A Case Study On Failure Of Vkt (Nh 45c) Road
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ABSTRACT
Heavy capital investments are being made in the country towards upgradation, improvement, and rehabilitation of existing road network. The primary aim of such large investment is to provide safe, efficient, faster, economical and comfortable transportation system to the travelling. But now a days travelling become very difficult due to the damage of roads. However the extent and severity of road damage occur due to a variety of influencing factor, including heavy wheel load, improper drainage, temperature, improper bitumen mix, improper compaction etc. One of the major factor find out is Highway roads which is present inside the urban area will get damage and its life span is very short when compare to Highway roads which is present outside the urban areas. In this case study we have chosen VKT road NH45C which is present inside the urban, are going to analyze that road what are the types of damage occur in that road, analyzing the construction process, comparing it with IS codes.

Keywords: Highway roads, Failure, Analyze.

1, INTRODUCTION
1.1 General details about highway:
Road is the major mode of transportation which we are using in our day to day life. The main aim behind all movements of goods and persons is to augment the wealth and welfare of the society and to keep it appraised of new developments. Road is most essential mode of transportation in the whole world. It is one of the key factor in the economic and social development of nation. India with 33,00,000 km of road has the third largest network of roadways in the world half of which are unsurfaced roads. There are two types of pavements which are commonly used Flexible pavement, rigid pavement. The life span of Rigid pavement is more when compare to Flexible pavement. Generally the life span of Highway should be minimum 15 years. Due to various reason the life span of road become very less. The following are the reasons for failure of road pavement they are improper drainage, Heavy wheel load, Temperature, improper bitumen mix, improper compaction, flood etc. One of major factor we have found out is urban and rural roads are widely get damage rather than Highway roads. In this case study we have analyzed that what is reason for failure of highway roads which is present in urban areas. So we have choose VKT road( Vikirvandi-Kumbakonam-Thanjavur road) which is highly damaged, we are going to analyze the construction method of that road and comparing the data’s obtained with IS codes guidelines to find the failure of that road.
1.2 Focus:

The unique aspects of this project is to analyze why the failure occur in VKT (Vikiravandi-Kumbakonam-Thanjavur) road even if periodic renewal is made. This road is classified as National Highways NH.45C and starts from km 0/0 (Vikravandy) to 159/0 (Thanjavur) i.e 159 km and connecting Kolliyanur, Neyveli Township, Panruti, Vadalur, Sethiyathope, Meensuruty, Anaikarai, Thirupanandal, Kumbakonam, Papanasam and Thanjavur. State Highway 8 (SH8) was converted as NH45C. In this NH 45C, the stretch from km 20/2 to 80/4 comes under the jurisdiction of Chidambaram (NH) Sub-Division under the control of Chennai (NH) Division.

a) Importance of that road:

The stretch from km 20/2 to 80/4 lies in Cuddalore Districts and Panruti, Neyveli, Kurinjipady, Buvanagiry and KattuMamarr Koil Assembly constituency and in Cuddalore and Chidambaram Parliamentary constituency. It is plain terrain.

This road is an important National Highways branching from NH 45 ending at NH 67 and crossing NH 532 and NH 227. It connect the Villupuram, Cuddalore, Ariyalur and Thanjavur Districts. The Neyveli Lignite Corporation, Sugar Cane Factory located along the Road. The agricultural products such as cashews, jackfruits and many vegetables produced in Panruti Taluk are conveyed to marketing at Villupuram and Cuddalore centres. so this road plays a major role in the cashew export business. Neyveli Town in this road is a mining and power generation township. The township covers 53 square kilometers provide around 21000 houses for the employees. Vadalur Town in this road attracts lot of tourists from all over the world of the famous “Sathya Gnana Sabha” established by the famous saint VALLALAR before 150 years. Sethiathope Town in this road was established as a civilian town by the Cholas in 11th century. The employees and school going children, college students and business people mainly use this road.

Since so for no improvement works were taken up at Km 43/850-45/800 and 48/100 - 50/8 after handed over to NHAI. This stretch is heavily damaged due to monsoon and heavy intensity of traffic. The traffic intensity along this road is increased day by day due to the growth of Industrial and Educational institutions in this route.

The industrial materials and Agricultural Products are being transported through this road to the nearby cities. Due to monsoon and heavy traffic lot of pot holes, cracks were developed in this road. The vehicular movement causes much inconvenience and hardship to the road users due to damaged condition of the riding surface. Hence this estimate is prepared with the following provisions

b) Existing carriage way and crust details:

This existing carriageway width is 6.8
The existing riding surface is has the following crust composition
c) Traffic details

The traffic intensity in the year 2014 at count station km 40/8 of NH 45C is 18416 PCUs.

d) Previous improvement:

As reported the stretch from km 0/0-80/4 was not improved since 2005 i.e. after handed over to NHAI except some temporary restoration.

Construction & Maintenance wing of Government of Tamil Nadu has taken up rectification to some stretches to a length of 11.80 km from km 39/0-43/850, 45/800-48/100 and 50/8-54/0 for temporary restoration by providing bituminous patches, and Bituminous Concrete in the Month of January 2014 using the State CRIDP fund km 0/0-4/0, 7/0-8/0, 9/0-12/0, 14/20/2, 24/0-25/0, 56/0-57/0, 63/0-64/0, 67/0-72/0, 73/0-75/0, 76/0-78/0 & 79/0-80/0 was renewed in 2014 under Periodical Renewal 2013-14 works by NH wing.

2, RISK ASSOCIATED WITH HIGHWAY

2.1 Failures on Highway:

Different types of failure encountered in flexible pavement are as follows:

- Alligator or Map Cracking (Fatigue Cracking)
- Consolidation of pavement layers (Rutting)
- Shear failure cracking
- Longitudinal cracking
- Frost Heaving

3, TEST RESULT FOR SOIL

- **SIEVE ANALYZIS** - Since more than 50% of the soil passes through 75 µ sieve, the collected soil sample is identified as fine grained soil.
- **SPECIFIC GRAVITY** – Specific gravity of clay soil is 2.44
- **DETERMINATION OF LIQUID LIMIT** – The liquid limit of soil sample is 62.5%
- **DETERMINATION OF PLASTIC LIMIT** – The plasticity index is 43.81%
- **CBR TEST** - The VKT road has 4.4 CBR value which has very low load bearing capacity.
The main reason for failure of VKT road is because of very week subgrade, the subgrade cannot able to withstand the heavy traffic load so the road get damage easily.

4, FIELD SURVEY
4.1) Damage due to flood:

Figure.1 Damage due to flood

The road will have both agricultural land and residential area. Proper drainage is not provide in that area, so in residential area water will stagnant on road and cause failure.

4.2) Traffic Problem:

Figure.2 Damage due to traffic

Traffic is one of the major problem faced by the people in their day to day life because Sand quarry is present in that area. 1000 of lorries were crossing that road. Due to the continuous movement of heavy loaded vehicles on that road will cause heavy damage. Actual load is greater than the design load.

4.3) Improper maintenance:

They are not maintaining the road properly. If any damage occur in that road they are not rectify it immediately even when public complain to concern department. Small damages have become a huge damage and this is the main reason for the failure of that road. Even periodical maintenances is done, frequent damage will occur in that road. Peoples are suffering a lot due to the damage of that road.

4.4) Improper construction:

i) Temperature:
The standard temperature of bitumen laying in road is 100 to 120 °C. This is the photo we have taken during the construction of VKT road. From the industry the bitumen is heated at 180 °C. The bitumen preparing industry is at Tindivanam. From Tindivanam it will take one and hour travelling so the bitumen will get tighten and the degree of the bitumen reaches to 80 °C. Due to this decrease in temperature the bitumen will reduce its binding capacity. In this photo we can see that the bitumen will spread on the side and settlement takes place.

**ii) CBR value:**

The main reason for the damage of that road is because of weak subgrade. During designing they have taken CBR value as 3. Due to continuous movement of vehicles the pavement is settle and sub grade is highly damage. In order to increase the strength of sub grade we have to increase the sub grade value up to 10 by compacting the soil.

**iii) Problems during construction:**

The emulsion used in tack coat should not be in liquid state but here they are spraying the emulsion as liquid so spalling of Bitumen will takes place and damage in road will takes place.
During laying the road itself the vehicles will pass over the road, they are not leaving the bitumen to settle. So the road will get damage while constructing.

5, PROJECT PROPOSAL

5.1) Introduction:
This road is classified as National Highways NH.45C and starts from km 0/0 (Vikravandy) to 159/0 (Thanjavur) i.e 159 km and connecting Kolliyanur, Neyveli Township, Panruti, Vadalur, Sethiyathope, Meensuruty, Anaikarai, Thirupanandal, Kumbakonam, Papanasam and Thanjavur. State Highway 8 (SH8) was converted as NH45C.

5.2) Name of the work
Widening and strengthening of NH45C (Vikravandi - Kumbakonam - Thanjore road.

5.3) Location
This road is classified as National Highways NH.45C. In this NH 45C, the stretch from km 20/2 to 80/4 comes under the jurisdiction of Chidambaram (NH) Sub-Division under the control of Chennai (NH) Division. The stretch from km 20/2 to 80/4 lies in Cuddalore Districts and Panruti, Neyveli, Kurinjipady, Buvanagiry and KattuMannar Koil Assembly constituency and in Cuddalore and Chidambaram Parliamentary constituency. It is plain terrain.

5.4) Existing
This existing carriageway width is 7.5
. CBR value 10 and MSA value 20
The existing riding surface is has the following crust composition

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Bituminous course</td>
<td>40mm thick</td>
</tr>
<tr>
<td>WBM layer</td>
<td>250mm thick</td>
</tr>
<tr>
<td>Granular sub base</td>
<td>200 mm thick</td>
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<tr>
<td>Total</td>
<td>490 mm</td>
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5.5) Traffic Details
The traffic intensity in the year 2015 at count station km 40/8 of NH 45C is 18416 PCUs.
5.6) Drains

The right of way of road is 10m and most of the stretch lies through lands on both sides. Hence earthen drains are proposed.

5.7) Proposal

It is proposed to two lane carriage way 7.5m with 1.0m earth shoulder on either side.

5.8) Provisions

This Estimate is prepared with the following Provisions.
1. Advance Patches using BM.
2. Tack coat @0.25Kg/Sq.m over the BT Surface 3. Bituminous Macadam 50mm thick using VG30 grade. 4. Bituminous Concrete 30mm thick using Crumb 55 Bitumen.
5. Construction of Gravel shoulder on both side of carriage way.
6. Provision for Road marking.

6, Conclusion

This project focus on the failure of Highway road which is present inside the urban area than the Highway road which is present outside the urban areas. We have analyzed the VKT road and found out the reason for failure of the road is poor subgrade by doing Sieve analyzes, Specific gravity test, Liquid limit, Plastic Limit, Standard proctor compaction, CBR test. The CBR value is very less so the sub-grade is very week and it cannot able to withstand high volume of traffic. After the analyzing all the failure we have given a new proposal for VKT road as per IRC 31-2012 and MORTH.

7, Reference

#7. MORTH.