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Use of Geosynthetic in Road Construction

Prof. Radha Ajay Powar[1], Sanket Namdev Mengane[2], Vaishnavi Sambhaji Farakate[3], Sakshi Prakash Kolekar[4]
Department of Civil Engineering[1,2,3,4]
D. Y. Patil Technical Campus, Talsande, Kolhapur, Maharashtra, India

Abstract: *Geosynthetic materials primarily made of various polymers provide excellent durability and have been increasingly used in civil and transportation infrastructure projects. The authors described an overview of the various geosynthetic materials, brief details on manufacturing processes, and various application areas in infrastructure works. Four infrastructure case studies using different geosynthetic materials including geocells, geotextiles, geofoam, geofibers, and others are described to explain the role of these materials in enhancing the performance of transportation and civil infrastructure including pavements, bridge approach slabs, dams, and embankments. The relevant material properties and design methodologies applied are also described in these case studies. Overall, it can be mentioned that geosynthetic polymeric materials and their durable performance characteristics make them excellent materials for the construction and renovation of civil infrastructure works. Sustainability and life cycle cost studies will provide more insights into these materials and how they can reduce maintenance costs in the longer design life periods. Geosynthetics are synthetic products used to stabilize terrain. They are generally polymeric products used to solve civil engineering problems. This includes eight main product categories: geotextiles, geogrids, geonets, geomembranes, geosynthetic clay liners, geofoam, geocells and geocomposites.The geosynthetics are one of the popular and major reinforcement materials in civil engineering construction practices. Geosynthetics are known for offering economical, technically efficient, and environmentally friendly solutions for complex problems. The effective utilization of geosynthetics in civil engineering practice depends on fundamental aspects of the reinforcement material. The present chapter provides a brief overview of the geosynthetics including different categories, properties, and functions of geosynthetics. Further, the evolution, applications, and reinforcement mechanisms of cellular confinement systems have been described.*

Keywords: Geosynthetic

I. INTRODUCTION

Geosynthetic materials are widely used in many civil engineering fields, especially geotechnical engineering. Synthetic fiber, which is the raw material of geotextile, was produced from PVC (polyvinyl chloride) in the beginning of 1900s and since the mid-1960s, non-woven fabrics were manufactured as fabrication. The first known geosynthetic material application was synthetic woven fabrics (geotextiles) used in Florida USA for the control of coastal erosion in 1958 and it is seen that this geotextile material application still continues its duty. In the following years, the usage of geosynthetics has increased rapidly in other fields of civil engineering such as geotechnics with the expansion of the usage area of geotextile product with different functions.Common types of geosynthetics used for soil reinforcement include geotextiles (particularly woven geotextiles), geogrids and geocells. Geotextiles are continuous sheets of woven, nonwoven, knitted or stitch- bonded fibers or yarns. The sheets are flexible and permeable and generally have the appearance of a fabric. Geogrids have a uniformly distributed array of apertures between their longitudinal and transverse elements. These apertures allow direct contact between soil particles on either side of the sheet. Geocells are relatively thick, three- dimensional networks constructed from strips of polymeric sheet. The strips are joined together to form interconnected cells that are infilled with soil and sometimes concrete. In some cases 0.5 m to 1 m wide strips of polyolefin geogrids have been linked together with vertical polymeric rods used to form deep geocell layers called geomattresses.

II. LITERATURE REVIEW

Sina Mirzapour Mounes, Mohamed Rehan Karim, Abdelaziz Mahrez and Ali Khodaii et. al. (2011)] :- The focus of this paper pertains to the utilization of geosynthetics in flexible pavements. It will go over the outcomes of a number of research studies related to this issue. This paper focuses on investigating the three primary approaches through which

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geosynthetics are incorporated into pavement structures: as a means to restrict fluids, to mitigate strain, and as a reinforcing component.

[JORGE G. Zornberg et. al. (2011)] :- Geosynthetics and their contribution to the improvement of pavement have been the focus of recent investigations. The primary objectives of the research were to comprehend the mechanisms and efficacy of geosynthetics, establish methods to assess these characteristics in laboratory experiments and on actual pavements, and anticipate the influence of various geosynthetic types on pavement performance.

[Oğuzhan Yavuz Bayraktar et al. (2020)]:-Geosynthetics are typically placed on the soft foundation of roads prior to introducing a layer of geosynthetic granular material. The utilization of geosynthetics ensures the slab's strength and hinders the sandy base from penetrating the vulnerable layer beneath it. The use of geosynthetics aids in maintaining the durability of a weak floor over an extended period.

[Ravindra Kumar, Utsav Singh, Priyanshu Saini, Varun Sharma, Matloob Ali et. al. (2020)]:-The purpose of this study is to investigate the application of geotextiles in road construction and examine previously published literature on the subject. The findings of this study will offer helpful insights in formulating recommendations on the effective implementation of geotextiles for improving the subgrade beneath airport pavements intended for smaller planes. The guidelines will encompass topics such as pavement design, pavement construction techniques, appropriate material choices, and performance benchmarks. Geotextiles can be utilized in various methods for constructing gravel-surfaced roads and flexible pavements, as indicated by the findings of the study.

II. CONCLUSION

Geosynthetics are polymeric products which are applied to fulfil various functions in civil and geotechnical engineering. Since geosynthetics can perform different functions, as presented in the first part of this paper, they should be designed to meet criteria to sufficiently perform these functions in given applications. The filtration and stabilisation functions were also discussed in this paper.

As presented in parts two and three of this study, geosynthetics for both filtration and stabilisation functions require specific features, since their application is quite complex. Whilst filtration seems to be more established with standardised design approaches and many successful applications, stabilisation is still at a relatively initial point on the learning curve, especially in the context of differentiation from well-established reinforcing applications. The authors hope that the review given in this paper will help to put in order the variability in the specific applications of geosynthetics for both of the functions.

REFERENCES

[1]. Singh, Rajesh, and Gupta, Arun. "A review study of geosynthetics applications in civil engineering." *Journal of Geotechnical and Geoenvironmental Engineering*, vol. 25, 2018.

[2]. Patel, Ankit, and Sharma, Ravi. "A review of geosynthetics in infrastructure projects." *International Journal of Civil Engineering Research*, vol. 12, 2022.

[3]. Khan, Ayesha, and Rahman, Azizur. "A brief review of geosynthetic materials for soil stabilization." *International Research Journal of Engineering and Technology (IRJET)*, vol. 06, 2019.

[4]. Gupta, Neha. "Review on geosynthetics for erosion control." *International Advanced Research Journal in Science, Engineering, and Technology*, vol. 10, 2020.

[5]. Kumar, Amit. "Review on the use of geosynthetics in retaining wall design." *International Journal of Structural Engineering*, vol. 5, 2018.