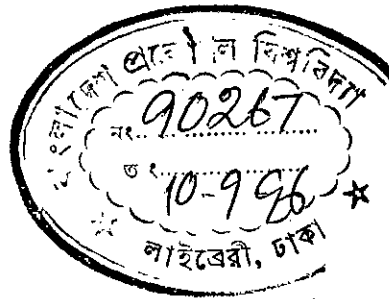


**EFFECT OF NON-MOTORIZED TRANSPORT
ON THE PERFORMANCE OF ROAD TRAFFIC IN
METROPOLITAN DHAKA**

BY

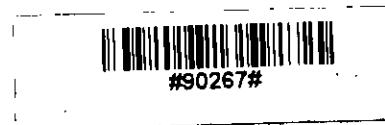
AKHTER BIN HOSSAIN



A thesis submitted to the Department of Civil Engineering of
Bangladesh University of Engineering and Technology, Dhaka
in partial fulfillment of the requirements for the degree

of

MASTER OF SCIENCE IN CIVIL ENGINEERING



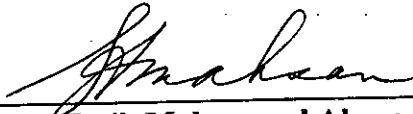
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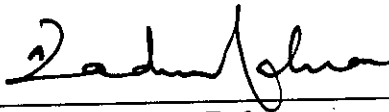
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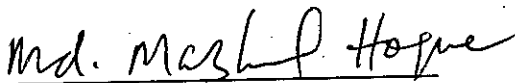
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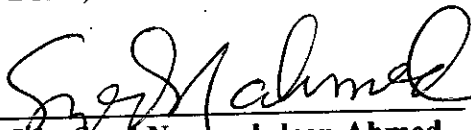
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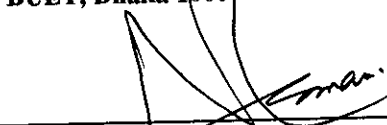
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DECLARATION

I hereby certify that the research work reported in this thesis has been performed by me and this work has not been submitted elsewhere for any other purpose (except for publication).

August, 1996

Akhter Bin Hossain
(Akhter Bin Hossain)

TO

MY

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ABSTRACT

Road based transport in metropolitan Dhaka consists of an integration of motorized transports, non-motorized transports (NMTs) and walking. Besides motorized transports there are about 400000 rickshaws, 10000 rickshaw vans, 3000 pushcarts, and over 40000 bicycles in non-motorized transport group (DITS, 1993). According to DITS (1993) NMTs account for 56.7 percent of daily vehicle kilometers of travel in metropolitan Dhaka. Present scenario of transport modes and travel patterns clearly reveal that road transport in metropolitan Dhaka is predominated by NMTs. But in the past, these modes of transport were given very little consideration in transport planning as well as in the selection of management schemes to alleviate traffic problems (viz. traffic congestion, delay, accident, emission etc.). This study is an attempt to investigate the effect of NMTs on road traffic performance (i.e. mobility, speed and safety), which would provide useful information towards solving existing traffic problems in the metropolis.

Traffic volume and speed studies were performed at selected road links in order to determine the volume and composition of traffic as well as their speeds. Mobility in terms of persons/ hr were determined in the selected road sections using the volume, composition and average occupancy data of each vehicle category. Mean speeds of different types of vehicles as well as of the Link traffic were also calculated from speed distributions of the vehicles at the selected sites. Analysis of four lane divided major roads showed an average mobility of about 15000 persons/hr without NMTs in the link traffic and about 9000 persons/hr with 45 percent NMTs in the links. Speed analysis showed an average speed of 21 mph without NMTs and 16 mph with 45 percent NMTs in the traffic of the links. Moreover, an attempt was made to develop mathematical relationships for both mobility and speed in terms of the composition of traffic and road geometry. Formation of models on the basis of multiple linear regression technique and related statistical analysis were performed using a standard statistical computer package SPSS release 6.0. The model, with mobility as the dependent variable, shows that mobility of a road section decreases with the increase of NMTs in the link traffic. Another model, with mean speed as the dependent variable, indicates that speed decreases with an increase of NMTs in the link traffic and increases with an increase in the effective road width.

Accident data for different thana zones in metropolitan Dhaka were also collected from available documents to examine the role of NMTs in road safety. Modal share of total accidents (fatality,

injury and property damage) showed that NMTs share of accidents is lower (rickshaw 12 %, other NMTs 2 %) than the share of motorized modes (truck 18%, mini-bus 17%, autorickshaw 11%, car 11% etc.). However, when only fatalities are considered, the share of NMTs, especially rickshaws, become much higher (26%) than that associated with motorized transports (bus 14%, tempo 14%, motorcycle 11%, truck 9%, autoricksaw 9% etc.). Furthermore, accident data in those selected links where volume and speed studies were performed, were identified to develop mathematical relationship. The model, which has been formed with the number of accidents in one year as the dependent variable, indicates that accidents increase as the speed ratio of motorized and non-motorized transports increases and that accident decrease with an increase in effective road width.

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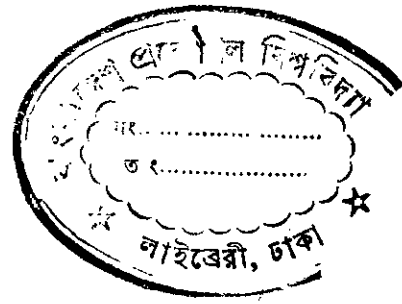
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CHAPTER 1 INTRODUCTION



1.1 GENERAL

Dhaka is a large and densely populated metropolitan area. It has one of the most diverse road transportation systems in the world. This system consists of both motorized (viz. bus, mini-bus, car, baby taxi, motorcycle etc.) and non-motorized (viz. rickshaw, rickshaw van, bicycle etc.) modes.

Non- Motorized Transports (NMTs) play a significant role in catering to the transport demand in metropolitan Dhaka and other regions of Bangladesh. But, these modes of transport are given very little consideration in the transport planning phase, and are almost ignored in the planning of metropolitan road network. Lack of traffic regulations and management schemes for non-motorized transport in metropolitan Dhaka has created ever increasing traffic problems, viz. traffic accidents, congestion, delay, emissions etc.

Studies related to traffic situations, NMT in particular, are few in number and are of limited scope. For example, Gupta (1980) conducted a study in metropolitan Dhaka concerning rickshaw pullers, rickshaw owners and role of rickshaws in passenger transport. Gallagher (1992) made a study on rickshaws of Bangladesh. In the study he investigated the uses and characteristics of rickshaws and its growth trend. He also studied the characteristics of the rickshaw pullers and rickshaw users. Government of Bangladesh (1994) investigated the uses and physical characteristics of NMT as a component of the integrated transport study.

Most of such studies focused basically on the physical, economical and social aspects of the NMTs. Very few of them, however, in a limited scope investigated the traffic performance of NMTs. It is therefore, timely to study in detail, the effect of NMT on the performance of road traffic in metropolitan Dhaka.

1.2 SIGNIFICANCE OF THE STUDY

Non-motorized transport (NMT) is the most common vehicular mode as well as the largest source of employment in the transportation industry in overall Bangladesh. There are about 400000 rickshaws, 10000 rickshaw vans, 3000 pushcarts, and over 40000 bicycles in Dhaka (DITS, 1993). About 18-20 percent of Dhaka's working population are directly employed by the rickshaws (DITS, 1993). NMTs carry more passengers and goods than any other modes in metropolitan Dhaka. According to DITS (1993) NMTs account for 56.7 percent of daily vehicle kilometer traveled (VKT) in metropolitan Dhaka.

NMTs thus play a significant role in metropolitan Dhaka's transport system. Many policies towards NMTs, especially regarding rickshaws, were taken in the past to improve the traffic situation in Dhaka. But these policies were not based on extensive studies. Actually, a very few studies were performed on NMTs in metropolitan Dhaka as well as in other urban areas of Bangladesh. Review of related literature indicates that most transport and traffic studies related to metropolitan Dhaka have been done to understand the traffic behaviour of motorized vehicles and economic and social aspects of NMTs. Therefore, this study intends to investigate the effect of NMTs on the performance of the road traffic in metropolitan Dhaka.

Information gathered from this study would not only provide avenues for further research but also help transport planners and decision makers in taking steps towards solving existing traffic problems in metropolitan Dhaka and thus evolve a more efficient transport network.

1.3 OBJECTIVES OF THE STUDY

Objectives of the proposed study are as follows :

- Investigate the overall road traffic situation in metropolitan Dhaka..

- Examine the effect of non-motorized transports (NMTs) on road traffic performance in metropolitan Dhaka. Road traffic performance parameters generally include travel time, delay, travel cost, accessibility, mobility, speed, safety etc. However, this study attempts to examine three of this performance parameters i.e. mobility, speed and safety.
- Recommend effective ways to improve the existing traffic situation in metropolitan Dhaka with special attention to NMTs.

1.4 THESIS STRUCTURE

The remainder of the thesis has been structured into five chapters.

Chapter two deals with relevant literature. It illustrates different transport and traffic studies done in Bangladesh and abroad.

Chapter three gives a general view about the road traffic situation in metropolitan Dhaka with special emphasis to Non-Motorized Transport (NMT).

Chapter four deals with the volume, mobility and speed studies performed at different selected road sections in metropolitan Dhaka. It is also associated with the attainment of mathematical relationships and statistical analysis.

Chapter five investigates the effect of NMT on road safety in metropolitan Dhaka.

Chapter six contains the conclusions of the findings and recommendations for improvement measures and directions for future studies.

CHAPTER 2 LITERATURE REVIEW

2.1 INTRODUCTION

Literature review is a task that continues throughout the duration of a research work. An extensive literature survey of the documents on the topics concerning non-motorized transports (NMTs), performed within Bangladesh and abroad, has been conducted and some of them are discussed in this chapter. Some of the review items presented here are directly adopted from Ahsan (1990).

2.2 TRANSPORT AND TRAFFIC STUDIES IN BANGLADESH

It is informative or perhaps desirable to review the relevant transport and traffic studies performed in Bangladesh, Particularly in Dhaka. This section summarizes those studies.

2.2.1 Transport Studies

2.2.1.1 Policy studies

Dacca Bypass and/or Penetrator Road (1968), one of the earliest studies, illustrated the engineering and economic feasibility study of Dhaka bypass road. Along with others, one of its recommendation was to control as well as phase out non-motorized transports, especially rickshaws, to reduce traffic congestion.

Shankland and Cox partnership (1980), a comprehensive study on transport development in metropolitan Dhaka, emphasized on the construction and management of road network. It also described physical characteristics such as capital cost, life of vehicles, and capacity of different vehicles in the study area. Furthermore, it suggested to include special design consideration for rickshaws in road construction.

Gupta (1980) conducted an study regarding rickshaw pullers, rickshaw owners, and the role of rickshaws in metropolitan Dhaka. He found that the overwhelming majority of the pullers were rural migrants. They were illiterate, untrained and somewhat unskilled adult males. On the other side, there were different types of rickshaw owners, e.g. pullers cum owners, small investors, full time big owners etc.

Gupta also pointed out that if the growth of rickshaws are not restricted then it may continue to increase at the present rate. On the other hand if rickshaws are eliminated from the metropolis the situation will create serious pressure on other modes of transport which are grossly inadequate at present and will also have impact on the general living conditions of the public as the travel cost is likely to elevate. The most serious impact, however, will be on the employment situation since a large number of people will be rendered jobless.

Gallagher (1992) made an study on rickshaws of Bangladesh. In the study he investigated the uses and characteristics of rickshaws and its growth trend. He also studied the characteristics of the rickshaw pullers and rickshaw users.

Gallagher found that about 78 percent of rickshaws were carrying passengers and the remaining 22 percent were carrying only goods or goods with passengers. Detail distribution is shown in Figure 2.1

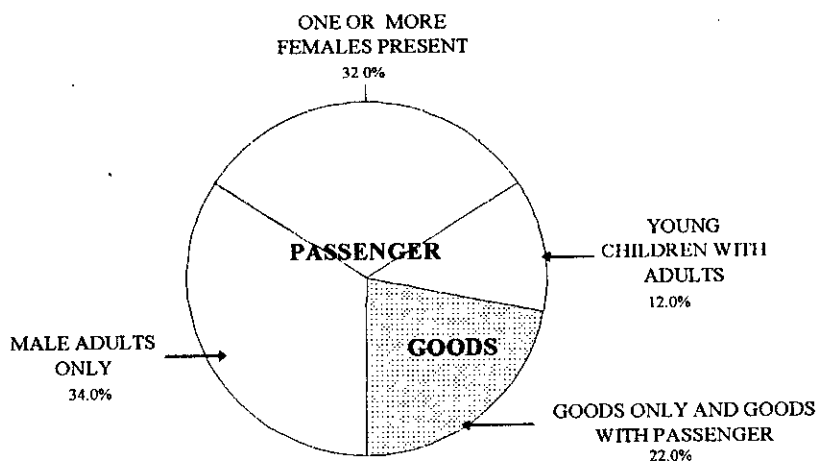


Figure 2.1: Use of rickshaw in Dhaka city

2.2.1.2 Transport status studies

DITS (1993) investigated the uses, physical characteristics and the role of NMT, especially rickshaws, as a part of the study called DITS. This study states that there were many policies in the past (e.g. Third Five Year Plan 1985-90, Fourth Five Year plan 1990-95) to discourage rickshaws and replace them with auto-rickshaws, tempos and buses. However, surveys show that the rickshaws are much more efficient than people give them credit for. Over short distances they are the only half the cost of traveling by auto-rickshaws. Rickshaws are smaller and more maneuverable than cars, and where the traffic move slowly (as in narrow streets and in congested conditions) they can achieve passenger flows about 50% higher than that of cars.

The study estimated that in 1988 rickshaws accounted for 70% of all passenger trips in metropolitan Dhaka (excluding pedestrians), and contributed about 43% of the total passenger transport output (measured in passenger-kilometers). And this did not include their role in carrying goods, which adds another 13% to their output. So, the useful role of rickshaws can not be neglected.

Rejecting the hostility of the past policies towards rickshaws DITS encourages the following improvement measures of rickshaws:

- providing separate rickshaw lanes
- improving road surface and maintenance
- providing 'islands' to enable rickshaws/pedestrians to cross busy main roads
- providing traffic lights/ pedestrian signals to enable rickshaws/pedestrians to cross busy main roads
- changing the rickshaw design

2.2.2 Traffic Studies

2.2.2.1 Traffic classification and volume studies

Roads and Highways Department (RHD) of Bangladesh (1995) prepared a survey format to conduct a Manual Classified Traffic Count or Manual Classified Count (MCC) as a part

of its annual nation-wide traffic census. RHD classified the vehicles in the following thirteen groups (picture of these vehicles are shown in appendix-H):

1. Heavy truck
2. Medium truck
3. Small truck
4. Large bus
5. Mini bus
6. Microbus
7. Utility
8. Car
9. Auto rickshaw
10. Motorcycle
11. Bicycle
12. Cycle rickshaw
13. Cart

However, the result of this traffic count is not yet published.

2.2.2.2 Management studies

Ahmed (1980) focused on different aspects of failure in traffic management and administration in Dhaka city. It concluded that existing transport modes are not adequate to meet the travel demand and mixed mode situation has resulted in traffic congestion and less safety. It also suggested for modifications of traffic management and policies.

2.2.2.3 Safety studies

Hoque (1981) mainly dealt with different aspects of roadway safety. He identified several types of road accidents in metropolitan Dhaka. It was found that a total of 7767 vehicles were involved in 4514 accidents. In this investigation bus was placed in the third position (12.85%) according to its accident contribution, with cars and taxies being on the top (40.47%).

2.2.3 An Overview

In Bangladesh few studies have been undertaken on the transport sector. However, the urban sector transportation studies in the country is richer than the rural sector. But these studies are not adequate to provide a comprehensive picture of the mixed mode urban road transport situation, traffic behaviour of NMTs in metropolitan Dhaka, in particular .

2.3 OVERSEAS STUDIES

Many studies have been done in different countries relating to transport policy, transport status, traffic behaviour, traffic management and safety. Some of them are discussed in the following sections.

2.3.1 Transport Studies

2.3.1.1 Policy studies

Sarna (1991), made a study regarding the importance of non-motorized modes in mixed traffic Indian cities. His analyses indicate that non-motorized modes play a significant role catering to the transport demand in most of the Indian cities with less than 2.5 million population. Despite growing economic affluence and fascination for owning motorized vehicle in urban areas, the dependence on non-motorized transport will persist in the foreseeable future. The transport planning studies conducted so far in metropolitan cities have not paid the attention needed for providing facilities for non-motorized modes. According to Sarna some of the issues that need to be addressed relating to Indian cities are as follows:

- For assessing precisely the requirements of non-motorized modes, transportation studies need to be conducted in medium sized and small cities to match transport facilities with transport demand patterns. The transport systems to be developed for such cities should have a blend of all transit modes, including facilities for NMT modes.
- Cycle rickshaw is a very popular paratransit mode that provides door to door service in congested parts of most Indian cities. The requirements of this mode need to be studied and better understood in relation to the socio economic environment.
- In the majority of the cities, a large proportion of road users killed or injured in road accidents is composed of users of non-motorized modes (pedestrians and cyclists). Studies need to be conducted to assess the socio economic aspects of these users to minimize fatalities among them.

Replogle (1992) made a comprehensive study on the non-motorized transport (NMT) of many mixed traffic Asian cities. He found that the future of NMT in those cities is threatened by growing motorization, loss of street space for safe NMT use, and changes in urban form prompted by motorization. Transport planning in most part of Asia has focused principally on the motorized transport sector and has often ignored the needs of NMT.

Replogle pointed out that without changes in policy, NMT may decline precipitously in many Asian cities in the coming decade. Large-scale replacement of NMT with motorized transport would have major negative impacts on air pollution, traffic congestion, and the employment and mobility of the poor.

He gave example of Japan, the Netherlands, Germany and other European nations where the transport system consist of an appropriate integration of walking, NMT modes, and motorized transport. As in European and Japanese cities, where a major share of trips are made by walking and cycling, NMTs have an important role to play in urban transportation systems throughout Asia in coming decades.

2.3.1.4 Transport status studies

Pendakur (1993), found that the use of energy-efficient, cost effective and environmentally sound NMTs for urban and rural use have gained significant interest around the world during the last few years and has become an attractive alternative. According to him, NMTs (Walk, bicycle and cycle rickshaw) constitute 30-60 percent of total person trips in Asian Mega Cities. Contribution of NMTs in nine Mega Cities are as follow:

- Tokyo: walk and bicycle 25 percent
- Bangkok: walk 16 percent and other NMT 8 percent
- Jakarta: walk 13 percent, other NMT 12 percent
- Delhi: walk and cycle 44 percent, other NMT 6 percent
- Lahore: walk 12 percent, other NMT 5 percent
- Singapore: walk 12 percent, other NMT 4 percent
- Mexico City: walk 23 percent
- Manila: walk 14 percent

- Hong Kong: walk 13 percent

2.3.2 Traffic studies

2.3.2.1 Speed-volume study

Central Road Research Institute of India (1982) conducted a study to develop simple and robust relationships governing the speed and volume of traffic under Indian condition. For the study it classified the vehicles into the following ten categories:

1. Cars, Jeeps and light vans
2. Buses
3. Trucks
4. Tempos, auto-rickshaws
5. Tractors, trailers
6. Motorized two wheelers (motor cycles, scooters and mopeds)
7. Cycles
8. Cycle rickshaws
9. Bullock carts
10. Horse carts

The statistical analysis was attempted on the basis of the multiple linear regression technique. The speeds of each class of vehicles were taken as the dependent variables and the volume of the ten different categories of vehicles per hour were taken as the independent variables. The first analysis was, therefore, done using all the ten independent variables. The objective of this approach is to establish how each of the ten distinct categories of traffic contributed to the drop in the speed of the traffic stream as the volume increased. In order to simplify the approach, a combination of some of the vehicle categories was attempted. Finally, all the ten categories of vehicles were totaled into one single category and used as the single independent variable. For analysis purpose, the study developed a total number of 133 equations.

When the vehicles were brought down into three broad categories, namely, motorized vehicles, cycle traffic and animal drawn traffic the equations showed statistically significant results.

2.3.2.2 Safety studies

Sarna (1991) states that motor vehicles, in addition to their ill effects on environment, kill or injure people and damage property in India. He presented the accident trends for twelve metropolitan cities of India. The total number of accidents, persons killed, and persons injured has increased over the year. In 1985, as compared with the all-India level, around 29 percent of accidents occurred in these 12 metropolitan cities, where as the proportion of persons killed and injured were around 11 and 19 percent respectively. From available statistics, the road users killed or injured in road accidents are mostly pedestrians and cyclists who constitute between 50 and 80 percent of the population in most of the cities.

Road accidents, besides social problem, also cause economic loss. According to some estimates, the total cost of road accidents in 1978 was INR 2370 million (US \$1= INR 18), which was 0.3 percent of the national income of India. Again the fatality rates per 10,000 motor vehicles for India and those for developed countries suggests that there is a wide gap, and considerable work has to be done to make the road system safer in India.

Koike (1991) studied the accident problems associated with bicycle traffic in Japan. He observed that there is an increasing number of traffic accidents that involve bicycles, especially among the students and older people. Japan experienced a serious traffic accident increase that peaked in 1970. Total deaths were 16,765 with injuries of 981,096 in one year. In those days, the majority of victims were pedestrians and cyclists. However, since then the number of traffic accidents has been steadily decreasing due to massive investment of capital in traffic safety facilities such as guardrails to separate cars and pedestrians, grade separated pedestrian crossings, signalized intersections, and various safety operational countermeasures (e.g. permitting bicycles on sidewalks).

Replogle (1992) observed that traffic accident rates are subject both under-reporting and wide ranging interpretation depending on the rate used for analysis. The motorized

transport bias of most transport policy analysis has led to a focus mostly on fatality rates per number of registered vehicles. By this measure, countries with low levels of motorization appear to have the worst safety problems and increasing levels of motorisation bring a reduced fatality rate per number of motor vehicles.

However, by a human, rather than vehicle based standard, this relationship is reversed. This analysis procedure is shown in Figure 2.3. It is therefore important to examine both the statistics during discussions on safety implications of transport policy choices. It is also important to look at accident rates by modes on a per trip or per hour traveled basis, not just on a per distance traveled basis. The latter measure, which is often used to assert the hazards of NMT, ignores the fact that people dependent on NMT travel less distance than motor vehicle users, changing their relative exposure.

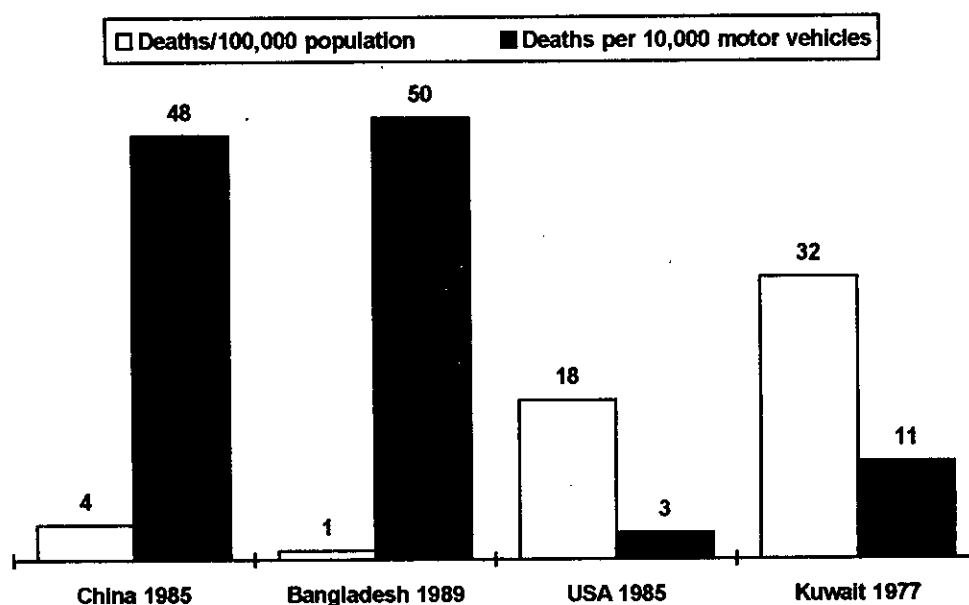


Figure 2.3 Traffic accident rates, selected countries and Years
Source : Replogle ,1992

Replogle also investigated the traffic safety problems associated with NMTs in different Asian countries. In Bangladesh, according to him, rickshaws constitute the majority of the vehicles on many roads, but rickshaw drivers and passengers account for only 10 percent of traffic deaths, despite their relative vulnerability in a collision with a motor vehicle, contradicting the popular impression that rickshaws are the major traffic safety problem. He showed (see Table 2.1) that estimated fatal accident rates for rickshaws appears to be much

lower than for motorized vehicles common in Bangladesh. Nearly all rickshaw users and pedestrians killed in reported accidents died in collision with trucks, buses, or mini-buses.

✓ **Table 2.1** Estimated fatal accident rates for vehicle users in Dhaka, Bangladesh, 1986-87

Mode	Per 1000 vehicles on the road	Per 100 million Vehicle miles	Per 100 passenger miles
Bus and mini-bus	25.70	100.0	2.0
Tempo	5.30	24.0	2.7
Motorcycle	0.35	3.6	2.4
Rickshaw	0.25	2.6	1.5
Baby taxi	0.50	2.8	1.1
Car	0.30	3.1	1.0

Source : Replogle ,1992

He found that rickshaws are often restricted on some selected major roads, showing them as traffic safety problem. However, evidence suggests that the banning of these vehicles does not offer any significant safety improvement. For example, after rickshaws were banned from the Airport Road in Dhaka, traffic speeds increased and accidents remained at a high level, with 15 fatalities, mostly pedestrians, on this facility in the year after the banning.

2.3.3 An Overview

Transport and urban planners, now a days, are giving more emphasis on mixed mode traffic system. It is argued that modern urban transport does not need total motorization, but rather the appropriate integration of motorized and non-motorized transport modes.

In developing countries, non-motorized transport (NMT), with combination of various motorized vehicles, play a major role in urban transportation. Methods for evaluating the performances of NMT in the mixed traffic situation are becoming a key interest to transport planners and a variety of methods are suggested by different researchers.

2.4 SUMMARY

From the review, it appears that a very few studies have been done to study the mixed mode transport system in metropolitan Dhaka. Despite the important role of non-motorized transports (NMTs), a very few attempts have been taken to study the traffic behaviour of NMTs in metropolitan Dhaka.

Literature discussed in this chapter along with some more review in the following relevant chapters would act as guidance for the present research.

CHAPTER 3 DEVELOPMENT AND OPERATION OF ROAD TRANSPORT IN METROPOLITAN DHAKA

3.1 INTRODUCTION

The nature and efficiency of the transportation system determine the magnitude and distribution of economic and demographic activity in an urban area. Conversely, a wide variety of social, economic, demographic, and political factors interact to affect the type, nature and configuration of urban transportation systems as well as the general urban form.

The road transport situation in metropolitan Dhaka, therefore, has to be considered in the overall perspective of various factors viz: urban transport policy, travel pattern, road network, the number and variety of road transport, share of passengers for each mode and their relative operational characteristics.

From the factors mentioned above, the demand on the urban road transport facilities can be understood. As well as the developments and/or improvements of the facilities required can be determined. This chapter intends to examine the overall road transport situation in metropolitan Dhaka. Particular emphasis has been given to investigate the contributions of different transport modes, especially non-motorized transports (NMT), in the current transport situation in metropolitan Dhaka.

3.2 URBAN TRANSPORT AND TRAFFIC POLICY

There are three key objectives in any transport system. These are mobility, accessibility, and economy (Ogden, 1982). More examples of goals and objectives in planning an urban transport system are: increased safety on the transportation system, decreased travel cost, development of a mass transit system, and maximum support from transportation for the selected urban form (Victor, 1979). It is therefore, emphasized that the selected urban

transport system must provide at least a minimum level of mobility, safety and accessibility to all urban residents, at least resource cost.

So it is desirable to investigate how much the present road transport situation is consistent with this policy in metropolitan Dhaka.

3.3 ROAD TRANSPORT FACILITIES

3.3.1 Road Network

Dhaka's transport system is predominantly road based. This road network basically determines the accessibility of different modes to different locations of the metropolitan area. So, understanding of the existing road network is also required for planning an efficient transport system.

Historically, Dhaka has expanded from the banks of Buriganga towards the north. As the metropolis expanded, its road network also has been growing time to time. The major roads in the old part of Dhaka have been developed in the east-west direction and major roads in the new part have gradually been developed in the north-south direction. Roads in east-west direction in the new part have been developed mostly as link roads. Furthermore non-motorized transports (NMTs) has been usually given inadequate attention in street network design. So too, road facilities have never been planned scientifically in cognizance with the well-developed process of trip generation, distribution and assignment. As a result an irregular pattern of network, rather than more efficient pattern as grid-iron or radial-circumferencial pattern, has developed (Ahsan, 1990).

The road network composed of 199 km of primary roads, 109 km of secondary roads, 152 km of collector roads, and about 2540 km of access and other roads (Quium, 1995). Except some of the primary roads, almost all other roads are single carriageway. With the exception of few planned residential areas, in most of the areas the road network is quite narrow and alignment is poor to accommodate motorized modes, especially the public transport modes. This also poses a serious problem to provide other network infrastructure for utility services.

Width (Shankland Cox Partnership, 1979) of streets, within the old part of Dhaka, varies between 10 ft. and 24 ft., with the average being around 16 ft. Outside the old part, the major roads are four to six lanes wide. All the intersections are at grade. The major ones are signal controlled. Some of the intersections are of rotary type. Only few intersections have channelization measures. There are only a few pedestrian overpasses.

The existing road network in metropolitan Dhaka thus needs a planned restructuring to support an efficient transport system. This restructuring should be based on standard and functional road classification system which provides a hierarchy of roads, viz: Local streets, collectors, Arterials, and Freeways (see for example Brindle, 1988). It is, therefore, essential to carry out detailed studies on road classifications, road capacities, and geometric standards. Such studies are beyond the scope of this thesis and could be done separately.

3.3.2 Transport Modes

Metropolitan Dhaka has traditionally been served by a wide variety of transport modes. These modes can be classified into motorized transports (viz., Bus, Mini-bus, Truck, Car, Auto-rickshaw, Auto-tempo, Motorcycle) and Non-motorized transports (viz., Rickshaw, Rickshaw van, Bicycle, Cart).

Motorized transports: There have been a number of recent attempts to estimate the vehicle population for overall Bangladesh and metropolitan Dhaka. DITS (1993) estimated the number of motorized transports (see Tables 3.1 and 3.2). From the tables it is evident that overall annual growth of motorized transport in Bangladesh is 6.93 percent whereas the overall annual growth in Dhaka is 8.46 percent. Table 3.2 shows that only autorickshaws are experiencing an increased rate of growth in numbers (overall annual growth in period 1988-91 is 11.48 percent whereas growth in 1990-91 is 18.52 percent). All other vehicles show a decline in the growth rate. For example Buses have a overall annual growth rate of 8.88 percent during the period 1988-91 but during 1990-91 this growth rate declined to 4.64 percent. The increase in auto-tempo number is probably due to an expansion of Dhaka making rickshaw less viable for many purposes and particularly for trips from Dhaka city to

the very rapidly growing areas like Mirpur, Savar and Tongi which are mostly beyond the range of rickshaws.

Table 3.1 Motorized vehicles by type in Bangladesh

Item	Year			
	1988	1989	1990	1991
1. Motor Car	35443	38278	41340	43960
2. Jeep (Jeep/ Station wagon/Microbus	23049	24893	26884	28673
3. Taxi	1622	1719	1822	1914
4. Bus	10643	11175	11734	11982
5. Mini-bus	6233	6856	7542	7893
6. Truck	21341	22621	23978	24904
7. Auto-rickshaw/ tempo	17429	18562	19769	23430
8. Motor cycle	97639	108379	120301	130292
9. Others	7373	7703	7890	8040
	220102	239856	261180	21088

Note: Estimated on the basis of registrations, fitness certificate, licenses and permits.

Source: DITS, 1993

Table 3.2 Motorized vehicles by type in greater Dhaka

	1991	% growth 1990-91	% growth 1988-91	% of total vehicles 91	% of national vehicles 91
1. Motor Car	26376	6.34	8.01	24.76	60
2. Jeep (Jeep/Station wagon / Microbus	14336	6.65	8.13	13.45	50
3. Taxi	1531	5.08	6.01	1.44	80
4. Bus	4792	2.11	4.19	4.50	40
5. Mini-bus	3946	4.64	8.88	3.70	50
6. Truck	9961	3.86	5.56	9.35	40
7. Auto-rickshaw/ tempo	18744	18.52	11.48	17.59	80
8. Motor cycle	26058	8.30	11.15	24.46	20
9. Other	804	1.90	3.03	0.75	10
Total:	106548	8.26	8.46	100	

Source: DITS, 1993

Even though the growth in motorized vehicle numbers as declined slightly their number is still expanding at a rapid rate of 8.26 percent per annum and if this trend continues it will result in a doubling by 2001 (DITS, 1993).

Non-motorized transports (NMTs): Rickshaws are the most common type of NMTs in metropolitan Dhaka. More than three-fourths of all rickshaws in operate in urban areas and many of them are found in Dhaka. In 1992, There were about 400,000 rickshaws in Dhaka (Mayor of Dhaka, 1992). Estimated number of rickshaws in metropolitan Dhaka and its growth trend is shown in Table 3.3. In Dhaka, there were about 40,000 bicycles in 1988 which was 25percent of the countries total (Gallagher,1992). By now there could be further increases in bicycle fleet. Rickshaw van is a common non-motorized goods transport in metropolitan Dhaka. Actual number of rickshaw van in Dhaka is not known. DITS (1993) estimated that total population of rickshaw van in 1990-91 was about 10,000. Another non-motorized goods transport is the cart but they are less common in Dhaka than rickshaw van. Population of carts in metropolitan is estimated to be 3,000 (DITS, 1993).

Table 3.3: Estimated number of rickshaws in Dhaka city

Year	Number	Source
1969	17,500	Dhaka Municipal Corporation
1974	19,000	Economist Intelligence Unit(1974)
1978	45,000	Selim Rashid(1979)
1979	81,000	Dhaka Police Commissioner(1979)
1980	100,000	Holiday (5/10/80)
1986	200,000	New Nation (28/11/86)
1992	400,000	Mayor of Dhaka (1992)

Extracted from DITS (1993)

Table 3.4 : Estimated number of other NMTs in metropolitan Dhaka

NMT type	Number (year)	Source
Bicycle	40000 (1988)	Gallagher (1992)
Rickshaw van	10000 (1990-91)	DITS (1993)
Cart	3000 (1990-91)	DITS (1993)

3.4 TRAVEL PATTERN

A wide variety of transport modes (characteristics of modes are discussed in the previous section) serve the travel needs of metropolitan Dhaka's population. Share of different passenger transport modes are presented in Table 3.4. From the table it is evident that about 80 percent of total daily trips are made by NMTs (including walk) alone, whereas only about 6 percent of those trips are made by motorized transports alone. Again, when

only vehicular trips are considered, about 50 percent of the trips are made by NMTs and about 18 percent of the trips are made by motorized transports.

Table 3.4 also shows that Bus has the longest average trip length in metropolitan Dhaka (32 minutes) and walk has the shortest trip lengths (15 minutes). Car, rickshaw and bicycles have average trip lengths of 22 minutes, 21 minutes and 21 minutes respectively.

Table 3.5: Distribution of daily trips by different modes in metropolitan Dhaka.

Broad Group	Mode	Daily Trips	Average Trip Length (Mins)	% of Total Trips	% of Trips Involving Vehicle Usage
NMT	Walk	5151783	15	60.1	-
	Rickshaw	1480411	21	17.3	43.3
	Walk+Rickshaw	156487	74	1.8	4.6
	Bicycle	76466	21	0.9	2.2
	NMT total	6865147	18	80.1	50.2
Mixed (NMT+MT)	Walk + Bus	483280	51	5.6	14.1
	Multi + Bus	129565	74	1.5	3.8
	Walk + Other MT	150259	61	1.7	4.4
	Total mixed	763104	57	8.8	22.3
MT	Car	259437	22	2.0	7.6
	Motor Cycle	128710	21	1.5	3.8
	Bus	80318	32	0.9	2.4
	Other MT	142091	39	1.5	4.2
	Total MT	610556	27	5.9	17.9
	Others (Mixed + MT)	328543	-	5.2	9.6
	Total	8567350	-	100.0	100.0

Notes: Trip: A trip was defined as the movement from origin to destination and might involve several modes, each mode comprising a trip segment.

NMT= Non-motorized transport

MT= Motorized transport

Source: DITS (1993) adopted from Quium (1995)

Hoque et.al. (1995), furthermore, compared modal split in metropolitan Dhaka with some other Asian cities (see Figure 3.1). He showed that modal share of NMTs in metropolitan Dhaka is quite significant, which is over 80 percent, compare to Delhi around 50 percent and Bangkok around 16 percent.

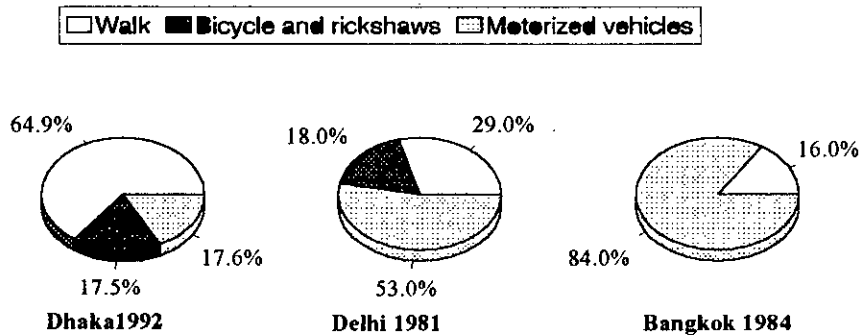


Figure 3.1 Transportation mode share in selected cities in Asia

From another point of view, passenger miles per day for different modes in a metropolitan area reflects the travel pattern of its inhabitants. It is calculated from average passengers boarding, average trip length, and average number of trips per day for each vehicle. According to DITS (1993) buses run the highest passenger miles per vehicle per day (9520 miles) and motor-cycles run the lowest passenger miles (35 miles) among motorized transports in metropolitan Dhaka. Whereas among NMTs rickshaws contributes the highest average passenger miles per vehicle per day (72 miles) and bicycles run the lowest average passenger miles (10 miles). However, when total passenger miles per day is considered, rickshaws run 10800000 miles which is around 36 percent of the total passenger miles per day by all the modes in metropolitan Dhaka.

The overwhelming bias of Dhaka's transport system towards NMTs, as expressed in this section, has resulted due primarily to two reasons: poor condition of the public transport system, and a historical urban development pattern of the city that gave rise to mixed type of high density land uses with multiple major centers of activities which produces short trip lengths. Moreover, these modes can effectively operate on almost all roads of the city.

3.5 STRIKING FEATURES OF NON-MOTORIZED TRANSPORT

There are a large number of different types of NMTs in use throughout metropolitan Dhaka. Some are of local invention, while others are of imported design or local adaptations

of imported technology. Their physical and operational characteristics, uses and advantages are given in this section.

3.5.1 Characteristics

Rickshaws are the most important type of NMT in Dhaka with three pneumatic tyre wheels. Rickshaw has one driving seat in the front and can carry a driver and two to three passengers or goods upto 250 kg. It travels at speeds of 5 to 12 km/hr and distances up to 40 km (DITS, 1993).

Bicycle, with two pneumatic tires, is capable of carrying loads of 100 to 180 kg if additional carrier is fitted. It travels at an average speed of 6 to 10 km/hr and a top speed of 15 to 20 km/hr (DITS, 1993).

Push carts are of two types. The thelagari is a large cart with inflated rubber tyres. It is common throughout metropolitan Dhaka and in other urban centres. It is used for transporting all manner of materials and products, but its greater use is for transporting building materials. Because of its bulk and slow movement it can cause considerable friction in traffic. The smaller hand cart, another type of pushcart, has solid wheels and is mainly used in old parts of Dhaka for moving heavy loads on the narrow streets.

3.5.2 Uses

Non-motorized transports are used for various purposes. Some of the uses, as identified in Hoque et. al (1995), are listed below:

Rickshaw

- To carry people to short to moderate distances
- To carry vegetables, fruits and fish from wholesale markets to local markets
- To carry building materials (small amount) to construction sites

Rickshaw van

- To carry people to different places
- To carry long narrow items such as bamboo, steel pipes or rods to

different places

- To carry building materials to places inaccessible to heavy motorized vehicles
- To carry wholesale rice, vegetables, fruits and fish to local markets
- To carry refrigerators , furniture and other household items
- To carry sick animals to nearby hospitals
- To carry sick people or deadbody to nearby hospital or graveyard

Bicycles

- It is easy to popularise bicycle because of its low initial and operating costs (Ying , 1987)
- Offers great flexibility

Pushcart

- To carry Long narrow items such as bamboo, steel pipes or steel rods to construction sites
- To transport building materials to short distance
- To carry furniture, refrigerators and other household items from markets to houses or other places

3.5.3 Reasons Behind the Uses of Rickshaws

It has been pointed out that besides walking, rickshaws occupy an important position in urban transport in Bangladesh, the following are some outstanding advantages of rickshaws:

- Cheaper, on a straight cost per passenger kilometer basis it is only half the cost of traveling by auto-rickshaw, and much less than half the cost of car travel (DITS, 1993). However, DITS (1993) did not show the comparison of this fare with metropolitan bus or tempo services.
- Availability for door to door services
- Flexibility of use, serving neighbourhoods where road network is too narrow to accommodate larger modes
- Ideal for short and medium length trips

- Ideal for people who do not have reasonable alternative means of transport
- Require lower investment and operating costs and hardly needs foreign exchange
- Do not contribute to air and noise pollution and are environmental friendly
- Contribute least to roadway damage
- Provides earning opportunities for a multitude of low income urban residents having no alternative means for survival.
- Rickshaws have a further role in supplementing the congested public transport services.
- Only vehicular mode available during hartal period.
- Reduces transport energy use and fuel consumption.

3.6 SUMMARY

From the aforesaid discussion it is clear that the role of NMTs is quite significant in metropolitan Dhaka. Nearly 50 percent of the total daily trips (excluding walk) are made by NMTs alone whereas only 18 percent of the trips are made by all other motorized modes and the remaining trips are accounted by mixed modes. In consequences mobility in this city continue to be dependent on the NMTs, particularly rickshaws. In view of the vital role of NMTs in metropolitan Dhaka it is necessary to investigate the effect of this important mode on such road traffic performance parameters as mobility, speed and safety.

- to obtain traffic mobility at the same selected sections using traffic volume and average occupancy of vehicles
- to measure speeds of different types of vehicles at those locations and obtain mean speed of each types of vehicles as well as mean speed of the link traffic
- to develop simple mathematical relationships between traffic mobility and composition of traffic and road geometry
- to develop simple mathematical relationships between speed of the link traffic, volume and composition of traffic and road geometry
- to understand the effect of NMTs on the traffic movement (mobility and speed) from the above stated objectives

4.2.2 Methodology

4.2.2.1 Measurement of traffic volume and mobility

Volume is a variable of greatest importance to the traffic engineer and essentially a counting process referring to the quantity of movement per unit of time at a specified location (Hobbs, 1979). The quantity of movement may refer specifically to single types of traffic unit - pedestrians, cars, buses, or goods vehicles - or to composite groups.

Mobility is another important variable in traffic engineering. Mobility may be defined as the number of persons traveling on a road section per unit of time by different vehicles. Mobility can be obtained from traffic volume if average occupancy of vehicles are known.

Traffic volume counts can be done by the following methods (Bindra, 1986):

- (a) Manual counts.
- (b) Automatic counters
 - i) Photo electric cell
 - ii) Electrical method

iii) Pneumatic method

c) Moving car method

- a) **Manual counts:** In this method of traffic count the observers record not only the traffic volume but also vehicle classification, turning movements and direction of movements. In this method it is not practicable to have manual counts for all the 24 hrs. of the day and on all the days round the year. Still, this is the most reliable and best method to obtain classified volume and directional volume for short counts.
- b) **Automatic counter:** Generally, they are either fixed type or portable type. In case of photo-electric cell method the automatic counter is actuated by the interruption of a light beam falling on photo-electric cell placed on the road side as a vehicle passes.

In the electrical method the counter is actuated by the closing of an electric circuit by the passage of the vehicle.

In the pneumatic method the counter is actuated by an air switch attached to a flexible hose stretched across the road over which the vehicle passes.

These methods are suited to take long counts and for permanent installations. The pneumatic type bends itself more readily to portable requirements. These methods do not give directional counts or classified counts. So, also the data is not as accurate as that from manual method since two or more vehicles going abreast will be recorded as a single unit.

These counts should be supplemented by manual short counts to check the accuracy of working and to evolve directional or classified counts by sampling techniques.

- c) **Moving car method:** The method consists in counting the number of vehicles met, overtaken and the time taken to travel by the observer once moving against the traffic and once along with the traffic. Volume is calculated by the following relationship:

$$q = \frac{x + y}{t_a + t_w} \dots\dots\dots(4.1)$$

where,

q = Vehicles per minute in one direction

x = Number cars met when moving against the desired direction.

y = Number of cars overtaking - number of cars overtaken by observer while moving along with the traffic.

t_a = Time taken in minutes by observer to travel against the traffic.

t_w = Time taken in minutes to travel with the traffic.

The accuracy in this method depends upon the number of tests conducted.

Since manual method traffic volume count is considered the least expensive in Bangladesh, this was favoured in preference to methods involving the use of sophisticated equipments.

For the study purpose all road vehicles are divided into two major groups :

Motorized Transports:

- i) Bus (single decker and double decker)
- ii) Minibus
- iii) Jeep (jeep, microbus, pajero)
- iv) Car
- v) Autorickshaw
- vi) Autotempo
- vii) Truck

Non-motorized Transports:

- viii) Rickshaw
- ix) Bicycle
- x) Rickshaw van
- xi) Carts

Data sheet (see appendix A) was prepared to record traffic volume by individual vehicle types of each group. Help of five survey assistants were taken at each selected sites during

the manual count in the field. Then average hourly traffic volume for each vehicle type for the day of study was obtained in the following way:

$$\text{Hourly volume for the day (vehicles / hr)} = \frac{(\text{Total traffic volume in the morning} + \text{Total traffic volume in the evening})}{(\text{Hours of count in the morning} + \text{Hours of count in the evening})} \dots\dots\dots (4.2)$$

Mobility was obtained from hourly volume using the following relation:

$$\text{Mobility (persons/hr)} = \sum \text{Hourly volume of a specified class of vehicle} \times \text{average occupancy of that vehicle class} \dots\dots\dots(4.3)$$

4.2.2.2 Measurement of traffic speed

There are two basic methods of conducting spot speed study:

- i) Method which measures time and distance, and
- ii) Method which takes the advantage of Doppler Principle.

The time versus measured distance method is the most commonly used method of spot speed study. This method involves the measurement of the time required for a vehicle to traverse a measured course. The measured course is first laid out at the location under study. The length of the course is generally made some multiple of 1.467, so that speed may be conveniently expressed in miles per hour. For example, for a course length of 88 feet (= 1.467 X 60) and a travel time of 1 second, the speed is 60/1.0 = 60 miles per hour since 1.467 feet per second = 1 miles per hour. Therefore, to obtain the speed in miles per hour, it is only necessary to divide 60 by the number of seconds taken to travel the course. The length of the course is dependent upon the average speed and the type of location under study (see Table 4.1).

Table 4.1: Recommended course lengths

Average Speed of Traffic (mph)	Course Length (ft)	Changing Seconds to (mph)
less than 25	88	60÷seconds = mph
25 to 40	176	120÷seconds = mph
greater than 40	264	180÷seconds = mph

Source: Pignataro, 1973

In the methods based on Doppler principle meters direct radar or audio beam of a certain frequency at the moving vehicle. The reflected signal is shifted in frequency, then the speed is obtained from the difference in frequency using the principle that difference in the frequency is proportional to the speed of vehicles.

Time-distance method of speed measurement was used in this study. In this study five survey assistants were engaged for speed study at the selected sites. Speed Study was performed simultaneously with volume study. Time (in seconds) required by each type of vehicle to travel the laid course was measured with the help of stop watches was recorded in data sheets prepared for the purpose of speed study. The data sheet for speed study is shown in Appendix A.

4.2.2.3 Sites selected for the study

To study the effect of NMTs on the traffic volume, mobility and speed for variation in vehicle composition and road geometry it is essential to conduct survey at different sites. The sites were so selected that they covered variable combinations of traffic compositions needed to examine the effect of NMTs. At some locations there were preponderance of NMTs, whereas at some other locations there were no NMTs at all. Considering the limitations of time and fund, survey was conducted at eight such locations. Geometrical features of these selected road links are given in Table 4.2.

Table 4.2: Different sites for the study

Site No.	Road link	Length (ft)	Road width in one direction (ft)	Effective road width in one direction (ft)
1	Sonargaon Hotel to Farmgate (Airport Rd) (Figure 5.1)	2669	35	30
2	Sonargaon Hotel to Banglamotor (Airport Rd) (Figure 5.1)	1342	35	30

Table 4.2 (Contd.)

Site No.	Road link	Length (ft)	Road width in one direction (ft)	Effective road width in one direction (ft)
3	Banglamotor to Moghbazar (Eskaton Rd) (Figure 5.2)	2925	35	28
4	Moghbazar Intersection-1 to Moghbazar Intersection-2 (New Circular Road) (Figure 5.2)	2830	35	29
5	Paltan to Bijohnagar (North-South Road) (Figure 5.3)	1060	34	29
6	Bijohnagar to Kakrail Intersection (Figure 5.3)	1300	34	29
✓ 7	Dhanmondi to Kalabagan (Mirpur Road) (Figure 5.4)	741	40	35
✓ 8	Kalabagan to Panthapath (Mirpur Road) (Figure 5.4)	1424	40	35

Table 4.2 shows the length of the selected road links and width of the road sections in one direction of travel. The total width of the road sections are not effectively used by traffic due to the presence of stalled vehicles, shops and other road side activities. For this reason effective width of the road sections are used in the study instead of total width.

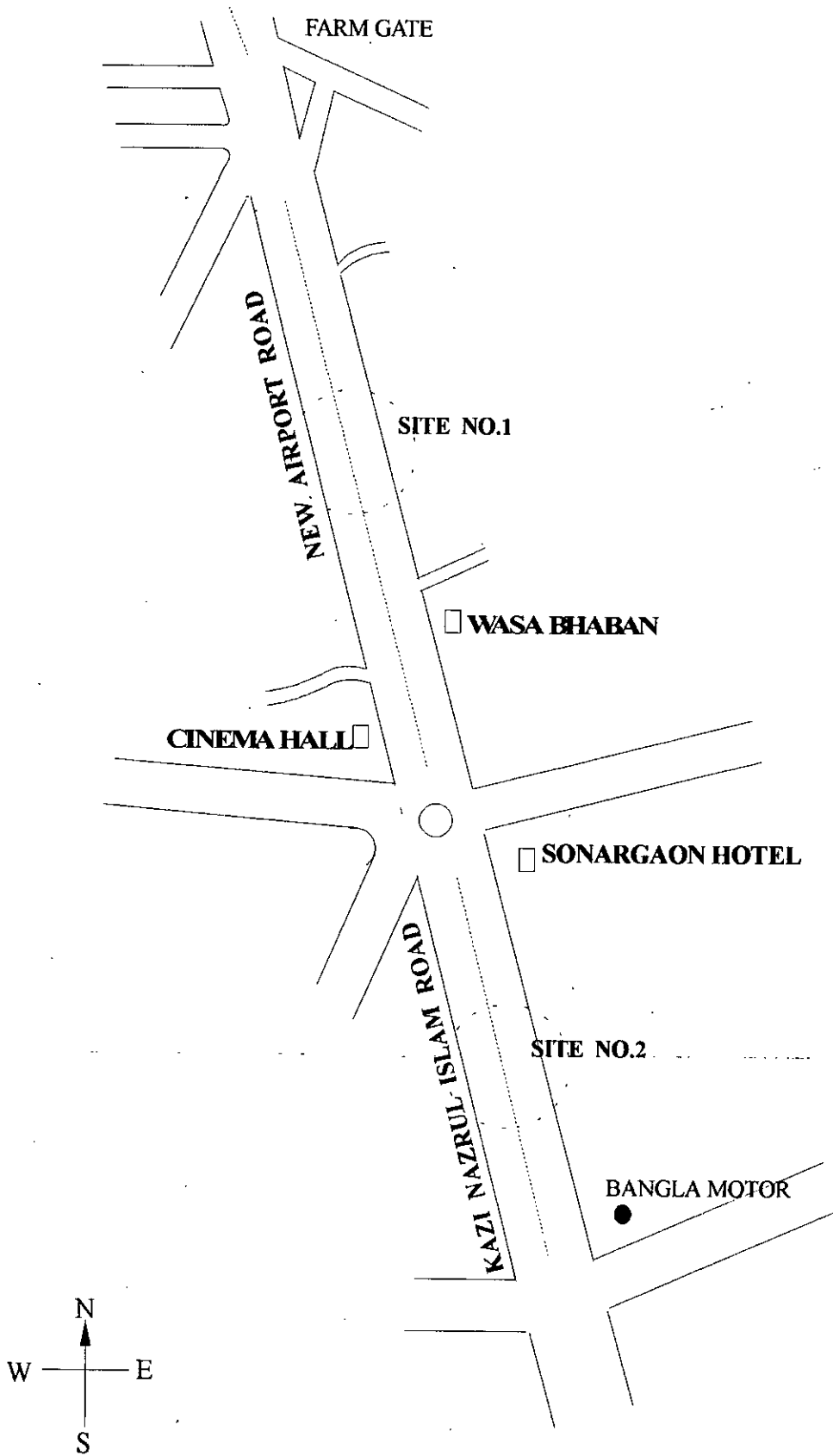


Figure 5.1: Layout of Site Nos.1 and 2

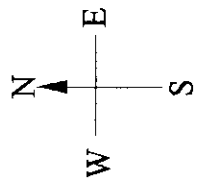
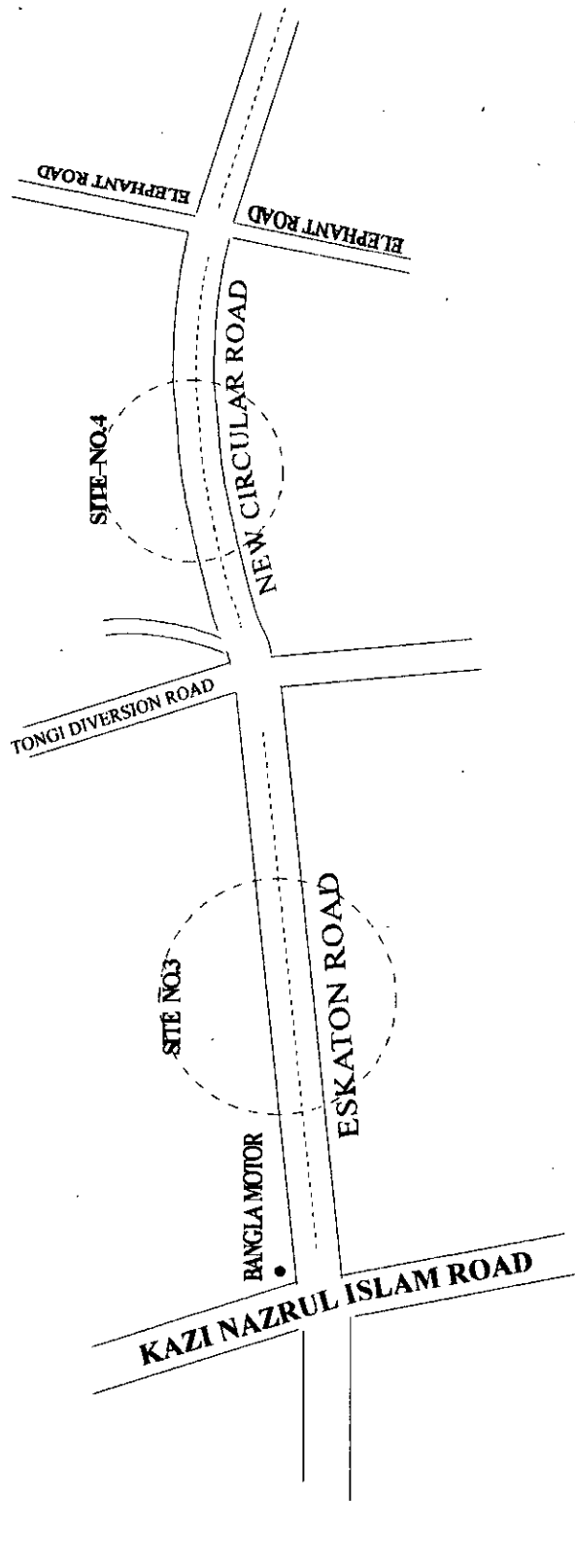


Figure 5.2 : Layout of Site Nos. 3 and 4

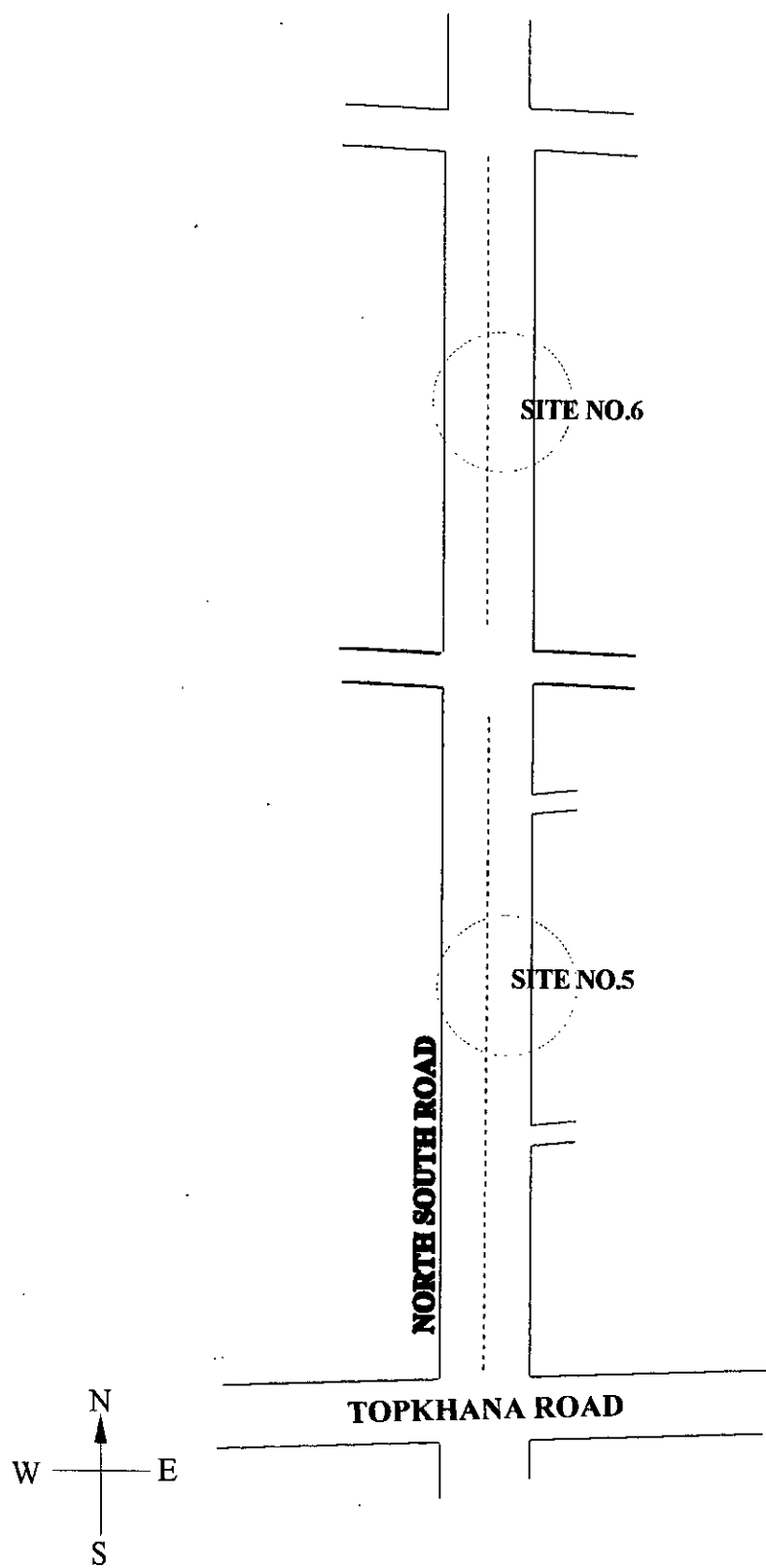
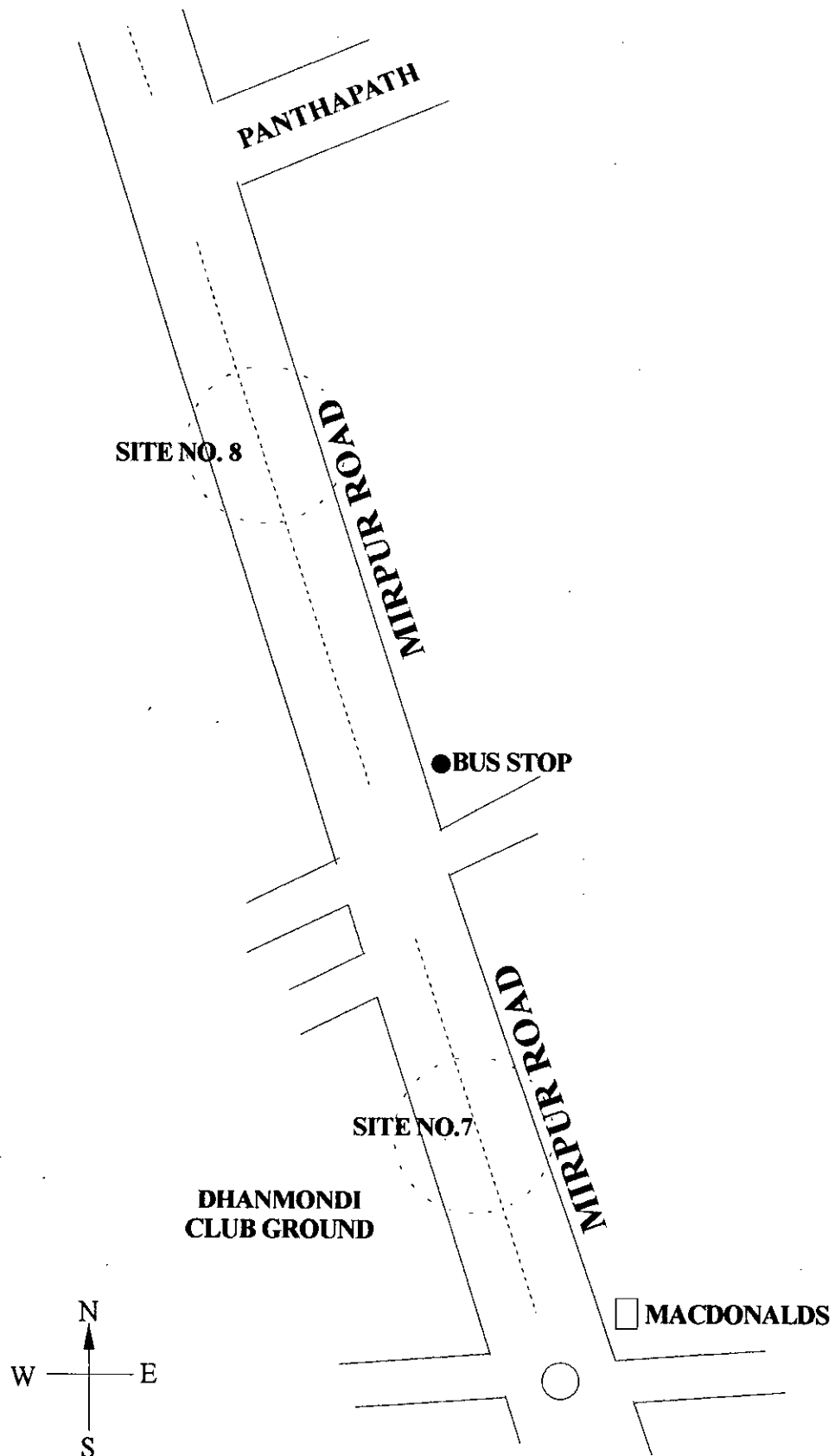


Figure 5.3 :Layout of Site Nos.5 and 6



[Signature]
Figure 5.4 : Layout of Site Nos.7 and 8

4.2.2.4 Duration of volume count and speed measurement

Short durations are generally used for volume count if there is a limitation of manpower, time or fund. This counting method is known as short count method. According to Pignataro (1973) short count method involves counting for one-half hour between morning peaks and one-half hour between afternoon peaks on one day at each station. The counts are confined to the four off-peak hours on the premise that traffic volumes during these periods of the day are generally more stable and subject to the least variation from day to day, thus providing more reliable samples. This hour count is then expanded by appropriate factors developed from counts taken at control stations.

In this study volume count and speed measurement were performed simultaneously at each of the selected locations. The studies were performed for a total 2 hours per day per location, 1 hour (11-30 am to 12-30 PM) in the morning and 1 hour (4-30 PM to 5-30 PM) in the afternoon (half an hour for each direction) for at each site. No control stations were used in this study.

4.3 ANALYSIS OF THE DATA

Data collected in this study were analysed to determine mobility and speed for different road geometry and vehicle composition. The procedure is described in the following sections.

4.3.1 Mobility

Average hourly volume for each type of vehicles were determined using equation (4.2). PCE (Passenger Car Equivalent) values were used to convert average hourly volume in both directions into Passenger Car Unit (PCU). Table 4.3 gives the hourly volume and composition of traffic at different locations under the study. PCU and average occupancy of different vehicle class are also shown in the table. It is clear from table 4.3 that the data covered a variety of traffic flow volumes and compositions. At some locations preponderance of motorized transports and absence of non-motorized transports (Site no.1

and Site no.2) were found and at other locations there was preponderance of NMTs. Thus, it can be said that the entire data covered all possible extremes of traffic mix which is essential to understand the heterogeneous nature of traffic in metropolitan Dhaka. Hourly volume of traffic is then converted to PCU using PCE values for different types of vehicles (see Table 4.4). From the hourly volume and average occupancy of vehicles shown in Table 4.3 mobility of the selected roads were determined using equation (4.3). Persons carried by each types of vehicles and mobility of different selected road locations are shown in Table 4.5.

Table 4.3: Hourly volume by type of vehicles in both direction

Site No.	1	2	3	4	5	6	7	8	Average Occupancy *	PCE *
Motorized Transport										
CAR	590	782	190	261	166	148	538	600	2.2	1.0
JEEP	266	306	60	82	36	41	117	115	2.2	1.0
M.CYCLE	147	198	46	87	66	54	78	78	1.3	0.75
A.RICKSHAW	1733	2017	483	710	525	443	600	610	2.2	0.75
TEMPO	264	65	110	110	31	38	5	10	10.2	0.75
BUS(D.D.)	3	3	0	0	0	0	0	0	115.0	3
BUS(S.D)	14	29	7	33	27	26	19	24	85.0	3
M.BUS	135	130	1	64	72	75	65	68	33.0	3
TRUCK	45	16	10	29	3	4	12	9	3.0	3
Non-motorized Transport										
RICKSHAW	0	0	1052	1116	1849	1694	1155	1121	1.6	1
BICYCLE	0	0	15	19	12	5	38	34	1.0	0.5
R.VAN	0	0	35	54	62	66	100	106	1.0	1
CART	0	0	3	9	8	11	4	4	2.0	4

* Average occupancy and PCE of vehicles are obtained from DITS (1993)

Table 4.4: Hourly volume (converted to PCU) by type of vehicles in both direction

Site No.	1	2	3	4	5	6	7	8
Motorized Transport								
CAR	590	782	190	261	166	148	538	600
JEEP	266	306	60	82	36	41	117	115
M.CYCLE	110	148	34	65	49	40	58	59
A.RICKSHAW	1300	1513	362	533	394	332	450	458
TEMPO	198	49	82	83	23	28	4	7
BUS(D.D.)	9	9	0	0	0	0	0	0
BUS(S.D)	42	87	20	99	80	78	57	72
M.BUS	405	389	2	191	216	225	195	204
TRUCK	134	48	30	87	9	12	36	26
Non-motorized Transport								
RICKSHAW	0	0	1052	1116	1849	1694	1155	1121
BICYCLE	0	0	8	10	6	3	19	17
R.VAN	0	0	35	54	62	66	100	106
CART	0	0	12	34	32	44	16	14

Table 4.5 : Mobility (persons/ hr) of selected road sections

LOCATION	1	2	3	4	5	6	7	8
Motorized Transport								
CAR	1298	1720	418	574	365	326	1184	1320
JEEP	585	673	132	180	79	90	257	253
M.CYCLE	191	257	59	113	85	70	101	101
A.RICKSHAW	3813	4437	1063	1562	1155	974	1320	1342
TEMPO	2688	663	1117	1122	311	383	51	97
BUS(D.D.)	345	345	0	0	0	0	0	0
BUS(S.D)	1190	2465	553	2805	2253	2210	1615	2040
M.BUS	4455	4274	17	2096	2376	2475	2145	2244
TRUCK	134	48	30	87	9	12	36	26
Non-motorized Transport								
RICKSHAW	0	0	1682	1786	2958	2710	1848	1793
BICYCLE	0	0	15	19	12	5	38	34
R.VAN	0	0	35	54	62	66	100	106
CART	0	0	6	17	16	22	8	7
Total	14699	14882	5127	10415	9681	9343	8703	9363

4.3.2 Speed

Measured times in seconds in the field for individual vehicles were entered in the computer for the calculation of speed of vehicles. From this calculated values, average speed of each type of vehicles for all the survey sites were obtained and are shown in Table 4.6. In this study speed of about 13 percent of total traffic volume was measured for each site.

Table 4.6 : Speed of vehicles at selected locations

Vehicle Type	Site No.								Vehicle Mean Speed (mph)
	1	2	3	4	5	6	7	8	
CAR	23.1	23.5	20.8	15.9	17.6	18.4	23.6	19.1	20.7
JEEP	22.7	24.3	18.2	19.8	22.0	22.6	24.1	21.1	22.2
M.CYCLE	18.1	18.1	20.5	19.4	19.4	17.9	24.2	20.1	19.9
A.RICKSHAW	20.7	21.6	18.7	16.5	17.5	18.3	21.8	19.9	19.3
TEMPO	19.1	22.0	20.3	15.8	15.1	17.6	-	-	18.6
BUS(S.D)	18.8	22.3	20.2	19.3	14.9	18.4	18.1	-	19.4
M.BUS	19.2	23.2	-	13.7	15.7	17.8	19.4	17.7	18.6
TRUCK	19.0	19.0	18.0	14.6	16.3	16.6	14.5	15.7	16.5
RICKSHAW	-	-	8.8	8.5	6.8	8.8	9.3	9.3	8.9
BICYCLE	-	-	9.9	-	9.5	11.3	9.1	8.9	9.8
R.VAN	-	-	7.3	7.1	6.6	7.2	-	10.7	7.5
CART	-	-	3.3	4.0	-	3.3	-	-	3.3
STREAM MEAN SPEED (mph)	20.4	22.3	15.4	13.7	14.2	15.3	18.3	20.4	

Table 4.6 reveals, that car is the fastest mode and truck is the slowest mode in the motorized transport group and bicycle is the fastest and cart is the slowest mode in the non-motorized transport group. The table also shows that mean speed of the link traffic is much higher (around 21 mph on average) at road links where NMTs are restricted than on road links where NMTs are present (around 16 mph on average).

Traffic speeds are presented by frequency histograms, frequency distribution curves and cumulative frequency distribution curves. These curves for eight selected sites are shown in Figures 4.5 to 4.12 (Curves for individual vehicles, i.e. car, autorickshaw and rickshaw, at individual sites are given in appendix C). Frequency distribution curves are obtained by rounding off the histograms in such a way that the area under the curve is equal to the area under the histogram. Frequency distribution curves are used to obtain the modal speeds. Modal speed is the speed which occurs most frequently and which is the peak of the frequency distribution curve (Hobbs, 1979). It is interesting to note that the frequency distribution curves show two distinct peaks at road links where NMTs are prevalent, whereas at road links where NMTs are absent frequency distribution curves produce only one peak. The reason for this is that a second peak for slower speed is created by the NMTs thus resulting in a drop in the speed of the link traffic.

The cumulative frequency distribution curves or ogives are used for determining the number of vehicles traveling above or below a specified speed. The median speed, another measure of central tendency, is the speed below which 50 percent of the vehicles move. Percentile speeds (i.e. speeds below which a specified percentage of vehicles are moving) are also readily indicated by the frequency distribution curve. The percentile speeds of particular interest are the 98th percentile which is often used as a design speed in geometric layout, the 85th percentile which is used in the consideration of speed limit imposition or overtaking distances, and the 15th percentile shows the slower vehicles whose speed may be causing interference within the link traffic. For example, in figure 4.5 the 98th, 85th, and 15th percentile speeds are 28.5 mph, 22.5 mph and 12.5 mph respectively

4.3.3 Analysis Results

The results of the analysis are summarized in Table 4.7.

Table 4.7 : Summary of the survey and analysis

Site No.	Road Geometry		Non-motorized transports (%)	Hourly volume (PCU)	Mobility (persons/ hrs)	Mean Speed (mph)
	Length of the road link (ft)	Effective width (ft)				
1	2669	62.0	0	3053	14698	20.4
2	1342	62.0	0	3330	14882	22.3
3	2925	56.0	58	1886	5126	15.4
4	2830	58.0	47	2613	10414	13.7
5	1060	58.0	67	2920	9680	14.2
6	1300	58.0	67	2711	9342	15.3
7	741	70.0	48	2745	8703	18.3
8	1424	70.0	46	2797	9363	20.4

Table 4.7 shows that mobility and mean speed is higher for the sites where NMTs are absent than the sites where NMTs are present. It is also evident from the table that mean speed is higher for the roads with greater effective width. For example, site no. 1, 2, 7 and 8 has greater effective width as well as higher mean speed than other four sites.

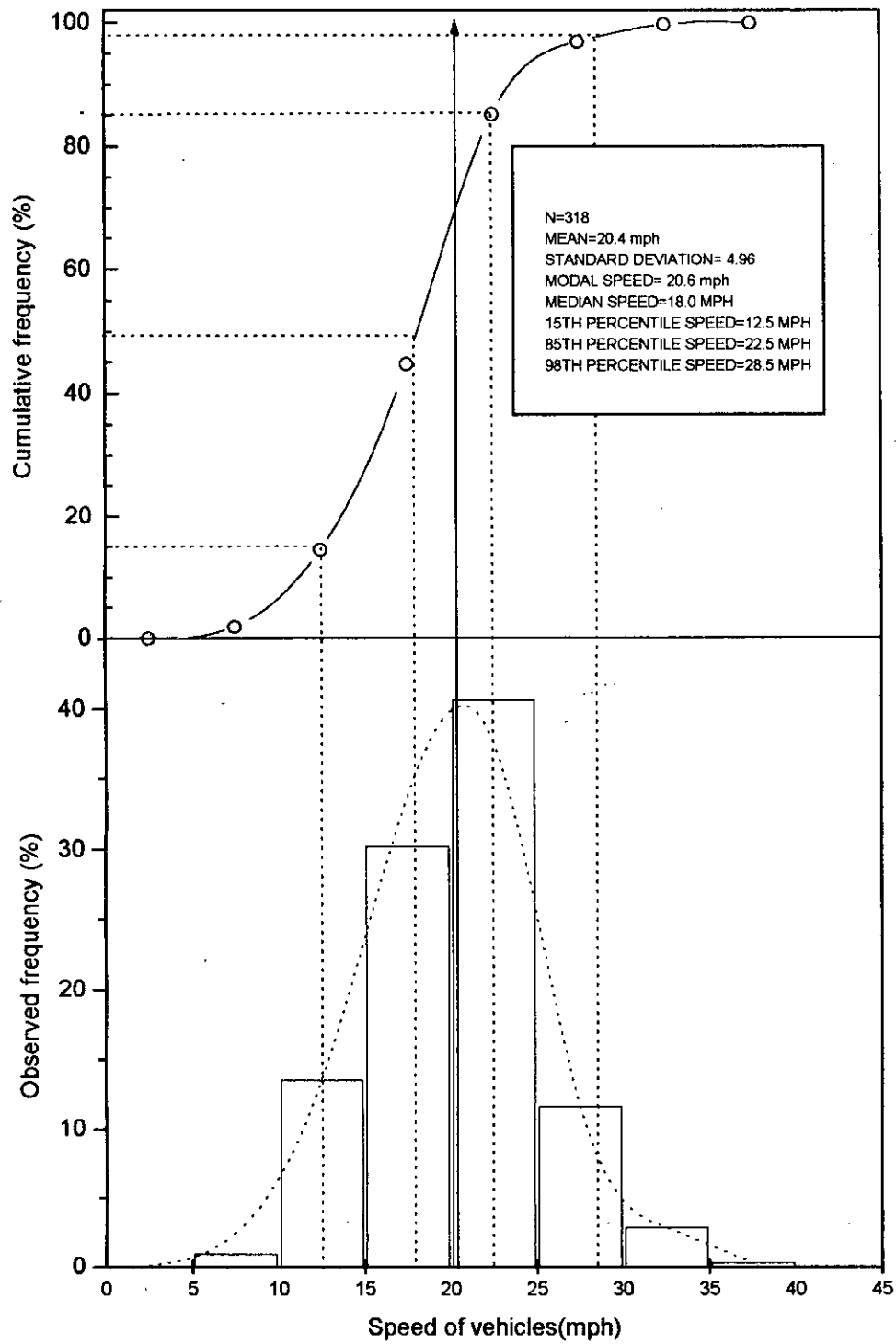


Figure 4.5: Distribution of vehicle speeds at site No.1

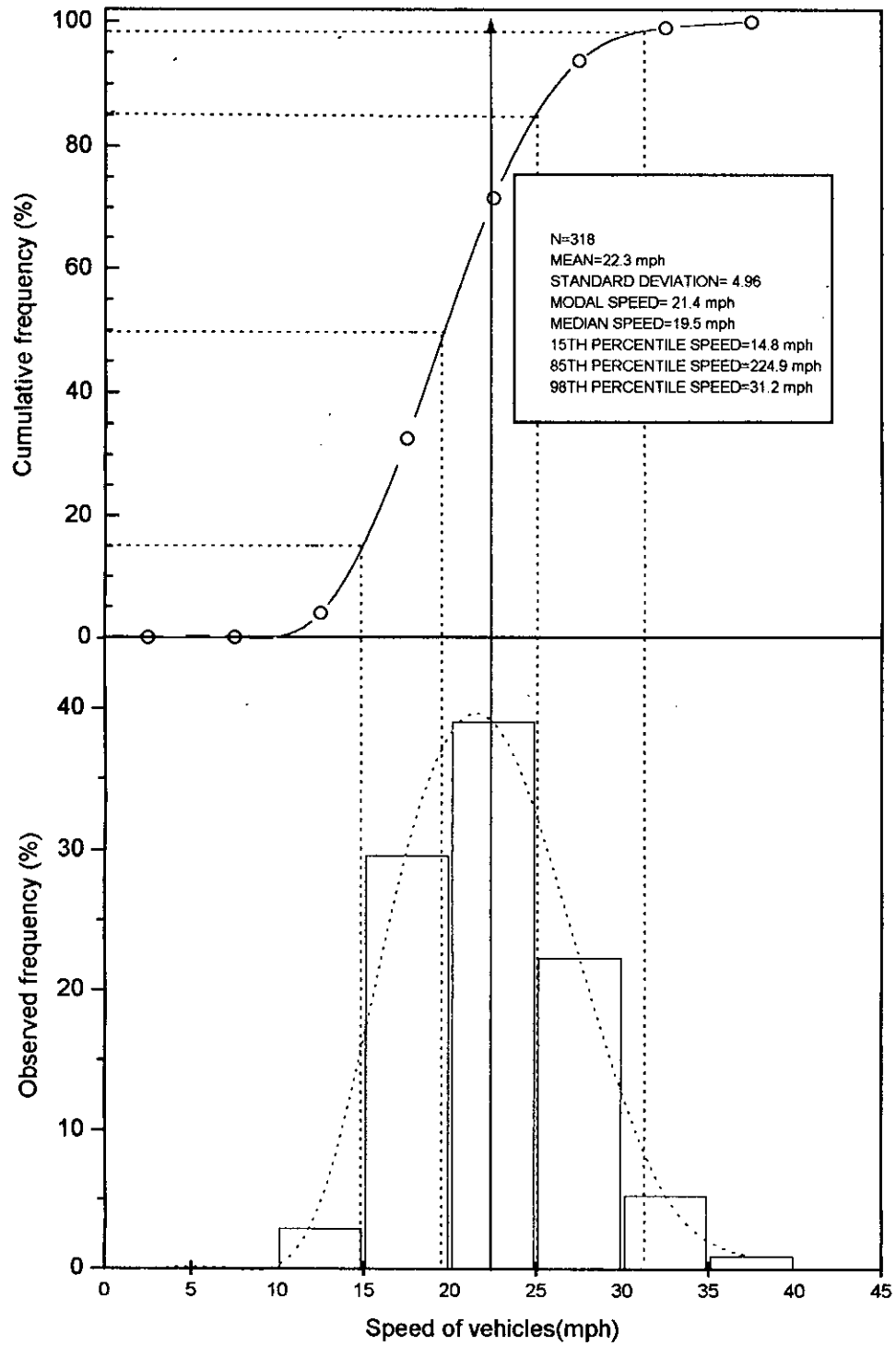


Figure 4.6: Distribution of vehicle speeds at site No.2

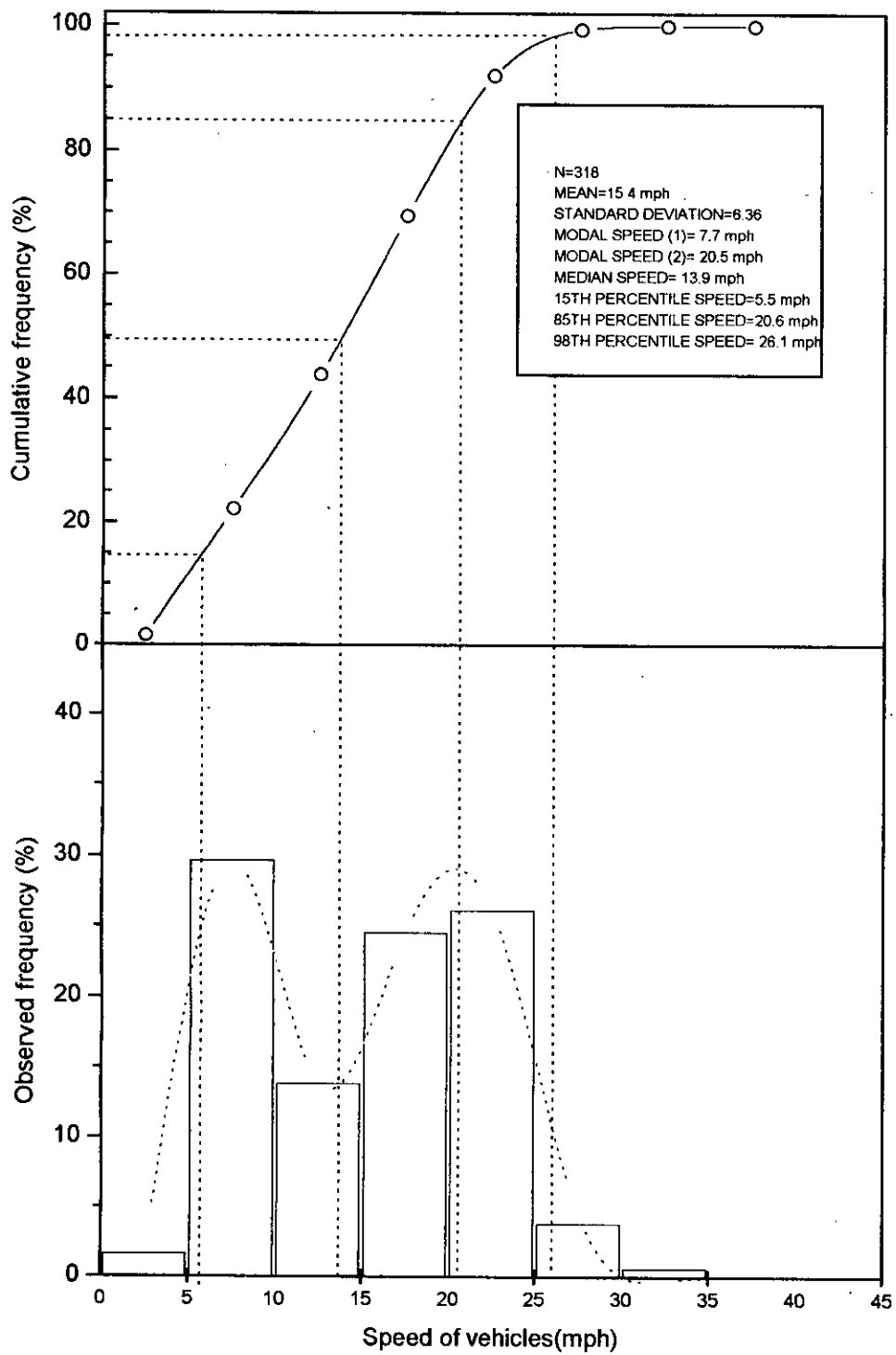


Figure 4.7: Distribution of vehicle speeds at site No.3

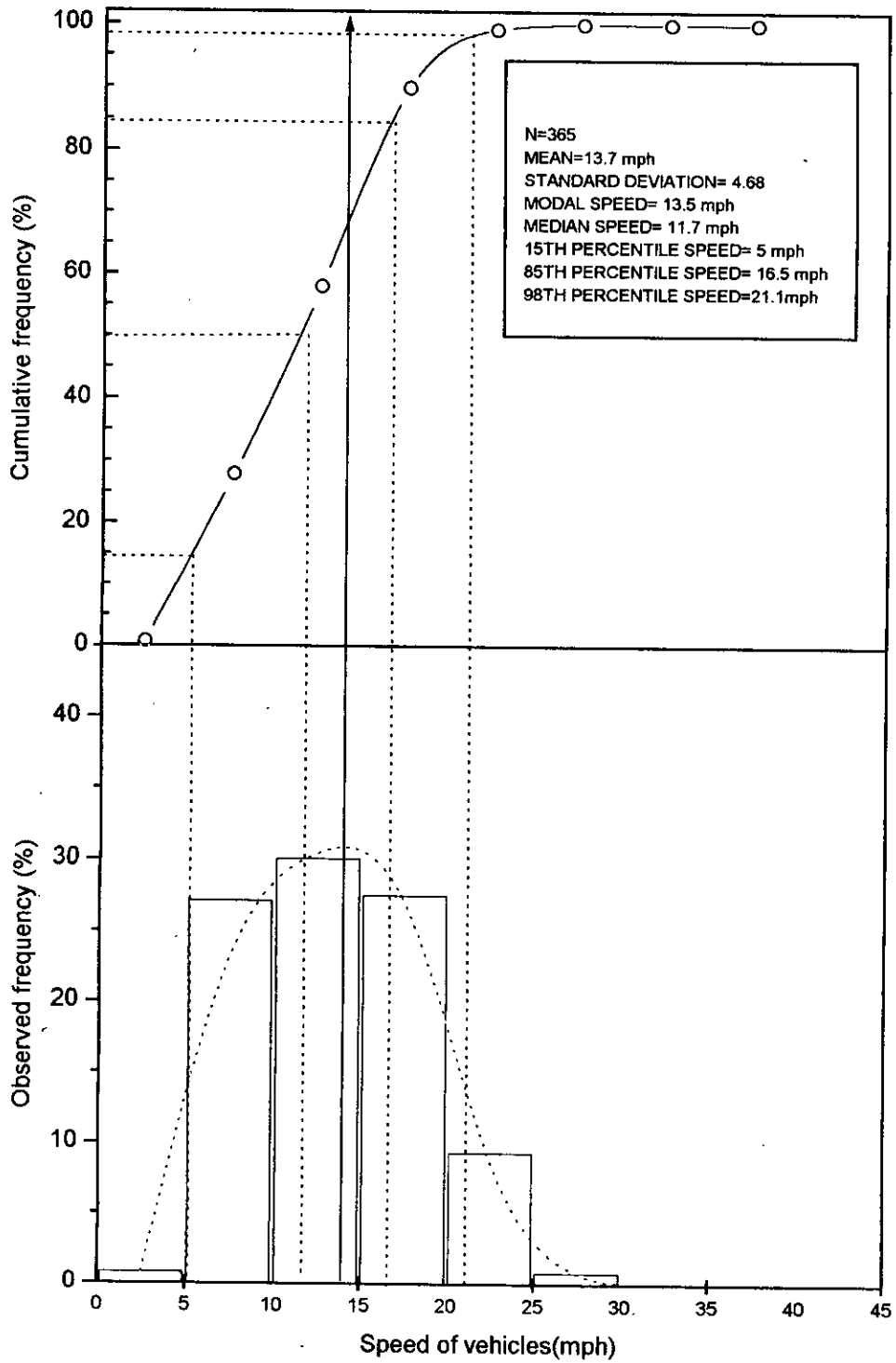


Figure 4.8 : Distribution of vehicle speeds at site no.4

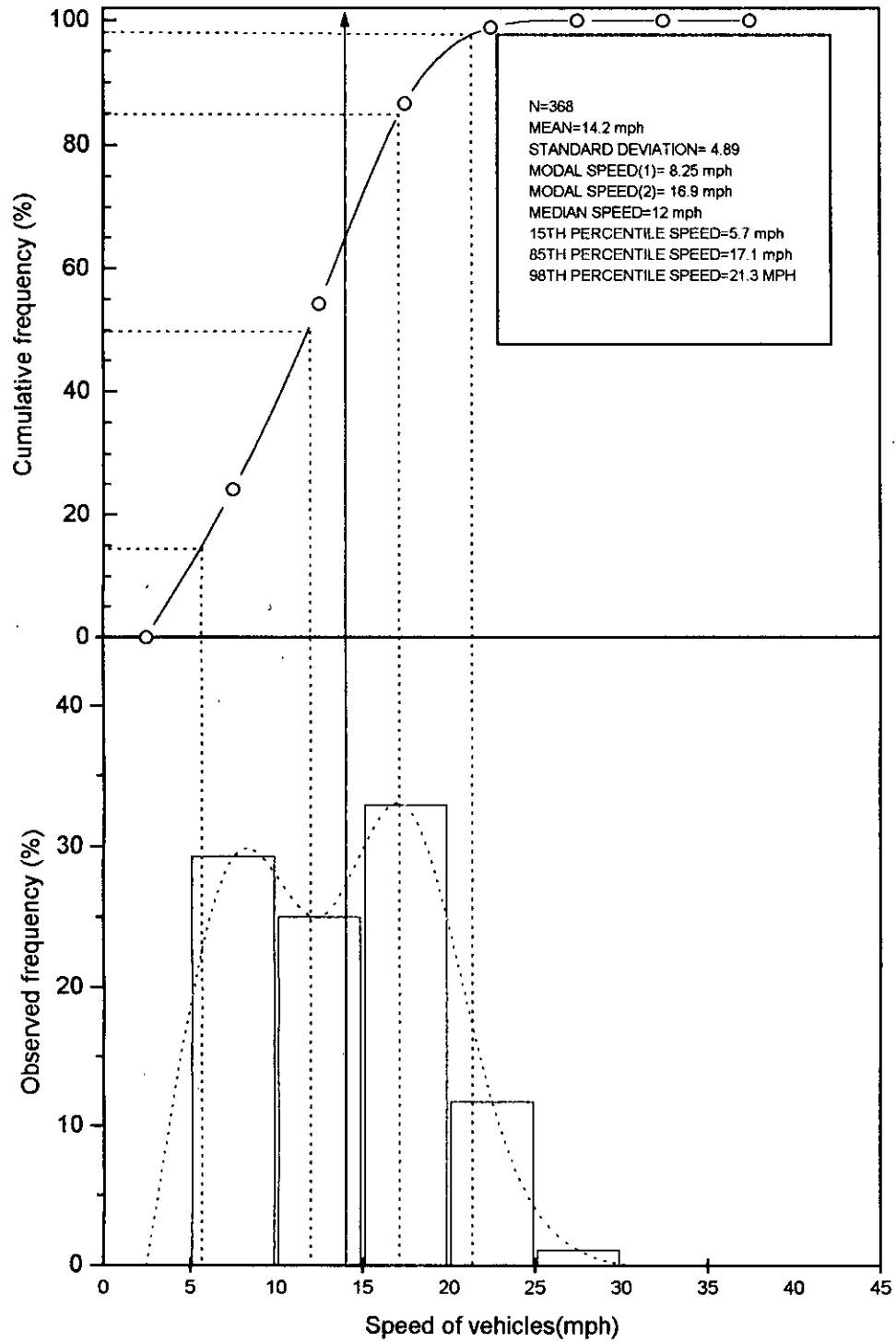


Figure 4.9: Distribution of vehicle speeds at site No.5

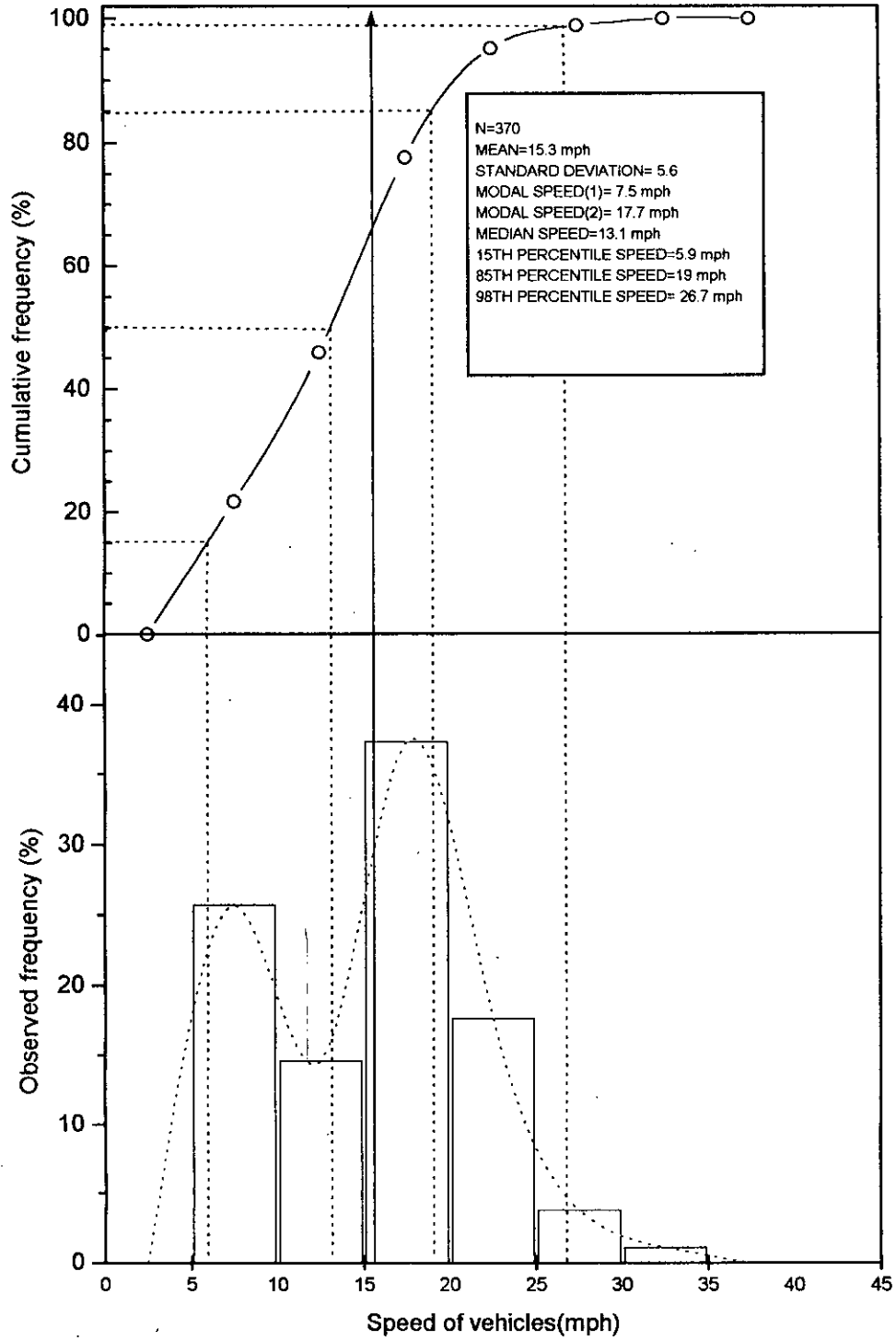


Figure 4.10: Distribution of vehicle speeds at site No.6

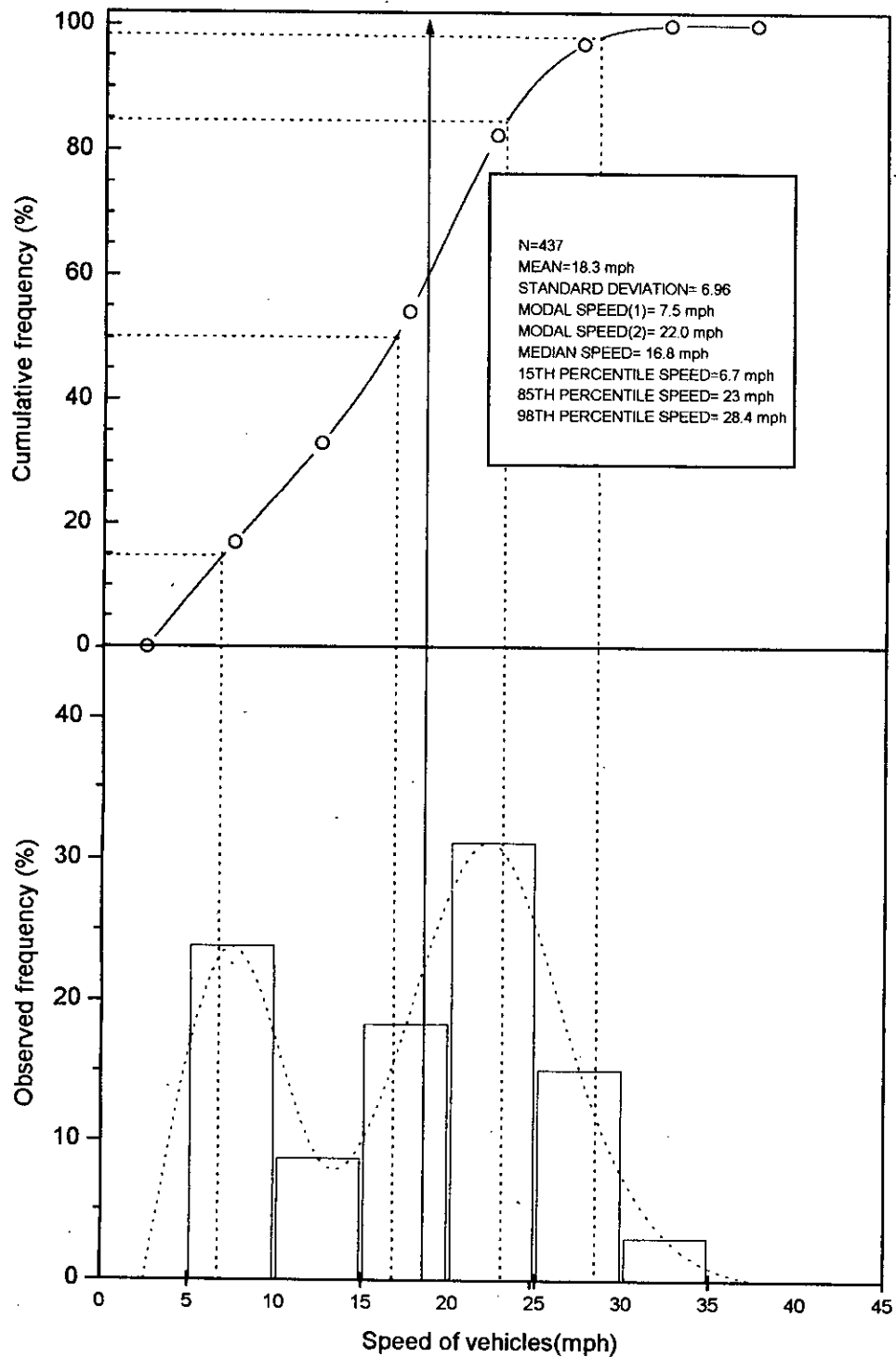


Figure 4.11: Distribution of vehicle speeds at site No.7

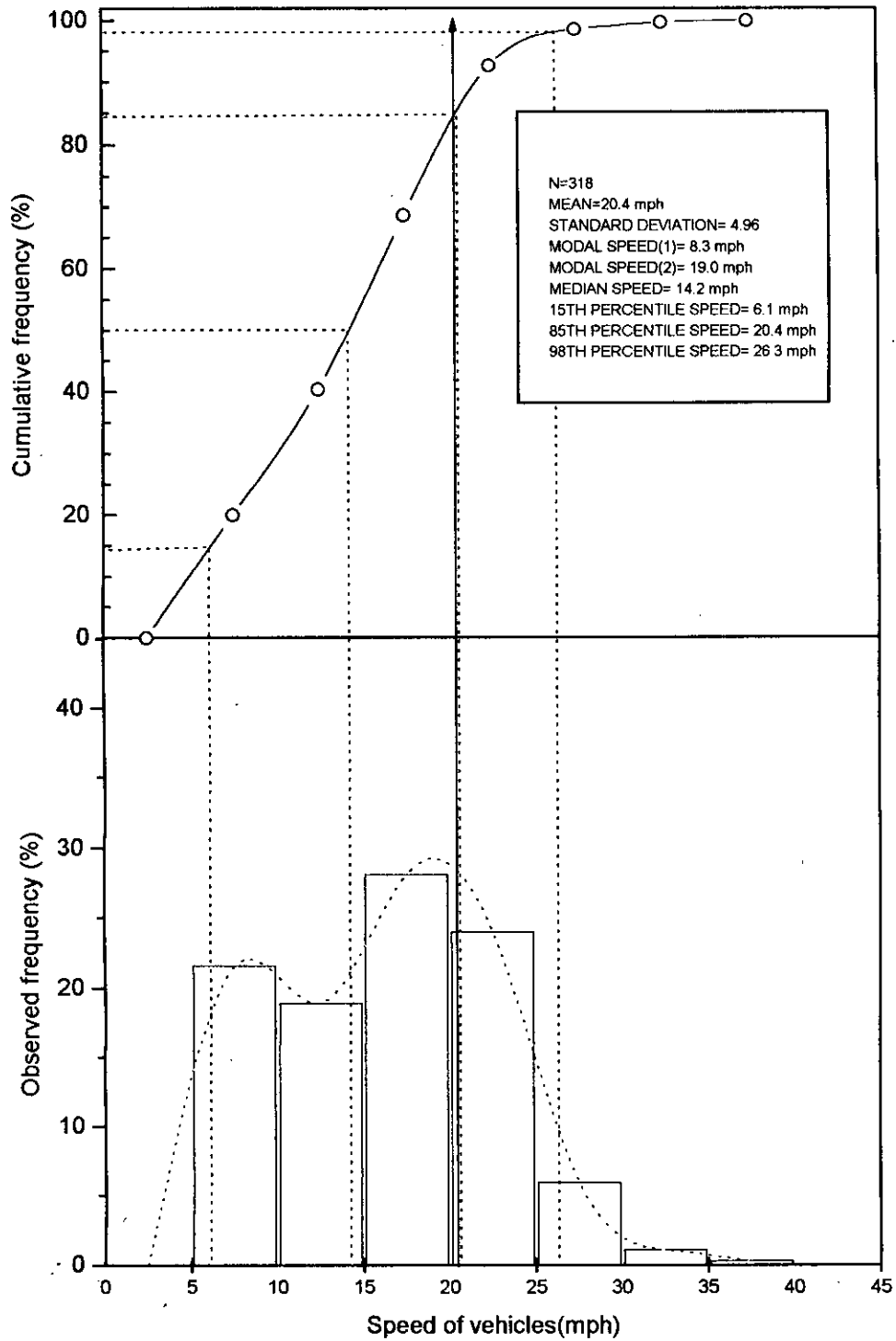


Figure 4.12 : Distribution of vehicle speeds at location No.8

4.4 MATHEMATICAL RELATIONSHIPS

Mathematical relationships among different variables are obtained using the multiple linear regression technique. According to Betha (1985) regression is a highly useful statistical technique for developing quantitative relationship between a dependent variable and one or more independent variables. It utilizes experimental data on the pertinent variables to develop a numerical relationship showing the influence of the independent variables on a dependent variable of the system.

The general equation of a multiple regression model may be written as:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon_i \quad (4.4)$$

Where,

Y= the dependent variable

X= explanatory variable

ε = random error or residual which is the amount of error in Y not accounted for by the linear relationship

i= the ith observation

n= the nth observation

β_0 = the intercept term

$\beta_1, \beta_2, \beta_3, \dots, \beta_n$ = the partial regression coefficients.

4.4.1 Steps Followed in Derivation of Regression Model

A standard statistical computer package SPSS (Statistical Package for Social Science) has been used to formulate the regression models. Steps followed in this package are briefly described in this section (for detail see Norusis, M.J. (1983), "SPSS[®] Introductory Statistics Guide", Mc Graw-Hill Book Company).

4.4.1.1 Preliminary selection of variables

One of the first steps in deriving a regression equation with several independent variables is to calculate a correlation matrix for all the probable variables. The matrix shows the correlation between the dependent variable and each independent variables, as well as the

correlation between the independent variables. Depending on the degree of association, the Pearson correlation coefficient lies between -1 and +1 and it is zero when variables are independent. In order to select independent variables in the equations, the variables which have correlation coefficient more than 0.5 are included in the preliminary equations. It is also important not to include independent variables which have large intercorrelation among themselves.

4.4.1.2 Selection of most relevant variables

Stepwise procedure is generally used to select independent variables. It is a combination of backward and forward procedure. The first variable considered for entry into the equation is the one with largest positive or negative correlation with dependent variable. The F test for the hypothesis that the coefficient of the entered variable is 0 is then performed. The F value is compared to established criterion. One criterion is the minimum value of F statistics that a variable must achieve in order to enter, called F-to-enter (Keyword FIN), with a default value of 3.84. The other criterion is the probability of F-to-enter (Keyword PIN) having a default value of 0.05. If the variable fails to meet the entry requirement (either FIN or PIN), the procedure terminates with no independent variable in the equation. If it passes the criterion, the second variable is selected based on the highest partial correlation. If it passes entry criteria, it also enters the equation. The first variable is then examined to see whether it should be removed according to the two removal criterion (FOUT or POUT). The first is the minimum F value (FOUT) that the variable must have in order to remain in the equation. Variables with F values less than F-to-remove (FOUT with default value= 2.71) are eligible for removal. The second criterion available is the maximum probability of F (keyword POUT with a default value=0.10). In the next step variables not in the equation are examined for removal. Variables are removed until none remain that meet removal criterion. variable selection terminates when no more variable meets entry or removal criteria.

4.4.1.3 Statistical tests

Both formal statistical tests, such as t test, F test and Goodness of Fit, and more informal tests such as the sign of the estimated coefficients should be considered during formation of the model. SPSS includes these statistics in the result output.

4.4.2 Regression Model with Mobility as the Dependent Variable

4.4.2.1 Notations used in the model

The followings are the notations used in the regression model:

Dependent variable

M = Mobility (Persons/ hr) of the selected road sections

Probable independent variables

Mobility depends on several factors such as traffic composition, speed, road geometry, time of the day, weather etc. However, the following variables are preliminarily selected to develop the relationship:

WLR = Effective width to length ratio of the road sections

W = Effective width of the road sections (ft)

S = Mean speed (mph)

N = Percentage of NMTs (%)

4.4.2.2 Selection of variables and formation of the regression model

For preliminary selection of variable the correlation matrix was found which is shown in Table 4.8. From the correlation matrix it is seen that independent variables S and N have good correlation (correlation coefficients more than 0.5) with dependent variable M. So, these independent variables were primarily selected for the stepwise regression procedure. After the stepwise regression variable was finally selected as shown in Table 4.9 (See appendix-D for the detail output of the procedure).

Table 4.8 : Correlation matrix for mobility analysis

	M	WLR	W	S	N
M	1.000	-.0864	-.1345	.6173	-.8454
WLR	-.0864	1.000	.6744	.1945	.1860
W	0.1345	.6744	1.0000	.6301	-.2277
S	.6173	.1945	.6301	1.0000	.8026
N	-0.8454	.1860	-.2277	-.8026	1.000

Table 4.9: Regression results for mobility analysis

Variables	Coefficients	Standard Error	t-ratio
Constant	14448.588811	1259.19177	11.474
Percentage of non-motorized transports (%)	-100.242374	25.857811	-3.877
R ²	0.71467		
Adjusted R ²	0.66712		
F-value	15.03		

The regression model for mobility, therefore, takes the form:

$$M = 14448.59 - 100.24 N$$

Where,

M = Mobility (Persons/ hr) of the selected road sections

N = Percentage of NMTs (%)

4.4.2.3 Regression statistics

Correlation coefficients:

Since all the values of R, R square and adjusted R square are high (0.84538, 0.71467 and 0.66712 respectively) and much higher than 0.5, the dependent variable M is explained very well by the independent variables.

F-test:

From F-distribution table at significance level 0.05 ($\alpha=0.05$),

$$F_{\alpha,k,n-(k+1)} = F_{0.05,1,6} = 5.99 \text{ (see appendix-E)}$$

Computed F-value,

$$F=15.02$$

As $F > F_{0.05,1,6}$ the hypothesis $H_0: \beta_1 = 0$ is rejected at a significant level 0.05

t-test:

From t-distribution table at significance level 0.05 ($\alpha=0.05$),

$$t_{\alpha/2, n-(k+1)} = t_{0.025, 6} = 2.447 \text{ (see appendix-E)}$$

As $|t_{\beta_1}| > t_{0.025, 6}$ the hypothesis $H_0: \beta_1 = 0$ is rejected at a significant level .05 .

4.4.3 Regression Model with Speed as the Dependent Variable

4.4.3.1 Notations used in the model

The followings are the notations used in the speed-flow regression model:

Dependent variable

S = Mean speed (mph) of the link traffic at selected road links

Probable independent variables

Traffic speed depends on several factors such as traffic composition, road geometry, time of the day, weather etc. However, the following variables are preliminarily selected to develop the relationship:

L = Length of the road links (ft)

W = Effective width of the road sections (ft)

WLR = Effective width to length ratio of the road sections

N = Percentage of NMTs (%)

V = Average hourly volume (PCU)

4.4.3.2 Selection of variables and formation of the regression model

For preliminary selection of variable the correlation matrix was found which is shown table 4.10. From the correlation matrix it is seen that independent variables W and N have good correlation (correlation coefficients more than 0.5) with dependent variable S. So, these independent variables were primarily selected for the stepwise regression procedure. After

the stepwise regression the variables were finally selected as shown in Table 4.11 (See appendix-D for the detail output of the procedure).

Table 4.10 : Correlation matrix for speed analysis

	S	L	W	WLR	N	V
S	1.0000	-.2171	.6301	.1945	-.8026	.5895
L	-.2171	1.0000	-.5178	-.8895	-.1996	-.4816
W	.6301	-.5178	1.0000	.6744	-.2277	.3452
WLR	.1945	-.8895	.6744	1.0000	.1860	.2958
N	-.8026	-.1996	-.2277	.1860	1.0000	-.6083
V	.5895	-.4816	.3452	.2958	-.6083	1.0000

Table 4.11: Regression results for speed analysis

Variables	Coefficients	Standard Error	t-ratio
Constant	3.649586	6.707810	0.544
Effective width of road sections (ft)	0.281096	0.104150	2.699
percentage of NMTs (%)	-0.084259	0.021189	-3.977
R ²	0.855		
Adjusted R ²	0.798		
F-value	10.86		

The regression model for mean speed, therefore, became as follows:

$$S = 3.65 + 0.28 W - 0.08 N$$

Where,

S = Mean speed (mph) of the link traffic at selected road links

W = Effective width of the road sections (ft)

N = percentage of NMTs (%)

4.4.3.3 Regression statistics

Correlation coefficient:

Since all the values of R, R square and adjusted R square are very high (0.925, 0.855 and 0.798 respectively) and much higher than 0.5, the dependent variable S is explained well by the independent variables.

F-test:

From F-distribution table at significance level 0.05 ($\alpha=0.05$),

$$F_{\alpha,k,n-(k+1)} = F_{0.05,2,5} = 5.79 \text{ (see appendix-E)}$$

Computed F-value,

$$F=10.86$$

As $F > F_{0.05,2,5}$ the hypothesis $H_0: \beta_1 = \beta_2 = 0$ is rejected at a significant level 0.05.

t-test:

From t-distribution table at significance level 0.05 ($\alpha=0.05$),

$$t_{\alpha/2, n-(k+1)} = t_{0.025,5} = 2.571 \text{ (see appendix-E)}$$

As $t_{\beta_1} > t_{0.025,5}$ and $|t_{\beta_2}| > t_{0.025,5}$ the hypothesis $H_0: \beta_1 = 0$ and $H_0: \beta_2 = 0$ are rejected at a significant level .05 .

Considering the sign the sign of the estimated coefficient, it appears that both of the independent variables have proper sign. The equation may therefore be used as a transport planning model.

4.5 SUMMARY

This study was performed to investigate the effect of non-motorized transports (NMTs) on mobility and speed of traffic in metropolitan Dhaka. Volume and speed of various types of vehicles at selected road locations were measured. Mobility of different road sections were obtained using traffic volume and average occupancy of vehicles. Mathematical relationships were also developed using multiple linear regression technique using both mobility and speed as the dependent variables. The models show that both mobility and speed of the link traffic decrease with the increase of NMTs in the link traffic.

CHAPTER 5 ACCIDENT STUDY

5.1 INTRODUCTION

Traffic safety is another indicator to evaluate the performance of road traffic. Traffic accidents and fatalities are common phenomenon in metropolitan Dhaka and this problem has been increasing alarmingly in the recent years bringing about huge loss of life and property. NMTs, especially rickshaws, are frequently restricted as a traffic safety problem. But, very little research has been done into this important aspect before such policy implementation. The present study, therefore, involves the analysis of collected accident data to understand the effect of NMTs on road safety. The next three sections of this chapter explain related issues for accident analysis and the remaining sections describe specifically the different features of accident analysis for the present study.

5.2 FACTORS INVOLVED IN ROAD ACCIDENTS

According to Elahi (1986) following have been identified as the major factors directly or indirectly responsible for road accidents:

- i) Roadway features
- ii) Vehicle characteristics
- iii) Road user behavior
- iv) Road Environment
- v) Administration of laws relating to road accidents.

Roadway Features: The width, surface condition, geometric standards of the roads markedly affect traffic accidents.

The capacity of a roadway decreases with the decrease in pavement width. The passing and overtaking maneuvers of two vehicles are difficult in two-lane roads with narrow pavement.

The danger is further increased when the shoulders are narrow and unstable and lie at a level lower than that of the pavement with hazardous ditches caused by rainwater and movement of vehicles. Poor quality of road surface is no less hazardous for motor vehicles. On a road with bad surface condition the driver is more likely to lose control of the vehicle, and may meet an accident, particularly at a high speed of movement.

Poor geometric standards of roads are quite dangerous for movement of motor vehicles. Degree of curvature not consistent with the topography and vehicle speed enhances the chances of accidents. Non-horizontal curves must develop considerable side friction to keep the vehicle on the curved path. Lack of required side friction will produce a tendency to outward skidding for a vehicle. Horizontal and vertical curves with restricted sight distances may also create accident producing situations.

Vehicle Characteristics: The condition and characteristics of vehicles may be responsible for causing road accidents. The following are recognized as the major defects of vehicles:

Defect in the braking system may bring about accident since the vehicle cannot be stopped when required to do so.

Defect in the steering system may also bring about accident.

Old and worn-out tyres will have low frictional coefficient and vehicle braking distance for vehicles with such tyres may substantially increase. A vehicle having relatively smooth tyres will have more chances of skidding outside the road, particularly on curves.

Defects in the lighting system and signaling device of a vehicle may also cause accident. Headlight glare from one vehicle may disturb the concentration of the driver of an opposing vehicle. Defect in the signaling device of a vehicle may mislead the driver of another vehicle resulting in hazardous situations.

Deviation from specifications of some key aspects of the vehicle, such as laden weight, overhang, length and width may not match the structural as well as geometric design of the road, thereby causing accident.

The presence of vehicles of varying speeds and operational characteristics in the same link traffic creates hazards and conflicts.

Road User Behavior: Road users may be grouped into two categories (1) Pedestrians and (2) Drivers. Their contribution to road accidents is discussed in the following paragraphs.

Lack of pedestrian control can lead to traffic accidents. Pedestrian controls include physical features such as side-walks, cross walks, special pedestrian barriers, pedestrian refuge islands, pedestrian tunnels and overpasses, highway lighting as well as enforcement control. Pedestrians' lack of knowledge regarding traffic rules and regulations may also bring about accidents.

The driver of a vehicle is an important road user. He can cause an accident due to a number of reasons of which the following are important:

- a) **Inefficient and Indisciplined Driving**: Driving is a technique which for its successful accomplishment involves almost all the sensory organs at a time. Educational background and professional skill together bring about efficiency in driving. A driver with a reasonably good educational background is likely to behave more responsively in the traffic stream than an illiterate driver. An inefficient driver is more likely to be indisciplined. He may not have sufficient knowledge of traffic laws and attitude for observing them. Non observance of traffic rules and general unawareness of the risks involved in road traffic on the part of the driver may create accident.
- b) **Overspeeding**: Some drivers have a tendency to run a motor vehicle at speeds which may exceed the operating or design vales. There may be many reasons for which a driver can take resort to overspeeding. Some of the main causes are to increase the number of trips for maximizing profit, to make up the time that might have been lost and craze for speed.

overspeeding will increase sight distance requirement and may exceed other designed values, thereby creating dangerous situation.

c) Overtaking: This is a normal phenomenon when a vehicle is on the road. The act of overtaking is not an offense and may not normally lead to accidents. But dangers are involved in overtaking in wrong time and in places where it is prohibited.

d) Overloading: there is a large-scale tendency among the public transport vehicles to overload. Overloading may cause an accident in any of the following ways:

i) Overloading makes the vehicle unstable which may, in turn, make the driver to lose control of the vehicle.

ii) Overloading increase momentum of the vehicle and as a result, the stopping sight distance of the vehicle increases and brake failure may also occur.

iii) Continuous overloading damages the condition of road which in turn creates problem to road safety.

e) Physical and Mental Condition of the Driver: A driver has to be both mentally and physically fit to perform his duties. Also if a driver works for many hours together without any rest, he may get fatigued and lose concentration while driving. This becomes dangerous for traffic safety.

Road Environment: A traffic stream having vehicles of varying range of speed creates great hazard that may lead to road accident. The slow-moving vehicle will block the way of the fast moving vehicles, thereby creating danger to road safety.

Sometimes markets are held right on the road which reduce the effective width of the road. They may also bring about haphazard and indisciplined movements of pedestrian on the

road. Again the presence of schools or colleges beside the road will increase the pedestrian flow in the road. This situation can easily lead to an accident.

Bus-stops right on the intersection can also hamper the road safety. It obstructs the visibility at the intersection and also occupies a substantial portion of the road width. Poor visibility and wet weather conditions enhances the chances of road accidents.

Administration of Laws Relating to Road Accidents: The inadequacy or lack of standard traffic control signs, signals and road marking greatly encourage occurrence of road accidents. Traffic rules regulations have to be enforced and administered strictly by the relevant authorities for the proper functioning of a road.

5.3 DEFINITIONS AND CONVENTIONS

Some important terms related to accident and accident location are described by Hoque (1987) which are helpful to understand accident investigation procedure and therefore included in this section.

Terms Relating to accident Location

- "1. Road: a thoroughfare open to public by right or custom. Excludes off-street parking, access areas and other private property not regarded as a thoroughfare, e.g. railway yards, wharves, sports areas etc.
2. Carriageway: portion of a road improved, designed or ordinarily used for vehicular traffic and includes the shoulders and areas at the sides or centre of the carriageway used for the standing or parking of vehicles, including parking embayments; and if a road has two or more such portions divided by a reservation or reservations, a carriageway means each portion separately.
3. Intersection: a place where two or more roads intersect or join and includes the area where vehicles traveling on different joining or intersecting roads may collide. In this study, it is the point at which any road meets/cross the highway.

4. Link: a section of a road between two consecutive intersections.
5. Intersection accidents: intersection type accidents are regarded as having occurred within 30 feet of the intersection.
6. Between-intersection accidents: all other accidents except those as defined in (5). These have been referred to as link accidents".

Terms Relating to accidents

Definitions of some of the commonly used terms relating to accidents are given below:

1. Road Traffic Accident: an accident which follows from the movement of at least one road vehicle on a road (defined earlier), was reported to the police, and resulted in a casualty or a non-casualty.
2. Road traffic Casualty: a casualty is a person who either died or was injured as per definitions (3) and (4).
3. Road traffic death: recorded when any person is killed at the time of road traffic accident, or succumbs to injuries received in a road traffic accident up to 30 days after the accident (For this study, it is on-the spot death).
4. Road Traffic Injury: is a bodily injury suffered as a result of road traffic accident.
5. Road Traffic Fatal Accident: recorded when one (or more) death, as defined in (3) occurs as a result of the accident.
6. Road traffic Injury accident: is an accident in which any person is injured as defined in (4). It is to be noted that an accident is classed by the most severe result.

7. Road traffic Casualty Accident: is one in which a person either died or was injured, and is generally the sum of definitions (5) and (6).

8. Road Traffic Non-injury accident: is recorded for a accidents except those defined by (5) and (6) above. This is referred to as the Property Damage Only (PDO) accident."

9. "Severity level" vs. "Casualty class": this requires some clarification. There exists a difference between "severity level" and "casualty class". While the casualty class refers to a person involved in an accident, the severity level refers to an accident, which is classified based on the most severe casualty class received by any person involved in that accident. The severity levels (fatal, injury, and PDO) are used to classify accidents.

5.4 ACCIDENT RECORDS

The proper recording of accidents requires description of the following data items.

- accident location (intersection, link others)
- accident severity (fatal, injury, property damage)
- time of accident (hour, daylight/dark time)
- date of accident (month of the year, day of week)
- vehicle types (car, bus, trucks, minibus, rickshaws etc.)
- accident type (according to RUM or DCA Codes, for detail see appendix-F)
- number of persons killed
- number of persons injured
- objects hit (tree, electric pole, bridges, ditches etc.)
- damage costs (vehicle, property damages)
- age and sex of casualties
- direction of vehicular travel

The primary source of accident data available for accident investigation in Bangladesh is the accident records as collected by the police department. The reporting procedure requires the reporting of accidents of all severity levels (viz. fatal, injury and property damage). An official report form is used for accident reporting and investigation. The department

maintains two different cases viz. First Information Report (FIR) and Motor Collision Report (MCR) depending upon the degree of severity of accidents. A sample FIR form is shown in appendix-F. The accident records are maintained also by the police department at different police stations. No orderly sequence is followed in maintaining these accident records.

The under-reporting of road traffic accidents, particularly the less severe but the more common types of accidents, and the incomplete collection of accident data loom as a major problem in Bangladesh (Hoque 1990). As a result, the actual number of accidents occurring in the highways may differ greatly from the reported number of accidents. The unreported accidents are generally not included for accident analysis purposes. Thus the present study is based on all reported accidents.

The present-day accident reporting system as followed by the police has considerable deficiencies and weaknesses with respect to information on above variables. It is envisaged that major revisions of the existing accident report form be made to provide accurate, informative and useful data for use in accident analysis and in the evaluation of road safety initiatives. Notwithstanding these deficiencies, efforts were made to glean factual information from narratives in the accident report forms.

5.5 STUDY DESIGN

5.5.1 Objectives

The objective of the present study is to investigate the effect of Non-Motorized Transports (NMTs) on traffic accidents and fatalities from the analysis of available accident data of the Dhaka metropolitan area.

5.5.2 Methodology

Due to limitations of time and funding collection of recent accident data of Dhaka metropolitan area from different police stations was not possible. One year (1991-1992) accident data of these police stations/ thanas were collected from the "Working Paper No.2 of Greater Dhaka Metropolitan Area Integrated Transport study (DITS, 1993). Different

information were extracted from the collected data and then were entered into computer for analysis.

5.5.3 Sites Selected for the Study

There are 14 police stations in metropolitan Dhaka . Accident data of 9 of these police stations were collected from available documents. The police stations covered in this study were: Dhanmondi, Demra, Gulshan, Mirpur, Motijheel, Ramna, Sabujbagh, Tejgaon and Uttara police stations. Accident records of four road links (related to the sites where volume and speed studies were performed) of metropolitan Dhaka were also collected to develop a regression model. These roads are Eskaton Road (Site No.3), New Circular Road (Site No.4), North-south Road (Site No.5), and Mirpur Road (Site No.8).

5.6 ANALYSIS OF THE DATA

To understand the effect of NMTs on road safety in metropolitan Dhaka, the following items were analyzed:

- accident distribution by modes for individual thanas of metropolitan Dhaka,
- accident distribution by modes for metropolitan Dhaka, and
- modal distribution of traffic fatalities in Dhaka metropolitan area.

Description of the related data are presented in the next four sections.

5.6.1 Accident Distribution by Modes for Individual Thanas of Metropolitan Dhaka

Modal accident breakdown of different thanas of Dhaka metropolitan area is shown in Figures 5.1 to 5.9. These figures show that rickshaws are involved in traffic accidents more frequently than other NMT modes. But, while all the modes of transport (viz. motorized and non-motorized) are considered rickshaws involvement in traffic accident becomes less frequent compared to motorized modes such as truck, bus, minibus, car and autorickshaw. Data of Uttara, Mirpur and Gulshan thanas show that rickshaws and other NMT modes are rarely involved in accidents (around 6 percent in average) whereas a higher percentage (around 15 percent) can be found in other thanas. This may be due to presence of lower

number of NMT modes on the streets of these areas or may be due to lower speed of traffic stream. The above information were further summarized in Table 5.1.

5.6.2 Accident Distribution by Modes for Metropolitan Dhaka

Modal distribution of accidents in Dhaka metropolitan city is shown in Figure 5.10. From the figure it is evident that rickshaws share of accidents in Dhaka is only 10 percent compared to 18 percent of truck, 17 percent of minibus, and 14 percent of bus. Other NMTs except rickshaws are involved in only 2 percent of the total accidents.

5.6.3 Modal Distribution of Traffic Fatalities for Metropolitan Dhaka

In 1991-92 a total of 65 fatalities, considering only the vehicular accidents (excluding pedestrians), took place in Dhaka. Modal distribution of fatalities is shown in Figure 5.11. The figure shows that rickshaws share of fatalities is the highest (26%), which is much higher than that of other motorized modes such as bus (14%), truck (9%), autorickshaw (9%) and car (0%). But while fatality rates (fatalities per ten thousand vehicles) of different transport modes are considered for the same period it is seen that rickshaw's and other NMT's fatality rates (1 fatalities per ten thousand rickshaws and 1 fatalities per ten thousand other NMTs) are much lower than the fatality rates of most of the motorized transports (see Figure 5.12).

5.6.4 Number of Accidents at Selected Road Links

Number of accidents at selected road links of metropolitan Dhaka are shown in Table 5.1. Road geometry, mean speed and composition of traffic at those sites (site locations are shown earlier in chapter 4) are also shown in the table. The table shows that the number of accidents increases with the increase of the ratio of motorized to non-motorized transport speed. It is also evident from the table that accidents increase as the effective width of the road decreases.

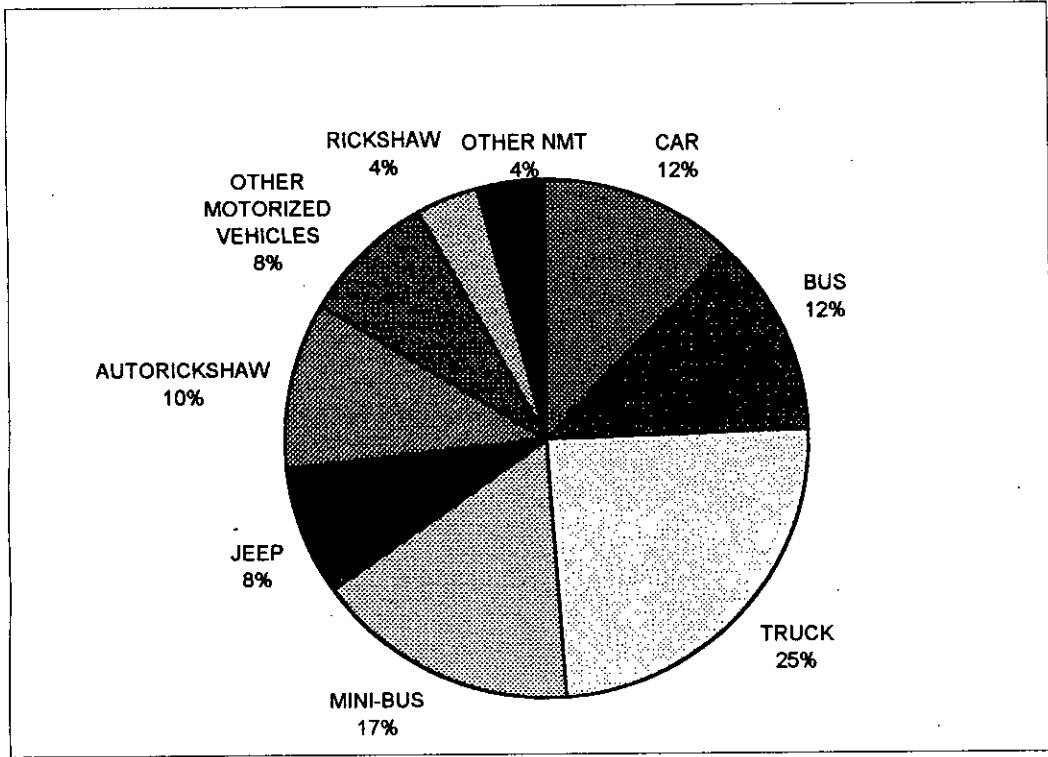


Figure 5.1: Modal distribution of traffic accidents in Uttara Thana in 1991-92
 Source: Government of Bangladesh (1993)

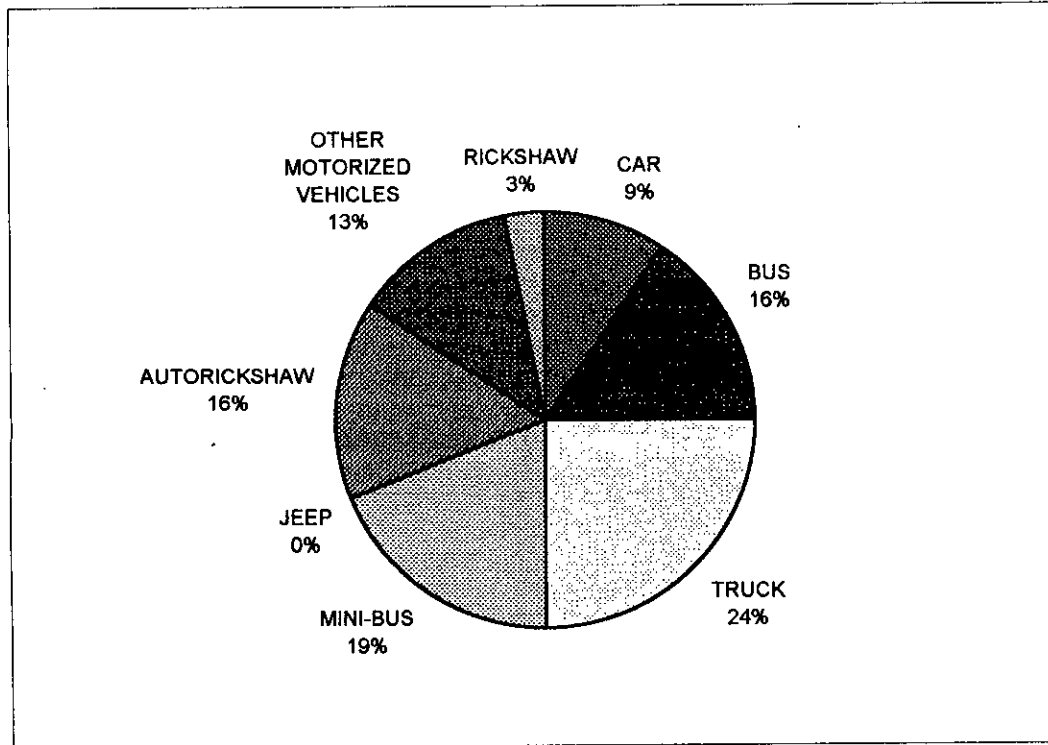


Figure 5.2: Modal distribution of traffic accidents in Mirpur Thana in 1991-92
 Source: Government of Bangladesh (1993)

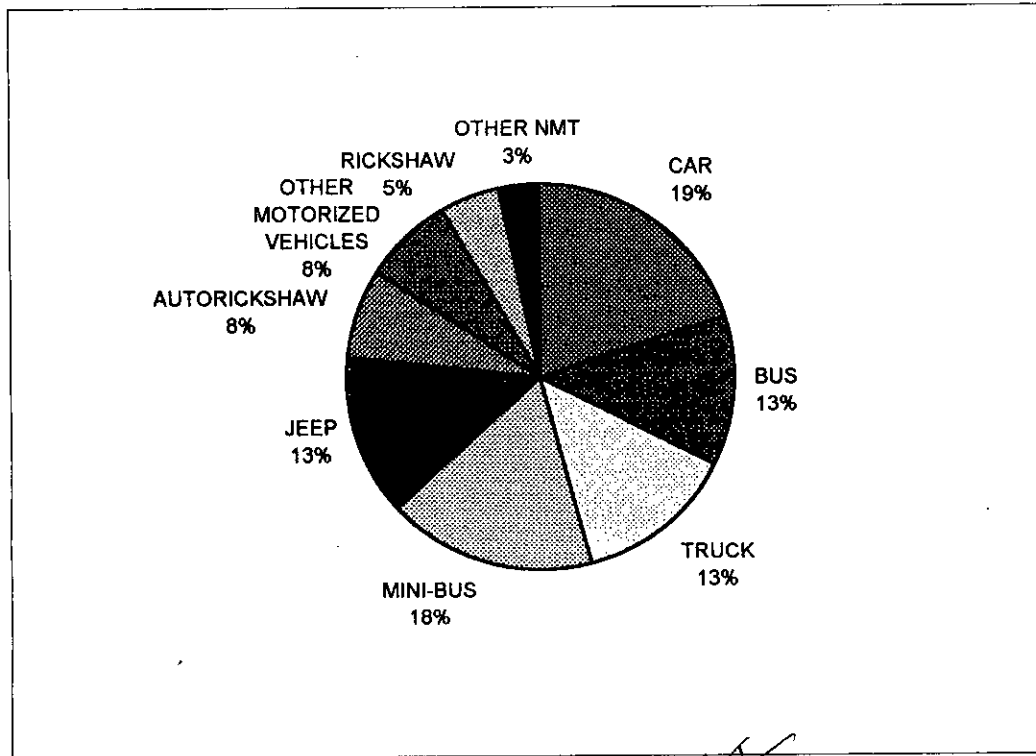


Figure 5.3: Modal distribution of traffic accidents in Gulshan Thana in 1991-92
 Source: Government of Bangladesh (1993)

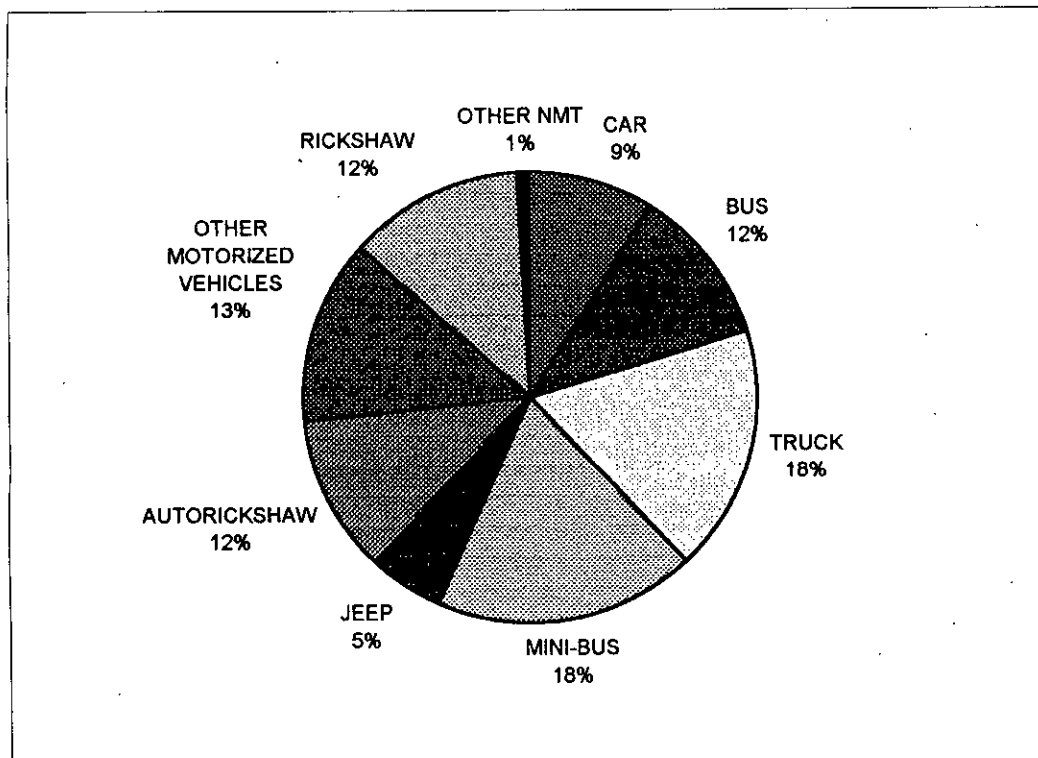


Figure 5.4: Modal distribution of traffic accidents in Motijheel Thana in 1991-92
 Source: Government of Bangladesh (1993)

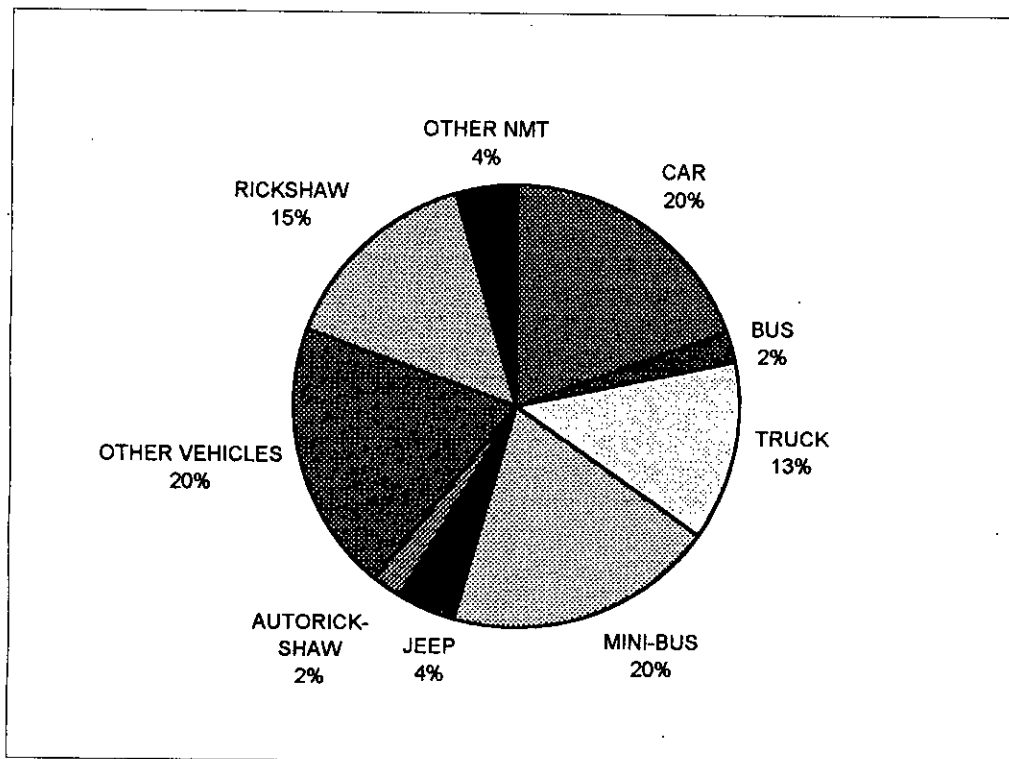


Figure 5.5: Modal distribution of traffic accidents in Dhanmondi Thana in 1991-92
 Source: Government of Bangladesh (1993)

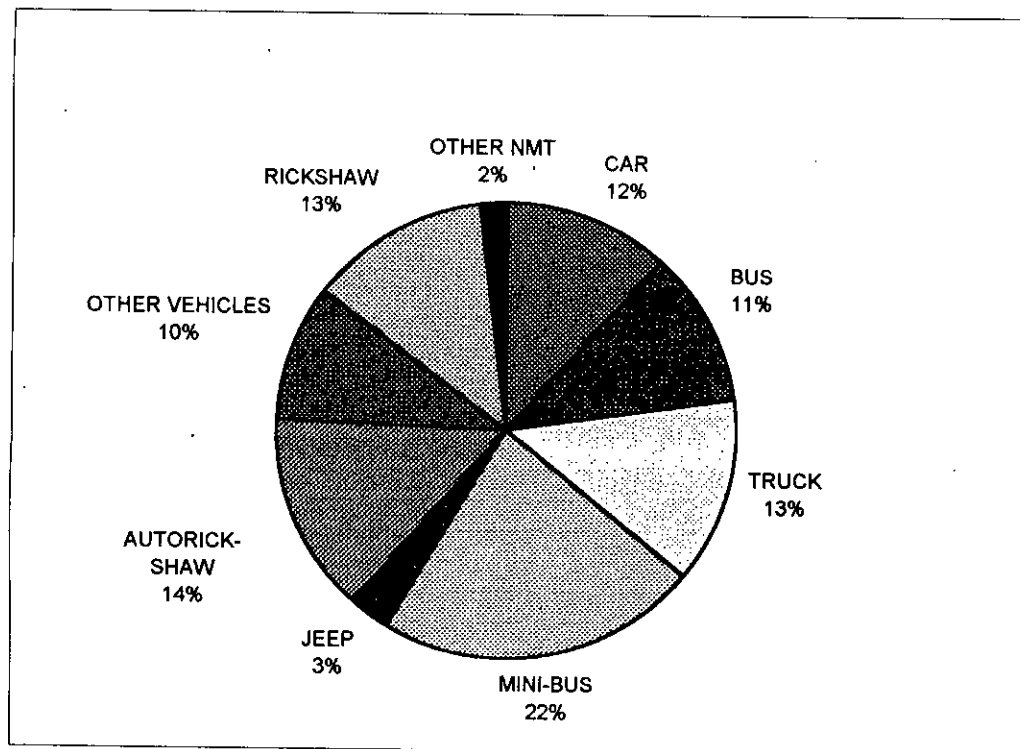


Figure 5.6: Modal distribution of traffic accidents in Ramna Thana in 1991-92
 Source: Government of Bangladesh (1993)

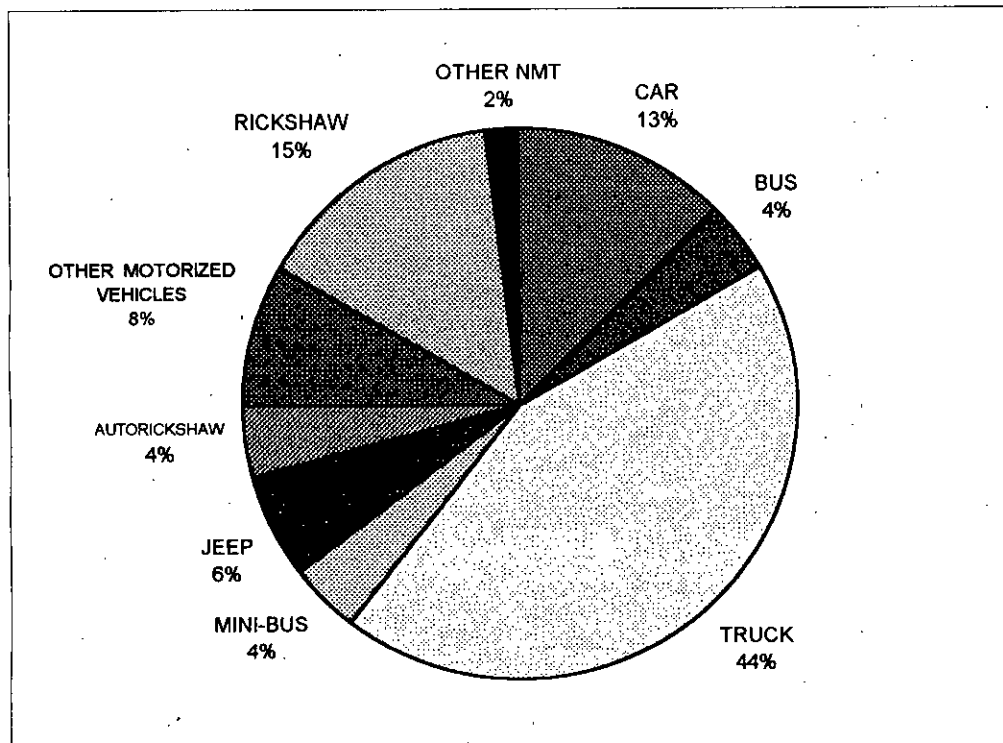


Figure 5.7: Modal distribution of traffic accidents in Sabujbagh Thana in 1991-92
 Source: Government of Bangladesh (1993)

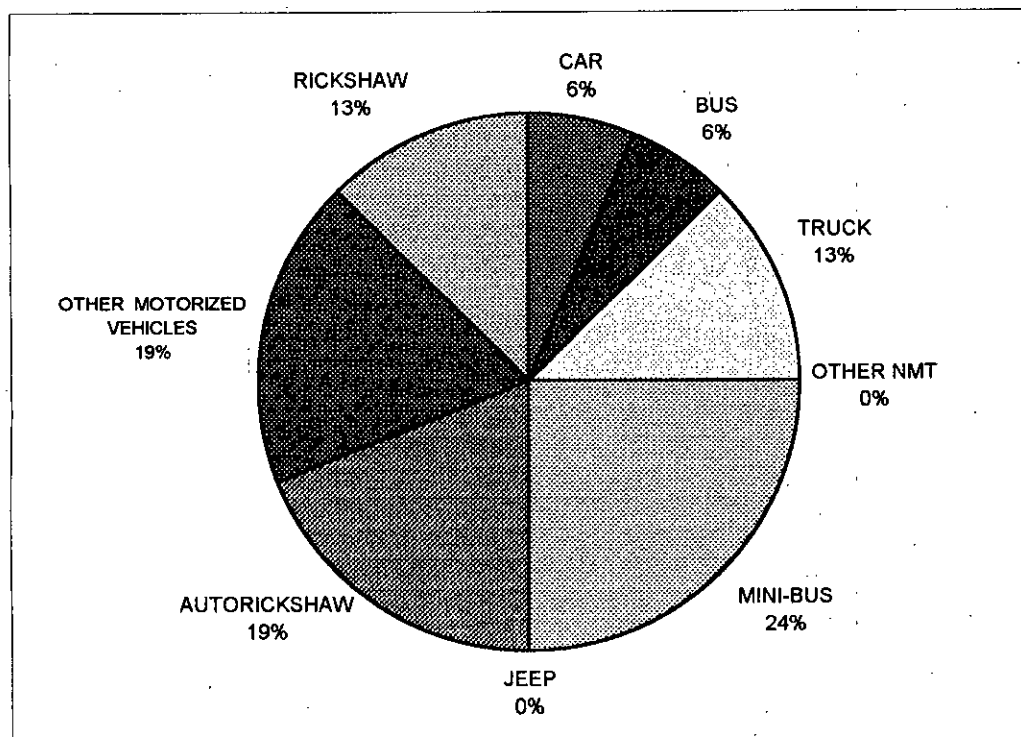


Figure 5.8: Modal distribution of traffic accidents in Tejgaon Thana in 1991-92
 Source: Government of Bangladesh (1993)

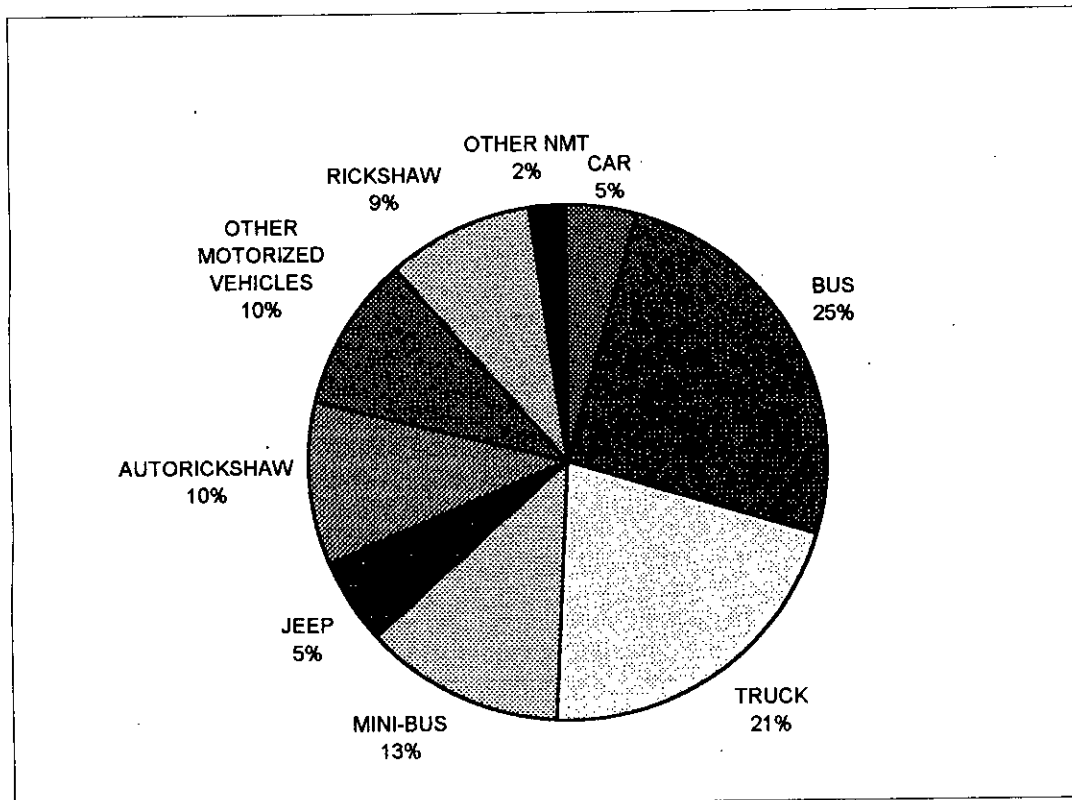


Figure 5.9: Modal distribution of traffic accidents in Demra Thana in 1991-92
Source: Government of Bangladesh (1993)

Table 5.1: Accident distribution (%) by transport modes for nine thanas of metropolitan Dhaka

	Uttara	Mirpur	Gulshan	Motijheel	Dhanmondi	Ramna	Sabujbagh	Tejgaon	Demra	Total
CAR	12.2	9.4	20.7	8.8	20.5	11.8	12.5	6.3	4.6	11.6
BUS	12.2	15.6	12.9	11.5	2.3	10.8	4.2	6.3	25.1	13.9
TRUCK	24.5	25	13.8	17.7	13.6	13.2	43.8	12.5	21.1	18.9
MINI-BUS	16.3	18.8	18.1	18.6	20.5	22.6	4.2	25	12.6	17.8
JEEP	8.2	0	13.8	5.3	4.5	2.8	6.3	0	5.1	5.8
AUTORICKSHAW	10.2	15.6	7.8	11.5	2.3	14.2	4.2	18.8	10.3	10.8
OTHER MOTORIZED VEHICLES	8.2	12.5	7.8	13.3	20.5	9.9	8.3	18.8	9.7	10.8
RICKSHAW	4.1	3.1	5.2	12.4	15.9	12.7	14.6	12.5	9.1	10.3
OTHER NMTs	4.1	0	3.4	0.9	4.5	1.9	2.1	0	2.3	2.1

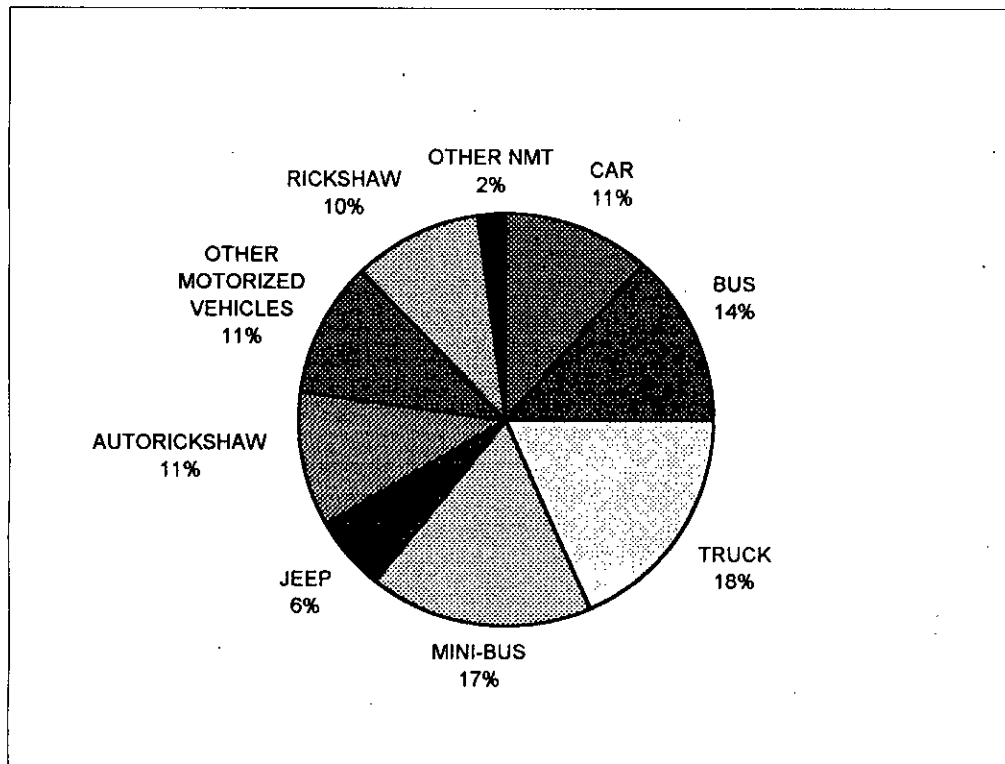


Figure 5.10: Modes involved in traffic accidents in total nine thanas in metropolitan Dhaka in 1991-92

Source: Government of Bangladesh (1993)

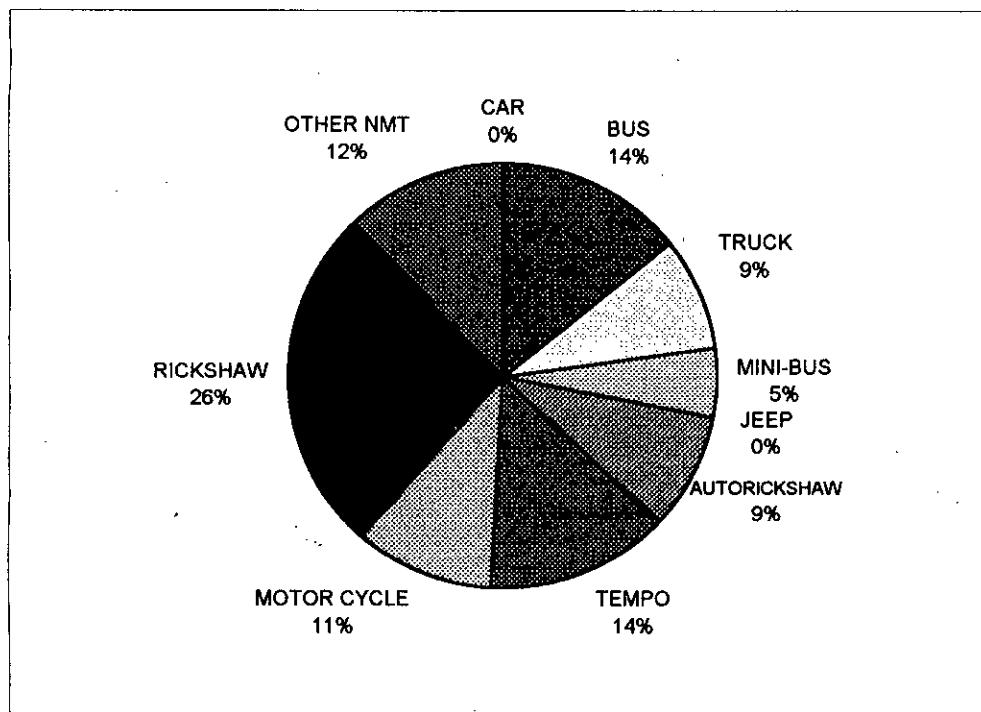


Figure 5.11: Modes involved in traffic fatalities in total nine thanas in metropolitan Dhaka in 1991-92

Source: Government of Bangladesh (1993)

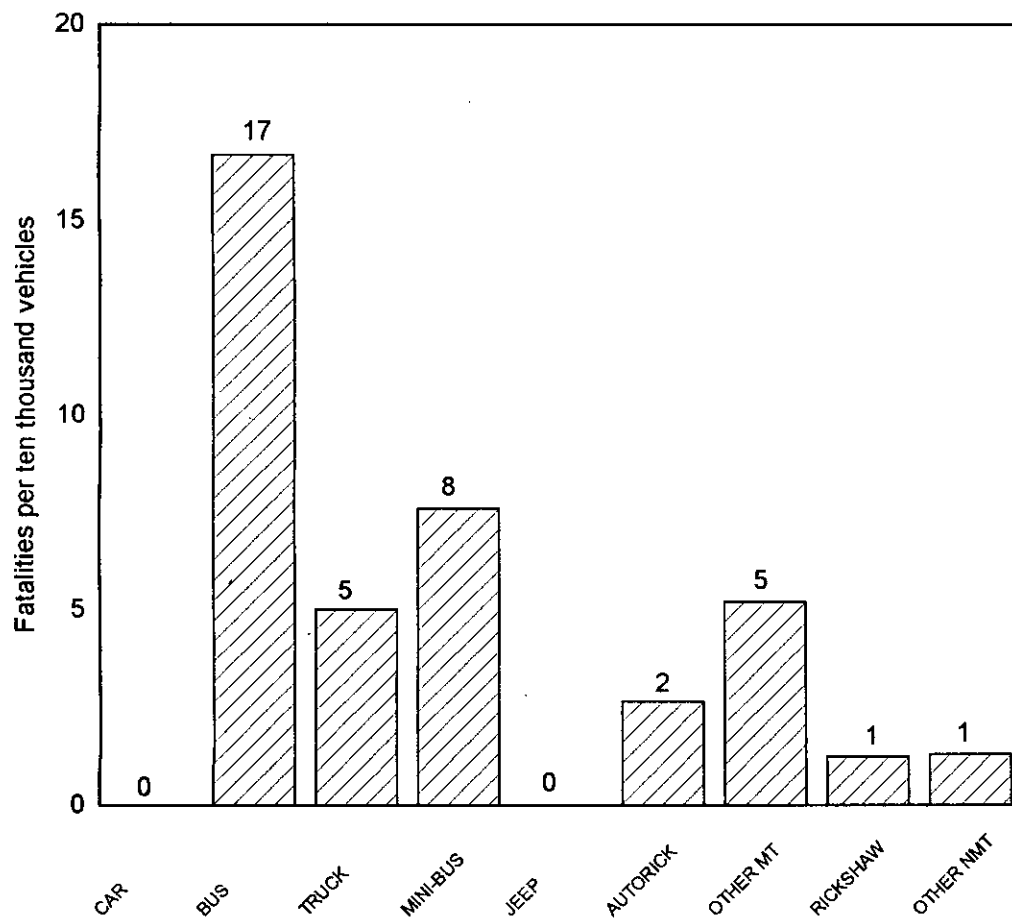


Figure 5.12: Fatality rates by different transport modes in nine thanas in metropolitan Dhaka in 1991-92

Table 5.2: Accidents at different selected road links

Site No.	Length (ft)	Effective width (ft)	Non-motorized Transports (%)	Speed of NMTs (mph)	Speed of Motorized Transports (mph)	No. of accidents in 1991-92	Speed ratio of motorized and non-motorized transports
3	2925	56	58	8.4	22.5	5	2.68
4	2830	58	46	8.5	19.7	4	2.32
5	1060	58	67	8.9	17.1	3	1.92
8	1424	70	45	9.3	19.2	3	2.06

5.7 REGRESSION MODEL WITH NUMBER OF ACCIDENTS IN ONE YEAR AS THE DEPENDENT VARIABLE

5.7.1 Notations Used in The Model

The followings are the notations used in the speed-flow regression model:

Dependent variable

ACC = number of accidents in one year

Probable independent variables

Road accidents depend on many variables. However, following variables are preliminarily selected to develop the relationship.

W = Effective width of road sections (ft)

S = Mean speed of link traffic (mph)

MNS = Speed ratio of motorized and non-motorized transports

SM = Speed of motorized transport (mph)

SN = Speed of non-motorized transport (mph)

N = Percentage of non-motorized transports

5.7.2 Selection of variables and formation of the regression model

For preliminary selection of variables the correlation matrix is formed which is shown in Table 5.2. From the correlation matrix it is seen that independent variables W, MNRS, SM, SN have good correlation (correlation coefficients more than 0.5) with dependent variable ACC. So, these independent variables are primarily selected for the stepwise regression

procedure. After stepwise regression procedure the variables are finally selected as shown in Table 5.3.

Table 5.3: Correlation matrix for accident analysis

	ACC	W	S	MNS	SM	SN	N
ACC	1.0	-.6253	-.3717	0.9840	.9122	-.8676	.0000
W	-.6253	1.000	.9292	-.4764	-.2541	.8923	-.5758
S	-.3717	.9292	1.0000	-.2091	.0380	.7774	-.5758
MNS	.9840	.4764	-.2091	1.0000	.9692	-.7758	-.1369
SM	.9122	-.2541	.0380	.9692	1.0000	-.5969	-.2588
SN	-.8676	.8923	.7774	-.7758	-.5969	1.000	-.1855
N	.0000	-.5758	-.5758	-.1369	-.2588	-.1855	1.000

Table 5.4: Regression results for accident analysis

Variables	Coefficients	Standard Error	t-ratio
Constant	-0.167428	.113465	1.476
Effective width of road sections (ft)	.030264	.001264	-23.95
Speed ratio of motorized and non-motorized transports	2.559944	.024374	105.027
R ²	0.99994		
Adjusted R ²	0.99994		
F-value	9056.5		

The regression model for accident, therefore, has become as follows:

$$ACC = -0.17 - 0.03W + 2.56 MNS$$

where,

ACC = number of accidents in one year

W = Effective width of road sections in ft

MNS = Speed ratio of motorized and non-motorized transports

5.7.3 Regression Statistics

Correlation coefficients:

Since all the values of R, R square and adjusted R square are very high (0.99997, 0.99994 and 0.99983 respectively) and very close to 1.0, the dependent variable ACC is explained well by the independent variable.

F-test:

From F-distribution table at significance level 0.05 ($\alpha=0.05$),

$$F_{\alpha,k,n-(k+1)} = F_{0.05,2,1} = 199.5$$

Computed F-value,

$$F=9056.5 \text{ (see appendix E for detail output)}$$

As $F > F_{0.05,2,1}$ the hypothesis $H_0: \beta_1 = \beta_2 = 0$ is rejected at a significant level 0.05

t-test:

From t-distribution table at significance level 0.05 ($\alpha=0.05$),

$$t_{\alpha/2,n-(k+1)} = t_{0.025,1} = 12.706 \text{ (see appendix E for detail output)}$$

As $|t_{\beta_1}| > t_{0.025,1}$ and $t_{\beta_2} > t_{0.025,1}$ the hypothesis $H_0: \beta_1 = 0$ and $H_0: \beta_2 = 0$ are rejected at a significant level .05 .

Considering the sign of the estimated coefficient, it appears that both of the independent variables have proper sign. The equation may therefore be used as a transport planning model.

5.8 SUMMARY

Analysis included in this chapter reveals that accidents involving NMTs are less frequent in Dhaka compared to motorized transports but they are more severe in nature. Most of the fatalities experienced by slow moving NMTs are caused by collision with fast moving motorized transports. However, while fatality rates (per ten thousand vehicles) are considered it is seen that fatality rates of motorized transports are much higher in the metropolis than that of NMTs. Regression equation derived here with number of accidents in one year as dependent variable shows that accidents increase as ratio of motorized to non-motorized transport speed increases and decrease as the effective road width increases.

CHAPTER 6 CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

It is clear from the previous discussions that the role of non-motorized transports (NMTs) in road traffic is quite significant in metropolitan Dhaka. This thesis is set out to study the effects of NMTs on road traffic performance (mobility, speed, and safety) in metropolitan Dhaka. Findings of the study are summarized as follows:

6.1.1 Volume, mobility and Speed Study

Volume and speed study were conducted at selected road links. The sites were so selected that they covered variable combinations of traffic compositions needed to examine the effect of NMTs. At some locations there were preponderance of NMTs, whereas at some other locations there were no NMTs at all.

Summarized below are the findings of the volume and speed study:

- The lowest average speed of motorized vehicles in metropolitan Dhaka is 16.5 mph (Truck's speed), whereas the average speed of the fastest non-motorized transport (NMT) is 9.8 mph (Bicycle's speed).
- Presence of NMTs in a road link causes a fall in the average speed of traffic. The average speed of link traffic where NMTs are banned (Site Nos. 1 and 2) is more than 20 mph, whereas the average speed of traffic at roads where NMTs are present varies from 13 to 18 mph.

- Two distinct peaks are discerned in the frequency distribution curves for speeds of the traffic for road links where NMTs are present, but the frequency distribution curves for roads where NMTs are banned show a single peak.
- The regression equation with mobility as a dependent variable shows that mobility decreases as the percentage of NMTs increases.
- The derived regression equation where mean speed is taken as a dependent variable shows that the mean speed of traffic decreases as the percentage of NMTs increases and increases as effective road width increases.

6.1.2 Accident Study

- Accidents involving NMTs are less frequent in metropolitan Dhaka compared to motorized modes but they are more severe in nature.
- Most of the fatalities experienced by slow moving NMTs are caused by collision with fast moving motorized transports.
- The derived regression equation where number of accidents in one year is taken as a dependent variable shows that accident increases with the increase in the speed ratio of motorized and non-motorized transports and decreases with an increase in effective road width.

6.2 LIMITATIONS

The regression models derived in this study and the overall study have some limitations. These are identified as follow.

6.2.1 Limitations of the Regression Models

- All the regression models developed in this study are applicable for four lane divided major roads.

- These models are further applicable for a maximum hourly traffic volume of 3330 PCU and a minimum hourly volume of 1886 PCU.
- The regression model, with number of accident as the dependent variable, is not applicable for roads where NMTs are absent.

6.2.2 Limitations of the Study

- No roads of old part of Dhaka, Mirpur and Uttara were selected for the volume and speed study.
- Similar sites were selected instead of sites having variation in link characteristics (viz. traffic composition, road geometry etc.).
- Effect of pedestrians was not considered in the study.

6.3 RECOMMENDATIONS

On the basis of the findings of this research, the following recommendations can be made to improve the performance of the road traffic in metropolitan Dhaka.

- Gradual replacement of low occupancy NMTs by high occupancy motorized public transports. It would increase the mobility of road sections.
- Separation of NMTs and motorized vehicles in the traffic stream. Allocating reserved right-of-way to NMTs would reduce conflict between slow moving NMTs and fast moving motorized vehicles and thus would improve the speed and safety condition.
- Measures to increase effective road width. Providing proper parking facilities to both motorized and non-motorized transports and preventing roadside activities would increase the effective road width for traffic flow. Thus improvement in mobility, speed and safety could be achieved.

6.4 RECOMMENDATIONS FOR FURTHER STUDY

The following recommendations are made for future development of the present research work:

- Due to limitations of fund and time no roads of old part of Dhaka, Mirpur and Uttara were selected for the speed-volume study. These locations should be included to obtain a better representation of the road traffic performance in metropolitan Dhaka.
- To obtain better mathematical relationships more locations should be included for volume and speed measurement and accident data collection.

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APPENDIX-A

Data Sheets for Volume and Speed Study

SPEED STUDY

Date:

Day:

Location No.:

Time: (From: To:)

Length of course:

	t (sec)	t (sec)	t (sec)	t (sec)	t (sec)	t (sec)	t (sec)	t (sec)	t (sec)	t (sec)	t (sec)	t (sec)	t (sec)	t (sec)
CAR														
Auto-Rickshaw														
Auto-Tempo														
Mini-bus														
Bus														
Truck														
Jeep														
Motor cycle														
Rickshaw														
Rickshaw van														
Bicycle														
Cart														

Figure A.2 : Data sheet for speed study

APPENDIX-B

Mean Speeds of Different Vehicles at Selected Sites

MEAN SPEED OF DIFFERENT VEHICLES AT SELECTED SITES

SITE NO.1

Variable	Mean (mph)	Std Dev (mph)	N
A. RICKSHAW	20.67	4.52	84
BICYCLE	-	-	-
BUS	18.80	4.25	18
CAR	23.12	5.65	76
CART	-	-	-
JEEP	22.73	1.08	7
MBUS	19.16	4.38	47
MCYCLE	18.12	4.05	32
R.VAN	-	-	-
RICKSHAW	-	-	-
TEMPO	19.13	4.64	36
TRUCK	18.95	3.69	17

SITE NO.2

Variable	Mean (mph)	Std Dev (mph)	N
A. RICKSHAW	21.58	3.94	97
BICYCLE	-	-	-
BUS	22.28	4.85	16
CAR	23.45	5.23	109
CART	-	-	-
JEEP	24.32	6.06	19
MBUS	23.15	4.46	43
MCYCLE	18.13	4.12	16
R.VAN	-	-	-
RICKSHAW	-	-	-
TEMPO	21.98	2.22	24
TRUCK	18.95	3.69	17

SITE NO.3

Variable	Mean (mph)	Std Dev (mph)	N
A. RICKSHAW	18.74	3.93	88
BICYCLE	9.87	.68	3
BUS	20.20	1.39	6
CAR	20.79	3.42	57
CART	3.26	.38	5
JEEP	18.16	.51	7
MBUS	-	-	-
MCYCLE	20.51	5.10	11
R.VAN	7.25	1.57	12
RICKSHAW	8.80	1.53	100
TEMPO	20.31	4.60	27
TRUCK	17.95	.78	2

SITE NO.4

Variable	Mean (mph)	Std Dev (mph)	N
A. RICKSHAW	16.50	3.50	107
BICYCLE	-	-	-
BUS	19.25	2.05	2
CAR	15.94	3.81	79
CART	3.97	.42	3
MBUS	13.74	2.91	17
MCYCLE	19.36	4.89	5
R.VAN	7.10	1.65	4
RICKSHAW	8.52	1.57	99
TEMPO	15.84	3.06	29
TRUCK	14.62	2.63	19

SITE NO.5

Variable	Mean (mph)	Std Dev (mph)	N
A. RICKSHAW	17.48	3.45	111
BICYCLE	9.45	.07	2
BUS	14.90	3.21	7
CAR	17.64	3.57	63
CART	-	-	-
MBUS	15.67	3.32	35
MCYCLE	19.36	4.89	5
R.VAN	6.63	1.27	4
RICKSHAW	6.83	.86	122
TEMPO	15.13	2.70	13
TRUCK	16.32	2.95	6

SITE NO.6

Variable	Mean (mph)	Std Dev (mph)	N
A. RICKSHAW	18.27	3.61	91
BICYCLE	11.33	3.03	3
BUS	18.43	4.31	6
CAR	18.41	4.25	75
CART	3.30	.36	4
JEEP	22.58	3.69	4
MBUS	17.80	3.85	40
MCYCLE	17.89	2.48	15
R.VAN	7.19	1.37	8
RICKSHAW	8.82	1.52	100
TEMPO	17.64	2.76	16
TRUCK	16.63	3.68	6

SITE NO.7

Variable	Mean (mph)	Std Dev (mph)	N
A. RICKSHAW	21.75	3.03	113
BICYCLE	9.10	.14	2
BUS	18.13	2.14	4
CAR	23.59	4.10	123
CART	-	-	-
JEEP	24.06	.33	5
MBUS	19.39	3.70	25
MCYCLE	24.17	3.84	25
R.VAN	-	-	-
RICKSHAW	9.30	1.34	136
TEMPO	-	-	-
TRUCK	14.53	1.94	4

SITE NO.8

Variable	Mean (mph)	Std Dev (mph)	N
A. RICKSHAW	19.85	3.86	95
BICYCLE	8.93	.31	3
BUS	-	-	-
CAR	19.08	4.68	84
CART	-	-	-
JEEP	21.14	1.63	8
MBUS	17.66	4.05	33
MCYCLE	20.09	4.47	29
R.VAN	10.67	1.96	3
RICKSHAW	9.31	1.77	106
TEMPO	-	-	-
TRUCK	15.70	3.12	5

APPENDIX-C

Speed Distribution of Different Vehicles at Selected Sites

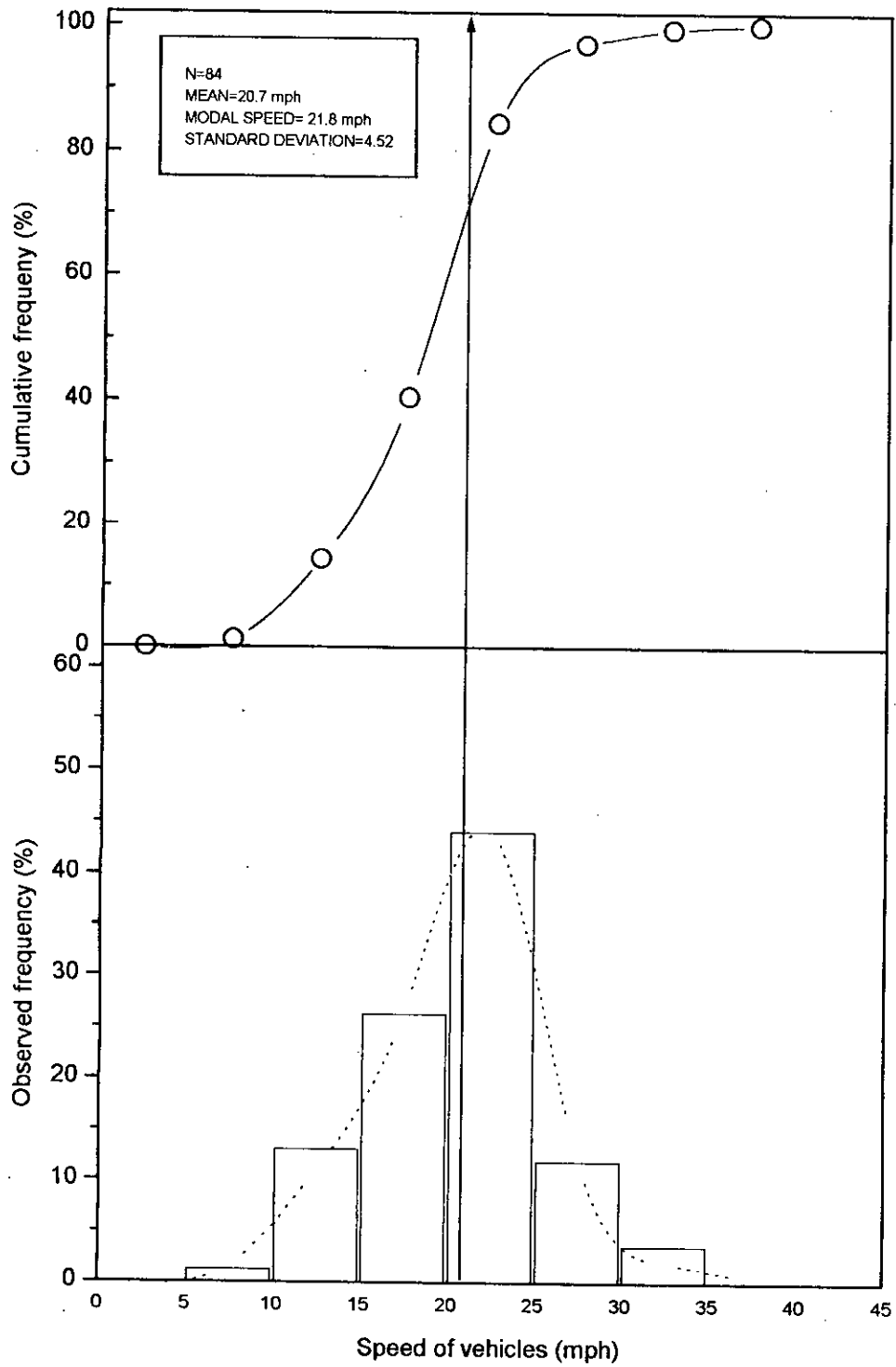


Figure C.1 : Distribution of autorickshaw speeds at site no.1

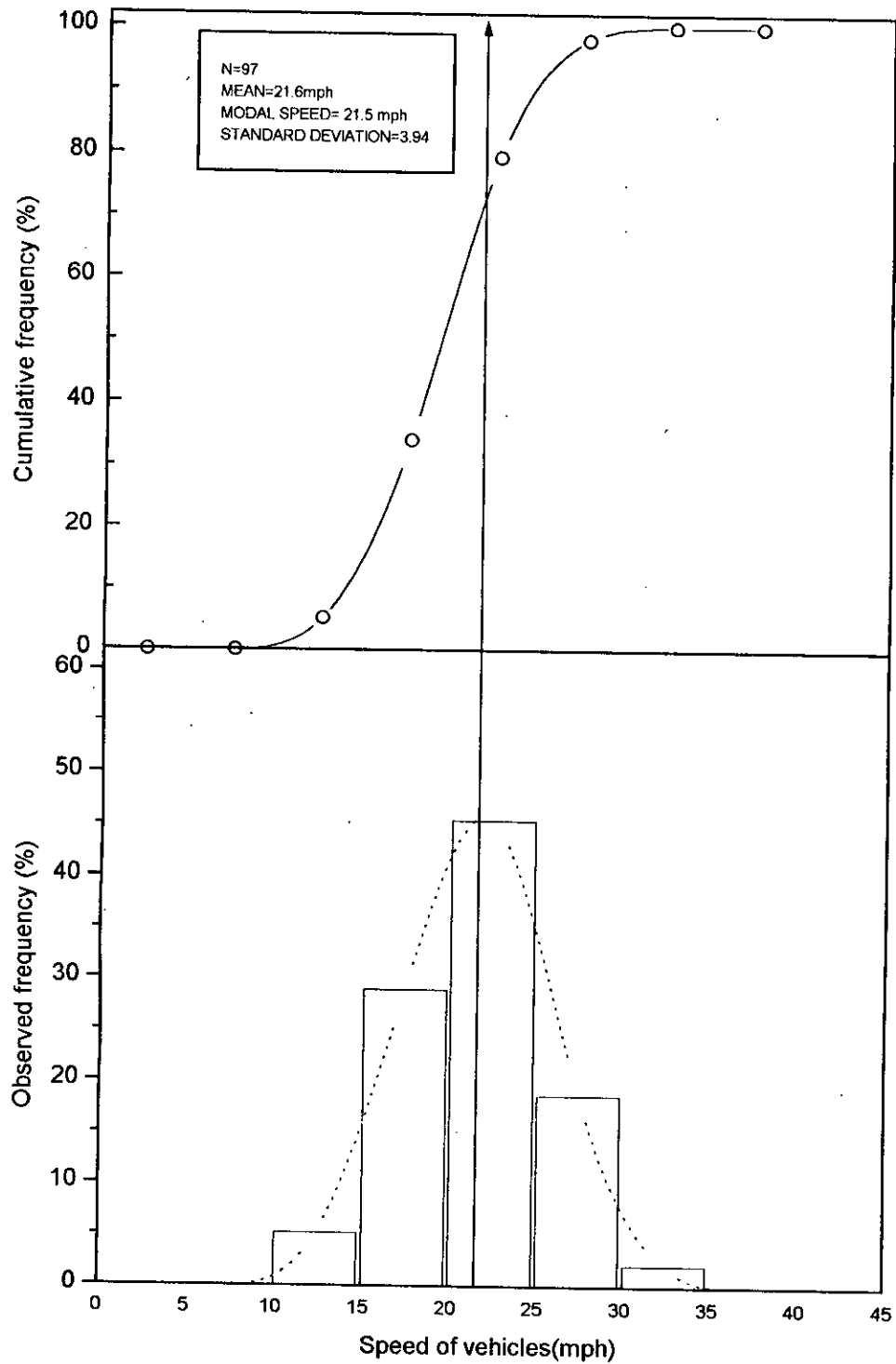


Figure C.2 : Distribution of autorickshaw speeds at site no.2

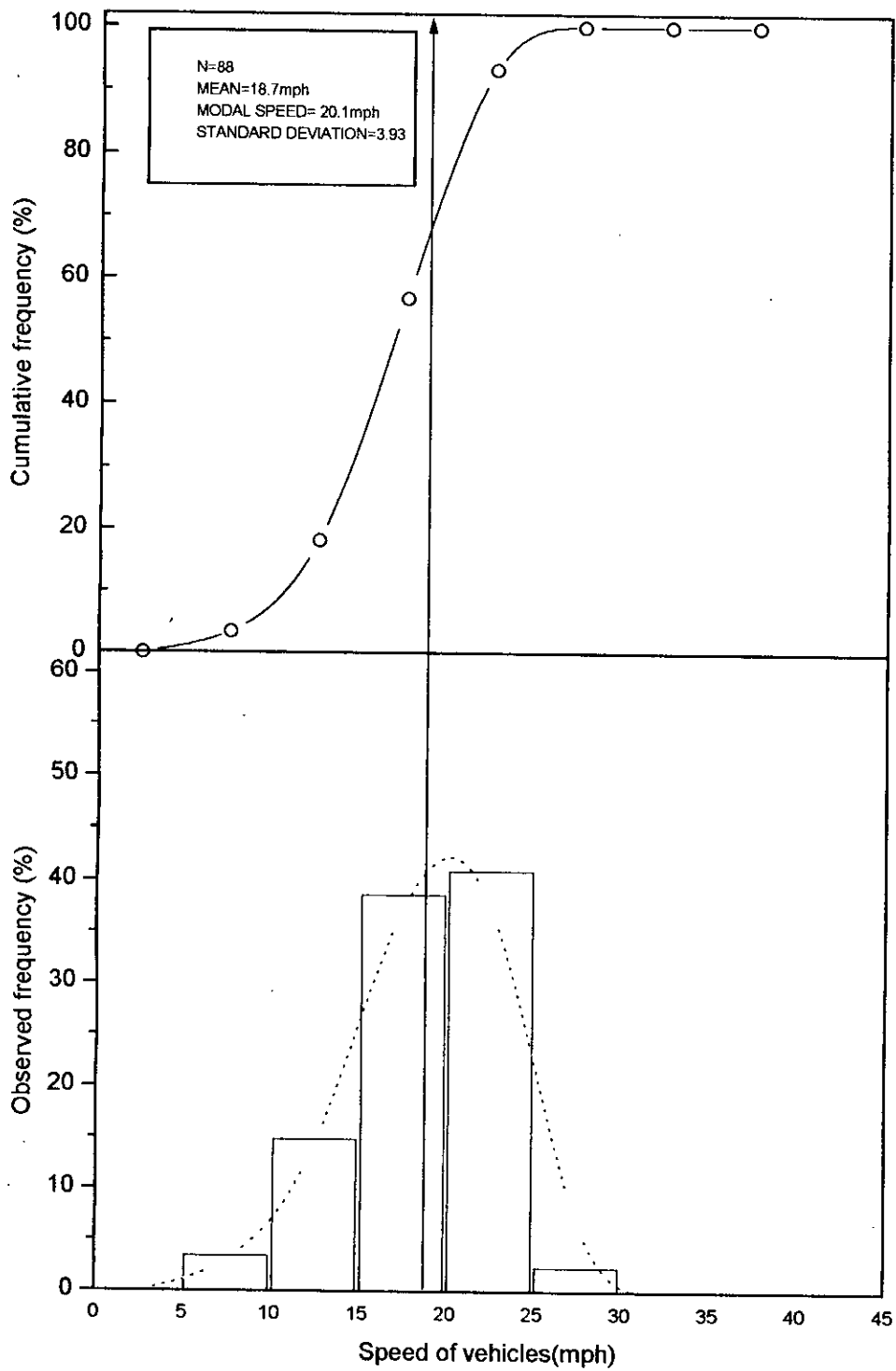


Figure C.3 : Distribution of autorickshaw speeds at site no.3

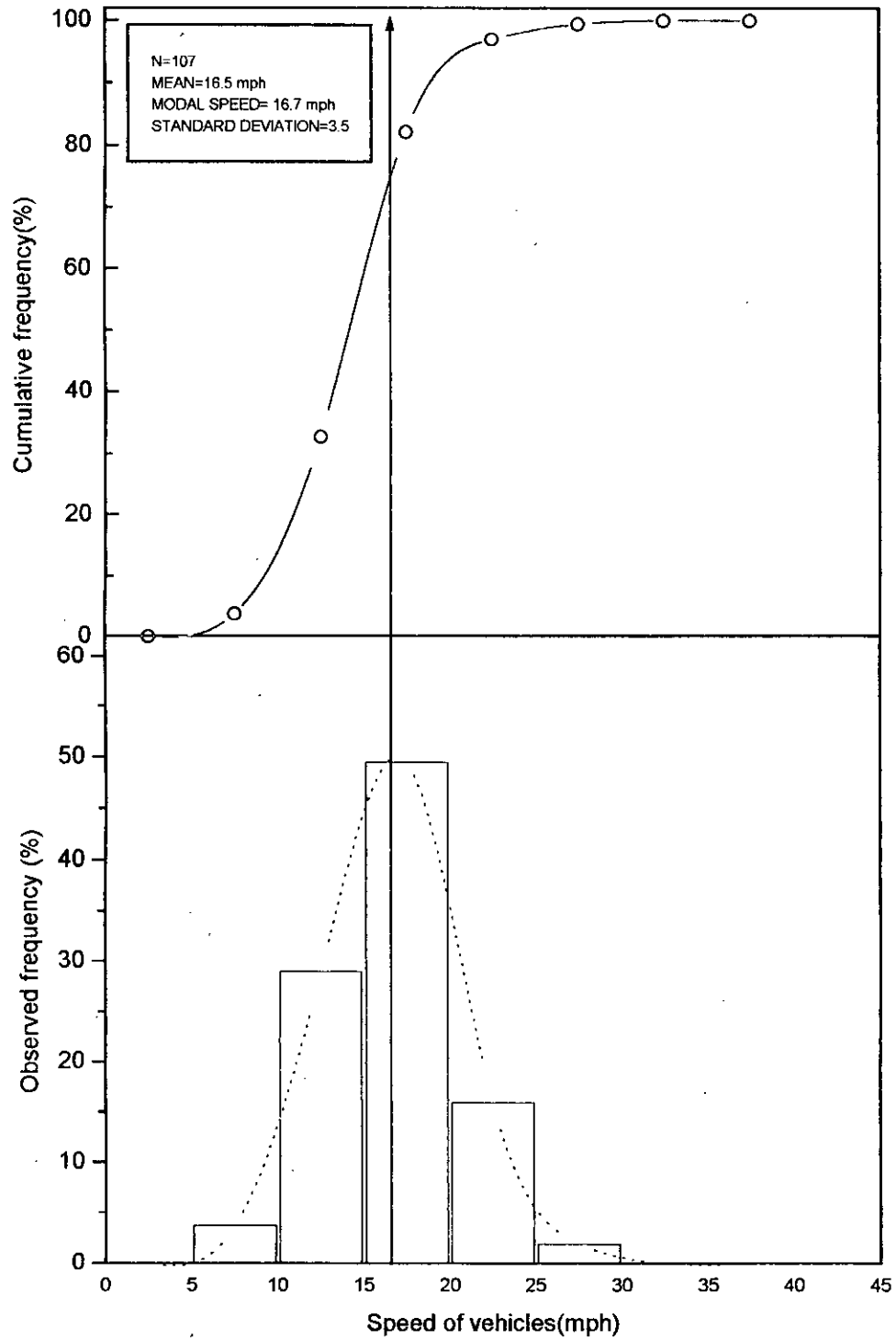


Figure C.4 : Distribution of autorickshaw speeds at site no.4

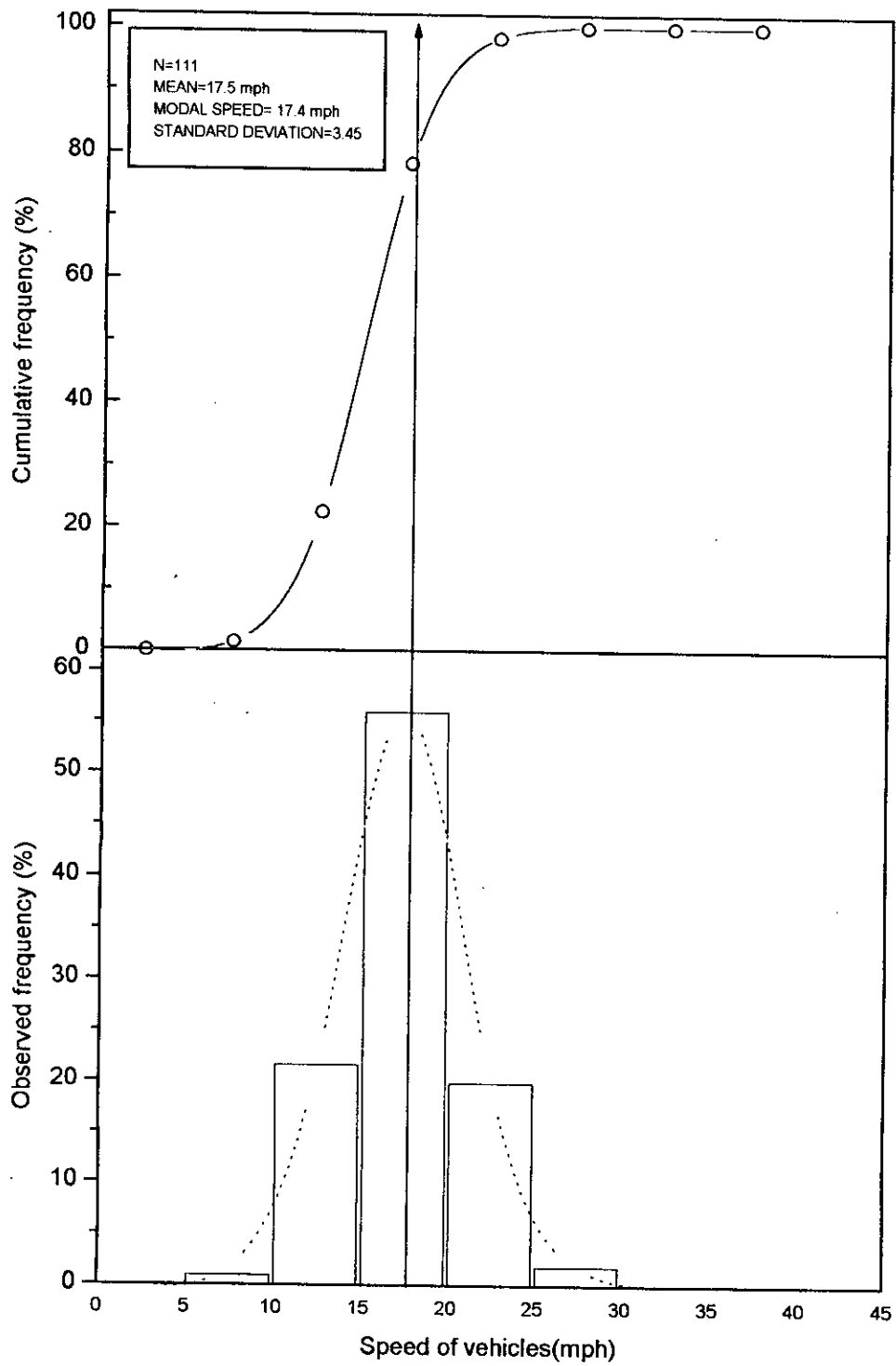


Figure C.5 : Distribution of autorickshaw speeds at site no.5

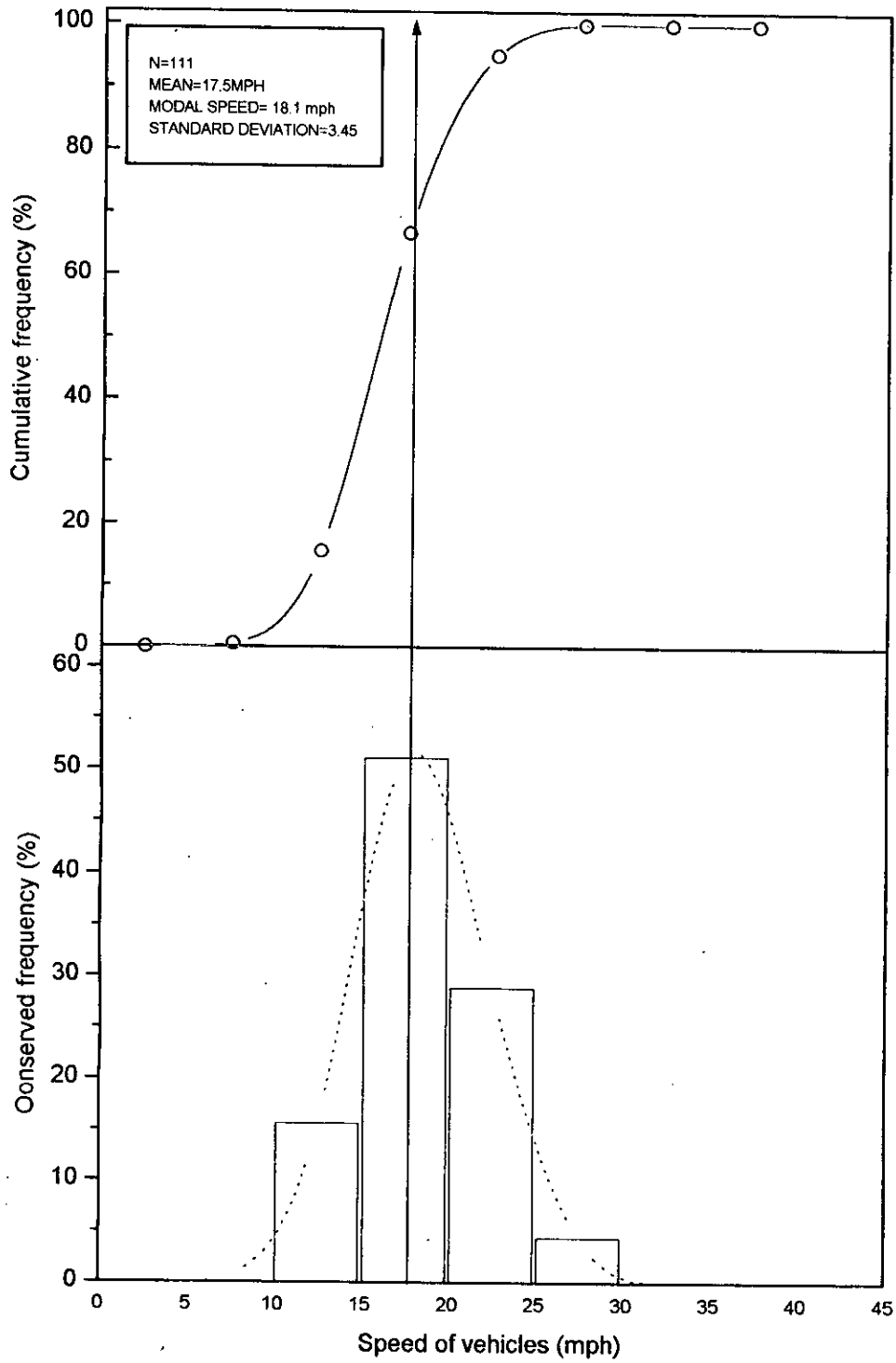


Figure C.6 : Distribution of autorickshaw speeds at site no.6

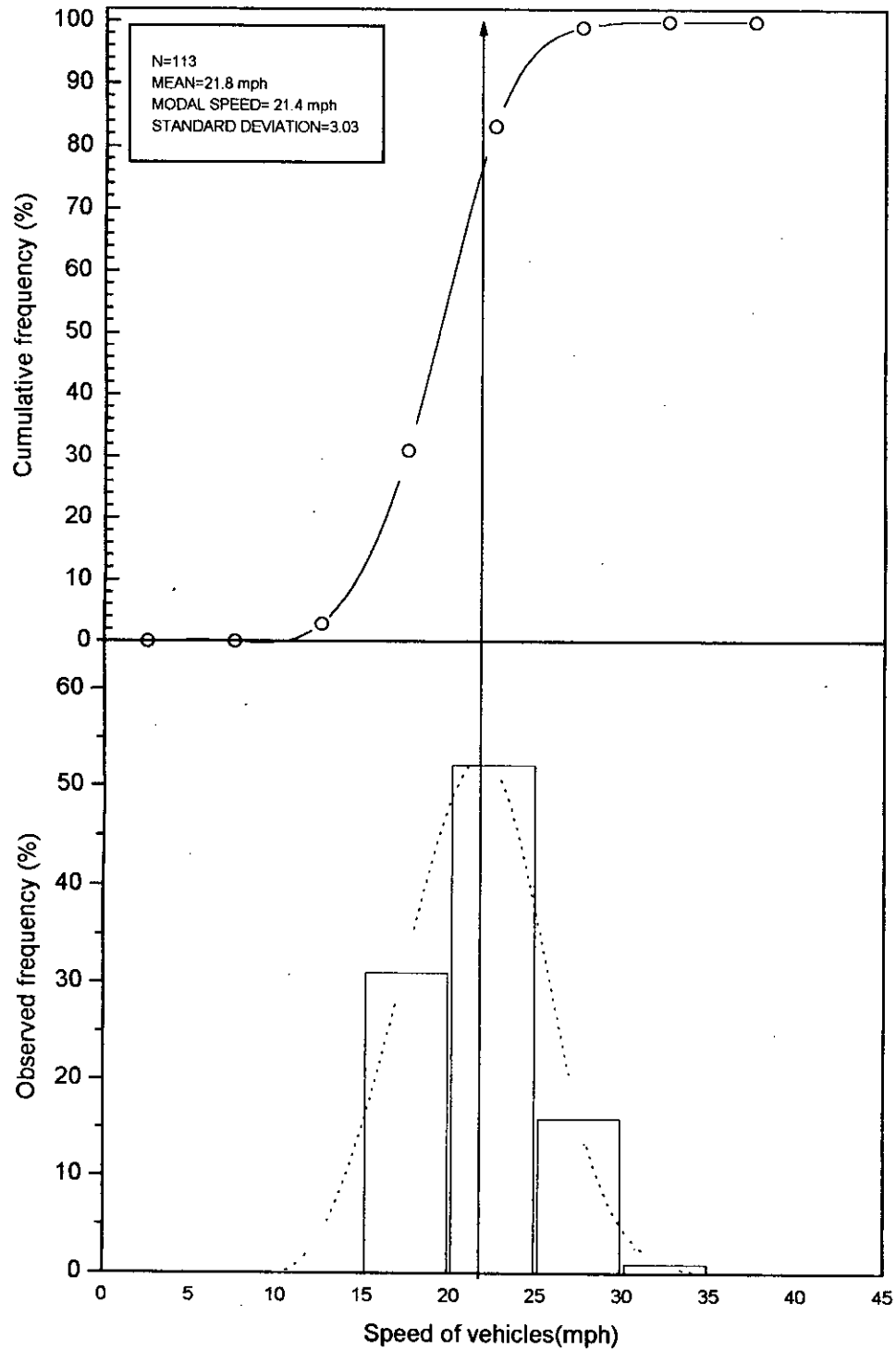


Figure c.7 : Distribution of autorickshaw speeds at site no.7

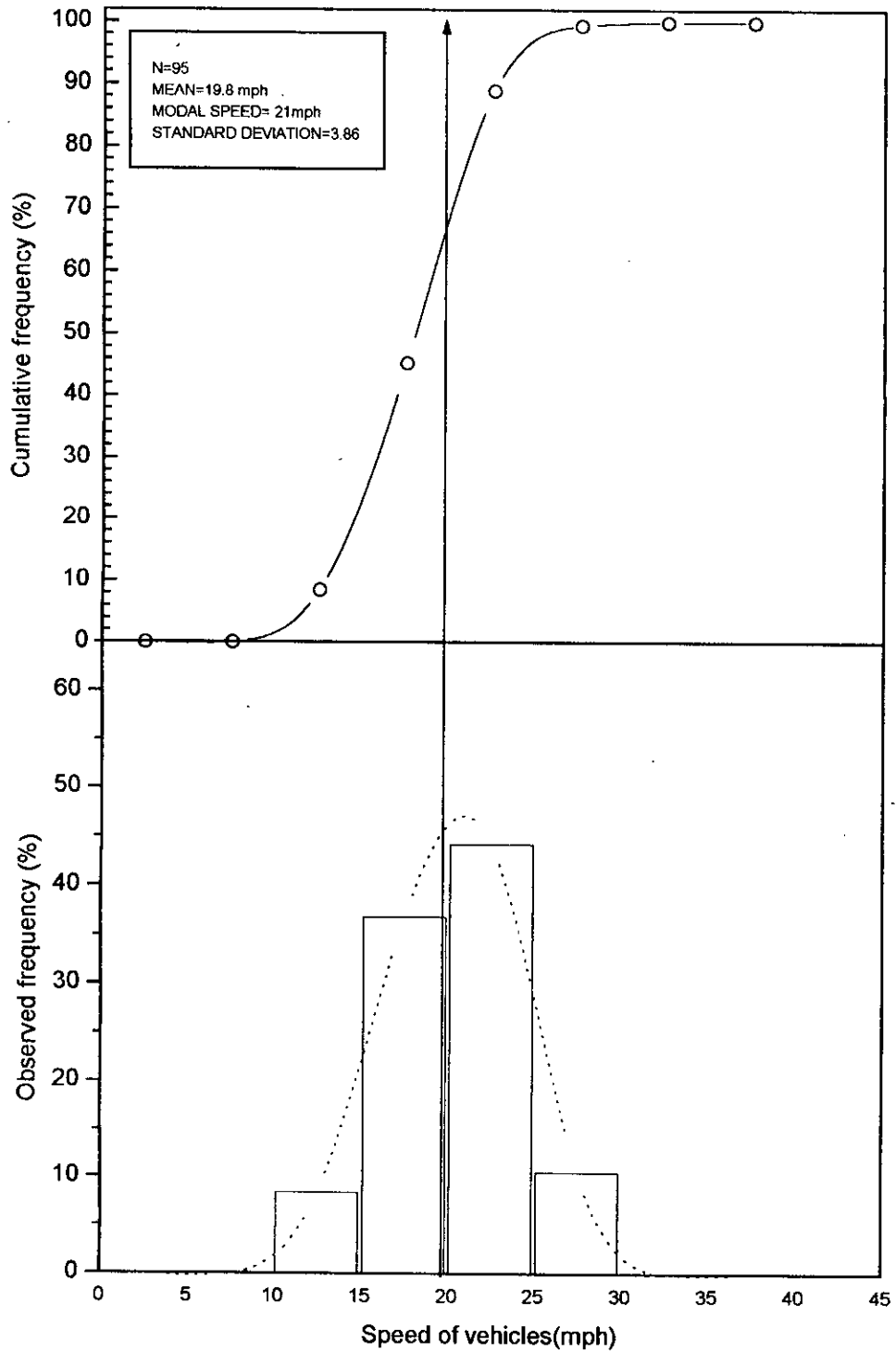


Figure C.8 : Distribution of autorickshaw speeds at site no.8

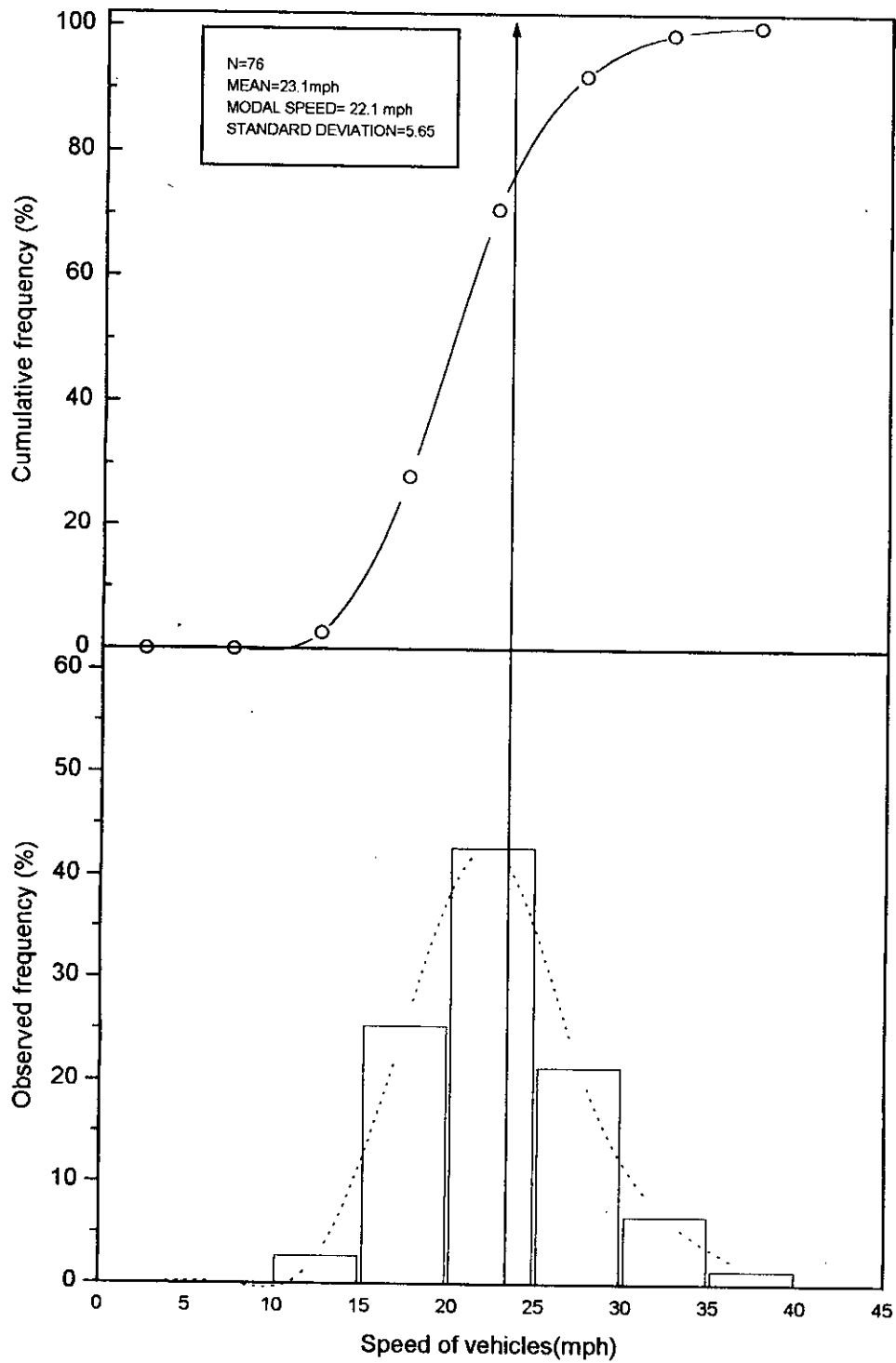


Figure C.9 : Distribution of car speeds at site no.1

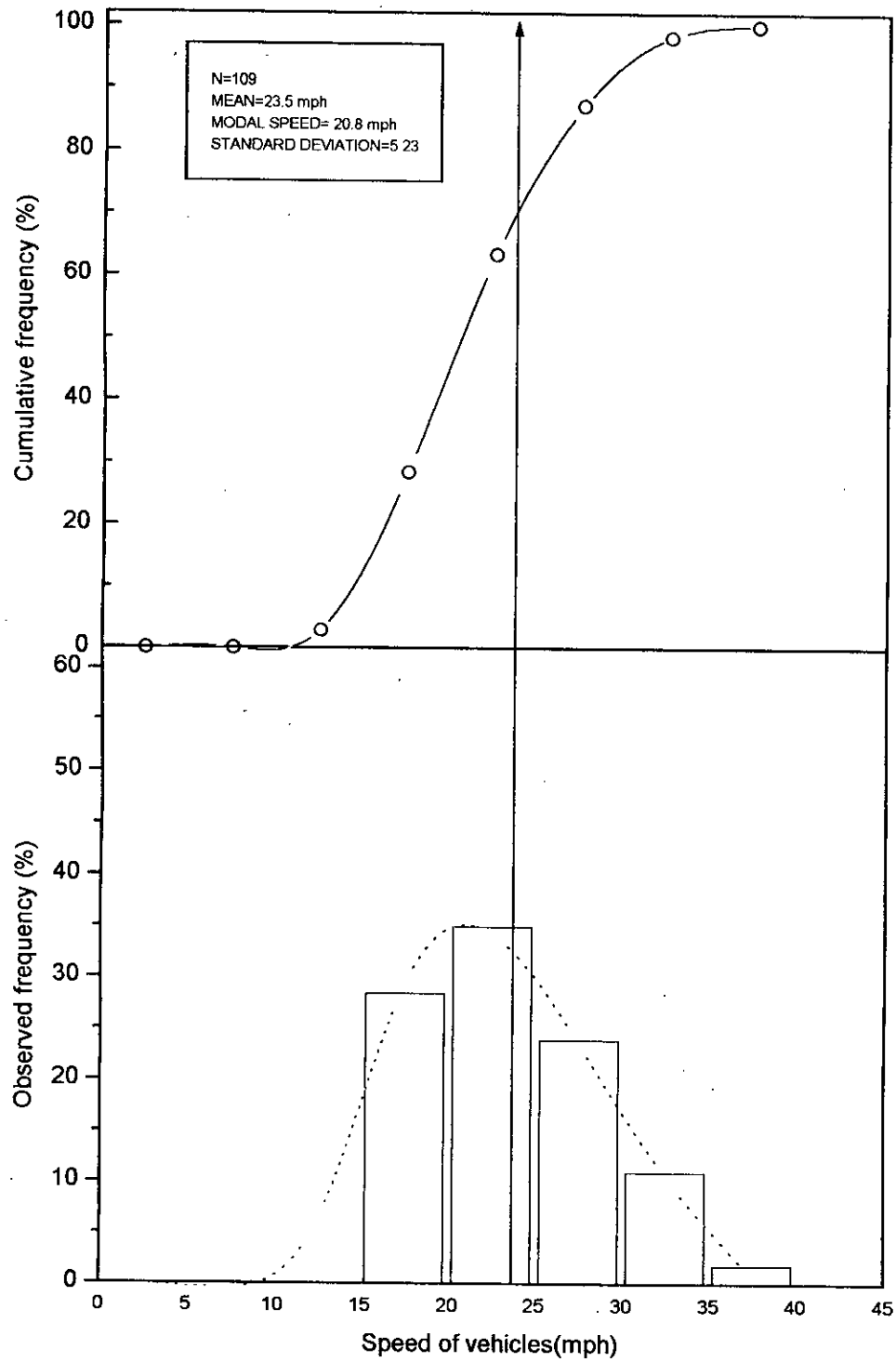


Figure C.10 : Distribution of car speeds at site no.2

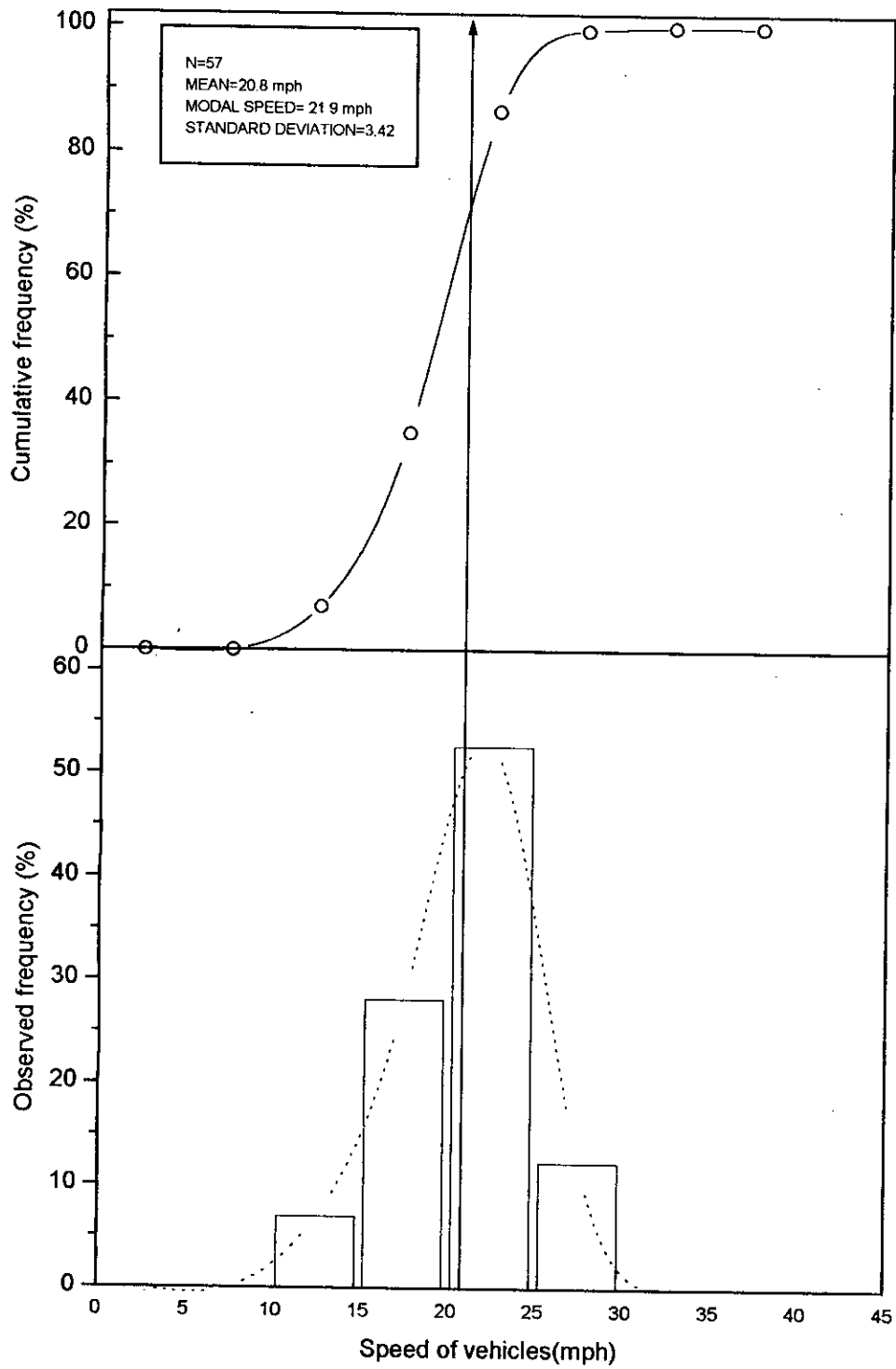


Figure C.11 : Distribution of car speeds at site no.3

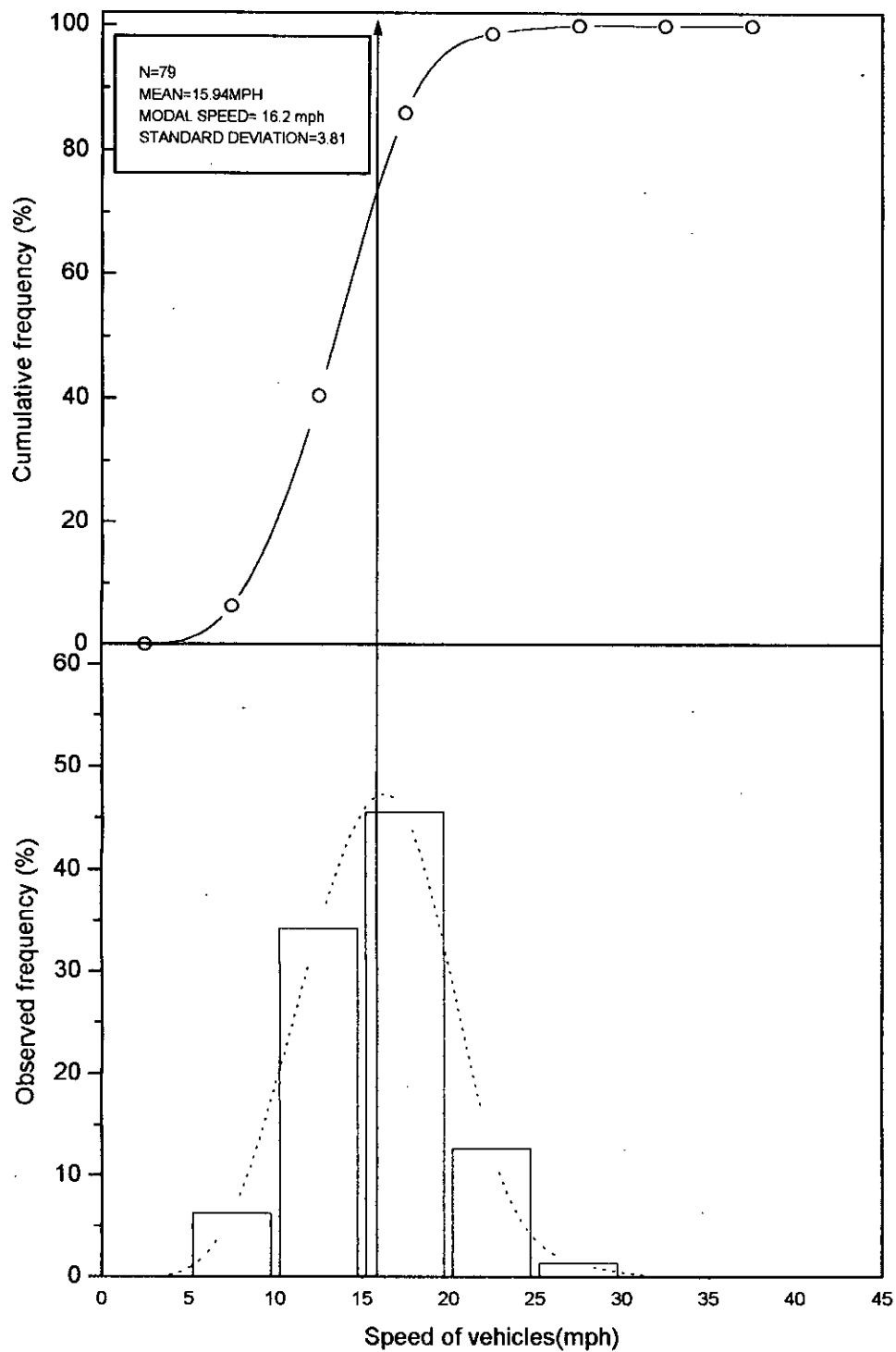


Figure C.12 : Distribution of car speeds at site no.4

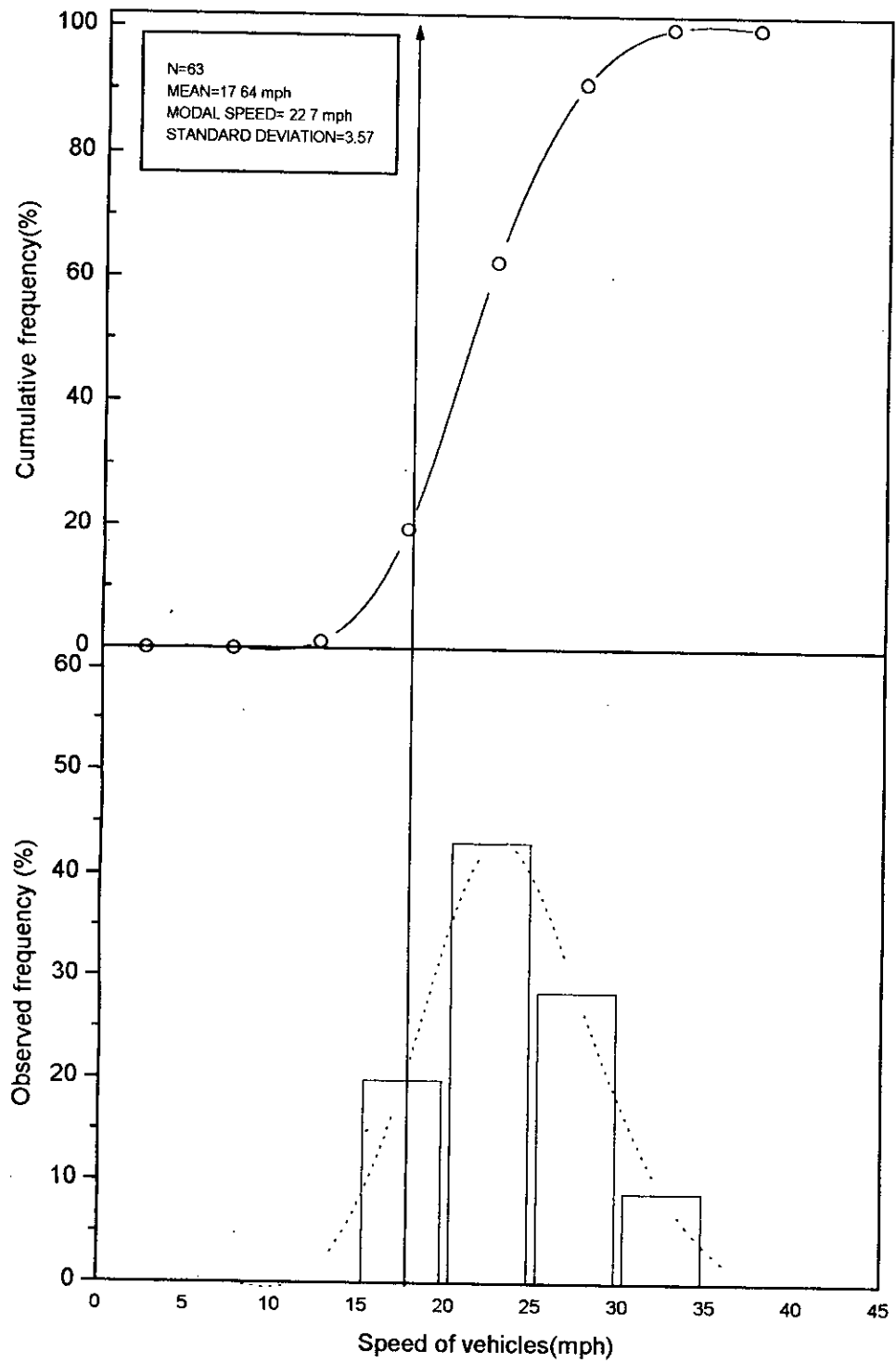


Figure C.13 : Distribution of car speeds at site no.5

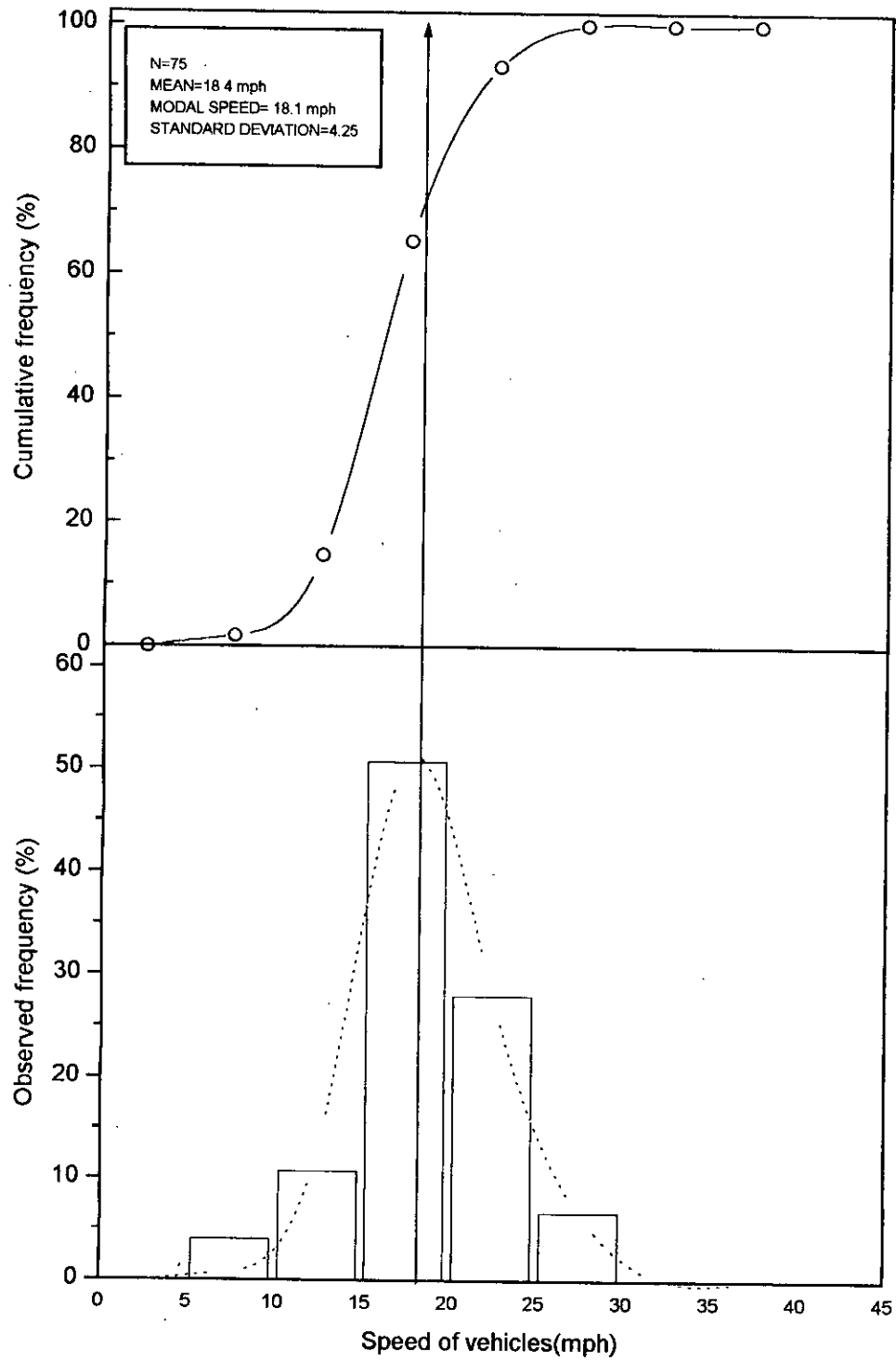


Figure C.14 : Distribution of car speeds at site no.6

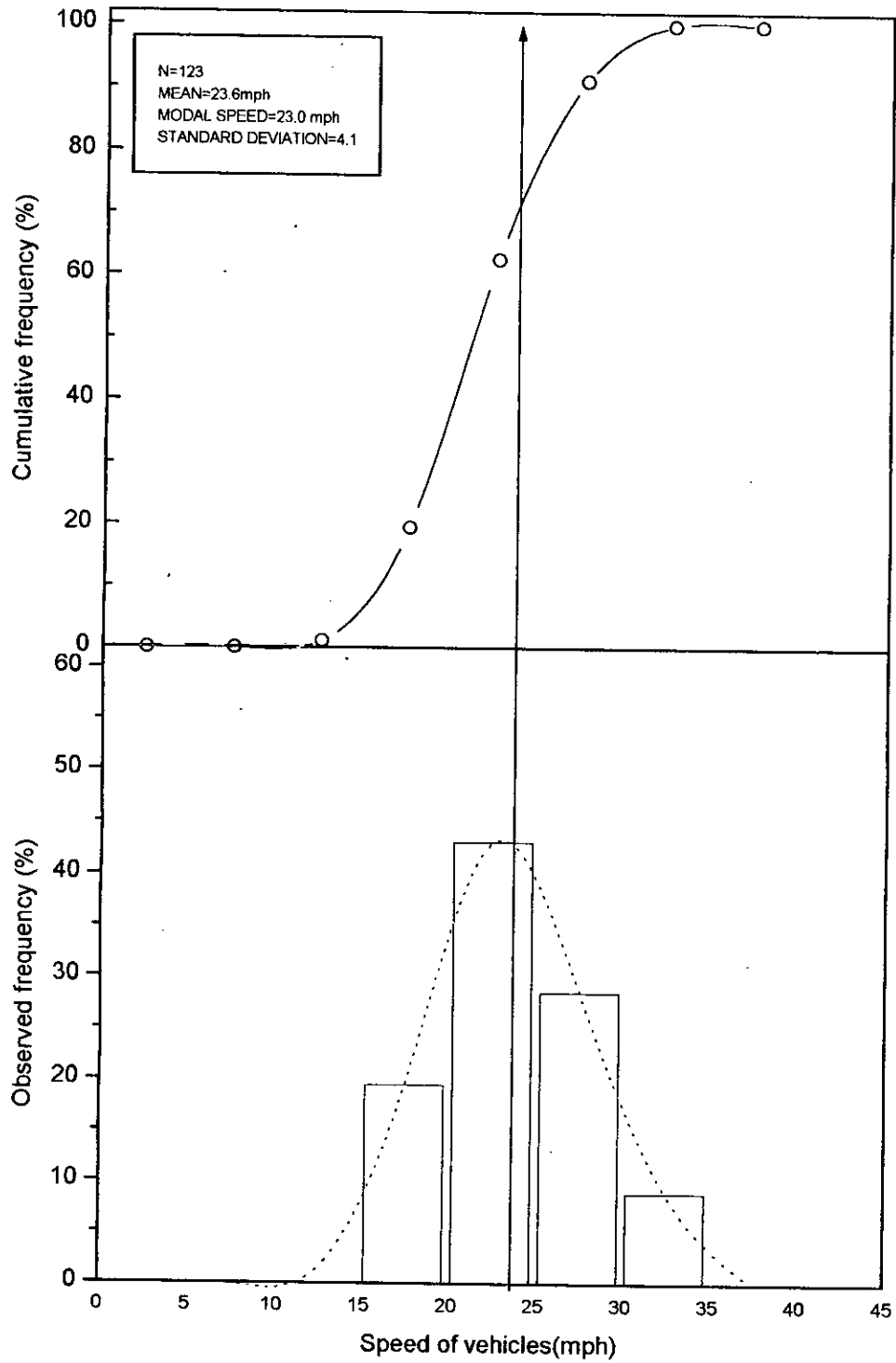


Figure C.15 : Distribution of car speeds at site no.7

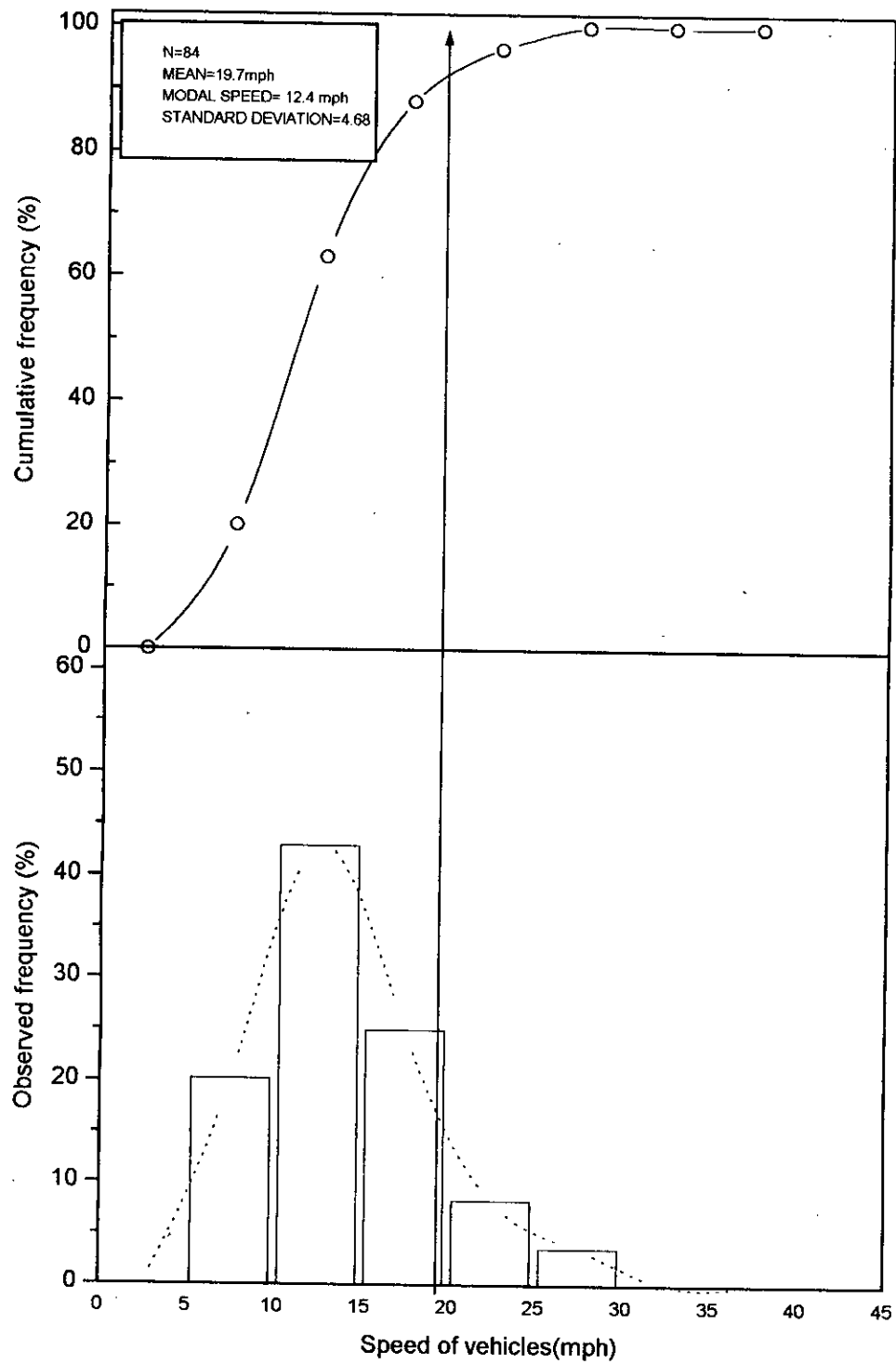


Figure C.16 : Distribution of car speeds at site no.8

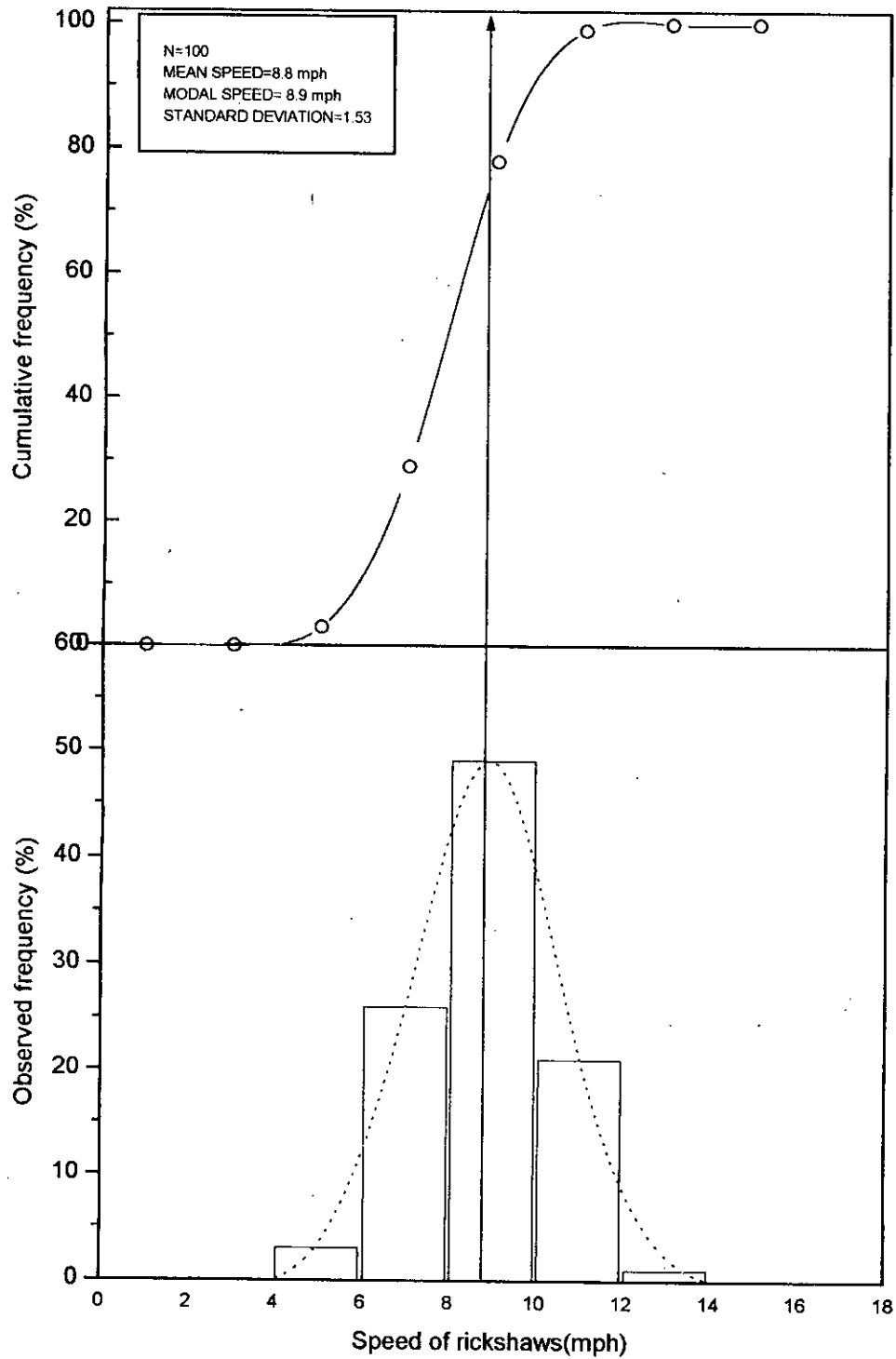


FIGURE C.17: Distribution of rickshaw speeds at site no.3

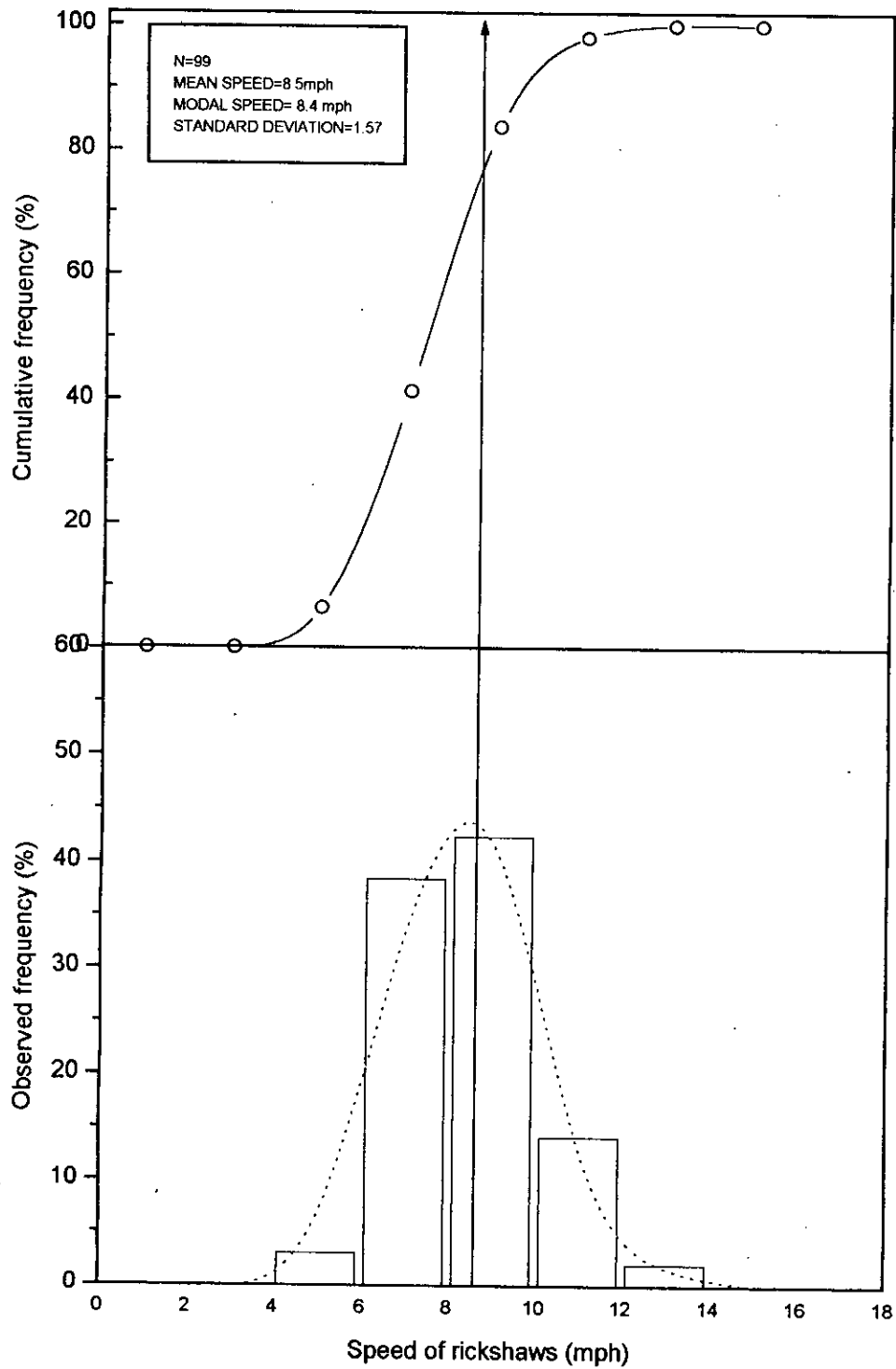


Figure C.18 : Distribution of rickshaw speeds at site no.4

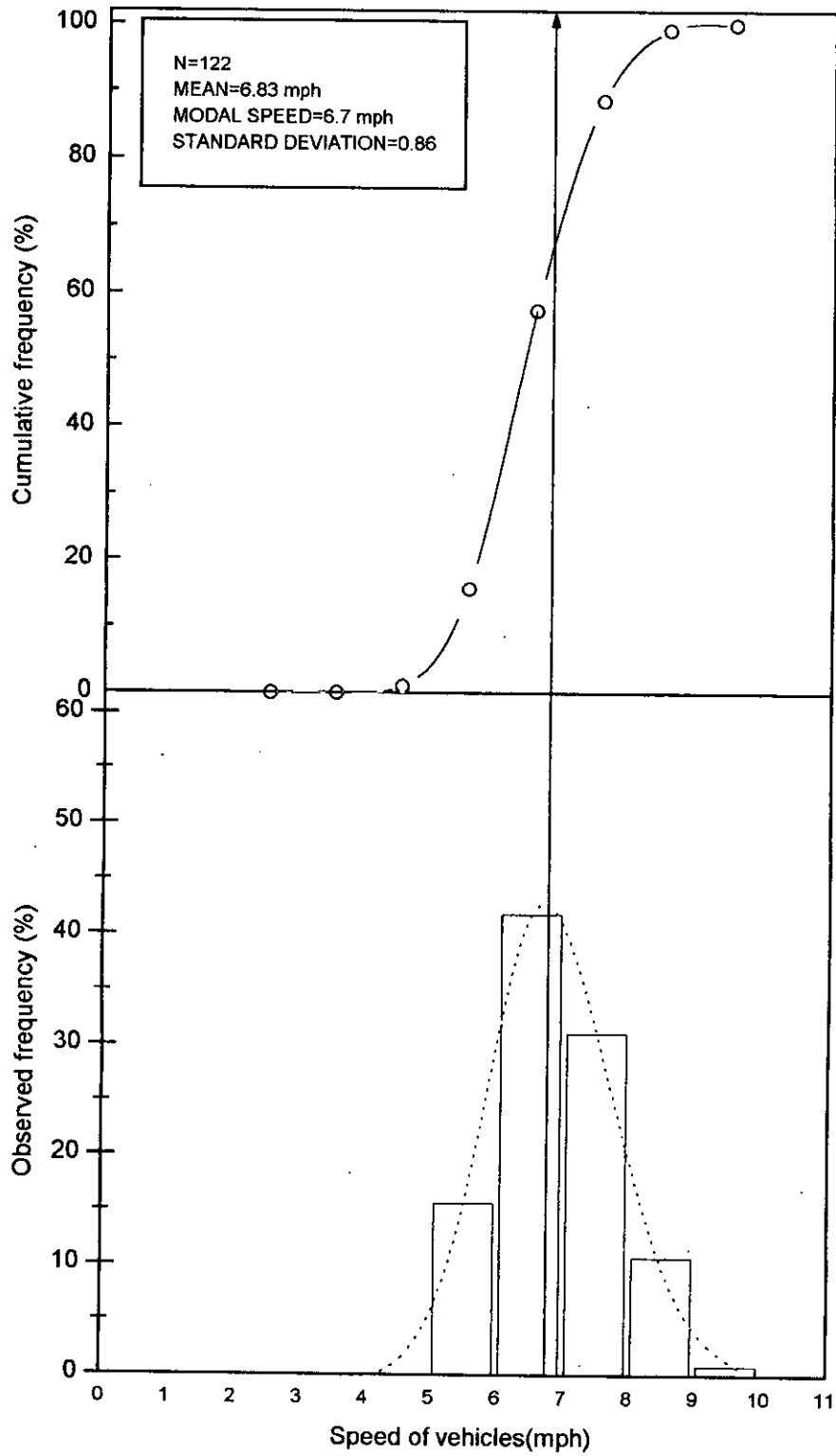


Figure C.19 : Distribution of rickshaw speeds at site no.5

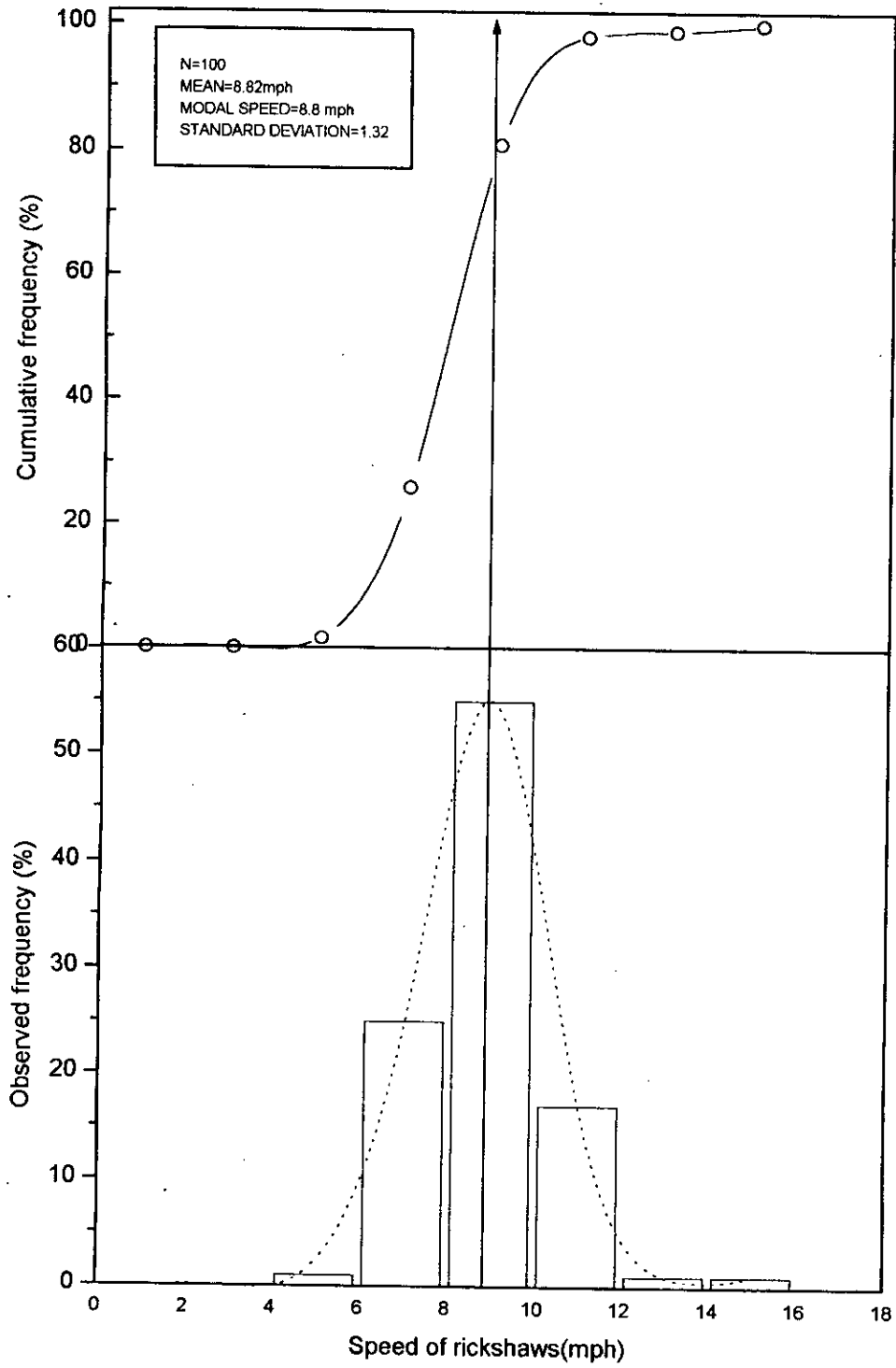


Figure C.20 : Distribution of rickshaw speeds at site no.6

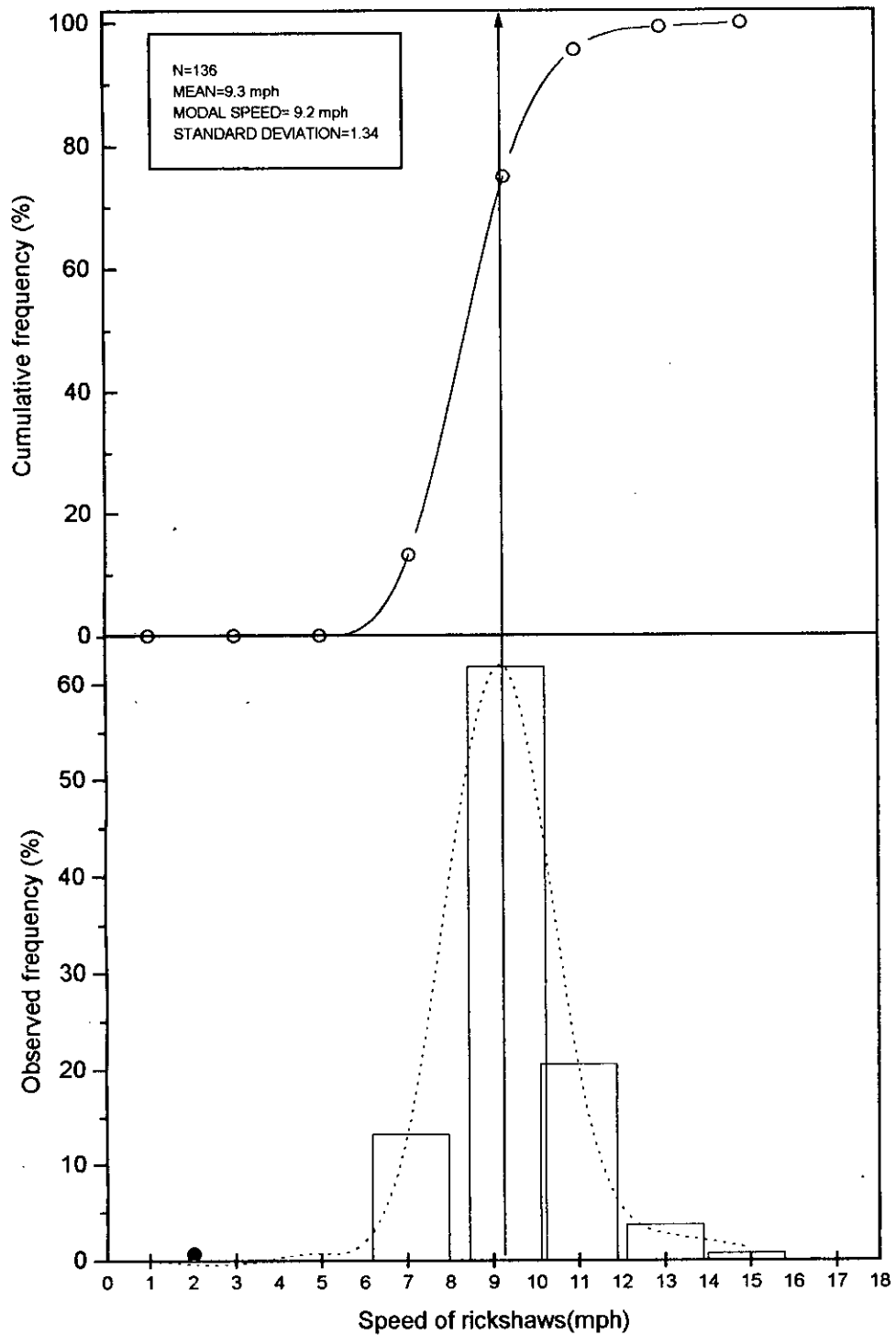


Figure C.21 : Distribution of rickshaw speeds at site no.7

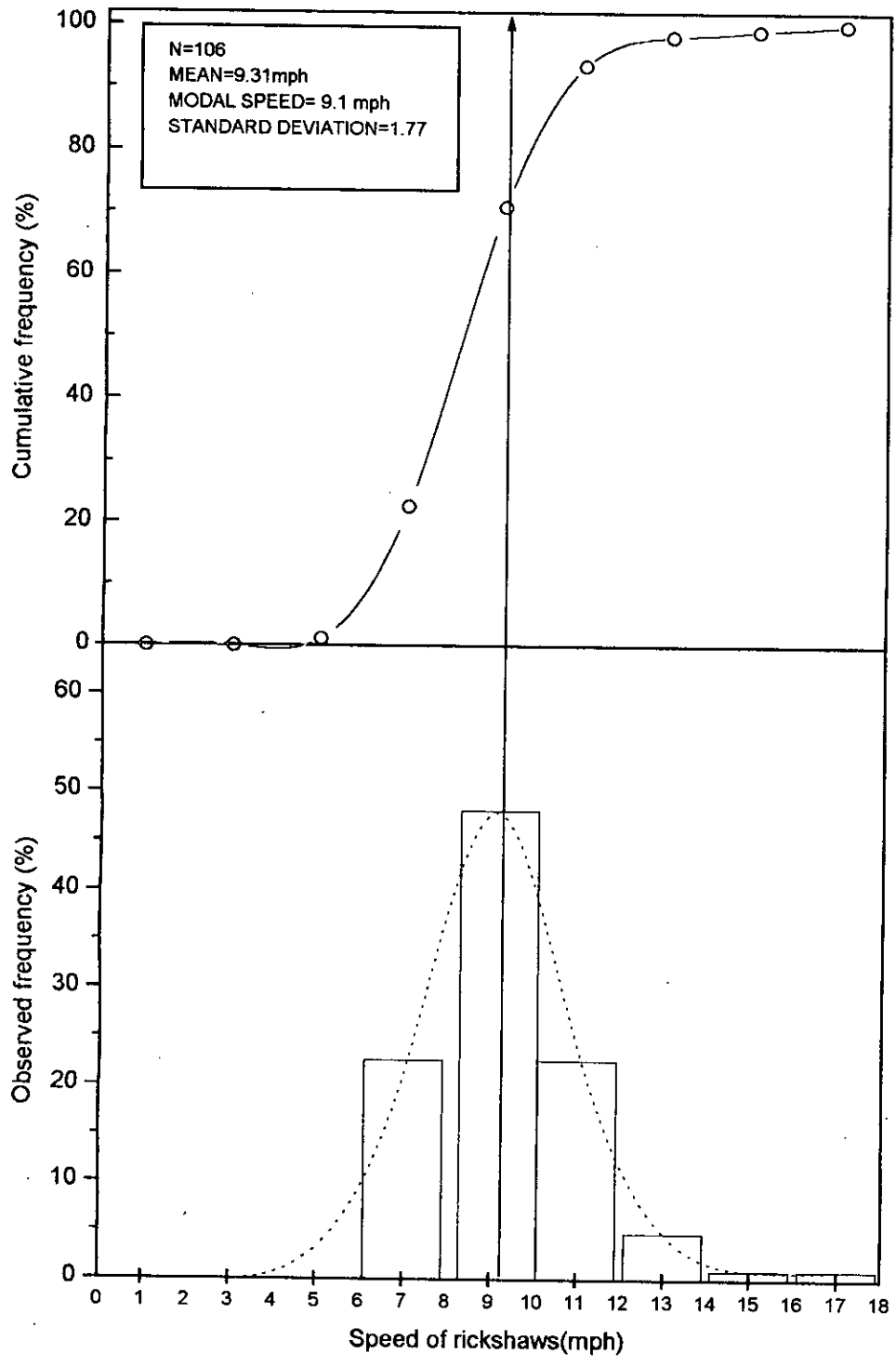


Figure C.22 : Distribution of rickshaw speeds at site no.8

APPENDIX-D

Output of Stepwise Regression Procedure

OUTPUT-1

- - Correlation Coefficients - -

	M	WLR	W	S	N
M	1.0000	-.0864	.1345	.6173	-.8454
WLR	-.0864	1.0000	.6744	.1945	.1860
W	.1345	.6744	1.0000	.6301	-.2277
S	.6173	.1945	.6301	1.0000	-.8026
N	-.8454	.1860	-.2277	-.8026	1.0000

* * * * MULTIPLE REGRESSION * * * *

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. M mobility (passenger/hr)

Block Number 1. Method: Stepwise Criteria PIN .0500 POUT .1000
S N

Variable(s) Entered on Step Number
1.. N percentage of NMT (%)

Multiple R .84538
R Square .71467
Adjusted R Square .66712
Standard Error 1848.40399

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	51346750.17999	51346750.17999
Residual	6	20499583.82001	3416597.30333

F = 15.02862 Signif F = .0082

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
N	-100.242374	25.857811	-.845384	-3.877	.0082
(Constant)	14448.588811	1259.191772		11.474	.0000

----- Variables not in the Equation -----

Variable	Beta In	Partial	Min Toler	T	Sig T
S	-.171841	-.191920	.355900	-.437	.6802

End Block Number 1 PIN = .050 Limits reached.

OUTPUT-2
- - Correlation Coefficients - -

	S	L	W	WLR	N
S	1.0000	-.2171	.6301	.1945	-.8026
L	-.2171	1.0000	-.5178	-.8895	-.1996
W	.6301	-.5178	1.0000	.6744	-.2277
WLR	.1945	-.8895	.6744	1.0000	.1860
N	-.8026	-.1996	-.2277	.1860	1.0000

* * * * MULTIPLE REGRESSION * * * *

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. S Mean speed of vehicles (mph)

Block Number 1. Method: Stepwise Criteria PIN .0500 POUT .1000
-W N

Variable(s) Entered on Step Number
1.. N percentage of NMT (%)

Multiple R .80256
R Square .64410
Adjusted R Square .58478
Standard Error 2.11033

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	48.35899	48.35899
Residual	6	26.72101	4.45350

F = 10.85865 Signif F = .0165

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
N	-.097282	.029522	-.802558	-3.295	.0165
(Constant)	21.549373	1.437625		14.990	.0000

----- Variables not in the Equation -----

Variable	Beta In	Partial	Min Toler	T	Sig T
W	.471789	.770050	.948137	2.699	.0428

* * * * MULTIPLE REGRESSION * * * *

Equation Number 1 Dependent Variable.. S Mean speed of vehicles (mph)

Variable(s) Entered on Step Number

2.. W Effective width of road sections (ft)

Multiple R .92474
 R Square .85514
 Adjusted R Square .79720
 Standard Error 1.47486

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	2	64.20393	32.10197
Residual	5	10.87607	2.17521

F = 14.75807 Signif F = .0080

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
W	.281096	.104150	.471789	2.699	.0428
N	-.084259	.021189	-.695115	-3.977	.0106
(Constant)	3.649586	6.707810		.544	.6098

End Block Number 1 POUT = .100 Limits reached.

OUTPUT-3
- - Correlation Coefficients - -

	ACC	W	S	MN S	SM	SN
ACC	1.0000	-.6253	-.3717	.9840	.9122	-.8676
W	-.6253	1.0000	.9292	-.4764	-.2541	.8923
S	-.3717	.9292	1.0000	-.2091	.0380	.7774
MN S	.9840	-.4764	-.2091	1.0000	.9692	-.7758
SM	.9122	-.2541	.0380	.9692	1.0000	-.5969
SN	-.8676	.8923	.7774	-.7758	-.5969	1.0000
N	.0000	-.5758	-.4870	-.1369	-.2588	-.1855

* * * * MULTIPLE REGRESSION * * * *

Listwise Deletion of Missing Data

Equation Number 1 Dependent Variable.. ACC No of accidents

Block Number 1. Method: Stepwise Criteria PIN .0500 POUT .1000
 MN S SM SN W

Variable(s) Entered on Step Number

1.. MN S ratio of motorised to non-motorised tran

Multiple R .98401
 R Square .96828
 Adjusted R Square .95242
 Standard Error .20885

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	1	2.66276	2.66276
Residual	2	.08724	.04362

F = 61.04734 Signif F = .0160

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
MN.S	2.838079	.363238	.984011	7.813	.0160
(Constant)	-2.622964	.822315		-3.190	.0858

----- Variables not in the Equation -----

Variable	Beta In	Partial	Min Toler	T	Sig T
SM	-.685694	-.947501	.060571	-2.963	.2072
SN	-.261796	-.927417	.398096	-2.480	.2440
W	-.202402	-.999129	.772997	-23.950	.0266

* * * * * M U L T I P L E R E G R E S S I O N * * * * *

Equation Number 1 Dependent Variable.. ACC No of accidents

Variable(s) Entered on Step Number
 2.. W effective width of road sections(ft)

Multiple R .99997
 R Square .99994
 Adjusted R Square .99983
 Standard Error .01232

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	2	2.74985	1.37492
Residual	1	.00015	.00015

F = 9056.50457 Signif F = .0074

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
MN ² S	2.559944	.024374	.887577	105.027	.0061
W	-.030264	.001264	-.202402	-23.950	.0266
(Constant)	-.167428	.113425		-1.476	.3791

----- Variables not in the Equation -----

Variable	Beta In	Partial	Min Toler	T	Sig T
SM	.107841	1.000000	.003923	.	.
SN	.035151	1.000000	.044680	.	.

End Block Number 1 PIN = .050 Limits reached.

APPENDIX-E

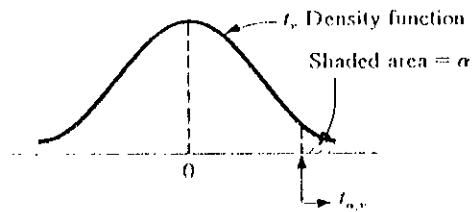
F-Distribution and t-Distribution Tables

Table E.1: Critical Values F_{α, ν_1, ν_2} for the F Distribution

$\alpha = .05$

$\nu_1 \backslash \nu_2$	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00

Table E.2: Critical Values $t_{\alpha, \nu}$ for the t Distribution



ν	.10	.05	.025	α .01	.005	.001	.0005
1	3.078	6.314	12.706	31.821	63.657	318.31	636.62
2	1.886	2.920	4.303	6.965	9.925	22.326	31.598
3	1.638	2.353	3.182	4.541	5.841	10.213	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.767
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

Source: This table is reproduced with the kind permission of the Trustees of Biometrika from E. S. Pearson and H. O. Hartley (eds.), *The Biometrika Tables for Statisticians*, vol. 1, 3rd ed., Biometrika, 1966.

APPENDIX-F
FIR and DCA Codes

FIR

B.P. Form No. 27

368336

FIRST INFORMATION REPORT

Control no. 243

First information report submitted to thana as per criminal procedure rule no 154

PS Name

District

Case No.

Date & Time

Time & date of FIR submission	-Place of occurrence, name of area distance for P.S.	Date of dispatch

N.B. - FIR must be signed and to be attested by the officer who noted down the FIR.

Home & address of complainant	Name & address of accused	Brief description of case with sections of law and list of commodities looted	Details of enquire and explanation of any delay in recording any facts	Result of case

Preliminary report is to be given below

Signature

Designation

Note - The fact supplier is to sign below Signature of complainant

PEDESTRIAN IN FOOT & BIKE / PRAM	VEHICLES FROM ADJACENT DIRECTIONS INTERSECTIONS ONLY	VEHICLES FROM OPPOSING DIRECTIONS	VEHICLES FROM SAME DIRECTION	MANEUVERING	VERTIKING	IN PATH	OFF PATH IN STRAIGHT	OFF PATH IN CURVE	PASSENGER AND MISCELLANEOUS
100	110	120	130	140	150	160	170	180	190
101	111	121	131	141	151	161	171	181	191
102	112	122	132	142	152	162	172	182	192
103	113	123	133	143	153	163	173	183	193
104	114	124	134	144	154	164	174	184	194
105	115	125	135	145		165	175		
106	116		136	146		166			
107	117		137	147		167			
108	118			148					198
109	119	129	139	149	159	169	179	189	199

1. DEFINITION FOR CLASSIFYING ACCIDENTS (OCA) SHOULD BE DETERMINED BY FIRST SELECTING A COLUMN USING THE TEXT ABOVE EACH COLUMN AND THEN BY DIAGRAMATIC SUB-DIVISION.
 2. THE SUB-DIVISION CHOSEN SHOULD DESCRIBE THE GENERAL MOVEMENT OF VEHICLES INVOLVED IN THE INITIAL EVENT. IT DOES NOT ASSIGN A CAUSE TO THE ACCIDENT.
 3. SUPPLEMENTARY CODES HAVE BEEN DEFINED FOR MOST SUB-DIVISION. THESE CODES GIVE FURTHER DETAIL OF THE INITIAL EVENT.
 4. THE NUMBER 1, 2 IDENTIFY INDIVIDUAL VEHICLES INVOLVED WHEN THE OCA IS LINKED WITH OTHER VEHICLE/DRIVER INFORMATION.
 5. THESE CODES WERE USED FOR 1987 ACCIDENTS AND REPLACE THE ROAD USER MOVEMENT (RUM) CODE.

Vic Roads
Definitions for Classifying Accidents

100 Near Side	134 Lane Change Right (not overtaking)	169 Other on Path
101 Emerging	135 Lane Change Left	170 Off Carriageway to Left
102 Far Side	136 Right Turn Side Swipe	171 Left Off Carriageway into Object/Parked Vehicle
103 Playing, working, lying, standing on carriageway	137 Left Turn Side Swipe	172 Off Carriageway to Right
104 Walking with traffic	139 Other Same Direction	173 Right Off Carriageway into Object/Parked Vehicle
105 Facing traffic	140 U Turn	174 Out of Control on Carriageway
106 On foot-path/median	141 U Turn into fixed object/parked vehicle	175 Off End of Road/T Intersection
107 Driveway	142 Leaving Parking	179 Other Straight
108 Struck while boarding or alighting vehicle	143 Entering Parking	180 Off Carriageway Right Bend
109 Other pedestrian	144 Parking vehicles only	181 Off Right Bend into Object/Parked Vehicle
110 Cross Traffic	145 Reversing	182 Off Carriageway Left Bend
111 Right Far	146 Reversing into fixed object/parked vehicle	183 Off Left Bend into Object/Parked Vehicle
112 Left Far	147 Emerging from Driveway/Lane	184 Out of Control on Carriageway
113 Right Near	148 From Footway	189 Other Curve
114 Two right turning	149 Other manoeuvring	190 Fell In/From Vehicle
115 Right/Left Far	150 Head On (incl. side swipe)	191 Load or Missile Struck Vehicle
116 Left Near	151 Out of control	192 Struck Train
117 Left/Right Far	152 Pulling Out	193 Struck Railway Crossing Furniture
118 Two Left Turn	153 Cutting In	194 Parked Car Ran Away
119 Other adjacent	154 Pulling Out - Rear End	198 Other
120 Head On (Not overtaking)	159 Other Overtaking	199 Unknown
121 Right through	160 Parked	
122 Left through	161 Double Parked	
123 Right Left	162 Accident or Broken Down	
124 Right Right	163 Vehicle Door	
125 Left Left	164 Permanent Obstruction on Carriageway	
129 Other Opposing	165 Temporary Roadworks	
130 Rear End	166 Struck Object on Carriageway	
131 Left Rear	167 Animal (not ridden)	
132 Right Rear		
133 Lane Side Swipe		

APPENDIX-G

Thana Accident Tables of Metropolitan Dhaka

DHANMONDI THANA ACCIDENT ANALYSIS (July 91-June 92)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/ INT	DIR	MODES INVOLVED	VEH OCCUPANTS			PEDESTRIAN		COMMENTS
									FATAL	SER	MIN	FATAL	SER	
1	Rd 27 (2 km from pol box)	76(7)	29/7	06:30	6B	L	S	mini/ped				M46		
2	Rd 8	30(8)	10/8	09:45	7		E/N	rick/mini			M26			
3	Rd 2 (Indian HC)	33(8)	11/8	08:00	6B	L	E	micro/ped				M28		
4	Rd 8 (near Mac rest.)	50(8)	19/8	16:00	2	L	N	b'taxi/truck		M29				
5	Alpana Plaza Bldg	65(8)	26/8	13:45	2	L	E	rick/micro		F28				
6	Jikatala BS	81(8)	28/8	18:00	2	L	W	m'cycle/metro		M32				
7	21 Green Road	82(8)	29/8	00:00	6A	L	W	ped/car				M21		road workers hit
8	Rd 8 (East side)	85(8)	31/8	16:45			N	ped/m'cycle					F35	
9	Nilkhet Crossing	8(9)	3/9	13:05	6B		E	ped/mini					M55	
10	Rd 27 (near signal)	90(9)	29/9	20:35	7	L	N	mini/ped		M31			3M(22,25,20)	
11	Rd 6 Crossing	11(10)	3/10	14:10	2	L	S	rick/mini		2M(22,35)				rickshaw waiting
12	New Market crossing	44(10)	11/10	16:00	6B		N	ped/car					M38	
13	Science Lab crossing	49(10)	15/10	16:08	6B	L	E	ped/mini					M26	signal disobeyed
14	60D Green Road	59(10)	19/10	09:00	6B	L	E	ped/tempo				M55		
15	Bata Crossing	48(11)	21/11	15:20	3	I	N/S	metro/metro		M28				
16	Gaucia/Kacha Bz	51(11)	23/11	14:30	2	L	S	ped/metro					M35	Traffic cophit
17	Rd 27 (East side)	55(11)	23/11	14:30	2	L	S	rick/truck		M29	M32			
18	Rd 19	8(12)	5/12	09:15	2	L	N	tempo/truck		2M(20,39)				garbage truck hit
19	Baitul Noor Mosque	10(12)	5/12	18:00	6B	L	E	ped/car					M42	
20	Dhaka College	22(1)	9/1	19:35	7	L	N/W	truck/van		M31				van did u-turn
21	Rd 3 Crossing	24(1)	11/1	08:50	7	L	S	bicycle/mini		M22				bicycle u-turn
22	Rd 27	36(1)	14/1	12:00	2		E	m'cycle/car			M32			
23	Dhaka College	78(1)	29/1	11:45		L	N	ped/mini					M19	student alighting
24	Kalabagan Mirpur Rd	14(2)	5/2	15:15	6A	L	S	ped/mini					M40	
25	Sobanbash	19(2)	8/2	16:30	6A	L		m'cycle/ped					M34	
26	Rd 21	27(2)	10/2	13:30	1	L	N	rick/car		2M(23,34)				
27	Rd 3 Crossing nr petrol pum	43(2)	17/2	13:45	6B	L	W	rick/m'cycle		M33				
28	Dhaka College	50(2)	19/2	07:35	6B	L	S	ped/car					M35	
29	New Mkt/Kacha Bz	22(3)	7/3	16:15	6B		W	ped/truck					M28	
30	Science Lab (police box)	77(3)	29/3	22:25	6A	L	N	metro/ped					M65	
31	Dhaka College	79(3)	30/3	05:45	7	L	S	mini/mini		M29				
32	Thana Crossing	3(4)	1/4	10:00	1		S/W	m'cycle/car		M36				
33	Kalabagan Bus Stand	5(4)	1/4	16:00	6A	L	S	ped/mini					F24	
34	Kalabagan Bus Stand	22(5)	9/5	04:30	6B	L	S	ped/truck					F5	
35	Rd 15 BS	77(5)	23/5	09:45	2	L	E	m'cycle/car		M42				
36	Bata Crossing	58(6)	21/6	21:30	6B	I	W	ped/metro					F38	

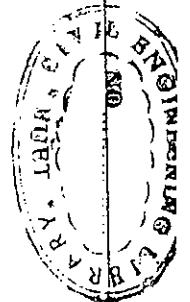
THANA ACCIDENT TABLES

DEMRA THANA ACCIDENT ANALYSIS (July 91 - June 92)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LNK/ INT	DIR	MODES INVOLVED	VEH OCCUPANTS			PEDESTRIAN		COMMENTS
									FATAL	SER	MIN	FATAL	SER	
1	Dhaka - Saidebad Rd	14(7)91	6/7	16:30	6B	L	S	ped/bus		M40				
2	Saidebad	16(7)91	6/7	08:00	6B	L	S	ped/car						
3	Matuail Bisha Rd	17(7)91	6/7	22:00	2	L	S	ped/car					M35	near Bridge
4	Sanupar Bisha Rd	20(7)91	7/7	09:00	2	L	S	pushcart/car						nr petrol pump
5	Golapbagh Rd	31(7)91	8/7	20:30	6B	L	N	m'cycle/mini		M(25,35)				nr Sanupar petrol pump
6	Shampur - Naryanganj	40(7)91	9/7	19:30	6B	L	N	ped/truck					F25	truck carrying sand
7	Saidebad	50(7)91	15/7	11:30	6B	I		ped/mini			M42		M25	nr bridge
8	Jame Mosque Rd	65(7)91	19/7	10:00	2	L	S	rick/pickup		2M				Janapar Crossing
9	Faridabad	68(7)91	20/7	16:00	6B	L	N	ped/mini					M40	
10	Golapbagh Rd	69(7)91	20/7	17:45	6A	L	N	ped/b'taxi					M8	
11	Jura	98(7)91	29/7	14:40	6A	L	N	ped/truck					M8	
12	Kutub Khali	102(7)91	30/7	00:10	6A	L		ped/bus				M8		
13	Shayampur	103(7)91	30/7	06:40	3	L	N	mini/truck		M7			M18	
14	Postagola Buriyanj Setu Rd	114(7)91	31/7	08:00	6A	L	S	ped/m'cycle					F25	on the bridge
15	Uttar Jatra bari Rd	16(8)91	6/8	18:20	6A	L	E	ped/truck					M13	before intersection
16	Samad Super Mkt	27(8)91	9/8		6B	L	S	ped/bus					F35	after intersection
17	Matuail Bisha Rd	33(8)91	11/8	06:00	3	L	W	mini/truck			M(2,4)			speeding truck
18	Karim Jute Mill	37(8)91	12/8	09:00	3	L	S	bicycle/bus					M17	
19	Shampur	42(8)91	14/8	12:10	6A	L	N	ped/bus					M35	
20	249/11 Jatrabari	51(8)91	17/8	11:15	6A	L	S	ped/truck					F50	
21	Dholipara	59(8)91	20/8	19:15	3	L	N	tempo/tempo		M(22,25)				
22	Bisha Rd - Rairbagh	66(8)91	23/8	13:00	6A	L	E	ped/truck					M10	
23	Jatrabari - West Chourasta	72(8)91	26/8	10:00	6B	L		ped/mini		M60				
24	Kajlarpar	82(8)91	27/8	22:30	6A	L	S	ped/truck					M35	road sweeper killed
25	Dolairpar	84(8)91	28/8	06:30	6A	L	N	ped/rick/truck					M22	r'shaw and ped hit
26	Bisha Rd - Wachkuruine	90(8)91	29/8	17:45	6B	L	S	ped/bus					M36	
27	Matuail Bisha Rd	4(9)91	3/9	11:00	6A	L	N	ped/bus					M14	raining, cowboy killed
28	Shani Rakhra	34(9)91	13/9	07:45	6A	L	E	ped/bus					M75	
29	Postogola	43(9)91	14/9	19:30	3	L	N	micro/truck		M35				
30	Jatrabari	48(9)91	17/9	09:05	2	L	S	bicycle/mini		M30				150 ft from junction
31	Jatrabari	50(9)91	17/9	19:00	2	I	E	rick/mini			M(35,40)			
32	Jatrabari	62(9)91	20/9	19:00	2	I	N	m'cycle/tempo		M35				Saidebad bridge
33	Kutub Khali	79(9)91	24/9	16:20	6A	I	N	ped/bus					M16	body found
34	Naryanganj Rd	82(9)91	25/9	16:30	3	I	N	mini/truck		M(30,35)				nr Shampur

DEMRA THANA ACCIDENT ANALYSIS (cont)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/ INT	DIR	MODES INVOLVED	VEH OCCUPANTS			PEDESTRIAN		COMMENTS
									FATAL	SER	MIN	FATAL	SER	
35	Fireservice Rd	4(10)91	1/10	19:20	6	L	S	bus					F35	
36	Jatrabari Rd	5(10)91	2/10	04:00	6	I	S	ped/truck						nr south Jatrabari
37	Jatrabari-Chourasta	11(10)91	3/10	08:15	2	L	S	tempo		M25		M17		cowboy killed
38	Dhaka Match Factory	20(10)91	5/10	13:45	2	L	S	rick/truck	M25	3M				
39	Matuail Bisha Rd	26(10)91	8/10	11:30	6B	L	N	b'taxi/b'taxi		M(30,32)				
40	Shampur-Doleswar	68(10)91	23/10	11:00	6	L	S	ped/truck		F25				truck skidded
41	Saidebad Bus Terminal	69910)91	23/10	15:45	6	L	S	ped/micro		M25				
42	Jatrabari Rd	80(10)91	29/10	11:00	2	L	S	rick/jeep/bus		M25				
43	Jatrabari Rd	1(11)91	1/11	16:00				ped/b'taxi				M32		
44	Golapbisha	5(11)91	2/11	15:00	6	L		ped/bus				M45		body found
45	Shani Rakhra	8(11)91	2/11	11:15	3	L	E	rick/car		M32				
46	Katherpol	9(11)91	2/11	09:00	6	L		ped/truck			M11			schoolboy hit
47	Shampur	12(11)91	2/11	04:35	3	L	S	b'taxi/truck	M40	M(30,42)				
48	Rairbagh	17(11)91	6/11	16:30	6B	L	E	ped/bus				M8		
49	Badsha Mia Rd	22(11)91	7/11	13:30	2	L	W	rick/bus	M35	M37				
50	Badsha Mia Rd	24(11)91	8/11	07:15	4	L	E	bus	M45	M40				speeding/overturn
51	Saidebad Bus Terminal	33(11)91	12/11	04:00	6	L		ped/bus				M40		on main road
52	Jatrabari	39(11)91	11/11	20:00	2	L	E	rick/micro		M36				
53	Jatrabari	50(11)91	18/11	19:30	2	I	E	micro/truck						TK 40,000 damage
54	Chourasta Rd	55(11)91	19/11	11:15	4	L	W	bus	5M					overturn into water
55	Jatrabari-Chourasta	79(11)91	26/11	06:45	1	I	S	b'taxi/truck		M27				
56	Jatrabari	80(11)91	26/11	22:00	3	L	S	b'taxi/mini			1M			
57	Dhaka-Demra Rd	2(12)91	1/12	06:00	4	L	E	tempo		M32	M40			speeding
58	Jatrabari Rd	6(12)91	2/12	16:20	6	L		ped/b'taxi					M12	
59	Saidebad Truck stand	15(12)91	5/12	17:15	7	L	W	ped/truck				M3		
60	Dhaka-Demra Rd	21(12)91	7/12	10:00	6	L		ped/bus				F8		
61	Dolairpara	51(12)91	16/12	15:00	6A	L	N	ped/mini					M6	
62	Golapbagh	53(12)91	17/12	12:30	6B	L		ped/car				M18		
63	Bangopress Rd	65(12)91	20/12	13:30	7	L	W	ped/truck				M22		
64	Rairlagh Bisha Rd	1(1)92	1/1	10:00		L		ped/jeep				F70		
65	Jatrabari	7(1)92	3/1	01:10	3	L	N	b'taxi/truck		F30, M35				
66	Konuparu	14(1)92	4/1	08:30	2	L	W	rick/b'taxi			5M			babytaxi standing
67	Jatrabari	24(1)92	7/1	01:30	6	L	E	ped/bus					M42	
68	Saidebad Hotel-Mehima	25(1)92	7/1	05:20	6	L		truck		1M	3M			truck out of control



DEMRA THANA ACCIDENT ANALYSIS (cont)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/ INT	DIR	MODES INVOLVED	VEH OCCUPANT			PEDESTRIAN		COMMENTS
									FATAL	SER	MIN	FATAL	SER	
69		29(1)91	8/1	13:15	2			mini	M36					
70	Saidebad Terminal	57(1)92	18/1	21:30	3	L	N	car/bus		M35				outside Terminal
71	Munshil Khola	58(1)92	19/1	00:45	3	L	N	truck		M(30,32,39,40)				truck carrying sand
72	Kajla	60(1)92	20/1	13:00	2	L	E	rick/mini		M35				
73	Golap bagh	65(1)92	22/1	09:30	4	L	S	tempo		M(23,45)				speeding/overtum
74	Jatrabari Crossing	66(1)92	23/1	07:00	3	L	W	rick/truck		M30				
75	Postagola	69(1)92	23/1	11:00	6B	L	S	ped/ b'taxi					F35	
76	Mautuail	75(1)92	25/1	12:15	6B	L	S	ped/bus				F7		mother & daughter
77	Mautuail-Mirdhal bari	86(1)92	27/1	10:30	3	L	S	tempo/bus		M42				
78	Doliarpar	93(1)92	28/1	08:00	3	L	S	rick/b'taxi		M30	2M			
79	Buriganj Setu (Bridge)	2(2)92	1/2	11:00	6A	L	W	ped/mini				M6		approach to Dhaka
80	Jatrabari	3(2)92	3/2	03:30	2	L	E	rick/bus		M35				
81	Kutub Khali	23(2)92	7/2	19:30	6B	L	S	ped/bus				M52		road crossing
82	Rairbagh	31(2)92	9/2	13:45	4	L	S	tempo		4M				skidded off road
83	Bhangapress	36(2)92	11/2	07:40	7	L	W	micro		M36				
84	Konapara	54(2)92	16/2	10:00	6B	L	W	ped/bus				M10		
85	Dhaka-Demra Rd	57(2)92	16/2	13:45	1	L	W	bus	F40	5M				hit speed breaker
86	Rairbagh	66(2)92	26/2	00:30	6B	L	S	ped/bus					M42	& turned over
87	nr Saidebad Rd	95(2)92	28/2	22:05	6B	L	N	ped/b'taxi				M60		& hit by bus
88	Bisha RdSunarpar	96(2)92	29/2	22:45	7	L	S	bus		M36				while overtaking
89	Saidebad-Shati Hotel R	1(3)92	29/2	17:30	6A	L	S	ped/bus					M40	bus on wrong side
90	Saidebad	2(3)92	1/3	10:00	2	L	N	b'taxi/bus		M35				truck carrying brick
91	Bisha Rd	29(3)92	10/3	00:30	3	L	S	bus/truck	M35	2M				Poldar petrol pump
92	Postogola	33(3)92	12/3	00:30	6B	L	E	ped/truck					M32	Munshigula
93	Naryanganj	48(3)92	14/3	12:00	2	L	S	?/truck	M40					
94	Dolairpar	51(3)92	16/3	06:00	2	L	S	b'taxi/truck					M35	
95	Kadamtali Shempur	53(3)92	16/3	11:30	2	L	N	b'taxi/bus	3M					
96	Jurail Crossing	54(3)92	16/3	17:00	6	L		police/truck		M				constable hit
97	Kajlarpar	60(3)92	18/3	18:45	7	L	W	tempo/truck	M60	M41				truck overtaking
98	Demra Rd	92(3)92	28/3	10:15	2	L	E	m'cycle/mini		M35				nr ind staff quarters
99	Bisha-nr Hashem Ali Rd	11(4)92	3/4	16:45	6	L	E	ped/bus		M35	M32			
100	Mirdha Bari	14(4)92	4/4	11:00	6B	L	E	ped/truck					F45	

DEMRA THANA ACCIDENT ANALYSIS (cont)

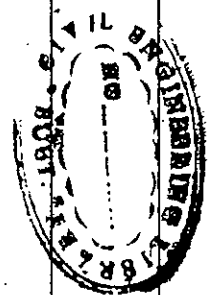
NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/INT	DIR	MODES INVOLVED	VEH OCCUPANTS			PEDESTRIAN		COMMENTS
									FATAL	SER	MIN	FATAL	SER	
101	Shani Rakha	28(4)92	8/4	10:00	6A	L	E	ped/bus					M(20,35)	
102	Saidebad	33(4)92	9/4	11:30	1	I	E	b'taxi/bus						Janapath Crossing
103	Biswa Rd	37(4)92	10/4	05:15	2	L	E	r'van/mini	M30					
104	Jurail Rail Gate	52(4)92	15/4	06:00	6B	L	N	ped/bus					F60	
105	Jatrabari-Moha Sharak	73(4)92	22/4	00:35		I		jeep/truck			1			Demra Official's jeep
106	Janapath Rd Crossing	82(4)92	24/4	09:30	1	I	N	m'cycle/truck		M50				
107	Jurail	100(4)92	28/4	20:10	6B	I	S	ped/truck					F7	road crossing
108	Dolairpar	102(4)92	29/4	22:30	3	L	N	mini/truck						
109	Kutub Khali	103(4)92	30/4	09:45	2	L	E	car/truck		M(16,28,35)				
110	Jurail Rail Gate	1(5)92	1/5	00:45	6A	L	S	ped/jeep	M40	M40				M(30, 2 groups and electric p
111	Postagole	5(5)92	3/5	19:40	6	L	N	ped/mini					M35	
112	Sharar Bisha Rd	12(5)92	6/5	11:10	6	L	E	bus	F60					Sanapara
113	Saidebad-Janapath	13(5)92	6/5	07:30	1	I	E	rick/bus	M(32,40)					
114	Saidebad Bus Terminal	19(5)92	7/5	08:00	3	I	N	b'taxi/bus		M(32,40)				
115	Jurail Rail Gate	20(5)92	8/5	16:00	6B	L		ped/truck		M30				M42 truck on wrong side nr petrol pump
116	Occidental	21(5)92	8/5	20:10	3	L	W	mini/bus		M(22,30,42)				
117	Badsha Mia Rd	35(5)92	14/5	14:00	3	L	E	mini/mini		5M			M30	
118	Jurail Rail Gate	50(5)92	19/5	17:30	6	L	S	ped/truck						M32
119	Ghit songit Cinema Hall	54(5)92	20/5	13:45	6	L	S	ped/tempo						M40
120	Saidebad Terminal	61(5)92	24/5	18:00	2	L	N	rick/truck		M35				
121	Saidebad Bus Terminal	62(5)92	24/5	21:45	6	L		ped/bus						M37
122	Kutub Khali	2(6)92	1/6	09:10	2	L	W	rick/mini		M40				
123	Sonir Akhra Bisha Rd	37(6)92	10/6	05:00	2	L	E	m'cycle/bus		M35				
124	Kutub Khali	41(6)92	10/6	23:30	5	L	S	bus/truck		3M				truck standing nr petro
125	Saidebad Bridge	42(6)92	10/6	22:30	6	L	S	ped/bus						M40 nr bridge
126	Shonir Akhru Bisha Rd	43(6)92	11/6	15:45	6	L	W	ped/bus					M60	cowboy injured
127	Kutub Khali Bisha Rd	48(6)92	13/6	15:30	5	L		ped/car						talking on roadside
128	Saidebad/Janapath	57(6)92	13/6	11:00	2	L	E	rick/mini/mini		M32				
129	Kutub Khali Bisha Rd	98(6)92	14/6	09:30	6B	L	S	ped/mini		M35				
130	Saidebad Bus Terminal	99(6)92	7/6	21:30	3	L	N	m'cycle/bus	M36					M45
131	Kazlu Dhaka Demra Rd	105(6)92	24/6	23:15	2	L	W	b'taxi/mini						
132	Chandra Toil Ral Rd	109(6)92	25/6	07:00	3	L	W	b'taxi/micro		M36				
133	Rairbag	110(6)92	28/6	15:10	2	L	S	b'taxi/bus	M32	2M				
134	Samad Super Mkt	113(6)92	29/6	06:00	6A	L	N	ped/m'cycle						M42 b'taxi hit and overturned

GULSHAN THANA ACCIDENT ANALYSIS (July 91-June 92)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/ INT	DIR	MODES INVOLVED	VEH OCCUPANT			PEDESTRIAN		COMMENTS
									FATAL	SER	MIN	FATAL	SER	
1	Banani-Airport Rd	9(7)	3/7	01:00				ped/truck				1		
2	Gulshan Ave/Rd 123	39(7)	15/7	12:30	1			ped/truck					1	
3	nr Hossain Mkt	43(7)	16/7	13:00	1			ped/car				1		
4	Progat Sarani-Natur BZ	58(7)	25/7	22:10	6B	L	N	ped/car					1	driver beaten
5	Banani-Airport Rd	7(8)	4/8	13:30	2	L	S	mini/truck		1				
6	Banani/Rose Valley Video	16(8)	8/8	18:00	2	L	S	b'cycle/car		1				
7	Banani/Chairman Bari	26(8)	14/8	10:30	6B	L	N	ped/mini					1	
8	Banani/Naval Staff Hdqrt	32(8)	17/8	19:15	3	L	S	mini/micro		1				
9	Mohakhali Wirleess Gate	66(8)	28/8	20:15	6B	L		2 ped/bus				1	1	
10	Banani/Dhaka Gate	74(8)	30/8	12:00	6B	L	S	ped/mini					1	
11	petrol pump nr Dhaka Gate	5(9)	2/9	14:00	2	L	N	ped/rick/micro		1				
12	Kakoli Crossing	30(9)	12/9	15:30	6B	I	N	ped/micro/bus					1	fleeingbus hit micro
13	Mohakhali Bus station	43(9)	17/9	08:30	1	L	S	baby/truck		1				
14	Banani petrol pump	46(9)	17/9	19:00	6	L	N	ped/bus				1		fell alighting after Rampura Brdg
15	Moddhe Badda	47(9)	19/9	07:50	1	L	N	car/car						
16	Banani/Soldier's Club	50(9)	21/9	10:00	2	L	N	mishuk/mini		1				
17	Moddhe Badda	60(9)	23/9	15:45	2	L		rick/truck	1					female killed
18	Banani/Chairman Bari	67(9)	25/9	20:00	6B	L	S	ped/car				1		
19	Moddhe Badda	72(9)	27/9	14:10	6A	L	N	ped/mini				1		7 yr old island damaged
20	Kakoli Crossing	78(9)	28/9	14:00	5	I	N	mini						
21	Rampura Bz	15(10)	4/10	14:45	1	L	N	baby/micro		1				
22	Mohakhali-Gulshan Rd	23(10)	6/10	13:30		L		car						Tk 30K wall damage hit passenger shed
23	Banani bus stand	26(10)	8/10	05:30		L		bus						
24	Kakoli Crossing	42(10)	13/10	12:30	6B	I		ped/car				1		
25	Kakoli Crossing	49(10)	16/10	15:10	6B	I	S	ped/micro				1		
26	Kakoli Crossing	58(10)	21/10	08:30	7	L	S	bus/bus			3			Tk 26,000 cow hurt
27	Banani/Rd 7	59(10)	21/10	12:00		L		bus						
28	Banani/Chairman Bari	60(10)	22/10	09:30	3	L	N	m'cycle/mini	1					

GULSHAN THANA ACCIDENT ANALYSIS (cont)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/ INT	DIR	MODES INVOLVED	VEH OCCUPANT			PEDESTRIAN		COMMENTS	
									FATAL	SER	MIN	FATAL	SER		
29	Middle Baddha/Rampura	67(10)	24/10	17:00	6A	L		ped/bus							
30	Banani Rail Crossing	76(10)	28/10	10:00	1	L		m'cycle/mini.					1		Shomail Remal Shop
31	Noya Nagar	84(10)	30/10	15:00	6	L	N	ped/truck							Tk 30,000 damage
32	Gulshan 2	1(11)	1/11	23:45	2	L	N	ped/jeep					1		old woman killed
33	Baridhara/Hs 65 main rd	2(11)	2/11	08:15	2	L	L	b'cycle/micro							minor injuries
34	Gulshan Park	4(11)	2/11	10:15	2	L		rick/car		2					
35	Kakoli X	7(11)	4/11	15:40	2	I	S	rick/bus		1					mother & daughter
36	Middle Baddha	15(11)	7/11	05:00	6B	L	S	ped/car							bus brakes failed
37	Middle Baddha	16(11)	8/11	06:30	6B	L	S	ped/car					1		Baitul Aman Mosque
38	Banani/Army Stadium	27(11)	14/11	19:30	6	L		ped/?					1		nr Hossain Mlt Mosque
39	Cantonment Rail Crossing	32(11)	19/11	18:00	6B	L	S	ped/mini					1		
40	Banani/Mohakhali	2(12)	1/12	11:15	1	L	S	bus/bus	1						bus pulled out
41	Gulshan No/Am Express Bar	4(12)	1/12	08:30	3	L	W	rick/car		1					
42	Mohakhali/Tejgaon	7(12)	4/12	19:30	3	I	N	pick-up/bus				3			army pick-up
43	Progati Sarani/New Airport	9(12)	7/12	15:00	6A	L	N	ped/car					1		waiting for bus
44	Noya Nagar	17(12)	10/12	14:15	6B	L	N	ped/truck							girl killed
45	Kernal Attaturk/Rd 4	21(12)	13/12	16:45	1	L	W	car/jeep					1		Tk 20,000 damage
46	Banani/Rd 7	23(12)	14/12	11:45	1	I	W	car/truck							Tk 5,000 damage
47	Banani/Chairman Bari	43(12)	24/12	18:30	3	L	N	jeep/mini							Tk 10,000 damage
48	Mohakhali petrol pump	46(12)	28/12	15:30	3	L	N	mini/mini							Tk 12,000 damage
49	North Baddha/Natun Bz	3(1)	4/1	15:30	6A	L	N	ped/micro					1		going to mkt
49A	Progati Sarani	4(1)	5/1	08:45	3	I	S	tempo/truck	7						nr Japanese School
50	nr Amtoli Crossing	5(1)	5/1	20:45	6B	L	N	ped/mini					1		nr Kuwait Embassy
51	Gulshan 2/Airport	15(1)	8/1	11:00	6A	L	S	ped/m'cycle							
52	Banani/Mohakhali	18(1)	9/1	09:30	3	L	N	cycle/mini	1						Rampura TV center
53	Rampura/Badda	24(1)	16/1	06:00	6B	L	N	ped/b'taxi					1		
54	nr Dhaka Gate	36(1)	22/1	08:15	3	L	N	micro/bus		2		3			
55	Banani	39(1)	24/1	14:00	3	I	W	car/truck							
56	Gulshan 1	43(1)	25/1	12:00	2	I		car/b'taxi							Tk 4,000 damage
57	Banani/Mohakhali	53(1)	28/1	10:00	6	L		ped/bus							testing car
58	Rampura/Baddha	2(2)	30/1	19:00	2	L		m'cycle/mini		1			1		pass. alighting nr Gulshan Mkt 10



GULSHAN THANA ACCIDENT ANALYSIS (cont)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/INT	DIR	MODES INVOLVED	VEH OCCUPANT			PEDESTRIAN		COMMENTS
									FATAL	SER	MIN	FATAL	SER	
59	Mohakhali	N/A	1/2	14:30				ped/car					1	
60	Banani/Naval Staff Hdqrt	15(2)	7/2	14:45	1	L	S	b'taxi/jeep			1			
61	Banani/Dhaka Gate South	33(2)	14/2	19:05	6	L		ped/bus				1		
62	Banani Rail Crossing	40(2)	19/2	21:30	6	L	N	ped/mini				1		
63	Mohakhali Metro Clinic	56(2)	25/2	20:00	2	L		rick/truck		2				
64	Kemal Attaturk/Moghul	58(2)	26/2	07:30	6	L		ped/micro					1	micro w/no lights
65	Bari/Natun Bz	60(2)	27/2	14:30	6	L		ped/truck				1		
66	Banani/Dhaka Gate	70(2)	29/2	21:30	2	L	N	b'cycle/car				2		car ran red light
67	Banani/Chairman Bari	5(3)	3/3	21:30	6B	L		ped/truck				1		
68	Banani/Rd 9	13(3)	8/3	17:15	6B	L		ped/car					1	child killed - w/mom
69	Mohakhali Bus Station	15(3)	9/3	15:15	2	L	N	mini/truck		2				standing truck
70	Banani/Chairman Bari	26(3)	18/2	10:15	2	L		tempo/mini					1	
71	Badda	N/A	16/3	19:30				ped/micro					1	
72	Banani/Chairman Bari	48(3)	22/3	15:30	6B	L	S	ped/mishuk				1		
73	Mohakhali Rail X	66(3)	31/3	16:35	2	I	N	car/bus			1			
74	Banani/Natun Bz	2(4)	1/4	14:00	6B	L	S	ped/b'taxi					1	7 yr girl in zebra X
75	Baridhara	8(4)	3/4	16:30	6	L	S	ped/micro				1		
76	Amtoli Rail X	37(4)	15/4	13:15	2	L	S	b'taxi/mini		1	1			
77	Kakoli	54(4)	24/4	10:45	1	I	S	tempo/mini		3				
78	Gulshan No/Aust HC	67(4)	29/4	22:30	2	L	S	m'cycle/micro		1				
79	Gulshan So/nr Iraq Em	7(5)	3/5	07:30	1	L		m'cycle/car		1				car violated signal
80	Baridhara/nr Saudi Embassy	17(5)	7/5	7:20	6	I		ped/car				1		old woman killed
81	Amtoli pass shed	27(5)	11/5	11:30	6	L	N	ped/bus				1	3	waiting for bus
82	Banani/Rd 11/Airport Rd	54(5)	31/5	08:00	6A	L		ped/mini				1	3	lost control/overturn
83	Moddhe Badda	7(6)	4/6	9:45	6B	L		ped/car					1	after bridge
84	Baridhara - nr bridge	12(6)	5/6	10:45	3	L		m'cycle/b'taxi		1				
85	Banani/Chairman Bari	20(6)	9/6	20:10	6B	L		ped/truck				2		
86	nr Banani R/way station	22(6)	10/6	17:30	2	L	N	b'taxi/truck				1		
87	Gulshan No 1 Rd 7/8	27(6)	16/6	11:15	1	I	W	b'taxi/car		1				

MIRPUR THANA ACCIDENT ANALYSIS (July 91-June 92)

	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/INT	DIR	MODES INVOLVED	VEH OCCUPANT			PEDESTRIAN		COMMENTS
									FATAL	SER	MIN	FATAL	SER	
1	Pollabi Police	1(7)91	30/6	22:00	3	L		car/truck	OUT OF SAMPLE FRAME				truck on wrong side	
2	X14 Police Quarters	101(7)91	19/7	19:00		L		ped/car				M7		Mir-Katchuket Rd
3	Kallyanpur Bus Stand	114(7)91	24/7	13:45	6B	L		ped/mini.				M25		coming from N
4	NR Clinic, Sec 10 (E side)	25(8)91	5/8	16:30	7	I		b'taxi/bus		4				bus fast/roundabout
5	Insulator Office		14/8	16:20				ped/b'taxi					1	
6	Ameo Market	91(8)91	22/8	09:15	7	L		tempo/mini	3	1				mini overtook
7	Rokeya Road(Sharapara)	63(9)91	16/9	05:40		L		ped/mini					1	
8	Gabtali Cattle Gate		30/7	18:00				ped/truck					1	
9	Darus Salam Police Box(S)	36(10)91	6/10	09:00	6B	L		b'taxi/ped			1			
10	Insulator Office	61(10)91	10/10	17:10		L		tempo/ped					1	nr Rubber Factory
11	Kallyanpur Bus Station		21/10	23:10				m'cycle/truck		1				
12	Darus salam Rd		18/10	11:00				ped/truck				M50		
13	Moon Moon Hotel-DS Rd	171(10)91	31/10	18:20		L		ped/bus				M25		
14	Kazipara	23(11)91	6/11	13:30		L	S	ped/car					1	car came from N
15	Khaja Nama Market	25(11)91	6/11	16:00	6B	L		ped/mini					1	
16	Wakapa Kallani Gate		7/11	09:15				rick/mini		1				
17	10 No Gate Chanker	36(11)91	9/11	14:00		L	N	ped/mini					1	minibus from South
18	44/G/C Emaran Backta		10/11	16:25				ped/bus					2	
19	Yesha Super Mkt-Gabtali	61(11)91	14/11	08:10		L		ped/bus					1	
20	Gabtali Bus Terminal	81(11)91	20/11	07:30		L		ped/?					1	RHD roller hit ped
21	Mirpur C Block	88(3)92	17/3	14:00		L		ped/truck				M50		nr WASA pump hse
22	Sherapara Bus Stand	101(3)92	19/3	09:00		L		ped/mishuk				M50		mishuk from No.10
23	Shial bari Rd	107(3)92	20/3	15:30		L		ped/truck				M25	2	
24	Palabey	156(4)92	29/4	01:00		L		ped/truck				M55		
25	Missionary Sch (10 No)	47(5)92	3/5	14:40		L		ped/tempo				M17		south Roundabout
26	Darusalam Rd	13(5)92	3/5	15:15		L		ped/truck				M10		sand truck hit boy
27	10 No. Crossing	47(6)92	6/6	13:40		I		ped/mishuk					1	
28	Sherapara	53(6)92	7/6	18:20	8	L		bus						minibus helper killed



MOTIJHEEL THANA ACCIDENT ANALYSIS (July 91-June 92)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LNK/ INT	DIR	MODES INVOLVED	OCCUPANT			PEDESTRIAN		COMMENTS
									FATAL	SER	MIN	FATAL	SER	
1	24 storied bank	10(7)	4/7	08:45	2	L	W	b'taxi/mini		1				Toynbee Circular
2	Dainik Bangla Crossing	33(7)	19/7	13:50	6B	I	W	ped/truck				1		
3	Agrani Bank	44(7)	25/7	21:25	2	L	E	rick/truck		2				
4	Mandarin, Purana Paltan	46(7)	27/7	13:45	6A	I	E	ped/car					1	waiting for bus
5	UBL Crossing	10(8)	5/8	22:30	1	I	S	truck/truck		1				truck carrying steel
6	UBL Crossing	14(8)	7/8	13:40		I	W	ped/mini					1	old man got off bus
7	Fakirapul Petrol Pump	19(8)	10/8	11:00	2	L	E	rick/car					1	
8	Outer Circular Rd	27(8)	11/8	12:45	3	L	E	rick/bus	1	3				
9	Chanmari Bat	29(8)	12/8	18:35	5	I	N	tempo		2				hit island
10	Shaninagar	33(8)	13/8	09:35	2	I		mini			3			mini ran red light
11	near Al Helal Puthi Ghar	56(8)	20/8	16:10	1	I	E	ped/car		2				
12	Santinagar-Chinese Rest.	65(8)	25/8	09:45	6B	L		ped/mini						minor injury
13	Dhaka Stadium(west side)	77(8)	28/8	20:30	6B	I	S	ped/mini					1	
14	Dainik Bangla Crossing	78(8)	29/8	08:30	1	I	E	bus/truck		3				truck ran red light
15	Rajuk Office	19(9)	8/9	15:30	8	L	N	tempo					1	tempo speeding
16	DIT Road	38(9)	18/9	14:00	1	I	W	mini/ambulance		1				
17	179 Arambug	61(9)	28/9	07:30	2	L	W	rick/car		1				
18	Rajarbag Police Line, No1 G	62(9)	28/9	07:45		L	S	ped/mishuk						minor injury
19	Shajahan Rail Gate(west)	69(9)	25/9	19:09	2	I	S	rick/tempo					1	
20	48 Motijheel CA	78(9)	29/9	22:45	6B	L	S	ped/bus				1		
21	Chamber of Commerce	32(10)	10/10	09:20	1	L	N	rick/mini		2				rick cut across road
22	Rajarbag Police Line, No2 G	55(10)	17/10	15:30	1	I	E	rick/truck			2			
23	Pirjangi Mazar	60(10)	19/10	07:15	6B	L	E	ped/jeep					1	
24	Police Hospital Crossing	80(10)	29/11	17:00	2	L	E	rick/mini		3				
25	Sonali Bank Crossing	15(11)	4/11	19:30		I		ped/mini					1	
26	Govt. R Colony crossing	21(11)	8/11	08:30	3	L	N	jeep/bus			2			
27	Post Office/high School	27(11)	11/11	16:30	7	L	E	m'cycle/car						3 on m'cycle
28	Baitul Mukarram(south gate)	59(11)	20/11	15:30	6B	I	S	ped/mini						minor injury
29	Golap ShahNagar	3(12)	1/12	21:00	1	I	W	rick/b'taxi				1		
30	Bangladesh Bank Crossing	5(12)	1/12	22:00	1	I	E	b'taxi/bus			2			Amin Ct
31	Bangladesh Bank Crossing	25(12)	10/12	10:30	6B	I		ped/b'taxi						minor injury/zebra X
32	Gulistan Intersection	(12)	10/12	17:15				jeep/bus						
33	Bijoy Nagar	(12)	21/12	22:50				car/truck						
34	UBL Crossing	(12)	31/12	06:00				ped/car				1		
35	Rajarbag Pump Crossing	6(1)	3/1	15:10	1	I	W	b'taxi/bus		1				
36	Topkhana Crossing	11(1)	4/1	09:40	2	I	N	car/min/bus			5			mini wait at signal
37	IFIC Bank	41(1)	28/1	21:00	6A	I		ped/truck					1	
38	Mosque nr DIT	59(1)	23/1	05:00	6B	L		ped/tempo					1	
39	opp Fakirapul	79(1)	30/1	19:30		L		ped/bus					1	

MOTUHEEL THANA ACCIDENT ANALYSIS (cont)

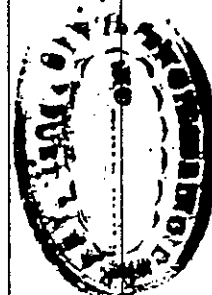
NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/ INT	DIR	MODES INVOLVED	VEH OCCUPANTS			PEDESTRIAN		COMMENTS
									FATAL	SER	MINOR	FATAL	SER	
40	Baitul Mukarram(south)	80(1)	31/1	19:00	6B	I	S	ped/mini					1	
41	nr Janata Head Office	15(2)	7/2	13:30	2	I	E	m'cycle/mini				1		
42	nr Santinagar Intersection	36(2)	20/2	09:30	2	L	E	b'taxi/mini		2				
43	nr Chamber of Commerce	37(2)	21/2	16:00	3	L	S	mini/bus		3				
44	Dainik Bangla Crossing	57(2)	29/2	08:00	3	I	E	tempo/mini		1				
45	nr Police Hospital Signal	45(3)	13/3	06:45	3	I	S	b'taxi/tempo		2				
46	nr Fakirapul petrol pump	46(3)	14/3	06:00	2	L	S	pushcart/truck		1				
47	Hotel Al-Halal	48(3)	15/3	16:30	2	L		rick/truck					1	
48	Central Govt. School	58(3)	17/3	16:20	2	L	N	m'cycle/truck	1					
49	Baitul Mokkarram(south)	23(4)	6/4	13:45	6B	I	E	ped/bus						minor injuries
50	nr Water Dev Board	26(4)	6/4	22:00	6B	L		ped/m'cycle					1	
51	Gulistn Cinema Hall(east)	38(4)	13/4	06:50	6B	L	S	ped/bus				1		
52	Fakirapul Katcha BZ	47(4)	16/4	09:00	6B	L	S	ped/m'cycle					2	
53	Stadium(western side)	5(5)	2/5	11:30	6A	L	S	ped/mini					1	
54	nr Purana Paltan petrol pump	10(5)	4/5	03:30	1	I	E	b'taxi/truck	1					
55	UBL Crossing (east)	25(5)	9/5	05:05		I		b'taxi/truck		1				
56	Bangladesh Bank Crossing		12/5	15:40				ped/jeep						1
57	Bango Bhaban No3 Gate	29(5)	12/5	12:30		L		b'taxi/mini		1				
58	Police Hospital Crossing	34(5)	13/5	22:30	8	L	N	b'taxi				4		
59	Pir Jangi Mazar	35(5)	14/5	01:00	2	L		rick/truck						2 minor
60	Purana Paltan Intersection	72(5)	22/5	12:00	3	I	N	truck/truck				4		
61	Rajarbag Police Line(east)	94(5)	28/5	05:30	6B	L	S	ped/truck					1	old man/sandtruck
62	Motijheel Colony Mosque	108(5)	31/5	15:00		L	S	ped/tempo						minor
63	Fakirapul, BRTC bus Stand	91(5)	26/5	14:30		L	S	ped/tempo						1
64	nr Pirjangi Mazar	1(6)	1/6	10:10				bus/truck						bus speeding
65	Al-Helal Police Box	2(6)	1/6	12:15	2	L	E	rick/car		1				
66	Kakrail Crossing	4(6)	1/6	17:30		I	N	ped/truck						constable hit - minor
67	Dainik Bangla Crossing	6(6)	2/6	18:30		L	E	ped/mini						1
68	nr Pirjangi Mazar	8(6)	2/6	12:40	6B	I	W	ped/b'taxi						1 girl hit after left turn
69	Minarva Travels	9(6)	3/6	05:25	6B	L	S	ped/truck						1
70	Dainik Bangla Crossing	17(6)	4/6	20:25	2	L	N	b'taxi/tempo				2		
71	Malibag Intersection	35(6)	8/6	09:30	6B	L	E	ped/micro						ped - minor injuries
72	Hotel Purbani(north side)	36(6)	8/6	16:00	2	I		rick/tempo						rick damaged
73	Khadder Market	39(6)	9/6	06:10	6B	L	S	ped/bus					1	human hauler
74	Bangladesh Bank Crossing	46(6)	11/6	07:00	2	I	W	rick/mini		1				
75	Rajarbag Police Line Crossin	47(6)	11/6	20:30	3	L	W	truck/truck		4				Ston truck/minitruck
76	24 storied building	56(6)	13/6	13:00	3	I	N	mini/mini		2				
77	nr Colony Katcha BZ	84(6)	23/6	21:00	6A	L		ped/bus						1 hit woman behind
78	Al-Helal Police Box	89(6)	23/6	20:40	6B	L	W	ped/car					1	Kamalapur Rd

RAMNA THANA ACCIDENT ANALYSIS (July 91 - June 92)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/INT	DIR	MODES INVOLVED	OCCUPANT		PEDESTRIAN		COMMENTS
									FATAL	SER	FATAL	SER	
1	Engineering Institute	7(7)	2/7	08:30	6B	L	N	ped/mini			1		
2	VVIP Rd	34(7)	8/7	0930	6B	L	S	ped/mini			1		
3	Topkhana Rd/Secretariate	35(7)	8/7	09:30	2	L	E	rick/mini			1		nr Diabetic Hosp. gate
4	Bangla Motor	76(7)	16/7	12:50	3	I	W	b'taxi/truck	1				vehicle damaged
5	Engineering Institute	84(7)	19/7	22:00	3	L	E	mini/truck	4				
6	nr Tennis Club	92(7)	21/7	12:50	2	L	E	car/mini			1		car pass hurt
7	Bangla Motor	103(7)	25/7	21:30	6B	I		ped/b'taxi				1	female ped
8	Shishu Park	107(7)	25/7	17:30	6	L		ped/b'taxi				3	children hurt
9	Santinagar	4(8)	2/8	13:45	3	I	S	b'taxi/bus			1		
10	nr Shahid Dullah Hall	9(8)	3/8	15:30	7	L	S	rick/bus			1		
11	Bijoy Nagar	33(8)	9/8	11:45	6B	L	N	ped/bus				1	human hauler hit old man
12	Bangla Motor	47(8)	12/8	19:50	1	I	N	m'cycle/mini	1				mini violated signal
13	Press Club Rd	50(8)	13/8	04:30	6	L	S	ped/car				1	constable hit
14	Chankapol	53(8)	13/8	13:45	1	I	W	m'cycle/bus				1	
15	Nilkhet	68(8)	16/8	19:30	5	I	N	rick/truck		1			lost wheel
16	Bijoy Nagar	83(8)	21/8	12:45	7	L	S	rick/bus		1			Hotel Shaheed
17	Engineering Institute	99(8)	23/8	11:30	6	L		ped/car				1	police found injured
18	Shahbag	108(8)	24/8	17:30	2	L	E	m'cycle/mini			1		at police control box
19	nr Ramna Park	102(8)	25/8	10:10	2	L		m'cycle/truck	1				student leader killed
20	Mogh Bazar (MISSING)		27/8	08:00				ped/car					
21	Railway Hospital	116(8)	27/8	21:45	6	L	N	ped/mini					
22	Topkhana Rd	121(8)	23/8	18:00	1	I	S	mini/mini		2			2 bus lost control
23	Fulbaria	131(8)	30/8	10:30	6B	I	N	ped/truck					1 girl hit
24	PG Crossing	23(9)	8/9	06:20	1	I	S	ped/bus			1		
25	Eskaton	34(9)	10/9	16:00	6	L	E	ped/bus				1	nr Passport Office
26	Engineering Institute	36(9)	11/9	11:30	3	L	E	m'cycle/bus		1			
27	Bangla Motor	69(9)	20/9	23:30	6	L	S	ped/truck					
28	DIT Rd/Malibag Rail X	87(9)	23/9	18:30	2	L	N	rick/tempo		1			past crossing
29	Press Club Rd	91(9)	25/9	09:30	6B	L	S	ped/mini				1	zebra crossing
30	PG Crossing	116(9)	29/9	08:15	2	L		rick/mishuk/mini			1		
31	Shishu Park	3(9)	2/10	04:45	3	L	W	jeep/truck		8			
32	Kakrail	25(9)	8/10	10:30	2	L	E	ped/jeep/bus					
33	nr UBL Crossing	32(9)	9/10	15:00	6	L	E	ped/mini				1	
34	nr Idgon Field	55(9)	18/10	10:30	6B	L	N	ped/bus				1	nr Little Flowers school

RAMNA THANA ACCIDENT ANALYSIS (cont)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/INT	DIR	MODES INVOLVED	OCCUPANT		PEDESTRIAN		COMMENTS
									FATAL	SER	FATAL	SER	
35	nr Ramna Park gate	56(10)	18/10	8:00	6B	L	S	ped/mini				1	
36	Kakrail Mosque	70(10)	21/10	6:00	2	L	S	rick/bus	1	1			
37	T&T Intersection	81(10)	23/10	13:30	6B	I		ped/car				1	witness reported
38	VIP Road	46(11)	12/11	8:30	1	I		b'taxi/car		1			
39	Idgon Field	50(11)	15/11	9:00	5	L	N	mini		1			
40	Mogh BZ	60(11)	18/11	18:30	2	I		b'taxi/truck		4			
41	Zero Point	65(11)	19/11	14:00	2	I	N	b'cycle/bus	1				driver escaped
42	Topkhana Crossing	67(11)	19/11	17:00	6B	I		ped/mini				1	Moon Garden Rest
43	Fulbaria	69(11)	20/11	3:00	3	I	W	truck/truck		3			
44	BangaMkt	90(11)	20/11	6:30	6A	I	N	ped/mini				1	hit island nr comm centre
45	Bangla Motor	89(11)	26/11	21:45	6	L	N	ped/truck			1		
46	New Eskaton	92(11)	27/11	13:50	2	I	W	rick/truck	1				
47	Agani Rd	97(11)	28/11	11:00	6B	I	S	ped/mini		1	1		minibus driver hurt
48	Topkhana Rd	21(12)	6/12	12:30	6	L		ped/b'taxi				1	female in procession
49	Katabon	22(12)	6/12	11:00	6	I		ped/b'taxi				2	
50	Bangla Motor	26(12)	8/12	3:00	6A	I		ped/b'taxi			1		paper collector killed
51	Poribag	43(12)	11/12	9:45	1	I	S	rick/bus		1			r'shaw violated signal
52	DIT Road	44(12)	12/12	17:30	6	L	N	ped/bus				1	
53	PG Crossing	48(12)	15/12	9:40	2	L	S	m'cycle/mini		1			m'cycle stnding nr Diabetic H
54	New Circular Road	49(12)	15/12	19:05	2	L	E	rick/bus		1			Century Arcade
55	Katabon Crossing	53(12)	18/12	2:30	1	I	N	mini/truck		1			mini driver hurt
56	VIP Road	75(12)	27/12	10:30	1	L	N	m'cycle/car		1			
57	Mogh Bz	79(12)	30/12	8:30	2	L	E	rick/bus	1				
58	UBL Crossing	58(12)	31/12	18:45	2	L	E	rick/mini		1			
59	Bailly Rd	3(1)	1/1	17:00	1	L	E	m'cycle/b'taxi		1			by Swiss Bakery
60	nr Ramna Park	22(1)	4/1	8:20	2	L	W	car/tempo		1			tried to overtake
61	Kakrail	47(1)	10/1	8:00	1	I	N	b'taxi/car		1			PM Office
61A	Mouchak Crossing	49(1)	10/1	20:00	2	I	N	rick/truck		1			r'shaw did U-turn
62	Shishu Park	50(1)	11/1	14:00	7	L	W	car/mini		1			nr RHD Office
63	Kakrail	53(1)	12/1	1:00	6B	I	S	ped/car					opp Manpower Office
64	Bangla Motor	79(1)	19/1	21:00	2	I	W	rick/mini		1			just past crossing
65	Mogh Bz	80(1)	30/1	10:45	5	L	W	truck					hit electric pole
66	nr High Court	94(1)	24/1	4:00	5	I	S	truck					hit tree
67	Medical College Rd	97(1)	26/1	15:00	6	L		ped/ambulance				1	inside gate
68	New Eskaton Rd	112(1)	27/1	22:00	3	L	W	m'cycle/b'taxi		1			nr Chinese Rest
69	Circular Rd	114(1)	28/1	17:00	1	L	E	rick/bus	1	1			universtiy bus



RAMNA THANA ACCIDENT ANALYSIS (cont)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/INT	DIR	MODES INVOLVED	OCCUPANT		PEDESTRIAN		COMMENTS
									FATAL	SER	FATAL	SER	
70	Press Club	122(1)	30/1		2	L	W	rick/bus		1			bus speeding
71	Sidheswari Rd	126(1)	31/1	18:30	2	L	W	b'cycle/b'taxi		1			
72	Public Woks Dept	130(1)	31/1	20:45	6	L	S	ped/mini					mini speeding
73	Engineering Institute	20(2)	7/2	19:30	6B	L		ped/mini			1		
74	Circular Rd	24(2)	9/2	06:30	6B	L		ped/mishuk			1		
75	Poribag Crossing	36(2)	14/2	10:25	1	I	S	b'taxi/mini		1			old man crossing road
75A	Hatipool Intersection	39(2)	14/2	23:30	2	I	N	rick/b'taxi		1			b'taxi ignored constable signal
76	Press Club Crossing	57(2)	19/2	21:00	1	I	W	car/mini		1			hit while turning left
77	nr Press Club Crossing	59(2)	20/2	23:30	2	L	W	b'taxi/truck		1			car pass. injured
78	Mogh BZ	62(2)	21/2	08:00	7	L	N	b'taxi/bus	1				b'taxi violated signal
79	Eskaton Garden Crossing	67(2)	23/2	10:30	1	I	N	m'cycle/mini	1				passenger hanging on
80	High Court Crossing	70(2)	23/2	10:00	3	I	N	b'taxi/mini		2			mini speeding
81	Bijoy Nagar	78(2)	25/2	15:00	5	L	S	rick/mini		2			
82	Shishu Park	85(2)	27/2	13:00	3	L	W	m'cycle/truck		2			mini overtaking
83	Out?Circular Rd	90(2)	29/2	13:30	7	L	E	tempo/tempo		1			bumped into each other
84	Topkhana Rd	91(2)	29/2	11:30	6B	L	W	ped/car		1			1 Igloo ice cream shop
85	Nazrul Islam Ave	15(3)	4/3	15:30	2	L	W	b'taxi/bus		1			human hauler involved
86	University Rd	28(3)	6/3	14:30	6B	L		ped/mini			1		high speed
87	Mogh Bz	33(3)	8/3	11:00	2	L		rick/truck		1			Sunrise Chinese Rest
88	nr Ramna Park	45(3)	13/3	18:00		L		bus/truck		1			night coach
89	Fulbaria Bus Stand	54(3)	14/3	21:55	6A	L		ped/bus			1		died in hospital
90	Topkhana Rd	64(3)	17/3	11:00	6B	I	W	ped/mini					1 mini ran red light
91	Bangla Motor	67(3)	17/3	15:30	2	I	S	car/mini					1 car rearended at signal
92	Kakrail	69(3)	17/3	9:30	2	L	S	rick/car		1			wallah hurt
93	Engineering Institute	70(3)	17/3	21:45	3	L	W	car/car		2			
94	Maliibag Crossing	77(3)	19/3	19:00	6	I		ped/m'cycle					1
95	Shishu Park	108(3)	27/3	10:00	2	L		rick/mini		1			in middle of road
96	Barat Mogh Bazar	117(3)	28/3	2:00	6B	I	W	ped/b'taxi					1
97	nr PG Crossing	131(3)	31/3	14:00	6B	L	S	ped/mini					police made case
98	Stargate	26(4)	6/4	7:00	8	I	E	mini					overturned on right turn

RAMNA THANA ACCIDENT ANALYSIS (cont)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/INT	DIR	MODES INVOLVED	OCCUPANT		PEDESTRIAN		COMMENTS
									FATAL	SERIO	FATAL	SERIO	
99	Shantinagar	39(4)	10/4	15:00	8	I		tempo/bus		2			overturned & hit by truck
100	Old High Court Crossing	38(4)	10/4	19:20	3	I	S	rick/mini					at roundabout
101	Press Club Rd	40(4)	10/4	10:00	2	I	E	rick/mini		1			
102	Malibag	69(4)	18/4	17:30	6A	L		ped/truck				1	Polda Cinema Hall
103	Noyatala	72(4)	19/4	09:15	6B	L		ped/truck				1	Precadet School
104	High Court Crossing	77(4)	19/4	19:00	6B	I	S	ped/truck				1	helper driving—hit 5 rik
105	inner Circular Rd	82(4)	20/4	09:00	4	L	E	tempo	1				overturned, pass killed
106	VIP Rd/Kakrail	93(4)	23/4	10:40	3	L	S	mishuk/car		1			speeding
107	Nilkhet	121(4)	30/4	11:30	4	L		car		2			brake failure
108	Secretariat Gate	16(5)	5/5	10:30	2	I	S	m'cycle/car		1			m'cycle driver hurt
109	Paribag	21(5)	6/5	08:10	3	I		car/mini					
110	Kakrail	30(5)	7/5	13:00	3	L	S	ped/b'taxi					near Church
111	Star Gate Crossing	33(5)	8/5	10:00	1	I	E	rick/mini					
112	UBL Crossing/Purana	41(5)	10/5	11:00	2	L	N	car/truck					minor injuries
113	Sheraton Hotel	43(5)	10/5	22:30	1	I	N	car/jeep		1			car ran red light
114	nr High Court	51(5)	12/5	22:30	1	I	N	ped/jeep					
115	Malibag Level Crossing	53(5)	11/5	21:15	3	I	N	b'taxi/truck		2			Jaganath Hall
116	Shahī Mina Road	58(5)	14/5	10:30	1	I	S	car/mini		2			bicyclist killed
116A	Mouchak Crossing	73(5)	14/5	6:30	6A	I	E	ped/b'taxi				1	hit old man
117	PG Crossing	76(5)	18/5	14:15	1	I	E	b'cycle/mini	1				in front of PG mkt
118	PG Crossing	81(5)	20/5	16:30	6	L	W	ped/truck					
119	Nilkhet Crossing	87(5)	21/5	21:00	2	L	S	rick/car		1			
120	Katabon Crossing	90(5)	22/5	16:00	6A	L	N	ped/mini				1	
121	Bangla Motor Crossing	97(5)	24/5	07:45	6A	I	N	ped/truck				1	
122	Zero Point	98(5)	24/5	06:30	3	L	N	jeep/mini		1			
123	Circular Rd.	105(5)	25/5	12:00	2	L	W	rick/mini		1			Century Mkt
124	Eskaton Rd	131(5)	31/5	11:00	5	L	W	rick/m'cycle/mini		1			overtaking and swerved
125	Secretariate	2(6)	1/6	12:30	6B	I	S	ped/m'cycle				1	
126	Palash Crossing	43(6)	7/6	05:50	2	I	N	b'taxi/mini		1			b'taxi turning right
127	Segum Bagicha	47(6)	7/6	11:45	6A	L		ped/mini				1	reversed into children
128	PG Crossing	50(6)	8/6	16:15	7	I	W	car/truck					just motor damage
129	Fulbaria	67(6)	1/6	11:45	6A	L	W	ped/mini				1	car standing
130	Kakrail Crossing	75(6)	15/6	16:15	6B	I	E	ped/b'taxi				1	Chankerpool
131	Engineering Institute	87(6)	18/6	16:30	6B	L	E	ped/mishuk				1	nr Church Crossing
132	Bangla Motor	108(6)	21/6	13:45	6	I	S	ped/tempo				1	truck supplying goods.
133	Engineering Institute	119(6)	28/6	11:45	6B	L	E	ped/mini				1	
134	Kakrail Crossing	129(6)	29/6	18:50	1	I	E	b'cycle/b'taxi		1			nr Mosque
135	Eskaton	(6)	30/6	20:30				ped/b'taxi					

SABUIBAG THANA ACCIDENT ANALYSIS (July 91-June 92)





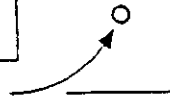
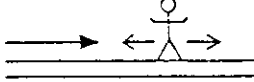
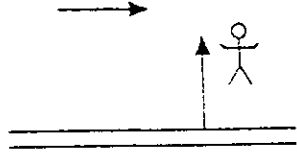
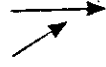
NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/ INT	DIR	MODES INVOLVED	VEH OCCUPANTS			PEDESTRIAN		COMMENTS
									FATAL	SER	MIN	FATAL	SER	
1	Basabo	5(7)	4/7	12:00	3	L	N	car/truck		M35				nr police camp
2	Malibagh BZ	52(7)	29/7	12:00	6B	L		ped/bus					M7	child crossing
3	TT Para	8(8)	3/8	19:30	6B	L	N	ped/truck				F30		nr Gopibag
4	Kamalapur HS	3(9)	2/9	11:15	6A	L	S	ped/truck				F12,M4	M(5,9)	BRTC bus hit school
5	Kamalapur HS	14(9)	7/9	19:15	5	L	N	ped/truck						v3eh damage-school h
6	Khilgaon	32(9)	19/9	08:30	2	L	W	rick/car/bus						north of crossing
7	Khilgaon	8(10)	7/10	21:45	2	L	W	ped/rick/mini					M15	
8	Moddha	10(10)	8/10	15:15	2	L	E	b'cycle/truck	M30					at tempo stand
9	Basabo TS	19(10)	12/10	16:00	3	L	E	car/tempo						
10	Khilgaon	52(10)	27/10	15:30	6A	L	E	ped/truck					F2	child sleeping in island
11	Malibag	18(11)	7/11	17:30	6	L	E	ped/micro					F11	nr community centre
12	Malibag	11(12)	11/12	18:30	6B	L	W	ped/truck				F7		
13	TT Para	30(12)	23/12	10:45	6B	L	N	ped/m'cycle					F10	Bosti area
14	Khilgaon Taltara SM	8(1)	3/1	09:00	3	L		car/jeep						veh damage-nr pol ca
15	Khilgaon Govt. PS	14(1)	7/1	16:45	3	L	E	rick/truck	M57					truck escaped
16	Magdapara BZ	16(1)	8/1	12:00	8	L	W	2 rick/truck		M45				Magda BZ-brakes fail
17	Rampura BZ	28(1)	25/1	20:30	2	L	S	rick/truck				M40	M(25,	East portion of DIT
18	Malibag BZ	46(1)	24/1	17:10	6B	L		ped/truck					F8	
19	Basabo	17(2)	15/2	13:30	6B	I	E	ped/truck				M65		right turn
20	TT Para	23(3)	15/3	14:30	3	L	S	b'taxi/truck	M30					
21	Basabo	27(3)	20/3	10:50	6B	L	N	ped/truck					M75	nr Mosque
22	Khilgaon	34(3)	24/3	17:30	3	I	N	3 rick/truck					M35	
23	Khilgaon	38(3)	25/3	05:30	6	L		ped/truck				F35		supposed suicide
24	Malibag Taltala SM	6(4)	2/4	13:30	6B	L		ped/car				F16		learner driver
25	Khilgaon	21(4)	12/4	16:40	5	L		ped/truck						Muslim misti shop dam
26	Khilgaon	29(4)	15/4	13:00	6	L	S	ped/truck				M30		Freedom fighter club
27	Khilgaon	31(4)	16/4	17:30	6B	L	S	ped/micro					M11	nr Model School
28	Kamlapur	41(5)	22/4	11:00	2	L	S	tempo/truck		M16				tempo helper hurt
29	Khilgaon	5(5)	27/5	15:00	6B	L		ped/m'cycle					M47	ped running across roa
30	Khilgaon	11(5)	14/5	11:00	2	L	S	rick/truck				F27		rickshaw pass died
31	Khilgaon	23(5)	16/5	16:30	6	I	S	b'taxi/ped		M5				
32	Rampura	37(5)	22/5	03:30	2	L	S	car/truck	M35	M32				front of TV center
33	Malibag SM	45(5)	27/5	20:20	6A	L	W	ped/truck	M37	M32				in front of Malibagh SM
34	Rampura	1(6)	1/6	05:00	6B	L	S	ped/mini				M60		nr TV station
35	Khilgaon	34(6)	27/6	11:30	3	L	W	rick/truck	F18	M38				wrong side of road

UTTARA THANA ACCIDENT ANALYSIS (July 91 - June 92)

NO	STREET NAME	CASE NUMBER	DATE	TIME	ACC TYPE	LINK/ INT	DIR	MODES INVOLVED	OCCUPANT		PEDESTRIAN		COMMENTS
									FATAL	SER	FATAL	SER	
1	Airport Roundabout	14(7)	15/7	05:40	2	I	N	b'cycle/truck	1				
2	Azampur Rajlakmi SC	33(7)	30/7	10:30	6B	L	N	ped/m'cycle				1	
3	Azampur Bus Stand	6(8)	10/8	21:30	6B	I	S	ped/truck					
4	Abdullapur	12(8)	15/8	10:00	6B	L	N	ped/pickup			1		
5	Azampur/Eastern Video	18(8)	18/8	20:00	2	L	SS	rick/mini				1	
6	Abdullapur	19(8)	19/8	21:05	1	I	S	car/bus	1	1			
7	Abdullapur	20(8)	22/8	16:20	6	L	S	ped/b'cycle/bus		1			
8	Jashirmuddin Rd	24(8)	31/8	13:45	3	L	S	bus/truck					1 ped hit by bike/bus
9	Azampur Bus Stand	5(9)	5/9	12:30	6A	I	N	ped/mini	3	1			100 metre before X
10	Azampur/US Dental Clinic	8(9)	13/9	06:30	6A	L	S	truck					1 bus hit waiting people
11	Abdullapur	5(10)	5/10	17:00	6	L					1		madman hit
12	Azampur/Eastern Housing	21(10)	17/10	20:10	2	L	N	car/bus			1		madwoman's body found
13	Azampur SC	12(11)	17/11	18:40	1	L		rick/truck					1 rt turn to Rd 7
14	Azampur	20(11)	30/11	07:30	1	L	E	car/mini	1	2			father died
15	Kashaibari Bz Rd	14(12)	11/12	22:25	2	L		b'taxi/truck					1 LGEB veh
16	Abdullapur Housing Dev	20(12)	17/12	19:15	2	L	N	m'cycle/mini		1			b'taxi stop/veh damage
17	Abdullapur nr Tongi Brdg	23(12)	27/12	16:15	2	L	N	b'taxi/mini					turning right
18	Azampur N/A		27/12	14:30				truck			1		turning right
19	Azampur/Sector 4	12(1)	18/1	10:10	2	L	N	car/micro			1		
20	Rajlokmi Highway	2(2)	5/2	14:30	2	L	N	car/micro		1			turning right
21	Abdullapur	6(2)	7/2	23:00	6A	L	N	ped/car		1			
22	Abdullapur	23(2)	17/2	23:45	3	L	N	tempo/truck		1		1	hit island first
23	Abdullapur nr Tongi Bdg	24(2)	20/2	12:30	2	L	N	b'taxi/oil tanker	1				truck no light
24	Airport Rd	28(2)	26/2	01:00	7	L	S	truck		2			
25	Abdullapur Bus Stand	30(2)	28/2	03:05	6A	L	N	ped/truck		2			
26	Abdullapur Bus Stand	22(3)	17/3	08:35	6B	I	N	ped/mini				1	woman sleeping on island
27	Gawait Bz Road	29(3)	25/3	14:30	3	L	E	m'cycle/truck				1	old man killed
28	Abdullapur	1(4)	3/4	07:30	6B	L	N	ped/mini		1			East side
29	Kachkira/East of RWY	12(4)	13/4	04:30	7	L	E	truck				1	crossing road
30	Azampur/Sector 4	18(4)	15/5	11:30	2	L	S	m'cycle/mini	2	2			carrying labourers
31	Azampur Bus Stand	30(4)	30/5	15:30	6	I	N	ped/jecp		1			Rajuk Eng on m'cycle
32	Alaol Avenue Crossing	31(4)	30/5	20:30	1	I	N	b'taxi/bus				1	Chinese Embassy veh
33	Abdullapur	4(6)	3/6	10:30		L	S	bus			1		b'taxi turned over
34	Azampur/Rd 28	12(6)	17/6	12:10	2	L	E	b'taxi/car	1				conductor threw pass out car standing/veh damage

Type of Road Accident

D.I.T.S.

1	2	3
		
Right Angle Collision	Rear-End Collision	Head-on Collision
4	5	6
		Movement Unknown
Off Road Accident	Hitting Fixed Object	Pedestrian Related
6A	6B	7
		
Ped Roadside	Ped Road Crossing	Sideswipe
8		
N/A		
Other		

APPENDIX-H

RHD Classification of Vehicles in Bangladesh

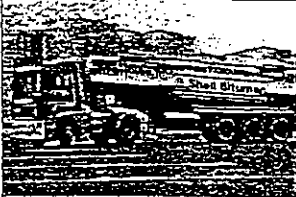

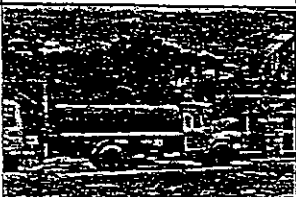
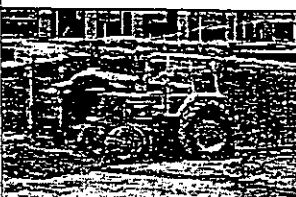




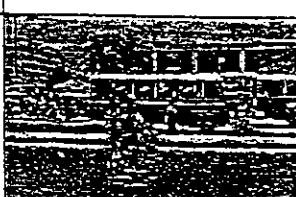
No.	CATEGORY	CHARACTERISTICS	TYPICAL VEHICLES			
1	HEAVY TRUCK	3 OR MORE AXLES				
2	MEDIUM TRUCK	2 AXLES OVER THREE TONNES UNLOADED WEIGHT				
3	SMALL TRUCK	2 AXLES UNDER THREE TONNES UNLOADED WEIGHT				
4	LARGE BUS	OVER 39 SEATS				
5	MINI BUS	16-39 SEATS				

Figure H.1: RHD classification of vehicles in Bangladesh

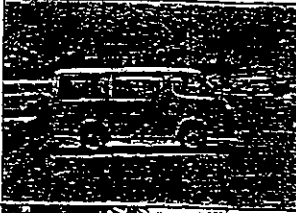



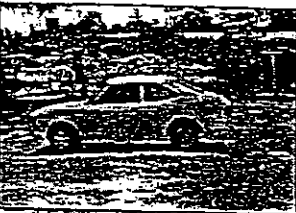
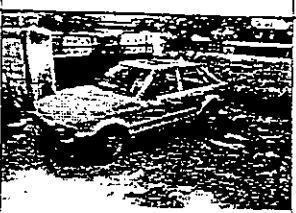


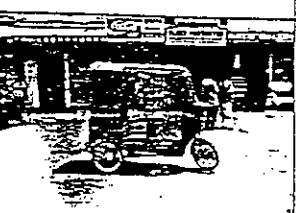
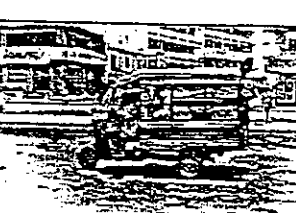


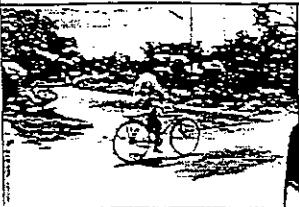
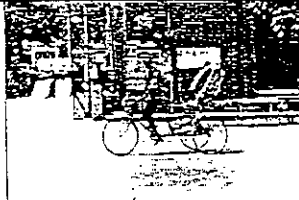
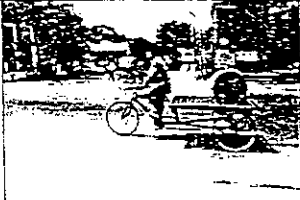
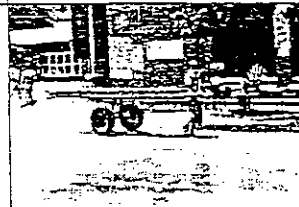

No.	CATEGORY	CHARACTERISTICS	TYPICAL VEHICLES			
6	MICROBUS	LESS THAN 16 SEATS				
7	UTILITY	PICK UPS AND FOUR WHEEL DRIVE VEHICLES				
8	CAR	ALL CARS AND TAXIS				
9	AUTO RICKSHAW	ALL THREE WHEELED MOTORISED VEHICLES				
10	MOTOR CYCLE	ALL TWO WHEELED MOTORISED VEHICLES				

Figure H.1: RHD classification of vehicles in Bangladesh (contd.)

No.	CATEGORY	CHARACTERISTICS	TYPICAL VEHICLES			
11	BICYCLE	PUSH BICYCLE				
12	CYCLE RICKSHAW	ALL THREE WHEELED NON MOTORISED VEHICLES				
13	CART	ALL ANIMAL AND PERSON DRAWN/PUSHED CARTS				

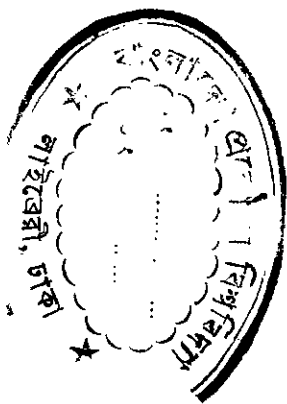


Figure H.1: RHD classification of vehicles in Bangladesh (contd.)