A

Seminar report

on

Geotextiles

Submitted in partial fulfillment of the requirement for the award of degree of CIVIL

SUBMITTED TO: **SUBMITTED BY:**

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Preface

I have made this report file on the topic **Geotextiles**, I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to …………..who assisting me throughout the prepration of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

Content

Introduction

This article presents current information on geotextiles installed experimentally in an unpaved road 35 years ago.

In 1972, geotextiles were largely untested, and the site was set up as an accelerated field test to determine the comparative performances of several fabrics for use as a geotextile. But because the site was still accessible 35 years later, it offered an opportunity to review the ultimate potential lifetime of geotextiles in unpaved roads.

When the fabrics were exhumed in 2007, we learned that they had survived and continued in service despite 2 factors that had worked against them:

1. The lack of adequate cover (in some cases, less than 6in. of stone) had adversely affected the fabrics.
2. And, by current standards, an inadequate polymer stabilization package used when these fabrics were produced.

The unusual opportunity to look at geotextiles this old in situ and the fact that some of the fabrics survived and continued to perform under the adverse circumstances offers important information. With current stabilizers, design, and installation procedures, today's geotextiles perform even better and longer.

What is geotextile?

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

"A permeable geosynthetic comprised solely of textiles. Geotextiles 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 geotextile 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 geotextile 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 geotextile cloth, agricultural fabric, and geosynthetic .

Geotextiles History

During the last some years we often hear the term «geotextiles» or, in a Russian manner, «dornit». Many construction companies who have already used this interesting and promising material and have appraised its characteristics and properties, probably, do not know who its inventor was.

It is assumed that all kinds of geosynthetics (geogrids, geolattices, geomembranes, geofabrics and etc.) are innovative materials, which have appeared recently, during the XXI century. However, this assumption is false. In the middle of the last century geotextiles were used in the USSR. Geotextile materials were imported from abroad for the huge all-Union project -construction of the Baikal-Amur Mainline.

The local engineers did not properly understand how to use these materials. Therefore, geotextiles were placed as rolls. Outwardly it looked like a usual fabric, a cloth (as a matter of fact, a rag). There were no experts who could explain to young builders all the advantages of geotextiles and the appropriate technology and application.

In 1977 experts of the Russian Highway Scientific-Research institute, («DorNII»), were involved in developing a new material on the basis of the French production technology of a nonwoven cloth. Manufacturing of this material has been started in 1977. The new material was given the name «Dornit» as a tribute to its developers, workers of «DorNII». However specialists began to use «Dornit» later.

In 1996 the Moscow Department of building issued a document, according to which road-building companies have to use officially developed and made in accordance with the Russian Specifications - nonwoven material "Dornit". The western analog of Russian «Dornit» is the material «Typar». Today there is a variety of materials made under the technology of «Dornit» and «Typar», all of them with different quality and production costs.

Details about these technical textiles differences and spheres of application you can find out at the Symposium for Technical Textiles, Nonwovens and Protective Clothing - Techtextil Russia, which will be held in Moscow, in April 19-20, 2011.

THE BASIC PROPERTIES OF GEOTEXTILE

The properties of polymer material are affected by its average molecular weight (MW) and its statistical distribution. Increasing the average MW results in increasing:

- tensile strength
- elongation
- impact strength
- stress crack resistance
- heat resistance

Narrowing the molecular weight distribution results in:

- increased impact strength
- decreased stress crack resistance
- decreased processability

Increasing crystallinity results in:

- increasing stiffness or hardness
- increasing heat resistance
- increasing tensile strength
- increasing modulus
- increasing chemical resistance
- decreasing diffusive permeability
- decreasing elongation or strain at failure
- decreasing flexibility
- decreasing impact strength
- decreasing stress crack resistance

Types of Geotextiles

In general, the vast majority of geotextiles are made from polypropylene or polyester formed into fabrics as follows:

- Woven monofilament
- Woven multifilament
- Woven slit-film monofilament
- Woven slit-film multifilament
- Nonwoven continuous filament heat bonded
- Nonwoven continuous filament needle-punched
- Nonwoven staple needle-punched
- Nonwoven resin bonded
- Other woven and nonwoven combinations
- Knitted

Functions

1. Separation
Geotextiles will prevent two soil layers of different particle sizes from mixing with each other, as is illustrated the image below.

2. Drainage
Geotextiles will efficiently collect superfluous water from structures, such as rainwater or surplus water, from the soil and discharge it.

3. Filtration
Geotextiles are an ideal interface for reverse filtration in the soil adjacent to the geotextile. In all soils water allows fine particles to be moved. Part of these particles will be halted at the filter interface; some will be halted within the filter itself while the rest will pass into the drain. The complex needle-punched structure of the geotextile enables the retention of fine particles without reducing the permeability of the drain.

4. Reinforcement
Heavy geotextiles can be used to reinforce earth structures by means of fill materials. Thanks to their high soil fabric friction coefficient and high tensile strength, they are an ideal reinforcement solution.

5. Protection
Geotextiles are an ideal protection from erosion of earth embankments by wave action, currents or repeated drawdown. A layer of geotextiles can be placed so as to prevent leaching of fine material. They can be used for rock beaching or as mattress structures. They can even easily be placed under water.

Advantages

The geotextiles market requires bulk quantities of material. Warp-knitted weft-insertion geotextiles offer the following advantages when compared to woven geotextiles:

1. Strength-for-strength, they are lighter than woven geotextiles using the same yarn.This makes for easier handling and laying on site; thus transport and labour costs are less in real terms.

2. Knitted geotextiles have exceptional tear strength. Additional strength can be designed and built-in to the weft direction such that a bi-axial high tensile, high strength warp/weft geotextile becomes a reality; e.g. 500kNm warp and 500k Nm weft.

3. Knitted geotextiles can incorporate an additional fabric to form a true composite geotextile, the fabric being simply knitted-in.

4. The individual yarns in the warp knitted weft-insertion geotextile are straight when incorporated, so they are able to take-up the strain immediately on loading. Those in woven geotextiles are interlaced.

Disadvantages

Properly installed mattings provide excellent erosion control but do so at relatively high cost.
This high cost typically limits the use of mattings to areas of concentrated channel flow and steep slopes.

- Mattings are more costly than other BMP practices, limiting their use to areas where other BMPs are ineffective (e.g. channels, steep slopes).
- Installation is critical and requires experienced contractors. The contractor should install the matting material in such a manner that continuous contact between the material and the soil occurs.
- Geotextiles and Mats may delay seed germination, due to reduction in soil temperature.
- Blankets and mats are generally not suitable for excessively rocky sites or areas where the final vegetation will be mowed (since staples and netting can catch in mowers).
- Blankets and mats must be removed and disposed of prior to application of permanent soil stabilization measures.
- Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
- Plastic results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- The use of plastic should be limited to covering stockpiles or very small graded areas for short periods of time (such as through one imminent storm event) until alternative measures, such as seeding and mulching, may be installed.
- Geotextiles, mats, plastic covers, and erosion control covers have maximum flow rate limitations; consult the manufacturer for proper selection.
- Not suitable for areas that have heavy foot traffic (tripping hazard) – e.g., pad areas around buildings under construction.

Uses Of Geotextiles

Separation

In this function, the geotextile serves to separate two dissimilarmaterials, eg, two different soils, landfill material and the native soil, stone material and subgrade soil, old and new pavement, foundation soils and various types of walls, or one of many other similar situations.

In some instances, it is difficult to distinguish between the separation and stabilization functions because in both situations the geotextile is serving as a separator. However, in stabilization some additional phenomena occur.

Stabilization

In this application, the natural soil on which the geotextile is placed is usually a wet, soft, compressible material, exhibiting very little strength.

By acting as a separator, the geotextile allows water from the soft natural soil to pass from this soil into a free-draining construction soil, which in turn allows consolidation of the natural soil to take place. As a result of the consolidation process, there is a strength gain in the natural soil, which then provides an adequate foundation for construction to take place.

Reinforcement

The key difference between stabilization and reinforcement is that stabilization is accomplished by providing for drainage of water from the unstable soil, while in reinforcement the strength characteristics (stress–strain) of the geotextile provide added strength to the whole system.

Another difference is that in stabilization the geotextile is placed on or around the area being stabilized and thereby also acts as a separator, whereas in the reinforcement application the geotextile is placed within the material being reinforced. This is in line with reinforcement concepts in concrete and other materials.

Filtration

Here the prime function is to retain soil or other fine materials, while allowing water to pass through. Again, it is seen that more than one function is being performed. If there were no drainage of water taking place, movement, and therefore retention of the soil, would not be of concern.

Part of the mechanism by which filtration occurs is through the development of a soil filter behind the geotextile. As the water passes through, soil is filtered out and collects behind the geotextile. As buildup takes place, a natural soil filter is developed.

Drainage
In the previous sections, drainage was discussed as taking place in a direction perpendicular to the plane of the geotextile. Here, drainage parallel to the plane of the geotextile is described. The property called transmissivity is defined as flow parallel to the plane of the geotextile.

This type of flow can occur to some extent in all geotextiles, but is best achieved in needle-punched nonwoven materials. This class of geotextiles can be manufactured in a range of thicknesses such that this characteristic is optimized.

Moisture Barrier
When impregnated with an asphaltic emulsion, geotextiles become impermeable and can then be used as moisture barriers. The primary application for this type of geotextile is in pavement rehabilitation.

Conclusions

The report is unusual in that it documents the use of a geotextile type of fabric and its performance over a 35 year period.

The initial purpose of the test, 35 years ago, was to determine if and which fabric would perform effectively as a geotextile in a separation application under an unpaved road. (A test of durability was not part of the initial purpose).

It showed that Typar 3401 could perform that function very effectively, even though it was not specifically designed for that use and was installed with inadequate "safety factors" – too little base cover for the extreme loads it was subjected to "saturated", wet, conditions.

The loads used in the initial testing would normally require a minimum of 2.5X the base used and the tests were conducted after heavy rain. A severe test to say the least. The fabric, Typar 3401 has performed the separation function for 35 years and is still working.

References

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- www.studymafia.org