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''TRAFFIC SIGNAL DESIGN AT GRADE INTERSECTION'' (NASIK CITY) STUDY AREA: CANADA CORNER-CHATRAPATI CHWOK-WAVRE CHWOK

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Abstract: Cities are the engines of economic growth. Transportation infrastructure plays a vital role for the development of cities. This also backbone of the city & nation. The unprecedented growth of population coupled with level of urbanization causes for the increase in number & size of cities. The major concentration of population & vehicles in million cities aggravates the problems in study in the study area. As a part of development of nation there is development in all sectors such as infrastructure, commercial, & agriculture etc. but one of the major development is in our transportation system. Due to increase in high income group public can offered more no of vehicles causing tremendous vehicle load on the road network forming intersection at many point causing conflict movement of vehicles at such a point. For that purpose we have conducted volume count survey & tried to design traffic signal at intersection mentioned above. From this study we have calculated cycle time, red period, green period, yellow period & camber period for each intersection on the basis of vehicular volume count at each intersection mentioned above. These traffic signals will definitely assist vehicle load for orderly movement.

Keywords: Signal, Intersection, Volume count survey, Phase design, cycle time.

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INTRODUCTION

Urbanization can be defined as a concentration of people in a geographic area who can support themselves from the city's economic activities on a fairly permanent basis. The city can be center of industry, exchange, education, government, religious activity, tourism, or involve all these activities. These diverse areas of opportunity attract people from rural area/smaller towns/other cities to the cities where the opportunities' and life style quality match their aspirations. Urban areas have many obvious faults insofar as their services to people are concerned. They can be overcrowded, contain large amounts of substandard housing, be polluted (air, noise, environmental), be centers of unemployment, and have vested interest groups. Taxation tends to be high and services less than adequate. However, with all of these faults, urban areas are here to stay. The charge to planners, at all levels, public and private, is to find ways of making these essential elements in our social system work better, more efficiently and thus make our cities better places to live in.

Traffic Signals are one of the more familiar types of intersection control. Using either a fixed or adaptive schedule, traffic signals allow certain parts of the intersection to move while forcing other parts to wait, delivering instructions to drivers through a set of colorful lights (generally, of the standard red-yellow (amber)-green format). Some purposes of traffic signals are to (1) improve overall safety, (2) decrease average travel time through an intersection, and (3) equalize the quality of services for all or most traffic streams. Traffic signals provide orderly movement of intersection traffic, have the ability to be flexible for changes in traffic flow, and can assign priority treatment to certain movements or vehicles, such as emergency services. However, they may increase delay during the off-peak period and increase the probability of certain accidents, such as rear-end collisions. Additionally, when improperly configured, driver irritation can become an issue.

At intersection where there are a large number of crossings and right turn traffic, there is possibility of several accidents as there cannot be orderly movement. The earlier practice has been to control the traffic by means of traffic police by showing stop signs alternately at the cross roads so that one of the traffic streams may be allowed to move while the cross traffic is stopped. Thus the crossing streams of traffic flow are separated by time, segregation. Traffic signals are control devices which could alternately direct the traffic to stop and proceed at intersection using red and green traffic light signals automatically. The main requirement of traffic signals are to draw attention, provide meaning and time respond and to have minimum waste of time.

II. DETAILS AND DESIGN OF INTERSECTION

We have selected the major arterial route of Nasik city with three intersection one after another. There were tremendous flow of the vehicles on the road causing conflicts & congestion at the three inter sections Canada corner, Wavare chowk, Chhatrapati chowk. Vehicles were have to wait to pass over the intersection. There were some cases of accidents also reported. Local public give an idea about the daily load on the roads & troubles cause to the road user due to laciness of efficient signaling. Signals were seen to be not working. Thus we have tried to design the intersections by determining the cycle length time, green time, red time, and amber time of each intersection's traffic signals by collecting traffic volume count data at each intersections at following points: 1. Canada Corner 2.Chatrapati chowk 3. Wavare chowk

This intersections are crowded with a huge daily traffic causing congestion of the vehicles at that point resulting in delay and inconvenience to the users of it. Thus we have conducted Traffic volume count survey and have design this signals according to the data collected.

1. Volume count survey:

The most important point measurement is the vehicle volume count. Data can be collected manually or automatically. In manual method, the observer will stand at the point of interest and count the vehicles with the help of hand tallies. Normally, data will be collected for short interval of 5 minutes or 15 minutes etc. and for each types of vehicles like cars, two wheelers, three wheelers, LCV, HCV, multi axle trucks, non-motorized traffic like bullock cart, hand cart etc.

Modern methods include the use of inductive loop detector, video camera, and many other technologies. These methods helps to collect accurate information for long duration. In video cameras, data is collected from the field and is then analyzed in the lab for obtaining results. Radars and microwave detectors are used to obtain the speed of a vehicle at a point.

We have adopted manual method for our survey. One of the fundamental measures of traffic on a road system is the volume of traffic using the road in a given interval of time.it is also term as flow and it is express in vehicles per hour or vehicles per day. When the traffic is composed of number of types of vehicles, it is the normal practice to convert the flow into equivalent passenger car unit (PCU'S), by using certain equivalency factors. The flow is expressed as PCU/hr. or PCU/day.

2 PHASE DESIGN:

The objective of phase design is to separate the conflicting movements in an intersection into various phases, so that movements in a phase should have no conflicts. If all the movements are to be separated with no conflicts, then a large number of phases are required. In such a situation, the objective is to design phases with minimum conflicts or with less severe conflicts. There are five phase signals, six phase signals etc. They are normally provided if the intersection control is adaptive, that is, the signal phases and timing adapt to the real time traffic conditions

3 DESIGN STEPS FOR INTERSECTIONS:

The signal design procedure involves six major steps which are as follows,

(1) Determining phases of intersections

(2) Pedestrian crossing requirements (pedestrian clearance interval)

(3) Determining and applying the corrections for left and right turning vehicles

(4) Determination of amber time, clearance time and lost time

(5) Determination of cycle length

(6) Apportioning of green time, Red time.

III. RESULT AND DISCUSSION

1 Volume count data at Canada Corner:

Table 1: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	Cycle	Pedestrian	Total
	Left(W)	54	30	9	11	8	2	28	25	41	208
N	Straight(S)	65	43	18	5	6	4	29	31	54	255
	Right(E)	53	35	13	7	7	6	26	28	33	208
	Total vh/hr	172	108	40	23	21	12	83	84	128	671
	Pcu Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	86	108	60	17.25	63	36	83	42		495.25

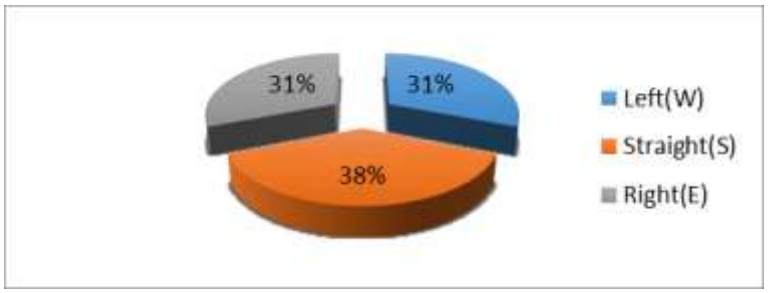

Figure 1: Percentage wise turning movement

Table 2: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	Cycle	Pedestrian	Total
	Left(N)	39	27	6	5	1	3	10	13	57	161
E	Straight(W)	156	65	14	15	11	8	12	29	55	365
	Right(S)	94	69	16	12	6	10	8	16	47	278
	Total vh/hr.	289	161	36	32	18	21	30	58	159	804
	Pcu Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	144.5	161	54	24	54	63	30	29		559.5

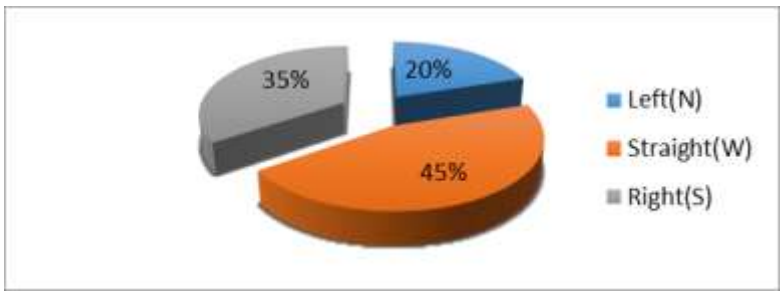

Figure 2: Percentage wise turning movement

Table 3: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	Cycle	Pedestrian	Total
	Left(E)	52	49	3	7	5	5	11	6	21	159
S	Straight(N)	55	45	7	4	2	2	8	8	40	171
	Right(W)	69	52	13	14	7	8	12	7	19	201
	Total vh/hr.	176	146	23	25	14	15	31	21	80	531
	PCU Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	88	146	34.5	18.75	42	45	31	10.5		415.75

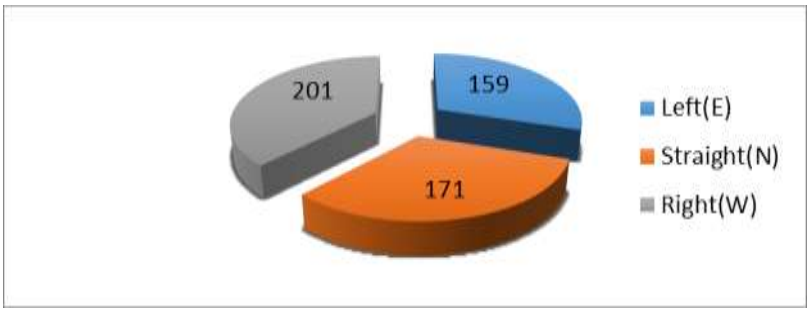

Figure 3: Percentage wise turning movement

Table 4: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	Cycle	Pedestrian	Total
	Left(S)	95	45	12	7	7	7	9	36	57	275
W	Straight(E)	89	41	12	11	11	11	9	40	43	267
	Right(N)	58	47	14	14	7	7	6	23	45	221

	Total/hr.	242	133	38	32	25	25	24	99	145	763
	Pcu Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	121	133	57	24	75	75	24	49.5		558.5

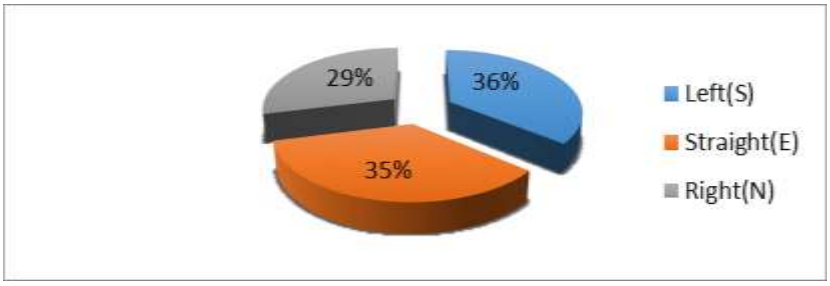

Figure 4: Percentage wise turning movement

2. Volume count data at Chatrapati Chowk:

Table 5: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	Cycle	Pedestrian	Total
	Left(W)	104	50	7	7	0	2	71	46	78	365
N	Straight(S)	174	114	11	17	12	13	80	25	71	517
	Right(E)	101	115	5	10	0	6	75	50	50	412
	Total vh/hr.	379	279	23	34	12	21	226	121	199	1294
	Pcu Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	189.5	279	34.5	25.5	36	63	226	60.5		914

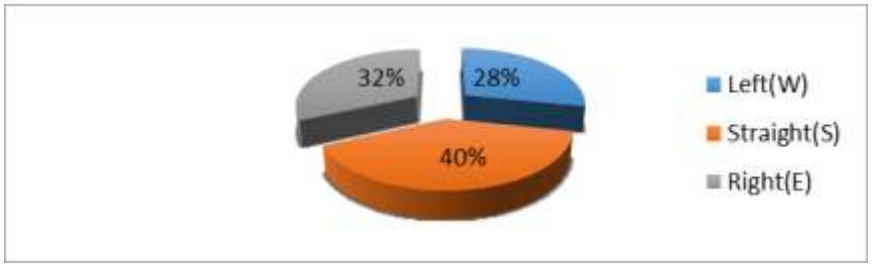

Figure 5: Percentage wise turning movement

Table 6: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	Cycle	Pedestrian	Total
	Left(N)	119	98	0	9	1	1	74	62	105	469
E	Straight(W)	67	52	2	12	3	5	84	57	92	374
	Right(S)	98	56	16	23	7	5	76	67	88	436
	Total vh/hr.	284	206	18	44	11	11	234	186	285	1279
	Pcu Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	142	206	27	33	33	33	234	93		801

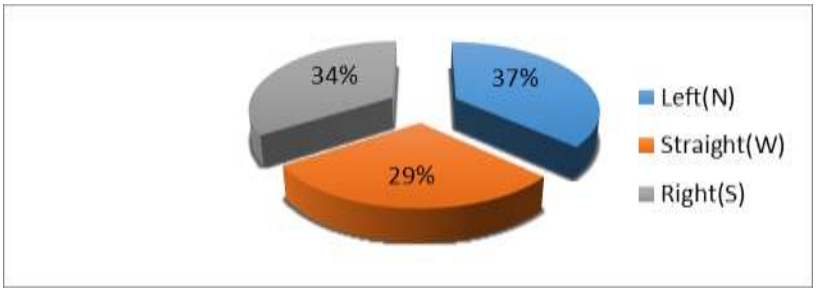

Figure 6: Percentage wise turning movement

Table 7: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	Cycle	Pedestrian	Total
	Left(E)	107	80	0	13	0	3	104	68	75	450
S	Straight(N)	114	72	15	28	11	11	96	65	95	507
	Right(W)	111	102	0	15	0	0	75	44	60	407
	Total vh/hr.	332	254	15	56	11	14	275	177	230	1364
	Pcu Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	166	254	22.5	42	33	42	275	88.5		923

Table 8: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	Cycle	Pedestrian	Total
	Left(S)	68	57	5	10	0	0	60	69	108	377
W	Straight(E)	67	60	0	0	9	0	61	62	116	375
	Right(N)	78	57	8	16	0	0	56	49	78	342
	Total /hr.	213	174	13	26	9	0	177	180	302	1094
	Pcu Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	106.5	174	19.5	19.5	27	0	177	90		613.5

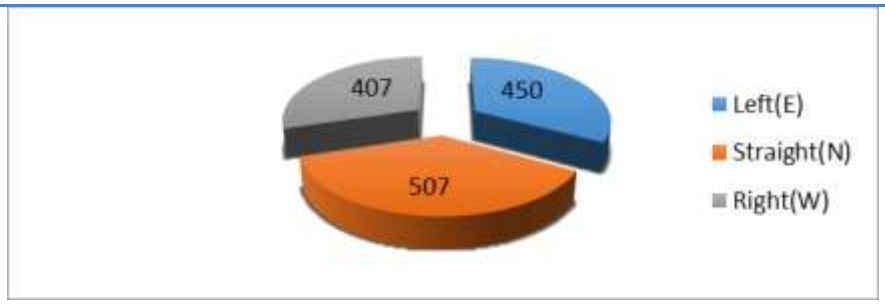

Figure 7: Percentage wise turning movement

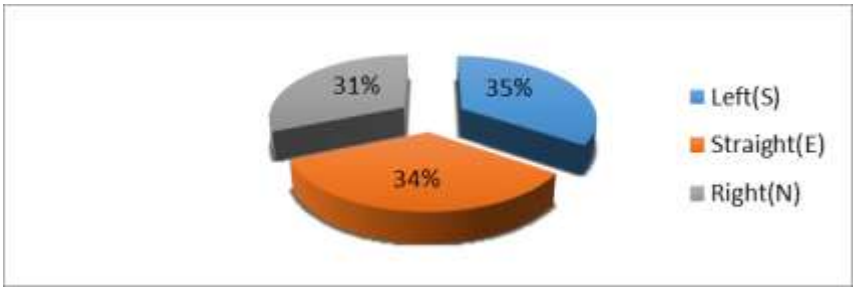

Figure 8: Percentage wise turning movement

3. Volume count data at Wavare Chowk:

Table 9: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	Cycle	Pedestrian	Total
	Left(W)	92	73	7	7	14	9	80	15	44	341
N	Straight(S)	91	92	11	9	6	6	74	14	38	341
	Right(E)	96	69	10	6	10	7	60	15	42	315

	Total/hr.	279	234	28	22	30	22	214	44	124	997
	Pcu Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	139.5	234	42	16.5	90	66	214	22		824

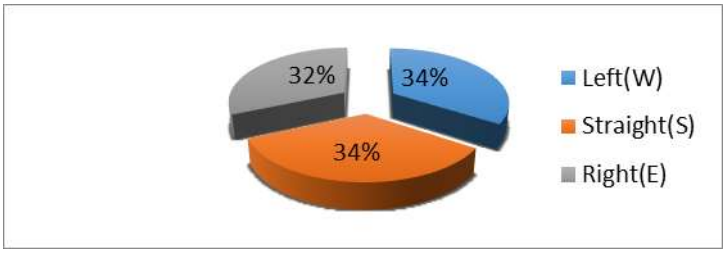

Figure 9: Percentage wise turning movement

Table 10: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	Cycle	Pedestrian	Total
	Left(N)	98	56	10	38	10	7	63	34	47	363
E	Straight(W)	64	64	8	29	3	12	46	25	45	296
	Right(S)	64	59	14	34	6	9	56	33	36	311
	Total vh/hr.	226	179	32	101	19	28	165	92	128	970
	Pcu Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	113	179	48	75.75	57	84	165	46		767.75

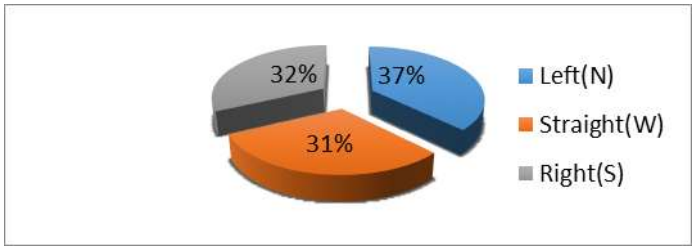

Figure 10: Percentage wise turning movement

Table 11: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	cycle	Pedestrian	Total
	Left(E)	108	84	4	7	9	6	54	30	32	334
S	Straight(N)	104	111	6	11	12	6	75	32	47	404
	Right(W)	96	105	5	5	2	10	68	33	69	393
	Total vh/hr.	308	300	15	23	23	22	197	95	148	1131
	Pcu Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	154	300	22.5	17.25	69	66	197	47.5		873.25

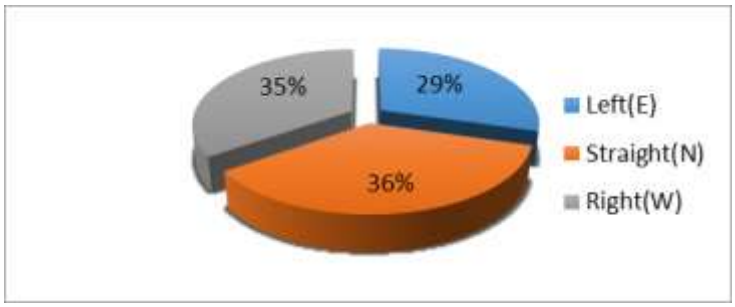

Figure 11: Percentage wise turning movement

Table 12: Vehicular movement in veh/hr.:

From	To	Two wheeler	Auto rickshaw	Mini-Bus	LCV	Bus	Truck	Car/Jeep/Van	Cycle	Pedestrian	Total
	Left(S)	72	69	9	8	5	5	71	45	40	324
W	Straight(E)	59	62	8	10	0	0	72	35	44	290
	Right(N)	83	86	7	8	5	0	90	38	23	340
	Total/hr.	214	217	24	26	10	5	233	118	107	954
	Pcu Factor	0.5	1	1.5	0.75	3	3	1	0.5		
	Total PCU	107	217	36	19.5	30	15	233	59		716.5

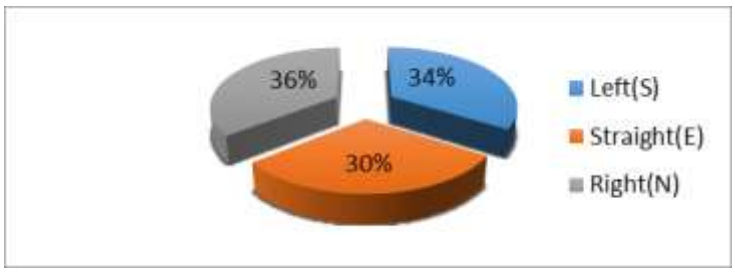

Figure 12: Percentage wise turning movement

IV. CONCLUSION

1. Design of traffic signal will help in advancing transportation network to provide ease & safety to the using it.
2. They will provide easy & efficient control over the movement of vehicles at intersections.
3. It will lead to minimum time delay resulting in saving in fuel & hence the cost of travelling will minimize achieving economy. Also there will be less pollution as vehicles have to wait for no such longer time than before.
4. Traffic signals will also reduce the conflict points at intersections will minimize the accident. Thus resulting in overall efficiency & economy will assist the road user for better experienced.

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