

intersection and hence blocking the possibility of letting the cross stream to pass through the intersection.

All these behaviour would create disorderly traffic movements, aggravating the traffic congestion situation, reducing the handling capacity of both intersections and road sections, and lastly increases the chances of traffic accidents.

Drivers should recognized that obeying the traffic rules and traffic control devices would benefit all road users, contribute to shorter travel time, and make the road safer for everyone. Some form of enforcement is absolutely necessary to correct the poor driving habits particularly those of bus and taxi drivers.

4.4 Necessity and Objectives of Traffic Signal Control System

4.4.1 Necessity of Traffic Signals

Signalization is one of the most effective way to control traffic at intersections. If manual traffic control by policeman is continued in future, traffic situations at intersections will not improve and may in fact worsen.

This Study therefore proposes the installation of traffic control signals as one of the alternative traffic improvement measures. The traffic control signals are deemed necessary for the orderly management of both pedestrian and vehicle traffic. Signals have the following advantages:

- (1) Signal control is much more efficient and effective in controlling the traffic than manual control which has many limitations as discussed above.
- (2) Signal can increase the traffic handling capacity of the intersections.
- (3) Signal can control several and complex traffic movements at the intersections, so that traffic regulations such as right turn prohibition or one way operation can be removed.
- (4) Signal can be coordinated to provide for continuous movement of traffic at a definite speed along a given route within the road network.
- (5) Pedestrian signals at critical intersections can promote safe and easy crossings by all pedestrians and particularly the old and young.

- (6) Policemen need not be subjected to traffic accident hazards and concentrated pollution at the intersections.
- (7) Policemen are relieved of their traffic control duties and they can instead concentrate more on enforcing traffic regulations, help inculcate better driving behaviour among drivers especially bus and taxi drivers, assist pedestrians or break down vehicles.

4.4.2 Objectives of Signal Control System

(1) Alleviation of Traffic Congestion

There are many critical intersections in the city where traffic police just cannot cope with the complex and conflicting traffic movements. As these traffic demands are expected to increase in future, signalization is aimed at increasing the intersection handling capacity which would contribute to alleviate further deterioration of the traffic congestion situations. By providing well-coordinated signal operation and well-designed control timings to all the signalized intersections, the effects of signalization in alleviating traffic congestion can in fact be greatly enhanced.

(2) Less Policemen are Needed in Traffic Control at Intersections

As traffic demand increases in future, a greater number of traffic police would be required if manual traffic control is to continue. But with traffic signals, less policemen are in fact needed in future even with the increase in traffic demand.

(3) Better Enforcement on Traffic Violators and Decrease Traffic Accidents

With signalization, most of the policemen can concentrate on better enforcement of traffic regulation violators. Such effective enforcement is necessary as one of the ways in educating the general road users. With better and smoother traffic flows, traffic accidents will eventually decrease too.

(4) Training

Along with the introduction of traffic control signal system, appropriate training program can be conducted to produce traffic control and management specialists who will be well versed with traffic control methods and traffic behaviour. These specialists will manage the signal system and gain valuable experience in responding to changing traffic demand and pattern. They would therefore be well equipped to cope with more complex problems in future by devising adequate traffic management measures.

4.5 Concept and Strategies of Signal Operation

4.5.1 Signal Control Concept

There are basically three traffic signal control concepts for an urban road network:

(1) Isolated Intersection Control

This is a form of signal control for a signalized intersection through which the traffic flow is controlled without giving any consideration to the operation of adjacent signalized intersections.

(2) Arterial Intersection Control

This form of signal control is applied to signalized intersections along an arterial road where the major consideration is given to the provision of a progressive traffic flow along the arterial.

(3) Area-wide Intersection Control

This form of signal control treats all traffic signals in the city or a major portion thereof as a total system. Signals under the system are all linked and their operation are coordinated through the use of computer.

For the central area of Calcutta, a computerized area-wide traffic control system (hereinafter called ATC in short) is the most appropriate form of traffic signal control. This is because traffic flow in this area complex and any measure taken at a single intersection quickly affects the operation and conditions of other nearby intersections. Thus it is necessary to treat most of the major intersections in the city as an entire system. This system should be introduced to the city in the near future without further delay.

It should be recognized that it is not possible to construct flyovers at all intersections. Even if the proposed flyovers are built at several critical intersections, the ATC system installation is still essential. Signals are still required to control the surface traffic both vehicular and pedestrian at intersections having flyovers.

The implementation of an ATC system can be carried out in a flexible manner. It is not necessary to implement the entire system covering the whole city at once. The system can be implemented to cover a critical section of the city first and other sections added as needs arise in future.

The key features of the ATC system to be proposed for Calcutta are:

- (1) Intersections in the central business district (CBD) shall be centrally controlled by an ATC system where all the signalized intersections are linked and coordinated.
- (2) Intersections along major arterials that are not covered under the above ATC system shall have their signals operated with the 'arterial intersection control'.
- (3) Important intersections at urban fringes that are not covered by either the ATC system or arterial control shall be signalized and operated under the isolated control.
- (4) The system to be implemented shall however be flexible such that signalized intersections under the isolated or arterial control can be easily brought under the ATC system. This is an important feature because as the city and traffic demand grow in future, intersections under these two forms of signal control may become less efficient in later years unless they are coordinated with the total system. In other words, the ATC system shall have the capability to expand its scope in future as need arises without much modification to its traffic control software, the central and field equipment.

4.5.2 Scope of the Signalization Plan

The presence of traffic policemen at intersections indicate that some form of traffic control is necessary at such intersections.

From the survey and analysis above, the initial ATC system plan for the central area of Calcutta shall therefore covers a total of 126 intersections:

- (1) A total of 33 intersections in the CBD area are recommended to be signalized under the ATC system.
- (2) 57 intersections along the AJC Bose Road, APC Roy Road, J.L.Nehru Road-Chowringhee Road, M.G Road and Park Street are to be signalized under the coordinated arterial control.
- (3) The other 36 intersections at minor streets having manual traffic control shall also be signalized under the isolated mode. Some of these intersections will be brought under the central ATC system while the outlying ones may be operated under isolated control.

The above proposed traffic signalization plan for Calcutta is illustrated in Figure T-4.5.1.

4.5.3 Recommended Implementation Considerations and Future Expansion

To derive the full benefits of the traffic signal proposal, the following two aspects however must be carefully considered:

- (1) It must be stressed here that the above concept plan should be implemented in total or at least by sub-system. Signal should not be implemented in any random or disarray fashion.

If the proposal cannot be implemented in total as one project, the following order of priority is recommended:

Priority 1: Arterial Intersection Control,
Priority 2: ATC System for the CBD area,
Priority 3: Isolated Control for Other Intersections.

- (2) Besides the installation of traffic signals at the above intersections, the concept plan also calls for improvement of other traffic control devices such as traffic signs, lane markings, channelizations, as well as pavement improvements. These traffic engineering improvements are very necessary, not just to accommodate the field signal equipment, but to ensure the full benefits of the signal control system.

Experiences have shown that traffic signals, lane markings, traffic signs and other facilities would in fact provide the necessary bases for policemen to enforce and educate the general public on traffic rules and regulations.

The above signal plan can be treated as PHASE I of a comprehensive Calcutta Traffic Signal Plan. If this phase is completely implemented, traffic flow in the central area will improved.

Expansion into PHASE II will be needed. PHASE II of the system should therefore consider areas immediately south, east and north of the above PHASE I area.

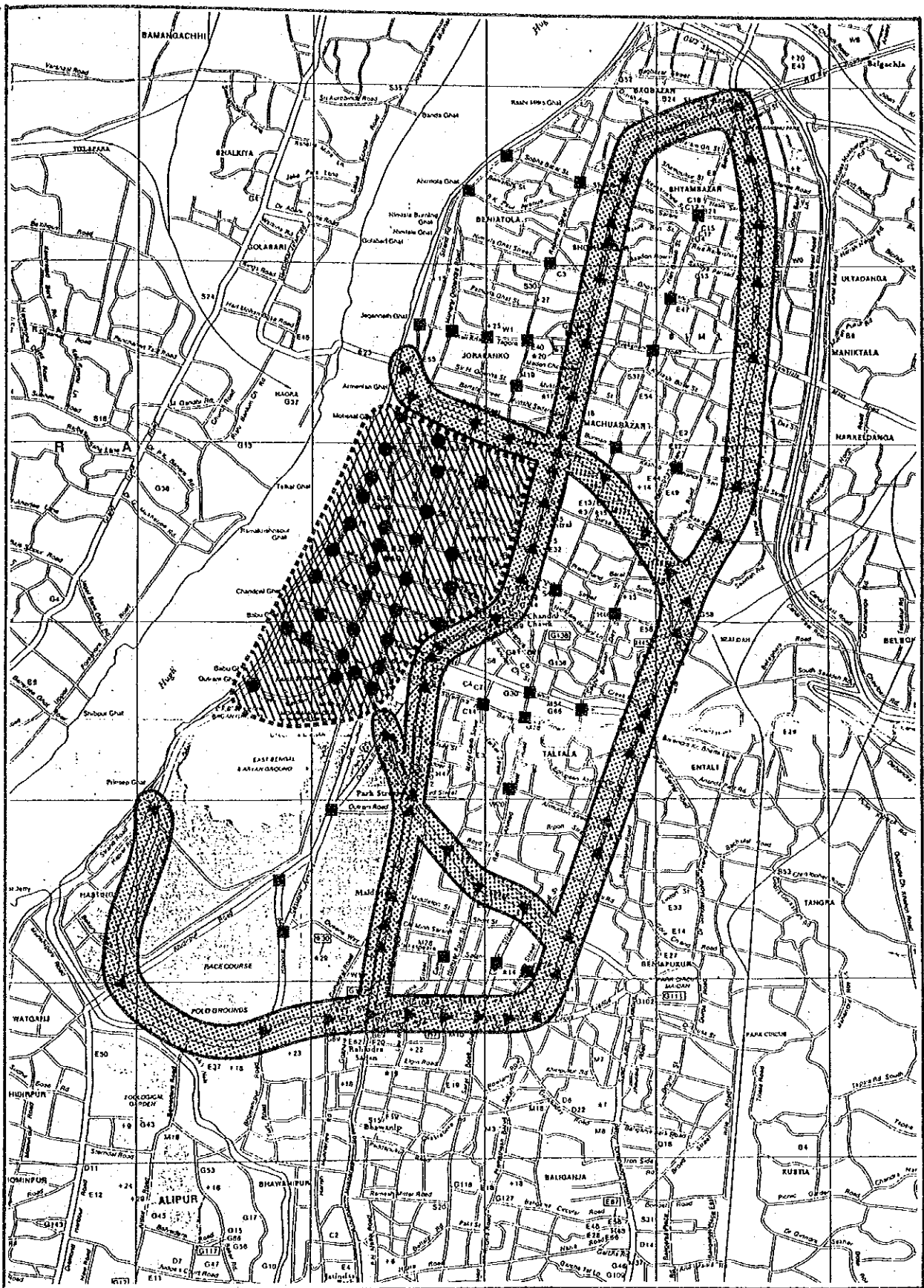
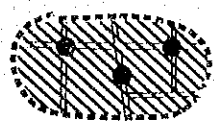


Figure T-4.5.1: Recommended PHASE I of the Calcutta Signalization Plan

Legend



Area Traffic Control



Arterial Control



Isolated Control

