

ROADWAY MAINTENANCE

**Comparison of Ongoing Roadway Maintenance Projects by
Roads and Highways Department**

P.M. Shishir Ahmed Bappi

ID#163-47-257

Supervised

By

Dr. Mohammad Hannan Mahmud Khan

Assistant Professor & Associate Head

Department of Civil Engineering

Daffodil International University



**Department of Civil Engineering
Daffodil International University**

DECEMBER - 2019

The Project & thesis submitted to the Department of Civil Engineering for Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science-in-Civil Engineering

Course Code: CE 400

Course Title: Project and Thesis

Prepared by: P.M. Shishir Ahmed Bappi

ID#163-47-257

Supervisor: Dr. Mohammad Hannan Mahmud Khan

Assistant Professor & Associate Head

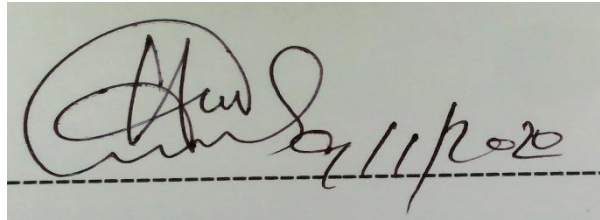
Department of Civil Engineering

Daffodil International University

Date: December 2019

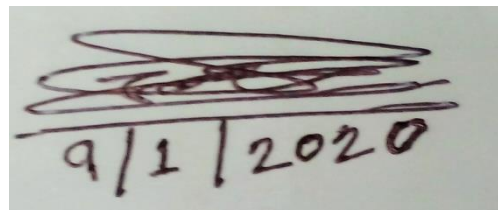
CANDIDATE'S DECLARATION

This is here by declared that this Project or any part of it has not been submitted elsewhere for the award of any degree.

A handwritten signature in black ink, appearing to read 'Hannan Mahmud Khan', written over a horizontal dashed line.

Supervised by: -----

Dr. Mohammad Hannan Mahmud Khan
Assistant Professor & Associate Head
Department of Civil Engineering
Daffodil International University

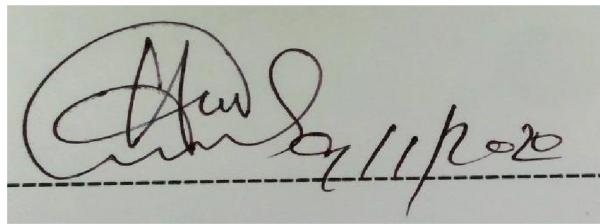
A handwritten signature in black ink, appearing to read 'P.M. Shishir Ahmed Bappi', written over a horizontal dashed line.

Submitted by: -----

P.M. Shishir Ahmed Bappi
ID#163-47-257
Department of Civil Engineering
Daffodil International University

APPROVAL

It is Project titled “**Comparison of Ongoing Roadway Maintenance Projects by Roads and Highways Department**” Submitted by **P.M. Shishir Ahmed Bappi** has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Science in Civil Engineering **on December 2019.**

A handwritten signature in black ink on a light-colored background. The signature is written in a cursive style and includes the date '27/11/2020' at the end. A horizontal dashed line is drawn below the signature.

DR. MOHAMMAD HANNAN MAHMUD KHAN (Supervisor)
Assistant professor & Associate Head
Department of Civil Engineering
Daffodil International University. Dhaka

SYNOPSIS

Road networks in Bangladesh are spending much faster than relative budgets and institutional capabilities. Generally, projects review various aspects of road maintenance. In the end, kilometers are studied for different sections of roads. Successful road maintenance strategies are evaluated and reviewed. Due to road failure and breakdown, periodic maintenance is visible to everyone. Moreover, proper equipment is used and maintained for road maintenance. The necessary resources for manpower and maintenance are also mentioned in the project. Roads play an important role in enhancing the country's economic development and social benefits. The most important public assets are the construction and maintenance of road infrastructure.

ACKNOWLEDGEMENT

First of all, thank you to the great Almighty Allah, in the time that I have been able to complete the project successfully.

The project has active ingredients encouragement; courage, direction, education and support in producing the report express Dr.Mohammad Hannan Mahmud Khan Assistant Professor & Associate Head, Department of Civil Engineering and so then any wish gratefulness of the topics.

Acknowledgments thank you to all the teachers, associate heads, department head and all staff who provided supported for the education in the civil Engineering department.

In addition, the vice-chancellor, Chairman, parents and are thanked for their recognition

TABLE OF CONTENTS

<u>Contents:</u>	<u>Page</u>
ROADWAY MAINTENANCE.....	i
CANDIDATE’S DECLARATION.....	iii
APPROVAL.....	iv
SYNOPSIS.....	v
ACKNOWLEDGEMENT.....	vi
Chapter-1	
1.1 INTRODUCTION.....	1
1.2 Objective.....	2
1.3 Methodology.....	2
1.4 The roadway construction process.....	3
1.5 Currently roadway maintenance monitoring techniques.....	4
1.6 Roadway maintenance project in economic growth & development.....	5
1.7 The roads maintenance works advantages & disadvantages.....	6
Chapter-2	
NECESSARY EQUIPMENT FOR ROAD MAINTENANCE	
2.1 Introduction.....	7
2.2 Types of the equipment for roads construction and maintenance as.....	8
2.2.1 Backhoes.....	8
2.2.2 Bulldozers.....	8
2.2.3 Compactors & Rollers.....	8
2.2.4 Excavators.....	8
2.2.5 Motor Graders.....	9
2.2.6 Skid Steer Loaders.....	9

TABLE OF CONTENTS

<u>Contents:</u>	<u>Page</u>
2.2.7 Compact Track Loaders.....	9
2.2.8 Water Trucks.....	9
2.2.9 Air Compressors.....	10
2.2.10 Jackhammers.....	10

Chapter-3

COMPONENT OF ROADWAY MAINTENANCE

3.1 General.....	11
3.2 Types of component roadway maintenance.....	12
3.2.1.1 Surface maintenance.....	12
3.2.1.2 Methods of Surface Treatment for Road Maintenance.....	14
3.3 Roadside and Roadway Drainage maintenance.....	16
3.4 Shoulders Maintenance.....	16
3.5 Snow and Ice control.....	17
3.6 Bridge maintenance.....	17
3.7 Traffic services.....	18

Chapter-4

COMPARISON OF TWO ONGOING ROADWAY MAINTENANCE PROJECTS BY ROADS AND HIGHWAY DEPARTMENT

4.1 Project – 1.....	19
4.2 Projects background.....	20
4.3 Objectives.....	21
4.4 Identification and assessment of options.....	21
4.5 Description of the Preferred Option.....	21
4.7 Detail engineer’s description measurement.....	23

TABLE OF CONTENTS

<u>Contents:</u>	<u>Page</u>
4.8 Project – 2.....	28
4.9 Projects background.....	29
4.10 Objective.....	29
4.11 Identification.....	29
4.12 Description of the Preferred Option.....	29
4.14 Detail engineer’s description measurement.....	31
4.15 Investigate the work detailed project report.....	35
4.16 Sustainable development report for roadway maintenance projects in Bangladesh.....	35
Chapter-5	
CONCLUSION.....	36
REFERENCE.....	37

TABLE OF FIGURES

<u><i>Figures:</i></u>	<u><i>Page</i></u>
Fig 2.1 Backhoes.....	10
Fig 2.2 Bulldozers.....	10
Fig 2.3 Compactors & Rollers.....	10
Fig 2.4 Excavators.....	10
Fig 2.5 Motor Graders.....	10
Fig 2.6 Skid Steer Loaders.....	10
Fig 2.7 Compact Track Loaders.....	10
Fig 2.8 Water Trucks.....	10
Fig 2.9 Air Compressors.....	10
Fig 2.10 Jackhammers.....	10
Fig 3.1 Component Roads Maintenance.....	11
Fig 3.2 Roads Maintenance.....	12
Fig 4.1 Project Location.....	19
Fig 4.2 Pavement Widening and Strengthening.....	24
Fig 4.3 Surfacing.....	25
Fig 4.4 Road Marking.....	26
Fig 4.5 Concrete Guide Post.....	26
Fig 4.6 Traffic Sign, Sign, KM Post.....	27
Fig 4.7 Project Location.....	28
Fig 4.8 Widening and Strengthening & Surfacing.....	32
Fig 4.9 Construction of Road Median.....	33
Fig 4.10 Roads Marking Ballotini.....	34

LIST OF TABLES:

<u>Tables:</u>	<u>Page</u>
Table 4.1 Data Measurement.....	22
Table 4.2 Procurement of Inspection.....	23
Table 4.3 Heavy Procurement of Inspection.....	23
Table 4.4 Pavement Widening and Strengthening.....	24
Table 4.5 Surfacing.....	25
Table 4.6 Road Marking.....	26
Table 4.7 Concrete Guide Post.....	26
Table 4.8 Traffic Sign, Sign, KM Post.....	27
Table 4.9 Data Measurement.....	30
Table 4.10 Procurement of Inspection.....	31
Table 4.11 Procurement of Inspection.....	31
Table 4.12 Widening & Strengthening.....	32
Table 4.13 Surfacing.....	32
Table 4.14 Construction of Road Median.....	33
Table 4.15 Sign, Signal, Guide Post, KM Post.....	33
Table 4.16 Roads Marking.....	34

Chapter-1

INTRODUCTION

1.1 Introduction:

Maintenance other infrastructure permanent installations, the road also has a life span and becomes unusable over a period of time. It is mainly responsible for the excessive weight of vehicles for the loss of roads and damage. Also, fog, snow, excess heat and acidic metals contribute to road damage.

The design of the pavement is based on the importance of the road, the pattern of service or the design of the road for the general public to use. In some countries of the UK, the life expectancy of pavement with bitumen and concrete is estimated to be 40 years. In that case, the life expectancy of the road is fixed at 10, 20 or 30 years.

In designing the life span of the road, the design is made to suit the 8, 15, 30 and 60 years. When the life span of the footpath lasts longer, it should naturally be assumed that it has been recycled and costs much more than normal. When the footpath survives less than the normal time, the road construction company builds the contract and determines the cost again. By the 9th, many concrete roads were less durable than usual.

1.2 Objectives:

- Learn the Road Construction Maintenance Process
- Investigate The Equipment Needed for Roadway Maintenance Work
- Discuss for Solutions of The Limitations for Current Roads Monitoring Techniques
- Significance of The Maintenance Projects in Economic Growth and Development
- The Advantages and Disadvantages of The Road Maintenance Works

1.3 Methodology:

- Select Implementing Agency
- Collect Roadways Project Maintenance Information
- Study Relevant Project Information From The Project Report
- Physical Observation of Roads Maintenance Work of Those Projects
- Compare The Findings of Above Mentioned Projects in Terms of Items and Their Quantity, Maintenance Works and So on

1.4 The roadway construction process:

- The type of road construction used varies from one job to another. The road built for a particular depends on the amount and nature of traffic used. So the road depends on the amount and nature of use
- The available to nature of the materials
- Topography
- The foundation conditions
- The type for availability of construction equipments
- The financing arrangements timing
- If a basic road construction is made up of a number of steps

The steps can be summarized as:

- Plan of the programming activities
- Site clearance
- Settings out
- Earthworks
- Bridges construction
- Drainage structure
- Pavement construction
- Placement of the road surfacing
- Placement of the furniture
- For landscaping

1.5 **Currently roadway maintenance monitoring techniques:**

As a timely data collection before the monitoring project. When data is analyzed it is possible to identify progress or constraints. This is evaluated by adjusting project activities as needed by project managers.

The primary objectives of monitoring are to:

- ❖ Explain if there is an upcoming issue to avoid disaster / delay
- ❖ Evaluate the progress of the project timeline with the proposed respect
- ❖ Make the necessary adjustments to the resources
- ❖ Ensure the running condition of the work quality
- ❖ Learn from the weaknesses and strengths of project management
- ❖ Project Implementation Strategies Adjust or redesign project components to achieve the desired objectives

1.6 Roadway maintenance project in economic growth & development:

At present, the role of development and maintenance in the economic activities of the highways immense importance. Maintenance of roads is very important for improving the quality people of the life and improving the communication system. As a result, rural roads and road infrastructure are rapidly evolving for the transportation and proper marketing of agricultural & non-agricultural products produced. Regular maintenance work is carried out to keep of road network in constant use rural roads contribute significantly to the socio-economic index of the country, especially in the advancement of education, health and gender equality growth centers and rural hats and bazaars are being developed to mobilize the rural economy and trade. Farmers are able to market the produce easily and get fair price of the crop. This is increasing people's income and creating employment opportunities, which are helping to alleviate poverty an economic point of view. Road maintenance is essential for the adoption and implementation of important highway construction projects.

It is mentioned below that the Government Department of Bangladesh is doing special road maintenance work and development.

- a) Roads and Highways Department www.rhd.gov.bd
- b) Bangladesh Railways Department www.railway.gov.bd
- c) Local Government Engineering Department www.lged.gov.bd

1.7 The roads maintenance works advantages & disadvantages:

Advantages

- Rapid drainage of the surface water
- Reduction of the traffic noise
- Reduction of the spray and improvement of skid resistance in wet weather
- Reduction of the road surface glare from oncoming headlights
- The improvement fuel consumption due to the smooth ride qualities of the negatively textured surface
- Reduction in tire wears due to the reduced rolling resistance

Disadvantages

- Reduced pavement strength leads to having to provide more support in the structural layers of the pavement reduced strength can also limit application of the material to areas not susceptible to high stresses
- Reduced pavement life in the comparison with other materials due to the increased likelihood of binder oxidation caused by the voided nature of the material
- The possible clogging of pores and drainage paths while under construction and also during the service life of the road
- Increased construction costs due to the increased by sensitivity of the material to temperature and adverse weather condition
- It needs more salting as winter snowfall

Chapter-2

NECESSARY EQUIPMENT FOR ROAD MAINTENANCE

2.1 Introduction:

Different specialized equipment is needed for road construction and maintenance. We need a lot of different machines and equipment to build and maintain our roads. Whether the surface of the road is asphalt, concrete or even stone, there is one type of the tool specially designed for each unique purpose. We must be considering the independent maintenance and repair of our road construction and maintenance equipment. We may need different tools for different sites. So maintenance of road construction equipment is very important. A variety of road construction equipment is available, from extremely heavy equipment to portable and light equipment. As a result, modern and advanced construction tools make construction work easier and faster. Also heavy machinery of the good quality work, due to which different types of equipment are available at each construction site. Heavy machines make it possible to do much more work safely and with reliability that cannot be manually performed. However, the equipment always requires more than one person to perform its heavy work.

2.2 Types of necessary equipment for road maintenance as:

2.2.1 **Backhoes:**

Backhoes are one of the most versatile machines in road building. They have a loading bucket on one end and a trench bucket on the other end. The backhoes take on any excavation, trenching and backfilling project you can imagine. With rubber tires, backhoes drive about a site faster than a tracking machine.

2.2.2 **Bulldozers:**

For perfect strength and ability to cut through, nothing beats a bulldozer in the world of road construction. Cat bulldozers are driven on tracks and with the total weight of the machinery. Bulldozers plow through wet, crunchy conditions and perform operations without cutting, grading, and slowing down.

2.2.3 **Compactors & Rollers:**

Compactor & roller selections include vibrator, pad foot and double drum design. This cross-section allows you to choose the right weight and compaction rate to complete the geotechnical tests and road construction engineering details.

2.2.4 **Excavators:**

Excavators come in different sizes and ranges of power. They gain equipment attachments and perform tasks such as trenching, sewing, loading and grading. There are options in your locomotion with the excavator. Most cat excavators are tracked but wheeled excavators can be handled.

2.2.5 **Motor Graders:**

Most road building or maintenance units have one or more motor graders. These are essential for the construction and maintenance of roads. Sophisticated blade to the consistency rough works and fine to details. These tools can be surprisingly adaptable to attachment. Motor graders 5 Cat brand ranging from 145 to 259 horsepower and in weights from 39,892 pounds up to 53,738 pounds.

2.2.6 **Skid Steer Loaders:**

High quality of the Cat Skid Steer Loader all kind power up to 2700 pounds. Choosing the best quality high quality skid loader that suits your needs is not an exorbitant amount of money to spend on an oversize machine, no need to risk loads. In terms of size and operating capacity, I can select the appropriate skid loader.

2.2.7 **Compact Track Loaders:**

Some of the road building and maintenance sites do not land well to rubber-tired skid steers. Conditions like mud, snow and soft ground require less weight distribution across a machine foot print. Where compact to the track loader coming.

2.2.8 **Water Trucks:**











Dry summer conditions inevitably lead to the dust on road building site. We can always hope for rain. But most the road building contractor's option for water trucks to spray areas and keeps the dust down. Water trucks provide excellent the insurance when we are work in fire season. We are really can't be without a water truck.

2.2.9 Air Compressors:

Here may be a time in your road building or maintenance project where you need an air compressor. Here may be a time in your road building or maintenance project where you need an air compressor. Rock strikers, jackhammers or other equipment do not strike compressed air for energy while running. Although not a common use, it can be useful at time.

2.2.10 Jackhammers:

We can use a jackhammer for holes maintenance or broken maintenance in various areas of the road. This can be easily performed quickly. This machine is used on the current system via a vibrator.

				
Figure: 2.1 Backhoes	Figure: 2.2 Bulldozers	Figure: 2.3 Compactors & Rollers	Figure: 2.4 Excavators	Figure: 2.5 Motor Graders
				
Figure: 2.6 Skid Steer Loaders	Figure:-2.7 Compact Track Loaders	Figure:- 2.8 Water Trucks	Figure:- 2.9 Air Compressors	Figure:- 2.10 Jackhammer

Chapter-3

COMPONENT OF ROADWAY MAINTENANCE

3.1 General:

Preserving and keeping each type of roadway, roadside, structures as nearly as possible in its original condition as constructed subsequently improved or operation of highway facilities and services to provide satisfactory, safe of the transportation, is called Road Maintenance.



Figure: - 3.1 Component Roads Maintenance

Roadway Maintenance:-



Figure:-3.2 Roads Maintenance

3.2 Types of component roadway maintenance:

3.2.1 Surface maintenance:

Pavement maintenance and rehabilitation programs maintain the structural integrity of the pavement over the quality of riding and the entire design life.

The asphalt concrete of pavements is subjected to various types of pavement distress or failure these include:

3.2.1.1 A). Surface Distresses:

I. Alligator cracks:

A series of cracks or cracks interconnected due to the fatigue of the concrete surface leading to repeat traffic. (Reason for cracking due to sub-grade movement).

II. Block cracks:

Cracks form to large interconnect polygons usually with sharp corners or angles. These cracks are generated by hardening or shrinking. Asphalt reflection cracking from underlying layers such as cement treatment of the base.

III. Transverse cracks:

The pavement holds the cracks in the center line at almost the right angle. These may be due to the rigidity and compression of the dump or due to differential thermal stress of the asphalt concrete or reflection cracking.

IV. Longitudinal cracks:

The cracks are approximately parallel to the pavement center line. These are caused by poorly constructed construction joint shrinkage of the asphalt concrete surface. Longitudinal cracks may be reflection cracks.

V. Raveling:

The surface of the pavement is well equipped with the removal of aggregate particles and binders. This is usually the result of insufficient asphalt binder in the mixture or sprinkling of the dump from the particle in the material.

VI. Drip Track Raveling:

Progressive disintegration of surface between wheel paths caused by dripping of gasoline oil from vehicle.

VII. Bleeding or Flushing (Fattening Up):

Exuding of bitumen on the pavement surface cause to reduction skid resistance. Bleeding is the generally caused by excessive amount of asphalt in mixes or lowers air void content. It's occurs in the mix in hot weather.

VIII. Corrugations:

Due to instability of base or poor original riding surface (plastic movement of pavement)

IX. Pot Holes:

When the cracks are deep, the surface material of the road becomes a small bowl, like a shaft. It is very important to repair in the road maintenance as damage vehicles and bikes.

X. Ruts:

Heavy pressure creates pressure under the wheels, causing consolidation, deformation or plastic flow.

3.2.1.2 B) Methods of Surface Treatment for Road Maintenance

The surface treatment may be single or multiple. Although the best type of the surface course is pre-mix carpet for roads maintenance. The surface treatment methods are employed.

- a. The traffic intensity is not too high
- b. Pro-mix mixers are not readily available for long transportation or technical reasons.
- c. When the expense is high

In Roadway Maintenance, for good surface treatment it is necessary that:

- a. Base course is well prepared to its profile and is made free from potholes and ruts.
- b. Excellence of surface dressing depends upon the correct proportion to binder aggregate.
- c. Before placing a dressing coat on the first surface, the base should be free of all loose dust

In all bituminous construction it is necessary that the newly surface possess a bond with the existing base at the interface. It is also necessary that the base is nearly impervious.

- a. Bleeding and occasional rebuilding are maintained on gravel roads
- b. For surface treatment of low types of bituminous in road maintenance. Involves patching, sealing or possibly lose oiling, re-mixing and relays.
- c. For high-type bituminous concrete and Portland cement concrete, removal and replacement or replacement of failure zones are an approximate treatment method for Roadway maintenance.
- d. Use the same components and methods for road surface maintenance as possible.
- e. Maintenance and renovation of roads should be planned for fast performance and to minimize potential disruption or hazard to traffic.

3.3 Roadside and Roadway Drainage maintenance:

Depends on the characters of road side where the roadside is grassy it must be mowed cutting, plugging or spraying with weed killer must be done. If the risk of dry grass fires continues to burn, plowing should be done on road maintenance. In order to improve the visibility and increase the distance of sight road trim clearance should be done. It's important to note that side slope erosion by mulching to seed etc. Keeping the road drainage empty, culverts and other drainage structures, clean and ready to carry water from the next stream. Badly damaged channels and ditch need to be properly secured to restore the deposits during heavy flow.

3.4 Shoulders Maintenance:

The maintenance of shoulders depends on the surface character of the area where the maintenance and repair is performed.

Sod shoulders are earth shoulders on which a solid turf has been established. Normally they require very little maintenance and holes, ruts, and settlements should be repaired with sod or stabilized material. Must to be moved occasionally bladed down to level of the road, so that water is not trapper in traveled way. Grass must be kept in good condition. In maintenance of roads shoulders protected by bituminous blankets have surface treatments same as for roadway surface. The release of cranks and earth shoulders at the edges of the pavement creates the risk of a fatal accident. It should be reconstructed or corrected in other appropriate ways. Due to continuous wetting and drying of the shoulders, edge joints between the lanes and shoulders result. This can cause the pavement to settle due to water entry into the sub grade soil. It can be repaired by filling the joint with sand and asphalt concrete.

3.5 Snow and Ice control:

Ice forming on roadway reduces coefficient of friction between tires and surface, which makes vehicle control almost too impossible. In repair of roads, we can apply abrasive to heavily traveled roadway and street. Suitable materials that can be use to clean and sharp sand, cinders and washed stone screening.

3.6 Bridge maintenance:

Bridge maintenance is a major part of road maintenance. Bridges can be maintained in good condition by following the guidelines below:

- The exposed steel work must be cleaned by sandblasting flame or another way after repainting.
- Deck joint may as extrude or become filled with dirt so that cleaning and sealing is necessary.
- Out of control vehicle, causing damage to guardrail, must be repaired and strengthened.
- Once the bridge is deck, a complete rebuild is needed
- If bridge deck become rough resurfacing is required
- The remedial measures to correct serious scour around and under piers and abutments.
- Locating void and delaminating in the bridge pavements and scour around bridge support columns.
- Determining types of steel and reposing in the concrete
- Quality control assurance in new concrete installations.

3.7 Traffic services:

Include stripping, sign repair and maintenance (particularly needed for repair after stormy weather).

Factor Affecting Roads Maintenance:

a. Increase the severity of the traffic

We have known that road transport increases every year by about 8%. So this is the most important factor, which influences road maintenance.

b. Inadequate Thickness of Pavement

Adequate thickness of the footpath is necessary as already discussed. If sufficient thickness is not provided, it often results in pavement failure, disparity, and heavy patches.

c. Effect of No on Lane

Roadway maintenance research laboratories have established that the density of roads on a single lane road is about 4 times higher than that of a double lane pavement section. So the problem and maintenance of single lane pavement roads is more than double lane pavement.

Chapter-4

COMPARISON OF TWO ONGOING ROADWAY MAINTENANCE PROJECTS BY ROADS AND HIGHWAY DEPARTMENT

4.1 Project – 1

Name of Project: Improvement of Barisal-Bhola-Laxmipur Highway (N-809) from Barisal (Char kaowa) to Bhola (Laharhat Ferryghat) to appropriate level of standard and width.

Implementing Agency: - Roads and Highways Department

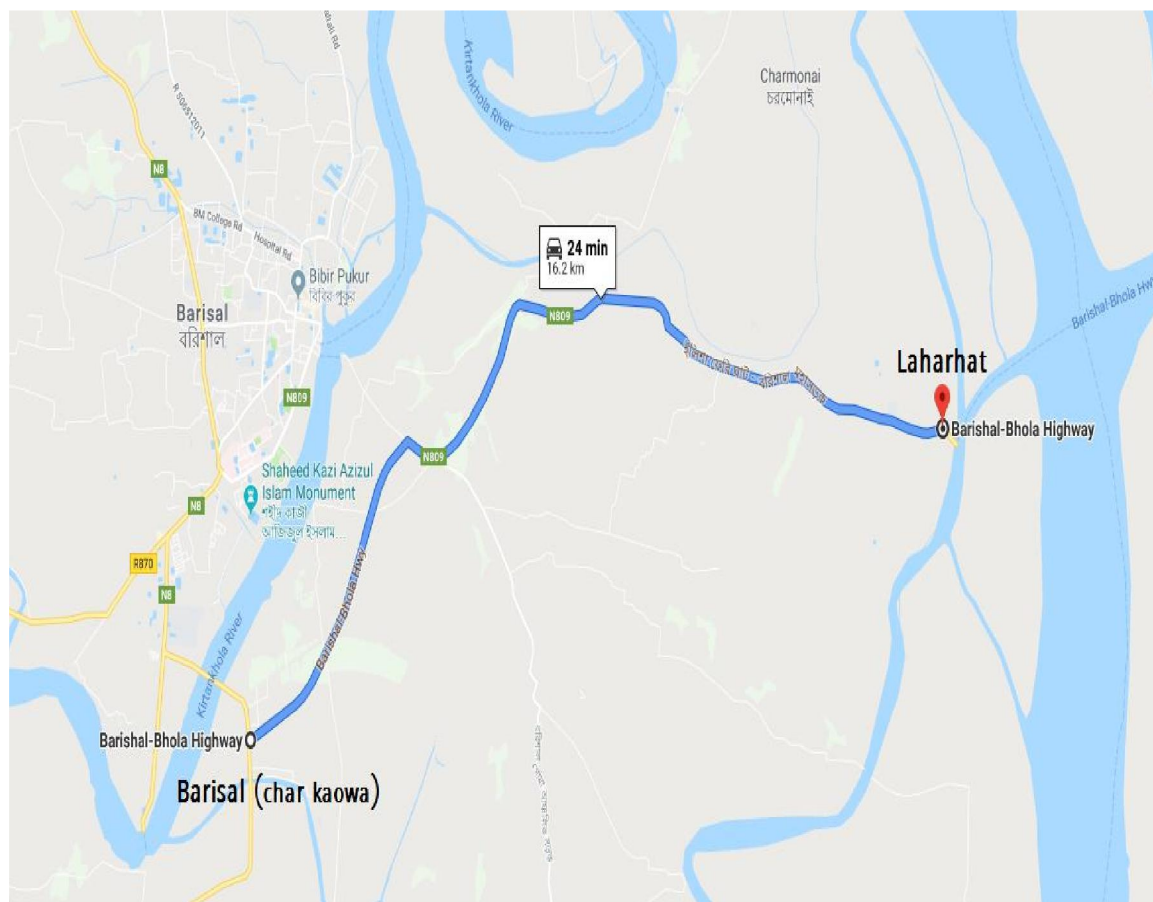


Figure: - 4.1 Project Location

4.2 Projects background:

Barisal district is an important divisional headquarter of Bangladesh. Bhola is an isolated river and different khal surrounded district in Barisal division. There is no direct roadway to reach Bhola district from other part of Bangladesh.

Barisal-Laharhat-veduria-Bhola-Ilisah- Maju Chudhury Hat-Laxmipur road is a national highway connecting 3 districts of two different division of Bangladesh. The road starts from Char kaowa of Barisal district runs to Laharhat ferryghat. There is a mighty river in between Barisal and Bhola district on which there is a ferry service. Length of this stretch is 16.2 km. The road is the only roadway communication of Bhola district with other part Bangladesh. Heavy loaded goods carrying transport vehicles from Khulna division use this route to travels Chittagong division. So, the road is very important from economic perspective. A good number of villages, Bazers and trade center are connection to this road through LGED roads and other village roads. A large number of light and heavy vehicles move on this road and also the traffic volume is increasing day by day.

The pavement condition of this road is not good and the road is never been constructed as per RHD design standard considering the traffic volume. As a result the pavement has been decayed over the years due to heavy rainfall in the rainy season and for huge traffic movement.

4.3 Objectives:

The main objective of this Project is to widen and strengthen 16.2 km road in order to:

- Establish direct & uninterrupted road communication between Barisal Division headquarters Bhola district and different upazilla of this area.
- Achieve safe, reliable, and efficient transportation means of people and goods.
- Accelerate easy movement of people and freight.
- Save Travel Time.
- Improve the socio-economic condition of the project area as well as the country.
- Reduce poverty by creating new job opportunity during construction and afterwards establishment of industries.

4.4 Identification and assessment of options:

No other alternatives modes exist along the proposed route which could be considered to improve transport services but this road best integrates different modes of transport. This road is very useful for the marketing and transporting the industrial products to near and far markets and as such only this option is assessed thought the PAF (Project Appraisal Frame Work).

4.5 Description of the Preferred Option:

As the traffic demand is increasing day by day, the existing road cannot sustain and accommodate the huge amount of traffic demand. On the other hand the road is very much important because it plays an important role in transportation of industrial goods. To ensure a smart, efficient and demand responsive road network with a minimum time of travels time.

4.6 Name of Project: Improvement of Barisal-Bhola-Laxmipur Highway (N-809) from Barisal (Char kaowa) to Bhola (Laharhat Ferryghat) to appropriate level of standard and width.

Road length Location: Ch 25+690 m to 42+160 = 16.470 km.

Bridge Culvert Gap: 180.00 m

Working Length: 16.470 km – 0.180 m = 16.290 km.

S. No	Items Description	Unit & Quantity
1	Acquisition of Landed Properties :	
2	0.1 Land Acquisition (Axle Load Control Station)	8.020 Acre
3	Civil Works :	
4	0.2 Road Embankment (Earth Work)	1.282 L.Cu.m
5	0.3 Flexible Pavement :	
6	a) Pavement Widening (2*2.40 m)	6.935 km
7	b) Pavement Widening & Strengthening (2*2.40+5.50 m)	9.355 km
8	0.4 Surfacing (DBS Base & Wearing Course)	16.290 km
9	0.5 Protective work	
10	a) RCC Palisading	1650.00 L. M.
11	0.6 Sign Signal & KM Post, Road Marking	
12	a) Road Marking	3952.80 Sq.m
13	b) Traffic Sign	60.00 No.
14	c) Sign Post	60.00 No.
15	d) Concrete Guide Post	1200.00 No
16	e) Concrete KM Post	17.00 No
17	0.7 Axle Load Control Station	1.00 Set
18	Procurement of inspection Vehicle (jeep)	2 Nos
19	Procurement of inspection Vehicle (Motorcycle)	2 Nos
20	Procurement of Dump Truck (10 Ton)	1 Nos
21	Procurement of Payloader	1 Nos
22	Procurement of Excavator	1 Nos

Table:- 4.1 Data Measurement

4.7 Detail engineer's description measurement:

4.7.1 Procurement of Inspection:

S.No	Items Description	Measurement	Unit & Quantity
1	Procurement of Inspection Vehicle (Jeep)		2 Nos
2	Procurement of Inspection Vehicle (Motor-cycle)		2 Nos

Table:- 4.2 Procurement of Inspection

4.7.2 Procurement of Inspection:

S.No	Items Description	Measurement	Unit & Quantity
1	Procurement of Dump Truck (10 Ton)		1 Nos
2	Procurement of Payloader		1 Nos
3	Procurement of Excavator (0.75 m)		1 Nos

Table:- 4.3 Heavy Procurement of Inspection

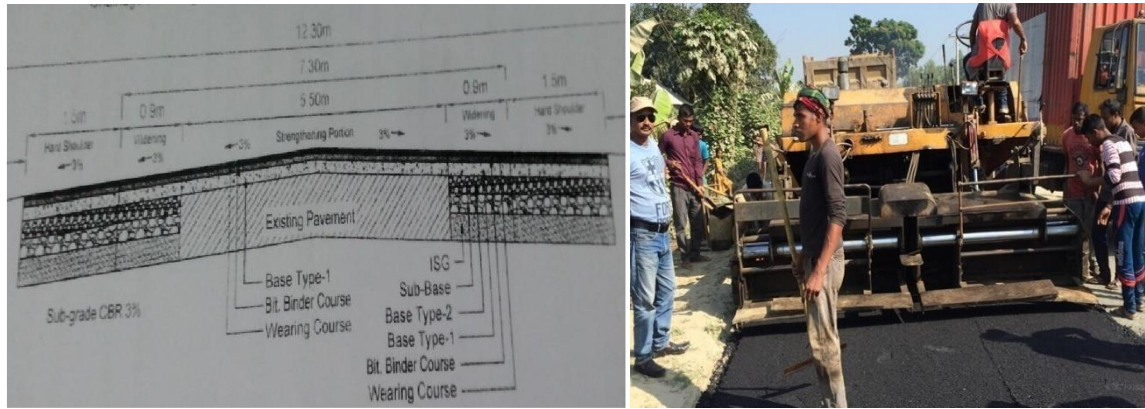


Figure:- 4.2 Pavement Widening and Strengthening

4.7.3 Pavement Widening and Strengthening:

Location: ch 25+690 to 35+195 to 42+160 = 16.470 km

Deduction Bridge/culvert Gap = 0.180 km

Working Length = 16.290 km

S.No	Items Description	Measurement	Unit & Quantity
1	Road Excavation in Suitable Soil	2 * 1000.00 * 2.40 * 0.650	3120 Cu.m.
2	Preparation of subgrade 300 mm Depth	2 * 1000.00 * 2.40	4800 Sq.m.
3	Improved Sub-Grade	2 * 1000.00 * 2.40 * 0.300	1440 Cu.m.
4	Sub-Base	2 * 1000.00 * 2.40 * 0.200	960 Cu.m.
5	Aggregate Base Type – I	2 * 1000.00 * 2.40 * 0.250	1200 Cu.m.
6	Aggregate Base Type – II	2 * 1000.00 * 2.40 * 0.150	720 Cu.m.
7	Scarify, Mix and Recompact Existing Pavement	1 * 1000.00 * 5.50	5500 Sq.m.
8	Brick on End Edging	2 * 1000.00	2000 L.m.

Table:- 4.4 Pavement Widening and Strengthening



Figure: - 4.3 Surfacing

4.7.4 Surfacing:

Location: Ch. 25+690 to 35+195 to 42+160 = 16.290 km (Excluding B/C Gap)

S.No	Items Description	Measurement	Unit & Quantity
1	Bituminous Prime Coat	2 * 1000 * 12.70	25400 Sq.m.
2	Dense Bituminous Surfacing-Base	2 * 1000 * 12.70 * 0.085	2159 Cu.m.
3	Bituminous Tack Coat	2 * 1000 * 10.30	20600 Sq.m.
4	Dense Bituminous Surfacing-weary.	2 * 1000 * 10.30 * 0.050	1030 Cu.m.

Table: - 4.5 Surfacing



Figure:- 4.4 Road Marking

4.7.5 Road Marking:

S.No	Items Description	Measurement	Unit & Quantity
1	Road Marking (Thermoplastic Materials)(By spray) 3mm Thick	$16290 \times 0.10 = 3258 \text{ Sq.m@}$ 2.40%	3952.80 Sq.m.

Table:- 4.6 Road Marking



Figure: - 4.5 Concrete Guide Post

4.7.6 Concrete Guide Post:

S.No	Items Description	Location	Unit & Quantity
1	Concrete Guide Post (1.6 m long or, 200mm dia)	Ch 25+690 to 42+160 km	1200 NO.

Table: - 4.7 Concrete Guide Post



Figure:- 4.6 Traffic Sign, Sign, KM Post

4.7.7 Traffic Sign, Sign, KM Post:

S.No	Items Description	Location	Unit & Quantity
1	a) Traffic Sign	Ch 25+690 to 42+160 km	60 NO.
2	b) Sign Post	Ch 25+690 to 42+160 km	60 NO.
3	c) Kilometer Post	Ch 25+690 to 42+160 km	17 No.

Table:- 4.8 Traffic Sign, Sign, KM Post

4.8 Project – 2

Name of Project: Improvement of Sirajganj- Kazipur-Dhunut-Sherpur Road (Z-5401) to Appropriate Standard and Width

Implementing Agency: - Roads and Highways Department

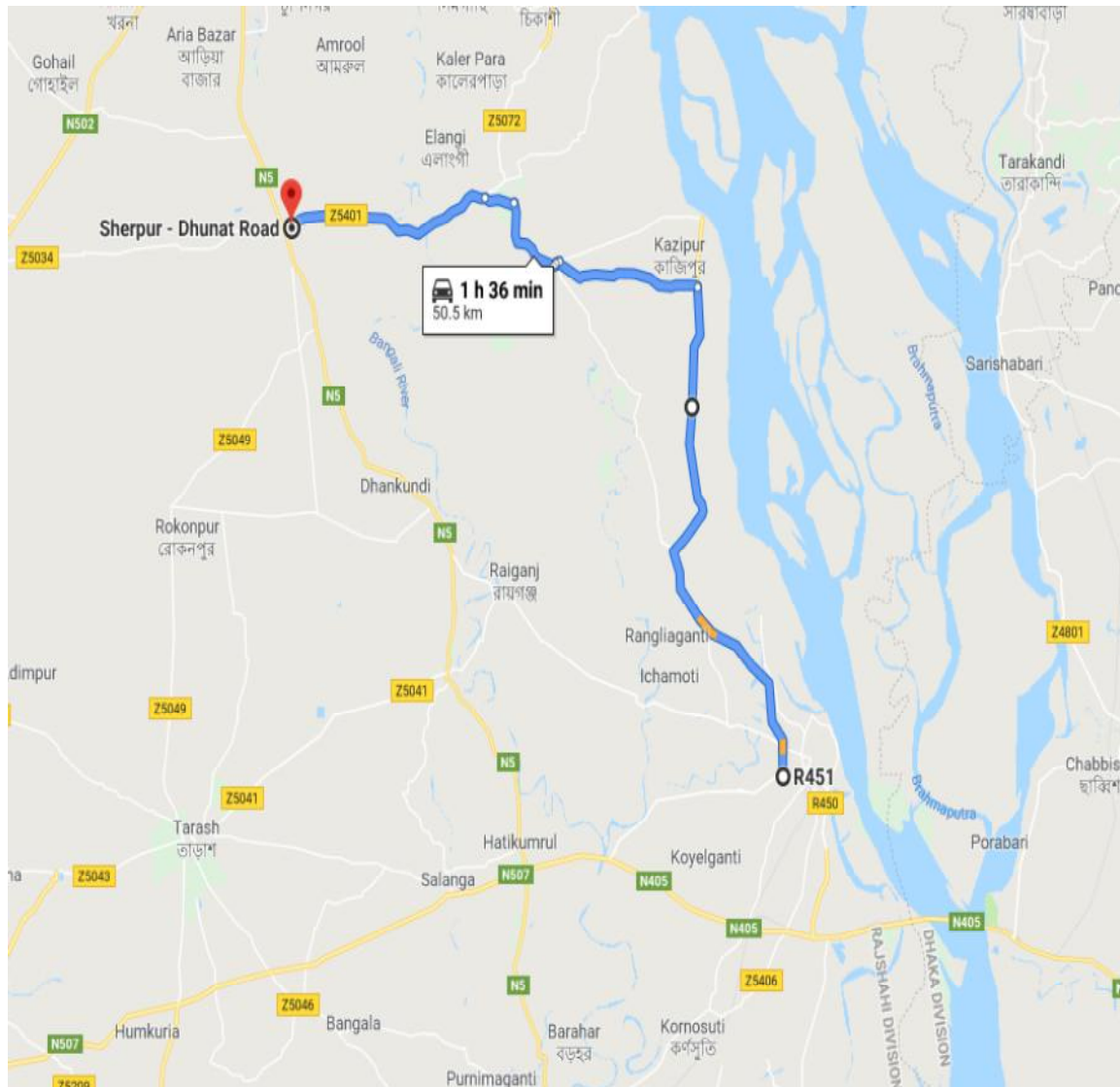


Figure: - 4.7 Project Location

4.9 **Projects background:**

Sirajganj-Kazipur- Dhunot- Road is more important Zillah road. Total length of this road 55.2 km. The Project is 1st km to 4th km 4-lane rest length widening of existing road, construction of Superstructure 02 Nos bridges and 08 Nos new Culvert. This project is important project because considering the connectivity point of view with other road network of the northern region as well as rest of the country.

The recently established Shaheed M Monsur Ali Medical College is 9th km of Nalka-Sirajganj Road. Again Government of Bangladesh has approved a BISIC Industrial park at Sirajganj. From that time, many minutes were produced to connect the Industrial park with the main stream of Road network. Road & Highway Department (RHD) under Ministry of Road Transport & Bridges is responsible for construction and management of the main road network in the country.

4.10 **Objective:**

Main objective of the project is to improve Sirajganj- Kazipur- Dhunat-Sherpur Road (Z-5401) to Appropriate Standard and Width to establish better road communication.

4.11 **Identification:**

No other alternatives modes exist along the proposed route which could be considered to improve transport services but this road best integrates different modes of transport. The road is very useful for the marketing and transporting the industrial products to near and far markets and as such only this option is assessed through the PAF (Project Appraisal Formwork).

4.12 **Description of the Preferred Option:**

As the traffic demand is increasing day by day, the existing road cannot sustain and accommodate the huge amount of traffic demand. On the other hand the road is very much important because it plays an important role in transportation the industrial good.

4.13 **Name of Project:** Improvement of Sirajganj- Kazipur-Dhunat-Sherpur Road (Z-5401) to Appropriate Standard and Width

Working Length: 50.5 km.

S. No	Items Description	Unit & Quantity
1	Procurement of inspection Vehicle (jeep)	2 Nos
2	Procurement of inspection Vehicle (Motorcycle)	2 Nos
3	Procurement of Dump Truck (10 Ton)	1 Nos
4	Procurement of Payloader	1 Nos
5	Procurement of Excavator	1 Nos
6	Land Acquisition with Compensation	36.33 Hector
7	Flexible Pavement:	
8	a) Widening & Strengthening (including Hard Shoulder)	4 km
9	b) Surfacing (DBS) (including Hard Shoulder)	4 km
10	c) Widening & Strengthening (5.50m to 7.30m)	35 km
11	d) Surfacing (DBS) (1*7.30m)	35 km
12	Construction of Road Median	4 km
13	Construction of Bus-Bay	8 Nos
14	Intersection Development	5 Nos
15	Construction of PC Girder Bridge (2 Nos)	104.75 m
16	Construction of RCC Box culvert (8 Nos)	80 m
17	Construction of Drain:	
18	a) RCC U-Drain	8500 m
19	b)RCC Cross Drain	3600 m
20	c) Inspection Pit	360 m
21	d) Saucer Drain	4500 m
22	Protective Work :	
23	a) Concrete Slope Protection with geo-textile	34000 Sq.m
24	b) Retaining Wall	600 m
25	c) Brick Masonry Toe Wall	4000 m
26	d) Grass Turning	700000 Sq.m
27	Sign, Signal, Guide post , KM Post & Road Marking	
28	a) Traffic Sign	120 Nos
29	b) Sign Post	120 Nos
30	c) Concrete Guide Post	3000 Nos
31	d) Concrete KM post	40 Nos
32	e) Road Marking (Thermoplastic)	11180 Sq.m
33	f) Application of Balloting	11180 Sq.m
34	Maintenance During Construction	39 Km

Table:- 4.9 Data Measurement

4.14 Detail engineer's description measurement:

4.14.1 Procurement of Inspection:

S.No	Items Description	Measurement	Unit & Quantity
1	Procurement of Inspection Vehicle (Jeep)		2 Nos
2	Procurement of Inspection Vehicle (Motor-cycle)		2 Nos

Table: - 4.10 Procurement of Inspection

4.14.2 Procurement of Inspection:

S.No	Items Description	Measurement	Unit & Quantity
1	Procurement of Dump Truck (10 Ton)		1 Nos
2	Procurement of Payloader		1 Nos
3	Procurement of Excavator (0.75 m)		1 Nos

Table:- 4.11 Procurement of Inspection

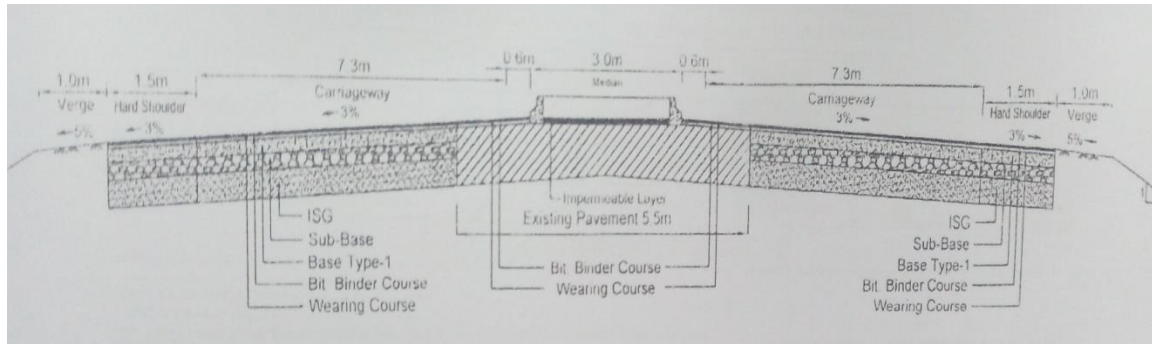


Figure:-4.8 Widening and Strengthening & Surfacing

4.14.3 Flexible Pavement:

- a) Widening & Strengthening (Including Hard Shoulder) (5.50m to 21.80m) or (5.50m to 7.30m)

S.No	Items Description	Measurement	Unit & Quantity
1	Clearing & Grabbing	2 * 1000 * 9.05m	18100 Sq.m
2	Roadway Excavation in unsuitable soil	2 * 1000 * 9.05m * 0.910m	16471 Cu.m
3	Preparation of Suds-Grade 450mm Depth	2 * 1000 * 9.05m	18100 Sq.m
4	Scarify, Mix and Re-compact exiting pavement / or Shoulder	2 * 1000 * 5.50m	11000 Sq.m.
5	Improvement Sub-Grade (F.M.= 0.5)	2 * 1000 * 9.05m * 0.300m	5430 Cu.m
6	Sub-Base	2 * 1000 * 9.05m * 0.250m	4525 Cu.m
7	Aggregate Base Type-I	2 * 1000 * 9.05m * 0.200m	3620 Cu.m
8	125mm Brick on End Edging (1 st Class)	2 * 1000m	2000 Cu.m

Table:-4.12 Widening & Strengthening

- b) Surfacing (DBS) (Including Hard Shoulder) (2 * 9.40m) or (1 * 7.30m)

S.No	Items Description	Measurement	Unit & Quantity
1	Bituminous prime Coat (plant placed)	2 * 1000m * 16.70m	33400 Sq.m.
2	Dense Bituminous Surfacing-Base Course (Plant Method) (Bitumen Grade 60 / 70)	2 * 1000m * 16.70m * 0.110m	3674 Sq.m.
3	Bituminous Tack Coat (Plant Work)	2 * 1000m * 16.70m	18800 Cu.m.
4	Dense Bituminous Surfacing-Wearing Course (Plant Method) (Bitumen Grade 60 / 70)	2 * 1000m * 16.70m * 0.050m	1670 Cu.m

Table:-4.13 Surfacing



Figure: - 4.9 Construction of Road Median

4.14.4 Construction of Road Median:

S.No	Items Description	Measurement	Unit & Quantity
1	Highway Excavation in Excising Pavement (not reinforced concrete)	2 * 1000m * 0.230m * 0.145m	66.70 Cu.m
2	Concrete Class – 10	2 * 1000m * 0.230m * 0.050m	23 Cu.m
3	Concrete Class – 25 (Vertical member col. pier, abutment / wing wall, culvert etc)	2 * 1000m * 0.225m * 0.225m 2 * 1000m * 0.5(0.225+0.150) * 100m 2 * 1000m * 0.5(0.150+0.225) * 0.225m	214.375 Cu.m
4	Top soil	1 * 1000m * 2.550m * 0.505m	1287.75 Cu.m
5	Plantation / Beautification		625 Nos

Table: - 4.14 Construction of Road Median

4.14.5 Sign, Signal, Guide Post, KM Post:

S.No	Items Description	Measurement	Unit & Quantity
1	a) Traffic-Sign		120 Nos
2	b) Sign Post		120 Nos
3	c) Concrete Guide Post		3000 Nos
4	d) Concrete KM Post		40 Nos

Table:- 4.15 Sign, Signal, Guide Post, KM Post



Figure:- 4.10 Roads Marking Ballotini

4.14.6 Road Marking

S.No	Items Description	Measurement	Unit & Quantity
1	Road Marking (Thermoplastic Materials indicate if screed or Spray Application)	2 * 2 * 4000m * 0.100m 3 * 1 * 4000m * 0.100m * 60% 4 * 35000m * 0.100m 1 * 35000m * 0.100m * 60%	11180 Sq.m
2	Application of Balloting	2 * 2 * 4000m * 0.100m 3 * 1 * 4000m * 0.100m * 60% 4 * 35000m * 0.100m 1 * 35000m * 0.100m * 60%	11180 Sq.m

Table:- 4.16 Roads Marking

4.15 **Investigate the work detailed project report:**

- Responsible for overseeing the performance of all works under this project
- Ensure that RHD quality control procedures are implemented for all work under the project
- Scrutinize and process of annual development work program
- Examine tender documents and estimates in respect of rate, quantity and Specifications and accordance with guidelines & standards
- Compile and submit monthly progress report and IMED quarterly progress to the monitoring circle, relevant offices and ACE-ZONE
- Co-operate ACE to Facilitated formation of appropriate teams for management and supervision of large-scale development works under the project

4.16 **Sustainable development report for roadway maintenance projects in Bangladesh**

- The project assesses the government's ownership and commitment and evaluates the project as less than potentially sustainable
- Proper policies to ensure continued funding for the maintenance of project Roads
- Appropriate policies to ensure the maintenance of required human resource financial viability of operating entities.
- Some project road sections were already damaged at project completion, Requiring maintenance work
- The weighbridge station along the project road was not yet operational at completion and so overloaded vehicles continued to be a problem.

Chapter-5

CONCLUSION

Engineers were always opening minded to accept any material available for use in their construction. It is plausible to see that the purpose of highway construction is to provide a firm and even surface for the carriageway or sidewalk which can cause stress due to the number of loads applied.

In learnt the ground of a project proposal. In both of the projects the aim was to increase the capacity and flow in order to ensure a smart, efficient and demand-responsive road network with a minimum of time. The difference in project volume (cost) significantly influences the construction equipment and their usage. Project supervision should be performed regularly for better quality of the finished infrastructure.

Maintenance of highway facilities and service management is called for the construction of all types of roadways, roads, structures as much as possible in their original condition or subsequently upgraded and maintained and to provide satisfactory and safe transportation. Highway maintenance should be planned for faster performance and at least possible interruption or hazard for traffic.

REFERENCE

- *Highway engineering' Wright, P.H. & Paquette R.J., John Wiley and Sons*
- *Roads construction and maintenance activities of the local bodies' a report by LGED OR RHD.*
- *Code of practice for maintenance of bituminous surfaces of highways' irc: 82-1982.*
- *The roads maintenance problem' Hodgkinson, W.G. SAARC Seminar on and costs of Road construction, Roads and Highways Dhaka, Bangladesh, 1984.*
- *www.ukupedia.com*
- *www.slideshare.net*
- *www.aboutcivil.org*
- *www.miltoncat.com*
- *www.asphaltzipper.com*
- *www.researchgate.net*
- *Project ongoing of roads and highways department.dhaka.bangladesh*