1.5.6 Parking Surveys

Parking surveys are carried out with the intention of gathering enough relevant information on the characteristics of parking demand in the study site (or "bottleneck" area), through a relevant sample. Among the objectives of the parking surveys will be to gather relevant background and baseline information with regard to such characteristics as the level of demand, duration of vehicles parked, peak hour of demand, and the time variation of parking demand.

Methods

The license plate method for the Parking Surveys is commonly used to obtain estimates on average parking duration, turnover, and accumulation.

Survey Personnel Requirements

The number of survey personnel required for the study is dependent on the number of parking slots that will be observed. It is estimated that one observer can cover around 30 parking slots within the 15-minute interval of license plate checks, as long as the parking slots are within the same block.

Survey Procedures

Parking surveys are normally undertaken for one day per "bottleneck" area, if so decided, and would last from 7:00 to 19:00. Observation and recording will be conducted every 15 minutes.

Roadside areas used for parking along both sides of the streets will be delineated into individual parking slots. Arbitrary markings and slot numbers will be made to define each individual parking slot and these will serve as guides for the surveyors. he dimensions that can be used for reference for a space is 2.5 meters wide by 5 meters long for cars and small vans. Trucks would take up to two car spaces. Sampling is at 100% for the assigned areas.

At the time of observation, any vehicle seen parked within a particular slot would have its license plate number recorded on field survey sheets, including the identification number of the parking slot. Observations will be made every fifteen (15) minutes (or shorter, if decided), for the whole survey period.

Each observer will be assigned to observe a fixed set of parking slots. At the start of the survey, the license plate of each vehicle will be recorded together with the particular slot it occupied. Checks will be conducted generally at 15-minute intervals. This is based on the assumption that the 'parker' would use, at the minimum, 15 minutes of the parking slot. In cases wherein there is a possibility of shorter duration, the observer would make continuous rounds of the parking slots being observed. For each round of checking, the observer would note if there was a change in the license plate of the vehicle first observed at each slot. If the same license plate was observed, a check mark was recorded on the field sheet for the particular slot and time period. If the license plate was not identical with the number previously recorded, the new license plate was recorded on the field sheet for the particular slot and time period.

Data Processing

The raw field data will be summarized by encoding them into computer files, from the duration of each vehicle parking, as well as the cumulative number of vehicles entering and leaving the entire parking area were generated.

Data Presentation

Parking data is summarized in terms of parking accumulation and parking duration.

Parking Accumulation

Parking accumulation is defined as the number of vehicles parked at any given moment using the parking facility. It gives an indication of the time (hourly) variation of the fluctuation of the demand for parking. The planning of parking facilities, and to some extent land uses, can be carried out more efficiently with enough information regarding the time variation of parking demand. In some areas, particularly where space for parking is difficult, shared parking becomes a viable alternative, so that different building uses will create parking demand that is more or less level through the day and night.

Parking accumulation is used to evaluate the peak level of parking demand and when this occurs during the day. From the variation, the peak period of parking demand for that particular facility can be identified.

Parking Duration

One characteristic of parking usage is the duration of time of the demand for parking facility usage. In certain areas, particularly busy commercial areas, a large number of parking users generate a high level of demand for usually limited available parking stalls. As such, there arises a need to restrict the duration of parking, so that more users can be able to share the limited supply. Certain areas in some countries implement time restrictions, wherein a violator of maximum limits are correspondingly cited and penalized. In some business districts, a number of parking facilities restrict access with respect to time of day, e.g. a parking facility for a commercial center opens late in the morning after the peak hour so as not to be used by office workers in nearby buildings.

Figure 1.5-13 shows a Parking Accumulation Summary Chart, while Figure 1.5-14 shows a Parking Duration histogram.

Figure 1.5-13 **Parking Accumulation Summary Chart**

Parking Accumulation

Station Code: **PG-03** Date of Survey: **Thu 07 Jun 2001**
Location: **A. Mabini** Time of Survey: **7:00-19:00**

Time Period		Slots	Total	Time Period		Slots	Total
Total Slots		10		*Total Slots*		10	
6:00	6:15		0	13:00	13:15	4	4
6:15	6:30		0	13:15	13:30	4	4
6:30	6:45		0	13:30	13:45	4	4
6:45	7:00		0	13:45	14:00	4	4
7:00	7:15	6	6	14:00	14:15	4	4
7:15	7:30	6	6	14:15	14:30	4	4
7:30	7:45	6	6	14:30	14:45	4	4
7:45	8:00	6	6	14:45	15:00	6	6
8:00	8:15	6	6	15:00	15:15	5	5
8:15	8:30	6	6	15:15	15:30	3	3
8:30	8:45	6	6	15:30	15:45	3	3
8:45	9:00	6	6	15:45	16:00	4	4
9:00	9:15	6	6	16:00	16:15	5	5
9:15	9:30	5	5	16:15	16:30	5	5
9:30	9:45	6	6	16:30	16:45	6	6
9:45	10:00	5	5	16:45	17:00	5	5
10:00	10:15	5	5	17:00	17:15	5	5
10:15	10:30	6	6	17:15	17:30	6	6
10:30	10:45	6	6	17:30	17:45	6	6
10:45	11:00	6	6	17:45	18:00	6	6
11:00	11:15	7	7	18:00	18:15	5	5
11:15	11:30	7	7	18:15	18:30	5	5
11:30	11:45	7	7	18:30	18:45	5	5
11:45	12:00	6	6	18:45	19:00	4	4
12:00	12:15	5	5	19:00	19:15	4	4
12:15	12:30	5	5	19:15	19:30		0
12:30	12:45	5	5	19:30	19:45		0
12:45	13:00	5	5	19:45	20:00		0
				Capacity		10	10

Parking Accumulation

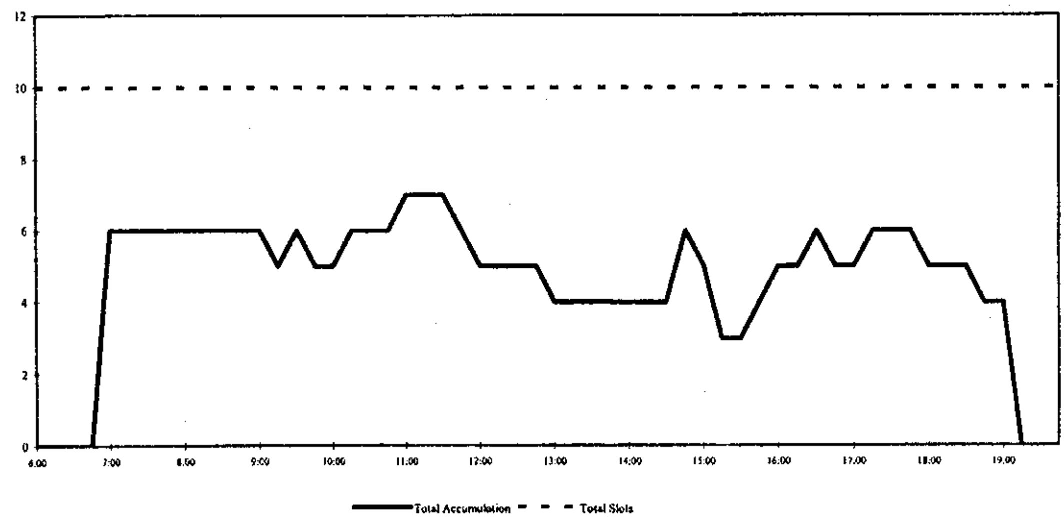
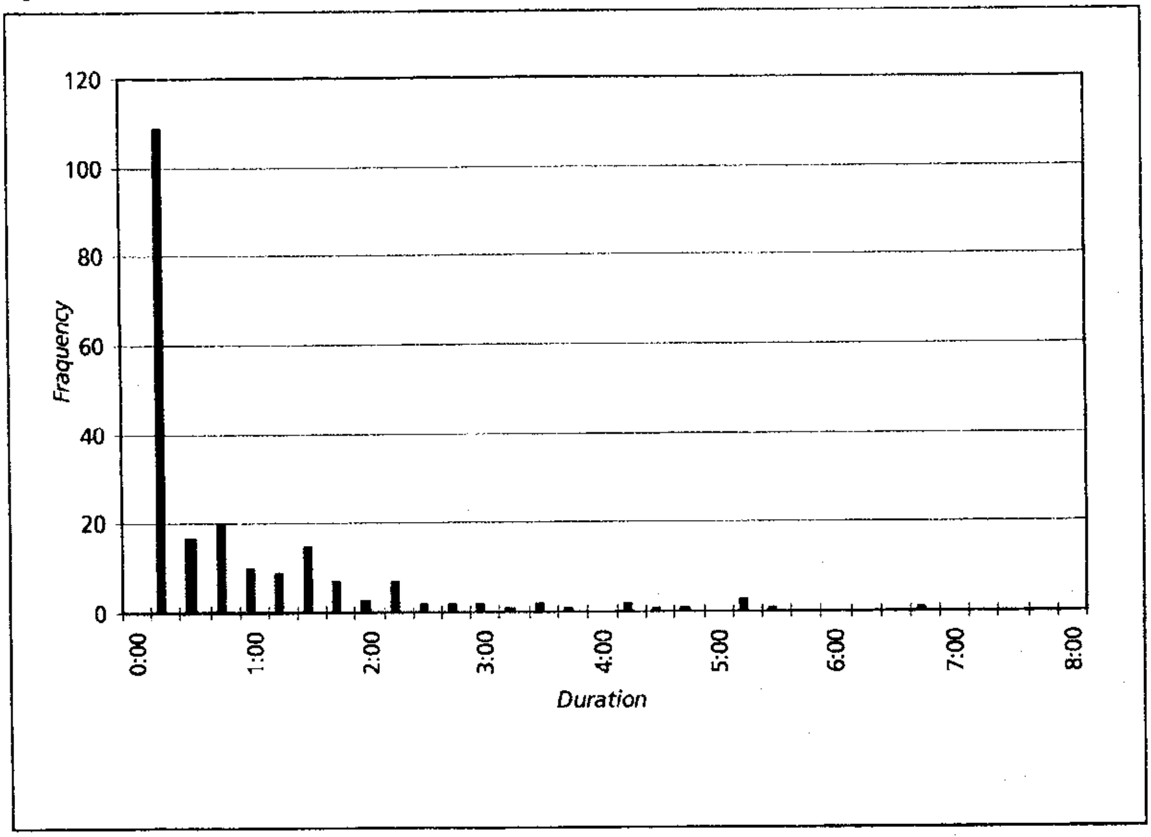


Figure 1.5-14 **Parking Duration Histogram**



1.5.7 Other Surveys

Other surveys may be undertaken depending on the need of the particular area. Perception surveys and interviews of transport passengers and residents of the area regarding the traffic and transport problems in their respective communities, may be conducted where necessary. A minimum of 50 samples for each location is recommended.

This kind of focus discussion survey is ideal in evaluating results of traffic experiments or improvement schemes – as it can provide information before and after the intervention.

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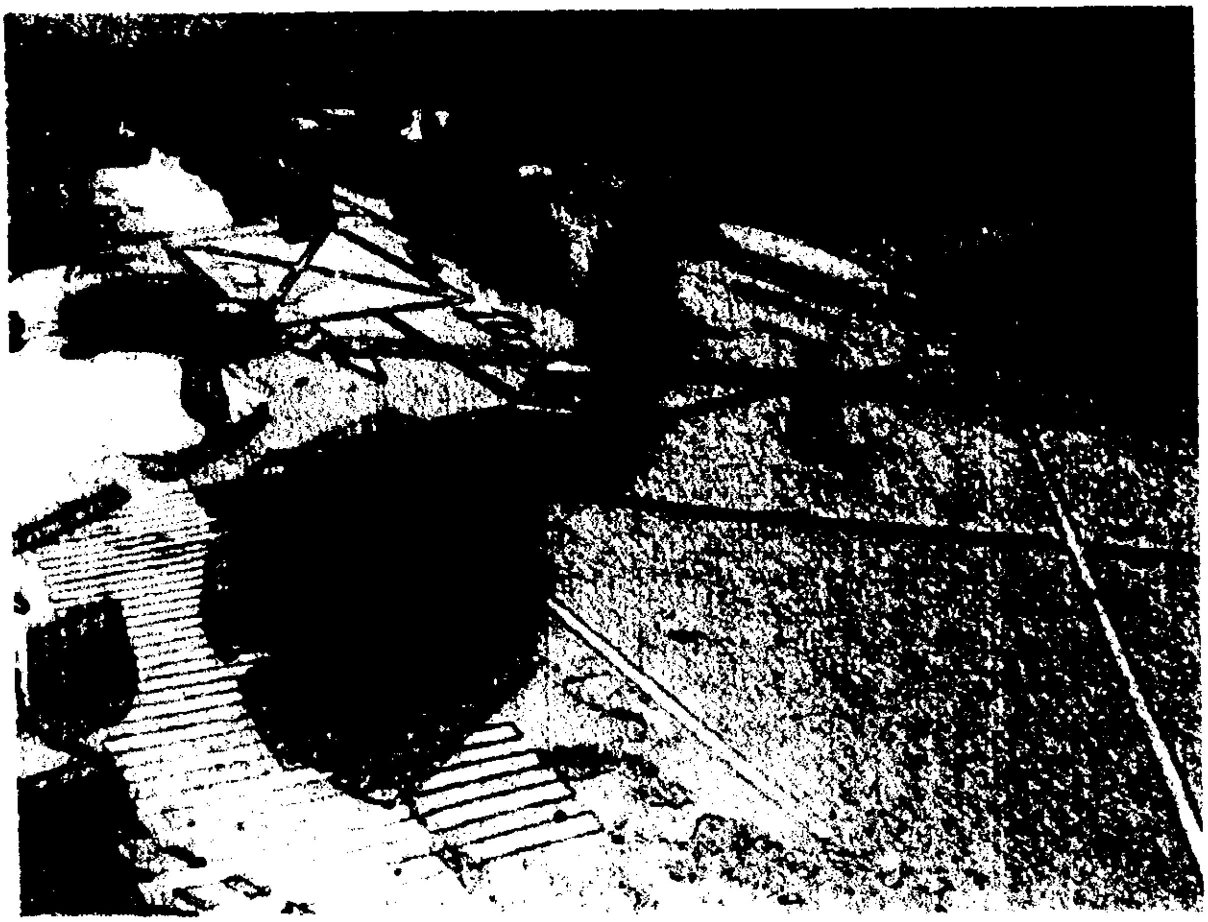


Part II

Analysis and Solutions Generation

Part II

Analysis and Solutions Generation

Once a traffic bottleneck point has been identified, and the information about the traffic problems had been assembled, the next step is to generate possible schemes or options that will solve or mitigate the problem. This is at the heart of traffic engineering.

The following topics typify the common tasks and issues in the analyses and formulation of traffic improvement schemes in Metro Manila:

- The ABCs of Traffic Engineering
- Signalization (and Traffic Control)
- Locating Loading/Unloading Stops for PU vehicles
- Pavement Markings
- Signages
- General Tips Concerning Turning Movements
- Generic Solutions to Typical Problems

2.1 Traffic Engineering

2.1.1 What is Traffic Engineering?

Traffic Engineering is that phase of engineering which deals with the planning, geometric design and traffic operations of roads, streets, and highways, their networks, terminals, abutting lands and relationships with other modes of transportation for the achievement of safe, efficient, and convenient movement of persons and goods.

Traffic Engineering applies engineering principles to help solve transportation problems, and brings into play a knowledge of psychology and habits of users of the transportation systems, aside from technical foundations.

2.1.2 Why is Traffic Engineering Essential?

Many persons still wonder why a traffic problem is so difficult that an Engineer should be called upon for a solution. Why not just install a traffic signal, or raise/lower the speed limit, or erect more signs?

One of the greatest obstacles a professional traffic engineer faces in applying sound principles of traffic engineering is the fact that "everyone is a traffic expert!" The unfortunate result of this attitude of expertise is the creation of traffic hazards when false theories of individuals or groups are put into effect. Without the training, the cure may be worse than the disease.

Whenever unnecessary or excessive traffic controls are installed, hazardous traffic conditions usually result.

2.1.3 How Does the Traffic Engineer Solve Traffic Problems?

The role of the traffic engineer may be compared to that of the medical profession in protecting the public. As a trained professional he/she looks at the symptoms, and in order to make a competent diagnosis she/he takes traffic counts, analyzes accident statistics, studies speed data, examines roadway conditions, conducts research, and studies what other professionals are doing and the results they have achieved.

Just as the doctor's decision is accepted in matters regarding health, even though the medicine may be bitter or the needle painful, so should the decision of the, professional traffic engineer be given the prime consideration. The choice of remedies is not decided on popularity, but by informed professional judgment.

2.1.4 **How Does the Traffic Engineer Promote Safer Traffic Operation?**

By providing roadway conditions that contribute to smooth and efficient traffic flow.

Experience has shown that safety goes hand-in-hand with smooth traffic operation. Disrupting the smooth flow of traffic increases the probability of accidents. Erratic traffic operation may be caused by vehicles stopping or slowing in the roadway, passing and weaving maneuvers, or surprise elements. For example, unwarranted traffic signals, unreasonably low speed limits, and too many signs may cause driver confusion and indecision.

Slower speed does not necessarily mean safer traffic operation. The chances of a driver becoming involved in an accident are least when he/she is traveling at the average speed of traffic.

Roads were designed to accommodate vehicles at a certain speed and for a maximum capacity. Outside of the design parameters, road performance can be unsafe.

2.1.5 **Why not search for solutions by trial and error?**

It can be done. But trial and error can be expensive. In terms of lost man-hours and wasted fuel consumption. The motoring public will get confused with traffic pattern that changes every now and then. More accidents could ensue. The streets of Metro Manila have no room for guesswork, or whimsical and unfounded theories.

2.2 Traffic Control

Traffic Control is the control of the movement of people and goods on the existing road network by means of such devices as signals, signs and markings in the short term and at low capital cost in order to achieve safety, mobility, good environment and energy conservation.

2.2.1 **Background**

Rapid urbanization and motorization have brought about serious traffic problems such as traffic accidents, congestion, pollution and energy problem. A long—term plan and high capital cost are required to solve these problems. However, if we leave these problems alone until the long—term plan is adopted and completed, traffic situation will further deteriorate. Therefore, traffic control is necessary to ameliorate problems in a short term.

2.2.2 **Objectives of Traffic Control**

The objectives for Traffic Control are the following:

- To increase safety levels
- To increase traffic efficiency and mobility
- To ensure a harmonious and comfortable environment, and possibly
- To conserve energy

2.2.3 **Basic Techniques and Elements**

Basic techniques for traffic control involve the following:

- To simplify traffic flow (in order to achieve similarity among components and stabilized flow)
- To segregate road users in space and time (in order to reduce conflicts and to simplify traffic flow)
- To increase capacity in order to accommodate more vehicles.
- To restrain traffic in order to reduce traffic volume.

The elements of traffic control include the following:

- Speed limits
- Turn regulations
- U—turn regulations
- Parking controls

- No standing
- Stop / Yield / Give Way
- Channelization
- Lane use control
- No lane-changing
- Reserved lane
- Bus lanes / roads
- Reversible lanes
- No overtaking
- One way restrictions
- Vehicles only (pedestrian restrictions)
- Vehicle bans
- Special routing
- Pedestrian crossings
- Pedestrian precincts

Table 2.2-1 gives the different elements of traffic control and how basic techniques relate to each of the objectives.

Table 2.2-1 **Elements of Traffic Control**

Basic Techniques	**Objectives**				**Elements**
	Safety	**Mobility**	**Environment**	**Energy**	
Simplification	●	○			Speed limit, turn regulation, u-turn regulation, parking control, no standing, stop/yield, channelization, lane-use control, reserved lane, no-lane change, no overtaking, one way, vehicle only, vehicle ban (signal)
Segregation	●	○	○		Stop/yield, pedestrian crossing, channelization, lane-use control, reserved lane, bus lane/road, no lane change, no overtaking, one way, vehicles only, vehicle ban, special routing, pedestrian precinct
Capacity Increase		●	○	○	Turn regulation, u-turn regulation, parking control, one-way, reversible lane/road, vehicle only, stop/yield
Restraint	○	○	●	●	Bus lane/road, parking control, vehicle ban, pedestrian precinct, traffic cell, road pricing, ramp control, signal

● Primary Concern ○ Secondary concern

2.2.4 What is Meant by Uniformity of Traffic Control Devices?

Uniformity means treating similar situations in the same way. This simplifies the task of the driver because it aids in instant recognition and understanding.

Uniformity aids police, courts and road users by giving everyone the same interpretation. It aids public highway officials through economy in manufacture, installation, maintenance, and administration. In the United States, the Manual on Uniform Traffic Control Devices (MUTCD) is the publication that sets forth the basic principles which govern the design and usage of traffic control devices. The Manual was prepared by a National Committee which included state, county, and municipal representation. The standards in the MUTCD with certain exceptions apply to all streets and highways regardless of the governmental agency having jurisdiction.

In the Philippines, the Department of Public Works and Highways (DPWH) has published the Philippine Road Signs Manual, which describes and prescribes the standards and conditions for use of road traffic signs. An accompanying Manual on Pavement Markings has also been published by DPWH.

The basic prescriptions in the DPWH standards follow the provisions of the Convention on Road Signs and Signals, ratified at Vienna, Austria on 08 November 1968, to which the Philippines was a signatory. (It was amended with the new provisions, which came into force 30 November 1995). It was recognized that there was a need to standardize road signs, signals and symbols, as well as road markings, in order to facilitate international road traffic and road safety.

2.2.5 How are Speed Limits Determined?

Legal speed limits are established by law based on engineering principles and may be changed only when justified on the basis of an engineering study. In many congested streets of Metro Manila, speed is often the wrong issue but knowledge of it is important in traffic analysis.

Speed limits are set with the following objectives

- To simplify traffic flow by reducing difference of speed (simplification — safety, mobility).
- To compensate restricted sight distance by reducing speed and thus giving enough time for reaction (safety).
- To alleviate the severity of accidents by reducing speed (safety).
- To save fuel by avoiding high-speed travel (energy conservation).

One disadvantage of setting low speed limits is that they sometimes cause congestion and drivers are inclined to disregard them. For example, Republic Act No. 4136 has set a very low speed limit which might have been valid in the 1950s but is now disregarded.

In setting speed limits, several factors need to be considered. These involve the prevailing speeds of vehicles, wherein the limit is set usually at the 85th-percentile speed of motor vehicles during off-peak periods is usually considered. The design speed or physical features of the street or highway system also needs to be considered. These are represented by the sight distance, the alignment, the road surface conditions, the number of intersections, sidewalk widths, etc.

A widely accepted principle is to set speed limits as near as practicable to the speed below which 85% of the vehicles are traveling on the highway. Experience has shown that approximately 85% of the motorists drive at a speed that is reasonable and prudent.

Speed limits thus established encourage voluntary compliance because they appear reasonable to the public. Those 15% of drivers who will not comply with reasonable speed limits are the drivers who are subject to enforcement action.

Traffic characteristics, such as the traffic volume, the kinds of vehicles, presence of parking, loading / unloading, the type of signal control, and pedestrian - vehicle conflicts also plays a factor in setting speed limits. Other factors include the presence of abutting development in residential area or peripheral area of schools, where vehicle speeds should be low, the weather and lighting conditions, such that in case of bad weather, speed limits should be lower in an express highway. This may be through the use of variable signs or two speed signs.

2.2.6 What Effect Do Posted Speed Limits Have On Actual Traffic Speeds?

Very little effect. There is a common belief among laymen, and even by some officials, that the mere posting of speed limit signs will cause drivers to react accordingly. This is not true, and that is the reason why posted speed limits must be realistic to receive compliance.

Unrealistically low speed limits will invite violation by responsible drivers. Enforcement of unreasonably low limits sets up the so-called "speed trap," which results in poor public relations. The posting of proper speed limits has the beneficial effects of smoothing traffic flow and aiding effective law enforcement. Also, low speed limits tend to lower road capacity.

2.2.7 When Should Traffic Signal Lights Be Installed?

Traffic signals should be installed when they will alleviate more problems than they will create. This must be determined on the basis of an engineering study.

A warranted traffic signal which is properly located and operated may provide for more orderly movement of traffic, and may reduce the occurrence of certain types of accidents. On the other hand, an unwarranted traffic signal can result in increased delay, congestion, and accidents.

Many people seem to believe that traffic signals are the answer to all traffic problems at intersections. If this were true, no traffic engineer in his right mind would deny a request for a signal.

However, a traffic signal only functions by stopping traffic, and any time a motor vehicle is stopped in the road an accident potential is created. It does not matter whether the stop is caused by a flat tire, a left turn into a driveway, or by a traffic signal - the possibility exists that a following motorist will not notice the stopped vehicle until it is too late.

What traveler has not experienced that sickening feeling that occurs when a traffic signal suddenly turns amber a few hundred feet in front of him? Who has not experienced the aggravating hopelessness of waiting in a long line of cars for a traffic signal to change, moving ahead a few feet, and then having the signal turn red again?

The need for traffic signals should be based on competent engineering study.

2.2.8 What Is the Primary Purpose of Guide Signs?

The principal purpose of guide signs is to direct travelers to their destinations by the best route. However, it is not feasible to install signs listing all of the possible destinations that may be reached from a particular road.

Drivers must be expected to make reasonable preparation for locating their destination and to have information that is readily available on road maps.

2.2.9 How are Guide Sign Messages Determined?

Simplicity and clarity are necessary because drivers of moving vehicles are unable to read lengthy or complicated messages on signs. For this reason, the number of lines on a sign is kept to a minimum, and should not exceed three.

On major arterial roads and national highways, high traffic speeds demand that the number of signs be limited to those absolutely essential for the guidance of the motorist.

Expressway exits are identified by exit number, the route number or by the name of the intersecting road or interchange location. Certain additional messages may be provided where justified.

In rural areas signs may be installed to direct travelers to services such as roadside rests, gas, food, and lodging.

2.3 Traffic Signal Control

2.3.1 Traffic Signal Operation

There are three (3) basic elements of traffic signal operation. These are:

- Cycle Length
- Split
- Offset

Cycle length

Cycle length, usually given in seconds, is the duration of one complete cycle of traffic signal phases. As an example, it can be determined by the total length of time from the start of the green light for one particular approach to the intersection, up to the next start of the next green light for that same approach.

Split

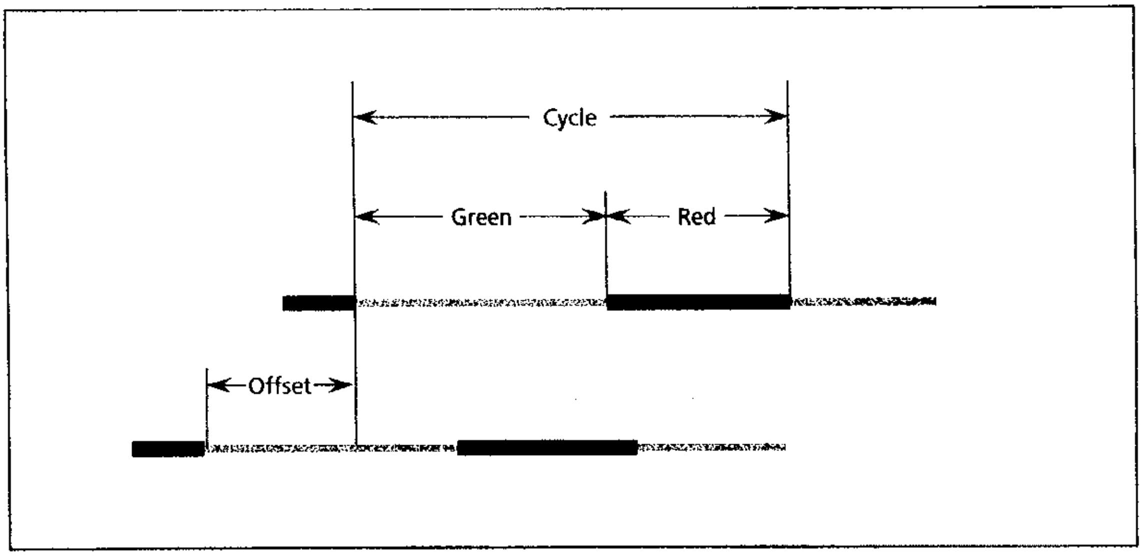
The split, or green split, is defined as the percentage of green time against total cycle length.

Offset

Offset is defined as the time difference of the start of the green phase between two adjacent signals at two different locations, with the same cycle length.

Figure 2.3-1 graphically shows the relationships among these three elements of traffic signal operation.

Figure 2.3-1 **Elements of Traffic Signal Operation**



2.3.2 Modes of Automatic Signal Control

Time of Day

Automatic signal control can vary by time of day. This is where phasing and timing plans are selected according to time of day. This is effective to location where the daily traffic pattern is more or less fixed, and where vehicle detector not required. The traffic lights installed by DPWH under TEAM I to III are of this type.

Traffic Responsive Control

In the traffic responsive mode of automatic signal control, the signal timing is adjusted according to data gathered by vehicle detectors installed at intersection approaches. This mode of control is capable of coping with variations in traffic pattern, such that the signal timing adjusts to the needs of varying levels of traffic volume. One consideration in a traffic responsive mode of control is that vehicle detectors are required, and this will have a financial cost. DPWH has upgraded its signals to the so-called SCATS system.

2.3.3 Advantages and Disadvantages of Automatic Signal Control

The advantages of automatic signal control include the following:

- Multiple control modes and patterns
- Responsive to traffic variations
- Signal timing coordination with signals for adjacent locations is possible

There are also disadvantages, however. These include:

- Signal design requires expertise
- Automatic control needs periodic review and adjustment of timing plans
- Control depends on vehicle detectors
- Automatic control cannot prevent intersection blocking

2.3.4 Advantages and Disadvantages of Manual Signal Control

The advantages of manual signal control include the following:

- Flexible to cope with varying traffic levels
- Adjustable in case of incidents

Disadvantages include:

- Tendency for personnel to create longer cycle time
- Less efficient

- Inconsistent timing
- Difficult to coordinate with adjacent signals

2.3.5 Why is a long cycle time not efficient?

A long cycle time is not efficient in the sense that, with the same traffic volume, total waiting time doubles with double cycle lengths. This is illustrated in Figure 2.3-2. The first portion shows the dispersion of vehicles arriving at the junction controlled with a short signal cycle length. The gray triangle represents total waiting time for vehicles at the junction. The bottom portion shows the same number of vehicles arriving at the junction, this time controlled with a longer cycle time. The gray triangle now becomes about four times that with the shorter cycle time. This is a fact often misunderstood by untrained traffic enforcers in Metro Manila. Waiting makes people impatient. When it becomes intolerable, drivers resort to counterflows, worsening the situation.

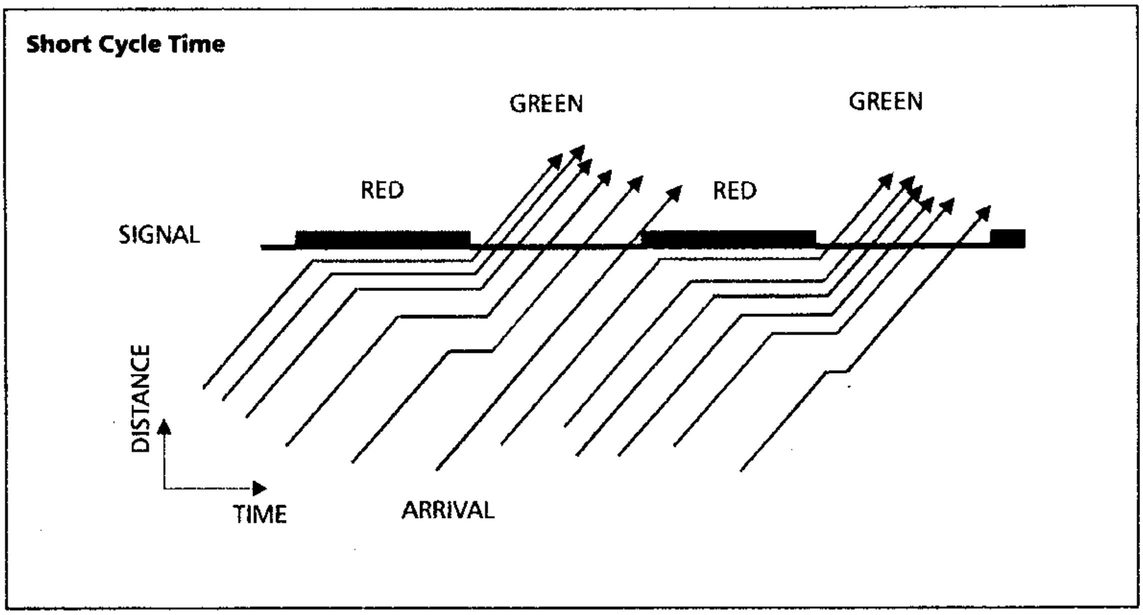
2.3.6 Why is manual control not efficient?

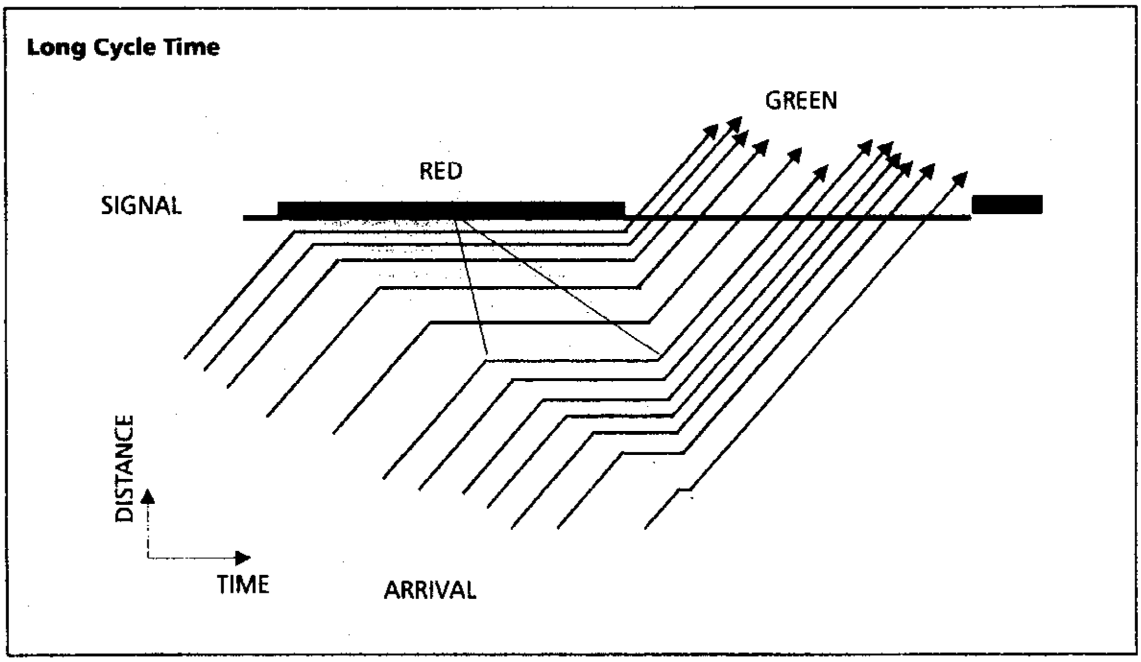
Manual control of intersections, compared with automatic means of signal control, is often less efficient due to the observed long cycle times being used by traffic enforcers. The usual tendency for changing the phasing is to let all approaching vehicles through. The green is kept on until the approach is cleared.

With manual control, it is very difficult to achieve coordination between succeeding signals along a travel corridor. Manual control often seeks local optimization, not network optimization.

Human beings get tired and their controls become inconsistent and erratic. Or to minimize efforts, they reduce the number of signal changes resulting in very long cycle time.

Figure 2.3-2 **Short Cycle Time vs. Long Cycle Time**





2.3.7 **Traffic Platoons**

Figure 2.3-3 shows the concept of traffic platoons. Simply defined, traffic platoons are groups of vehicles approaching the junction with minimal gaps between vehicles. Figure 2.3-3a shows the appearance of the platoon at the end of the red light phase. Figure 2.3-3b shows it at the start of the next green phase, and Figure 2.3-3c shows the appearance of the platoon when the green phase ends (or should end).

Figure 2.3-3 **Traffic Platoons**

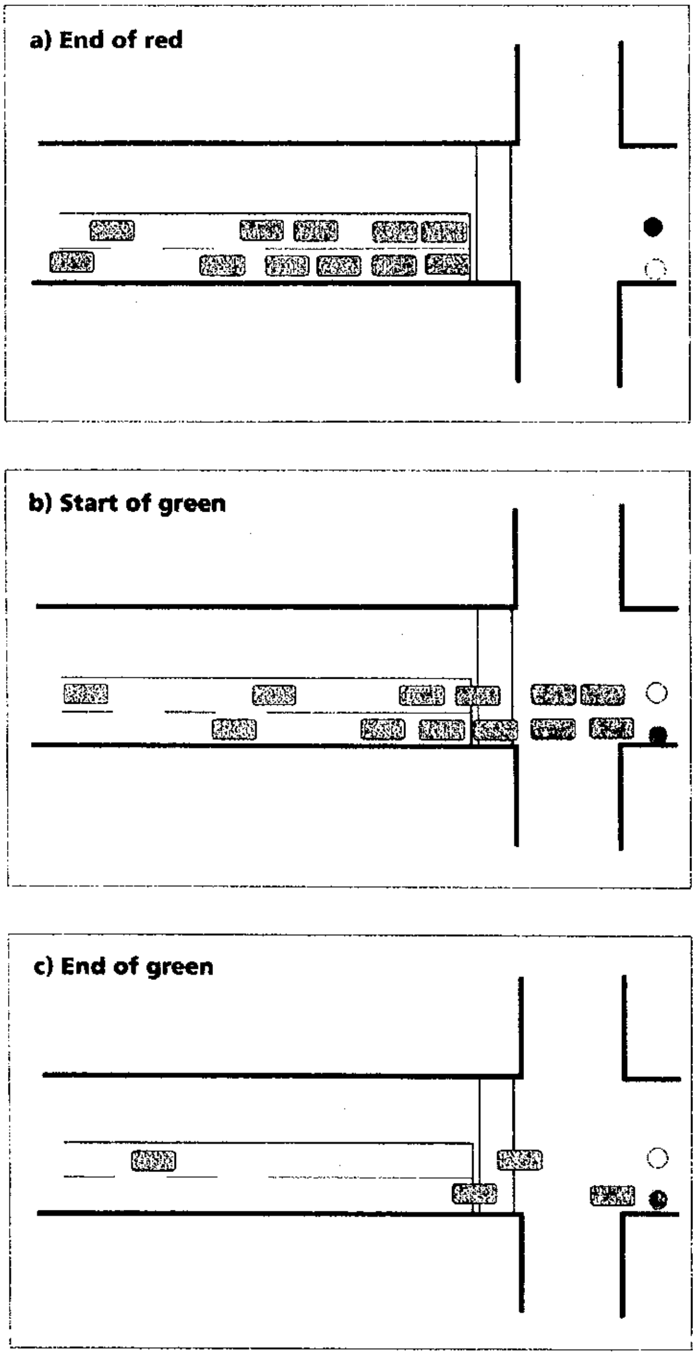


Figure 2.3-4 shows the platoon patterns, given as the number of vehicles per unit of green time, versus green time. It shows that the number of vehicles dissipates as green time runs.

Figure 2.3-4 **Platoon Patterns**

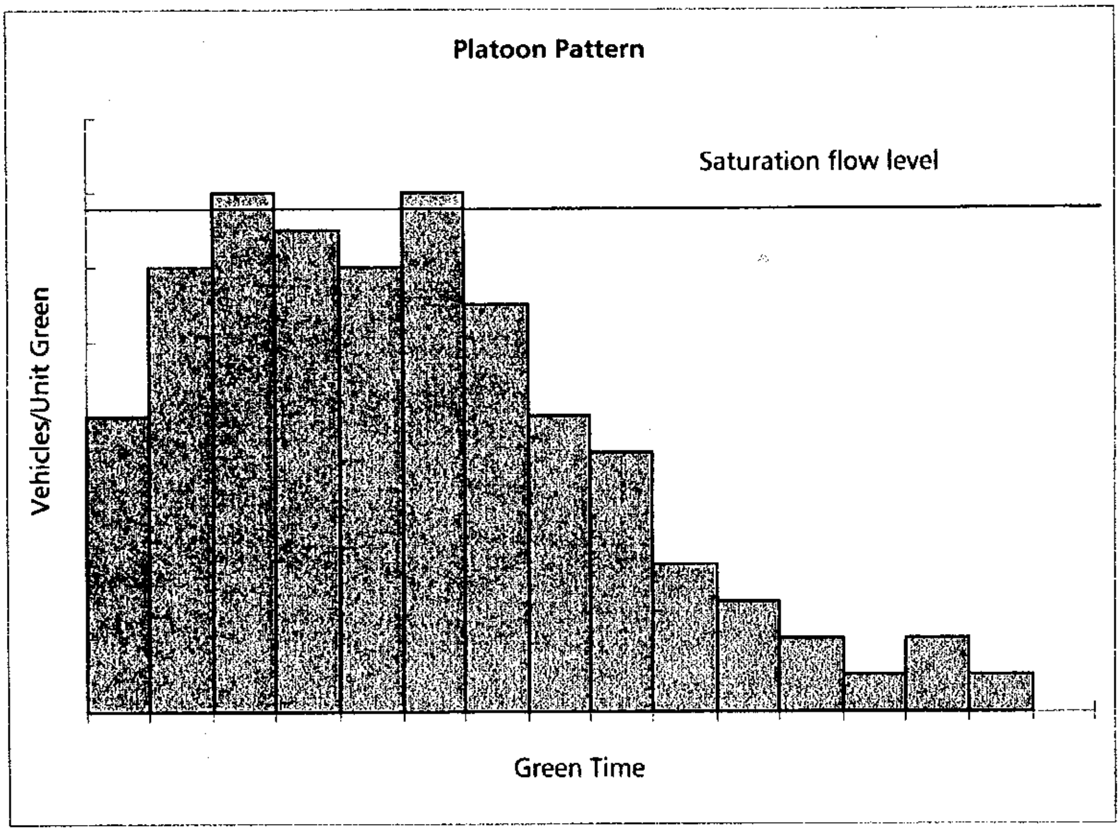
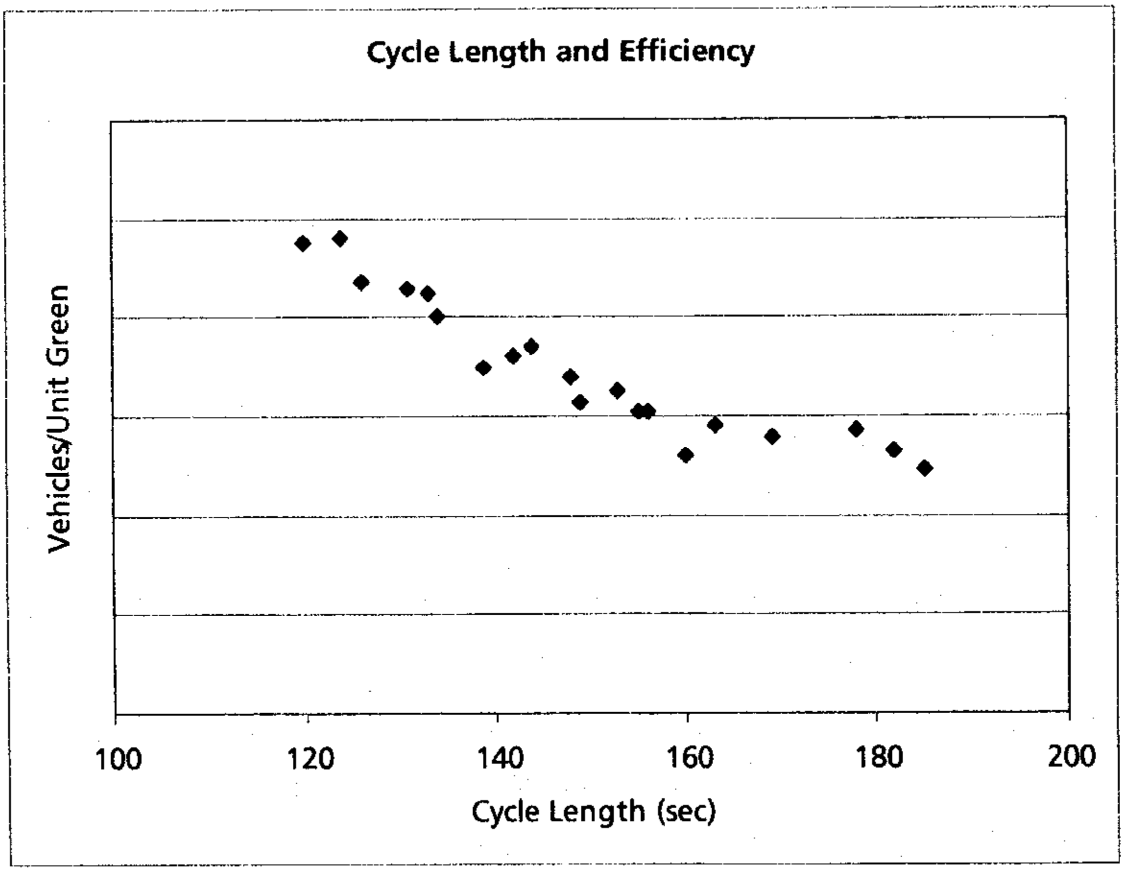


Figure 2.3-5, on the other hand, shows how the efficiency of the signal-controlled intersection varies with increasing cycle length. As cycle length is increased, the number of vehicles per unit green time decreases, and thus the traffic efficiency of the junction is hampered.

Figure 2.3-5 **Cycle Length and Efficiency**



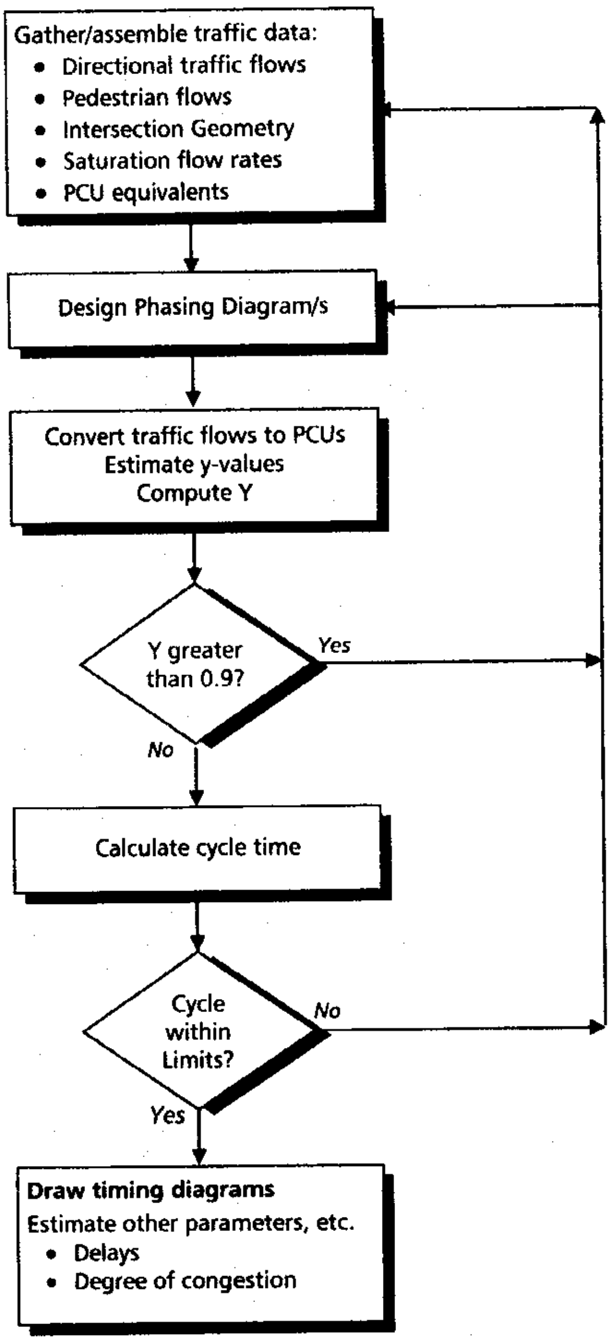
2.3.8 **What needs to be done for a better signal system?**

There needs to be a full understanding of signal operation mechanism, its advantages and weak points among traffic enforcers and traffic engineers. In general, traffic enforcers should not override automatic signals connected to and synchronized over a wider area traffic control. A periodic review and updating of phasing and timing plan sets should also be undertaken. And in order to have an efficient traffic signal control system, proper maintenance of traffic signal equipment, including communication lines, should always be observed.

2.3.9 **Procedure for basic signal timing design**

Only a few LGUs have installed signals of their own. But more LGUs may go this route in the future. Installing signal lights is not as simple as erecting a street light, as can be gleaned in the following sections. Figure 2.3-6 shows the flowchart for a basic signal timing design procedure.

Figure 2.3-6 **Procedure for basic signal timing design**

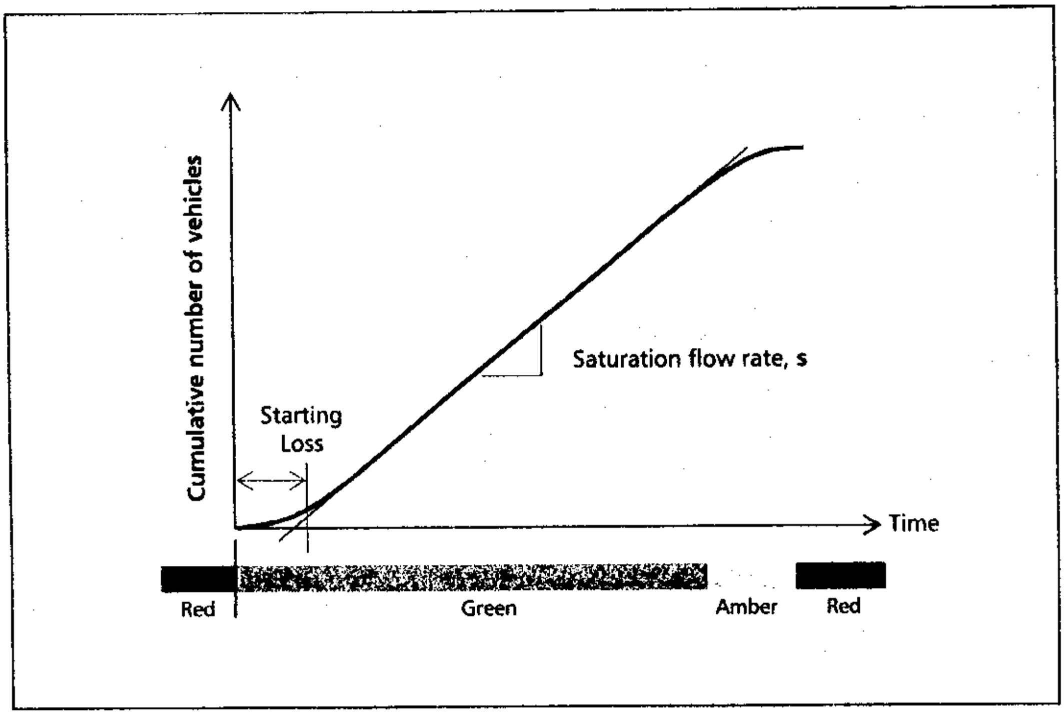


2.3.10 Summary of Designing Traffic Signal Settings

Data Requirements

The data requirements for calculating traffic signal settings are the following:

- Traffic volume
- Pedestrian Flows
- PCU values
- Saturation flow rate
- Physical characteristics of the road: no. of legs; width of approaches; no. of lanes; gradient



Signal Phasing

Phasing is the process of giving right of way to particular movements in a logical manner with the primary purpose of minimizing the number of conflicts. The data requirements for planning for phasing patterns are traffic volumes, turning prohibitions, and a knowledge of the various conflicts that may exist – crossing, merging, diverging.

The main principles in the design of signal phasing are as follows:

- Minimize the number of phases commensurate with safety
- The minimum is a 2-phase system
- The maximum number of phases should be equal to the number of intersection approaches

There are many possibilities of developing the phases. Examples of commonly used phase patterns are shown in Figure 2.3-7:

Figure 2.3-7a **2-Phase Systems**

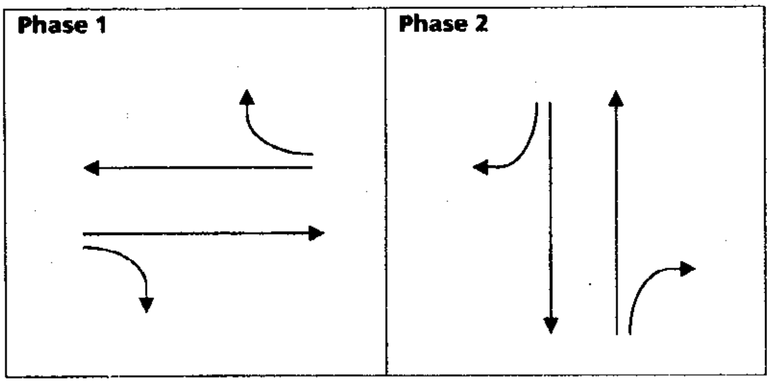


Figure 2.3-7b **3-Phase Systems**

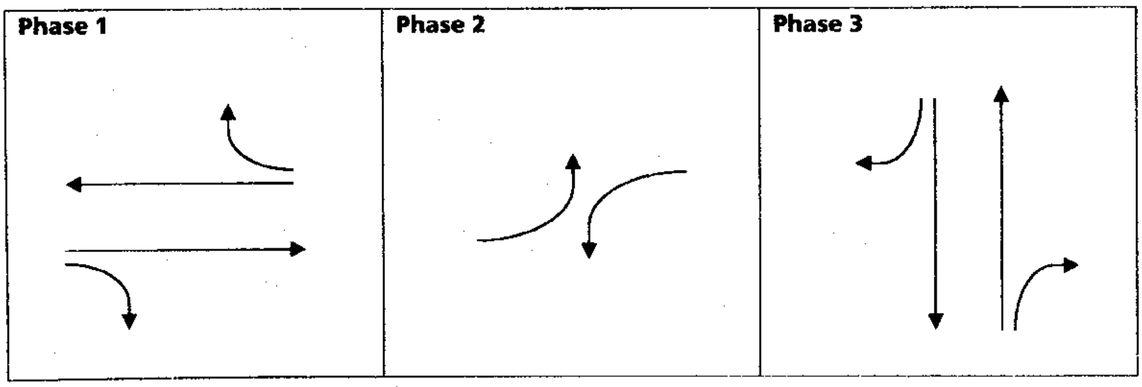
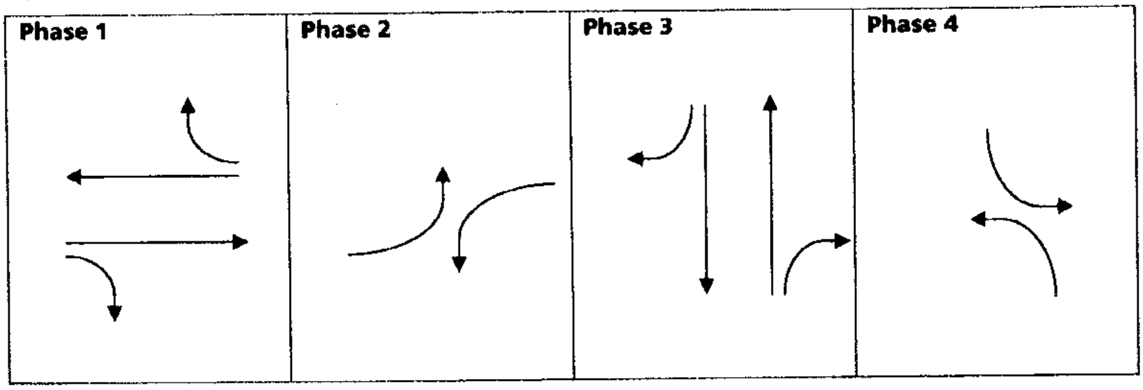


Figure 2.3-7c **4-Phase Systems**



Lost Time

Lost time is calculated including the starting loss (when no vehicles are yet moving when light has turned to green), and the all-red phase

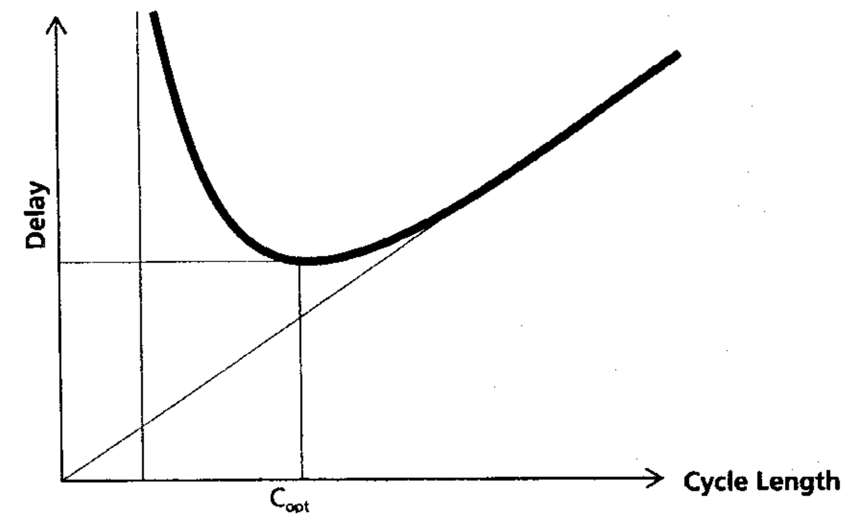
Intergreen Time

Intergreen time is the clearance interval minus yellow (amber) plus all-red phases

Optimum Cycle Length

Figure 2.3-8 shows the graph of vehicle delay as a function of cycle time. When cycle times are short, delay is high. As cycle times are lengthened, delays drop up to a certain cycle time C_{opt}. As cycles are increased past C_{opt}, delays increase again. This value of C_{opt} where delays are minimum is the optimum cycle length.

Figure 2.3-8 **Optimum Cycle Length**



Webster's Formula for Optimum Cycle Length, C_{opt}

Optimum cycle length may be calculated given by Webster's Formula, as follows:

$$C_{opt} = \frac{1.5\,L + 5}{1 - Y}$$

Where: C_{opt} = optimum cycle length
L = total lost time
Y = sum of y-values

Allocation of Green Times

Green times are allocated in proportion to the Y-values.

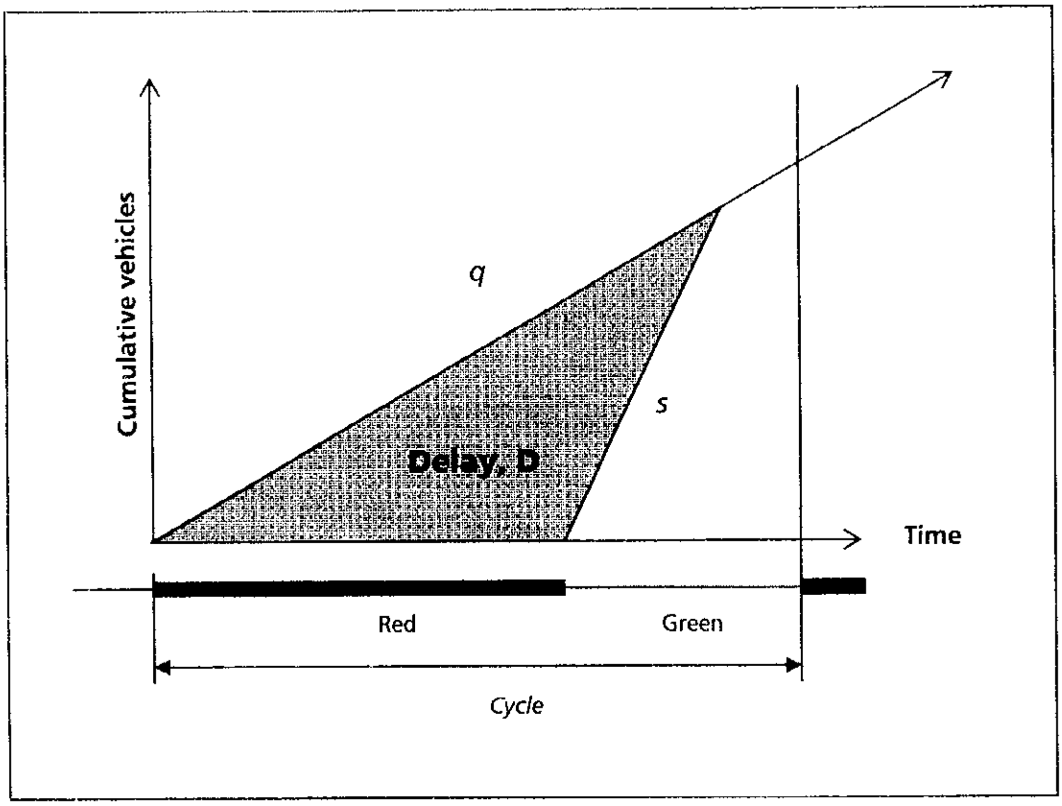
Capacity of Movement or Approach

Capacity is given by the following formula:

$$\text{Capacity} = s \times \frac{g}{c}$$

Where: s = saturation flow rate
g = effective green
c = cycle length

Estimation of Delay



Delay, *D* = area of triangle

$$D = \frac{qc^2 (1-\lambda)^2}{2 (1-\lambda x)}$$

Average Delay per vehicle, d

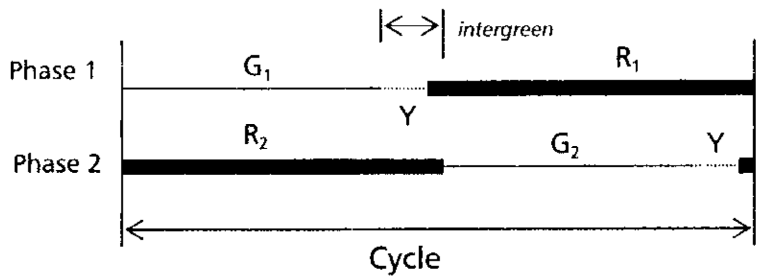
$$D = \frac{D}{qc} = \frac{c}{2} \; \frac{(1-\lambda)^2}{(1-\lambda x)}$$

Where: q = arrival flow rate

$$\lambda = \frac{g}{c}$$

g = effective green
c = cycle length

Timing Diagram

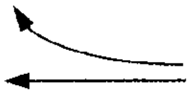
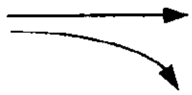
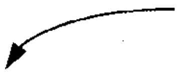
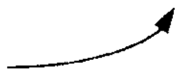


Intersection Degree of Congestion, *X*

$$X = \frac{CY}{g} = \frac{CY}{C - L}$$

Example on Signal Timing Computation

Take the case of a four-leg intersection. Particular movements and peak hour volumes, converted in PCUs, is shown in the table below. The calculations and solutions is shown in the succeeding page.

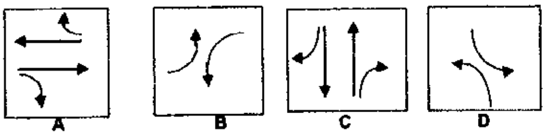
Movement		Volume, PCU per hour
1		590
2		360
3		210
4		120
5		520
6		525
7		200
8		195

Example: 4-leg intersection

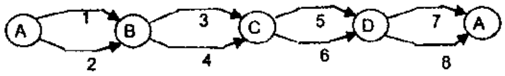
Movement	Volume, pcu/hr.	SFR*	IG**	y-value	ycr, Alt.1	ycr, Alt.2	ycr, Alt. 3
1	590	2000	5	0.295	0.295	0.295	.0.295
2	360	1800	5	0.200			0.2
3	210	1700	5	0.124	0.124		
4	120	1700	5	0.071		0.071	
5	520	1800	5	0.289	0.289	0.289	0.289
6	525	2000	5	0.263			0.263
7	200	1700	5	0.118	0.118	0.118	
8	195	1700	5	0.115			
				Y-value=	**0.825**	**0.772**	**1.047** (most likely value)

Alt. 2 is better!

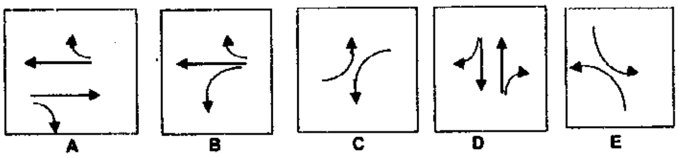
PHASING:
Alternative 1:



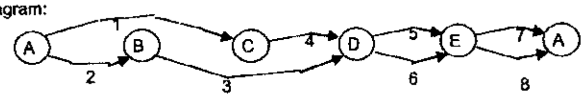
Critical Movement Diagram:



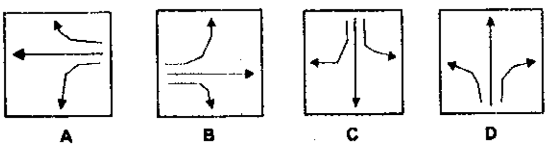
Alternative 2:

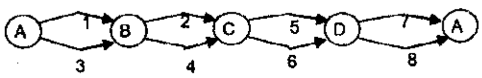


Critical Movement Diagram:



Alternative 3:





For alternative 2:

No. of Phases	4
Starting loss	2 sec.
All-red	2 sec.
Yellow	3 sec.

Total Lost Time, L = 4(Starting loss + All-red) = 16 sec.

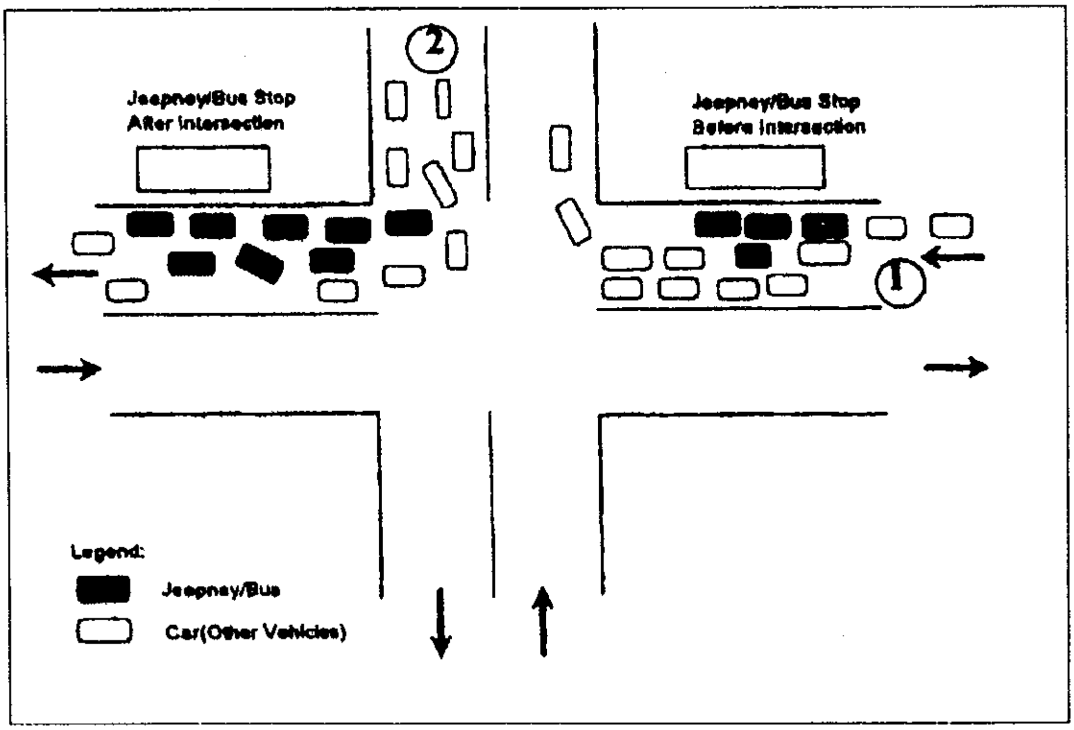
Optimum cycle time, Copt:

2.4 Bus and Jeepney Stops

2.4.1 How should loading / unloading zones be located?

Based on existing practice, the location of stop has to be 30 meters away from the curb line, be it before or after the intersection. However, with the great number of jeepneys or buses wanting to make stops along major thoroughfares here in Metro Manila, overflowing of these vehicles is inevitable when the stop is located after the intersection. In the same token, double stopping often occurs when the stop is located before the intersection.

Figure 2.4-1



2.4.2 Stops Located After Intersection

Some of the adverse effects of stops located after the intersection are as follows:

a. blocking right turn from other direction; this may not be severe since the vehicles may be able to use the next lane adjacent to the curb lane;
b. may cause blocking of path of through from other direction;
c. when there is long queue of stopping jeepneys, there is tendency to double-stop so as to avoid being caught inside the intersection which further causes blocking of through traffic in the same direction.

2.4.3 Stops Located Before Intersection

With stops located before the intersection, the following may occur:

a. blockage of right turn traffic;
b. reduction of approach capacity by one lane almost 100% of the time; with the jeepney stop located before the intersection, even if the signal is green, the outer lane (curb lane) is always almost unutilized.

2.4.4 Effects of Bus / Jeepney Stop Location

Table 2.4-1 summarizes the most likely effects of the location of stops with reference to the intersection. It will help the planner or the engineer in making a qualitative analysis and decision on the proper location of the stop depending on the criterion or criteria being used. Referring to Figure 2.4-1, for instance if traffic situation alone is to be considered and if in Approach 1, right turn and through traffic are heavy, and if in Approach 2, right turn traffic is light, then the stop has to be located after the intersection. If desired, each item may be assigned a weight in order to have a quantitative assessment.

Table 2.4-1 **Summary of Effects of Bus / Jeepney Stop Location**

Criteria		Location of Bus/Jeepney Stop	
		Before	After
A. Traffic Situation			
Approach 1			
1. Right Turn	Light	✓	-
	Heavy	X	-
2. Through	Light	✓	✓
	Heavy	X	X
Approach 2			
1. Right Turn	Light	O	✓
	Heavy	O	X
2. Probability of Blockage of through		O (low)	X (high)
B. Jeepney / Bus Drivers			
Chance to wait longer for passengers		O (high)	✓ (low)
C. Passengers			
Passengers' expected delay		X (more)	O (less)

Note: ✓ no adverse effect O preferable / favorable X not recommended

2.5 Traffic Signs[4]

2.5.1 The Purpose of Traffic Signs

Traffic control devices, which include traffic signs and pavement markings are generally used to promote road safety and efficiency by providing for the orderly movement of all road users on streets and highways. These devices notify road users of regulations and provide warning and guidance needed for the safe, uniform, and efficient operation of all elements of the traffic stream.

Traffic signs are a principal means for regulating, warning, and guiding traffic. However, to be effective, traffic signs must meet these several requirements. These are:

- fulfill a need
- command attention of drivers
- convey a clear and simple meaning
- command respect of road users
- provide adequate time for proper response

To meet basic traffic requirements and provide maximum effectiveness for road users, information presented on signs, whether legend or symbols, must be legible and understandable. Traffic speed, weather and light conditions, sight distance, and driver age directly affect the legibility and clarity of a sign message. To address these factors, sign design must consider overall sign dimensions, lettering size, color, contrast, and retroreflectivity. For effective use, signs must be positioned relative to the driver's cone of vision and located in a position that allows adequate response time.

2.5.2 Elements of Traffic Signs

As discussed preliminarily in section 2.2.4 of this Manual, traffic signs must conform to basic elements in order to meet the requirements enumerated in section 2.5.1. Traffic signs must conform to basic standards in terms of the following elements:

- Design — color, shape, size, lettering, retroreflectivity, and legibility
- Placement — sign location in relation to motorists and the subject to which the message applies.
- Operation — consistent service by the sign in meeting traffic needs.
- Maintenance — adequate attention to assure the sign remains visible and functional.

4 Annex D presents a discussion on international standard traffic signs, in accordance with the provisions of the International Convention on Road Traffic Signs ratified in Vienna, Austria on 8 November 1968, with amendments which came into force on 30 November 1995.

- Uniformity — consistent appearance and application to achieve consistent driver perception and response.

2.5.3 Types of Traffic Signs

Traffic signs can be categorized according to different classes. The international system prescribed in the Vienna Convention differentiates between the following classes of road signs:

- **Danger warning signs** — these signs are intended to warn road-users of a danger on the road and to inform them of its nature;

- **Regulatory signs** — these signs are intended to inform road-users of special obligations, restrictions or prohibitions with which they must comply;
  Regulatory signs may further be classified into the following:
  (i) Priority signs;
  (ii) Prohibitory or restrictive signs;
  (iii) Mandatory signs;
  (iv) Special regulation signs;

- **Informative signs** — these signs are intended to guide road-users while they are traveling or to provide them with other information which may be useful;
  Informative signs may further be classified into the following:
  (i) Information, facilities or service signs;
  (ii) Direction, position or indication signs; Advance direction signs; Direction signs; Road identification signs; Place identification signs; Confirmatory signs; Indication signs;
  (iii) Additional panels.

- **Special instruction signs** — According to the DPWH Philippine Road Signs Manual, these signs are "used at locations where ordinary guide and regulatory signs do not achieve the desired result. These signs instruct the motorist to follow a direction or to obey a course of action."

2.5.4 Danger warning signs

Danger warning signs alert road users of potentially dangerous situations on or adjacent to the road ahead. They provide drivers or other road users of the warning to possible situations, to which they must react accordingly to ensure road safety. Danger warning signs are triangular in shape, with black markings on a white background (yellow in other countries), and a red border.

The provisions in the Vienna Convention stipulate that the number of danger warning signs shall not be increased unnecessarily, but that such signs shall be sited to give warning of possible road hazards which are difficult for a driver proceeding with due caution to perceive in time. As such, danger warning signs shall be placed at such distance from the danger point as will make them most effective both by day and by night, having regard to road and traffic conditions, including the normal speed of vehicles and the distance at which the sign is visible.

The distance between the sign and the beginning of a dangerous section of road may be shown in an additional panel below the warning sign, which are triangular in shape. The information must be given when the distance between the sign and the beginning of the dangerous section of road cannot be judged by drivers and is not what they might normally expect.

Danger warning signs may be repeated, particularly on motorways and roads treated as motorways. Where they are repeated, the distance between the sign and the beginning of the dangerous section of road shall be indicated. However, if these are placed to frequently, warning signs may lose their effectiveness. As a general principle, warning signs need not be used if drivers can normally be expected to see and assess the potential danger situation.

Examples of danger warning signs include signs alerting drivers of dangerous bends, presence of pedestrians, presence of signalized intersection ahead, presence of speed bumps (humps), presence of intersecting roads, etc.

Design of danger warning signs

Danger warning signs are generally of an equilateral triangle having one side horizontal and the opposite vertex above it; the ground is white and the border red. The symbols displayed on these signs shall be black. The size of the normal sized warning sign shall measure approximately 0.90 m; that of the small sized warning sign, used for streets with slower speeds, shall measure not less than 0.60 m. The DPWH standards set the smaller size to be 0.75 m on each side.

Warning signs are classified in the DPWH Road Signs Manual into the following groups:

- W1 Alignment Series
- W2 Intersection and Junction Series
- W3 Advance Warning of Traffic Control Devices Series
- W4 Road Widths and Clearances Series
- W5 Road Obstacles Series
- W6 Pedestrian and School Zones Series
- W7 Auxiliary Series

Alignment Warning Signs
Signs in this series are used to indicate the type of road curve ahead of the motorist. Signs under this sub-category warn of a dangerous bend or succession of bends in the road alignment ahead, and include signs warning motorists of sharp turns, curves, reverse curves, winding roads and hairpin turns.

Intersection and Junction Series
Signs in this series are used when the sight distance to the approach to an intersection or junction is less than the sate stopping distance or where drivers may have difficulty in appreciating the presence or configuration of an important intersection ahead.

Advance Warning of Traffic Control Devices
Signs in this series include "Traffic Signal Ahead" and "Railway Crossing Ahead".

Road Widths and Clearances
Signs in this series include "Narrow Bridge", "Road Narrows", "Divided Road" and "End Divided Road".

Road Obstacles
Signs in this series include those warning motorists of humps, steep descent / ascent, and other road obstacles.

Pedestrian and School Zones
Signs in this series include "Pedestrian Crossing", "Children Crossing", and those warning of the presence of wheelchair users.

Auxiliary Series
The auxiliary series of warning signs include in conjunction with other warning signs, and may include advisory speeds, distances to the hazard, or special conditions such as "when wet" or "when foggy", for example. Auxiliary series signs are rectangular in shape, and placed on the same post and below the warning sign they are associated with.

2.5.5 **Regulatory signs**

Regulatory signs provide information to road users of traffic laws, rules or regulations, a violation of which would be considered an offense, subject to penalties. Except for the "STOP" sign, "GIVE WAY" sign, and one-way directions, regulatory signs are prescribed to be circular in shape. They may be of the form with black markings on a white background (some other countries use yellow background) and a red border, or a circular symbol with blue background and white markings.

"GIVE WAY" signs are used to notify drivers that, at the intersection where the sign is placed, they must give way to vehicles on the road they are approaching. "STOP" signs are used to notify drivers that, at the intersection where the sign is placed, they shall stop before entering the intersection and give way to vehicles on the road they are approaching. Please refer to Annex D for more discussion on the warrants for these signs.

For ease in manufacturing, rectangular panels are sometimes used for regulatory signs. However, the circular shape of the sign within the rectangular panel is still highlighted. The DPWH Road Signs Manual prescribes a plate size of 450mm width X 750 mm height for rectangular plates containing regulatory signs.

Regulatory signs are categorized in the DPWH Road Signs Manual into the following groups:

R1	Priority Series
R2	Direction Series
R3	Prohibitive / Restrictive Series
R4	Speed Series
R5	Parking Series
R6	Miscellaneous Series

Priority Series
The signs in this series inform road users of special rules of priority at intersections.

Direction Series
These signs give directions to be followed, as well as special directions for vehicles occupying specific lanes.

Prohibitive / Restrictive Series
These signs inform road users of prohibitions in force.

Speed Series
These signs inform road users of regulations concerning vehicle speeds.

Parking Series
The signs in this series inform road users of regulations concerning parking.

Miscellaneous Series
These signs include load and dimension restrictions.

2.5.6 Informative signs

Informative signs, or *guide signs*, provide directional and navigational information to road users. An important element of the guidance system is street name signs. These signs may not always receive sufficient consideration, in fact only a small percentage of Metro Manila's streets are provided with street name signs.

2.5.7 **Other classifications**

Special conditions on the road may warrant the installation of traffic signs, although these may not necessarily fall under any of the three aforementioned categories. These special signs are typically used for road works and other temporary special conditions along the roadway that road users need to be warned of.

The DPWH prescribes that signs for roadworks and other road conditions be of black legend on fluorescent yellow-orange or yellow background.

Special instruction signs, on the other hand, are used at locations where ordinary guide or regulatory signs do not achieve the desired result. They instruct the road user to follow a direction or a course of action.

They are generally rectangular in shape, with white reflectorized background and black markings. Legends must be concise and specific.

Signs such as "Reduce Speed", "Check Brakes", "No Right Turn on Red Signal", "Slow Vehicles Use Right Lane", etc. fall under this category.

2.5.8 **Prohibitions**

The Vienna Convention prescribes that countries shall undertake the following prohibitions concerning road signs:

a) "To affix to a sign, to its support or to any other traffic control device anything not related to the purpose of such sign or device; if, however, Contracting Parties or sub-divisions thereof authorize a non-profit-making association to install informative signs, they may permit the emblem of that association to appear on the sign or on its support provided this does not make it less easy to understand the sign";
b) "To install any board, notice, marking or device which might be confused with signs or other traffic control devices, might render them less visible or effective, or might dazzle road-users or distract their attention in a way prejudicial to traffic safety."

The first prohibition includes advertisements and other commercial uses affixed to a sign or to its support, with the exception of non-profit-making associations. The second prohibition covers visibility of traffic signs.

2.5.9 **Placement of signs**

Signs shall be so placed that the drivers for whom they are intended can recognize them easily and in time. They are normally be placed on the side of the road appropriate to the direction of traffic (right side in the case of the Philippines); they may, however, be placed or repeated above the carriageway. (For more detailed specifications regarding placement of signs, the user of this Manual is referred to the DWPH Road Signs Manual.)

Any sign placed on the side of the road appropriate to the direction of traffic shall be repeated above or on the other side of the carriageway if local conditions are such that it might not be seen in time by the drivers for whom it is intended.

All signs shall apply to the drivers from whom they are intended over the whole width of the carriageway open to traffic. However, signs may be made to apply to only one or to several lanes of the carriageway when lanes are defined by longitudinal markings. In this case, three options are prescribed:

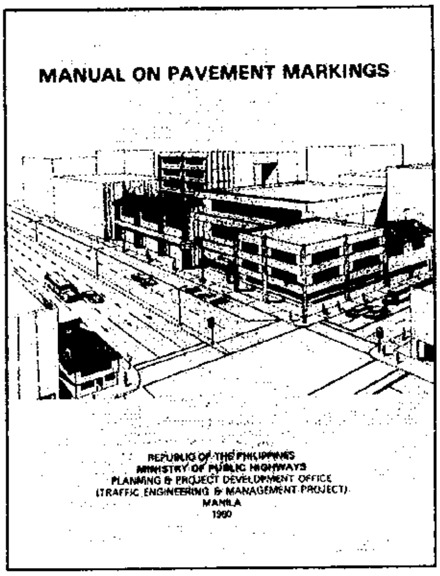
a) The sign with, if necessary, the addition of a vertical arrow shall be placed above the lane concerned, or
b) The sign will be placed on the nearside edge of the carriageway when the road markings indicate without doubt that the sign applies solely to the traffic lane on the nearside of the carriageway and that the only purpose of this sign is to confirm a local regulation already indicated by means of road markings, or
c) Signs indicating speed prescriptions for specific lanes of roads, or signs showing merging or diverging of lanes (Sign E,1 or E, 2 described in Annex 1, section E, subsection II, paragraphs 1 and 2 signs G, 11 and G, 12 described in Annex 1, section G, subsection V, paragraphs 1 and 2 of the Vienna Convention) will be placed on the edge of the carriageway.

2.6 Pavement Markings

Markings on roadways have important functions in providing guidance and information for the road user. Major marking types include pavement and curb markings, object markers, delineators, colored pavements, barricades, channelizing devices and islands. In some cases, markings are used to supplement other traffic control devices such as signs, signals and other markings. In other instances, markings are used alone to effectively convey regulations, guidance, or warnings in ways not obtainable by the use of other devices

2.6.1 MPH Manual on Pavement Markings

In 1980, the then Ministry of Public Highways (of the Philippines) released a Manual on Pavement Markings which defines the types and uses of various pavement markings and discusses their limitations and applicability. This section draws heavily from that manual. For more detail, the reader is referred to the said manual, although other publications based on international conventions on signs and pavement markings may also be suitable references. In particular, the stipulations in the Vienna Convention also prescribe standards on pavement markings.



This section focuses primarily on introducing the following general aspects of pavement markings and their usage:

- Functions of Pavement Markings
- Limitations of Pavement Markings
- Legal Authority
- Standardization
- Types of Markings
- Materials
- Color
- Types of Lines
- Widths

2.6.2 Functions of Pavement Markings

The main purpose of pavement markings is to provide guidance and control for vehicles and pedestrians. These may be in the form of lines, symbols, messages or numerals that may be set on the surface of the pavement. Pavement markings supplement other forms of guidance and control such as traffic signs and signals.

2.6.3 Limitations of Pavement Markings

Because of the nature of these markings being placed on the pavement, they are subject to the following limitations:

- subject to wear and tear due to vehicular and pedestrian traffic
- they may not be clearly visible when the road is wet, dusty or dirty
- they may be obscured by traffic
- depending on materials used, they may affect skidding or braking by vehicles
- they may not be placed on unsealed roads

2.6.4 Legal Authority

Markings may only be applied and removed by duly authorized entities. Pertaining to national roads, all pavement marking plans must be approved by the Department of Public Works and Highways. For city or municipal roads, these must be approved by the local traffic management authority, or in its absence, by the (City) Engineer's Office.

2.6.5 Standardization

Uniformity of markings aids recognition and instant understanding for the guidance of motorists. The standards to be used are those specified by the Department of Public Works and Highways.

2.6.6 Types of Markings

Markings are classified as follows:

a. Pavement and Curb Markings
   1. Longitudinal Lines – lines laid out in the direction of travel.
      These include Center Line, Lane Line, Double Yellow Line, "No-Passing" Zone Markings, Pavement Edge Line, Continuity Lines, and Transition Line
   2. Transverse Lines – Lines which are laid out across the direction of travel.

These include the Stop Line, Yield (Give Way) Lines, Pedestrian Crossing Markings.

3. Other lines – This includes Turn Lines, Parking Bays, Painted Median Islands and Bus and PUJ Lane Lines, and the "Yellow Box" lines to denote "Keep Intersection Open".
4. Other marking which include approach markings to islands and obstructions, chevron markings, diagonal markings, markings on exit and entrance ramps, curb markings for parking restrictions, approaches to railroad crossings, messages and symbols and pavement arrows.

b. Object Markings
    1. Objects within roadway
    2. Objects adjacent to roadway

c. Reflector Markings
    1. Retro-Reflector Raised Pavement Markers
    2. Hazard Markers
    3. Delineators

2.6.7 **Materials**

Materials used for pavement marking have evolved along with technological advances especially in material science. The main concern when selecting the material is that it does not compromise safety requirements of the roadway, such as those related to stopping/braking. In other words, markings should be of non-skid materials and should not protrude more than 6 mm above the level of the carriageway. On the other hand, raised pavement markers, should not protrude more than 15 mm above the level of the carriageway. The following are common materials for road markings.

a. Paint – Paint with or without glass beads embedded or premixed can be applied by hand or with line marking machines. For proper reflectorization at night, the amount of glass beads should be no less than 0.45 kg and no more than 0.50 kg per liter of mixed paint.
b. Thermoplastic materials – Use of thermoplastic materials with or without reflective properties is recommended at locations subject to extreme traffic wear. The average service life of thermoplastic materials has been observed to reach eight times that of beaded traffic paints.
c. Pre-cut sheeting – Pre-cut materials both with or without reflective properties may be used. This is usually in the form of a kind of adhesive tape with aggregate or pigment and plastic rubber combined on one side and adhesive on the other side.
d. Raised pavement markers – These are studs or plastic, ceramic, aluminum, cast iron, etc. which are set into the carriageway or attached to the road surface with an adhesive. These may be reflective or non-reflective.

2.6.8 Color

The main concern regarding the color of markings is their effect on legibility and contrast with the pavement. In combination with the size of markings, contrast plays an important role in providing markings which can be easily understood by pedestrians and motorists alike.

Pavement markings are normally white with the exception of the following cases wherein yellow is used instead:

a. Raised pavement markers – These are studs or plastic, ceramic, aluminum, cast iron, etc. which are set into the carriageway or attached to the road surface with an adhesive. These may be reflective or non-reflective.
b. Double-Yellow lines – These indicate "No-Passing" conditions, vehicles on both direction are disallowed from crossing the lines.
c. Unbroken portion of "No-Passing" lines - these indicate that traffic on the side of the unbroken line are disallowed from entering the opposing lane.
d. Curb markings for the prohibition of parking - Yellow diagonal stripes are often used in combination with black parallel stripes to indicate areas where parking is prohibited.
e. On islands in line of traffic
f. Bus and PUJ lanes
g. "Yellow Box" markings denoting "Keep Intersection Open"

Yellow indicates a higher level of concern or call for attention than white.

2.6.9 Types of Lines

Depending on the direction that the lines are marked on the pavement, lines may be longitudinal, transverse or oblique. Depending on the use and meaning of such lines, they are either broken lines or solid lines.

Broken Lines
A broken line shall consist of line segments of equal lengths separated by uniform gaps. The speed of the vehicles on the section of road or area in question should be taken into account in determining the lengths of the strokes and of gaps between them. In general, the gaps and length of strokes become longer as area or section speed increases. Broken lines form a general guidance but may be crossed under certain conditions.

Solid Lines
A solid unbroken line is used where crossing of the line is either discouraged or prohibited. It is generally used to replace or supplement a broken line where required (e.g. barrier

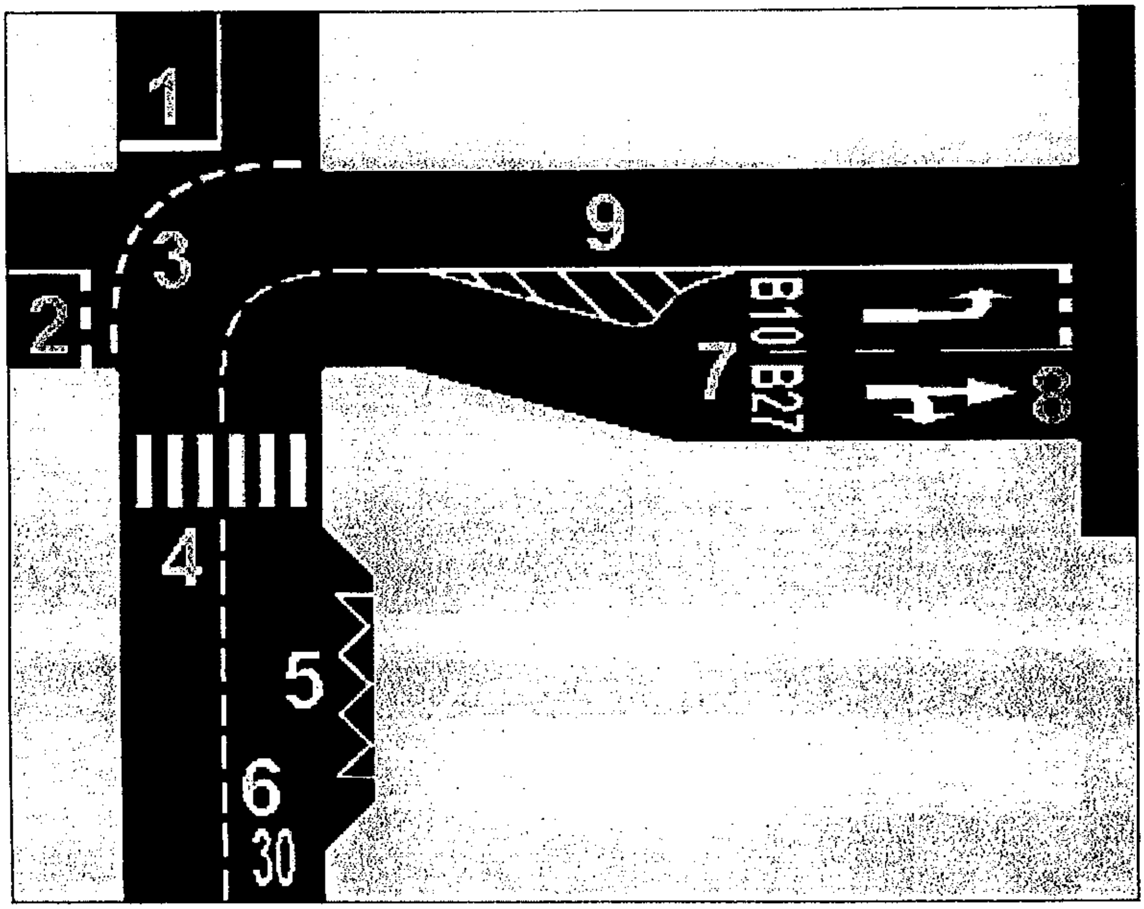
lines, center lines, etc. Solid lines may be either yellow or white depending on whether or not crossing the line is legally prohibited (yellow indicates legal prohibition).

2.6.10 **Width of lines and tolerance**

The specification of width of solid or broken lines ranges from 100 mm to 300 mm depending upon the usage or application of the said line. Transverse lines are usually wider because of the angle at which the driver sees markings on the carriageway. However, due to the statistical impossibility of assuring exact conformance to a given specification, a certain amount of variance (or tolerance) from the specification is allowed. Line marking should conform to the following tolerances.

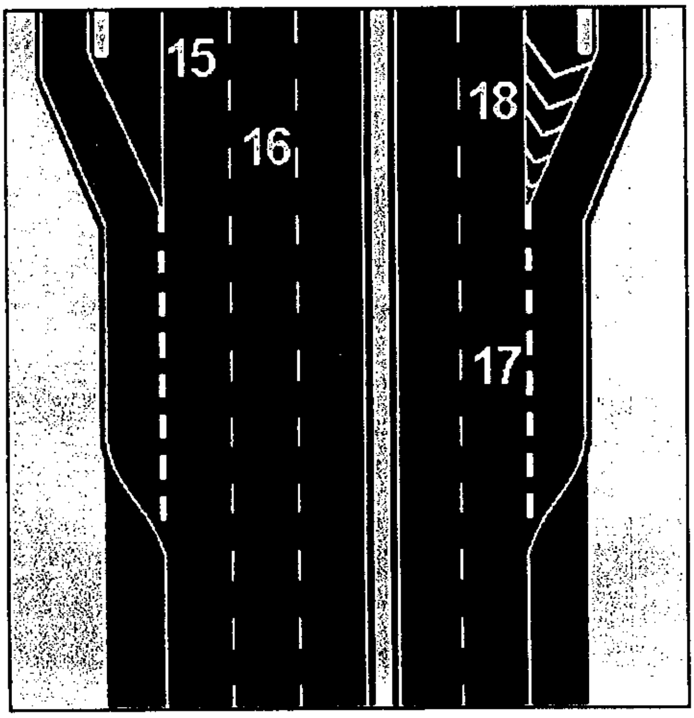
a. Under 500 mm ....± 20% or – 10%
b. 500mm up to under 5.0 meters.......±10%
c. 5.0 meters and above ....± 5%

Figure 2.6-1 **Pavement Markings examples**



1. **Stop line:** You must stop behind the thick solid line across your lane.
2. **Wait line:** A thick broken line across your lane is the equivalent to a yield sign (and is often used in conjunction with it.) If necessary, you must wait behind the broken line across your lane.
3. **Priority road:** A broken line passing through an intersection along the edge of one of the roadways indicates the path of the priority road.
4. **Pedestrian crosswalk:** Zebra-striped markings across the roadway mark a pedestrian crosswalk. You must yield the right-of-way to pedestrians in the crosswalk.
5. **No stopping/parking zone:** Zig-zag lines next to the curb mark a specific area (often near a near a bus stop or driveway) where you may not stop or park. (Used in Europe)
6. **Numbers:** Numbers on the pavement in your lane usually indicate the speed limit. Often used during sudden drops in the speed limit for safety reasons.
7. **Letters and numbers:** A combination of letters and numbers on the pavement usually indicate route numbers. These are frequently used at complicated intersections to get traffic in the correct lane. Example: a marking such as "B27" indicates that the lane you are in follows the B27 highway.
8. **Intersection arrows:** Arrows on the pavement in your lane indicate which turns are allowed from your lane.
9. **Restricted zone:** You may not drive in an area with diagonal lines.

Figure 2.6-2 **More Pavement Markings examples**



15. **Edge marking:** A solid line along the side of the roadway marks the edge of the roadway or separates the travel lanes from the shoulder.
16. **Lane separators:** Long broken lines separate traffic lanes traveling in the same direction.
17. **Acceleration/deceleration lane:** Short, thick broken white lines separate a deceleration (exit) lane or acceleration (entrance) lane from the main traffic lanes.
18. **Restricted zone:** You may not drive in an area with diagonal lines.

2.7 Common Causes of Road Congestion and Typical Countermeasures

Table 2.7-1 lists the common causes of traffic congestion in Metro Manila, and also presents a menu of solutions for such problems.

Table 2.7-1 **Common Causes of Road Congestion and Typical Countermeasures**

Common Causes	Menu of Solutions
Indiscriminate loading/unloading of PU vehicles Deliberate slowing down before the traffic lights to catch the red light and pick-up/unload passengers	• Designate specific points for bus / jeepney stops, about 50 meters away from intersection • Provide loading/unloading bays off the main road, space permitting, to keep lanes for mainstream traffic free • Impose penalties, and/or fines to erring drivers; • Persuade passengers to co-operate via education, information campaign, imposition of fines
Usurpation of road space, and/or sidewalk, by vendors, or as parking space, or as transport terminals	• Provide off-road alternative locations for vendors or parkers or transport terminals • Conduct periodic, recurring, drives to remove, tow, and/or demolish • Impose penalties/fines on violators;
Too much road friction arising from vehicles getting in/out of establishments with large frontage along main roads	• Reduce the length/breadth of ingress/egress for properties and establishments along major thoroughfares • Impose frontage tax • Require new buildings to have their egress/ingress from service or secondary roads;
Too many conflicts at intersections, due to left-turns, right-turns, through and U-turn movements	• Minimize conflicts by banning low-volume turning movements at that intersection and transferring it elsewhere • Channelize the intersection, to limit movements to specific lanes • Improve geometries of road curbs, to speed up turning movements
Tug-of-war between pedestrians and vehicles for the same road space, especially in commercial, educational, and leisure areas	• Provide separation – in time or space - of pedestrians and vehicles, for the safety of life and property • Build pedestrian overpasses or underpasses; • Install pedestrian barriers, to preclude overspill from sidewalks to road lanes • Transform the area into pedestrian malls, at specific days / times
Parking problem: high demand for parking but no spaces on-street or off-street	• Imposition of parking charges • Shared parking

Other common problems and solutions are as follows:

Common Problems	Menu of Solutions
Physical inadequacies such as deteriorated pavement, lack of sidewalks, wrong geometry	• Possible solutions include land use control, physical improvements to sidewalk pavement, or clearing of sidewalks which entails enforcement
Temporary obstruction arising from diggings, road closures, construction, etc	• Measures need to be undertaken in order to shorten the period of disruption to traffic flow. • Utility companies, and other applicants for road closure, need to prepare, submit and have approved traffic management plans which include rerouting schemes and proper advisories.
Queue propagation, or ripple effect, from adjoining problem intersection	• Coordination of intersection control. by traffic enforcers, for intersections without signals. • For signalized intersections, automatic control should be left to do its work.
Uncoordinated traffic signals, outdated signal phasing, phasing inappropriate to road configuration	• Periodic review of signal timing plans to conform to changing traffic patterns
Inter-mixing of pedicabs and tricycles with other modes	• Enforcement of prevailing rules and regulations concerning tricycles and pedicabs • Regulation of tricycle and pedicab franchising such that no new franchise will be granted without provision of an off-street terminal space.
Counterproductive driving patterns, such as cutting corners, jumping the queue, initiating own counterflows, wrong priority in traffic hierarchy	• Strict enforcement of road rules. • Re-orientation of traffic direction to favor motorists in proper lane, and penalize, by means of prolonged delays and other punitive measures, road users who do not observe rules.

2.8 Last Minute Review of Proposed Scheme

Finally, you have formulated or designed a solution to a traffic bottleneck point that you feel is the best among several possibilities.

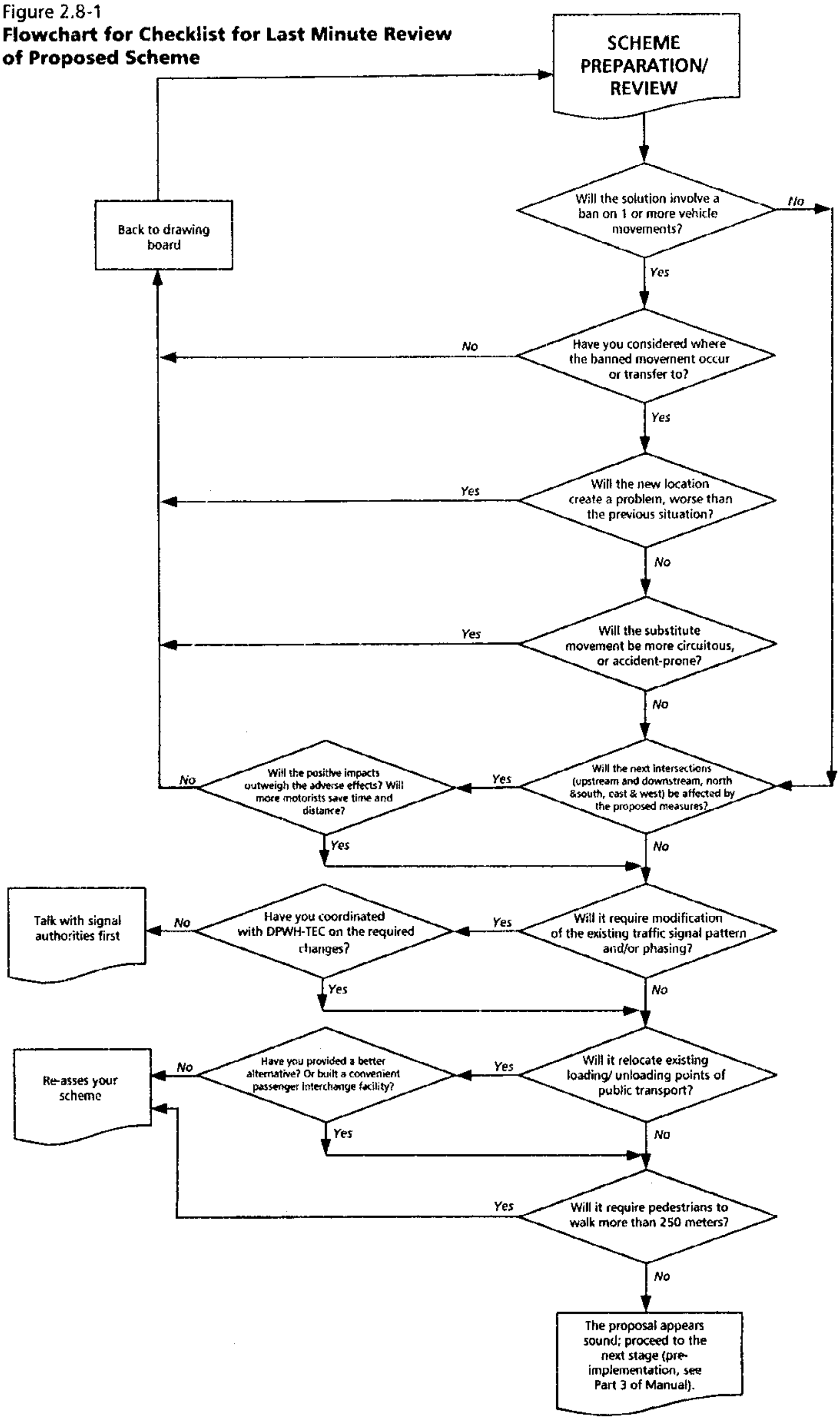
But is it?

As a guide to checking the practicality, robustness, and responsiveness of the proposed scheme, it will be worthwhile to subject it to the checklist given in Table 2.8-1 and graphically shown in Figure 2.8-1 on the following page.

Table 2.8-1 **Checklist for Last Minute Review of Proposed Scheme**

Check List		YES	NO
Q1	Will the solution involve a ban on 1 or more vehicle movements?	Go to Q2	Go to Q3
Q2	Have you considered where the banned movement occur or transfer to?	Go to 2a	Go back to the drawing board
Q2a	Will the new location not create a problem, worse than the previous situation?	Go back to the drawing board	Go to Q2b
Q2b	Will the substitute movement be more circuitous, or accident-prone?	Go back to the drawing board	Go to Q3
Q3	Will the next intersections (upstream and downstream, north &south, east & west) be affected by the proposed measures?	Go to 3a	Go to Q4
Q3a	Will the positive impacts outweigh the adverse effects? Will more motorists save time and distance?	Go to Q4	Go back to the drawing board
Q4	Will it require modification of the existing traffic signal pattern and/or phasing?	Go to Q4a	Go to Q5
Q4a	Have you coordinated with DPWH-TEC on the required changes?	Go to Q5	Talk with signal authorities first
Q5	Will it relocate existing loading/unloading points of public transport?	Go to Q5a	Go to Q6
Q5a	Have you provided a better alternative? Or built a convenient passenger interchange facility?	Go to Q6	Re-assess your scheme
Q6	Will it require pedestrians to walk more than 250 meters?	Re-assess your scheme	Go to 7
Q7	The proposal appears sound; proceed to the next stage (pre-implementation, see Part 3 of Manual).		

Figure 2.8-1
Flowchart for Checklist for Last Minute Review of Proposed Scheme



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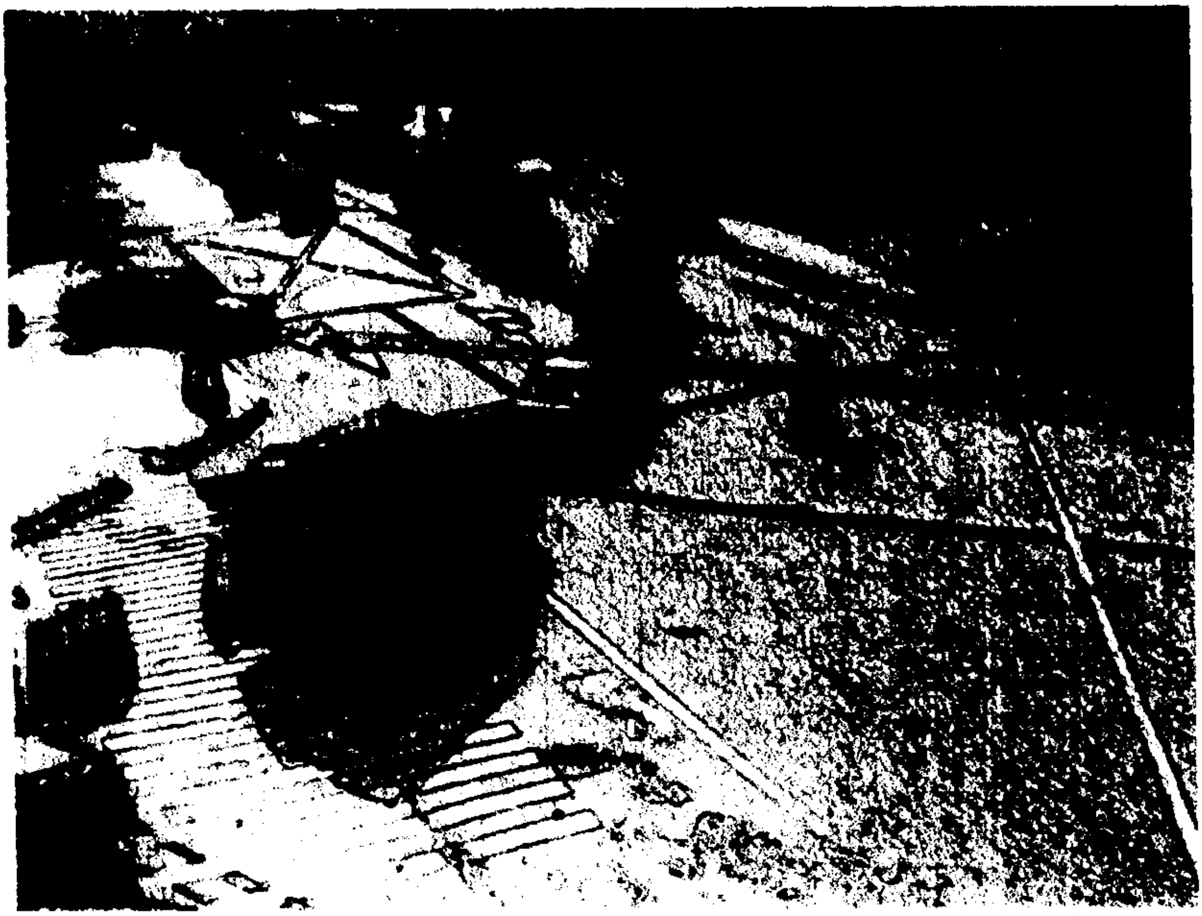


Part III
Pre-Implementation Routines

Part III

Pre-Implementation Routines

The following sections of the traffic management manual revolve on the inter-related activities immediately preceding implementation of the proposed traffic improvement scheme. It takes off from the earlier steps – wherein a solution has already been designed and accepted.

It encompasses the following sub-processes:

- Estimating the cost of the improvement
- Securing funding for the improvement scheme
- Consulting various stakeholders about the proposed scheme
- Legal backing

3.1 Estimating the Cost

3.1.1 Expressing the LTIP in peso terms

The local traffic improvement project (LTIP) has to be expressed in peso terms. Otherwise, funding can not be secured.

How much will it cost?

Generally, all physical works items have to be quantified – broken down into bill of quantities with unit prices for labor and materials, as well as some provisions for contingencies. The cost for non-physical items, if it will entail incremental amounts, should also be estimated.

The cost items include labor, paints, and other materials needed for such works as pavement markings, signage, steel or concrete barriers, repaving, etc.

Of course, not all LTIP will require financial resources – as when no physical items are required. It would still be worthwhile to estimate the incremental workload to existing personnel that the LTIP would entail.

3.1.2 Who will do the cost estimation?

The unit or person that prepared the design is the most logical entity to prepare the cost estimates. Usually, the task falls on the Engineering Department. On the other hand, if there is a Traffic Engineering unit, the latter might assume the responsibility. Ordinarily, the same unit will supervise the subsequent execution of the works.

3.1.3 Improving accuracy of cost estimates

In preparing the cost estimates, one has to canvass prevailing prices of materials from potential suppliers, examine past records for similar works, and talk with potential contractors/suppliers to arrive at a realistic price. Use of spreadsheet application software (e.g., MS-Excel) is ideal for this task.

Through time, as the LGU gains more experience, the accuracy of cost estimates should (and can be made to) improve through a systematic method of research and meticulous record-keeping. Cost data has to be gathered continuously, and expectations compared with actual costs. Annex F presents a listing of typical cost items that would need to be gathered in typical traffic improvement projects.

3.2 Getting Funding Support

3.2.1 Annual Appropriations

The City usually enacts an annual appropriations ordinance (or Local Budget) using its own revenues. The local traffic improvement projects (LTIPs) should be included in the capital expenditures program of the City. Since the expenditures are determined in advance, several LTIPs need to be constituted into a yearly program – and ranked according to priority. The Kagawads (or Council members) can then decide on the level of funding support it could muster for traffic.

On this aspect, the local traffic management authority has to take the cue from their Budget officers. Usually, LGUs have their respective budgeting cycles, procedures and formats.

3.2.2 Special Budget

If the proposed LTIP is not covered in the regular budget of the City, it may not get implemented unless covered by a special budget ordinance. It is not unusual, but taking the exception-route is always a long shot. Unless there are compelling reasons for the urgency, likelihood of approval is low. Hence, the local traffic management authority might as well prepare (and wait) for the regular budgeting cycle.

Because of the budgeting cycles that LGUs normally follow, it is important for the local traffic management group to keep on generating as many LTIPs as possible in their projects portfolio – and secure annual budget support for as many of them as resources will permit.

3.2.3 Tapping External Sources

Aside from the general revenues, the City may opt to tap funding sources from such national agencies like the DPWH and MMDA, or piggyback them on forthcoming transport projects. A non-traditional source is for the City to borrow – from development financing institutions like DBP or Official Development Assistance. Invariably, these sources would involve a longer lead time than warranted by small-scale LTIPs. Furthermore, the city has to demonstrate high level of traffic management capability in order to qualify for and access these external funding sources.

3.2.4 **Special Traffic Fund**

To insulate traffic projects from the vagaries of the annual budgeting exercise, it is recommended that a special Traffic Fund be created. This will, of course, require legislation, i.e. a City Ordinance.

Contributions to the Fund may come from the following:

- Penalties and surcharges for traffic violations as stipulated in the local traffic ordinance;
- Parking fees for any pay-for-parking facilities operated by the City;
- Towing charges;
- Fees for road diggings or excavations;
- Donations and grants from whatever sources;
- Other sources that may be identified by the Sangguniang Panlungsod, such as land conversion tax, frontage fee, access fee, tax on private roads, etc.
- Appropriations from the general fund.

To avoid any potential abuse, expenditures from the Fund should be subject to review and approval of a multi-sectoral local Traffic Advisory Council or its equivalent. Also, eligible items should be limited to traffic improvement projects, cost of parking tickets, cost of traffic citation or violation receipts, construction of sidewalks and parking facilities, including renovation or rehabilitation thereof. Salaries and allowances of personnel, whether permanent or contractual, should be excluded from Fund application.

3.3 Consultations

3.3.1 Identify the stakeholders

Generally, motorists will constitute the majority of stakeholders in any local traffic improvement scheme. However, they are too many and nebulous a group to be periodically consulted. There is no one association that can be considered the voice of motorists. The local residents adjoining the project area – represented by its neighborhood association or Barangay officers – might be the closest sub-group that can be consulted. Jeepney drivers, as well as tricycle drivers, usually have some kind of associations that might also be affected by the scheme. Aside from these categories of road users, the local traffic management authority should also pre-test the proposed scheme before local civic and/or professional groups, as well as local chamber of commerce.

Consultation is not the same as voting. Traffic schemes are, and should not, be decided by popularity. The aim is to accommodate different views that may lead to further refinement and improvement to the scheme. Remember that at the stage of consultation, the traffic scheme is neither final nor casts in stone. It can be revised, modified, and re-formulated. Even if there are vehement objections from some quarters, the scheme may still be pursued if in the judgment of local traffic management authority, the societal benefits outweigh the costs. Objections to a scheme serve a useful purpose – they alert local authorities about potential problems down the road.

3.3.2 Consultation is not always interactive

While direct face-to-face dialogue is ideal, it is not always practical or mandatory. Informing the stakeholders in advance, prior to implementation, may be sufficient.

An example of a 'flyer' or information bulletin is shown in Figure 3.3-1. It is short enough to be contained, back-to-back, in a single A4 size bond paper.

3.3.3 Coordination with other government agencies

In traffic matters, no man is an island.

Because of the strategic roles of DPWH, DOTC and MMDA in the transportation system of Metro Manila, a local traffic improvement project may not be as 'local' as it may seem. Congestion on national roads tends to overspill into local roads, and vice versa. Also, a traffic jam in an adjoining municipality can cascade into, and halt movements in, the City.

Figure 3.3-1 **An Example of an Information Brochure About a Traffic Scheme**

A Primer on the

Shaw Boulevard
Wack-wack Road
Lee Street
Intersection

in Mandaluyong City

AN EXERCISE IN
LOCAL TRAFFIC MANAGEMENT INITIATIVES

Prepared by:

City of Mandaluyong (Traffic Task Force)
Metro Manila Development Authority
(Project SSTRIMM)

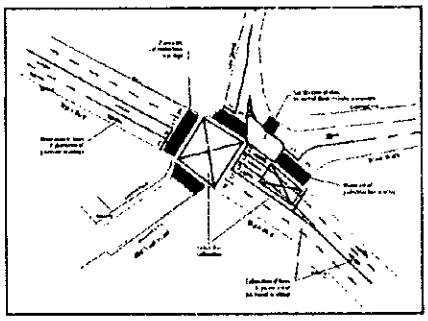
with the assistance of Japan International Cooperation Agency

THE AUGEAN TASK

Wrestling with the traffic problems of Metro Manila is probably even more difficult than Hercules cleaning up the Augean stable. But it is not impossible. Everybody has to pitch in; a minor alleviation here and there ultimately becomes a deluge. Take the intersection of Shaw Boulevard and Wack-wack with Lee Street in Mandaluyong. The congestion there is not the worse in Metro Manila, but bad enough to warrant priority attention of the City of Mandaluyong.

THE PROBLEM

Nature abhors a vacuum. Filipino drivers abhor too much road space. That may explain in a nutshell why traffic congestion occurs now and then, especially during rush hours, at the intersection of Shaw Boulevard,Wackwack Road, Lee Street, and Old Wackwack. It is a complicated vehicular junction – with 5 legs and 2 intersections in one place. Each leg allows 3 turning movements each. More than 4,600 vehicles were counted over 1 hour at peak -- large but not as crowded as other streets in Metro Manila. In fact, the junction has wide approaches. And therein lies the problem: drivers tend to jump the queue and occupy all available spaces at the approaches, thereby multiplying the points of conflicts. And make life for Traffic Enforcers extremely difficult and frustrating to manage and to untangle.



The basic solution is to reduce the points of conflicts and force drivers to queue – through channelization, pavement markings, proper signage, yellow box rule.

WHO WILL BENEFIT (OR SUFFER)?

Any change from the existing situation produces 'winners' as well as 'losers'. Queue breakers will be losers. Law-abiding drivers will benefit. Left turners from Lee Street to Wack-wack Road (1.3% of peak-hour hour volume), as well as left turners from Wack-wack Road to Old Wack-wack Road (1.2%), will suffer. The dominant traffic flows along Shaw Boulevard and Lee Street will be winners.

WHY NOT PUT IN TRAFFIC SIGNALS?

The DPWH is planning to install the so-called SCAT traffic signals, but it is still 2 to 3 years away. Meantime, what should be done? Small-scale traffic engineering measures should alleviate the congestion now. And sets the stage for the computerized signals of DPWH.

WHY NOT MAKE LEE STREET ONE-WAY?

It was an option considered, but eventually drop. A parallel road would have to become one-way also, in the opposite direction, to accommodate the flow of vehicles displaced at Lee Street. S.Laurel and Ideal Streets can not take up this role. Paired one-way streets work best in a grid-pattern road network. Such a configuration, unfortunately, does not exist in the area.

HOW DID THE PROPOSED SCHEME COME INTO BEING?

It evolved from a study called Small-Scale Traffic Improvement Measures for Metro Manila (SSTRIMM), funded with grant money from the Japan International Cooperation Agency (JICA) and coordinated by the Metro Manila Development Authority. The purpose of SSTRIMM is to assist the 17 local government units (that comprise metropolitan Manila) develop their capability to initiate and solve a number of traffic problems. The Shaw-Wack-wack intersection was identified by the City of Mandaluyong as its top priority traffic problem. As a consequence, it got into the planning scope of SSTRIMM traffic consultants. Traffic counts were made, and a practical scheme formulated. After several reviews, the chosen scheme was discussed extensively with Mandaluyong local officials sometime in May and June 2001. The Barangay gave its thumbs up for the implementation of the scheme.

Consultations have been made. Such a process should become standard operating procedure of LGUs. However, it does not mean a decision by popular vote by the residents of Wack-wack nor 100% satisfaction of those consulted. For practical reasons, the consultation did not include motorists from San Juan, Pasig, Manila, Makati and Quezon City who regularly pass the junction.

WILL THE SCHEME WORK?

There are no guarantees. Traffic management deals with 'unquantifiable' human behavior as well as 'measurable' traffic data. It should work, if experiences with similar chokepoints elsewhere are any gauge.

As a concession to 'doubters', the proposed 'island' at the corner of Lee and Wack-wack (side of the golf country club) will not be built immediately. A temporary barrier will first be set up.

To make sure that we – especially Mandaluyong traffic personnel -- learn from the scheme – whether a success or a failure, an evaluation of the traffic delays "before" and "after" will be made. It will attempt to answer: was there really an improvement? An impact evaluation is a pre-condition of JICA. It is intrinsic to a more scientific approach to our urban traffic problems.

Comments may be sent to:

Mandaluyong Traffic Task Force:

MMDA Project SSTRIMM
Orense St. corner EDSA
Guadalupe, Makati
Telefax: 882-0898
e-mail: sstrimm@transportas.com

The DPWH, DOTC, and MMDA may have projects that are about to be implemented as to impact -- negatively or positively – the proposed local traffic scheme. For example, in one project, pavement markings were about to be installed when the contractor of DPWH started to excavate the road.

The potential impact may also come from MWSS (and its two concessionaires Maynilad and Manila Water), PLDT, Globe, Smart, Digitel, Bayantel, and other telecommunications firms.

3.3.4 How long shall the consultation period be?

The larger the number of people consulted, the longer it will take to wrap up the discussions. As a guide, the bigger the influence area of the project, the more people may have to be consulted. One cannot cover all bases, however, by enlarging the circle ad nauseam. Or extending the period. At some point, the issue has to be laid to rest.

One week is short, but 2 months may be too long.

3.3.5 Local Traffic Advisory Council

Because traffic affects many sectors, it is good practice to bring these groups into the planning and implementation of traffic schemes. An advisory council can be constituted as a consultative mechanism in lieu of, or in addition to, the public consultation process adverted to in section 3.401.

The possible members of such a council are:

Chairman	:	The City/Municipal Mayor
Vice-chairman	:	The City/Municipal Administrator
Members	:	The City/Municipal Engineer
		The City/Municipal Planning & Development Coordinator
		The City/Municipal Police Chief
		The City/Municipal Legal Officer
		Representative of LTFRB
		Representative of LTO
		3 Private Sector Representatives appointed by the City/ Municipal Mayor

3.4 Legal Underpinnings

3.4.1 Is an Ordinance required?

It depends.

Existing ordinances in the 17 LGUs of Metro Manila are diverse, but quite specific. Very few clothe their respective traffic organizations with sufficient powers and authority to execute new traffic schemes. For example, in one City, the proposed conversion of a 2-way street into One-Way flow required the enactment of an ordinance. In another city, it did not. Establishing street-parking for pay is likely to require an Ordinance.

To be safe, check with your legal officers (or your Sangguniang Panglunsod / Sangguniang Bayan) whether a proposed scheme will need legislation. During the public consultation phase, this requirement might have surfaced. If it does require, then the implementation would have to be deferred until the ordinance is passed.

3.4.2 De-politicizing traffic issues

There are compelling reasons why a City should not depend on special ordinance for every new traffic scheme devised:

- It slows down the development process;
- It will likely overload the Sangguniang Panglungsod / Sangguniang Bayan with non-weighty or non-policy matters;
- It casts what is essentially a technical issue into a political question.

In the long run, it is advisable that the City enacts a comprehensive traffic Ordinance that will adopt the principle 'legitimate unless declared otherwise' within a trial period. This means the traffic management organization can proceed to implementation, on an experimental basis, of any traffic scheme sans special legislation. If not overturned by the Sangguniang Panglungsod / Sangguniang Bayan within a period, say after two months trial, then the scheme shall be deemed permanent or adopted.

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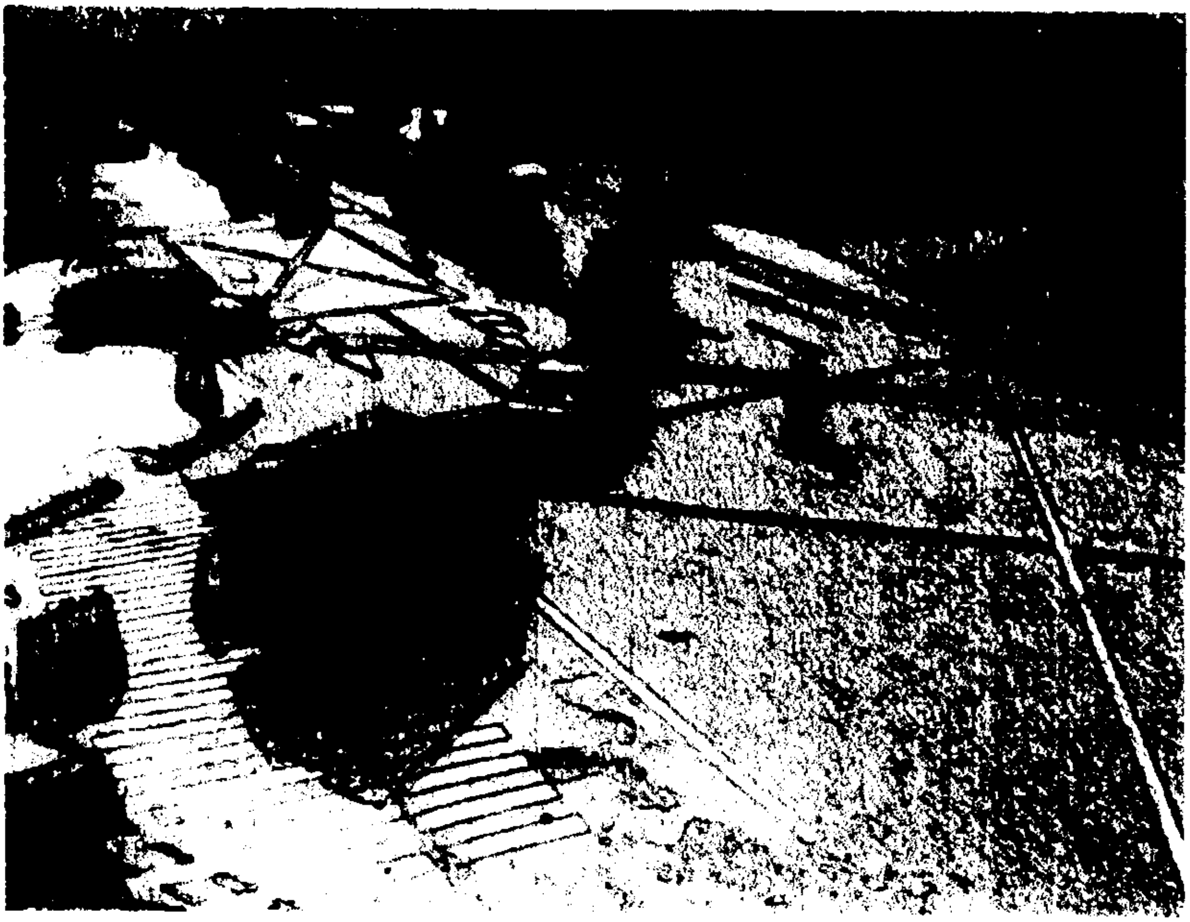

Part IV

Implementation and Execution

Part IV

Implementation and Execution

This section of the manual discusses the activities involved when a traffic improvement scheme gets out of the drawing board and effected on the streets. It assumes that the proposed scheme had been discussed, refined or modified, and gotten approval as well as funding.

It encompasses the following sub-processes:

- Implementing any physical works
- Information and education component
- Enforcing the desired behavior on the street
- Monitoring the results against expectations

4.1 Executing the Physical Works

4.1.1 Who should execute?

It depends on how the city is organized.

Usually, the Engineering Department of the city executes any physical works. It is also the unit that prepares the detailed design and cost estimates (i.e., bill of quantities and unit prices). If this function has been re-assigned by ordinance to a local traffic management authority, then the latter implements.

The implementation can be in any of three ways:

(a) in-house by personnel employed by the city and using materials procured, and equipment owned, by the City;
(b) contracted out to private company specializing in traffic engineering works; or
(c) by forced account, whereby the materials are furnished by the city to a private contractor.

It is preferable to start with Method B, i.e., by contracting out the works to a private entity, like what DPWH normally does. This is ideal for a city that has no manpower yet, no long experience in doing similar works, and no tools to do the job. If there is a sizeable program of traffic improvement projects year in and year out, then the City might find it worthwhile to follow Method A (in-house).

When contracting, the standard procedure for government-funded projects is to conduct open bidding, or to get firm quotations (price and duration) from three suppliers or more or contractors. The implementing unit must provide as much detail as may be necessary for an intelligent bid or quote to be made. An example of such a quotation is shown in Figure 4.1-1.

Figure 4.1-1 **Sample Quotation for the Execution of a Traffic Management Scheme**

Traffic Control Products Corp.
TFC Bldg. Electronics Ave., FTI Complex, Taguig, Metro Manila
Tels 838-4693 • 838-4712 • 838-4718 • 838-4725
Fax 838-4711 • 838-4612 * E-mail: tcpc-lanemark@pacific.net.ph

18 June 2001

SSTRIMM
G/F MMDA Building
Orense St. cor, Edsa Guadalupe
Makati City

ATTENTION: ENGR. RENE SANTIAGO
Project Team Leader

Sir:

We are pleased to submit our proposal for the following scope of works for your STRIMM project located at Shaw Blvd. to wit:

Description	Quantity		Unit Price	Amount
I.) PAINT REMOVAL				
a.) Along Shaw Blvd. from Edsa Crossing				
30 cm wide	96	lm.	P 80.00	P 7,680.00
45 cm wide	7	lm.	120.00	840.00
15 cm wide	79	lm.	40.00	3,160.00
				11,680.00
b.) Along Shaw Blvd. from City of Manila				
30 cm wide	84	lm.	80.00	6,720.00
45 cm wide	7	lm.	120.00	940.00
15 cm wide	77	lm.	40.00	3,080.00
				10,640.00
c.) Lee St.				
30 cm wide	68	lm.	80.00	5,440.00
d.) Wack Wack Road				
30 cm wide	105	lm.	80.00	8,400.00
e.) 20 cm wide	236	lm.	53.00	12,508.00
			Sub-Total	48,668.00
II.) THERMOPLASTIC APPLICATION				
a.) Old Wack-Wack/Shaw Blvd./ Lee St.				
15cm Broken line	192	lm.	90.00	17,280.00
15cm Solid line	214	lm.	90.00	19,260.00
20cm yellow box	175	lm.	120.00	21,000.00
30cm Pedestrian line	361.4	lm.	180.00	65,052.00
45cm Stop line	37	lm.	270.00	9,990.00
45cm Chevron	2	lm.	270.00	540.00
Thru Arrow	3	pcs.	945.00	2,835.00
Turn Arrow	1	pc.	1,165.00	1,165.00
Combined Arrow	6	pcs.	1,575.00	9,450.00
			Sub- Total	146,572.00

Above are assumed quantities only. Final billing will depend on actual accomplishment upon completion of the project.

Description	Quantity		Unit Price	Amount
III.) ROAD SIGN (supply and installation)				
30 x 90 cm (R2-8 (L))	1	pc	4,780.00	4,780.00
75 triangle (W6-1) & 60 Octagonal (R1-1)	2	pcs.	7,575.00	15,150.00
			Sub-Total	19,930.00

Specifications:

Engineering Grade, Reflective sheeting
1.5mm, Aluminum Substrate
1" diameter G.I. Pipe frame w/ clamp
2" diameter G.I. Pipe post

Figure 4.1-1 **Sample Quotation for the Execution of a Traffic Management Scheme** (page 2)

TCPC **Traffic Control Products Corp.**

TFC Bldg. Electronics Ave., FTI Complex, Taguig, Metro Manila
Tels. 838-4693 • 838-4712 • 838-4718 • 838-4725
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4.1.2 What is involved in physical works?

Traffic improvement measures usually entail physical works as well as non-physical items. The former usually entails: signage of various categories (e.g., No Parking, No Entry, One-Way, Stop, etc.), pavement markings of various types and quantities (e.g., double yellow lane, left-turn arrows), geometric improvements (re-shaping roadway curbs, construction of islands or channels, construction or repaving of sidewalks, carving out loading bays, erecting billiards, etc.), erection of barriers, installation of automatic traffic signals, construction of a pedestrian overpass, and construction of off-street parking or terminal facilities.

In some instances, road widening may require the acquisition or expropriation of the rights-of-way (ROW). Because of the lengthy process involved, it is advisable that ROW acquisition be undertaken only as a last resort.

The timing of the works has to be considered, also. Pavement markings should be laid out in dry weather, as they may not bond properly on wet surfaces. Day-time application is convenient to contractor as well as the supervising or works foreman, but it might induce a traffic jam on busy streets.

CIVIL WORKS ENTAILED BY TRAFFIC ENGINEERING MEASURES ARE OFTEN 'TOO SMALL' IN VALUE WITH SO MANY LITTLE COST ITEMS THAT THE LOCAL ENGINEERING DEPARTMENT (USED TO BIG-TICKET CONSTRUCTION PROJECTS) MIGHT FIND UNATTRACTIVE, NOT CHALLENGING ENOUGH, OR TOO "MUCH ADO ABOUT NOTHING."

THUS CONTRACTING OUT THE WORKS, AS WELL AS ASSIGNING THE IMPLEMENTATION RESPONSIBILITY TO THE LOCAL TRAFFIC OFFICE, MAY BE

4.2 Information and Education Component

4.2.1 The soft part is not always easy

Physical works do not make a traffic improvement scheme; there are usually complementary measures that are non-physical. They are often referred to as the 'software' part – comprising the information and education component (IEC). Although not as costly as the physical items, IEC also entail hidden costs – in terms of time and efforts by city officers and employees. The costs are not accounted for separately, often hidden as part of operating and maintenance expenses, unless a major campaign is launched in relation to a specific project.

The objectives of IEC are to gain acceptance of the 'new' traffic scheme, to modify behavior of road users on the streets, and to re-train traffic enforcers about their modified or new tasks with the new traffic scheme.

Since it involves human behavior, and shedding off of old habits, the IEC is often the more difficult part to achieve. Sustaining the campaign is also a challenge. Organizations often falter or backslide, after the initial phase of enthusiasm. Success is also difficult to measure.

4.2.2 Are drivers incorrigible?

If all drivers know the rules and have discipline, there might be no need for traffic policemen. The reality is that many don't. And many have secured driving licenses without the traffic sense and good underpinnings.
Some blame it on 'Filipino culture'. But it ignores the fact that in other countries where rules are enforced strictly, Filipinos are obedient. In some areas of the Philippines, they comply with traffic rules. As long as no one gets special treatment.

Local government units might as well forget about basic traffic education. These are better address through the educational system and to a broader audience beyond the residents of the City. This is not to say that the City's traffic management authority has no role in traffic education. They have. At the tail-end and as a last resort. To re-enforce a risk-reward regime that penalizes traffic misbehavior and rewards those that comply with the rules.

DRIVER EDUCATION IS AN INTRINSIC RESPONSIBILITY OF THE LAND TRANSPORTATION OFFICE; THEY MUST ENSURE THAT ONLY THOSE QUALIFIED GET A LICENSE, AND THAT A LICENSE HAS AN OBLIGATION.

The most obvious educative tool at the local level is to arrest erring drivers (and pedestrians). But not all-local traffic enforcers are authorized to issue Traffic Citation

Tickets or Traffic Violation Receipts. Nor does obedience with the law always require the power to confiscate driver's licenses. If an errant driver gets delayed in the process, he loses valuable time and eventually gets the message that misbehavior does not pay. Small things done repeatedly and consistently lead to bigger things.

4.2.3 **Respect for the road users**

An essential element of getting acceptance for a new scheme is to inform the affected parties ahead of time. This is simple respect for the road users, and the citizens who pay the taxes that enable governments to function.

If the proposed improvement scheme went through the consultation process, then a major part of the IEC has already been accomplished – even before implementation.

If the pre-implementation consultation has not been sufficient, then an information campaign should be conducted – especially if the new traffic scheme will require major changes in the existing traffic pattern. Otherwise, an extensive publicity will only be superfluous.

The Information Campaign should deliver the message in as simple a manner as to be intelligible – preferably with plenty of visual aids. Tailor fit the message (and the medium) to the target audience. If the scheme will require re-routing of jeepneys, then the target for the campaign should be the drivers of those jeepneys (and perhaps, also their passengers). If a street will be declared one-way, then the households or establishments along that street must be informed. As a medium, newspapers, radio and TV might appear as overkill for a local traffic improvement project (LTIP). The most common medium for LTIP is a white bulletin board erected at the site, and painted with the appropriate message.

An example of an information bulletin about a new traffic scheme is shown in Figure 4.2-1. It was intended for those who had expressed initial misgivings about the scheme and a few influential households within the area who preferred an alternative solution. In terms of timing, this bulletin preceded implementation.

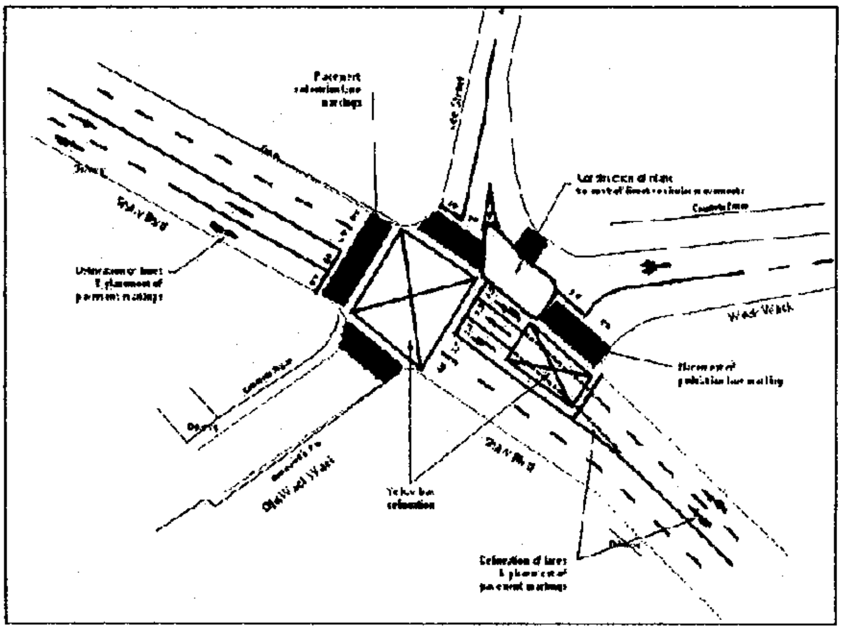
Figure 4.2-1 **Inside Pages of an Illustrative Brochure about a Traffic Scheme**

THE AUGEAN TASK

Wrestling with the traffic problems of Metro Manila is probably even more difficult than Hercules cleaning up the Augean stable. But it is not impossible. Everybody has to pitch in; a minor alleviation here and there ultimately becomes a deluge. Take the intersection of Shaw Boulevard and Wack-wack with Lee Street in Mandaluyong. The congestion there is not the worse in Metro Manila, but bad enough to warrant priority attention of the City of Mandaluyong.

THE PROBLEM

Nature abhors a vacuum. Filipino drivers abhor too much road space. That may explain in a nutshell why traffic congestion occurs now and then, especially during rush hours, at the intersection of Shaw Boulevard,Wackwack Road, Lee Street, and Old Wackwack. It is a complicated vehicular junction – with 5 legs and 2 intersections in one place. Each leg allows 3 turning movements each. More than 4,600 vehicles were counted over 1 hour at peak – large but not as crowded as other streets in Metro Manila. In fact, the junction has wide approaches. And therein lies the problem: drivers tend to jump the queue and occupy all available spaces at the approaches, thereby multiplying the points of conflicts. And make life for Traffic Enforcers extremely difficult and frustrating to manage and to untangle.



The basic solution is to reduce the points of conflicts and force drivers to queue – through channelization, pavement markings, proper signage, yellow box rule.

WHO WILL BENEFIT (OR SUFFER)?

Any change from the existing situation produces 'winners' as well as 'losers'. Queue breakers will be losers. Law-abiding drivers will benefit. Left turners from Lee Street to Wack-wack Road (1.3% of peak-hour hour volume), as well as left turners from Wack-wack Road to Old Wack-wack Road (1.2%), will suffer. The dominant traffic flows along Shaw Boulevard and Lee Street will be winners.

WHY NOT PUT IN TRAFFIC SIGNALS?

The DPWH is planning to install the so-called SCAT traffic signals, but it is still 2 to 3 years away. Meantime, what should be done? Small-scale traffic engineering measures should alleviate the congestion now. And sets the stage for the computerized signals of DPWH.

WHY NOT MAKE LEE STREET ONE-WAY?

It was an option considered, but eventually drop. A parallel road would have to become one-way also, in the opposite direction, to accommodate the flow of vehicles displaced at Lee Street. S.Laurel and Ideal Streets can not take up this role. Paired one-way streets work best in a grid-pattern road network. Such a configuration, unfortunately, does not exist in the area.

HOW DID THE PROPOSED SCHEME COME INTO BEING?

It evolved from a study called Small-Scale Traffic Improvement Measures for Metro Manila (SSTRIMM), funded with grant money from the Japan International Cooperation Agency (JICA) and coordinated by the Metro Manila Development Authority. The purpose of SSTRIMM is to assist the 17 local government units (that comprise metropolitan Manila) develop their capability to initiate and solve a number of traffic problems. The Shaw-Wack-wack intersection was identified by the City of Mandaluyong as its top priority traffic problem. As a consequence, it got into the planning scope of SSTRIMM traffic consultants. Traffic counts were made, and a practical scheme formulated. After several reviews, the chosen scheme was discussed extensively with Mandaluyong local officials sometime in May and June 2001. The Barangay gave its thumbs up for the implementation of the scheme.

4.2.4 Who is responsible for IEC?

Usually, the City has a public information unit or office. They should be the first to take a crack at IEC, upon the instigation of the local traffic management authority. The local business community, the neighborhood association, the barangay may also be tapped depending on the type and extent of the proposed traffic improvement project. Commercial establishments may find it worthwhile to bank roll an information drive where they see some advertising value. However, local government units should eschew this mechanism – to dissociate a LTIP from narrow commercial interests.

4.3 The Role of Traffic Enforcers

4.3.1 Main Job of the Traffic Police

The successful implementation of the non-physical items of LTIP will fall on the shoulders of the traffic enforcers. As indicated in Table 2.7.1, many of the causes of traffic congestion are amenable to enforcement solutions.

The main task of a Traffic Police or Traffic Enforcer is to get drivers and pedestrians to obey the traffic rules and regulations (as contained in the City's Traffic Ordinance), as well as follow the adopted traffic scheme in his area of assignment. Hence, he must know the traffic rules and regulations as well as the adopted traffic schemes in his area of assignment.

Directing traffic flows, i.e., performing the role of a human traffic controller, at an intersection is a secondary function.

It is often a thankless job. The public rarely complains, nor bothers to express their compliments - when the police are doing well. Criticisms emerge when they do not perform.

4.3.2 Who is responsible for enforcement?

In many parts of the country, the Philippine National Police – particularly its Traffic Management Group – is responsible for traffic enforcement.

In Metro Manila, the MMDA as well as most if not all the 17 LGUs have employed and deployed civilian traffic officers other than the police. Hence, there can be three groups doing enforcement work in Metro Manila.

There may be three different agencies paying the salaries of three different groups of Traffic Enforcers in Metro Manila, but their task is the same. Their common job is described in Section 4.3. above. What is critical to the City is that these traffic enforcers of various stripes get to work together as one team. This implies only one operational command within the City.

4.3.3 Directing traffic flow is secondary

In a signalized intersection, the job of the Traffic Enforcer is ministerial: ensure that motorists obey the signal lights and to keep intersection open. He or she can therefore focus on enforcing the loading/unloading restriction (which is the number one cause of congestion at intersections in Metro Manila) as well as any parking or jaywalking prohibitions.

In an un-signalized intersection, directing traffic becomes the main task of a Traffic Enforcer. This is because drivers often do not give way, and insist on having priority all the times. Hence, gridlock occurs without the presence of a Traffic Enforcer. As a traffic controller, the Traffic Enforcer decides the time allocation between competing users of the roads. In order not to worsen traffic delays, he must stick to a cycle time in proportion to the volume of vehicles in a particular street but not to exceed 2 minutes. In a 4-way intersection with no left turning movements, each approaches receive an equal allocation of 1- minute green times and 1-minute red times if the volumes are the about same. See Section 2.3 for some guide about signal phasing.

4.3.4 Why not empower every Enforcer to confiscate driver's license?

ENFORCEMENT IS EDUCATION OF LAST RESORT.
A DRIVER LEARNS WHEN VIOLATION = DELAYS +LONGER JOURNEYS.

Enforcers often want to be armed with the power to issue a Traffic Violation Receipt or a Temporary Operators Permit, corollary with the power to confiscate the driver's license.

A policeman can be credible and can command obedience even without a gun. So does an enforcer not authorized by MMDA or LTO to issue TVR or TOP. In this first place, drivers will not know beforehand that a traffic enforcer who flags him down has been authorized to issue Traffic Violation Receipts or can confiscate his license. In many instances, the mere act of being delayed is enough punishment for the driver not to do it again.

There are valid grounds why the authority to issue TVR / TOP is not granted to every enforcer on the streets. The MMDA and LTO require qualifications not easily hurdled by every officer. Every TVR / TOP is an accountable form that must be tracked – from release of the blank forms to the officer, then to issuance to the driver and its redemption. The information loop must close. Without the use of computers, it is difficult to trace the paper trail. The biggest headache of LTO is that many of its TOPs could not be accounted for; because reporting by authorized officers is erratic. In many cases, the confiscated licenses get misplaced in the administrative labyrinth.

4.3.5 Manual override of a traffic signal control

As a general rule, a Traffic Enforcer should avoid taking over manual control of an automatic traffic signal in an intersection. This is because the signals are synchronized with the adjoining intersections, so that a continuous green light is experienced by motorists from one crossing to the other. When an intersection's signal light control is overridden, it is de-linked from the synchronization regime. The system effects might be longer delays, although a particular junction might experience relief.

Another problem associated with manual control (as well as in un-signalized intersection manned by a human being) is the non-regularity of the phasing. It is very difficult for a human being to maintain the same phasing, or to allocate the green and red times like clockwork. As had been observed in Metro Manila, the tendency is to keep the green time as long as there are vehicles coming on stream from one direction. Without realizing it, the human traffic controller has stretched the cycle time to 5 minutes. In some observed cases, even 10 minutes or longer. In those instances, traffic congestion could be far worse than it should be.

It is recognized that manual override may be justifiable under the following circumstances:

- The traffic flow is heavily unbalanced, such that very few vehicles pass through green light in one direction while a larger volume waits at red light in the crossing directions;
- Traffic flow in one direction has virtually stopped or at standstill, as to render the programmed phasing meaningless;
- A parade or a funeral procession is underway in one of the intersecting roads;
- A temporary aberration in traffic flows induced by an event nearby, such as a rally or school-bound trips.

4.3.6 Should a traffic enforcer cook up a new traffic improvement scheme?

No. The last thing that traffic enforcers should do on the streets is to devise their own schemes to change the existing traffic flows. It is tempting to 'play God', especially when one is at the frontline on a daily basis.

When in the front line, the traffic enforcer must adhere to the 'game plan', not formulate a new one. The reason for such a prohibition is simple. The referee should not make the rules, nor change them as he sees fit. He only sees the trees – that is, the problem in a particular intersection or location – but not the forest (the overall impact upstream and downstream). As they say, his nose is too close to the grinder. Invariably, his limited framework leads to transferring the problem elsewhere, with the resulting situation worse than before. His cure may be worse than the disease.

But he can suggest. Any proposed scheme must be backed up by traffic data, not by guesswork or fancy, and gets evaluated first by a traffic engineer.

4.3.7 Untangling Obstructions and Congestion from Incidents

Another important, albeit occasional demand, on the Traffic Enforcer is to clear the roadway of obstructions immediately, as what happens when a vehicle gets stalled on the street or when there is a traffic accident.

A stalled vehicle should be penalized for the lost time it has inflicted on other motorists. In addition, a tow truck should immediately be dispatched to get the stalled vehicle out of 'harm's way'.

In case of traffic accident, the first priority is to save lives, not to pinpoint blame. Hence, any victim should immediately be given medical attention. Thereafter, and also when there are only property damages involved, the immediate task of the traffic enforcer is to record the facts – preferably with a camera – and then to get the vehicles out of 'harms way' as soon as possible.

4.3.8 Enforcement Fatigue

It is quite normal for traffic enforcers to suffer from 'enforcement fatigue', i.e., lose the edge and enthusiasm to enforce traffic rules and decorum. It is often a daily test of wills – between the driver and the enforcer. Persistent and recurring violations by abusive drivers take their toll on the latter.

To avoid enforcement fatigue, it is advisable to launch periodic campaigns with different emphasis or themes. For example, one week can be devoted to the apprehension of loading / unloading violations. Next week, it can be violations of traffic signals like going through red lights. On another week, the focus can be on overtaking at signalized intersections marked by double yellow lines. If these are implemented randomly, and varied from week to week, rotated from place to place, then enforcers (and motorists) will be kept on their toes. Internal contests within the traffic organization may also be conducted – to honor the dedicated ones. There are many ways, all it takes is creative leadership.

4.3.9 Ten Commandments of Traffic

A traffic officer on the streets is expected to know all the rules. But remembering the entire traffic code by heart might be difficult.

The Land Transportation Office has issued a primer called "Ang Sampung Utos Sa Trapiko" (see Figure 4.3-1) which can be circulated and drilled into every traffic enforcer (and drivers).

Ang Sampung Utos Sa Trapiko

1. Mamalagi sa kanan.
2. Magbigay galang. Bigyang-daan ang mga sasakyang pangkagipitan, mga taong naglalakad, tren, nauunag sasakyan, sasakyang paahon sa trapiko, padiretsong trapiko.
3. Bawal pumarada sa interseksyon, tawiran ng tao, himpilan ng pamatay-sunog, boka insendyo, pribadong daanan, at dobleng pagparada or pagparada sa tabi ng sasakyan nakaparada sa tabi ng bangketa.
4. Tuntunin sa pag-lampas:
   a. Bawal lumampas sa dahilig, kurbada, krosing na riles, interseksyon, sa pagitan ng konstruksyon
   b. Sumenyas ng balak, bago lumampas sa kaliwa.
   c. Kung nag-aalinlangan, huwag nang lumampas.
5. Tuntunin sa hintuan ng bus: Linya ng sunod-sunod ayon sa pagdating. Hindi maaaring magtagal nang mahigit sa isang minuto. Pinakahuling bus sa linya, hindi pwedeng umabot ng 6 metro mula sa interseksyon.
6. Tuntunin upang maiwasan or papalaya ang pagkabuhol-buhol ng trapiko.
   a. Huwag sarhan ang magkabilang linya at interseksyon.
   b. Kapag masikip, mabagal or nakatigil and trapiko, bawal mag-overtake sa kasalungat na lane(s).
   c. Kung paliit o pakipot and daan o trapiko, magsanib ng salitan.
7. Sundin ang mga hakbang sa pamamahala ng trapiko, tulad ng:
   a. Tuntuning Dilaw na Guhit para sa mga bus.
   b. Truck ban
   c. One-way.
8. Ang pilosopiya ng drayber na Pinoy para sa daloy ng trapiko na patungo sa iisang pangkalahatang direksyon.
   a. Karapatan ng nauunag sasakyan.
   b. Doktrinang last clear chance
   c. First come, first served o tuntuning rotonda.
9. Mga taong tumatawid: (a) Bawal tumawid sa hindi tawiran; (b) Bawal maghintay, sumakay o bumaba sa gitna ng daan.
10. Mga pandaigdigang kasabihang pangkaligtasan sa pagmamaneho:
    a. Kaligtasan Muna. Magmaneho ng ligtas.
    b. Mapagtanggol na pagmamaneho.
    c. Laging mag-ingat.
    d. Ang magaling na drayber ay yaong walang aksidente.
    e. Palagiang pagsusuri at pag-iwas sa panganib.

Ten Commandments of Traffic

1. Keep right.
2. Be courteous and give way to emergency vehicles, pedestrians, train, vehicles in front, vehicles climbing on steep slopes, vehicles going straight.
3. Do not park at intersection, fire station, fire hydrant, private gates. No double parking.
4. Rules on overtaking:
    a. Do not overtake on blind curves, railroad crossing, intersection, in-between construction works
    b. Signal your intention, before overtaking.
    c. When in doubt, do not overtake.
5. Rules on loading and unloading zones: Line-up properly, according to time of arrival. Do not wait for passengers. Limit your stay to 1 minute. Last bus on the line must be 6 meters away from intersection.
6. Rule to avoid traffic jams and untangle gridlock. Do not close both approaches to the intersection. Under heavy traffic, do not overtake nor counterflow. On streets that narrow, merge alternately.
7. Follow any traffic schemes that may be in force, like.
    a. Bus only lanes
    b. Truck ban
    c. One-way street.
8. Filipino driver basic philosophy for a smooth traffic flow:
    a. Car in front has priority
    b. Doctrine of last clear chance
    c. First come, first served.
9. Pedestrians/Commuters: (a) Cross only on designated crosswalks. (b) Do not wait, pick a ride, or go down on middle of streets.
10. Internationally-known maxims for a safer motoring:
    a. Safety first. Drive carefully
    b. Defensive driving
    c. Always be careful.
    d. The good driver is one without accident.
    e. Be alert for danger or hazard on the street.

4.4 Monitoring the Results

4.4.1 Basic principle of feedback

In management, monitoring is intrinsic to control. It requires feedback on what is happening, then compared against targets or expectations, followed by adjustments to keep things on track. Thus, a driver continuously gets feedback about where he is going, and changes his direction in order to reach his destination. Depending on the conditions of the streets and the level of traffic, he may also adjust his speed – slowing down at crowded sections or potholed roads, speeding up when there are very few road side friction. Without feedback, the driver will not know when to slow down or speed up.

Similarly, when a traffic improvement project (TIP) has been implemented, the results over several days should be monitored closely. This is meant to find out whether things are moving smoothly, or confusion is occurring, or whether it is being implemented faithfully.

4.4.2 What to monitor and measure?

Principally, the question to be answered by monitoring is whether there has been an improvement or not. This entails the choice of yardsticks – viz., increased safety and reduced delay and congestion, fewer complaints from motorists and the affected facilities such as shopping centers, restaurants, and gas stations.

Traffic volume, speed and travel time are the most commonly used to evaluate the effects of road traffic systems by applying before and after measures of effectiveness. The conventional method is to make a simple comparison of the changes in these measures.

The following tables provide an example of the comparative changes observed at the junction of Montillano St / Montillano Extension / National Highway in Muntinlupa. Table 4.4-1 measures the intersection delay at the intersection in terms of average delay per approach vehicle.

Table 4.4-1 **Comparison of Average Delay Per Approach Vehicle**
Montillano St / Montillano Ext / National Highway Intersection

Approach	Time Delay (seconds)		Difference	% change
	Before	After		
Montillano St to Montillano Ext	21	18	-3	+14%
National Highway northbound	20	15	-5	+25%
National Highway southbound	26	27	1	- 4%

Table 4.4-2 focuses on average delays experienced considering only vehicles which actually had to stop, and hence experienced delay. Naturally, the average delay per stopped vehicle would be larger than the average delay per approach vehicles (which includes both vehicles that were stopped and those that were not).

Table 4.4-2 **Comparison of Average Delay Per Stopped Vehicle**
Montillano St / Montillano Ext / National Highway Intersection

Approach	Time Delay (seconds)		Difference	% change
	Before	After		
Montillano St to Montillano Ext	36	29	-7	+19%
National Highway northbound	35	41	6	-17%
National Highway southbound	41	42	1	-2%

To avoid any wrong conclusion about the impact of a traffic improvement scheme, it is also advisable to measure traffic volume 'before' and 'after'. Table 4.4-3 illustrates this.

Table 4.4-3 **Comparison of Total Traffic Volumes**
Montillano St / Montillano Ext / National Highway Intersection

Approach	Time Delay (seconds)		Difference	% change
	Before	After		
Montillano St to Montillano Ext	231	682	451	+195%
National Highway northbound	1,646	2,478	832	+51%
National Highway southbound	807	1,890	1083	+134%

For TIPs, the most relevant yardstick is travel time delay at the congestion point. If the average travel times of all motorists in that area had decreased, then there has been an improvement. Sometimes, it is difficult or impractical to measure time for all vehicles. A corollary variable is the distance traveled – if the majority of motorists' "lines of travel desire" have shortened then, there has been an improvement. It is a basic principle of traffic engineering that heavier travel movements must be directly served or nearly so, while smaller movements can be channeled into somewhat indirect paths. Motorists are interested only in getting from Point A to Point B as fast as possible.

The twin pillars of conventional traffic engineering practice are the accommodation of high driving speeds and the attainment of high "levels of service," or freedom from delay due to congestion, for motorists traveling at those speeds. In urban areas, however, high speed is secondary to high passenger throughput. Faster is not necessarily better on urban roads.

The level of service for a road or intersection is a measure of how the volume of traffic affects driving ease. Typically, a road project is designed to accommodate traffic volumes predicted to occur during the most congested periods 20 years in the future. But in Metro Manila, road congestion is already now or 'yesterday' – rather than in the future. If motorists must wait an average of 5 seconds or less to get through an intersection, they experience level of service "A"; if they must wait 15.1 to 25 seconds, they experience Level of Service "C"; and, if they have to wait an average of a minute or longer, the intersection has Level of Service "F."

Another factor to consider or monitor is the level of service for pedestrians – in terms of amount of space on a sidewalk as well as waiting or crossing times at intersections.

One may also attempt to measure the improvement in emission and noise levels at the problem area. When vehicles are moving smoothly rather than idle on the streets most of the time, emission and noise levels are lower. However, local government units rarely have the means to acquire equipment that can measure air and noise pollution levels at specific intersections.

TIPs may also demand varying level of efforts from Traffic Enforcers. Some may demand more hands on the streets, or more work from existing personnel; others would save on manpower or time. This should not be an objective, however, as life may become simpler to enforcers but at the expenses of motorists. This practice has been observed in several areas of Metro Manila – traffic schemes designed to simplify the life of enforcers but 'hellish' to motorists.

The number and severity of traffic accidents in the area are also good indicators. Accident data should be gathered systematically and monitored over a longer period of time. A traffic scheme that is less accident-prone is definitely better than one that invites more accidents.

4.4.3 A simplified way to determine improvements

A simple way of gauging whether a scheme is working or not is the number of complaints. Filipinos have a penchant for complaining when they are adversely affected; but tends to be quiet when they benefit there from. Thus, a traffic scheme with no complaints, or very few adverse feedbacks, could be deemed to be working as planned or expected.

A random sample of motorists can be asked their impressions 'before' and 'after' the implementation of a TIP. Test vehicles (and unmarked) can be timed to go through the problem intersection before and after the implementation of a traffic scheme.

Assemble focus groups consisting of people knowledgeable about the chokepoint or frequent user of that problem area. Get them to answer specific questions that will determine changes that transpire.

4.4.4 Traffic advisory before implementation

If the scheme involves a major change in the habits or driving patterns of motorists and pedestrians, on-street traffic advisory (use of billboards) may be necessary. Local traffic management authorities have a natural tendency of omitting this information medium in order to minimize cost. But in the first day or hours of implementation, monitoring may show the urgent need for such advisory. It is good practice to place oneself in the shoes of the motorists, and to consider their need for information.

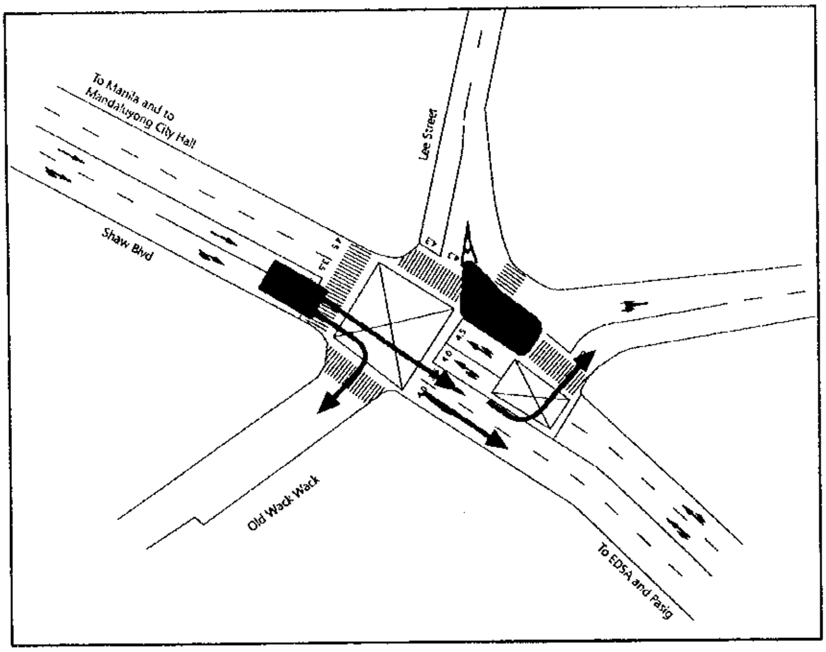
4.4.5 Traffic advisory during implementation

Monitoring is a continuous process that need not be limited 'before' or 'after' implementation. It is also important during implementation.

For example, when a new traffic scheme was tried in Mandaluyong, it was observed during the first day that motorists were getting confused about where to turn. It was therefore decided that large billboards at two (2) locations near the Lee St – Wack-wack Rd intersection will be put up. Figure 4.4-1 is a facsimile of the content of that billboard. In the actual case of Mandaluyong, it was never put up because the unit responsible for it was unable to get the funds for it. Besides, after a few more days, the situation had stabilized to the point that a billboard became unnecessary. Without constant monitoring, somebody might just have done the latter - after the need for it has vanished.

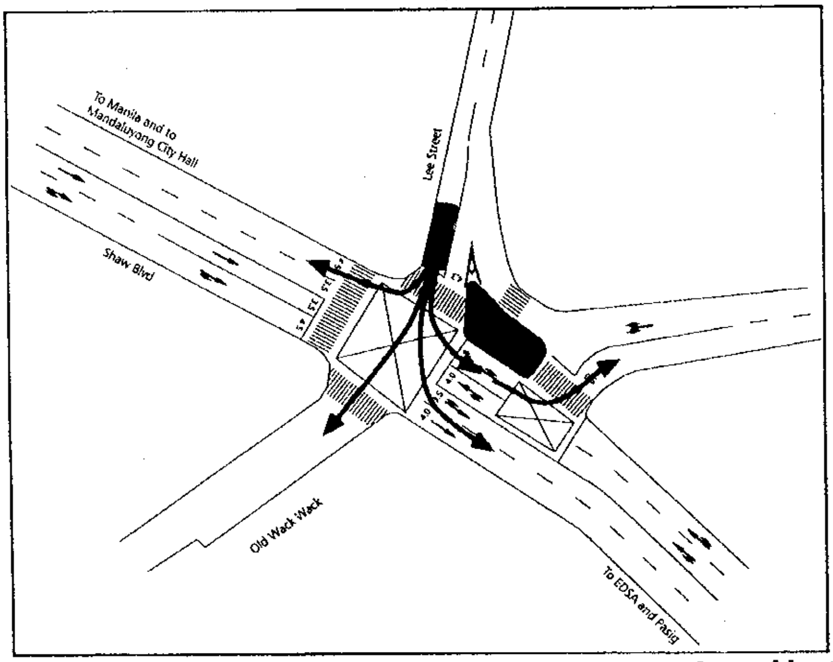
Figure 4.4-1 **Facsimile of Public Information Campaign Billboard** (left half)

For the information of all Motorists



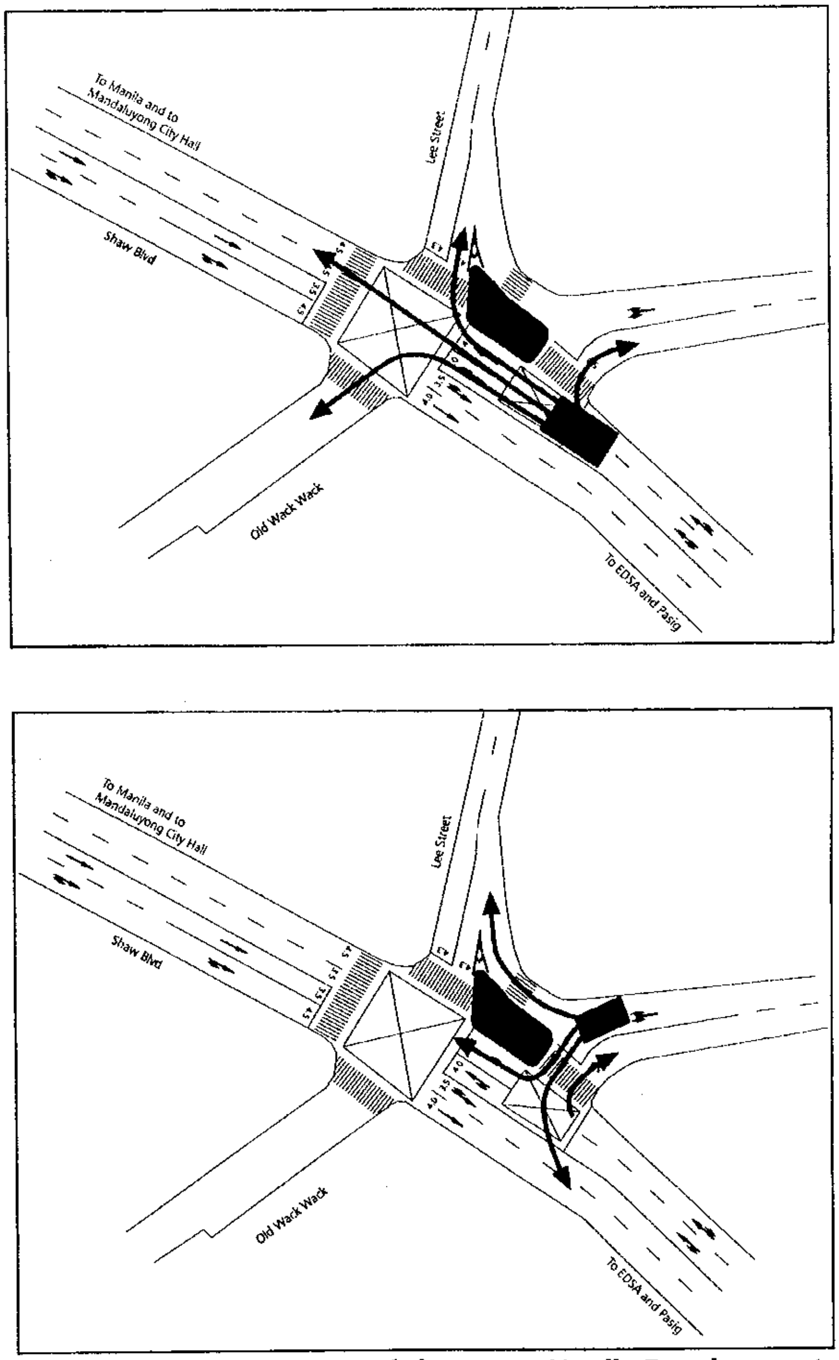
Effective 21 August 2001, the traffic flows illustrated in the following charts will be implemented on a trial basis.

Please be guided accordingly



Issued by the

Figure 4.4-1 **Facsimile of Public Information Campaign Billboard** (right half)



Mandaluyong City Traffic Task Force and the Metro Manila Development