.60	0.00
	4	5	85	5	35	0.50	1.00	0.18
	5	24	35	24	10	0.25	0.50	0.00
	6	19	40	19	10	0.30	0.60	0.00
	7	20	50	20	20	0.30	0.60	0.00
	8	21	45	21	25	0.20	0.40	0.03
	9	5	60	5	35	0.25	0.50	0.00
	10	12	90	12	60	0.30	0.60	0.00
Mean Deflection (\bar{x})						0.57	0.26	

Standard Deviation (o) 0.06
Characteristic Deflection (Dc) 0.68

For Meridian Constructions

For Client



Meridian
Constructions Space for Planning & Creativity

Off.: B-38, Jawahar Colony, Near Satnam Honda Showroom, Tonk Road, Jaipur Raj. - 18.
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Site Name : MDR - 11A, Mangalwar to Nimbanera

Agency : RSRDC



Services:

Architectural, Structural, Interior, Valuation,
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Testing, Real Estate, Construction

Temp. Range - 25° - 35 °
Km. 36.00 R

Date : 04-07-10

BANKELMAN BEAM DEFLECTION

S. No.	At Km	Readings				Final Delection (X)	(X-X)²	
		Initial		Fianl				
	Point	Small Dial	Large Dial	Small Dial	Large Dial	Difference		
8	1	0	40	0	10	0.30	0.60	0.04
	2	2	30	1	95	0.35	0.70	0.01
	3	10	90	10	40	0.50	1.00	0.04
	4	10	85	10	50	0.35	0.70	0.01
	5	17	70	17	35	0.35	0.70	0.01
	6	20	70	20	35	0.35	0.70	0.01
	7	14	55	14	10	0.45	0.90	0.01
	8	20	60	20	10	0.50	1.00	0.04
	9	14	75	14	40	0.35	0.70	0.01
	10	10	90	10	35	0.55	1.10	0.08
Mean Deflection (\bar{x})						0.81	0.27	

Standard Deviation (o) 0.06
Characteristic Deflection (Dc) 0.93

For Meridian Constructions

For Client