



***Tensar Earth Technologies, Inc.***

System Overview

## Changing the Way Flexible Pavements Are Designed

The Spectra System consists of three primary components:

- Tensar BX Geogrids — stiff geosynthetic reinforcement
- Design — developed using SpectraPave2 Software or Tensar engineering services that include conceptual designs and design assistance
- Site Assistance — maximizes time efficiency and minimizes costs of project construction

When weak subgrade, heavy loads, thick fill layers, high aggregate costs, contaminated subgrades, or shallow utilities disrupt your construction schedule or budget, the Spectra Roadway Improvement System normally provides the best solution.

The Spectra System from Tensar Earth Technologies improves flexible pavement systems in three ways:

- Simplifies construction
- Extends service life
- Reduces required materials

Not only does this system allow access and construction in less than ideal situations, it also offers a predictable engineered solution. This solution relies on Tensar® Biaxial (BX) Geogrids and crushed aggregate base acting together to create a stronger composite structure, which increases the performance of the underlying subgrade or the aggregate base course.

The result is a more durable and cost-efficient pavement. The Spectra System and the tested design principles it relies upon achieve these results by two distinct but related methods:

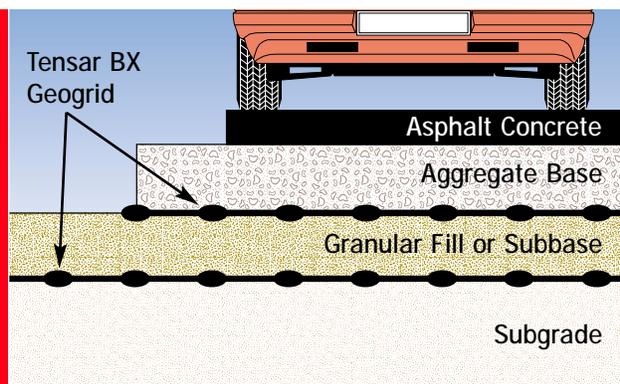
- Subgrade Improvement
- Base Course Reinforcement

The Spectra System has been used successfully for:

- Paved highways and secondary roads
- Parking areas for commercial and industrial facilities
- Airport runways and taxiways
- Truck freight distribution centers and terminals
- Heavily loaded equipment yards at port, rail, intermodal, and industrial facilities
- Haul roads



The Spectra System owes its strength and durability to BX Geogrids, Tensar's patented geosynthetic reinforcement grids. BX Geogrids stand the test of time, performing better than other commercially available geosynthetics due to their stiff interlocking capability. For more information, visit [www.tensarcorp.com](http://www.tensarcorp.com).



Whether the Spectra System is used to improve the subgrade, to reinforce the base course, or to do both, the result is the same — better performance and economy of flexible pavements. For nearly twenty years, Spectra design methods have been proven in over 75 million square meters of installations.



AMC Hampton 24 Theatres — Hampton, VA  
The Spectra System allows you to increase the performance of pavements without extensive undercutting, importing additional fill, constraining curing time, or increasing the thickness of the pavement system.

## Designing for Subgrade Improvement

Weak subgrades are a common problem in pavement construction. As the foundation for pavement, subgrade failure will lead to rapid deterioration of the pavement structure.

Traditionally, weak or pumping subgrades have been removed and replaced with imported fill or stabilized chemically. Both options are expensive and time-consuming, especially when compared to the Spectra solution.

The Spectra System improves the performance of the existing subgrades by distributing loads over a wider area which reduces pumping and shear failure while maximizing the load bearing capacity of the subgrade.

When undercutting or backfilling is required, Tensar BX Geogrids can reduce or even eliminate the need for undercutting, removing weak or contaminated soils, and importing expensive, select fill. The results are faster construction and lower costs.

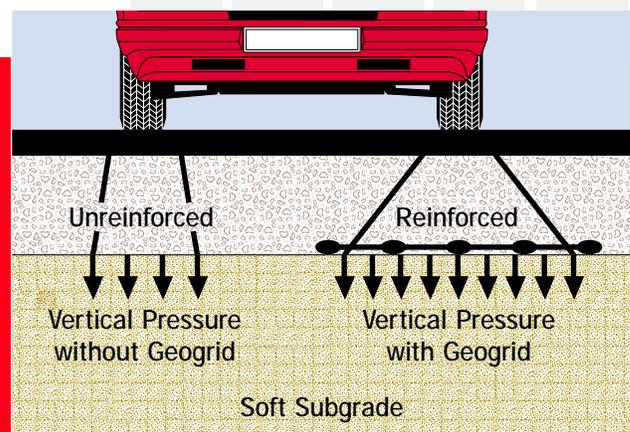
When lime or cement stabilization is considered, BX Geogrids can present an alternative. Support can be obtained without the time, cost, or environmental hazards of chemical stabilization methods, and without impeding internal drainage.

When deep fill sections are required, BX Geogrids can reduce the thickness of the fill layer by as much as 50% while achieving the needed load distribution. The result is reduced select fill costs and faster job completion.

When building paved or unpaved roads, parking lots, airports, taxiways, rail lines, or even foundations, subgrade improvement with Tensar BX Geogrids make the job more economical, save on materials, and reduce construction time. Over any weak soil, BX Geogrids distribute imposed load(s), improve bearing capacity, reduce rutting, and provide an alternative to costly conventional methods.



Snowshoe Effect — Tensar BX Geogrids distribute heavy loads over soft soils just like a snowshoe supports the weight of a man over soft snow.



Using the Spectra System for subgrade improvement changes the dynamics of the load interaction with the subgrade. By distributing the load, the Spectra System reduces pressure on the subgrade and increases its performance.

## Designing for Base Reinforcement

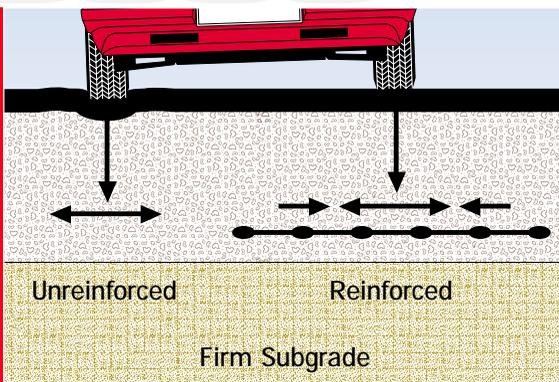
Pavement systems often fail prematurely because the base course material moves laterally away from wheel paths (load). This results in rutting and eventual cracking of the pavement surface.

By providing confinement, the Spectra System enables the reinforced base course to resist lateral spreading, thereby improving the structural performance of the pavement.

Not only is this system easy to install, it also saves time and money by reducing overexcavation, reducing the required materials for the pavement section, and extending pavement service life.

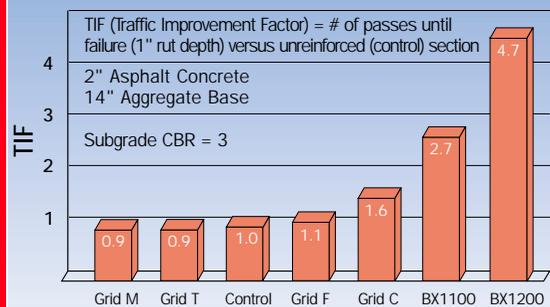
While providing a lower bottom line cost for the project, Tensor BX Geogrids for base course reinforcement can aid in maintaining pavement construction schedules or even facilitate completion ahead of schedule.

The Spectra System for base course reinforcement has also been proven in the toughest test of all — real world performance. Tensor BX Geogrids have been used by the FHWA, state departments of transportation, as well as local county and municipal agencies and private owners, proving the Spectra System's economic and structural value time and again.



Unreinforced aggregate moves laterally under traffic loads, causing rutting and eventual pavement failure. Tensor BX-reinforced base courses resist this lateral movement and deliver long-term performance.

“Under truck traffic, only the geogrid item performed better than the control item...”



Source:  
USACE Waterways Experiment Station, February 1991 &  
December 1992

## Designing with SpectraPave2 Software

Dr. J.P. Giroud and Dr. Jie Han recently released new technology for subgrade improvement design. Their work is the most comprehensive advancement in the structural design of unpaved roads in the last 20 years.

Tensar Earth Technologies has taken this technology a step further by developing SpectraPave2. This software has broken new ground with significant advancements over any other program available and features four modules including:

- Project Information
- Subgrade Improvement (with state-of-the-practice detailed analysis)
- Subgrade Improvement Cost Analysis
- Base Course Reinforcement

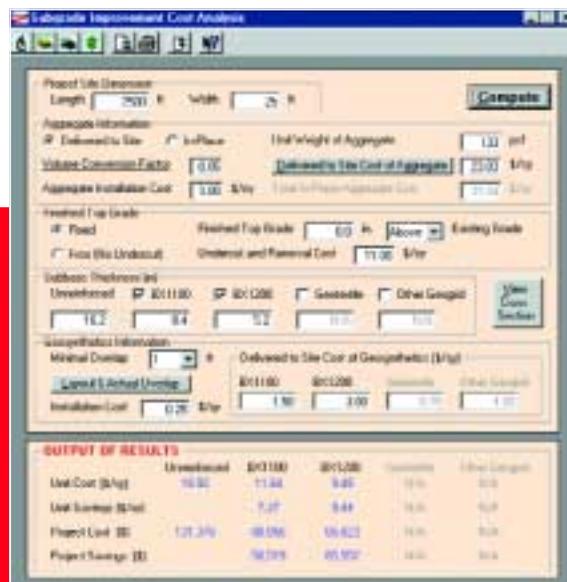
These advancements were based on the new Giroud-Han Design Technology which supports the use of certain geosynthetics to reduce aggregate requirements and improve subgrade performance. The Giroud-Han Design Technology and SpectraPave2 provide a faster, more user-friendly, and more comprehensive analysis than any similar application.



Available in CD-ROM format supporting Windows® 95, 98, 2000, XP, or NT, SpectraPave2 Software may be downloaded at no charge from our web site at [www.tensarcorp.com](http://www.tensarcorp.com).



Project Information, Subgrade Improvement, Base Course Reinforcement, and Subgrade Improvement Cost Analysis modules are all shown on SpectraPave2's homepage.



The Subgrade Improvement Cost Analysis module determines which design alternative is the most cost-effective for your project's soil conditions and requirements.

## The Engineered Advantage™

We can quickly provide you with:

- Information on products and services in your area
- Preliminary cost estimates, conceptual designs, and guidance specifications
- Summaries of completed projects
- SpectraPave2 Software

### Skates Road — DeSoto County, FL

#### Design Concerns:

- A stretch of road was severely deteriorated due to low shear strength marsh deposits underneath it.

#### Solution:

- BX Geogrids and aggregate fill created a firm, unyielding soil platform to support construction traffic and serve as the new roadbed for the flexible pavement system. The grid changed the dynamics of the load interaction with the subgrade and more evenly distributed load pressure. This maximized the load bearing capacity of the subgrade.

#### Results:

- Long-term savings of maintenance and scheduled repairs were realized. After 3 years, the road showed no sign of pavement failure or reflective cracking despite heavy traffic.



Skates Road — Florida

### Port of LA — Los Angeles, CA

#### Design Concerns:

- Pavement sections for a 230-acre terminal had to address container handling equipment, as well as geotechnical and environmental issues.

#### Solution:

- A pavement that allowed for a high level of operational flexibility was achieved by incorporating the Spectra Systems.

#### Results:

- Subgrade structural integrity was improved and pavement service life extended.
- Construction time was minimized.



Port of LA — California

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To find out how we can help you on your next project, call 800-TENSAR-1, send an e-mail to [info@tensarcorp.com](mailto:info@tensarcorp.com), or visit [www.tensarcorp.com](http://www.tensarcorp.com)

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