



# Kansas LTAP Fact Sheet

A Service of The University of Kansas Transportation Center for Road & Bridge Agencies

## Geogrid Questions? Here are Some Answers

By Lisa Harris

**W**e were contacted by an operations supervisor who describes himself as an “old farm kid” and admits he is skeptical about using geogrid to stabilize base, when it seems that rock would work just as well. His county is looking into using geogrid, and he wants to be convinced it is worth the time, effort and expense. Below are some questions he asked about the material, and answers from an interview with Dr. Jie Han at the University of Kansas, who conducts research on the use of geotextiles and geogrid.

**What is the importance of soil firmness in deciding to use geogrid?** Soil firmness is an important consideration for deciding when and how to use geogrid. You want to have a CBR (California Bearing Ratio) of less than 3 to show the benefits of geogrid. The California Bearing Ratio (CBR) test is a simple strength test that compares the bearing capacity of a material with that of a well-graded crushed stone. The test was developed by the California Division of Highways around 1930 and has been used by numerous states (including Kansas), counties, U.S. federal agencies, and internationally. Most agency and commercial geotechnical laboratories in the U.S. are equipped to perform CBR tests.

What if you don't have the ability to test the soil? You can approximate a CBR test by walking or driving on the site. If a pickup truck ruts more than 0.5 to 1 inch, your soil CBR is probably 3 or less. If a person walking on the site sinks in about 2-3 inches, the CBR is probably between 0.4 and 0.8.

**What can you put geogrid over? (how muddy)** You can put geogrid down directly on soil that has a CBR of more than 1. If the soil has a CBR of less than 1, you'll have to either lay down a woven geotextile and put the rock on top, or place a nonwoven geotextile underneath the grid and then add rock on top. In either case, the geotextile will help keep the rock from sinking into the soil.

**Would it help to double or crisscross in severe locations?** Doubling up the grid will help performance (may not double it), but it will double the cost. It is important



Images courtesy of Center for Technology & Training at Michigan Tech

Counties have used geogrid successfully in roads that have weak-subgrade soils. Above is an installation in Michigan's Upper Peninsula.



to overlap each section of grid laid down for effective performance. An overlap of 1 ft is recommended for areas with a CBR less than 3, and a 3 ft overlap for areas with a CBR less than 1.

### **Rectangular design vs. triangle design...which is better?**

Geogrids with both rectangular and triangular apertures are used in field and perform well if they are properly designed and installed. Different designs will require different rock thicknesses, which affect the cost.

### **Is there a cost difference between the two basic designs?**

Yes. However, cost comparisons should be made in terms of a road section, which includes geogrid and rock. A relatively expensive geogrid might have more reduction in the thickness of rock needed compared with a less expensive geogrid, so you might end up with a more economical design overall.

**The triangular product is lighter weight. Why?** The triangular type has narrower, taller ribs than the rectangular type. That saves on weight.



**How do you keep the geogrid flat? Is that important?**

Yes, geogrid performs best when it is flat. You can help the process by placing piles of soil, maybe every 3 to 10 ft, to hold down the material as it is being laid. The piles may have to be closer together than that if the wind is strong.

**How do you prevent waves and keep the geogrid running straight?** The piles of soil should help with this too.

**Why not use rock and make a better base, instead of using geogrid?** Rock can be used to stabilize the base, but you may need a much thicker base if the soil is very soft. You will use less rock if you use it with geogrid. Rock comes with its own costs, including hauling from the quarry, so using less can save you money. The savings will be offset by the cost of the geogrid, but the geogrid will improve performance of the area and result in less frequent maintenance in the future.

**How do you know it works or will work?** Research and case studies have proven geogrid will work, but the best way is to ask other road agencies that have used it—or give it a try yourself. Choose two sections with similar conditions, and use rock for one and a geogrid treatment for the other. After a few passes with a vehicle, you will be able to tell the difference in terms of rut depth.

**Any other concerns or tips?** This article covers the major concerns about using the product. More tips can be found in user manuals provided by geogrid manufacturers, and in the National Highway Institute publication titled *Geosynthetic Design & Construction Guidelines*, 2009 update. (FHWA NHI-07-092). You can download this publication at the NHI website for \$50. [https://www.nhi.fhwa.dot.gov/training/intro\\_materials.aspx](https://www.nhi.fhwa.dot.gov/training/intro_materials.aspx). This is considered an industry standard for installation of geogrid.

**Is using geogrid worth the time, effort and expense to provide a long term solution?** If designed and installed properly and used in the right conditions, definitely yes!

[Editor's note: A must-read on geogrid for locals is an excellent article in the Spring 2015 Michigan LTAP newsletter (The Bridge) titled "Geogrid Projects in Houghton & Baraga." Two counties that use geogrid share their installation practices and lessons learned. See page 4 at this link: <http://www.michiganltap.org/bridge/bridge-volume-28-no-4>] ■

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Sources:



- Han, Jie. Interview on May 19, 2015.
- Kern, Shaughn and Torolo, Pete. Geogrid Projects in Houghton & Baraga. The Bridge, Vol. 28, No. 4, Spring 2015. Michigan Local Technical Assistance Program. <http://www.michiganltap.org/bridge/bridge-volume-28-no-4>