Literature Search
Need Statement 555

Date: Thursday, April 05, 2018
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Resources searched: Transport Database, Research in Progress, Web, MnDOT Library Catalog, ASCE Library

Summary: Results are compiled from the databases named above. Links are provided for full-text, if applicable, or to the full record citation. I completed my searches using the following terminology: geogrid, cost benefit, benefit cost. The results are divided into most relevant and less relevant.

1. Geogrids in Roadway and Pavement Systems

2. Application of risk, cost–benefit and acceptability analyses to identify the most appropriate geosynthetic solution to mitigate sinkhole damage on roads
   http://www.academia.edu/28860683/Application_of_risk_cost_benefit_and_acceptability_analyses_to_identify_the_most_appropriate_geosynthetic_solution_to_mitigate_sinkhole_damage_on_roads

3. Incremental Costs and Performance Benefits of Various Features of Concrete Pavements

   Source: Baltic Journal of Road and Bridge Engineering. 2017. 12(3) pp 181-186 (Refs.)
   URL: http://dx.doi.org/10.3846/bjrbe.2017.22
   Abstract: Geogrid materials applied within asphalt layers defer or prevent the occurrence of reflective cracking. The contribution of this work significantly adds to extending pavement serviceability and improving benefit/cost analysis. Since 1970s many studies have demonstrated the benefits of geogrid reinforcement in asphalt pavements, but this knowledge did not translate to their extensive usage in the actual construction practice. Among potential reasons are higher initial costs, lack of in-depth understanding of working mechanism within adjacent asphalt layers and lack of commonly standard design procedures. This paper presents a recent study, which investigated the effect of geogrid reinforcement on asphalt mixture specimens. Two types of laboratory experiments were conducted, namely monotonic (strength and fracture) testing and cyclic (fatigue and modulus) testing. The results demonstrated a significant strengthening contribution of geogrid, which was observed regarding fracture energy results and terminal deflections in the fatigue testing. This paper also presents a short example connecting pavement deflections with the allowable axle loading (also known as fatigue life) to demonstrate the practical implications of geogrid reinforcement. The undertaken analysis shows the reduction of pavement deflections due to the geogrid application, which potentially leads to a significant extension of pavement fatigue life. Paper concludes with several recommendations for further work in the area of geogrid reinforcement.
   Year: 2017

   Source: Transportation Geotechnics. 2016/9. 8 pp 119-131
   URL: http://dx.doi.org/10.1016/j.trgeo.2016.04.002
   Abstract: There are numerous cost-effective applications for geosynthetics on low-volume roads, yet geosynthetic materials use on these roads is typically underutilized. The USDA Forest Service has been using geosynthetics on its low-volume roads for the past 40 years in applications of separation, reinforcement, drainage, filtration, and others. The objective of this paper is to document many of these uses on low-volume forest roads, both traditional and unique, and discuss the many cost-effective advantages of geosynthetic use. Uses in low-volume road applications are
similar to those used in many highway projects and have many of the same benefits and cost savings, yet utilization is variable and inconsistent. In many developing countries, engineers and technicians designing rural roads have barely heard of geosynthetic materials, much less taken advantage of their benefits. Low volume roads make up roughly two thirds of all the roads worldwide, or roughly 30 million kilometers of roads, yet they do not receive the attention and appropriate technologies deserving of such a major amount of infrastructure. Significant cost savings and improvements in design and ultimately roadway performance can be realized with the increased use of geosynthetics in underdrains, for subgrade reinforcement, in geosynthetically reinforced retaining structures, and in improved erosion control. Materials used include geotextiles, geogrids, geocells, geofoam, netting, and other geosynthetics.

Year: 2016

URL: http://dx.doi.org/10.1061/9780784413654.059
Abstract: Geogrid use at current US drilling facilities within the Marcellus and Utica Shale regions, as well as lesser publicized shale formations, have given the operators and producers a way to increase the performance of their access roads and well pads. Within this market, the construction costs for these roads have increased dramatically as a direct result of the presence of areas of soft soil or unforeseen environmental impacts (e.g., cold weather). Since some of these companies have started to include geogrids into their road and well pad sections, the time for construction has been reduced, the road and well pad have been and remain stabilized and, most importantly, their construction costs have been greatly reduced. One producer in PA has saved $1.4 million in construction costs and still maintains an incredible access road that requires little to no maintenance. This paper explains how geogrids enhance performance over conventional construction methods and documents this performance through the inclusion of case histories that will help more companies in the Oil and Gas Market better understand how they can utilize this same approach in their current operations.
Year: 2014

7. Down to Earth.
Source: Better Roads. 2014/5. 84(5) pp 5, 7-8,10 (Figs., Photos., Tabs.)
URL: http://www.betterroads.com/down-to-earth-2/
Abstract: Geosynthetic products can help construction to be faster and more cost-effective, while increasing the service life of structures. Geosynthetics can separate good materials from bad and help facilitate drainage, both of which will improve pavement performance. Different types of geosynthetics have different functions, but all are manufactured polymeric materials used with rock, soil, or other geotechnical material in construction and engineering projects. A recent project in a remote part of Arizona showed the benefit of geosynthetics when the Arizona Department of Transportation had to open an alternate route when a road had to be closed due to a landslide. Use of a geogrid helped save money and time in paving a detour road.
Year: 2014

8. Reinforced Soil Retaining Walls in the Mina Al Fajer Resort Project, Fujairah,
URL: http://dx.doi.org/10.1061/9780784413401.047
Abstract: Dhs 800 m (USD 218 m) Mina Al Fajer Resort project commenced in June 2007. The project - covering an area of 777,025 square feet - includes a marina, mountain villas, solarium villas, marina apartments and a five-star hotel. The layout of the mountain villas was designed to form a number of rows of villas at different levels forming terraces up the hillside on the sea-front.
The mountain villas and the road connecting the terraces at different levels required construction of retaining walls up to 18-m heights and having an overall face area of 20,000 m$^2$. Based on successful completion of a number of projects in the same region, TensarTechTW1 (ME) Wall System was chosen by the client. Some of the challenges facing the designer were: (1) the design of the reinforced soil structures to support structures with low tolerance to movement, such as concrete housing frames and swimming pools; (2) limited available space for geogrid placement; (3) tight construction schedule; and (4) architectural project requirements comprising frequent and acute corners on the wall layout. The chosen TensarTech TW1 (ME) Wall System proved to be a very successful solution that is inherently flexible enough to deal with the project requirements and resulting in cost-effective and maintenance-free structures designed to last for 120 years.

**Year:** 2014