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TO STUDY OF INFRASTRUCTURE MANAGEMENT FOR SIGNAL FREE MOVEMENT

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Abstract- ***Nearly all road traffic consists of mixed traffic in the existing situation, i.e. the blend of Non-Motorized and Motorized Traffic. Mixed traffic has a major impact on the dynamics of the traffic stream. The cars that can drive with the strength of human beings or livestock are non-motorized vehicles. Non-motorized vehicles include motorcycles, rickshaws, hand-drawn vehicles, pull-carts, etc. Motorized vehicles are such vehicles that are driven by motors. Medium motor vehicles and heavy motor vehicles are classified into motorised vehicles. Auto rickshaws, jeeps, buses, motorcars, three-wheeler conveyance vans and so on compose of small motorised automobiles. Motorcycles do not qualify within this group. Heavy motorised vehicles consist of vehicles with wheel numbers exceeding six wheels.***

I. INTRODUCTION

In the current situation, almost all road traffic consists of mixed traffic, i.e. the combination of Non-Motorized and Motorized Traffic. Mixed traffic has a major impact on the traffic stream's dynamics. Non-motorized vehicles are cars that can drive with the strength of human beings or animals. Motorcycles, rickshaws, hand-drawn vehicles, pull-carts and so on are non-motorized vehicles. Those vehicles that are powered by engines are motorised vehicles. Medium motor vehicles are classified into motorised vehicles as well as heavy motor vehicles. Small motorised vehicles consist of auto rickshaws, jeeps, buses, motorcars, three-wheeler conveyance vans and so on. Within this group, motorcycles do not qualify. Strong motorised vehicles are made of vehicles with a wheel count greater than six. Coaches, lorries, and trucks, etc. are part of this heavy motorised equipment. According to a World Bank survey, around 50 percent of non-motorized vehicles are present in South Asian countries such as India and Bangladesh. Non-motorized vehicles like bicycles and rickshaws are responsible for the maximum number of rides generated during peak hours in Bangladesh. The presence of non-motorized vehicles impacts the capability of the section. As the capacity of non-motorized vehicles increases, the overall capacity of the section will be reduced and the protection of the total flow and the decrease in energy supply will be affected (petrol, diesel etc.). In order to reduce the effects of non-motorized vehicles, there should be a special track for non-motorized vehicles such as in the U.S.A. or else adequate analysis should be performed on non-motorized vehicles and their impact on the traffic stream.

B. OBJECTIVE

1) To identify the key factor's for management of infrastructure from various journals, paper, books articles and etc.
2) To study and collect data from various site for signal free movement for infrastructure management.
3) To analyze and identify the different factors to be consider for infrastructure managements for signal free of movements.
4) To provide practical's suggestions, recommendation and discussion for signal free movements for infrastructure managements.

II. PROBLEM STATEMENT

A.STUDY AREA - BHAKTI – SHAKTI JUNCTION

- Low visibility due to existing rotary traffic, which leads to accidents?
- Deficient Geometry of Junction
- Because of the rotary form, it takes more time to weave right turning larger trucks from Bhosri directions, contributing to more traffic delays at the junction.
- Traffic from Mumbai to Pune would pause twice in the overall signal time, which often contributes to a gap in traffic.

B. TRAFFIC SURVEY FOR BHAKTI – SHAKTI JUNCTION

Table 1 PCU Values As suggested in IRC: 106 – 1990

Vehicle Type	Equivalent PCU Factors

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	Percentage Composition of Vehicle Type in Traffic Stream	
	0 - 10%	10% & above
Two Wheeler	0.50	0.75
Auto	1.00	2.00
Car/Jeep/Van/Taxi	1.00	1.00
Mini Bus	3.00	2.00
School Bus	3.00	3.70
Govt Bus/Pvt Bus	3.00	3.70
Pvt Bus	3.00	3.70
Mini LCV/Max Pickup	1.00	1.00
LCV	3.00	2.00
2 Axle	3.00	3.70
3 Axle	3.00	3.70
MAV	3.00	3.70
MAV (>6 Axles)	3.00	3.70
Tractor + Trailers	4.00	5.00
Heavy Machinery	3.00	3.70
Cycle	0.40	0.50
Cycle Rickshaw	1.50	2.00
Animal/ Hand Drawn	2.00	3.00

Table 2 Traffic Survey at Bhakti – Shakti Junction

Approach	Direction	Peak Hour Traffic		% of total PCUs	Type
		Vehicles	PCUs		
Pune	Pune to Mumbai	1,628	2,046	16%	Through
	Pune to Bhosri	1,679	1,687	13%	Right
	Pune to Akurdi	531	446	3%	Left
Mumbai	Mumbai to Pune	859	957	7%	Through
	Mumbai to Bhosri	869	752	6%	Left
	Mumbai to Akurdi	710	729	6%	Right
Bhosri	Bhosri to Pune	581	726	6%	Left
	Bhosri to Mumbai	1,055	1,810	14%	Right
	Bhosri to Akurdi	1,484	1,403	11%	Through
Akurdi	Akurdi to Pune	337	258	2%	Right
	Akurdi to Mumbai	263	208	2%	Free
	Akurdi to Bhosri	1,530	1,850	14%	Through
	Total	11,522	12,871	100%	

- Peak Hour (Morning and Evening) Turning Movement Count on Bhakti - Shakti and Transport Nagar Junction
- Two days traffic data was analyzed to identify peak hour traffic
- There are two peak hours at Bhakti - Shakti Junction as morning peak from 9:00AM to 10:00AM and evening peak from 6:00PM to 7:00PM.
- Morning peak has 8.856 Vehicles (9,480 PCUs) while evening peak has 11,572 vehicles (12,876 PCUs).

Table 3 Traffic Survey At Transport Nagar Junction

Approach	Direction	Peak Hour Traffic		% of total PCUs
		Vehicles	PCUs	
Pune	Pune to Transport Nagar	680	795	11%
	Pune to Mumbai	2,615	3,269	44%
Mumbai	Mumbai to Transport Nagar	75	104	1%
	Mumbai to Pune	2,139	2,396	32%
Transport Nagar	Transport Nagar to Pune	32	42	1%
	Transport Nagar to Mumbai	833	827	11%
	Total	6,374	7,433	100%

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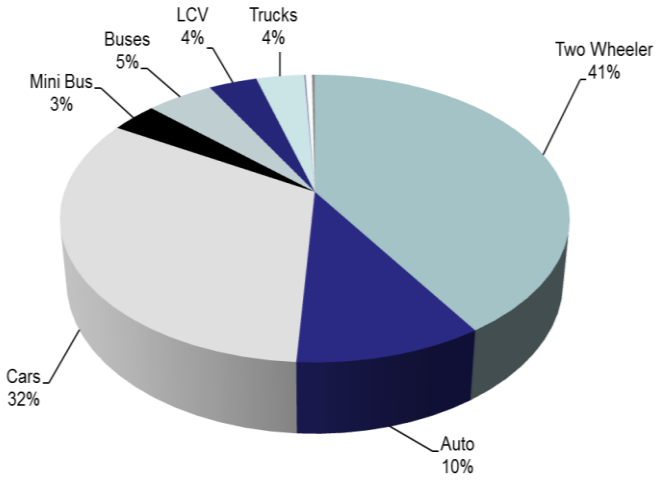

Fig 1 Traffic Composition Bhakti-Shakti Chowk

III. PROBLEM SOLUTION

A. SOLUTION OF STUDY AREA - BHAKTI – SHAKTI JUNCTION

(B. G. Shirke construction Technology Pvt. Ltd)

Bhakti Shakti Chowk, the gateway to Pimpri Chinchwad City from the old Pune-Mumbai Highway, is situated at the intersection of Pune-Mumbai Highway and Spine Road. The Pimpri Chinchwad Municipal Corporation (PCMC) has started the construction work of a grade separator and a revolving flyover at this chowk in order to ensure smooth traffic flow. At the intersection of Pune-Mumbai Highway and Spine Road in Nigdi, The Chowk is situated. From Dehu Road and other areas, vehicles driving along the Pune-Mumbai Highway reach the civic boundary at Nigdi via the junction towards Pune or Pimpri Chinchwad. The civic body has initiated the construction of the Bhakti Shakti Chowk-Mukai Chowk BRTS road, which will further increase traffic through the junction.

B. BHAKTI SHAKTI FLYOVER

Table 4 Contract Details & Scope of Work In Brief

A)	***CONTRACT DETAILS :-***	
01.	Name of the Project	Construction of Grade Separator and Flyover at Bhakti Shakti Chowk, Nigdi
02.	Name of Client	Pimpri Chinchwad Municipal Corporation, Pimpri.
03.	Name of Consultant	STUP Consultants Pvt. Limited
04.	Name of Contractor	M/s. B. G. Shirke Construction Technology Pvt. Ltd.
05.	Contract Value	Rs. 72,40,10,124/- (Lump-Sum)
		Rs. 18,13,48,968/- (Utility / Royalty)
	Total	Rs. 90,53,59,092/-
06.	Work Order No.	स्था/लेखा/१/१५१३/२०१७, दिनांक २७.०६.२०१७
07.	Completion Period	30 months (Including monsoon)
08.	Contractual Completion Date	26.12.2019
09.	Extension of Time	31.08.2020

B)	***SCOPE OF WORK IN BRIEF:-***		
Sr. No.	**Particulars**	**Unit**	**Qty**
A)	**Main Flyover**		
01	Total Length of Bridge	Mtr.	951.97
02	No. of Box Girder	No.	18.00
03	Solid Approach		
i)	Pune	Mtr.	149.12
ii)	Mumbai	Mtr.	217.85
B)	**Rotary**		
	Diameter (Outer / Inner)	Mtr.	84 / 60
	Connecting Approach Ramp	Nos.	8.00
C)	**Grade Separator**		
	Total Length	Mtr.	560.00
	Width	Mtr.	27 - 28.6
D)	**Akurdi Overpass**		
	Total Length	Mtr.	368.53
	a) Via Duct Portion	Mtr.	80.00
	b) Solid Approach		
	i) Akurdi side (A4 Ramp)	Mtr.	138.81

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	ii) Bhosari Side (A3 Ramp)	Mtr.	157.72
	c) Carriageway Width	Mtr.	8.50
E)	**Pedestrian Underpass (PUP)**	Nos.	4.00
F)	**Service Road**	Mtr.	1,490.00

C. DESIGN PLAN OF BHAKTI – SHAKTI JUNCTION

Fig 2 Design Plan of Bhakti – Shakti Junction

PHASE – 01

- 4 Phases signal are proposed
- Free left with single pedestrian phase is proposed
- Raised Zebra crossing is proposed (at the same level of Footpath)

Fig 3 Phase – 01

PHASE – 02

- 4-Lane flyover at first level is proposed along Mumbai-Pune highway.
- Present Traffic that would use flyover is 3003 PCUs (2487 Vehicles)
- Roundabout is proposed at ground level.
- Radius of central island is 30.0m
- Free left with single pedestrian phase is proposed
- Raised Zebra crossing is proposed (at the same level of Footpath)
- As per IRC-65-1976, the maximum traffic that a traffic rotary can handle in single hour is 3000 vehicles.
- The present vehicles that would remain on ground is 9035.

Fig 4 Phases – 02

D. PROJECT EXECUTION IN PROGRESS

Fig 5 Bhakti – Shakti Junction under construction
(B. G. Shirke construction Technology Pvt. Ltd)

- As Option – 3 has only 19 per cent traffic conflict, hence it is best recommended option
- Option – 4 has about 27 per cent traffic conflict.
- Also first level traffic Rotary would be used by 4876 vehicles (5419 PCUS), which is more than 3000 PCUs.
- As per IRC-65-1976, maximum traffic that rotary can handle efficiently is up to 3000 vehicles

Cost Estimate

Sr. No:	Component	Block Cost in Crore

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1	Flyover (Mumbai Pune)	37 Cr
2	Vehicular Underpas (Bhosari to Akurdi)	21 Cr
3	ElvatedRotary with Ramp and PUP	20 Cr
4	Vehicular Overpass	6 Cr
5	Nalla diversion	0.65 Cr
6	Nalla training	
7	At grade slip roads	

IV, CONCLUSION

A. FOR BHAKTI – SHAKTI JUNCTION

As Option – 3 has only 19 per cent traffic conflict, hence it is best recommended option. Option – 4 has about 27 per cent traffic conflict. Also first level traffic Rotary would be used by 4876 vehicles (5419 PCUS), which is more than 3000 PCUs. As per IRC-65-1976, maximum traffic that rotary can handle efficiently is up to 3000 vehicles

D. RECOMMENDATIONS

But providing rotary will not be sufficient to manage traffic at an intersection efficiently. Some solutions are required to reduce congestion at junction. Possible solutions are shown below.

i) Providing 2nd level flyover
ii) Providing Service Roads
iii) Providing Overpass

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