Research Article

Traffic Study and Analysis of Project Road (SH-93) Using Pavement Management System

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Abstract

Pavement Management Systems (PMS) are widely used to maintain safe, durable and economic road networks. Pavement gets damaged due to environment effect and traffic movement Maintenance, therefore essential for the safety of the passengers as well as vehicles. Thus accurate assessment of the existing traffic and forecasting attains utmost importance in the projects taken up under BOT/ Annuity / Any Other PPP format on DBFO Pattern. The traffic characteristic of a corridor is required for design of pavement, fixing a number of traffic lanes, geometric design, design of intersections and economic appraisal. Traffic is the first thing to check before upgrading any facility. In this study, In order to understand the characteristics and the volume of traffic using the project road, data on the road network and traffic and travel pattern of vehicles plying on the project road were collected through primary surveys., on the project road State Highway (SH-93) Wakan to Khopoli section (Km. 0 to Km. 41) for 10 km road section (Km 41 to Km 31), were collected. This section starts from the Khopoli junction where there is a T-junction formed with Pen-Khopoli road and the Wakan- Khopoli road. This junction is adjacent to the Mumbai – Pune expressway which can be accessed from this road. The data collected was categorized, processed, and analyzed, is used to generate prediction of pavement distress and condition models.

Keywords: Geometric design, characteristic of traffic, pavement distress, economic appraisal, predictions

1. Introduction

The project road from Wakan to Khopoli section (Km. 0 to Km. 41) of State Highway (SH-93) is the road which is proposed to be upgraded to two lanes with paved shoulder.

Figure 1: Map showing survey location (source: Google map)

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The road starts from T- Junction with Mumbai – Goa highway road near Wakan village and passes through Pali village which is one of the prime religious locations in the area. Parali and Pedali are other two major villages which fall on the alignment of this road. The road continues and connects to the Mumbai Pune Expressway near Khopoli Toll Plaza junction. The project corridor is presented in below table.
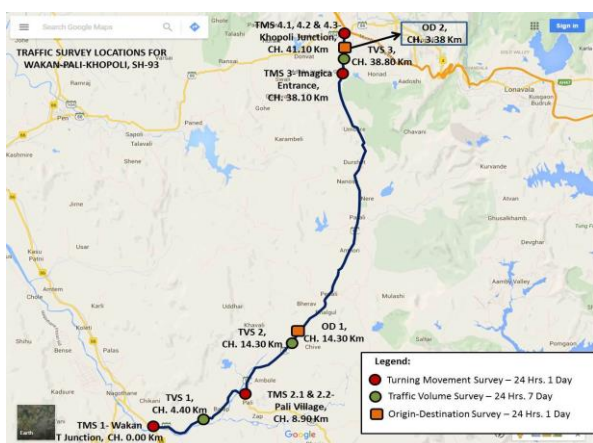
2. Types of Traffic Surveys

Turning Movement Survey (TMS)

Turning movement survey was conducted for one day (24 hours) at major intersection identified and shown in the map above. At each identified locations, all turning movements were covered and the data was collected by vehicle category. The survey was carried out using video recording method capturing data of all the turnings at the intersections.

Traffic Volume Survey (TVS)

The vehicle classification was developed based on the guidelines by IRC, project requirements and was approved by the client. The survey was carried out

using video recording technique and the data was entered for 15 minutes intervals. The survey was carried out for 24 hours – 7 days at the midblock locations.

Origin-Destination Survey (O&D)

The data collected in the origin-destination survey include trip origin, trip destination, trip length, occupancy and trip purpose for passenger vehicles and commodity, load carried in case of freight vehicles. The data was collected using road side interview method by stopping samples of vehicles on random basis and interviewing the driver/passenger.

Axle Load Survey

The axle load survey was conducted at the proposed toll plaza locations for one day. Axle load survey was done using the axle load pad and each axle was weighed to get the total weight of the vehicle.

Traffic Analysis

The data (primary and secondary) collected was analyzed to obtain information on ADT, Seasonal variation, AADT, traffic composition, Peak Hour traffic, travel pattern, and commodity movement. This information along with the appreciation of other relevant parameters formed part f the basic input for the estimation of revenue. These are discussed in the following paragraphs.

3. Objectives

- Establish base year traffic demand
- Capacity assessment based on demand forecasting for the concession period
- Identification of travel pattern & influence area of the project stretch
- Pattern of commodity movement
- Deriving Growth Factor for Traffic demand Forecasting
- Estimation of corridor traffic including traffic diversion if any
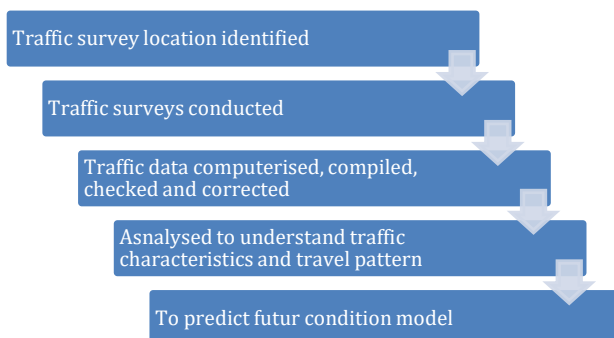- Enable Preliminary Design of project facilities

4. Methodology

Figure 2: Methodology flow chart

4. Result and analysis

Traffic Intensity and Composition:

The vehicle classification as generally used in the traffic surveys in Central/ State government studies along with their PCU values, as suggested in IRC: 64–1990, are presented in below table.

Table 1: Vehicle Classification and PCUs Factors

Type of Vehicle	PCU factor
Car/Vans/Jeeps	1
Two Wheeler	0.5
Auto Rickshaw	0.75
Private Bus	3
Govt. Bus	3
Mini Bus	1.5
Goods Auto	0.75
Mini LCV	1
LCV	1.5
2- Axle Trucks	3
3- Axle Trucks	4.5
MAV Semi Articulated	4.5
MAV Articulated	4.5
Cycle	0.5
Animal Drawn	1.5
Other	4.5

Table 2: Average Daily Traffic (ADT) at Traffic Homogenous Sections

Mode	Section: Pali – Imagica CH: 14.30 KM	Section: Imagica – Khopoli CH: 38.80 KM
Car/Vans/Jeeps	3495	5645
Two Wheeler	2562	4608
Auto Rickshaw	272	484
Private Bus	50	170
Govt. Bus	79	81
Mini Bus	34	99
Goods Auto	27	42
Mini LCV	299	400
LCV	162	262
2- Axle Trucks	334	394
3- Axle Trucks	183	224
MAV Semi-Articulated	26	43
MAV Articulated	108	128
Cycle	15	26
Animal Drawn	1	0
Other	24	30
Total Vehicles	7671	12635
Total PCU	8526	13144

The total traffic is more in the section from Khopoli junction to Imagica as this location is near to the Khopoli junction and the Mumbai-Pune expressway.

- Also the passenger traffic is higher in this section compared to other two sections on the corridor due to the Imagica theme park which is an

important entertainment spot in the region and attracts trips from Mumbai, Navi Mumbai, Pune and other nearby areas.

- The heavy vehicles and the truck traffic are found to be proportionately similar on all the sections.
- The total traffic is least found in the section connecting Wakan junction to Pali village where the total PCUs are 7201 in the entire day

Table 3: Annual Average Daily Traffic (AADT)

Mode	Section: Pali – Imagica CH: 14.30 KM	Section: Imagica – Khopoli CH: 38.80 KM
Car/Vans/Jeeps	3635	5871
Two Wheeler	2664	4793
Auto Rickshaw	283	503
Private Bus	52	176
Govt. Bus	82	85
Mini Bus	35	103
Goods Auto	28	44
Mini LCV	311	416
LCV	168	273
2- Axle Trucks	348	409
3- Axle Trucks	190	233
MAV Semi-Articulated	27	45
MAV Articulated	112	133
Cycle	16	27
Animal Drawn	1	0
Other	25	31
Total Vehicles	7978	13141
Total PCU	8867	**13670**

Table 4: Annual Average Daily Traffic (AADT)

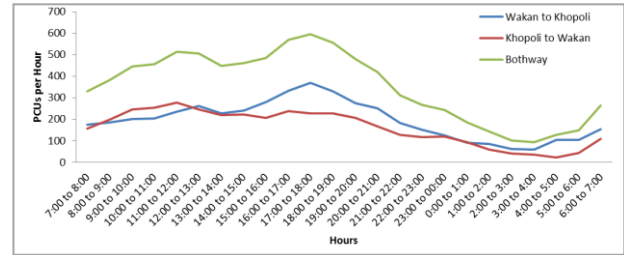| Mode	Section: Pali – Imagica CH: 14.30 KM	Section: Imagica – Khopoli CH: 38.80 KM
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Figure 3: Hourly Variation of Traffic at Section: Pali – Imagica CH: 14.30 KM
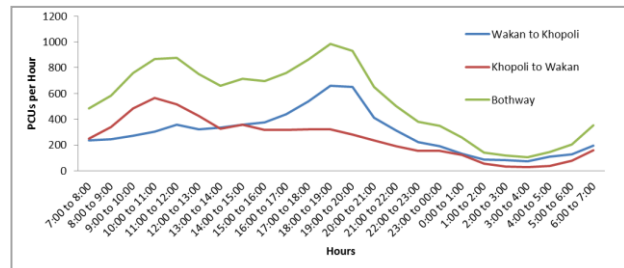

Figure 4: Hourly Variation of Traffic at Section: Imagica – Khopoli CH: 38.80 KM

Figures above shows the hourly variation of traffic observed at all the survey locations. The pattern is highly intuitive with higher traffic movements during the day time at all the survey locations.

Conclusion

Observations and Conclusions

From the traffic projections and the estimation of traffic along the project corridor, following are the observations and conclusions:

- The base year for the traffic projection on the project corridor is taken as 2017-2018.
- The completion year for the project is taken as 2019-2020.
- The traffic diversion from NH 17 is likely to be happening by the year 2019-2020 and hence considered in projection from that year.
- The development along the corridor is expected from the year 2023-2024 in a phase wise manner up to year 2033-2034.
- As per IRC 64 – 1990, for a 2 lane road design service volume is 15,000 PCUs/day and capacity is 30,000 PCU/day. The traffic projections show that the volume of traffic on the existing project road of 2 lanes is likely to exceed this capacity by the year 2030-2031.
- As per IRC 64 – 1990, for a 2 lane road with paved shoulder design service volume is 17250 PCUs/day and capacity is 34,500 PCU/day. From Table it can be seen that capacity augmentation of the road will be required after the year 2032-2033 by widening it to four lanes.

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