GOVERNMENT OF PAKISTAN
MINISTRY OF COMMUNICATIONS
NATIONAL TRANSPORT RESEARCH CENTRE
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FAISAL AVENUE - JINNAH AVENUE INTERSECTION

MANUAL VERSUS SIGNAL OPERATION

(CASE STUDY)

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C O N T E N T S

SUMMARY

One of the characteristics of Urban Traffic is that the volume of traffic vary considerably over the day with very sharp morning and evening peaks, in opposite directions respectively. Due to shear volume of traffic during these period, manual control is neither feasible nor desirable, therefore electronic signals are used to regulate traffic.

Unfortunately the earlier design of signals suffered from the limitation of fixed cycle length which could not cater for variation in traffic volume over 24 hour period. This problem has long been over come by the computer chip, which allows setting of green & red phase for each approach even on hourly basis. As a result the manual control is resorted to only when there is breakdown of the signal or disruption of traffic due to accident.

Unfortunately, the Islamabad traffic authorities have the misconception that the signals cause traffic jam and manual control during peak period can over come the problem.

In order to bring out the correct position, a comparative study of traffic flows when (a) Signal were switched off and (b) they were On, was carried out by NTRC during last week of May, 2000 on the intersection of Faisal Avenue with Jinnah Avenue, during morning peak hours. For this purpose two aspects namely queue length and stopping time were quantified. The sallient features of the results are as follow:-

a) The time traffic remained stopped at each approach when signal was in operation was 145 seconds i.e the cycle length of the signal.

b) During manual operation the corresponding time for the four approaches was:-

APPROACHES	SECONDS
Zero Point	174
Faisal Mosque	175
F-9	177
Presidency	202

c) The length of queue in terms of number of vehicles for signal & manual operation for various approaches was as following:-

APPROACH	SIGNAL	MANUAL
Zero Point	19	27
Faisal Avenue	14	24
F-9	19	25
Presidency	16	18

d) During manual operation the traffic queues blocked Fazal-e-Haq Road and Nazimuddin Road junctions with Faisal Avenue six times. In comparison with signals on the traffic queue partially blocked Fazal-e-Haq Road junction with Faisal Avenues once only.

e) The traffic violations i.e stop line crossing, red signal crossing, lane straddling, extra lane at approaches and over taking in the junction were more during manual operation than when signal was On.

CONCLUSIONS:

- Manual operation have reduced the capacity of junction.
- Queue lengths were longer during manual operation.
- Time required to clear the intersection was more during manual operation.
- Adjacent intersection were blocked during manual operation.
- More violations took place during manual operation.

RECOMMENDATIONS:

- Traffic signals should not be switched off.
- The traffic police staff may be directed to take cognizance of traffic violation, especially during peak hour.

FAISAL AVENUE – JINNAH AVENUE INTERSECTION MANUAL VERSUS SIGNAL OPERATION

1. INTRODUCTION AND BACKGROUND:

Faisal Avenue – Jinnah Avenue intersection is an important junction as it is intersecting two very busy roads. Faisal Avenue a four lane dual carriageway is extention of Islamabad Highway from Zero Point to Faisal Mosque. This highway carries most of the traffic between Rawalpindi and Islamabad besides traffic from N-5 via Islamabad highway and Kashmir Highway. Jinnah Avenue is also a four lane dual carriageway which carries most of the East – West traffic from F-10 to Pak Secretariat. Jinnah Avenue is a recognized VIP route from Parliament House to Faisal Avenue chowk. It is an important link for the G and F, residential and commercial sectors. Jinnah Avenue is also getting traffic attraction because of vast commercial development on both sides of the avenue in the form of Blue Area.

The traffic volume has increased rapidly during the last few years at this busy junction consequently long traffic queues has started taking place. The traffic queuing during peak hours is mainly due to offices and school traffic. The other reasons of congestion are increasing traffic volume on two service roads i.e Fazal-e-Haq Road and Nazimuddin Road. No any attempt have been made by the authorities to divert the traffic from these two adjacent junctions by opening more corridors. The traffic is causing more congestion due to interference to traffic signals by Traffic Police in the peak hours.

2. OBJECTIVE AND SCOPE:

The objective of this exercise is to find out the effect of traffic congestion/ queuing when signals are switched off by Traffic Police and to compare it to the traffic flows when signals are On. The other benefits achieved by conducting signals times and queue length surveys would be to find out the traffic management deficiencies and to suggest engineering measures. It will also be pointed out that efficient signal timings and proper synchronization with two adjacent junctions will improve traffic flows.

Long traffic queues in peak periods on the important junction in Urban Areas is a common feature. Faisal Avenue and Jinnah Avenue are very busy roads in the peak periods of working days because most of the North – South and East – West traffic of the capital passes through this junction. There is a need to have a long term solution of this junction. As a short term traffic management plan the capacity of junction can be maximized by proper allocation of signal timings and using enforcement for checking traffic violations i.e extra lanes, stop line crossing and signal violations.

3. METHODOLOGY:

The methodology adopted was very simple as it was decided that signal time and queue length survey will provide the desired objective of finding out the comparison of traffic flows when traffic signals are working to the one when signals are switched off by the traffic police. A three days morning peak hours survey of queue length and stopping time in each direction was carried out. Two days survey was to observe queue lengths when traffic was controlled manually and one day when signals remained switched on through out the morning peak hours.

4. CAPACITY OF JUNCTION:

The capacity of a junction is usually taken to mean the maximum rate at which traffic can pass through it. Capacity of an intersection depends upon many factors, which include width, type, alignment, road surface, composition of traffic, vehicle capability, environmental and operating condition and driver familiarity etc. Although capacity of intersection is a problem in urban road networks but Jinnah Avenue – Faisal Avenue intersection has all the above mentioned components at a reasonable level. It can not be said that the capacity of this junction is insufficient to feed the converging and diverging traffic from all the four approaches.

5. TRAFFIC SIGNALS:

We all know that light signals are most effective traffic control devices. Signal

timings should be in accordance with traffic requirement, longer cycles are used during peak periods to provide more green time for larger platoons and to reduce the number of starting delays. Selection of amber period is based on approach speeds. All red interval is based on width of intersection and approach speeds. The traffic signals have been noted having following cycle times.

	GREEN	AMBER	RED	RED AMBER
Zero Point approach	00:45	00:04	01:35	01
Faisal Mosque approach	00:35	00:04	01:45	01
Presidency approach	00:25	00:04	01:55	01
F-9 approach	00:25	00:04	01:55	01

Traffic signal timings may need resetting specially on the Zero Point approach of Faisal Avenue where its junction with Fazal-e-Haq Road is closer than the distance of junction of Faisal Avenue with Nazimuddin Road. Also traffic on Fazal-e-Haq Road is higher than the traffic on Nazimuddin Road. The signals on these two junctions also need to be monitored because of traffic variation at various times of the day and their synchronization with Jinnah Avenue signal.

6. LEFT TURNING MOVEMENTS:

Left turning slip roads or filters are usually provided where there is no conflict of through traffic to merging traffic. Both roads i.e Faisal Avenue and Jinnah Avenue have slip roads for left turning traffic. These wide slip roads encrouage double lanes of traffic merging into main streams.

7. QUEUE LENGTH:

The best measure of traffic performance at a signalized intersection is the length of queues developed. Average queue length is approximated by the larger result of the two formulas.

$$n = qr \quad \text{--------(1)}$$

and $$n = q\ \frac{(r)}{2+d} \quad \text{-------(2)}$$

Where n = average queue length in number of vehicles

q = approach flow (vehicles)

r = Red time in seconds

d = average individual delay from equation

The estimation of queue length are needed for detailed decisions in engineering designs and signal timings.

The major objective of this brief survey was to compare the queue lengths and red phased when signal were switched off to those when signals were working properly. The results are Annexed.

It is very clear from the comparison that higher queues occurred when signals were switched off as longer period of stopping was observed. As a result the queues were some times so long that they locked the adjoining intersections i.e Nazimuddin and Fazal-e-Haq Roads.

The results have made it clear that switching off of signal does not help the traffic flow instead it causes delay and inconvenience to all the traffic. There is a need to monitor the signal timings and to readjust if felt necessary.

8. LANE AND ROAD MARKING:

Road marking is one of the very effective traffic control devices. Clear and efficient marking is an essential part of multi lanes and multi roads junctions. Road users depend on guidance whether signs or marking. Markings like, road marking, lane marking, stop line, arrows, give way line, lane line, and Zebra Crossings are effective safety devices. To stream line the traffic flow at the approaches of Jinnah Avenue – Faisal Avenue junction there is a need to

strictly enforce traffic laws. Traffic makes four to five lanes at three lanes approaches to the junction. This traffic converges to lesser lanes in the direction of their travel while passing through junction. This causes severe maneuvering problems.

Continuous lanes are marked at approaches to junction to discourage overtaking in the vicinity of junction. It is observed that overtaking takes place at un-broken lines. To make the traffic flow more effective, disciplined and efficient, there is a need to discourage overtaking at continuous lines at approaches to junction.

9. EDUCATION/ PERSUASION:

The safety of all road users is vital to the consideration of all traffic matters. Any thing that is perceived to have an adverse effect on safety has become and will remain an issue of public concern. Accident prevention and mitigation measures include physical measures like improvement of road layout and putting of traffic control devices but more important of these measures are education and publicity. Road accidents involve, and are inevitably caused by the people who use the road system. The traffic police official deployed at this signalized intersection have plenty of time and means to educate the motorists. The minor mistakes like stopping away from stop line, turning right without indicator, and making untidy queues in the lanes can be easily over come by educating the motorists while they are waiting at red signals.

10. ENFORCEMENT:

All traffic controlling system are backed up by certain regulations in order to ensure smooth flow. It will be fruitful only and only if these regulations are enforced in merit and spirit by the law enforcing agencies otherwise how perfect a traffic controlling scheme or law is, it will not give the desired results if not properly implemented or enforced. This shows how essential the enforcement is in the art of traffic. As without enforcement all the engineering management measures become meaning less. The traffic police been put at Faisal Avenue – Jinnah Avenue chowk watches the violations taking place but do not take any action. When asked about the reason for not taking action the reply given by traffic police official deployed

during these three days was that they have been instructed not to challan in peak hours. This approach is just against what it should have been. By challaning the vehicles at busy junctions in peak hours the message gets across very quickly. Common violations taking place are, stop line crossing, red signal crossing, lane straddling, extra lanes at approaches and overtaking in the junction. It was observed that when police operates manually the first bunch of vehicle does not stop at police signals this is where police looses credibility.

11. CONCLUSIONS:

- Manual operation have reduced the capacity of junction.
- Queue lengths were longer during manual operation.
- Time required to clear the intersection was more during manual operation.
- Adjacent intersection were blocked during manual operation.
- More violations took place during manual operation.

12. RECOMMENDATIONS:

- Traffic signals should not be switched off.
- The traffic police staff may be directed to take cognizance of traffic violation, especially during peak hour.

13. ANNEXURE

STOPPING TIME AND QUEUE LENGTH SURVEY

DIRECTION FROM ZERO POINT TO FAISAL MOSQUE
TIME : FROM 0748 TO 0823 HOURS

S.NO	TRAFFIC LIGHT SIGNALS		MANUAL		REMARKS
	TIME INTERVAL	QUEUE LENGTH	TIME INTERVAL	QUEUE LENGTH	
	M : S		M : S		
1.	01: 35	16	02 : 05	21	Traffic queues
2.	01: 35	15	02 : 54	27	passed through
3.	01: 35	19	02 : 20	19	Fazal-e-Haq
4.	01: 35	11	02 : 05	20	Road junction
5.	01: 35	12	01 : 45	17	when more than
6.	01: 35	09	01 : 51	06	18 vehicles were
7.	01: 35	10	01 : 52	10	in the queue i.e
8.	01: 35	16	01 : 53	08	4 times.
9.	01: 35	10	02 : 06	16	
10.	01: 35	07	01 : 59	13	
11.	01: 35	09	01 : 58	07	
12.	01: 35	13	01 : 47	11	
Average:	**01: 35**	**13**	**02 : 03**	**15**	

DIRECTION FROM FAISAL MOSQUE TO ZERO POINT
TIME : FROM 0749 TO 0823 HOURS

S.NO	TRAFFIC LIGHT SIGNALS		MANUAL		REMARKS
	TIME INTERVAL	QUEUE LENGTH	TIME INTERVAL	QUEUE LENGTH	
	M : S		M : S		
1.	01: 45	13	02 : 45	18	Traffic queues
2.	01: 45	12	02 : 40	23	passed through
3.	01: 45	13	02 : 37	12	adjoining
4.	01: 45	10	02 : 50	24	junction when
5.	01: 45	14	02 : 55	16	there were more
6.	01: 45	09	03 : 12	21	than 20 vehicles
7.	01: 45	09	02 : 07	19	i.e 3 times.
8.	01: 45	10	02 : 10	16	
9.	01: 45	13	02 : 41	17	
10.	01: 45	06	02 : 00	09	
11.	01: 45	09	02 : 10	07	
12.	01: 45	08	02 : 30	20	
Average:	**01: 45**	**11**	**02 : 50**	**17**	

STOPPING TIME AND QUEUE LENGTH SURVEY

DIRECTION FROM F- 9 TO PRESIDENCY
TIME : FROM 0750 TO 0822 HOURS

S.NO	TRAFFIC LIGHT SIGNALS		MANUAL		REMARKS
	TIME INTERVAL	QUEUE LENGTH	TIME INTERVAL	QUEUE LENGTH	
	M : S		**M : S**		
1.	01: 55	19	02 : 38	17	Traffic queues
2.	01: 55	15	02 : 50	19	were very long
3.	01: 55	17	02 : 35	22	when signals
4.	01: 55	15	02 : 30	18	were switched
5.	01: 55	15	02 : 57	25	Off.
6.	01: 55	14	02 : 25	15	
7.	01: 55	12	02 : 13	15	
8.	01: 55	14	02 : 50	14	
9.	01: 55	15	02 : 20	19	
10.	01: 55	17	02 : 34	16	
11.	01: 55	13	02 : 00	13	
12.	01: 55	14	02 : 10	15	
Average:	**01: 55**	**15**	**02 : 33**	**17**	

DIRECTION FROM PRESIDENCY TO F- 9
TIME : FROM 0751 TO 0824 HOURS

S.NO	TRAFFIC LIGHT SIGNALS		MANUAL		REMARKS
	TIME INTERVAL	QUEUE LENGTH	TIME INTERVAL	QUEUE LENGTH	
	M : S		**M : S**		
1.	01: 55	15	03 : 05	17	Very long
2.	01: 55	09	02 : 55	16	queues were
3.	01: 55	09	03 : 55	18	observed when
4.	01: 55	08	02 : 50	12	signals were
5.	01: 55	13	02 : 45	16	switched Off.
6.	01: 55	10	03 : 17	11	
7.	01: 55	16	02 : 52	08	
8.	01: 55	13	02 : 30	13	
9.	01: 55	15	02 : 17	12	
10.	01: 55	14	02 : 42	15	
11.	01: 55	15	02 : 14	07	
12.	01: 55	08	02 : 20	06	
Average:	**01: 55**	**12**	**02 : 44**	**13**	