

Geosynthetics Testing Laboratory
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Lecture – 1
Introduction

Welcome I am Professor J. N. Mandal, Department of Civil Engineering, IIT, Bombay. I will take the course on Geosynthetics Testing Laboratory. Geosynthetics Testing Laboratory is very important area in geosynthetics engineering. The area of geosynthetics is a while established and exciting field with new uses being developed regularly. The vast majority of geosynthetics are made from polypropylene, polyethylene and polyester etcetera.

When placed in the ground, these textile fabrics are called geosynthetics. In a growing and ever changing area such as geosynthetics, it should come as no surprise that a completely unified set of worldwide standard and test method is currently not available. Yet, the activity towards such an ultimate goal is very intense. Organization that are involved in this activity are spread across the entire spectrum of potential user, raw material supplier, manufacturer, manufacturer representative, contractor and installer, testing organization, design engineering from owner, regulator, research institute as well as universities.

Within this group one, we will open here reference; two, either index or performing test. Many of the test method are not fully harmonized between the countries as far as their test procedure are concerned. There are currently about 300 geosynthetics standard. In this lecture, any ASTM, American Society for Testing Material; ISO, International Standard Organization; BIS, British Indian Standard and GRI will be discussed. That are developed from conventional textile test in most cases do not address the specific need of civil and IO engineers.

The tests that differ between the textile and geosynthetics are those which involve physical properties, mechanical properties, hydraulic property, environmental properties and degradation consideration. These are generally new test orientated completely towards the geosynthetics. The ability of a geosynthetics to perform in a particular application is a function of its properties. The geosynthetics properties provide

engineering design characteristics for fabric comparison and proper selection for a specific application.

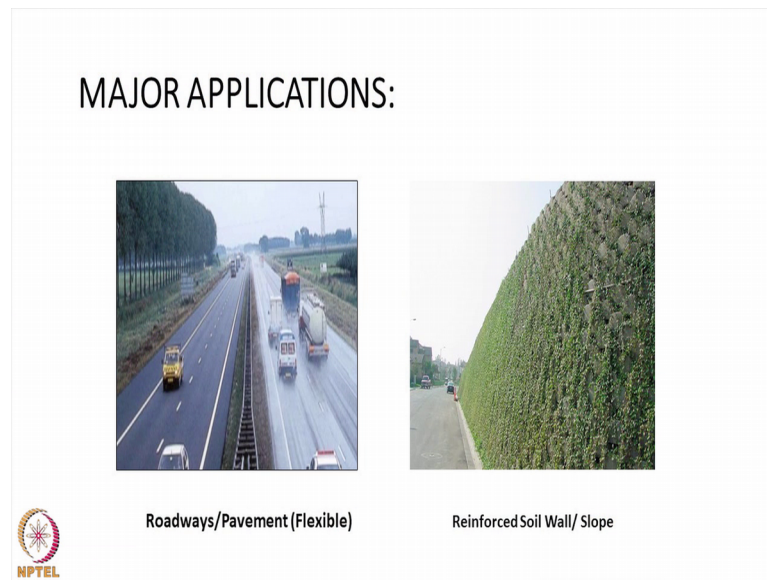
In this lecture, geosynthetics properties will be discussed within the context of their engineering significance, data sources, method of evaluation and specification. The specific procedure are recommended in order that a consistent determination of each property can be made. The main objectives of this course are: A- working knowledge of the physical property which are necessary for specification and proper selection of geosynthetics material. B- able to perform direct and evaluate geosynthetic physical testing in proper way.

It is necessary to understand the variability of geosynthetics properties, the disparity between the published data and procedural variation within the method used to obtain particular properties. It is imperative that the properties be determined with some precision for proper evaluation and selection of geosynthetics. Geosynthetics have been widely used throughout the world for over 4 decade and geosynthetics specified and adopted many different test methods to meet their immediate needs. The geosynthetic testing to be perform in laboratory is then, detailed in step by step operation followed by observation and record table along with the graph to be plotted what such are necessary.

Figure depicting the laboratory geosynthetic testing apparatus are given with full detail. Lastly, specimen calculation for each test with complete observation recorded on the data sheet and graphs are provided. This should enable student to compute the result of experiment very easily. This course is for all civil engineering student in India and abroad in particular, while civil and textile engineering student have to undergo practical courses in geosynthetic testing laboratory.

In other word, this course should prove beneficial to geotechnical, transportation, water resources, environmental, coastal and structural engineering, mining, agriculture, bio-engineering, practical engineer, manufacturer and supplier of geosynthetic testing, research development organization, universities, consultant and contractor and those involved in recharge in standardization of geosynthetics engineering. There are major application of geosynthetics material.

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You can see this is the Roadway or the Pavement as a Flexible pavement, where there is a reflection cracking. You can use these geosynthetic material even then you can use both the geogrid and geotextile for the construction of the roadway at the pavement. Even some other super light material geofoam can be used for the construction of the embankment on soft soil.

Then, this is the Reinforced Soil rigiding Wall or Slope. So, you can make use of the geogrid and geotextile material for the construction of reinforced soil wall and slope. Therefore, you should know how to perform the geosynthetic testing; what kind of testing are required; what kind of specification of properties of the geosynthetic material are required to design the road or for the design of the reinforced soil wall or slope.

And you can also make a greenery what is the green structure which is environmentally friendly. It can be used also for the reappearing or rehabilitation or for the new construction of the railway.

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Here, you can see the geosynthetics material is used beneath the Railway. You can use the Roadway; other in Pavement. Also is in the rigid structure, how the geosynthetics material has been used.

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It is Geotextile Tube can be used near to the seashore for the erosion control. You can use for the Geofoam; it is a very super light material. Its density about 100 time less than the soil. You can use for the construction of the embankment on soft soil or you can construct the reinforced soil retaining wall because lateral pressure is drastically reduced

for the inclusion of the geofabric material on the back of the reinforced retaining structure.

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You can use here the geosynthetic material for the Asphalt Pavement Rehabilitation. You find in Bombay, many places also surrounding many places across the world and in India you can fly there is a lot of reflection cracking and the photo; you can make use of this geosynthetic material to prevent the cracking. So, here is shown an Asphalt Pavement Rehabilitation and how it can be used for geosynthetics material.

So, what will be the proper kind of properties are required; that is very important. What specification you should do; what kind of test you should do for the use of geosynthetic material in Asphalt Pavement Rehabilitation. Here, Basal Reinforcement Embankment on the soft soil.

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You can use for the Breakwater Reinforcement and the Filtration. You can use Composite or the Geocontainment System in the Riverbank Protection. You can see many soil is eroded many places around the wall, you can use for the geocomposite material or geo container system for the riverbank protection. This is another, their construction for artificial island using geotextile tube.

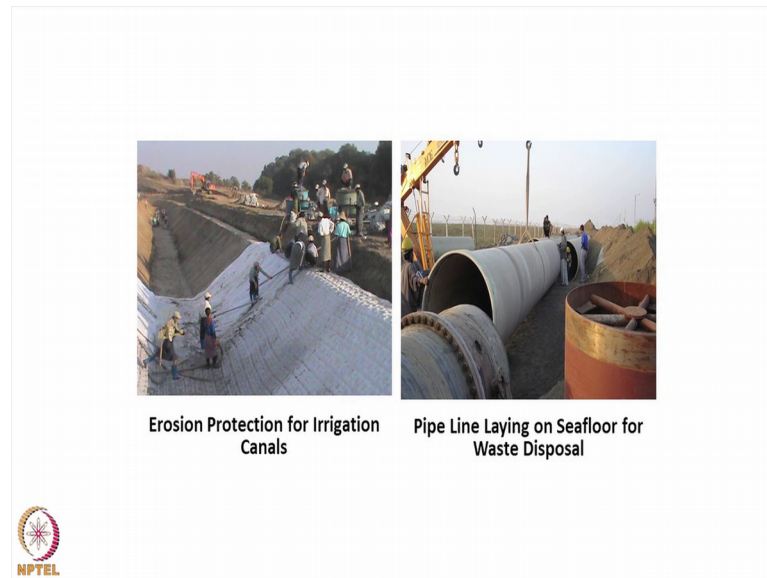
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So, this is the geotextile tube which is let down near to the seashore or artificial lake. You can you can construct the artificial lake when there is no space and you want to make use

of the sea for the rehabilitation; you can use the geosynthetics material for the for the extension of the roads or the place where it is required for any other kind of the construction. So, here construction of artificial island using geotextile tube. This is construction of the construction of the Longest Sea-Crossing Bridge with geotextile tube system.

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This another kind of the erosion protection in irrigation canal and most of the time you can see in the irrigation canal, you provide with the concrete and after the passage of time there is a development of crack and there is a development of the seepage. So, you can provide proper kind of the geomembrane material and then, it can be protected for the irrigation canal. There will be no seepage. The water can be controlled. You can see the not only in the canal, you can use for the earthen dam, you can use for the reservoir; the geomembrane material which is a impermeable material.

So, therefore, one should know not only for the properties of the geosynthetics material; but also one should know what will be the properties of the geomembrane material which is impermeable material. Here, I can show that pipe line laying on the seafloor for waste disposal is no one of the greatest factor and how you can use the geosynthetics material even the land field construction where you can use all kind of the material. You can control the contamination, you can control the safety, you can control the gas, you

can make use of this land field by making use of the geosynthetics material; you can we can have the cooking gas, you can have the electricity.

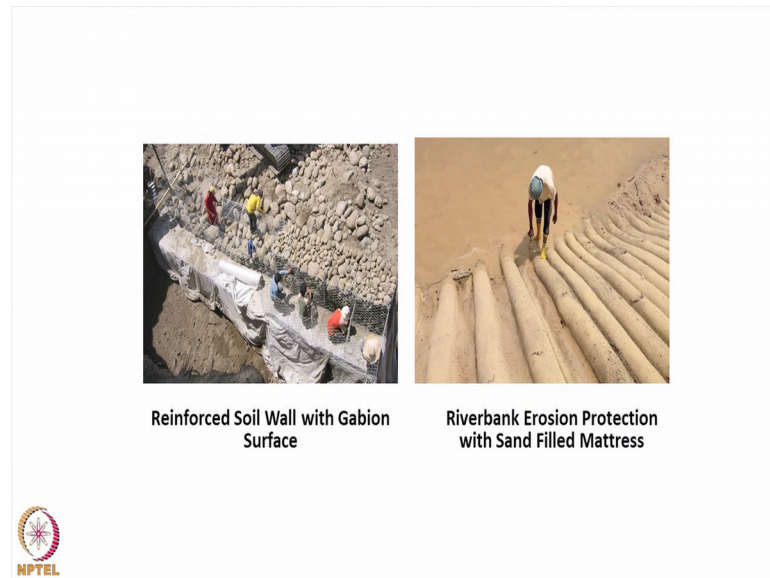
So, there is a lot of advantage of the use of geosynthetic material. But, what is more important that you should use proper kind of the geosynthetic material in proper application and proper kind of specification.

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You can use for the Pond liner or for the fishing and that water, water is leaking; you can use for the pond liner, you can use for the reinforced soil wall which I have already explained earlier. You can use reinforced soil with gabion.

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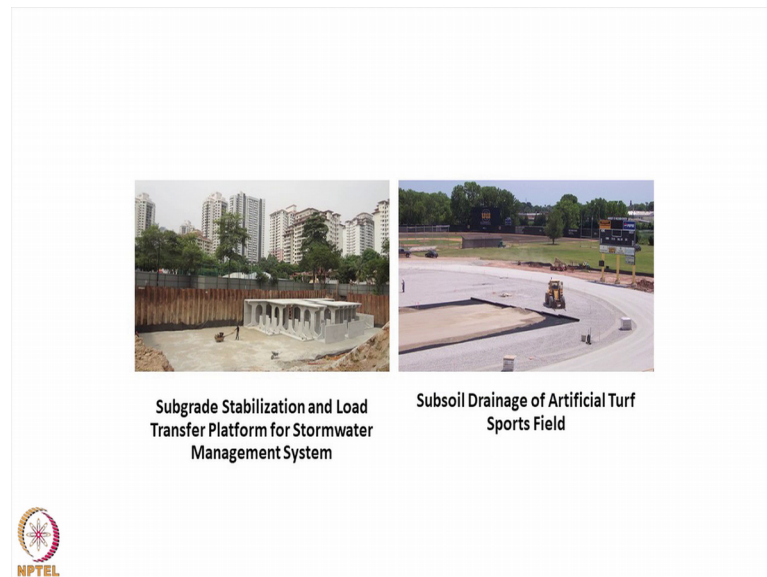
Gabion surface, this is another gabion you know the hexagonal mesh. It is a galvanized mild steel mesh and you can have it in the form of cube 1 meter by 1 meter by 1 meter and top one lids is open and you fill up with this gabble and compacted and you can construct the wall. So, we can make the inputs soil wall using the gabion. Here is that riverbank. Here is the riverbank erosion protection with sand filled material. You can use the sand filled material in the form of loop of the geosynthetic material.

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So, these are the some of the application including you can construct the road embankment, slope failure, repair here. You can use slope erosion protection for the re vegetarian.

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You can use the subgrade stabilization load transport platform for storm water management system; can use subsoil drainage and artificial turf sports field.

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You can also use the geosynthetics material for Transformation of the Wastewater Impoundment into YingCheng Reservoir in Sino - Singapore Tianjin Eco-City. So, these

are the some of the application of the geosynthetics material, you can see that there are various application of geosynthetic material in civil engineering. But, what is most important is that for any design, you need proper kind of the specification.

What material you should select; what will be their property; what property is required for a particular application; what strength, what strength? So, that is more important. So, you do not perform proper kind of the testing, proper kind of the specification; you cannot specify, you cannot design these for all these applications.

Therefore, it is very important that you should know the basic properties of physical property, mechanical property, chemical property, environmental property with for all kind of the geosynthetics material. I think it will be very much useful for this course and you can gather a lot of knowledge on this courses Geosynthetics Testing.

Thank you.