Efforts to Create Walkable Junction by Analysing Factors Intimidating Pedestrian Conveyance at Uncontrolled Junction

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***Abstract*- Walking is a key element of any balanced transportation network that has habitually been disregarded while planning most of the transit system. Pedestrian being the most overlooked and vulnerable set of road entities generally face threats especially when the place of crossing is beyond control. It becomes more of a risk for pedestrian in terms of security as most of the developments that have taken place are mostly directed towards the improvement of the vehicular network and least has been done for the pedestrians, leading to which they often get engulfed by different intimidations while crossing near un-controlled junction. One such junction was identified in a city of Ahmedabad, Gujarat and study was carried out. The study/paper is thus an endeavour to gather information manually regarding the pedestrian characteristics, pattern of movement, pedestrian behaviour and also studies the urge of pedestrian facilities required through questionnaires. The paper also reveals the possible ways to minimize conflict points near present intersection and further provides a conceptual idea to increase pedestrian safety by proposing alternatives to the present junction conditions. Pedestrian walkway, islands, proper signage and road makings that are needed to be developed are also discussed to have better insight with regards to safety, efficient and more reliable crossings facilities at an intersection.**

Index Terms— Vulnerable Road User, Uncontrolled intersection, unsignalized junctions, Risk Analysis, Alternative Design Parameters, vehicular behavior, safety concerns.

I. INTRODUCTION

A road belongs to as much pedestrian as it does to automobiles, and yet most of the times pedestrian safety and their welfares are not taken into account. As a result, it has been observed that the uncontrolled busy roads with lack of alternate walkways for the pedestrians at places where the road repairs are taking place have been encroached upon. At present, no proper methodology is available to develop suitable development to facilitate pedestrians at Indian streets and intersections especially when the junction is un-signalized and has an uncontrolled vehicular moment.

According to the Urban Mobility, India 2016, 80% of road traffic is carried by passenger and 65% freight traffic. Out of 5mn km length of roads in India, less than 0.1% are built keeping in mind pedestrian safety and convenience to promote walking. According to the census 2011, 47.1% people walk, cycle and take bus to work. Furthermore, according to World Health Organization (WHO), India registers highest number of road injuries and deaths every year. Over 3400 people die on world's roads every day and millions of people are injured or disabled every year among which maximum no of people dying on road are pedestrians. Pedestrian collisions, road traffic crashes should not be accepted as inevitable because they are both predictable and preventable. The key risks to pedestrians includes issues based on driver behaviour in terms of speeding; lacking of dedicated facilities for pedestrians such as sidewalks, raised crosswalks and medians; and design of vehicles in terms of solid vehicle fronts which are not forgiving to pedestrians.

II. STUDY AREA

A. Strategic Importance

Particular un-signalized locale, Thaltej is a census town and a suburb in Ahmedabad district of Gujarat, India. The subjected cross road connects to all major parts of the city and is a part of Sarkhej-Gandhinagar Highway. The study area falls under Ward number 8 provinces in North West Zone of Ahmedabad

Municipal Corporation. Furthermore, Thaltej road map is vital from strategic point of view for getting driving directions to reach Schools, Bus Stops, Hospitals, Shopping Malls, Restaurants Banks, ATMs & other important points of interest. The identified study area also receives a healthy demand for residential, commercial properties due to the availability of quality neighborhood in all budget categories. Investors get a host of alternatives to select from gated communities to villas and high-end properties. The composition of traffic consists of a large proportion of motorized two wheelers, a good percentage of auto rickshaws, cars, buses and very smaller proportion of heavy vehicles.

Figure 1 Location of Study

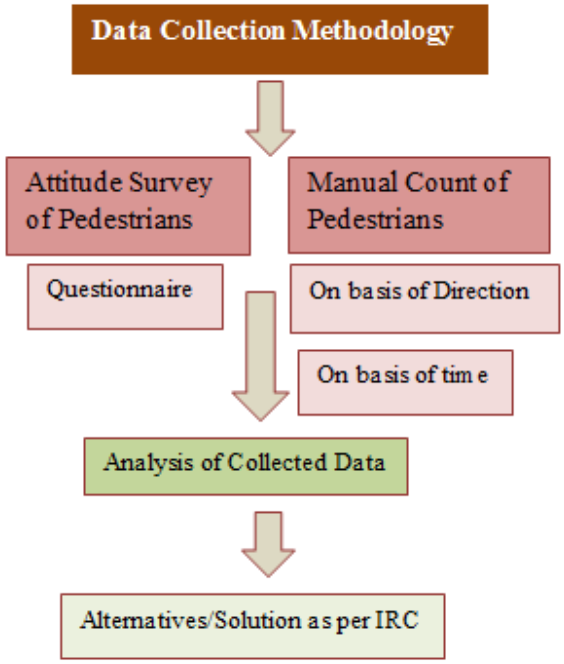
B. Need for Study

It has been observed that the performance of junction is pivotal to most of the congestion problems of that location. At grade separated intersections, proper signalization and other conventional standards are needed to reduce conflicts caused due to inadequate flow, as it widely affects the pedestrian behaviour leading to incidents. The following criteria were recognized for site selection studies.

1. Traffic conditions have been studied and were observed to be slightly heterogeneous in nature without following required lane disciplines.
2. No proper and visible road markings.
3. Illegitimate height of the footpath at the intersection.
4. Congestion due to stopping and waiting of shuttle vehicles leading to loss of public space.
5. Uncontrolled, un-signalized and poor planning of crossroad leading to indecision.
6. High count of the pedestrian flow has been witnessed as the area lies in the heart of the city. The pedestrians include employees, workers, labourers, students and passengers.

Figure 2 Inadequate height of footpath

III. DATA COLLECTION & METHODOLOGY



A. Survey Count

The pedestrian flow has been manually counted across the subjected intersection, along the connecting main and service roads using a tally marking sheet. Counts have been taken keeping into consideration the following.

1. The counts have been taken during the peak hours.
2. Non typical conditions such as holidays, strikes, and special occasion were avoided.

The field survey has been carried out to observe:

- Direction of the pedestrian conveyance
- To study the behaviour and characteristics that affects a pedestrian while crossing the junction.

The related data collected has been given below.

B. Attitude Survey

A short Questionnaire was prepared to enable complete information about different situation they possibly get engulfed while crossing at junction by recording the preferences of the respondents. Efforts have been made to gather data from pedestrians regarding what improvements they need to the existing facilities to foster their walking efficiently. However, there were some instances where it was not possible for pedestrians to give the interview.

The format of the questionnaire used during the survey has been given below.

Questionnaire					
Age			Child	Adult	Old
Gender			Female	Male	Other
How do you feel when you are about to cross a road alone without signals?			Very alert	Alert	Normal
When in group?			Very alert	Alert	Normal
Do you get confused while judging decision to cross a road without signals?	Always	Most of the times	Sometime	Never	
How far are you willing to walk to access crossings, skywalks/subways?	<50m	50-100 m	100-200m	200-300m	>300m

Figure 3 Questionnaire format – A

What criteria tend you to make decision to cross a road without signals?	1.Speed of the approaching vehicle 2. Distance of the approaching vehicle 3.Vehicle type (Whether approaching vehicle is car, 2w,3w) 4. Person who is already crossing 5. Others
How many times have you faced an accidental situation?	1. Minor accidents once, twice or more 2. Serious accident once, twice or more 3. Was about to collide, but saved once or twice 4.Was about to collide most of the times 5. Never happened any accidents
While you are crossing, what factors do you think creates the most unsafe conditions?	1. No signal and markings 2. Less priority given by drivers for pedestrians 3. Blocking vision during crossing due to improper location of bus stops 4. Raised median islands 5. Bright beam of lights from vehicles at night.
Where do you prefer to cross road mostly?	1. At zebra crossings 2. Where traffic signals or policemen are present 3. Using foot over bridge or subways 4. Will cross anywhere randomly.

Figure 4 Questionnaire format - B

IV. ANALYSIS OF COLLECTED DATA

B. Pedestrian Count Analysis

Manual pedestrians count on a comprehensive basis has been carried out to analyze the purpose of pedestrian trip which in turn can assist to pinpoint the locale of maximum pedestrian activity leading to which exclusive routes or areas of substantial benefit for a pedestrian can be identified and suitable alternatives can be proposed. In the respective survey conducted across Thaltej at hours from 8:00am-12:00 pm, on Wednesday, a casual working day the pedestrian hourly count with respect to the directions were studied. The pedestrian walking behavior in terms of direction have been studied in brief and it was witnessed to have twelve different directions they advance to cross the junction. Good counts of pedestrian were observed taking a long route to reach their destined location due to uncontrolled traffic nature at the junction. In terms of hourly count the peak hour has been noted as 8:00am - 9:00am with maximum pedestrian movement of 1828 pedestrian using the intersection, whereas a total of 1307 and 1288 pedestrians each hour have been observed in the following two hours between 9:00am-11:00am.The pedestrian activities gradually declined thereafter.

TIME	TOTAL COUNT
08:00-09:00	1828
09:00-10:00	1307
10:00-11:00	1288
11:00-12:00	875
Grand Total	5298

Grand Total 5298

Table 5 Hourly Distribution Count of Pedestrians

With respect to the directions, it has been observed that pedestrians had 3 alternate routes for each of the destinations, across the junction. A good count of pedestrians was observed taking straight path among that the moment across Udgam to Thaltej had a crown value of 847 people, followed by Amul to PVR, Thaltej to Udgam and PVR to Amul having a total of 793, 693 and 661 each. Most of the pedestrian moments identified were due to its strategic importance and easy availability of the sharing auto-services, cars and public buses available which would foster their daily travelling activities. The pattern of pedestrian moment across the junction was observed to be diagonal due to the absence of the median/rotary. A count of 271 such moments were recorded

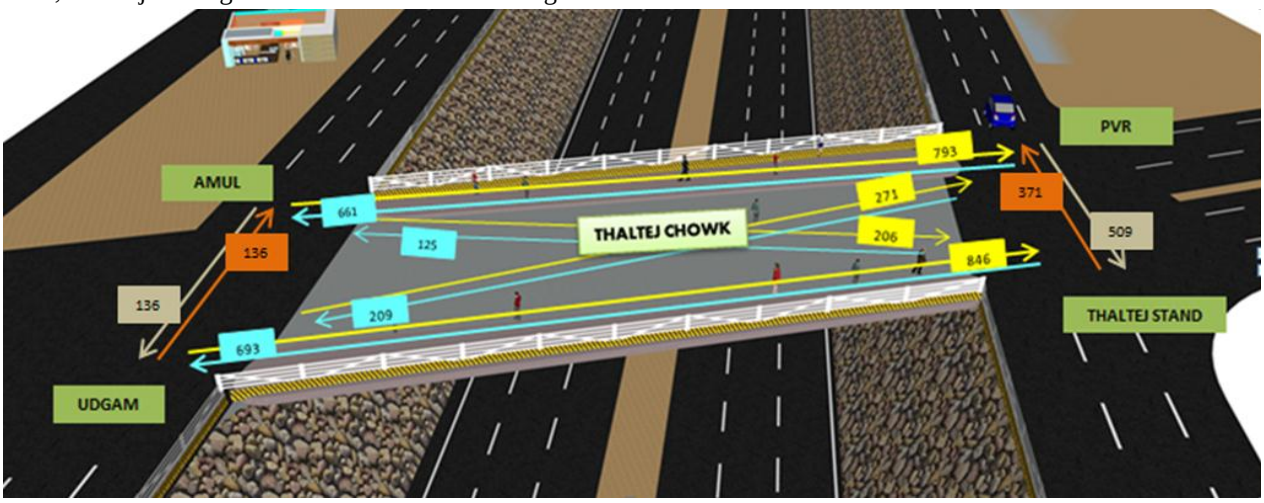


Figure 6 Direction-wise Pedestrian Movement Distribution

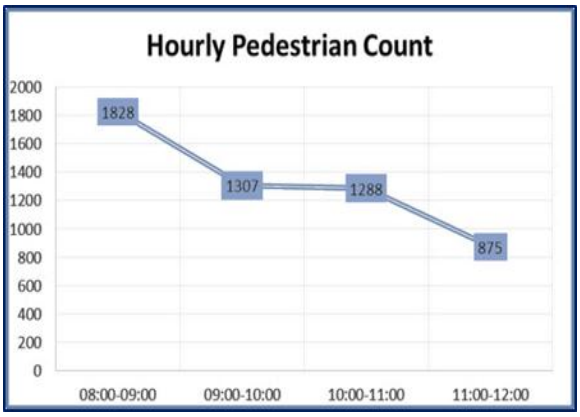


Figure 7 Hourly Graph of pedestrian count

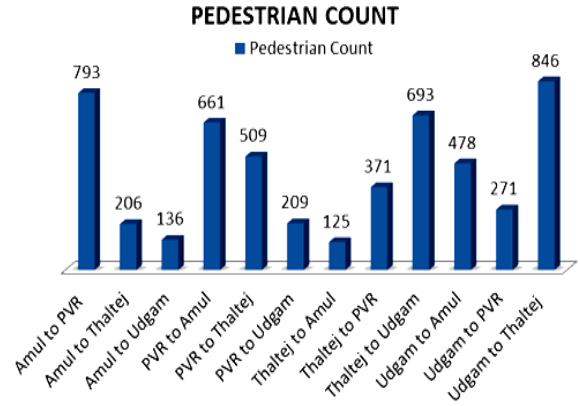
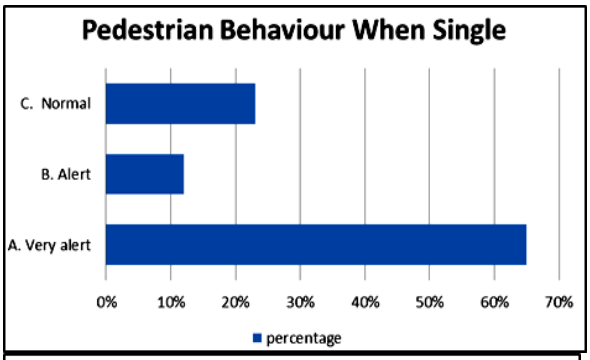


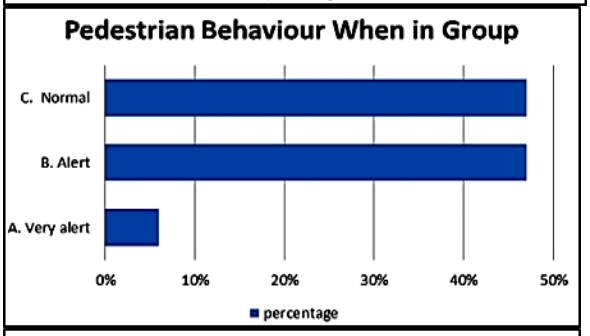
Figure 8 Direction-wise chart of pedestrian count

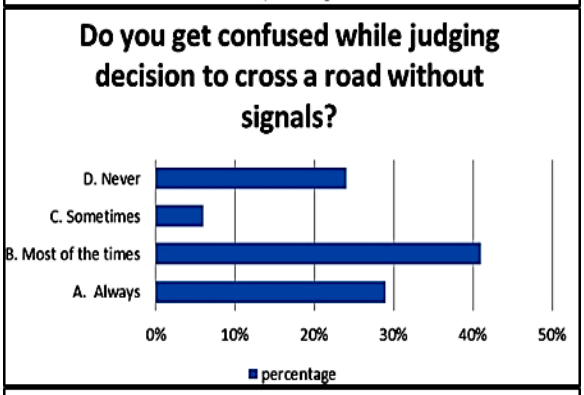
Attitude Survey Analysis

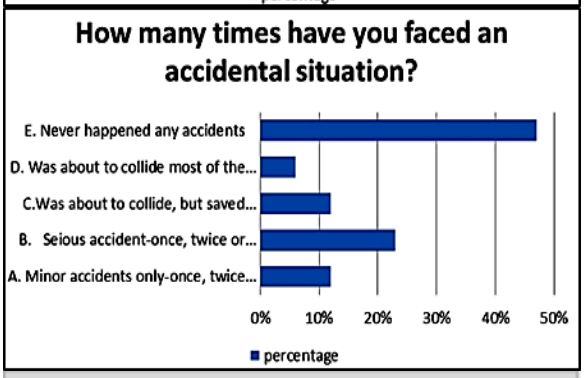
It has been observed that, out of many pedestrians attempted, a total of 135 pedestrians responded. Firstly, the gender and age of the interviewed pedestrians were noted and their responses were considered. The questions related to pedestrian behaviour were studied in different situations. It was observed that around 65% of pedestrians felt very alert when they were about to cross the intersection by one self-whereas normal or comparatively less alert was the reaction mostly recorded when in group. Secondly, the response of the pedestrian regarding the accidental situations across the subjected intersection was recorded. About 23% of the pedestrians faced serious accidents once or more than once whereas 12% of pedestrians faced minor accidents which are crucial. It was also observed that most of the times pedestrians were incapable to take a decision while crossing across the unsignalised cross-road.

Analysis based on Pedestrian Behaviour



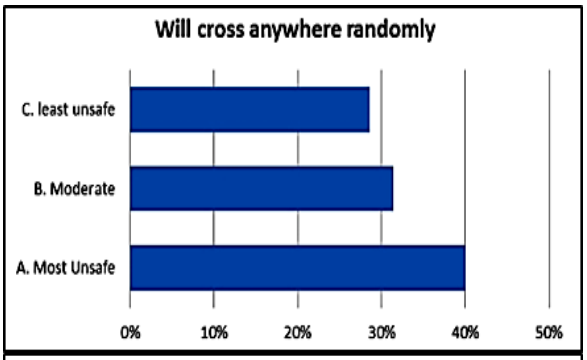


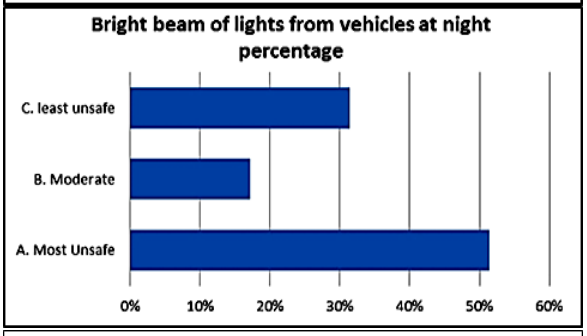


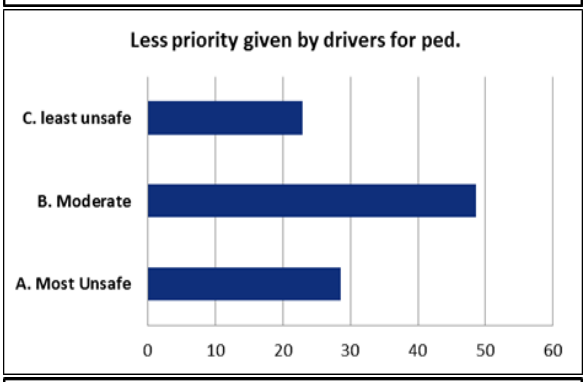


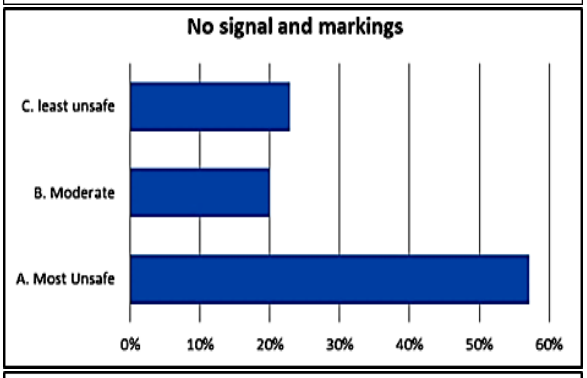
Analysis based on Pedestrian Demand

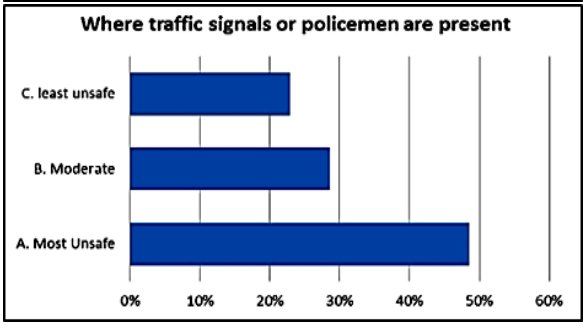
During the survey, in terms of the facilities needed by a pedestrian to cross a selected junction, it was observed that majority of the pedestrian felt absence of the road marking and signals to be the most unsafe followed by the bright light from vehicles at night for about 51%. The detailed information of all the other responses has been provided in the chart given below.











Whereas in terms of assistance needed by traffic signals or the presence of policemen at particular carriageway, it was evident that the tendency of people to cross anywhere summed up to a total of 40%. In spite of that, the urge to need conventional assistance was more supported despite of the pedestrian behaviour to cross anywhere randomly.

V. CONCEPTUAL SOLUTION TO THE PROBLEM

The following are the conceptual elements which were adopted for providing solution considering the standard regulations as shown in the figure:

- Footpaths and pedestrian crossings provided.
- Stop lines and road markings.
- Lane markings with proper alignment and signage wherever necessary.
- Advance directional sign board for location details.
- Road studs, speed controllers such as bump and bollards should be provided as shown below.
- Median and Island can be designed as shown in the following figures.

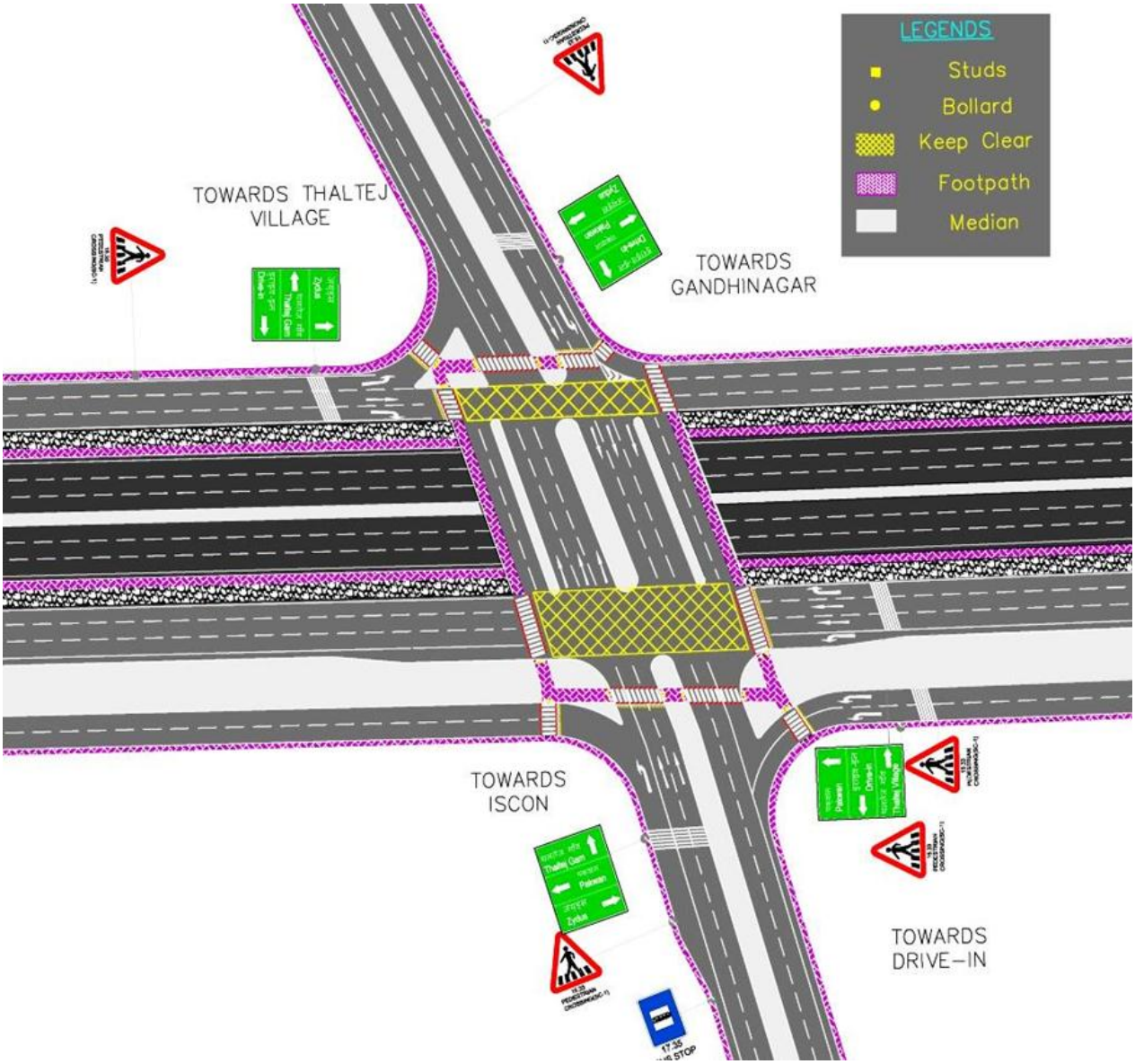


Figure 9 First Alternative

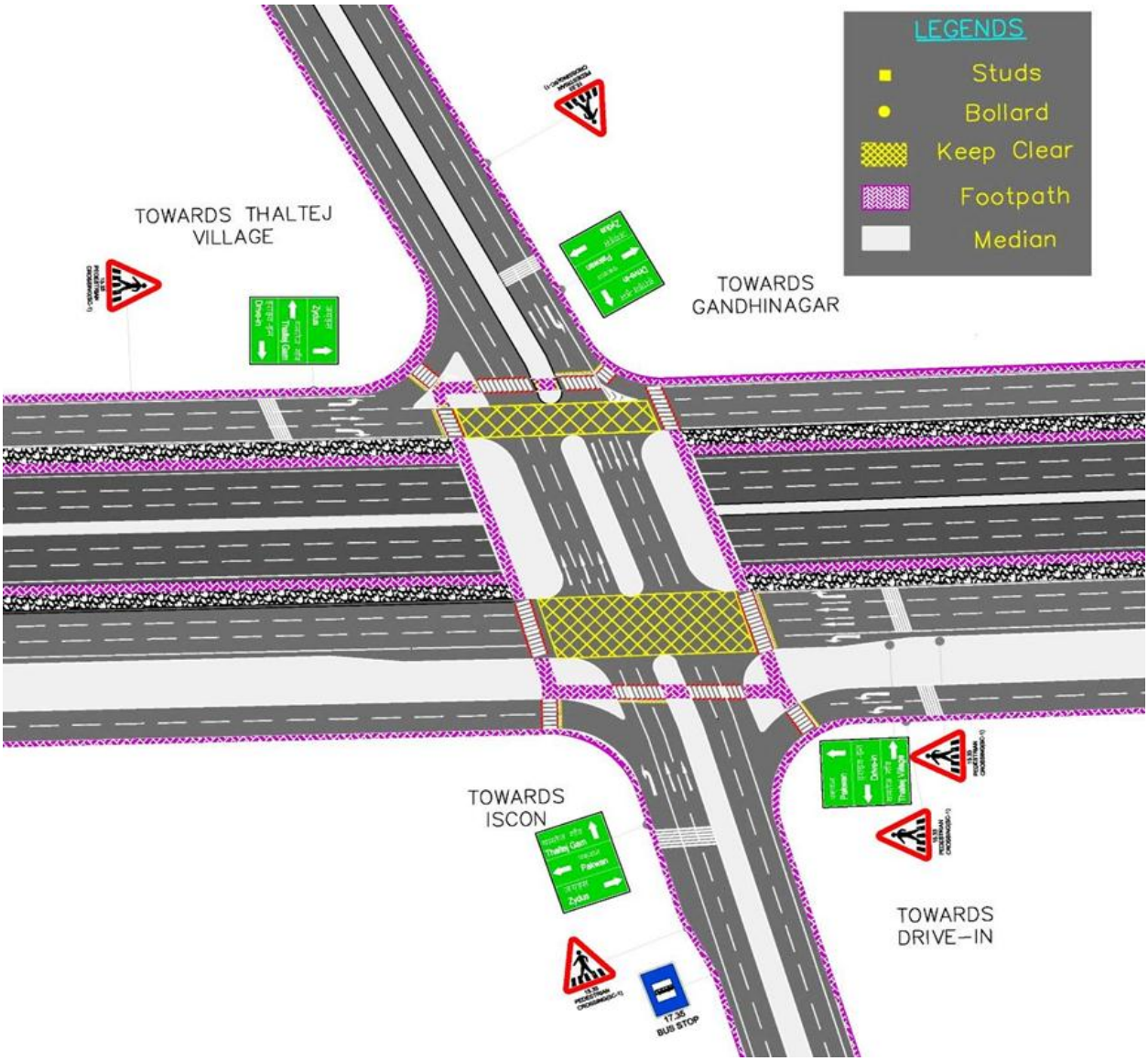


Figure 10 Second Alternative

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