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White Paper Series

Why Geocells Outperform Geogrids for Road Construction

by Bill Handlos, PE, Director, Presto Geosystems

Geocells (cellular confinement) offer a more effective and practical 3D design solution to load support challenges than multilayered 2D geogrid efforts. Geocells transfer applied loads instantaneously, delivering practical soil stabilization in a product that is fast and easy to install.

How do geogrids work?

Geogrids rely on rutting, displacement and lateral movement of the road material to activate the load support reaction of the product. As shown below, failure of the driving surface must occur before the geogrid reacts. As a result, rutting and soil displacement is a prerequisite reality to the system. Since the geogrid is two-dimensional, material not located directly within the plane occupied by the geogrid is free to move, shift and displace.

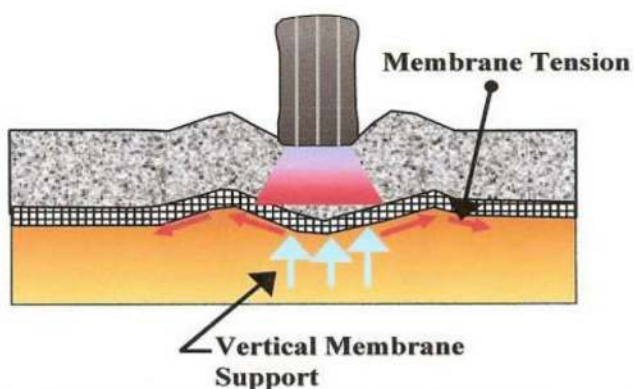


Figure 3. Tensioned membrane effect reinforcement mechanism.

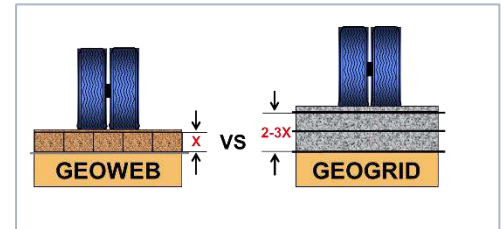
Source: U.S. Army Corps of Engineers ETL 1110-1-189

It is essential that geogrid is placed in a flat, or better yet a pre-tensioned manner, but that is not practical in a construction environment. It is common to see geogrid unrolled over a prepared grade with an undulating surface. As aggregate is placed over the top, the geogrid material kinks and waves, further warping the 2D plane. The geogrid is rarely pulled tight to be ready to receive the load in tension as required.

Geogrids are difficult to install in soft subgrades

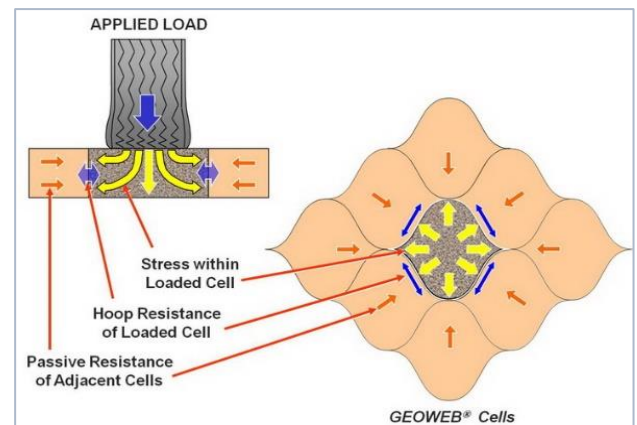
In cases where subgrade is particularly poor, over-saturated, or already damaged by rutting, geogrids are even more difficult to place flat and tight as recommended. Soft subbase does not support medium or heavy construction equipment to place and spread the base layer over the geogrid without deforming the geogrid even further. The overall deformation creates an uneven geogrid layer that is poorly suited to function as intended.

Often, geogrid manufacturers recommend two, or even three layers of geogrid to create a stiffened aggregate cross-section. This approach improves load support performance of the geogrids, but is time-intensive, as each layer must be unfurled, covered and compacted separately. Cost of installation and materials double and triple with the additional layers.



How geocells work?

Geocells are 3D structures that utilize the geocell hoop strength, passive earth pressures and particle confinement to create a stiff mattress layer that **resists wheel loads immediately upon impact** and without the partial driving surface failure required by geogrids. Load induced stresses are transferred from the infill particles to the cell wall and counteracted by hoop resistance and passive resistance of adjacent cells.



Workers expand geocells over the subbase quickly and easily and it is not critical that the geocells be pre-tensioned or placed perfectly on-grade. Loaders, bulldozers and bobcats are employed to fill the geocells. Loaded dump trucks can back over just-filled geocells with no damage to the product and no effect on the performance of the material.

Unlike geogrids, geocells are effective for a wide variety of infill, and is not limited to the high quality aggregate required for geogrids. Sand, fine aggregate, gravel or breaker run all see their properties enhanced by the strength of high density polyethylene (HDPE) geocells. Ability to use on-site infill or locally available materials can yield increase savings to the project.



Geocells are ideal for installation over soft soils

No equipment is necessary to expand geocell sections. So, they can be placed over the softest of subbases and no low-pressure equipment is required to infill the cells. Simply back up full-size loaded dump trucks, empty the payload and spread the granular material in and over the geocell.

Geocells proven performance

Geocells have been successfully improving road life of paved and unpaved highways, access roads and work platforms for 40 years. Since the United States Army Corps of Engineers (USACE) co-developed the technology in partnership with Presto Products, thousands of GEOWEB® load support projects have saved millions of dollars in construction cost and, in many cases provided three-dimensional stabilization simply not available with the use of traditional geogrids. For more information, see

www.prestogeo.com.



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