ROAD INTERSECTION RE-DESIGN

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Abstract: This project evaluates issues connected with vehicular movement moving through urban road at intersection. In cities like Kolhapur, which facing many problems such as frequent occurrence of traffic Congestion which result in delay, loss of time, increasing fuel consumption, increasing noise pollution and frequent interruption in traffic flow. Maulicha Putla is one of the busiest intersection in Kolhapur. This intersection faces many problems such as to traffic, collision of vehicles, long queue of number of vehicles due to traffic jam is created improper handling of traffic in peak hour. Improper location of central island (Maulicha Putla) causes there is no use of central island, due to this improper flow of traffic created. Vegetable Market, Bus stand, petrol pump are near to intersection due to this the abundant traffic is approaching to the intersection, so various problems created at intersection. Aim of this is to study of traffic problems rotary intersection at Maulicha Putla, which include site investigation (Pilot survey), measurement present geometry of intersection, followed by traffic volume count which is based onvideo graphic method, data collected at peak hours and volume conversion into PCU value (Passenger Car Unit).

***Key words*:** Central island, peak hour, congestion, flow rate, traffic volume, capacity

1. INTRODUCTION:

Population in the India is increasing tremendously and this is leading to traffic problem as, all people nowadays have started purchasing their own vehicles. This has led the city to be congested on road and on intersection. The traffic at the maulicha putla intersection coming from six roads such as Udyam Nagar Road A, Shahu mill Road B, Rajarampuri1 Road C (one way) road towards intersection, Rajarampuri2 Road D, Ciber Road E, Pratibha Nagar road F. In that the three major roads which have the abundant traffic observed i.e Road A, B, E Along with the Public transport runs the private transport whose number is increasing day by day. Flow of traffic on lane. The study area is within the Rajarampuri Road area of Kolhapur City. Kolhapur is one of the cities of Maharashtra having area 66.82 km2 with population 635000 (census 2022). Growth in percentage of vehicle in 2015-16 (9.06%), 2016-17 (31.54%),2017-18(18%). The rapid growth of transportation activities causing acute traffic problem particularly at intersection due to mix complex flow pattern. It is important to design regulation system for this rotary because efficiency of operation, safety, speed, capacity is directly

governed by design.

1.1 Objectives :

1.To study the factors affecting the design of Intersection.

2.To do comparative study of different types of Intersection and uses as per different scenarios.

3.To select the problem severity intersection in Kolhapur and analyse its performance and study it for working effectively.

4.To study the method of analysis and the performance of Intersections.

5.To compare between current volume carrying capacity with capacity of road and give proper solution.

1.2 Need of Improvement of intersection:

i. At the statue of mauli intersection is located near the main road with main market area, Petrol pump inviting large amount of traffic like Trucks, Private vehicles, Two wheelers,Three wheelers. There are number of temporary vendors occupying the most of the area of intersection due to which there is problems like congestion of traffic or slow down the traffic flow hence there is time delay for vehicles also traffic jam is created.

ii. At intersection the central island (statue of mauli) is at improper place where vehicles cannot circulate about central island so improper traffic flow is created. Due to this the conflict point at the intersection is in higher amount, there are 77 major conflict point, in that 8 crossing and 69 weaving conflict points and 20 minor conflict points. Due to this traffic conjuction or traffic jam is created.

iii. Slow amount of discharge from intersection causes problem. Hence we should provide central island is at centre with allowable shape. And segression of traffic is possible by proper channelization. Thus it is necessary the redesign the intersection for smooth traffic flow.

1.3 Benefits of Rotary Intersection:

i. Direct conflict is avoided.

ii.The turns in rotary intersection can be made for ease.

iii.The rotary best suits for intersection with 4-7 roads/ legs.

iv.The frequent start and stop of vehicles can be avoided.

v. The traffic flow is regulated in one direction of movement, thusreducing the vehicles.

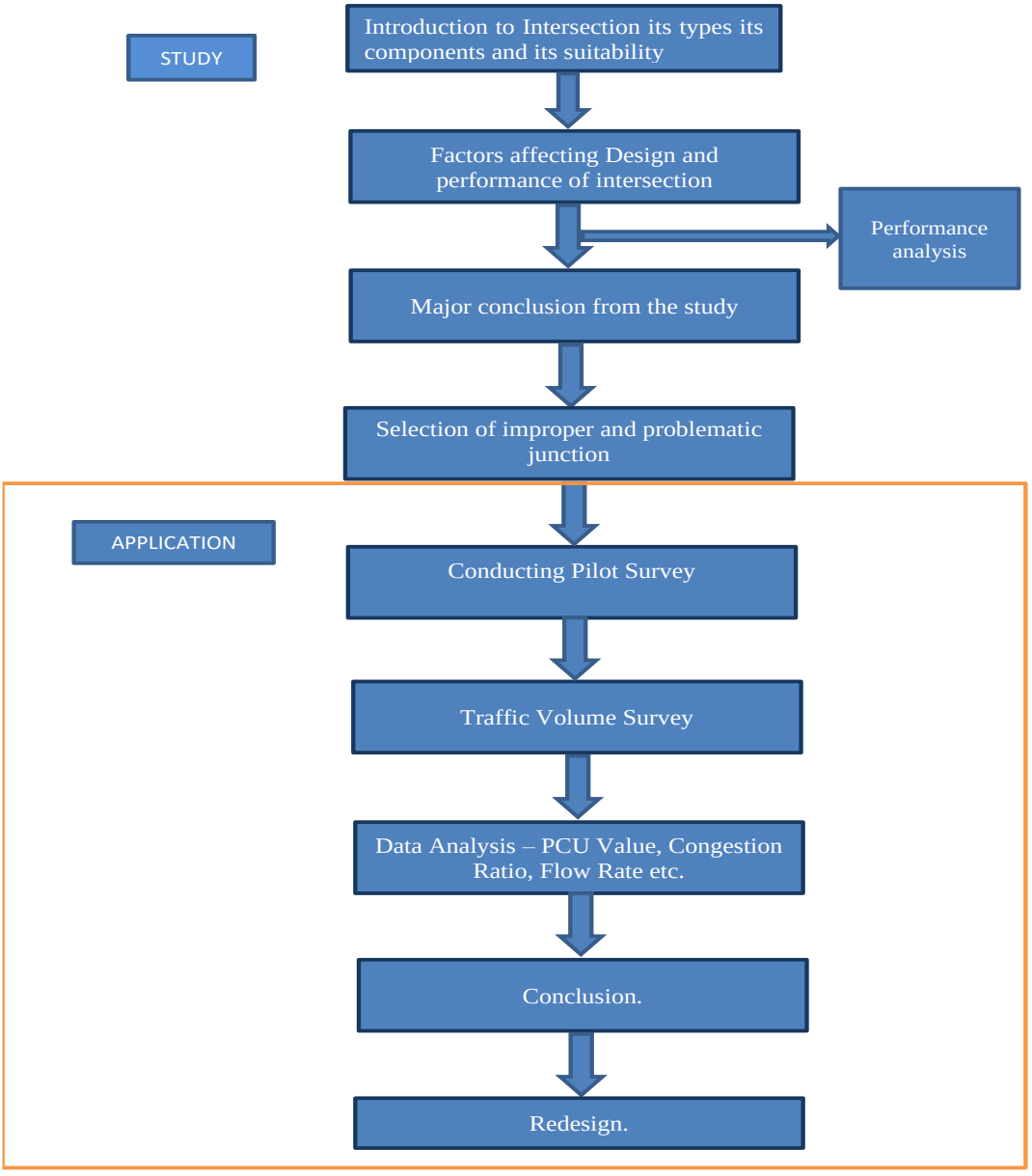
1.4 Concepts used in project:

Various concepts like Geometric survey, Pilot Survey, Traffic Volume Survey, use of various formulas depending on the traffic volume count, Passenger Car Unit method (PCU), Conjuction ratio of traffic, flow rate oftraffic etc.

1.5 Study Area

Fig.1.5.1 Map of Road intersction at v mauli statue

1.6.Methodology:



1.7 Data Collection

1. Geometric Survey

Geometric survey is used to find out the measurements of the roads present at intersection various measurements are found out like widthof each road, different angles in between roads. The geometric survey deals with dimensions and layout of visible features of intersection

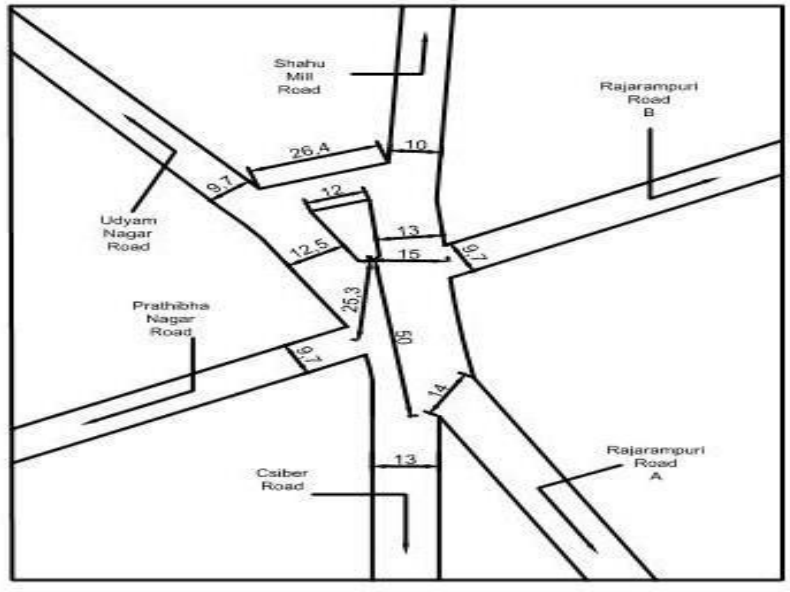
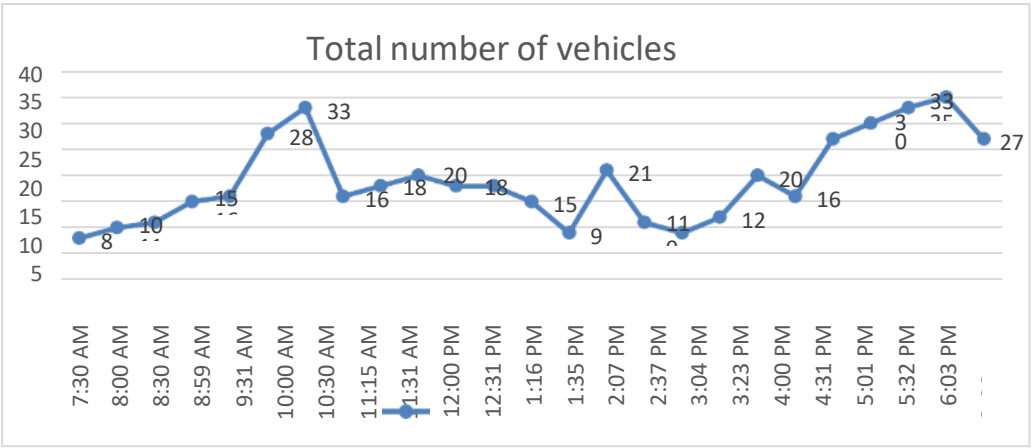


Fig 5.2.1.1: Geometric Measurements of the intersection

2. Pilot survey

We carried out pilot survey at the intersection to get the overview of the traffic flow of the intersection from 7:30 a.m. to 7:30 a.m.



As the graph shows two peak hours so we selected the morning peak hour 10.00 to 11.00 a.m. and evening peak hour 6.28 to 7:28 p.m.

3. Traffic Volume Survey:

The term traffic volume study or survey can be termed as traffic flow survey or simply the traffic survey. It is defined as the procedure to determine mainly the volume of traffic moving on the roads at a particular section during particular time. Traffic volume survey was conducted at week days and weekend. The video graphic method used for data collection. The traffic volume is converted into PCU (Passenger Car Unit). Data obtained after carrying survey in morning peak hours from 10AM to11AM. And evening peak hour from 6pm to 7PM

Following graph represent volume of traffic at intersection of traffic across the rotary intersection by peak hours in morning.

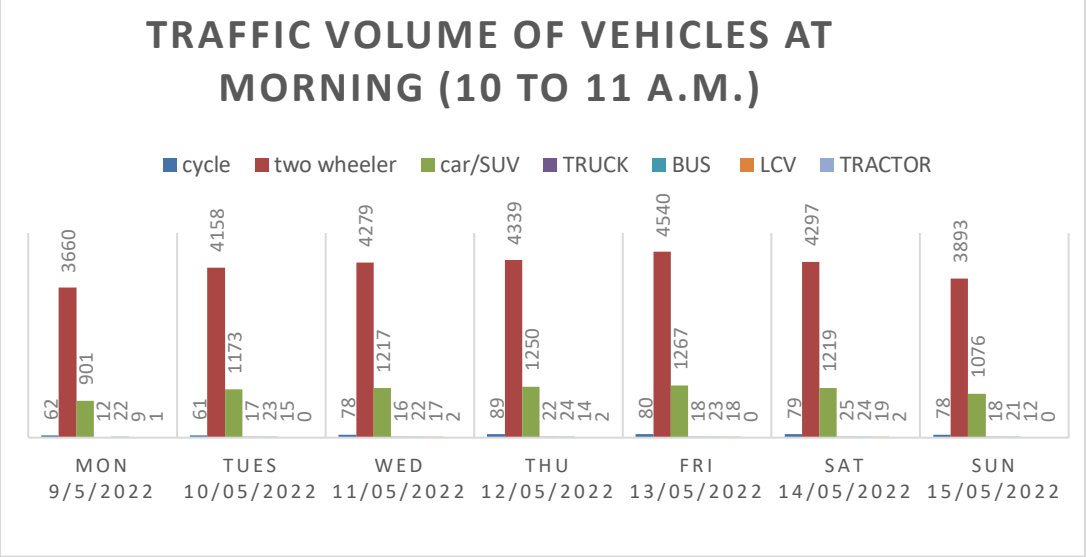


Fig 3.1 Traffic volume of vehicles at morning

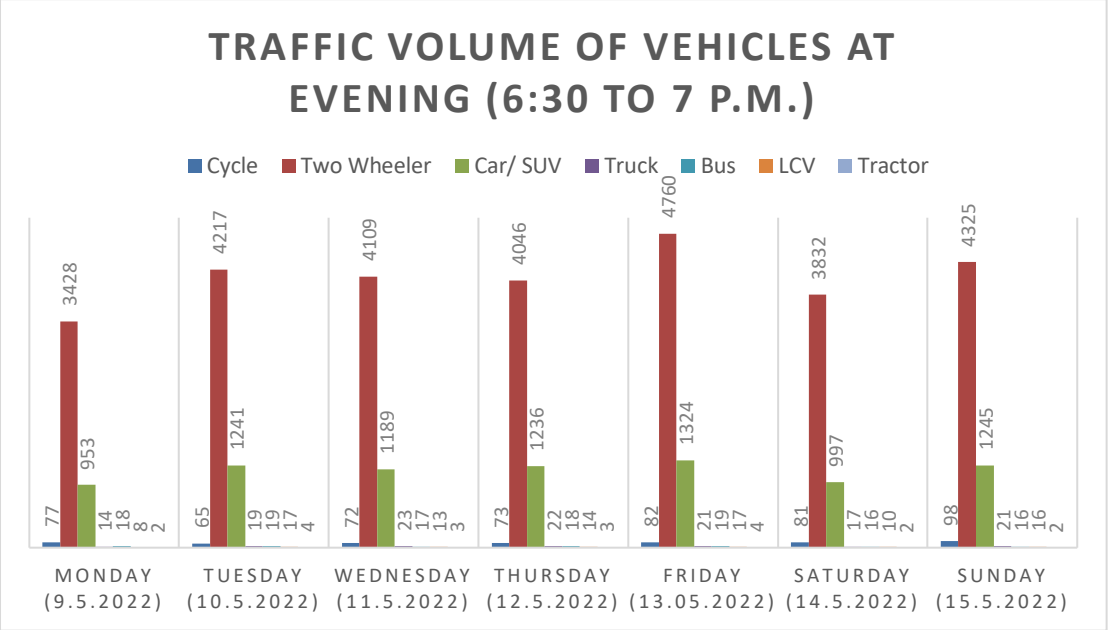


Fig 3.2 Traffic volume of vehicles at Evening

4. Directional Survey

i. Directional flow of traffic is the process in which calculated the vehicles are moving left turn, right turn and straight are calculated.

ii. This is helpful for the calculate the capacity of Rotary or determining the capacity of Rotary and also helpful for the design of signalized Rotary.

iii. This survey conducted for knowing the utility of roads, after that survey we conclude that the traffic at Y-section of intersection was very abundant.

iv. From that survey, we determined the traffic flow at that intersection. In the directional flow survey we found that at Y-intersection the traffic flow was maximum i.e. Road A, B and E.

Sr.	From	To	Morning	Evening
		B) Shahu Mill	107	114
		D)Rajarampuri Road (2)	314	291
		E) SIBER Road	384	374
		F)Pratibha Nagar	104	96
		D)Rajarampuri Road (2)	152	142
		E) SIBER Road	1254	1115
		F) Pratibha Nagar	107	105
		A) Udyam Nagar	45	51
		D) Rajarampuri road (2)	67	72
		E) SIBER Road	234	289
		F) Pratibha Nagar	161	158
		A) Udyam Nagar	334	367
		B) Shahu Mill road	24	27
		E) SIBER road	9	11
		F) Pratibha Nagar	94	104
		A) Udyam Nagar	204	198
		B) Shahu Mill road	148	174
		F) Pratibha Nagar	54	97
		A) Udyam Nagar	455	540
		B) Shahu Mill Road	1198	1378
		D)Rajarampuri Road	34	46

		(2)		
		A) Udyam Nagar	74	81
		B) Shahu Mill Road	261	240
		D) Rajarampuri road (2)	43	54
		E) SIBER Road	87	78
		C) Rajarampuri (1)	21	19

Fig. 4.1 Directional flow of traffic

5. Data Analysis

Shahu Mill to Rajarampuri (1) (B - C) =QP B-C = 2978 PCU/hr. capacity of road B.
Rajarampuri (1) Road to Rajarampuri(2) Road (C- D) =QP C-D 2456.11 PCU/hr. Capacity of Road C.
Rajarampuri (2) Road to CSIBER Road (D-E) =QP D-E 2963.52 PC
CSIBER Road to Pratibha Nagar Road (E-F)=QP E-F 2801.56 PCU/hr. Capacity of Road E.
Pratibha Nagar Road to Udyam Nagar (F-A)= QP F-A 2325 PCU/hr. Capacity of Road F.
The capacity of intersection is the maximum of the capacity of all the weaving section. As observed from the above results that the maximum capacity of the intersection is 2325 PCU/hr. and total traffic entering the intersection is 3567 PCU/hr in morning peak hour and 3394 PCU/hr in eveing peak hour.
According to IRC, Rotary can handle the traffic upto 3000 PCu/hr efficiently.

6. Flow rate survey

This survey was carried out during the selected peak hours. We take survey on three major roads of intersection where major traffic observed during traffic volume survey. Hence, we select the three roads such as CSIBER road, Shahu Mill Road, Udyam Nagar road.
Existing Flow Rate (Time) for CSIBER Road to Shahu Mill Road 1:10:00 (70 sec.)
Existing desing Time = Distance km /Speed km/hr= 0.280/20 *60* 60 = 50.4 sec.
For csiber road to shahu mill road design speed for pass the one vehicle from intersection is 50.4 sec but, required time taken by one vehicle was 70 sec but due to congection at intersection, there were 19.6sec time delay for a vehicle.
For udyam nagar road to csiber road existing time= 62.26, and from design speed of time 49.5, time delay= 12.76sec
For csiber road road to udyam nagar existing time= 57.72, and from design speed of time 49.5, time delay= 8.22sec
For shahu mill to csiber road existing time= 62.30, and from design speed of time 50.4, time delay= 11.9sec

6.1 Conjunction ratio

Congestion ratio is the proportion of Total Volume (PCU/hr.) to the capacity of rotary intersection.

For Road (A) Total Volume of Road Capacity of Intersection = 536/ 2325= 0.23

For Road (B) 0.331, For Road (C) 0.20, For Road (D) 0.10, For Road (E) 0.51, For Road (F) 0.10

Conclusion: The traffic at road A, B and E has the maximum. So, road A, B and E is the congested road where all types ofvehicles approaching towards intersection. Hence, we have to design at Y-section.

3. Result

PCU value at Road A = 730.4¯ +1026.7 =1757.11 PCU/hr.	**Road A = Existing volume at road A (PCU/hr.) and capacity ofthat road. Road A = 1757.11 < 2486 PCU/hr. OK**
PCU value at Road B = 1315¯ + 1026.7 = 3112 PCU/hr.	Road B = 3112.7 > 2978 PCU/hr. We need to enlarge width of road for quick clearance of vehicles and also need to increasing capacity of road.
PCU value at Road C = 776 = 776 PCU/hr. PCU value at Road D = 413.9¯ + 516.8 = 930.75 PCU/hr.	Road C = 776 < 2456.11 PCU/hr Ok Road D = 930.75 < 2963.52 PCU/hr Ok
PCU value at Road E = 1545.7¯ + 1648.8 = 3194 PCU/hr.	Road E = 3194 > 2801.56 PCU/hr We need enlargement of width of road for quick clearance of vehicles and also need to increasing capacity of road.
PCU value at Road F = 511.7 + 344.5 ¯ = 956.3 PCU/hr.	Road F = 956.3 < 2325 PCu/hr…..ok

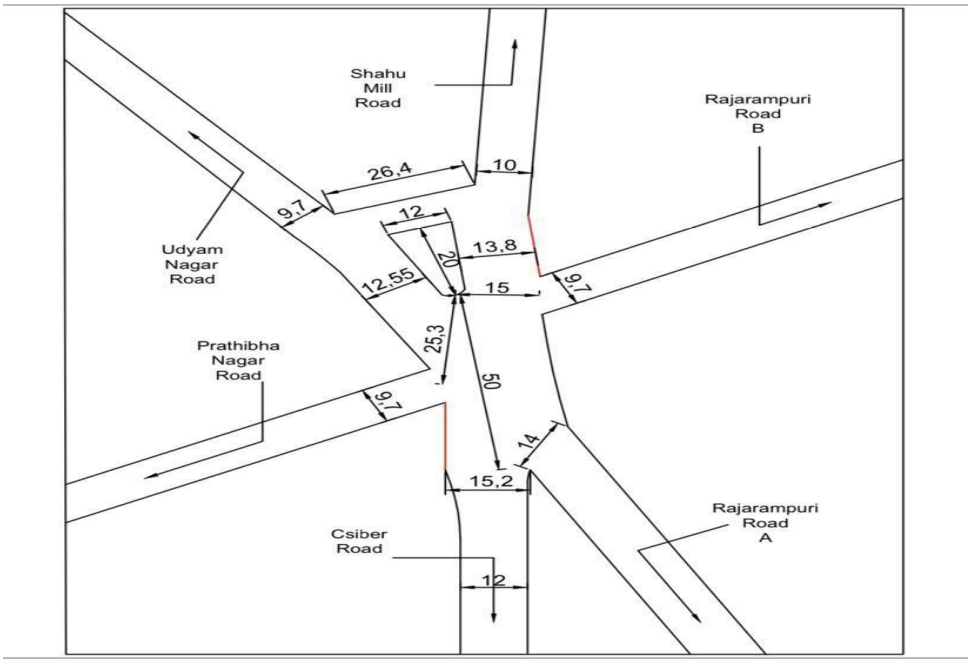
Table 3.1 Comparison of existing PCU value and essential PCU value

Existing Width	**Essential Width**
For Road B	
Entry width = 5.5 m Exit width = 7.5 m Total width = 13 m	Entry width = 5.8 m Exit width = 8 m Total width = 13.8 m

For Road E	
Entry width = 5.5 m Exit width = 7.5 m Total width = 13 m	Entry width = 6.5 m Exit width = 8.7 m Total width = 15.2 m

Table 3.2 Comparison of existing width and essential width.

3.1 Design of Designed Intersection



3.2 Proposals for Designed Intersection

i. Signals present at intersection should be operational

ii. Temporary venders should be relocated

iii. Space should be space for parking of vehicles

iv.The Road B and Road E width should be increased

4. Conclusion

i.The number of vehicles ae more at peak hour i.e, at 10.00 to 11.00 a.m. and evening peak hour 6.28 to 7:28 p.m.

ii. From that survey, we determined the traffic flow at that intersection. In the directional flow survey we found that at Y-intersection the traffic flow was maximum i.e. Road A, B and E.

iii. The traffic at road A, B and E has the maximum. So, road A, B and E is the congested road where all types of

vehicles approaching towards intersection. Hence, we have to design at Y-section.

iv.From study it is seen that the intersection redesign can increases the capacity of intersection for upcoming traffic flow.

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