Journal for Research| Volume 02 | Issue 07 | September 2016
ISSN: 2395-7549

Study on the Road Intersection at 26th Mile, Kanjirappally

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Abstract

The spectacular growth of the automobile as one of the most convenient modes of travel has brought in its wake frustrating problems of parking, accidents, delay, congestion, etc. It is no longer sufficient to build roads of adequate structural strength to cater to the needs of vehicles, but it is equally important that the safe, efficient and comfortable movement of traffic and other road user is ensured on these roads. Highway intersections are nodes of road networks and accident - prone locations. They are the places where vehicles coming from different approaches and moving towards different directions interact and conflict with each other. Due to the conflicts from all users, more traffic crashes could happen at unsignalized intersection as compared with roadway segments. This study is fully based on the existing conditions of unsignalized intersection, including geometric design, sight distance, traffic control devices etc. The problems of parking, accidents and delay are also prevailing in the area under our study i.e. intersection at 26th mile. The intersection is an unsignalized one and therefore, the chances of accidents during the peak hours are very high. Since, it is a meeting point of a national highway and a state highway, the variation in the design speed of both roads also interrupts the traffic flow. Our study on the intersection at 26th mile mainly aims at improving the geometrical as well as the safety features of the intersection like accident control by signal installation, incorporation of proper sight distances, uninterrupted traffic flow without causing crashes, delay, etc.

Keywords: Approaches, Conflict, Crashes, Intersection, Sight Distances, Traffic Control Devices

I. INTRODUCTION

An intersection is the junction at grade (that is to say, on the same level) of two or more roads either meeting or crossing. A T-intersection is a meeting point of three roads either with grade separation or at different grades.

This study involves checking the safety of operation at the intersection. It also involves suggesting suitable measures to reduce the rate of accidents.

II. SCOPE AND OBJECTIVE

With the advancement of technology in our day to day life, the transportation facilities for the easy conveyance and reliability are also needed to be provided. It therefore requires proper study on the alignment and geometric principles of road. The project helps to achieve efficient, free and rapid flow of traffic through the junction, to reduce the rate of accidents at the intersection, to ensure proper sight distances for vehicles at the intersection, to ensure minimum radius for curves at the junction.

The objective of the project is to study the volume of traffic flow through the intersection, along all the arms, study the rate and the causes of accidents at the intersection, to check the available sight distances and the turning angle at the curves, to study the alignment and vertical profile of the intersecting roads, study the speed of the vehicles passing the intersection and to suggest a permissible speed and to suggest traffic control and regulatory measures.

III. STUDY AREA – ROAD INTERSECTION AT 26TH MILE, KANJIRAPPALLY

The road intersection at 26^{th} mile is a T-intersection, having 3 roads meeting together – one coming from Erumeli, other from Kanjirappally and the third from Mundakkayam. It is an at grade intersection where National Highway 183 (NH 183, formerly known as NH 220) meets the State Highway 44.

The major problems at the intersection are poor visibility for the drivers approaching the junction, lack of warning signs and traffic signals, uncontrolled flow of vehicles to different directions causing accidents and delays, improper alignment and vertical profile of the intersecting roads, etc.

IV. METHODOLOGY

A. Traffic Volume Count

The traffic volume refers to the number of vehicles passing the road in a given interval of time. It is done to determine the flow of traffic in the peak hour. The traffic volume count can be used for fixing the signal time during the signal designing for peak hours. At intersection sites, the traffic on each arm should be counted and recorded separately for each movement.

Three video cameras were installed at the study approach of each arm of the intersection at a distant point so that the vehicles approaching and leaving the intersection from each arm was analysed. The volume count was taken during the morning peak hours from 08:45 a.m. to 10:45 a.m. on two consecutive days. From the traffic volume analysis, the peak hour is found to be 09:45 a.m. to 10:45 a.m.

Table - 1
Traffic volume at the intersection

Direction	*PCU*
Erumely to Kanjirappally	*366*
Erumely to Mundakkayam	*113.5*
Mundakkayam to Kanjirappally	*654*
Mundakkayam to Erumely	*88*
Kanjirappally to Mundakkayam	*413.5*
Kanjirappally to Erumely	*295*
Total PCU at the junction	*1930 PCU*

B. Total Station Survey

Total station is an electronic device used in modern surveying and building construction. It is used by land surveyors and civil engineers either to record features as in topographic surveying or to set out roads, houses or boundaries. Based on the survey, the vertical profile of the road was found.

C. Collection of Accident History

The records of accidents of past few years help in finding the causes of the majority of accidents at the intersection and to suggest suitable remedial measures to reduce such accidents. The data of the accidents occurred at the intersection for the past few years were collected.

Table – 2
Accident History

Year	*Death Cases*	*Severely Injured Cases*
2015	*1*	*8*
2014	*1*	*7*
2013	*0*	*8*

The 26th mile intersection is one among the 5 major black spots of accidents in the Kanjirappally region. The other black spots are Petta junction, curve in front of Faby's Auditorium, parathodu junction and Vellichayani. Most of the accidents occur between 4 p.m. to 8 p.m. Majority of the accidents are bus accidents in which either pedestrians or the other vehicular passengers are the victims. The main reason for most of the accidents is the absence of proper channelization.

D. Spot Speed Study

Spot speed studies are used to determine the speed distribution of a traffic stream at specific location. The spot speed study was conducted using stop watch method. A distance of 20 meters was marked on each of the approaching arms of the intersection and the speed of various vehicles to cross the desired distance was recorded.

Table – 3
Speed data

Vehicles Approaching From	*Mean Speed (Km/Hr)*	*Median Speed (Km/Hr)*
Kanjirappally	*36.55*	*33.5*
Mundakkayam	*38.35*	*32.5*
Erumely	*35.90*	*36.5*

The speed limit for the vehicles approaching the intersection is kept to 30 km/hr. But from the analysis, it is clear that the speed of approaching vehicles is greater than the speed limit. This must be prevented for the safety of the people, by introducing signals, roundabouts, channelizers, etc.

V. POSSIBLE IMPROVEMENTS AT THE INTERSECTION

A. Channelisation

Channelization is the separation or regulation of conflicting traffic movements into definite paths of travel by traffic islands or pavement marking to facilitate the safe and orderly movements of both vehicles and pedestrians. Divisional islands along with refuge islands are proposed for lanes from Kanjirappally and Erumely since the refuge islands provide enough space for the turning vehicles at the intersection without interrupting the flow of straight flowing vehicles. The lane from Mundakkayam does not need refuge islands because its turning to Erumely is free left turning.

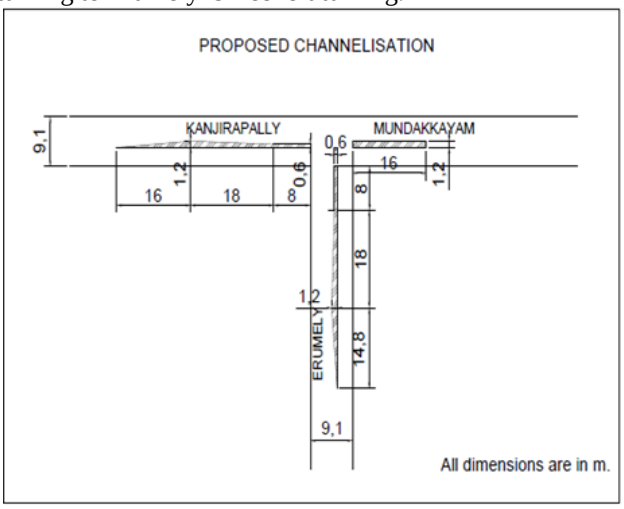

Fig. 1: Proposed channelisers at the intersection

B. Traffic Signal Installation

Installation of traffic signals reduces the conflicts at the intersection. To ensure controlled movement of vehicles at the intersection, traffic signalling during peak hours is suggested. The optimum cycle length is 153 s.

- Phase 1: Leg from Kanjirappally
- Phase 2: Leg from Mundakkayam
- Phase 3: Leg from Erumely

Fig. 2: Traffic signal phase diagram

C. Bus Bay

Bus bays and bus stops are designated places for buses to stop for passengers to board or to get down from a bus. Bus stops must be minimally 15 m away or ahead from junctions. Bus stops must be located to allow passengers to board and alight safely and conveniently.

The present bus bays at the intersection are opposite to each other and are located exactly at the meeting point of the intersection. It causes delay to the moving traffic.

The newly proposed bus bays are staggered and thus it eliminate the problems of delay for the vehicles passing through the intersection due to the stopped buses. It also ensures the safety of the pedestrians as well as the waiting passengers. Proper

distance from the intersection is also provided ahead of the bus stop so that the working of the bus bay does not interfere with turning vehicles.

VI. CONCLUSIONS

From the study the following conclusions can be made:

- From the traffic volume analysis, the peak hour is found to be 09:45 a.m. to 10:45 a.m. The peak hour volume at the intersection was found to be 1930 PCU/hour.
- The speed limit for the vehicles approaching the intersection is kept to 30 km/hr. But the speed of approaching vehicles is greater than the speed limit. Thus, speed bumps or other control measures must be taken.
- The curves must therefore be smoothened for the drivers to turn safely at the intersection.
- A minimum visibility distance of 15 meters along the minor road and 8- seconds gap distance on the major road is required at an intersection. But, at the intersection under study, the buildings are constructed very near to the shoulders. Thus, it obstructs the visibility criteria for the drivers.
- The intersection offers a rising gradient towards Kanjirappally and falling gradient towards Mundakkayam. The road must be fairly levelled at the intersection.
- The introduction of roundabout reduces the accidents at the intersection. But, it can only be introduced after the future expansion of road.
- The proposed channelisers, traffic signals and bus bays can reduce the occurrence of accidents and ensures safety at the intersection to a possible extent.

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