

STUDY AND MODELLING OF BITUMINIZED GEO-JUTE FABRIC PAVEMENT

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Abstract - The present study demonstrates the study and modelling of the bituminized Geo-Jute Fabric Pavement. The main idea is to reduce the Water Infiltration and the Erosive property of the traditional bitumen roads. In this project we have introduced 2 layers of Geo-Jute Fabric which are placed between the Subgrade and the Base course and another one is placed between the Binder course and the Surface course. The Geo-Jute layer between the Subgrade and Base course will reduce the Water Infiltration property whereas the Geo-Jute Fabric between the Binder course and the Surface course will reduce the progression of wear and tear underneath the Surface course. The materials are tested using the **Indian Standards** and Codal Provisions like **IS 2386:Part 4-1963, IS 1208-1978, IS 1904-1986, IS 2131-1981** and the road is laid using the **Indian Road Congress (IRC) Standards**.

Key Words: Geo-Jute Fabrics, Water Infiltration, Erosion, Road, Drapability, Wear and Tear, Life span

1. INTRODUCTION

Roads are the main means of transport that is mainly used in the country of India. In the rural areas Bitumen roads are mostly used in the recent times and this Bitumen roads are often damaged due to erosion and water infiltration. The main idea of the project is to minimise the water infiltration and erosion in the Bituminous roads using the Geo-Jute Fabrics. By introducing this Geo-Jute Fabrics over subsoil layer we are going to have an overview on the water infiltration and by placing this under the surface course layer wear & tear property is studied.

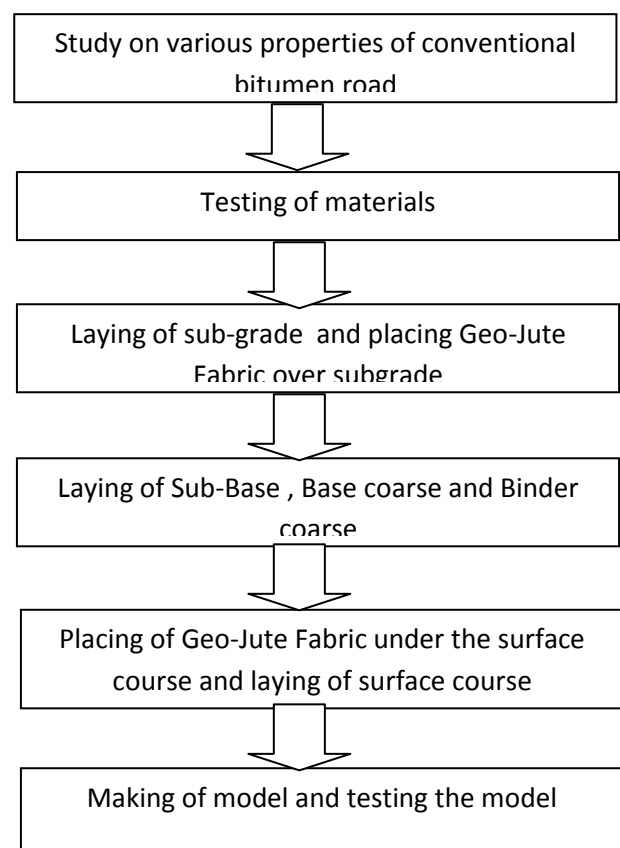
2. NEED FOR STUDY

Our main scope in this project is to minimize the water infiltration property of the conventional bitumen road. To reduce the damages caused in the surface coarse of Bituminized roads by using this Geo-Jute Fabrics. By this we can provide an effective bituminized roads to the rural areas where the funds for roads are minimal. This project will highly help in increasing the lifespan and wear and tear properties of the conventional bitumen roads.

3. OBJECTIVE OF STUDY

The main objective of this project is to minimise the water infiltration and wear & tear property of the bitumen roads. To introduce Geo-Jute Fabrics under the surface coarse layer to minimise the wear and tear properties of the roads. To introduce Geo-Jute Fabrics over the sub-grade layer so that the water infiltration property can be minimised. To increase the effectiveness of this road compared to the conventional bitumen road.

4. METHODOLOGY

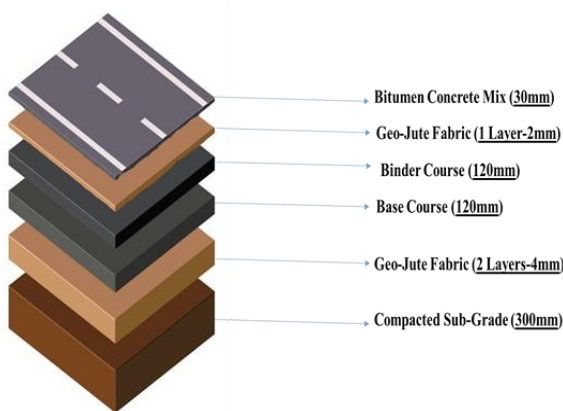


5. GEO-JUTE FABRIC PAVEMENT

Bituminized Geo-Jute pavements are mainly designed to reduce the water infiltration property of the traditional Bitumen pavements. By placing the geo-Jute in the lower layer it reduces the water infiltration

and by placing this Geo-jute fabric in the top layer it reduces the further development of peeling off of the road other than that of the surface course. By introducing this Geo-Jute fabric pavement the rural areas will be benefitted to a greater extent. This Geo-jute pavement will drastically increase the life span of the road. Geo-Jute have a great property of absorbing the water to a greater extent. Geo-Jute is introduced in the Bitumen road to increase the effectiveness and efficiency of the road. The cost of this Geo-Jute fabric is very low and thus effective road can be provided to rural areas.

LAYERS OF GEO-JUTE PAVEMENT



6. TESTS ON MATERIALS

Before laying the pavement it is necessary to test the materials used for better pavement. The testing of materials was done and the results are discussed.

- Bitumen test
- Aggregate tests
- Soil test

6.1 Bitumen Test Result

S.No	Test Name	Test value
1	Penetration test	84mm
2	Ductility test	68cm
3	Softening point test	65 degree
4	Specific gravity test	0.99

6.2 Aggregate test result

S.No	Test Name	Test Value
1	Impact test	16.09%
2	Crushing strength test	2.45%
3	Abrasion test	28%
4	Specific Gravity test	2.65
5	Shape test(Elongation Index)	41.20%

6.3 Soil test result

S.No	Test Name	Test Value
1	Direct Shear test	6°37'26"
2	Particle size distribution	From Graph
3	Specific Gravity test	2.75
4	Permeability test	0.0165 cm/sec

7. PROCEDURE FOR ROAD CONSTRUCTION

A general overview of the equipment and procedures involved in the construction flexible pavements. The equipment includes hot-mix operations , placement equipment and compaction equipment. Construction procedures is discussed below.

7.1 EXCAVATION OF SOIL

- The natural soil in the site is first excavated to required depth by using tools like iron crow bar, shovel and hoe etc.,
- Then the soil is levelled to get minimum slope so that road can be laid without any undulations in the surface.
- After levelling, the soil is compacted well using a soil compactor so that the soil is compacted well on the surface.
- The thickness of the compacted subgrade is fixed to 300mm which is the nominal thickness adopted in bitumen roads.
- As per Standard the thickness should range from 150mm to 300 mm.



Fig.7.1.1 COMPACTED SUBGRADE
7.2 GEO-JUTE FABRIC 1st LAYER(4 mm)

- The Geo-Jute Fabric is placed over the compacted subgrade.
- This Geo-Jute Fabric layer is mainly placed to reduce the water infiltration property of the soil.
- By reducing the water infiltration property of the soil, the damage and failure that is caused in the soil can be minimised drastically to acquire a good quality road.
- The thickness of this Geo-Jute is fixed as 4mm to meet out the needs of the experiment.



Fig.7.2.1 GEO-JUTE(4mm)

7.3 BASE COURSE(120mm)

- The Base Course is laid over the Geo-Jute layer to a thickness of about 120mm.
- The size of the aggregate used in this layer is 40mm aggregate and we can also use 20mm aggregate mixed with 40mm to lay the Base Course.
- This layer mainly transfer the load from the surface course to the compacted subgrade.
- Over the 40mm size aggregate the Water Bound Macadam is placed which acts as the filler material between the Base and the Binder course
- As per Standard the thickness should range from 100mm to 150 mm.



Fig.7.3.1 BASE COURSE

7.4 BINDER COURSE(120mm)

- The Binder course is laid between the Surface course and the Base course to bind the particles of the base and the surface course.
- The binder course is prepared by mixing 20mm aggregate with 5.5% of bitumen of the weight of aggregate taken.
- This mix is heated in a pan with a temperature of about 150° celcius.
- Then the mix is placed over the base coarse to a thickness of about 150mm and then its is compacted well to about 120mm.
- As per Standard the thickness should range from 100 mm to 150 mm.



Fig.7.4.1 BINDER COURSE

7.5 GEO-JUTE LAYER(2mm Thick)

- A layer of Geo-Jute Fabric is placed over the Binder course with a thickness of 2mm.
- This layer is laid to reduce the further wear and tear under the Surface course so that the road will not peel off beneath this Geo-Jute layer.
- This layer will drastically improve the lifespan of the bitumen road so that it reduced the peeling off of the road.



Fig. 7.6.1 SURFACE COURSE



Fig. 7.5.1 GEO-JUTE(2mm)

7.6 FINAL BITUMEN CONCRETE MIX(50mm)

- The surface coarse is laid over the Geo-Jute layer to a thickness of 50mm.
- This is the top layer of the Bitumen road which is laid by mixing 6mm
- aggregate with the Bitumen to a consistency of laying.
- This mix is laid and compacted well over the binder coarse to get a smooth surface coarse.
- As per Standard the thickness should range from **50 mm to 100 mm**.

8. CONCLUSION

Thus by this project we have engineered a most effective and low cost Bituminized Geo-Jute Fabric Pavement. By placing the Geo-Jute Fabric in the bottom layer we have reduced the Water Infiltration Property of the conventional bitumen road and by placing this Geo-Jute Fabric in the top layer beneath the surface course we have effectively reduced the wear and tear property of the road. By introducing this Geo-Jute fabric pavement the rural areas will be benefitted to a greater extent. This Geo-jute pavement will drastically increase the life span of the road. Geo-Jute have a great property of absorbing the water to a greater extent. Geo-Jute is introduced in the Bitumen road to increase the effectiveness and efficiency of the road. Thus by this project we have made a effective model of Bituminized Geo-Jute Fabric Pavement.

REFERENCES

- Bituminized Jute Paving Fabric (BJPF) for Road Constructions - A Potential Innovative Approach Swapam Kumar Ghosh , Rajib Bhattacharyya, Murari Mohan Mondal Professor, Department of Jute and Fibre Technology, University of Calcutta
- S. Gregory, Cleveland, W.Joe, and L. Robert, "Geosynthetics in Flexible and Rigid Pavement Overlay Systems to Reduce Reflection
- Cracking", Report No. FHWA/TX-02/1777-1, Texas Transportation Institute, the Texas A&M University System, College Station, Texas, 2002.
- D. Richard, and Barksdale, "Fabrics in Asphalt Overlays and Pavement Maintenance", National Cooperative Highway Research Program
- Synthesis 171, Transportation Research Board, National Research Council, Washington D.C.,1991.

- S.K. Ghosh, T.Sanyal, M.M. Mondal M.M. and R. Bhattacharyya, "Design and Development of Woven Jute Geotextiles for Applications"