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(Road, River bank & Hill slope stabilization)

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Project

Declaration

We sincerely declare that:

1. We are the sole writer of thistopic .
2. All the information contains in this topic is certain and correct to the knowledge of the author.

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Dedication

At first we want to dedicate this Thesis paper to almighty Allah for giving us a better opportunity to prove ourselves. Without his help nothing is possible.

Then we want to dedicate this thesis to our parents who are the best friends, showed us the light of this wonderful world. Now we are at this position because of them.

We also dedicate this paper to **Dr. Md. MahbubulHaque**Professor & Head **and teachers of daffodil International University** and all the people who have helped usto make in this paper.

Finally we want to dedicate this report to our well wisher and close hearted friends who were always with us.

Project

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Project

List of content

Declaration ii

Dedication iii

Acknowledgement iv

List of content v

CHAPTER–01 1

INTRODUCTION 1

1.1 Introduction 2

CHAPTER–02 5

LITERATURE SURVEY 5

2.1 Geo-textile 6

2.1.2 Classification of Geo textile 7

2.1.3 Important Properties of Geo-textiles 7

2.1.4 Fields of geo-textile application 9

2.2 Jute Geo-Textile 14

2.2.1 Physical properties of jute fiber 14

2.2.2 Chemical properties of jute 16

2.2.3 Advantage of Jute Geo-textile: 16

2.2.4 Comparative Properties of Synthetic & Jute Geo-textile: 17

2.2.5 Manufacturer of jute geo-textile 18

2.3 Present scenery of jute and jute product: 23

2.4 Geo-textiles & the environment 24

CHAPTER-03 26

EXPERIMENTAL \ SURVEY 26

3.1 Types of Jute Geo-textiles (JGT) selected for Bangladesh..... 27

3.2 Organizations Involved with jute Geo-textile Project 29

3.3 Treatment Procedure:..... 29

3.3.1 Rot-proofing Treatment: 29

3.3.2 Treatment with Bitumen emulsion of Specific density: 30

3.3.2 Treatment with silicate of specific Viscosity:..... 30

3.3.3 Treatment with Ca-base grease composite: 30

3.3.4 Preparation of horizontal Drain: 30

3.3.5 Preparation of vertical Drain:..... 30

3.3.6 Treatment of yarn and with polyethylene: 31

3.3.6 Treatment of fabric with polyethylene:..... 31

3.4 Installation Method for rural Road Construction:..... 32

3.5 Installation Method for River bank protection..... 36

3.6 Installation Method for Hill Slope Management 41

3.7 A practical observation of soil erosion control and slope stability using jute geo-textile on Dhaka Sylhet highway 44

3.7.2 Suitability of different fabrics for various geotechnical functions 48

3.7.3 Some Properties of jute geo-textile in unpaved earth road stabilization 49

3.8 Projected world jute geo-textile demand by type (millionsqmt) 1998-2018 51

3.9 Economic Benefit of Using JGT in Different Applications..... 51

3.10 Comparative Costs of JGT and Synthetic Geo-Textiles 52

3.10 Proposed Strategy for jute geo-textile: 53

CHAPTER-04 55

DISCUSSION AND RESULT..... 55

4. Discussion & Result 56

4.1 JGT use in Road: 56

4.2 Use of JGT in River Bank Erosion: 56

4.3 Use of JGT in Hill stabilization: 56

4.4 A new proposal for treatment of JGT: 57

CHAPTER-05 58

CONCLUSION 58

Conclusion 59

REFERENCE 60

REFERENCE 61

CHAPTER–01

INTRODUCTION

1.1 Introduction

Jute is a versatile vegetable fiber which is biodegradable and has the ability to mix with the soil and serve as a nutrient for vegetation. Their quick biodegradability becomes weakness for their use as a geo-textile. Jute geo-textile, a new entrant in the family of geo- textiles, have been identified as an opportunity for the development and introduction of a technically and financially competitive product which eventually could claim a portion of market share in the established market of synthetic geo-textiles. Jute produced in Bangladesh was once known as the 'Golden fiber' accounting for 80%of total world export. In course of time with the advent of synthetic material however, Jute lost that primary position and had to go for diversification. Jute Geo-textile is one of those effects of diversified approaches. Besides adding to the income of the farmers to whom jute is still the main cash crop, Jute Geo-textile is capable of being used as the most reliable base material for protection of slopes of embankments, roads and rivers. The flood affected roads and river embankments in our country are subjected to constant erosions all the year round because of the absence of any reliable protection measures. An in depth research carried out in this field has shown that Jute Geo-textile if properly treated with appropriate chemicals can successfully protect the roads and embankments against erosions and can also guarantee a desired durability.

Jute geo textile is a kind of fiber that addresses geo-technical problems. It is of different kind's coir geo textile, jute geo textile and blend of different fibers. Geo textiles can be effectively used in the management of eroding slopes of roads and railway embankments, mild landslides, prevention of railway track settlement, river embankment and management of solid waste. Presently, some 20,000 tones of jute is being used for geo textiles globally, accounting for about two percent of the market segment. The jute geo textile market has doubled since 1980.

Jute geo textile has some advantages. It is biodegradable and it does not spoil the fertility of soil. It is highly hygroscopic and can suck water as well as helps consolidate soil, enhances the flexibility of soil and above all, it is cheaper than the synthetic fibers. This item can be produced in the country's jute mills as raw materials are available locally. This can even be made from inferior jute.

Jute geo textile had so far been used locally in some place like as Hatirjheel project, the road from Prime Minister's office to Agargaon in the capital, Pakulla-Lawhati road situated in the District of Tangail, 7 km road in between Dhaka and Sylhet Highway, Thanchi- Alikadam road, Pathoraj river bank protection, Noabenki-Garazehat-Harinagarhat LGED road ShayamnagarSatkhira, etc. It is now being used globally, including the USA and Australia. It is more environment-friendly than traditional geo textiles. Bangladesh is the major contributor of jute geo-textiles. It's a new idea and if the use of geo textiles could be increased, the demand of jute would further rise and also its cultivation.

Jute comes principally from Bangladesh, India, China and Thailand. In British India, the jute fibre was known as Indian Grass but in Bangladesh, it is known as Golden Fibre. Jute plant is woody type growing to about 3 m high and under its bark bundles of fibres run longitudinally down the stem (stem diameter varies between 20 to 30 mm) held together by sticky resin. When harvested, the cut stems are tied into bundles and kept submerged in water for 20 to 30 days, the process being known as 'retting'. The tissues of the stems are then broken down under bacterial action. The resulting soggy mass consists of strands of overlapping fibres. The fibres are then stripped off from the stem manually, washed in water and dried under the sun (BJRI, 1974). To-day, the production of various jute geotextiles is an enormous industry with world-wide production of around 3 million tonnes. Of this, about 50 percent comes from Bangladesh, about 30 percent from India and the remainder from China, Indonesia and Thailand. Synthetic geotextiles have been used in many geotechnical engineering applications (Nagarkar et al 1980, Robnettetal 1980,Ingold 1984,USFHA 1985). World consumption of synthetic geotextile has grown rapidly; estimates vary from 250 to 400 million m2 per annum (Textile Horizon, 1985). One of the common uses of synthetic geotextiles is in road construction (McGown and Ozelton 1973, Jerrett et al 1977, Hore 1977, ASCE 1979, Lai and Robnett 1980, Sim 1984, Giroud and Noiray 1984, deBoer 1984). Synthetic geotextiles when used in areas where soft subgrades have created problems, have functioned very well resulting in increased durability and performance. Various laboratory and field investigations concerning the uses of synthetic geotextiles (both woven and non-woven) in various geotechnical applications are reported in literature (Ingold 1984, Giroud and Noiray 1984). But very little information is available on the application of natural jute geotextiles for geotechnical purposes. A five-year project, titled 'Development and Application of Potentially Important Jute Geo Textile', has been complicated in Bangladesh and

India under the support of Common Fund for Commodities (CFC) to promote jute geo textile. Of the total project cost of US$ 3.962 million, CFC is providing $2.045 million, Indian counterpart contribution will be $1.24 million while Bangladesh counterpart contribution is $0.567 million. IJSG is the supervising agency of the project while Jute Diversification Promotion Centre (JDPC) is the collaborating institution. Now that project is monitoring period.

As of now, LatifBawany Mills under the state-owned Bangladesh Jute Mills Corporation (BJMC), and privately-owned Janata Jute Mills are now exporting jute geo textiles to different destinations including EU, Australia and Canada. Janata Jute Mills exports around 2,000-2,500 tones of jute geo textiles every year.

The International Jute Study Group (IJSG) has suggested that Bangladesh government should use jute geo textile with concrete in construction of roads and highways in order to enhance jute usage. Indian experiment of effective usage of jute geo textile with concrete in constructing roads has been highly successful. This is one of the main reasons for the return of good days for jute there. Jute geo textile can be used as layers in making. Bangladeshi jute sector has tremendous possibilities. Economists have time and again recommended that total revival of the sector will ensure employment, inflow of foreign currency through exports and in other ways. In addition, the country's infrastructure, communication, manpower and land conditions are conducive to the growth of such an industry.

Bangladesh can take the opportunity of the worldwide environmental concern to popularize use of jute and jute geo textile. If proper management policies are adopted, the jute sector will be a profitable one. There can be no question about the possibility of the revival of jute sector since jute industries have been a profitable one in Bangladesh for decades. Short-term and long-term steps are needed to bring about a positive change in this sector. Due emphasis must be given on the diversified use of jute and jute geo-textile.

CHAPTER–02

LITERATURE SURVEY

2.1 Geo-textile

As we know, the prefix of geo-textile, geo, means earth and the ‘textile’ means fabric. Therefore, according to the definition of ASTM 4439, the geo-textile is defined as follows:

"A permeable geo-synthetic comprised solely of textiles. Geo-textiles are used with foundation, soil, rock, earth, or any other geotechnical engineering-related material as an integral part of human-made project, structure, or system."

The ASAE (Society for Engineering in Agricultural, Food, and Biological Systems) defines a geo-textile as a "fabric or synthetic material placed between the soil and a pipe, gabion, or retaining wall: to enhance water movement and retard soil movement, and as a blanket to add reinforcement and separation." A geo-textile should consist of a stable network that retains its relative structure during handling, placement, and long-term service. Other terms that are used by the industry for similar materials and applications are geo-textile cloth, agricultural fabric, and geo-synthetic .

Picture of geo-textile

2.1.2 Classification of Geo textile

According to the Origin

1. Natural
2. Synthetics

According to the period of use

a) First generation – Geo-textiles that were being manufactured for other purposes such as carpet or industrial sacking but later used for geotechnical purposes.

b) Second generation- These were the Geo-textiles which were manufactured for certain geotechnical purposes but without adopting any modern techniques

c) Third generation – These are the actual Geo-textiles designed and produced to meet certain end use.

2.1.3 Important Properties of Geo-textiles

These are broadly classified as;

1) Physical properties:

a) Specific gravity
b) Weight
c) Thickness
d) Stiffness
e) Density etc.

2) Mechanical properties:

a) tenacity
b) tensile strength
c) busting strength
d) drapability
e) compatibility
f) Flexibility

g) fracture strength

h) tearing strength

i) frictional resistance etc.

3) Hydraulic properties:

a) Porosity

b) permeability

c) permittivity

d) transitivity

e) turbity /soil retention

f) filtration length etc.

4) Degradation properties:

a) Biodegradation

b) hydrolytic degradation

c) photo degradation

d) chemical degradation

e) mechanical degradation

f) Other degradation occurs due to attack of rudden, mite, termite etc.

5) Endurance properties:

a) Crimp/elongation under texture

b) abrasion resistance

c) clogging length and flow etc.

2.1.4 Fields of geo-textile application

The main functions of geo-textiles make them suitable for application to many practical problems (Ingold& Miller, 1988). Some of these applications are:

- Temporary roads and yards
- Permanent roads
- Repair of permanent roads
- Railway tracks
- Embankments in soft ground
- Drainage applications
- Retaining walls, and
- Erosion control

Most of these applications are particularly suitable to the geological features prevailing in many parts of India, Bangladesh, South-East Asia, China and Japan. Vast areas of alluvial and marine deposits in these regions contain soft clay of high compressibility and low shear strength. They give rise to problems of stability and settlement even under small superimposed loads. Geo-synthetics have been used extensively in recent years in various construction works in India. These materials are highly resistant to biological and chemical degradation and have sufficient tensile strength and permeability for direct ground treatment applications. Geo-textiles made out of natural fibers, e.g., jute geo-textiles, have got high permeability but they are biodegradable and possess less tensile strength, in general. They have not been promoted as widely as geo-synthetics. Consequently their application, so far, has been on a limited scale.

Roads:

Geo-textile may be used in both unpaved and paved road constructions. These may also be used in road drainage and road embankment constructions. Geo-textile is used in construction of unpaved roads heralded the advent of Geo-textile era. These are now extensively used in unpaved road constructions on poor sub-soils. These include access roads, rural roads, forest roads and makeshift roads for military, border roads and emergency purposes. In Bangladesh, use of geo-textiles in such applications solves excessive rutting problems in soft alluvia, especially during the monsoon season. This allows keeping such roads open even during monsoon, when these usually become impassable by tired vehicles.

In paved road structure geo-textiles may be used between sub-base and sub-grade layer to protect the former from intermixing with the latter. Geo-textiles may also be used in the asphalt overlay layer as sealant and reinforcement. This will enhance the life of the overlay and will be very beneficial in protecting the newly paced asphalt course from reflective cracking. In Bangladesh, poor compaction of the sub-grade layer often leads to failure of road. For this problem geo-textiles are very suitable and are greatly enhance the performance of life. Failure of the overlay is also very common in this country. Reinforced asphalt overlay by geo-textiles is very beneficial in maintaining pothole free relatively comfortable riding surface. The melting points of polyester fiber made of geo-textile are 350 to 370 QC. Normally polyester made of geo-textile can be used in asphalt, overlay layer as sealant, where in asphalt retention is 0.80 to 1.00 liters/m2.

Figure: use of jute geo-textile in road

Airfields:

Geo-textiles may be conveniently used in support layers of airfield pavements especially those on soft grounds. Use of geo-textiles in subsurface drainage of airfield pavements is almost a prerequisite for efficient and satisfactory performance of airfield pavements at a lower cost.

Railways:

Geo-textiles may be used in the rail road constructions and repairing of existing facilities. These provide cost effective solution to rail track problems especially under increasing axel load, high speeds or increased frequency of loading. In Bangladesh maintenance cost, in the form of

overhauling and screening, may be considerably reduced by adopting of geo-textile in constructions.

River Erosion Problem:

The most effective applicable areas of this geo-textiles technology are to protect erosions. Geo-textiles provide the best protection for erosion prone sedimentary soils which are deficient in stability due to insufficient cohesion. In Bangladesh river bank soils are very unstable from errosional point of view. These soils are deposited by the action of river flow and therefore, are very prone to re-transportation. Geo-textiles technology provides the most effective solutions for these types of soils. The construction procedures practiced in Bangladesh is only intended for protection of river bank surface layers from erosion. The existing designs normally do not incorporate any measure for overall stability of the slopes due to, for example, failure as a result of seepage towards the river, under rapid down condition. B. J. Geo-textiles technology may be used in these applications in reinforcing the banks from deeper failures as well as protecting the surface layers from erosion due to flow and/or wave action.

Coastal Protection:

Coastal defense embankment structure is one of the most effective application areas of geo-textile. Geo-textiles are used in these structures in reinforcing the body of the embankment as well as protective layers mainly as filters under hydrodynamic reversible flow conditions. Geo-textiles have been effectively used in designs of coherent and durable structures for such applications. In Bangladesh several types of coastal embankments has already been constructed and more are being in plan. Some of these protecting the Chittagong city perimeters, incorporate

hard facing materials in the shape of large cubic, blocks or stone rubble revetments. In the rural areas low rise soil embankments have been constructed without hard facing materials. These were constructed mainly to protect the land from tidal flooding, as most of the coastal flats are situated below high tide level. These types of embankment suffer severe damage during cyclonic storms due to surges. Depending on the severity of cyclonic attack, cost of property or infrastructure and density of population to be protected a number of types of geo-textiles included designs may be produced. These may be divided into three major types.

These include,

a) Hard facing type
b) Intermediate facing type and
c) Soft facing type.

In the hard facing type concrete elements, fabriform, macadamat or gabions may be used. The intermediate type incorporates hard facing materials and vegetation may be used in alternate grid form which allows considerable cost savings. In the soft facing type vegetative cover integrated with geo-textile may be used as facing materials. In all of these applications geo-textiles in sheet or tube form may be used in the undercover layer.

Structures on Soft Foundations:

This subject include all structures like embankments, roads, railways, airfields, bridges, buildings, container storage yards, parking lots etc. constructed on soft foundation. Geo-textile included granular mattresses and geo-textile incorporated with other geo-materials like geo-grids, geo-webs, prefabricated vertical drains etc. may be used in improving foundation conditions in such cases. B. J. Geo-textile may be conveniently used in such applications, which are abundant in Bangladesh.

Site Reclamation and Hydraulic Fills:

In a lowland country like Bangladesh site improvement often by filling with structural fill materials is abundant. This is often performed by using hydraulic (dredged) fills. B. J. Geo-textile may conveniently be used in construction of container dykes as well as drainage systems in such applications.

Slope and Wall Reinforcement:

Geo-textiles application in design of retaining structures and slopes is probably the most revolutionary innovation from technical and cost points of view. Technology of geo-textile allows construction of retaining wall and abutment at a cost savings between 30 and 50 percent over their conventional reinforced concrete counterparts.

Fig: Slope and Wall Reinforcement

2.2 Jute Geo-Textile

Jute produced in Bangladesh was once known as the 'Golden fiber' accounting for 80% of total world export. In course of time with the advent of synthetic material however, Jute lost that primary position and had to go for diversification. Jute Geo-textile is one of those effects of diversified approaches. Besides adding to the income of the farmers to whom jute is still the main cash crop. So that which jute are use in geo-textile that is jute geo-textile.

Fig: Jute Geo-Textile

2.2.1 Physical properties of jute fiber

Sl. No	Properties	Values
01	Jute cell/ultimate width (range)	15-204 µm
02	Jute cell/ultimate length (range)	1-6 µm
03	Jute cell/ultimate width (average)	184 µm
04	Jute cell/ultimate length (average)	2.5 µm
05	Tenacity	2.7-5.3 g/tex
06	Specific gravity	1.48
07	Moisture regain at 65% RH/22^{0}c	13.8%
08	Fineness (g/1000m)	1.4-1.65 tex
09	Breaking elongation	0.8-1.8%

10	Refractive index (parallel)	1.577
11	Refractive index (perpendicular)	1.536
12	Fluorescence with corning filter	Bluish-white
13	Phosphorescence (colour)	Yellow
14	Phosphorescence (time)	15 second
15	Swelling in water (diameter)	20-21%
16	Swelling in water (area)	40%
17	Stiffness (average)	185
18	Specific heat	0.324 cal/g/c
19	Water retention	70%
20	Sorption ratio	1.6
21	Young's modulus (white)	0.86-1.74 dynes/cm^2×1011
22	Young's modulus (tossa)	0.96-1.94 dynes/cm^2×1011
23	Modulus of rigidity (tossa)	4.42
24	Breaking twist angle	79.71
25	Linear density	0.94-2.94tex
26	Density	1.52-1.59g/cc
27	Elastic recovery from 3 g/den stress	75%
28	Elastic recovery from 1.5 g/den stress	75%
29	Dielectric constant (at 2kHz)	1.8 (dry), 2.4 (RH 60%), 3.6(RH 100%)
30	Insulation resistance (depending upon RH)	10^{14}-10^{17} ohm
31	Electric strength	500 KV/cm
32	Heat of combustion	17.5 j/g
33	Ignition temperature	193^{o}C
34	Co-efficiency of thermal	0.255 kj/m/h/k
35	Conductivity (loosely packed and compressed)	0.920 kj/m/j/k

36	Specific internal surface	10-200 m^2/g
37	Elongation at break	1.0-1.8%
38	Heat of wetting	18.2 cal

2.2.2 Chemical properties of jute

Sl. No	Properties	Value
01	α-cellulose	59-61 %
02	Hemi-cellulose	22-24 %
03	Lignin	12-14 %
04	Fat and waxes	1.0-1.4 %
05	Nitrogenous matter	1.6-1.9 %
06	Ash content	0.5-0.8 %
07	Pectin	0.2-0.5

2.2.3 Advantage of Jute Geo-textile:

- Strengthening of road and highways
- Control of erosion in river bank and slopes
- Stabilization of embankments
- Soft soil consolidation
- Geo-environmental applications
- Jute Geo-textile is much cheaper than synthetic fiber.
- It is easy to blend with other natural material and synthetic fibers.
- It is also a renewable source of energy as natural biomass.

2.2.4 Comparative Properties of Synthetic & Jute Geo-textile:

Sl. No.	Observations	Effect on Synthetic Geo-textiles	Effect of jute geo-textiles
01	Biodegradability	Non- biodegradability	Designed biodegradability
02	Photo degradability	Non-photo biodegradability	Photo degradability
03	Ionic property	Normally nonionic	None
04	Metal content	Mercury, lead, cadmium, copper, nickel, cobalt, zinc, arsenic etc.	None
05	Stabiliser/sensitizer filler/pigment	Present	Absent
06	Warning effect	Soil temperature increases by 1-2^0C	No effect
07	Leaching effect	pH changes from 4.5-8.5	
08	Compatible	Normally not Compatible	Compatible
09	Biomass	Negative effect	Fertilizer effect
10	Stacking effect	Slippery	Non-slippery
11	On burning	Toxic gas evolves	Only CO_2 evolves
12	Effect on water	Pollution on leaching	No pollution
13	Effect on fish/microbes/eggs etc.	Harmful	Harmless
14	Effect on plants	Harmful	Helpful
15	Effect on biological pathway	Possibility of creating disturbance	No disturbance
16	Effect of agricultural activity	Increase in insect growth by increasing soil	No effect

17	Prone to rat	Yes	Modified
18	Extensibility	High extensible	Low extensible
19	Shape and size	Any dimension	Any dimension
20	Fabrication	Woven, non-woven and composite	Woven, non-woven and composite
21	Expected design life	Not possible (if possible create other problem)	Possible
22	Application technology	Special technology and costly	Simple and indigenous
23	Full scale model study in Bangladesh	Was not done	Done
24	Origin	Foreign	Local
25	Cost	More	Less
26	Availability	Imported	Local and easy
27	Foreign exchange	Yes	No
28	Supply	Foreign	Any quantity can be supplied locally

2.2.5 Manufacturer of jute geo-textile

1) Company name:CMZ trading & shipping

Company capacity:

Business Type	Manufacturer, Trading Company, Distributor/Wholesaler
Main Products	Raw Jute, Jute Gunny / Sack Cloth, Jute Hessian Cloth, Jute Gunny Sack / Bag, Jute Hessian Sack / Bag
Location	Bangladesh

Year Established	2011
Year start exporting	2005
Number Of Employees	5 - 10 People
Total Revenue	US$10 Million - US$50 Million
Main Markets	South Asia, Western Europe, Southern Europe, Eastern Europe, Northern Europe
Average Lead Time	21 Day(s)

Trade capacity:

Main Markets	Total Revenue (%)
South Asia	17 %
Western Europe	17 %
Southern Europe	17 %
Eastern Europe	17 %
Northern Europe	12 %
Mid East	4 %

Factory Information

Factory Size	Below 1,000 square meters
Factory Location	Pabna
No. of production lines	2
Contract Manufacturing	Buyer Label Offered

Annual Output Value	US$5 Million - US$10 Million

2) Company name: Bangjin group

Product Data (PP) or (PET):

Polymer Type	Polypropylene (PP) or Polyester (PET)
Fiber Type	Staple Fiber Monofilament
Fiber Length	80mm - 100mm
Manufacturing Process	Needle Punch
UV Protection	Minimum 70% of original tensile strength of Geo-textile after 90 days exposure to natural sunlight
Biochemical	Stability Stable for permanent functioning under naturally occurring acids alkalis and biological attacks
Range of Products	150gsm - 3000gsm
Roll Width	2.5meter - 5meter

The uses of geo-textiles and related products have exploded geometrically in Civil Engineering Industries almost allover the world. With the innovation of new products and recent development in design and construction methodology of old products, the uses of this technology are multiplying in different fields of its new applications day onwards. Bangladesh is a country of floods, cyclones and high rainfall therefore this technology has already been started about fifteen years ago with an ambition for creating its further applications. B. J. Geo-textile Limited has taken up the pioneering roles producing non-woven needle punch geo-textiles in this country with the plans expanding other fields of uses of Geo-textile products like Geo-grids, Woven Geo-textiles, Composite Geo-textiles and Prefabricated Vertical Drains.

3) Company name: Jutexs World

Company Introduction

Business Type	Manufacturer, Trading Company, Agent
Location	Bangladesh
Year Established	2003
Total Revenue	US$5 Million - US$10 Million
Main Products	Raw Jute,JuteCloth,JuteBags,GunnyBags,Jute Sacks
Main Markets	Southern Europe, Northern Europe, Central America, Western Europe

Main product of Jutexs World:

Std. A Twill Jute Bag

Jute cloth

Jute yarn

Jute webbing

2.3 Present scenery of jute and jute product:

All the jute industries in Bangladesh are primarily export oriented. Raw fiber is exported as well as jute manufactured goods. The range of products produced is similar to India but the structure of the industry is different. On the one hand there is the Government owned BJMC- Bangladesh Jute Mills Corporation with 22 or so mills, running the bulk of the operational looms and the semi-privately owned BJMA- Bangladesh Jute Mills Association with 12 operating mills. On the other hand there is the BJSA- Bangladesh Jute Spinners Association with over 40 mills which is an association of private sector yarn producers. In Statistical terms the BJMC and the BJMA output all of which are composite fabric mills are here shown together.

Bangladesh provides over 90% of the world's raw jute and allied fiber exports. Raw jute exported each year ranges between 300,000 and about 350,000 tons. India, Pakistan and China between them take about 250,000 tons with India accounting for half.

Jute fiber availability in Bangladesh is generally in the range 750,000 to 850,000 tons in recent years. As noted earlier about 300,000 tons is exported and about 45,000 tons is consumed in village consumption, which leaves about 500,000 tons for use in the national mills.

The internal consumption of jute goods in Bangladesh is about half the amount per capita compared to that of India.

The amount of jute goods consumed internally in Bangladesh is in the range 100,000 tons per year. There has been a slow build up of internal consumption over the years, in 1970 – 30,000 tons, 1980 – 40,000 tons, 1990 – 50,000 tons and in 2000 – 80,000 tons. It would be reasonable to anticipate a little over 120,000 tons by the year 2010.

Bangladesh exports a big amount of jute products in world market. In recent years the quantity of exporting jute goods is higher in comparing with the other countries and it is increasing day by day.

2.4 Geo-textiles & the environment

Now a day's environment and ecological sustainability become one of the prime issues in the modern development strategy. Without positive environmental and ecological sustainability product becomes obsolete. No benefit can be harnessed from this type of technology whatever big achievement it may be.

Geo-textiles are not new technology. But their modern uses have started with the advancement of synthetic and polymeric products and their ever increasing applications in different forms and areas of civil engineering are not very old. At the beginning synthetic geo-textile materials were mostly popular. Synthetic geo-textiles are made of polymers and plastics. Hydro-carbons, petro-chemicals, fossils are the basic raw materials for their production.

All green house gases and effects are somehow related with their manufacturing which causes acid rain, deforestation, desertification, depletion in ozone layer and biodiversity, warming of earth, rising of sea water level etc. During their manufacturing process various plasticizers, fillers, sensitizes, stabilizers, antioxidants etc. are to be compounded for effective product development. These additive materials are more hydrolysable and have got properties from alkaline to acidic in nature. Moreover, non-destructible nature of these synthetic geo-textiles has direct effect on soil, water, air and other biotic and a biotic system. Again these geo-textiles often

come in contract with life cycles of animals, fisher, insects, and pest along with various micro organisms and create imbalance in their natural conditions of life leading.

Synthetic geo bag laid alongside the Cox's bazar to Teknaf marine drive not successful in all the places to protect that.

On the other hand jute geo-textile is biodegradable and eco-friendly. In the manufacturing process of jute geo-textile no harmful chemical is used. So it is not harmful for the environment. After a certain period the jute geo-textile meshes with the soil and act as a fertilizer.

CHAPTER-03

EXPERIMENTAL \ SURVEY

3.1 Types of Jute Geo-textiles (JGT) selected for Bangladesh

- For rural road Construction : 627,724,and 760 gsm (woven)
- For river Bank Protection : 627 Gsm (woven, Bitumen or otherwise treated)
- For Hill Slope Management : 500,600 and 700 gsm (open Weave)

Application of JGT:

Type of Application	Location	District/Upazilla	Executing agency
Rural road construction	Turag-Rohitpur-Bourvita road	Dhaka/Keranigonj	RHD
Rural road construction	Circular road Savar Cantonment	Dhaka/Savar	LGED & SWO
Rural road construction	NoabenkiShamnagar Road	Satkhira/ Shamnagar	LGED
Rural road construction	South Para(Kanda Para) Road	Bancharampur/Brahmanbaria	LGED
Rural road construction	Tezkhali-Titas river-Chandumia Road	Bancharampur/Brahmanbaria	LGED
Rural road construction	Pakulla-Lawhati	Tangail	APDL & LGED
Rural road construction(Slope)	Dhaka-Sylhet Highway		RHD

Project

Rural road construction	Saibor-Kaligang-Mithapur bazaar Road	Lohagara/Narail	LGED
River Bank Protection	Pathoraj River	Panchagar/Boda	BWDB
River Bank Protection	Garai River	Rajbari/Baliakandi	BWDB
River Bank Protection	MadarpurBeel Route (MBR) Channel	Mkshodpur/Gopalganj	BWDB
River Bank Protection	Shakbaria river	Koyra/Satkhira-2	BWDB
River Bank Protection	Kazibacha river	Batiaghat/Khulna	BWDB
Hill Slope Management	Thanchi-Alikadam Road (36 Meter Uphill Segment) Located on 14.75 km point	Thanchi/Bandarban	SWO
Hill Slope Management	Thanchi-Alikadam Road (30 Meter Uphill Segment) Located on 10.8 km point	Thanchi/Bandarban	SWO

Project

Hill Slope Management	Thanchi-Alikadam Road (18 Meter Downhill Segment) Located on 11.7 km point	Thanchi/Bandarban	SWO

3.2 Organizations Involved with jute Geo-textile Project

- Bangladesh University of Engineering and Technology (BUET)
- Bangladesh Jute Research Institute (BJRI)
- Soil Resources Development Institute (SRDI)
- Local Government Engineering Department (LGED)
- Bangladesh Water Development Board (BWDB)
- Roads and Highway Department (RHD)
- Special Works Organization (SWO) of Armed Forces Division
- Bangladesh Jute Mills Corporation (BJMC)
- Janata Jute Mills Limited (JJML)
- Arcadia Property Development Ltd. (APDL)
- Jute Diversification Promotion Centre (JPDC)

3.3 Treatment Procedure:

Normally Jute fibre is swelled and degraded within six months in water. So some chemical treatment is necessary to increase its life span upto 5 –20 years.

3.3.1 Rot-proofing Treatment:

Sodium Carbonate and Sulfate of Copper is mixed with water and sprayed manually over jute fabrics. The treated fabrics were dried in sun light at NTP.

3.3.2 Treatment with Bitumen emulsion of Specific density:

Carbon black was prepared with required quantity of volatile oil and then bitumen emulsion was added with paste and stirred. After mixing homogenously, the emulsion was laminated on the modified hessian cloth by brass manually and dried in sunlight or open area at NTP.

3.3.2 Treatment with silicate of specific Viscosity:

Silicate solution was prepared by adding hot water and stirred according to need and then used on the modified bitumen treated samples manually and dried at NTP.

3.3.3 Treatment with Ca-base grease composite:

Ca-base grease was added with required amount of carbon black and prepared a paste by adding volatile oil. The composite paste was then rubbed haphazardly by hand on the modified hessian cloth and completed the rubbing by brass. After rubbing a small amount of carbon black was sprayed over the located area or full sample and then again rubbed by brass.

3.3.4 Preparation of horizontal Drain:

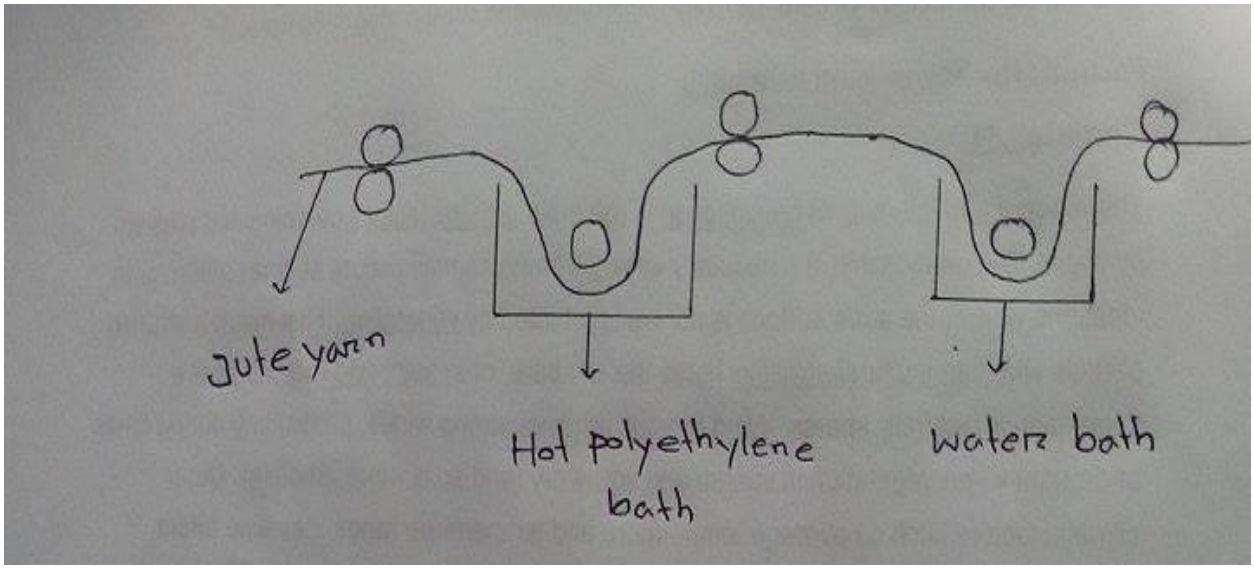
The whole portion of the drain prepared by hessian cloth was treated with bitumen emulsion composite. The located area i.e. the middle Yz portion of the sample was laminated by grease composite and dried in open air at NTP. Course Sand was used as filter materials.

3.3.5 Preparation of vertical Drain:

Lightweight Hessian cloth was laminated by grease composite and dried in open air at NTP. Course Sand was used as filter materials.

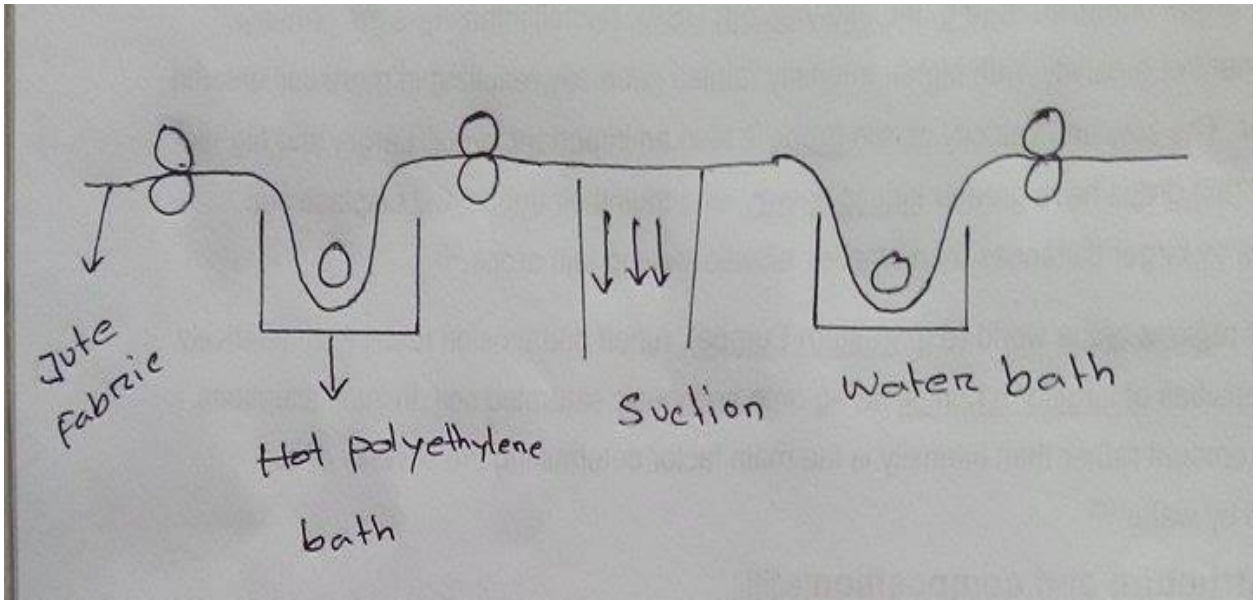
3.3.6 Treatment of yarn and with polyethylene:

A proposal Our teacher prof. dr. MahbubulHaque sir said that if Jute yarn are coated in polyethylene then may be jute yarn strength are more higher and durability may be long time.



3.3.6 Treatment of fabric with polyethylene:

Our teacher also said that if jute fabric are coated with polyethylene then fabric strength is so high and durability is also long time.



3.4 Installation Method for rural Road Construction:

1. Untreated 627 GSM or 724 GSM may be used for rural or union road construction depending on traffic volume.

Fig 1: 627 gsm JGT

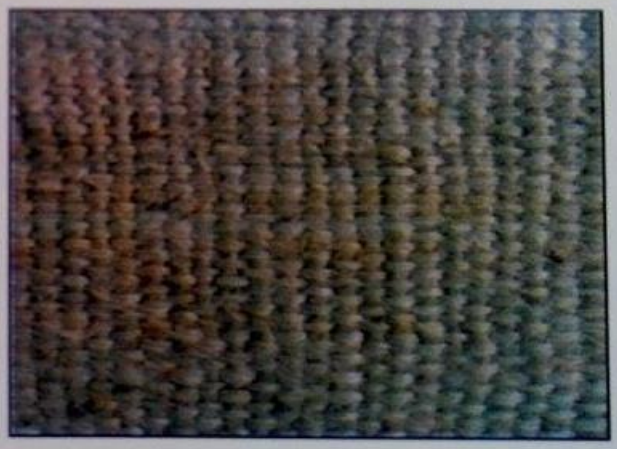


Fig 2: 724 gsm

2. The subgrade is to be prepared to the required level, cleared of all foreign materials and compacted to the OMC (Optimum Moisture Content) and Specified Energy. Vegetation, if any should be uprooted and the area leveled with earth and rolled
3. A thin layer (maximum 75 mm thick) of improved subgrade (I SG) of local sand should be placed first on the subgrade ensuring desired compaction

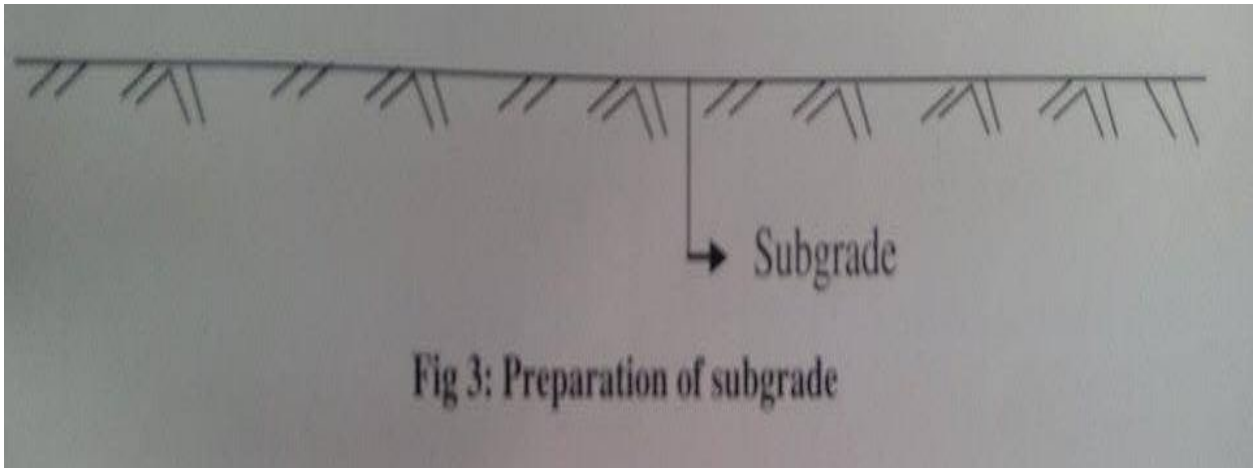


Fig 3: Preparation of subgrade

4. JGT, as selected, should be laid by unrolling, ensuring proper drapability (i.e. JGT should touch the ISG surface at all point) and stapled at an interval of 300 mm with overlaps of 100 mm. Staples should be preferably 6mm dia U-shaped pegs or 37 mm long mushroom nails. It is preferable to avoid overlaps to the extent possible.
5.

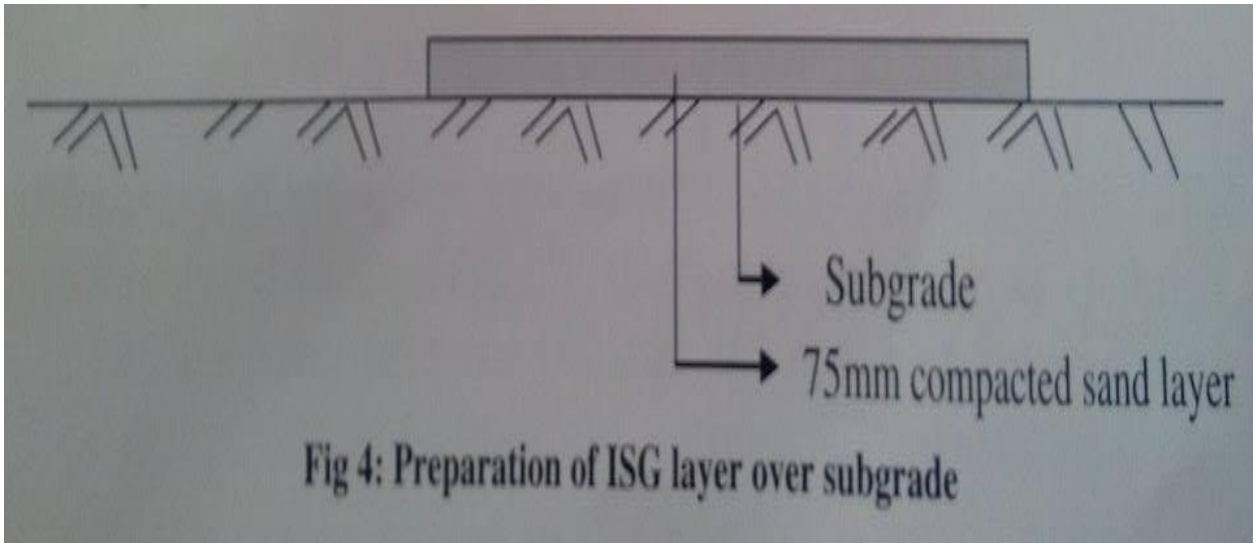


Fig 4: Preparation of ISG layer over subgrade

6. Another thin cushion of local of sand (75 mm thick or as required), i.e. the second layer of improved Subgrade (ISG) should then follow over the JGT to prevent puncture/damage due to rolling of the upper sub-base/base-layer.

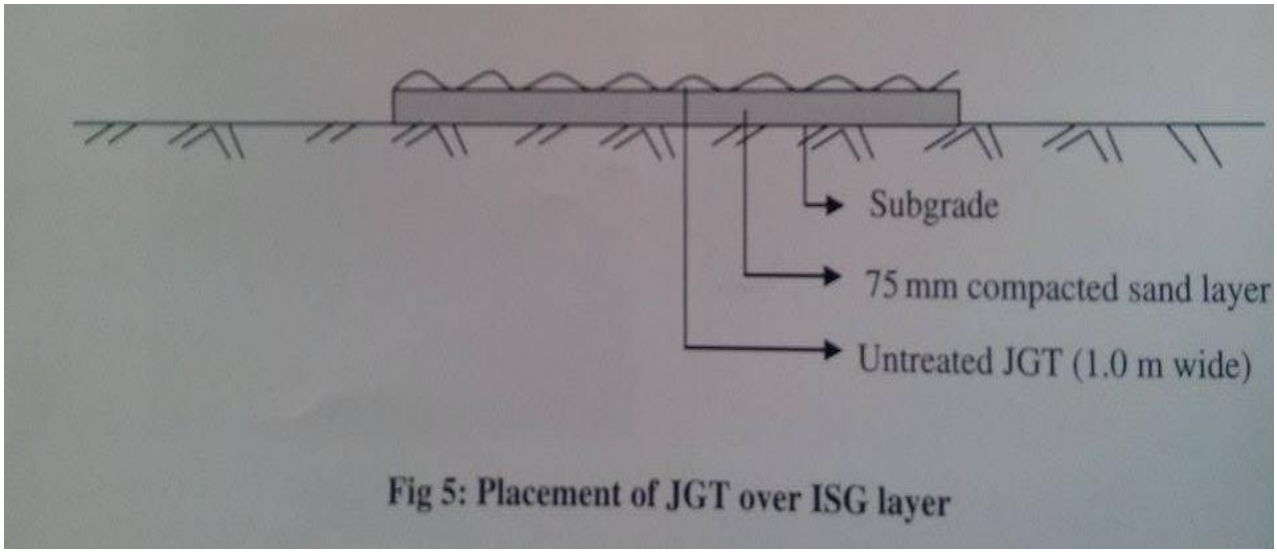


Fig 5: Placement of JGT over ISG layer

7. The first layer of aggregates in the base-layer should then be spread with gradings as recommended in design. No traffic should be allowed on uncompacted base with less then 200 mm (150 mm for CBR 3) thickness laid over JGT.

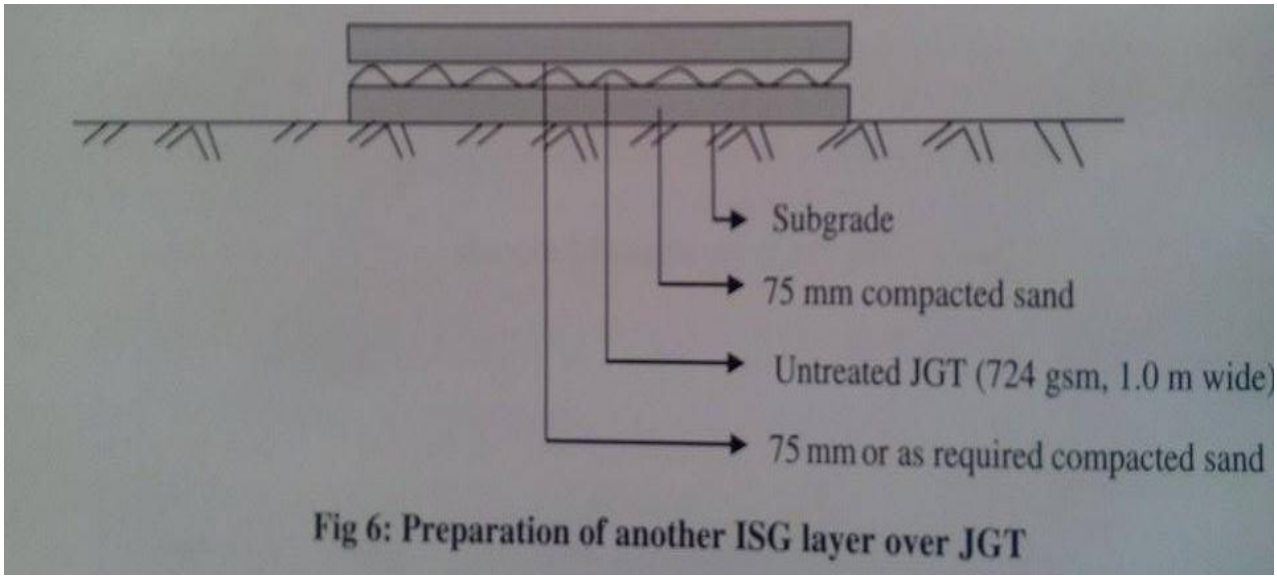


Fig 6: Preparation of another ISG layer over JGT

8. The subsequent layers should be constructed following the usual practice of relevant agency/organization.

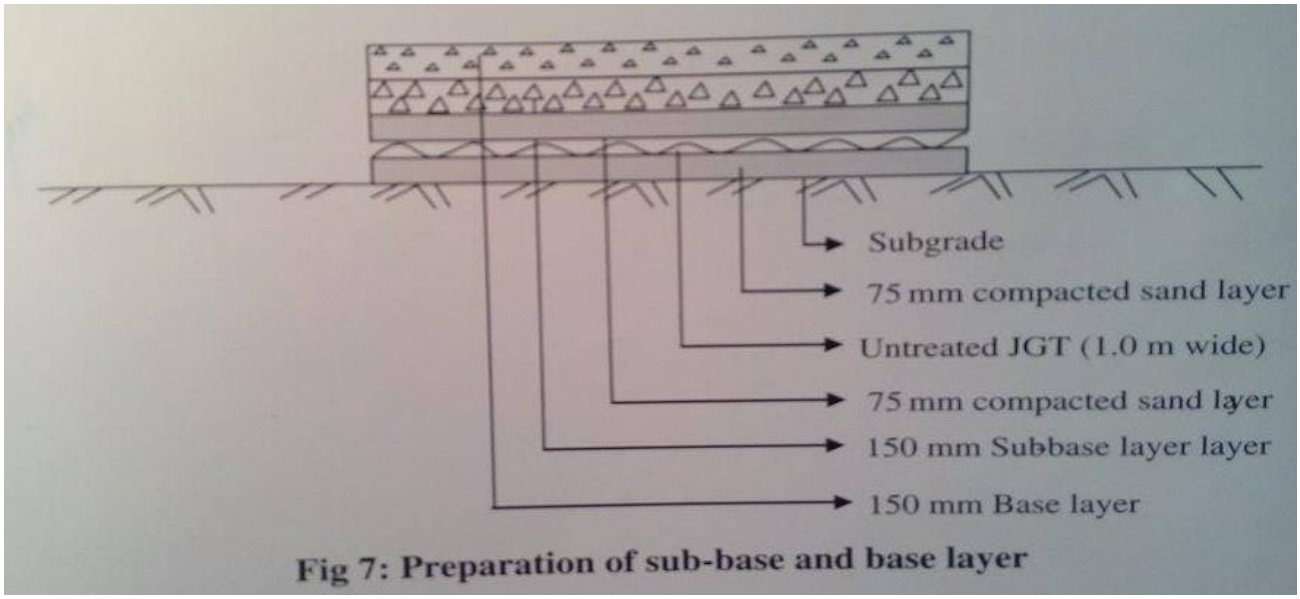


Fig 7: Preparation of sub-base and base layer

9. Any rut that may be developed during construction should be filled in.

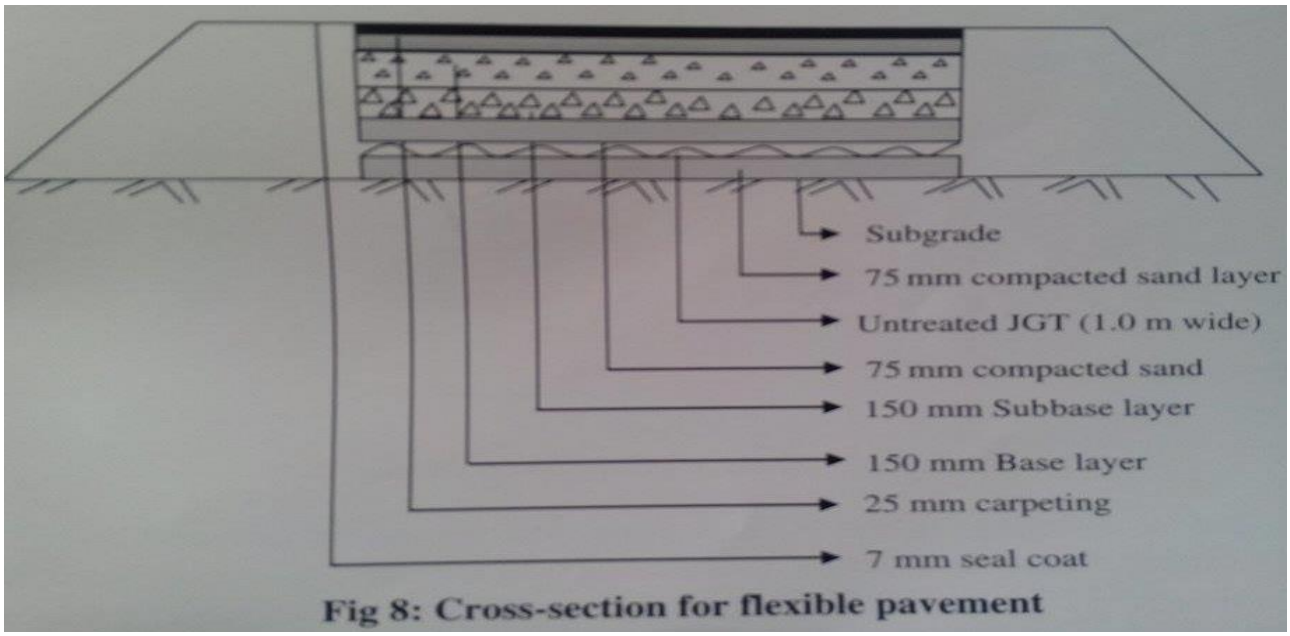


Fig 8: Cross-section for flexible pavement

10. Parallel rolls of JGT should be overlapped and stapled

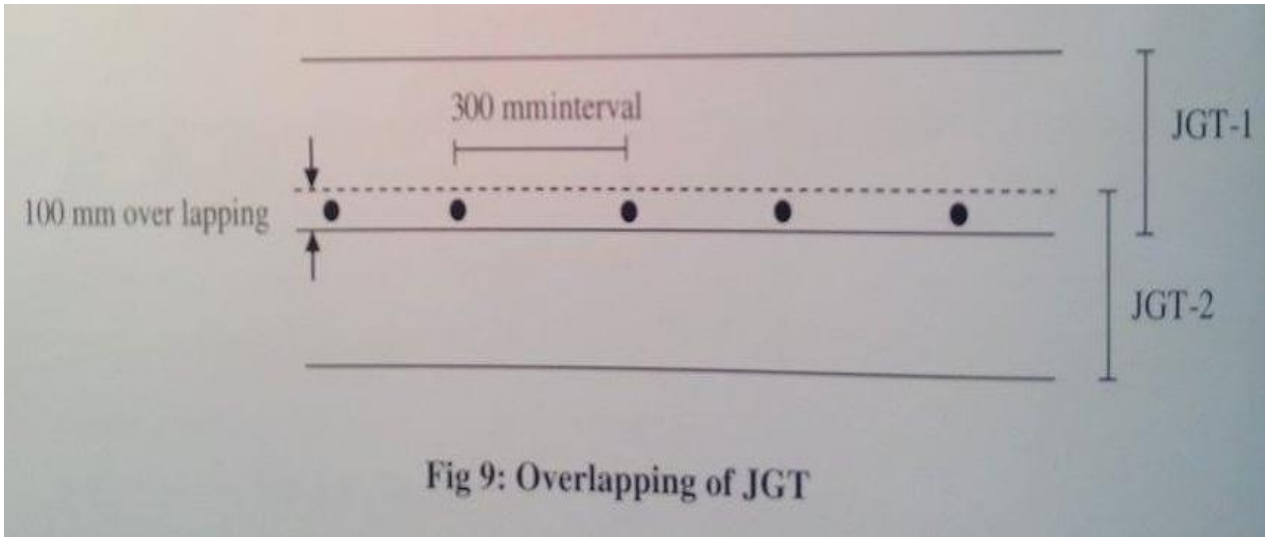
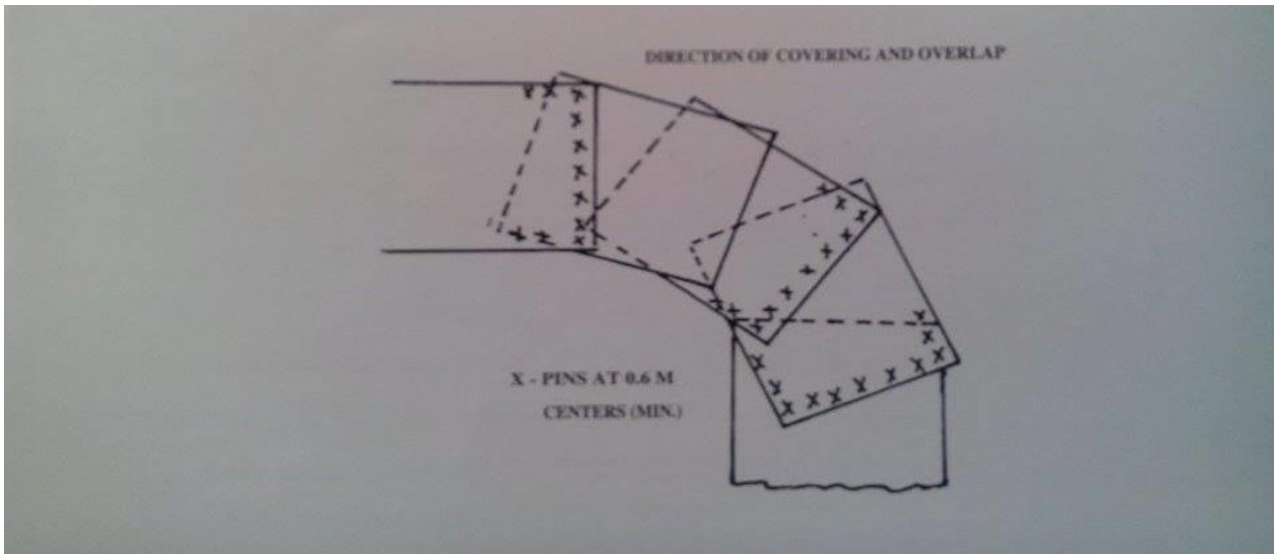


Fig 9: Overlapping of JGT

11. For application in curves, JGT should be folder or cut and overlapped in the direction of the turn. Fold in JGT should be stapled at an interval of 300 mm.



12. Before covering up the JGT, it condition should be assessed for any constructional/installation damage. Torn/damaged portions may be covered by pieces of JGT and duly staple on all sides preferably at interval of 75 mm. The extent of overlap will be such as to fully cover the damaged/torn portion fully plus at least 75 mm beyond, on all sides.

3.5 Installation Method for River bank protection

1. Only treated 627 GSM JGT shall be used for protection of mild to moderate river bank

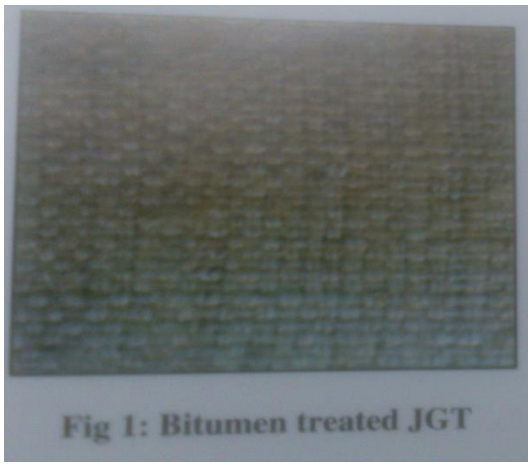


Fig 1: Bitumen treated JGT

Fig 2: Additive treated JGT

2. The bank should first be cut/filled to a slope at an angle of interval friction of the bank soiusually 1 V:2 H or 1V:3H.

3. The surface should be leveled and made free from angular projections, undulation, soil-slurry or mud. Anchoring trench (usually rectangular) should be excavated at the top of bank-slope. Recommended dimensions of the trench 500 mm deep and at least 250 mm wide at the bottom. The trench should be free foreign materials, mud etc.

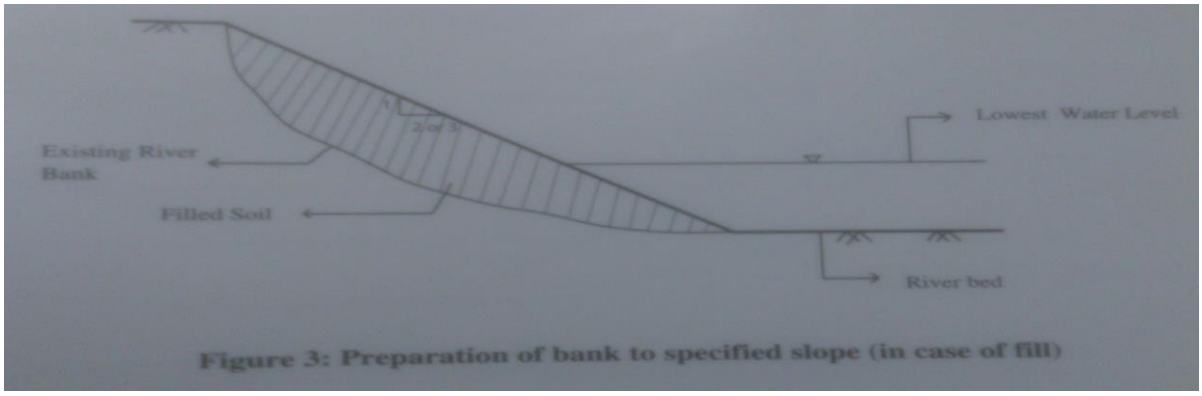


Figure 3: Preparation of bank to specified slope (in case of fill)

4. Sand cushion is provided over leveled surface before the placement of JGT. Usually, fineness modulus of sand lies in between 1 to 1.5.

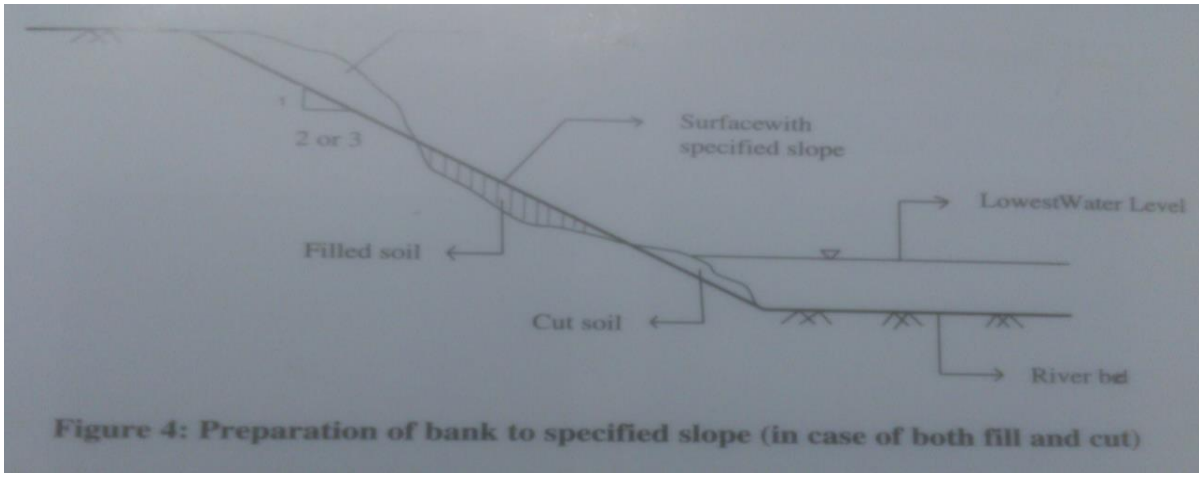


Figure 4: Preparation of bank to specified slope (in case of both fill and cut)

5. JGT should then be unrolled along the slope from top to down up to the lowest point of the slope (including falling apron).

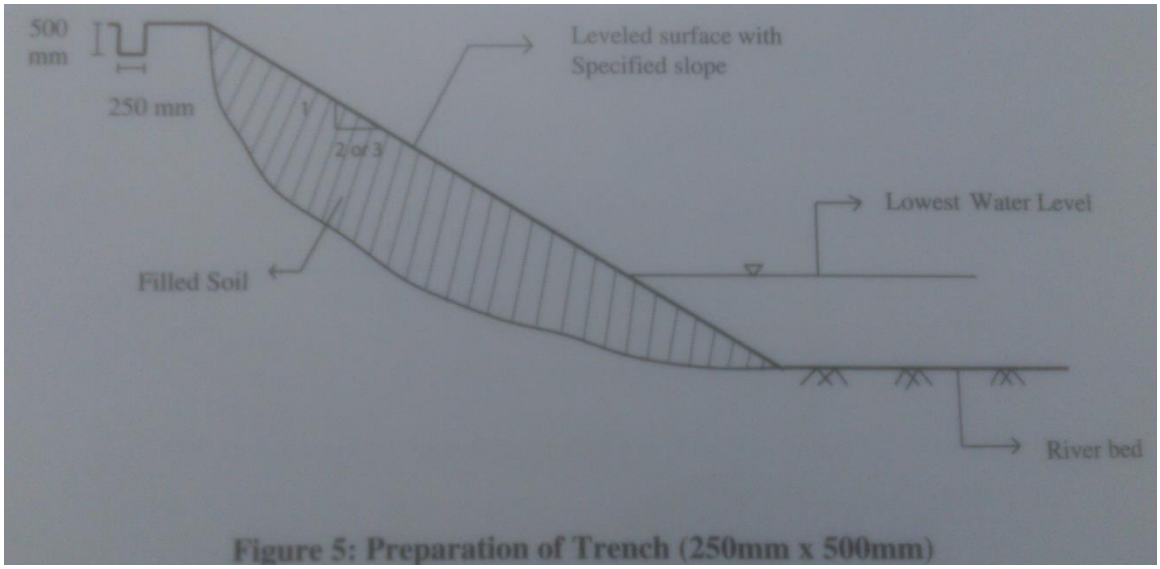


Figure 5: Preparation of Trench (250mm x 500mm)

6. JGT should be adequately embedded in the trench. The anchorage trench should then be filled with stones/boulders for securing and protecting JGT.

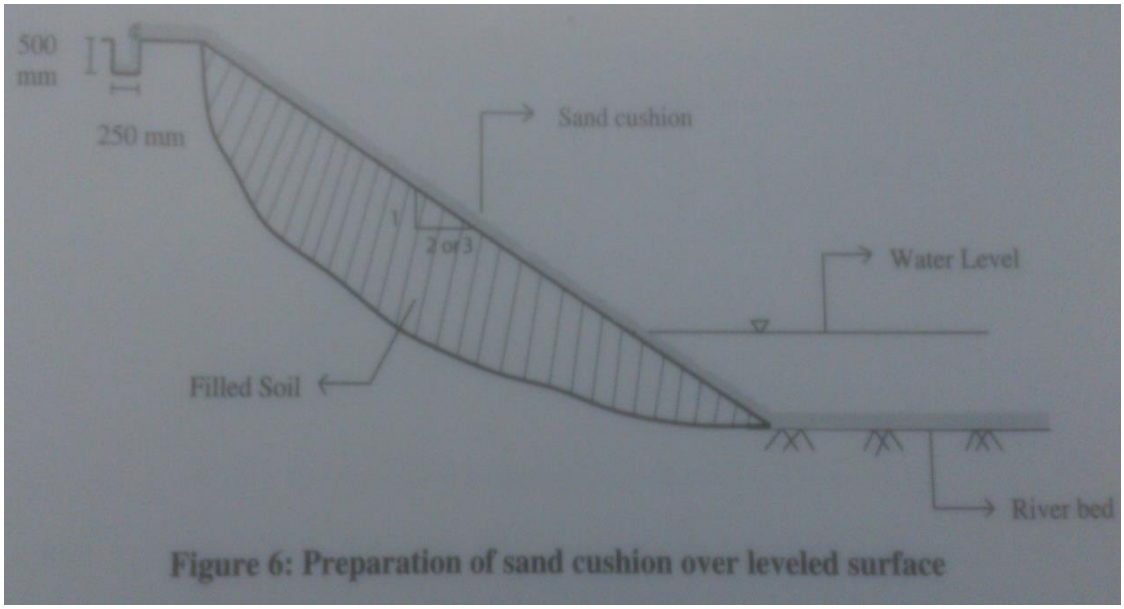


Figure 6: Preparation of sand cushion over leveled surface

7. Cara should be taken to ensure that JGT does not suffer damage due to puncture, tear and similar operational stresses.

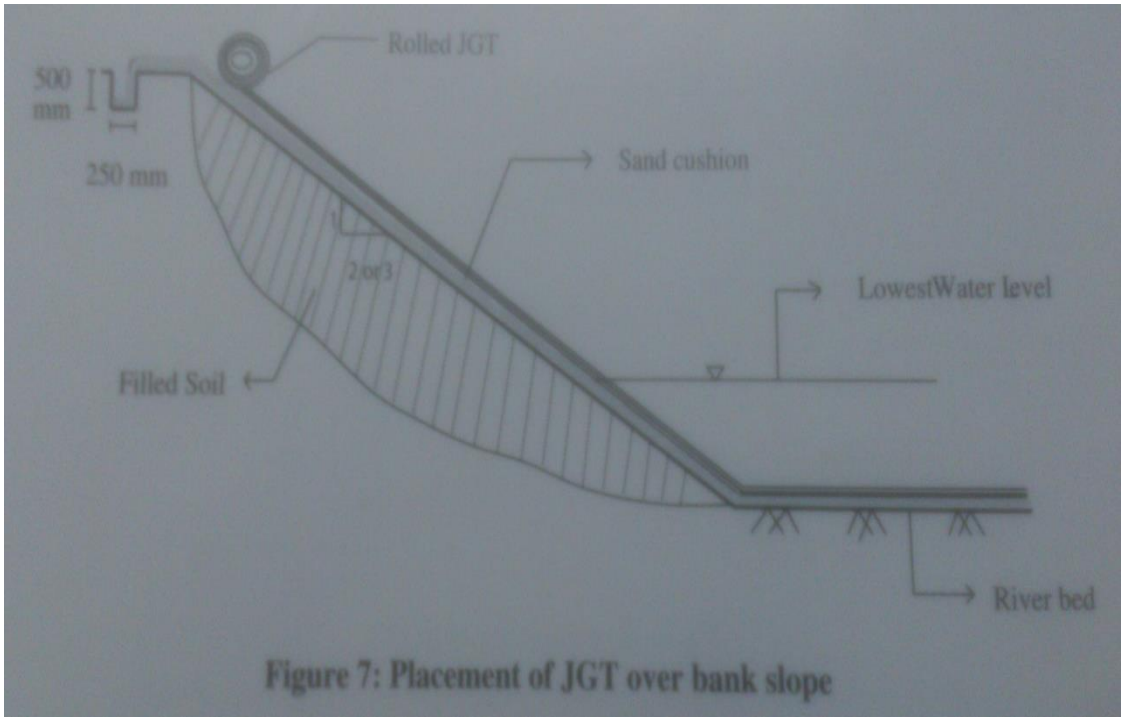


Figure 7: Placement of JGT over bank slope

8. The recommended overlap is 100 mm (minimum). The overlapped portion should be pegged at an interval of 300mm using 6mm wire U-hook or mushroom shaped 37 mm long nails.

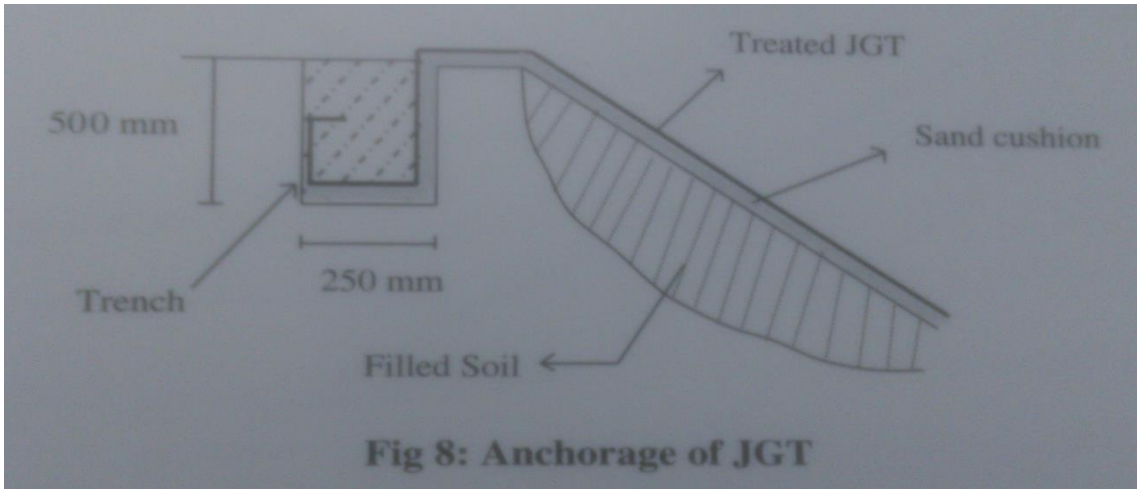


Fig 8: Anchorage of JGT

9. Care should be taken to ensure that JGT touches the bank slope at all points(proper drapability).

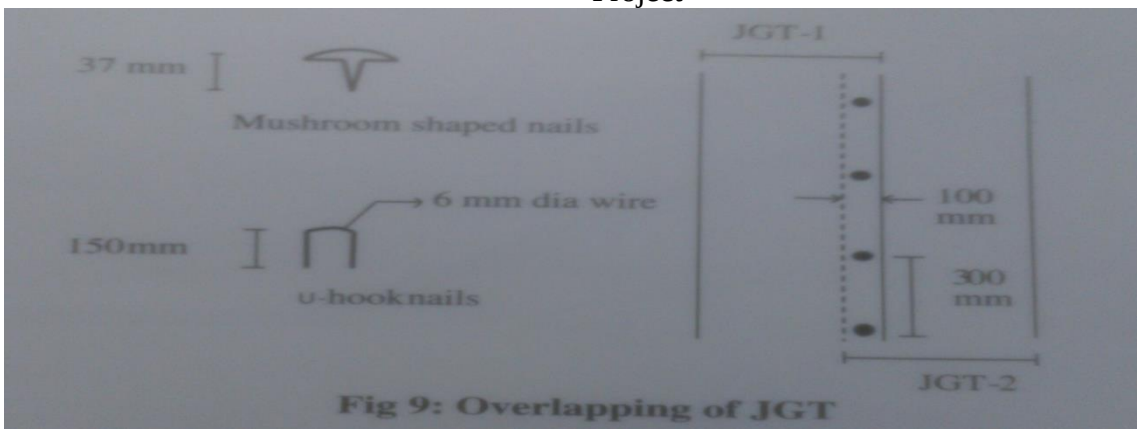


Fig 9: Overlapping of JGT

10. 75mm- 100 mm thick brick aggregate layer is provided over JGT.

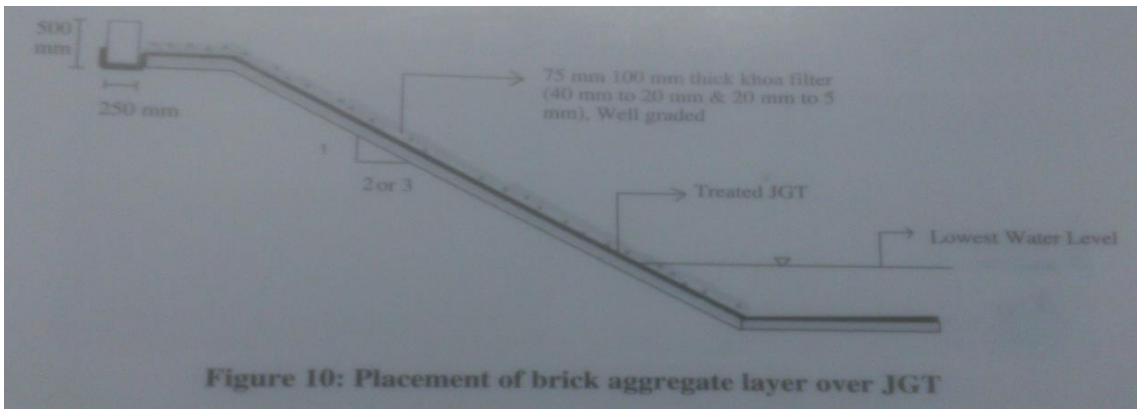


Figure 10: Placement of brick aggregate layer over JGT

11. Armour overly of stone/boulder should then be placed on the JGT carefully. It should be ensured that armour stones/boulders are not dropped on the aggregate layer.

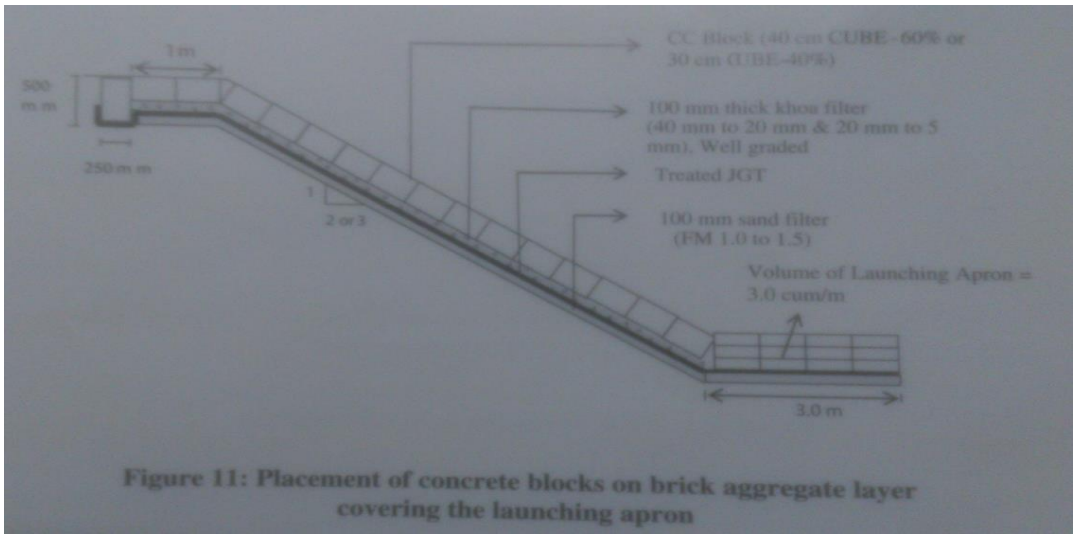


Figure 11: Placement of concrete blocks on brick aggregate layer covering the launching apron

3.6 Installation Method for Hill Slope Management

1. Only 500 GSM or 700 GSM open mesh type JGTs should be used.

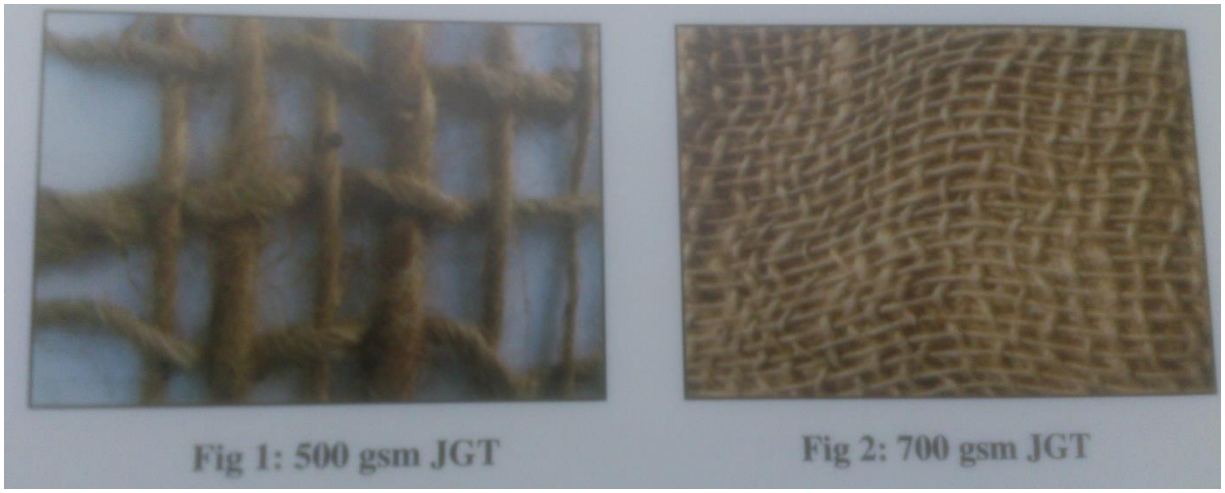


Fig 1: 500 gsm JGT

Fig 2: 700 gsm JGT

2. The sol surface s to be leveled without any sharp aggregate production over it (if necessary the slope may be regarded to the angle of internal friction of the soil prior to leveling)
3. Broadcasting of seeds of appropriate vegetation. Holes may be dug in selected locations for sowing of selected plants or trees.

   N.B. The plants/ tree shall have to be environmental friendly. They must have a widespread canopy of leaves. Roots must be strong enough and wide spread into the ground. The depth of root system should be at approximately 1m.

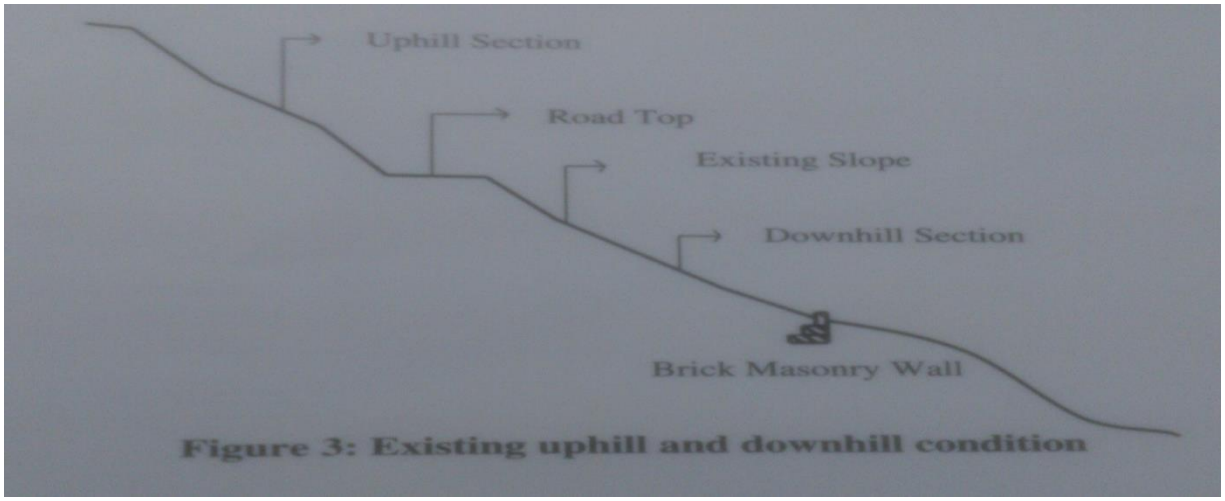


Figure 3: Existing uphill and downhill condition

4. Unrolling of JGT (soil saver) from the top of the slope to the bottom along the direction of surface run – off.

Figure 4: Root system of Gyma plant as an example

5. JGT (soil saver) should be carefully handled so that no part of it is torn.

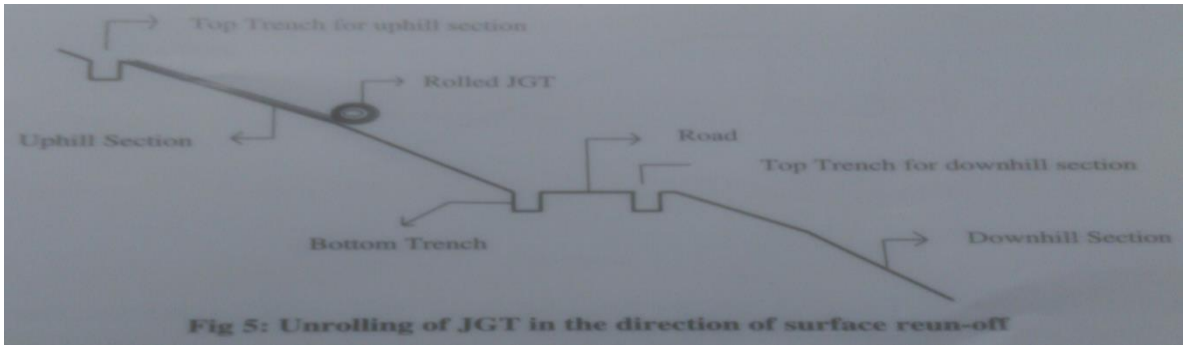


Fig 5: Unrolling of JGT in the direction of surface reun-off

6. JGT (soil saver) should be anchored with staples (U-shaped) into the ground at a specified spacing.

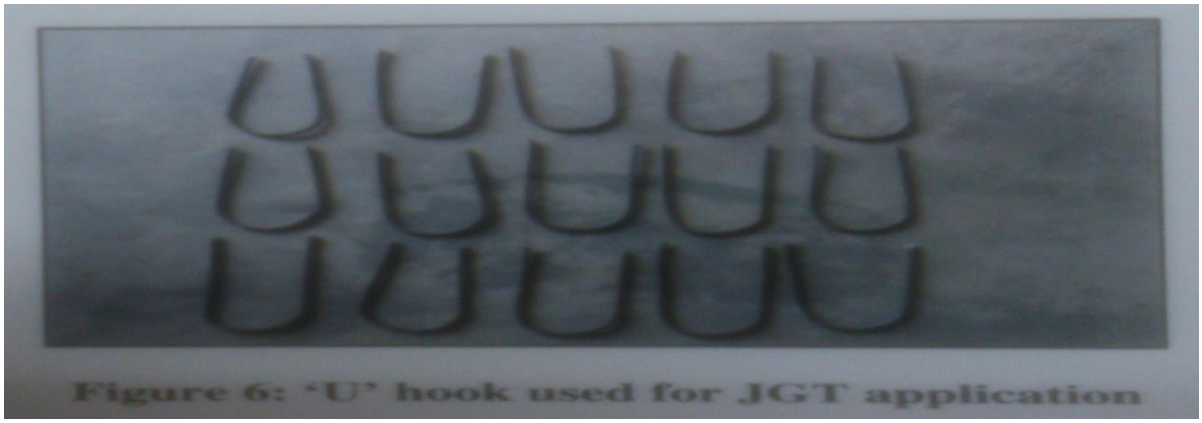


Figure 6: 'U' hook used for JGT application

7. JGT (soil saver) should be anchored within a trench at the two ends by filling the trench with big bats / gravel or other suitable materials.

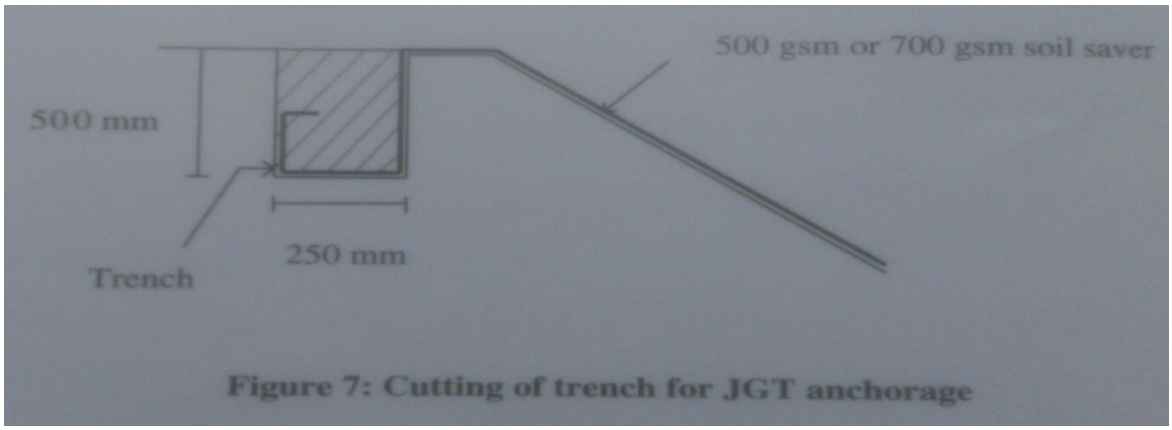


Figure 7: Cutting of trench for JGT anchorage

8. Care should be taken to ensure drapability of JGT (soil saver) i.e. the fabric must touch the ground at all points.

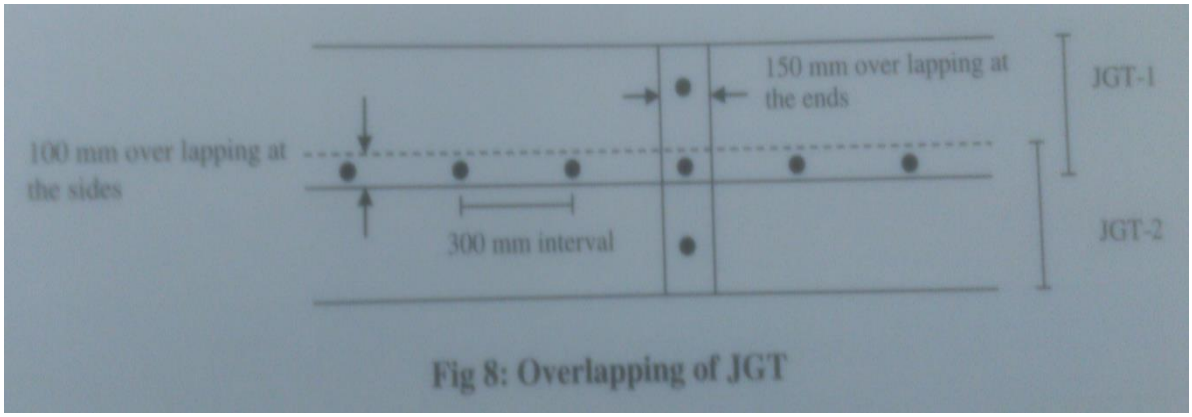


Fig 8: Overlapping of JGT

9. Overlaps should be 100 mm at the side and 150 mm at the ends

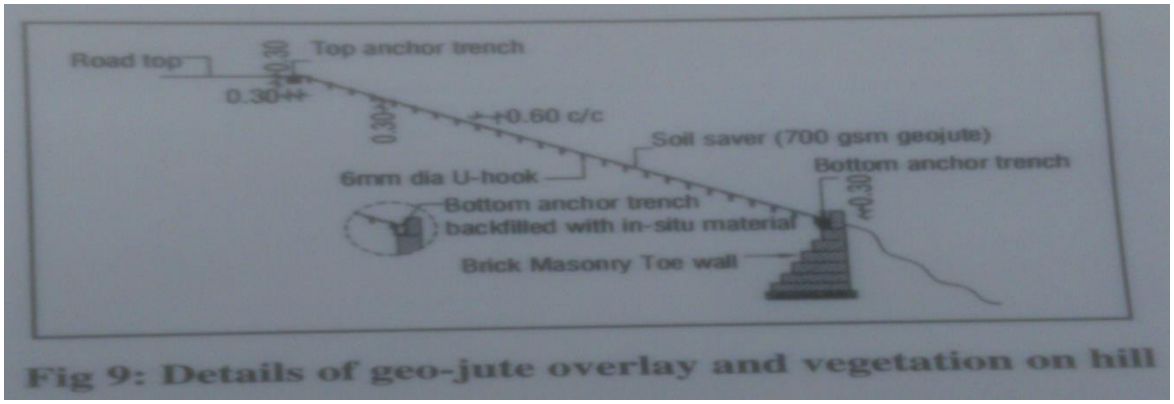


Fig 9: Details of geo-jute overlay and vegetation on hill

10. Plants/tree may be sowed at the predetermined holes.

11. The trench for the drain should be clean, free from mud, soil slurry at the sides and the bottom.
12. The drain materials should be filled in immediately after laying of JGT (soil saver)

3.7 A practical observation of soil erosion control and slope stability using jute geo-textile on Dhaka Sylhet highway

Name of the Project:

Soil Erosion Control and Slope Stability Using

Jute Geo-textile on Dhaka - Sylhet Highway

Design By : DR. ZAHID HOSSAIN PRODHAN

National Resource Person

Member, International Geo-synthetic Society (IGS), USA

Member, International Erosion Control Association (IECA), USA

Managing Director, Arcadia Property Development Ltd. (APDL)

Dhaka, Bangladesh.

Implementing Agency:

Roads and Highways Division

Govt. of Bangladesh

Funding Agency:

World Bank

&

Govt. of Bangladesh

Project Brief:

The Project aims at erosion control and slopeprotection on Dhaka Sylhet Highway extending over 7 K.M. at a place near Bhairab some 80 K.M. from Dhaka. Designed by

Dr.ZahidHossainProdhan this is cost effectivemechanism for Erosion Control and slopeprotection using indigenous raw material likeabundantly available Jute. The full scalemodel was first effectively tested by Arcadia Property Development Ltd. (APDL) in the premises of BJRI (Bangladesh Jute ResearchInstitute) and successfully implemented by BJRI in Pakulla–Lawahati Road Project inDelduarupazilla under Tangail District.

Salient features of Technology:

1. It brings stability in reinforced earth structure
2. It creates environment friendly interaction of the soil mass with Jute Geo-textile. The portion of Dhaka Sylhet Highway which needs protection from soil erosion mainly comprises sand-silted soil prone to damage and erosion by floods and other natural processes. Application of Jute Geo-textiles for erosion control and slope protection is likely to offer most appropriate solution. Advantages of Jute Geo-textile: Locally available Jute Geo-textile is much cheaper than any other synthetic fibre. It is easy to blend with soil mass to provide stability. Jute Geo textile is environment friendly and hydrophobic.

IMPLEMENTATION PROCESS

Materials => Carrying => Treatment =>Labour =>Logistics

Miscellaneous =>Design & Supervision

Stage 1: Chemical Treatment of Jute fabrics:

Normally Jute fibre is swelled and degraded within six months in water. Therefore some chemical treatment is necessary to increase its life span. After treatment Jute Geo-textile is expected to last for about 10 years. The treatments include:

a) Rot proofing treatment
b) Treatment with specific density material
c) Treatment with specific viscosity material
d) Ca-based grease treatment.

Stage 2: Drainage and filtration:

a) Preparation of Jute Geo-Textile

b) Preparation of horizontal Drain

c) Preparation of Vertical Drain

Stage 3: After levelling, dressing and manual compaction is done upto a specified level, Jute Geo-textile is laid as per approved design.

Non-woven Products.

No woven jute fabric weight 350 g/m2 treated with different chemicals were tested as regard to their resistance to microbial attack as well as strength and their geotechnical properties like tensile strength, thickness, bursting, punched, CBR, water permeability, pore size distribution.

Thickness and Linear Density of some modified fabrics.

Sample	Thickness* (mm)	Linear Density* (g/m^2)
Untreated	3.05	350.93
Binder+Copper nepthenate	2.85	455.50
Binder + CCA	2.90	437.25
Coal Pitch + Anthraescene oil	2.75	787.50

Durability of jute Geo-textile.

Property	Type A	Type B	Type C	Type D
Construction	B-Twill	A-Twill	Hycee cement	D.W Plain
Thickness (mm)	2	2	2	2
Mass/unit area (g/m^2)	644	756	682	538
Linear density M/C	0.3721	0.4656	0.3355	0.3416
Of Yarns ($g/m^{2\ X\text{-}M/C}$	1.0431	1.2745	0.8633	1.1736
No. of yarns M/C	13	10.	10	10
Per inch X-M/C	9	8	11	8
Narrow strip tensile M/C	21.78	27.50	24.26	20.00
Strength (kN/m) X-M/C	22.50	27.50	25.00	24.50

Some properties of yarn

Property	Type-1	Type-2	Type-3
Linear density (g/m)	0.3388	0.6400	4.2115
Tensile strength (N)	37	59	175

Reduction in strength after 4 months submergence in water

Type	Direction	Reduction in strength
A	M/C	35
A	X-M/C	25
B	M/C	22
B	X-M/C	43
C	M/C	36
C	X-M/C	40
D	M/C	45
D	X-M/C	38

3.7.2 Suitability of different fabrics for various geotechnical functions

Fabric Type	Separation	Filtration	Drainage	Reinforcement
25% Jute: 75% PP (282/g/m^2)	√	√	√	√
50% Jute: 50% PP (279 g/m^2)	√	√	√	×
75% Jute 25% PP Backing (272 g/m^2)	√	√	×	√
75% Jute: 25% PP(220 g/m^2)		√	√	×
75% Jute: 25% PP(353g/m^2)	×	√	√	×
75% Jute: 25% PP(500 g/m^2)	√	√	√	√

3.7.3 Some Properties of jute geo-textile in unpaved earth road stabilization

Product	Material characteristics	Weight(g/m^2)	Ultimate Tensile Strength(kN/m) Weft value	Extension at max. load(%)	Quality Ratio
Soil Saver	100% jute woven mesh	500	7.5	11	38%
IJIRA SSR	100% jute woven mesh	400	5.7	15.8	17%
Geomat	100% coir fibre woven mesh	700	11.6	40	
Grassmat	Jute nonwoven + polyethylene mesh	950	3.1	20	
Birla 300	100% jute needle punched nonwoven	300	2.8	22	
Birla 750	100% jute n.punched nonwoven	500	5.2	22	
Birla 1000	100% jute n.pounched nonwoven	1000	7.5	24	
Poltefelt TS 420	100% polypropylene needlepunched continuous	130	8.1	50.80	

	filament				
Fortrac	Polyester yarns covered with PVC geo-grid		.5	12.5	
Hessian Fabric			9.4		55%

Use of jute geo-textile:

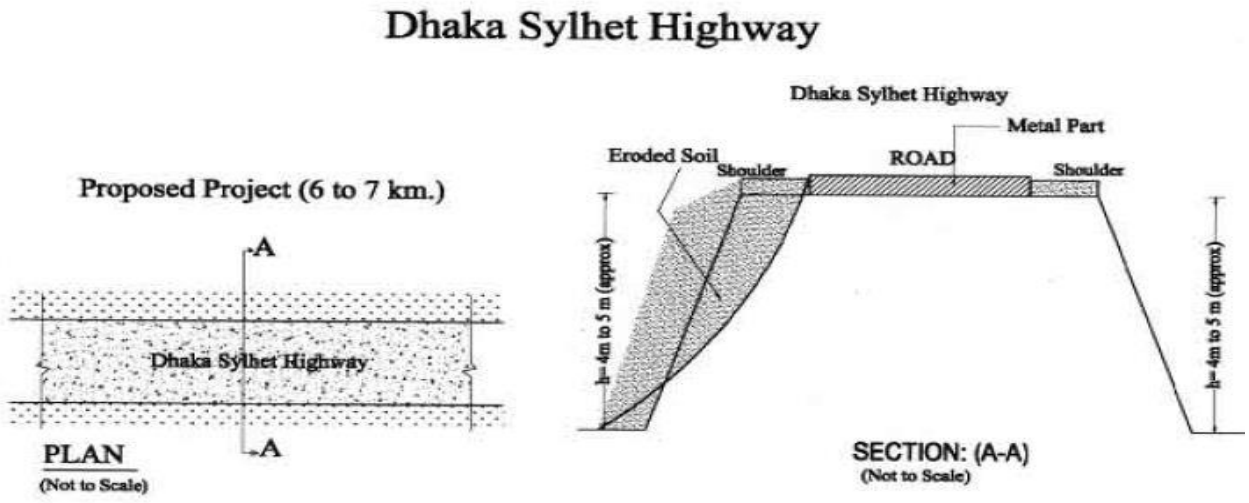
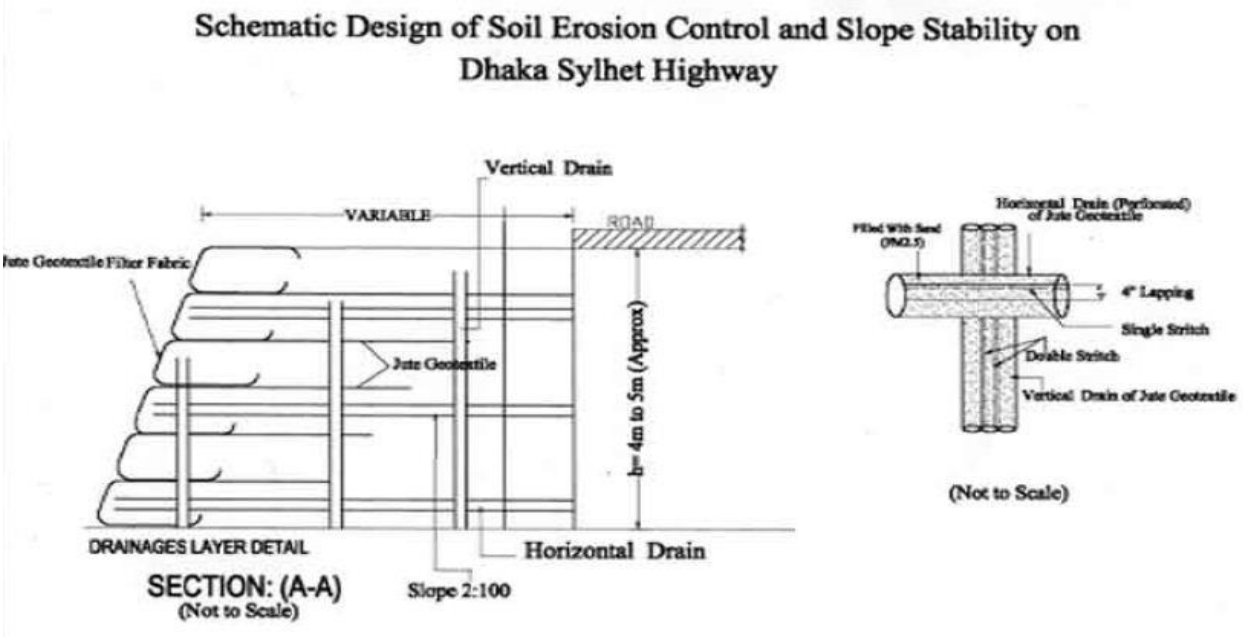


Fig: Dhaka-Sylhet Highway



3.8 Projected world jute geo-textile demand by type (millionsqmt) 1998-2018

Items	1998	2003	2008	2013	2018
Jute geo-textile demand	52	140	210	335	480
% share	4	7	7	9	10

3.9 Economic Benefit of Using JGT in Different Applications

On the basis of the analysis and design with JGT and synthetic geotextiles undertaken in this study for different applications and also on the basis of the costs of these materials mentioned above, it is suggested that by using JGT materials instead of synthetic geotextiles, a cost benefit of 35%-50% may be obtained. However, the technical shortcomings and durability restrictions of JGT materials must be appreciated prior to any application.

3.10 Comparative Costs of JGT and Synthetic Geo-Textiles

In making a proper economic assessment or evaluation, a number of inputs are required such as material cost, labor cost etc. Again, these inputs vary from place to place. In this study, an attempt has been made to analyses the comparative costs of untreated and treated JGT collected from BJRI, BJMC and local market. The comparative costs of the untreated JGT samples are shown in Figure

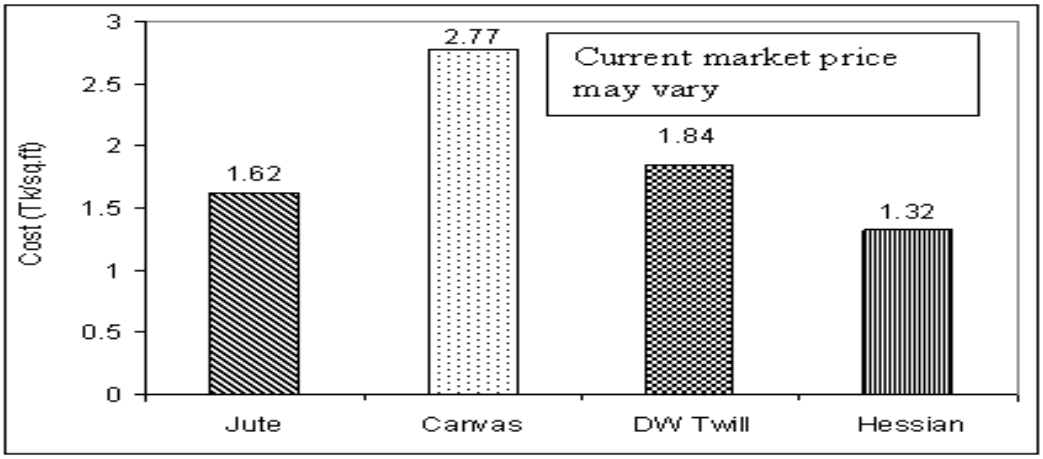


Figure 1. Comparative costs of the untreated JGT samples

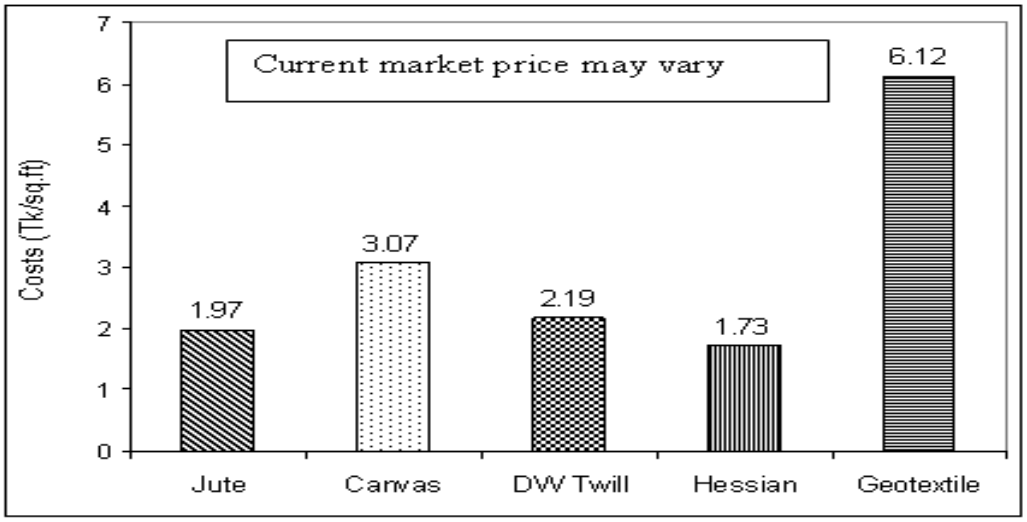


Figure 2. Comparative costs of treated JGT samples with synthetic geotextiles available in Bangladesh

The costing of different jute products developed by BJRI by blending jute with hydrophobic fiber like coir or by modification with bitumen, latex and wax resinous materials with the collaboration of BJMC and other governmental and non-governmental organizations are listed in Table

Type	Composition	Possible Durability	Wt./Unit (gm)	Cost Tk/yd^2
Woven Jute in different structure	Jute	2-6 month	220-800	8-18
Woven Jute in different structure	Jute, Coir	5-12 month	220-800	12-32
Woven Jute but treated composite	Jute Bitumen Carbon	6-48 Month	Var. Wt.	12-35
Non woven	Jute blanket	6-18 month	800	65
Non woven	Jute Blanket + Latex	5-20 year	≥ 800	80
Woven with different construction	Jute latex	5-20 year	≥ 800	20-40

Summary of cost of jute blended with different materials at BJRI (Source: Directorate of Technology, BJRI)

3.10 Proposed Strategy for jute geo-textile:

To get back the golden era of jute, Bangladesh must go for diversification. Jute Geo-textile is one of those aspects of diversified approaches. Now a days, jute geo-textile is getting popularity in foreign market. the following steps can be taken to increase the demand and hold the market of jute geo-textile.

- All market economics work on the principle of supply and demand. The objective is to continually enhance demand while simultaneously balancing supply with demand. If supply fails to meet demand the market then the purchaser's bye alternative reliable

sources of supply. In the case of jute geo-textiles there is already a market for erosion control product but supply is falling bellow demand. If this situation is allowable to continue the jute geo-textile market will die.

- At present the selling market is a technology market governed by price. In other words the product is a low technology product is exported at low price. The demand for the product is created by foreign importers and distributors who can make exceptional profit in selling the product on to the end user. The jute geo-textile manufacturer can make more money by selling more products at a current profit margin.
- Profit margin may also be increased by adding value to the product. Normally Bangladesh export basic jute geo-textile which is not specially treated. Having invested in developing the superior product, application technology and product promotion, the product can be sold at a higher profit margin then its inferior competition. The jute geo-textile can be improved by treating according to the purpose of use. Unfortunately present available jute geo-textile does not find a market in the commercially developed country. But the market of this product in developed countries is increasing recently.

Sometimes, some business men create artificial crisis of jute fiber for getting more profit. They export jute fiber to the neighboring countries in illegal way. Government should take steps to stop this unwanted situation.

CHAPTER-04

DISCUSSION AND RESULT

4. Discussion & Result

The works reported here in this thesis are mainly the use of JGT in road, erosion control and hill stabilization. In Bangladesh purposed road and erosion control are more important.

4.1 JGT use in Road:

We found that the treated JGT are use in the road construction. As a result the road strength is highand durability upper then normal road without JGT. We also found that day by day road are more strong. Normally 627 and 724 GSM are mostly use in rural road construction. But sometimes less GSM are use in the road construction according to situation of road. In this purposed woven jute fabric are more use. We also found that the road of hatirjheel where use in JGT.It was inaugurated on January 2, 2013. At present the road is good strength. We also knownabout Dhaka – shylet highway. Now that's road performance is also good and all this road are monitoring now for JGT standardization and accreditation.

4.2 Use of JGT in River Bank Erosion:

Actually in this sector JGT are use to prevent of erosion control. We find that here 627 GSM are use in river bank and mainly use in slope. Here woven, Bitumen or otherwise treated jute fabric are use in this project. As a result the slope are more strong on the other hand normally beside river bank environment are more suitable so that if the use of JGT then soil erosion are control and environment are Eco-friendly. If we use the JGT in the river bank the slope stability are high and don't loss our land. Normally this type of jute fabric thickness are75 mm to 100 mm. We found that JGT use in Jamuna river bank erosion control near the jamuna bridge. Also that performance is so good.

4.3 Use of JGT in Hill stabilization:

JGT use in hill slope at Thanchi- Alikadam road at Bandarban. Here JGT use in 36 Meter uphill segment. We did not practically see in the JGT use in hill stabilization. But we contacted with that which people are connected in that project. Normally 500, 600 and 700 GSM open weave

jute fabric are use in the hill stabilization. When use JGT in the hill then soil erosion are control and hill are not break down.This type of jute fabric thickness are 100 mm to 150 mm.

Forever At present Bangladesh had completed 10 JGT field trials-5 for rural road construction(1 km each), 3 for river bank protection (500 m each) and 2 for hill slope management (300 m each). But all site are monitoring now by JDPC, BUET, SRDI, BJIR and the respective facilitating agencies. And a seven member committee has been formed for standardization of Jute Geo-Textile in Bangladesh. Committee is preparing an approach paper for submission to respective authorities at national and international level for JGT standardization and accreditation. The committee shall also recommend to establish a national accredited laboratory in Bangladesh for JGT testing.

And they are confident that activities of the project would be completed within the stipulated time and the objectives of the project could be achieved.

Finally scientifically developed JGT play very crucial role in avoiding various deadly natural calamity like land sliding, river erosion, embankment etc.

4.4 A new proposal for treatment of JGT:

There are many treatment process for JGT such as Rot- proofing, Bitumen process, silicate of specific viscosity process etc. But our head sir and we are a new proposal for treatment of JGT. We know that jute degradation percentage is high so we coated the jute yarn with polyethylene. As a result jute degradation percentage is less and durability is high and strength is also high. As a result we may get economical benefit.

CHAPTER-05

CONCLUSION

Conclusion

Using of Jute Geo-textile to increase stability of road is very useful techniques. The main raw material used in the process is the jute fabrics. Therefore, demand of Jute will be increased in the market and Golden Fibre of Bangladesh will get its lost pride. Synthetic Geo-textile is very costly and it requires foreign currency to import it. As Bangladesh is flood prone area. We have to spend a lot to keep our rural roads in working condition. So we could use Jute Geo-textile to keep our communication network workable throughout the year. Geo-textiles are very useful for many application particularly civil constructions and agriculture. Bangladesh is one of the leading agro based country. In agriculture we have to fight with the nature. Geo-textiles can be used to fight with hazardous weather condition.

Recently jute geo-textile is getting popularity due to its eco-friendly characteristics. Although Bangladesh is one of the largest jute producing country, but it cannot earn money by exporting jute geo-textile due to lack of technical development. So we should concentrate on this part to increase our foreign currency. Recently Bangladesh signed a memorandum of understanding (MoU) with India for worldwide standardization of jute geo-textiles. If the project complete successfully the demand of jute geo-textile will increase severely.
The Philippines grow a fiber named ‘’abaca’’. They say it is the best fiber in the world. They are making tea bags, tissue papers, and some nonwoven products. They have some companies who are promoting abaca and marketing this to other countries. We have the jute fiber which is rich in natural properties. But we cannot utilize this fiber due to lack of our knowledge and irresponsibility. So we should work to develop the jute geo-textile and marketing it to the other countries. Otherwise jute will lose its market and we will loss the chance of earning a lot of foreign currency.

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SAY YES TO JUTE