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Research Paper Engineering

Requirement of Four Lane Highway : a Case Study of Bhavnagar- Dholera Highway(NH-8E) in Gujarat, India

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ABSTRACT

The Aim of this paper to provide four lane highway at based on traffic condition.This paper based on traffic volume count survey on bhavnagar-Dholera highway to describe the heavy traffic condition on this highway and also the soil condition of this road.

KEYWORDS:

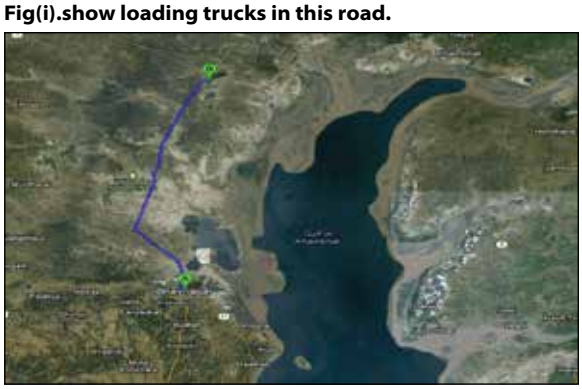
INTRODUCTION

In country like India traffic on National or State Highway is Near to 4500 CVD,hence m.s.a is near to 150 m.s.a.If those Highways are constructed in Black cotton soil it become problematic due to its characterstics .If there is a heavy traffic on this road than required to convert two lane in to four lane road. .Design of flexible pavement in india is from IRC 37-2001.Which need C.B.R value and Traffic load in m.s.a,If value of M.S.A is 150 than thickness of layer required 830 mm which is very uneconomical.Hence we need to required four lane highway due to heavy traffic condition.[1]

A. IMPORTANCE OF STUDY AREA

- Connecting road of National Highway – 8 E at Bhavnagar.
- The Ahmedabad-Dholera industrial region lies within 100 km from the Dedicated Freight Corridor (DFC) in Central Gujarat
- Traffic to Alang braking ship yard which is Asia's largest ship yard is connected to this Highway.
- Pipavav port is connected with this Highway.
- For the Military and Navy purpose this Coastal Highway is very important.
- Connecting road to Kalpsar Project for sweet water.

Fig(i).show loading trucks in this road.



Alang is a census town in Bhavnagar district in the Indian state of Gujarat. In the past three decades, its beaches have become a major worldwide centre for ship breaking

MARINE SALVAGE INDUSTRY

The shipyards at Alang recycle approximately half of all ships salvaged around the world. The yards are located on the Gulf of Khambat, 50 kilometres southeast of Bhavnagar.

FUTURE

Japan and the Gujarat government have joined hands to upgrade the existing Alang shipyard. The two parties have signed a Memorandum of Understanding, which focuses on technology transfer and financial assistance from Japan to assist in the upgrading of operations at Alang to meet international standards. This is a part of the Delhi Mumbai Industrial Corridor, a larger partnership between the Japanese and Gujarati governments. Under this plan, Japan will address the environmental implications of ship breaking in Alang, as well as devising a marketing strategy. The project is to be carried out as a public-private partnership. The project's aim is to make this shipyard the largest International Maritime Organization-compliant ship recycling yard in the world.

In future about 10 to 15 years after a kalpsar yojana and dholera Dedicated Freight Corridor (DFC) in Central Gujarat to affect this road.

PIPAVAV PORT

Port Pipavav, India's first port in the private sector, is a port on the West Coast of India for containers, bulk and liquid cargo. Its lead promoter is APM Terminals, one of the largest container terminal operators in the world. The services include pilotage/towage, cargo handling and logistics support. Port Pipavav is located in Saurashtra, Gujarat, at a distance of 90 km South of Amreli, 15 km South of Rajula and 140 km South West of Bhavnagar. The port handles both bulk, container and liquid cargo

The northwest market generates 60 % market of India and Gujarat itself major cargo generating state.

Dholera

Dholera is a town in Gujarat, India. Dholera is an ancient port-city in Gulf of Khambhat, 30 km. from Dhandhuka village of Ahmedabad district. One of the original six temples built by Swaminarayan is located here.

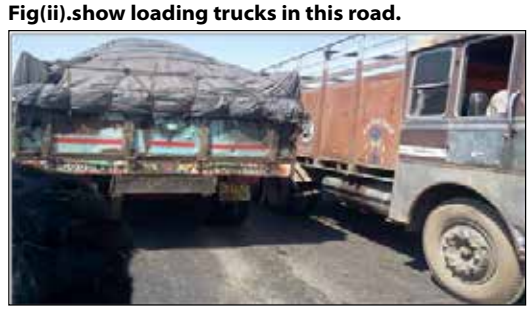
Dholera Metro City Dholera is in proximity with the coastal line. It is covered by water faces on three sides, namely, on the east face by Gulf of Khambhat, on the north side by Bavaliari creek and on southern side by Sonaria creekProximity to Ahmedabad has provided Dholera a strong locational advantage with a vibrant manufacturing base and investment scenario.

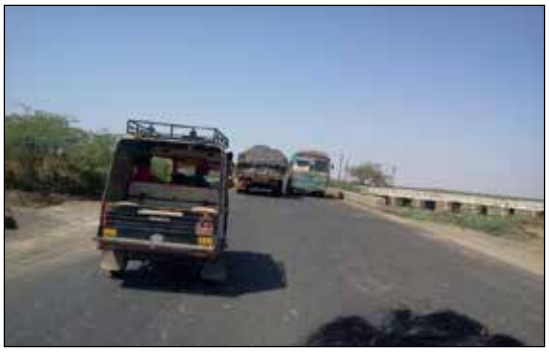
Strategically located, the Ahmedabad-Dholera industrial region lies within 100 km from the Dedicated Freight Corridor (DFC) in Central Gujarat

National Highway 8 connects the Dholera Special Investment Region with Ahmedabad, Bhavnagar and Mumbai. Dholera itself has good connectivity with National Highway (NH) 8 (Anand) and 8A (Bagodra), augmenting Bagodra -Bhavnagar, Bagodra- Surendranagar- Radhanpur.

B. PROBLEM DEFINATION

Fig(ii).show loading trucks in this road.





Fig(iii).show loading trucks in this two lane road.

Fig(iv).show loading trucks in side of this road.

Roads on two lane road with due to heavy loading traffic soil.

- To show in fig (i),(ii),(iii) it is the heavy traffic loading.
- Shrinkage creates crakes in subgrade in dry session.
- Consolidation creates uneven pavement in dry session.
- Due to heavy traffic and also two lane road this is the reason behind accidents.
- Heavy traffic of Multi Axle vehicles due to pipavav port,Alang Ship Yard, Connecting road to NH-8 E at Bhavnagar, Short Route for Ahmedabad , Proposed Kalpsar Project and Dahej Ferry Service.
- For the purpose of Navy and military it may not allowed to close this highway for a single day also.

II. REVIEW OF LITERATURE

In India, CBR method developed in USA is generally used for the design of crust thickness. This method stipulates that while determining the CBR values in the laboratory and in the field, a surcharge weight of 15 kg and 5 kg per 62 mm and 25 mm thickness respectively should be used to counteract the swelling pressure of Black cotton soils (BC soils). BC soils produce swelling pressure in the range of 20-80 tons/m2 and swelling in the range of 10-20%.Therefore, CBR values obtained are not rational and scientific modification is required for determining CBR values of expansive soil[1]

Having heavy-duty traffic of 4500 commercial vehicles per day and msa 150 as generally found on our National Highways and taking CBR value of 2%, total crust thickness of flexible pavement works out to 830 mm which is practically an impossible preposition. It is felt that CBR design curves require modification for expansive soil.[2]

Assuming heavy traffic intensity of 4500 commercial vehicles per day and msa 150, crust thickness of rigid pavement works out approximately 300-320 mm, which is about one third of thickness needed for flexible pavement. Therefore, it sounds reasonable to adopt cement concrete pavement in Black cotton soil areas. This type of pavement may save the engineers from day to day maintenance problems.[3]

Another approach to the problem can be in having semi rigid sub-bases. It is suggested that the CBR value of the BC soil be improved by giving a suitable treatment with the appropriate technology and then work out the crust thickness. This will substantially reduce the required crust thickness.[4]

III. LABORATORY TEST

Experimental setup has done in three step

i) Collection of Test sample
ii) Establish in soil properties
iii) Results and Interpritation

Following laboratory tests have been carried out as per IS: 2720. The tests were carried out both on[5]

(i) California Bearing Ratio Test

As per IS 2720 Part 31-1990,

IV. LABORATORY TEST RESULT

As per indian standard laboratory test was carried out in a laboratory below result i got between most sensitive section on dholera bhavnagar highway from chainage 133/00 to 160/00

C.B.R test Result

Sr. No.	Location	CBR Value	Sr. No.	Location	CBR Value
	Km	%		Km	%
1	133	2	15	147	2.5
2	134	3.2	16	148	3.8
3	135	4	17	149	4
4	136	2	18	150	2.8
5	137	2.2	19	151	3.8
6	138	2.9	20	152	2.9
7	139	3.9	21	153	3.2
8	140	2.9	22	154	3.9
9	141	3.4	23	155	2.5
10	142	2.6	24	156	2.5
11	143	3.4	25	157	3.4
12	144	3.8	26	158	3.1
13	145	2.6	27	159	2.8
14	146	3.5	28	160	3.1

As we can see lowest value of C.B.R is 2% at chainage 133/00 and 136/00

According to IRC-37-2001 (page no 29)

At 2% C.B.R and Load (In m.s.a) is between 10-150 required thickness of layer is 950mm ,In case study area traffic is around 100 m.s.a(Source by Road and Buiding Department,Bhavnagar)

Sr No.	Vehicle type	TRAFFIC VOLUME			PCU			
		Near dholera (direction dholera to bhanagar)	Near nari chowkdi (direction bhanagar to dholera)	pcu factor	Near dholera (direction dholera to bhanagar)	Near nari chowkdi (direction bhanagar to dholera)	Total No. of vehicle	Total No. of PCU
1	2 wheelers	1071	663	0.5	535	332	1734	867
2	3 wheelers	711	243	1	711	243	954	954
3	Passenger car	3963	2232	1	3963	2232	6195	6195
4	Mini bus	170	93	2	340	186	263	526
5	Standard bus	1049	715	3	3146	2146	1764	5291
6	LCV	422	351	1.5	1202	527	1153	1729
7	2-Axle	956	1189	3	7826	4148	3991	11974
8	3-Axle	1967	1378	4.5	15726	9351	5573	25077
9	MAV	244	269	6	3354	1615	828	4969
10	Ag.Tr. without Trailor	151	56	1.5	226	84	207	310
11	Ag.Tr.with Trailor	101	26	2	201	51	126	252
	Total	14680	8109		37232	20914	22789	58146

Traffic volume count survey as per IRC-37(2001).

- P.C.U.= 58146 (Based on traffic volume count survey)
- C.V.D.= 14007 (Based on traffic volume count survey)
- n= 15 year road life
- Initial traffic after completion of construction A=14007
- Annual growth rate r=0.10(consider a future traffic)
- Vehicle damage factor standard axle per cv
- Lane distribution factor D=0.75(Double lane single carriageway)
- Put the all value in equation
- $N=\frac{365x[(l+r)^{n-1}]}{r} xAxDxF$
- After that input the data and calculation the value are comes out 168msa but the IRC-37 limitation is a 150msa.
- So,it is required to design four lane highway. In four lane flexible pavement design this 168msa distribute in four lane so it comes out in under 150msa and design as per IRC-37(2001) .

V. CONCLUSION

From traffic survey data analysis. test results and calculate flexible pavement design we get the value of c.b.r at different chainage. for design of flexible pavement as per I.R.C 37-2001,value of C.B.R & Traffic load is required in this case study area traffic is heavy and value of C.B.R is very poor

Hence it is required to four lane highway for reduced accident and traffic.

VI. FUTURE SCOPE

In future kalpsar yojana and Dholera SIR to required to design this road with other design because in India there is not suitable design for heavy traffic like above 150MSA(million standard exle).So it is required to adopt AASHTO,AUSTRONODS method for heavy traffic loading road to flexible pavement design.

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