OUR FOCUS TODAY

BX (Biaxial) Geogrids
and how they can help you solve site Subgrade Problems for any pavement type

OUR FOCUS TODAY

...improve the performance or provide economic benefits of any flexible pavement

Geogrids

Biaxial
- Bi-Directional
- Polypropylene
- High Strength @ Low Strains
- Pavements & Foundations

Geogrids

Uniaxial
- One Directional
- HDPE
- High Strength @ Low Strains
- Slopes & Retaining Walls

Biaxial Geogrids
Two Basic Applications
Base Reinforcement
&
Subgrade Improvement
Base Reinforcement
*Structural Pavement Reinforcement*
Reduce Aggregate Thickness for Immediate Economy

Subgrade Improvement
*Soft Soil Reinforcement*
Cost Effective Solution
Immediate Results

Geogrids
*Are NOT Fabrics*
- Different Functions
- Different Properties
- Different Specification Criteria

Fabric Uses

Fabric Used in Pavements
*They Do Not Reinforce*
They Separate

Subgrade Improvement Mechanisms

*Literature Review on Geotextiles - COE*

"...if geotextiles are included in the structure (of a pavement), no structural support should be attributed to geotextiles."

"geotextiles should be used in filtration, drainage, and separation, but not reinforcement."
AASHTO M288
_Generic Geotextile Spec_
• Filtration
• Drainage
• Erosion Control
• Silt Fence
• Separation

_But Not Reinforcement!

Geogrids Were Designed to
Reinforce

What is the difference between
Fabrics & Geogrids?

DISTINCTIONS
_Tensile Modulus_

Strain Compatibility

TENSILE MODULUS
_A fancy word for the relationship between the amount a material will stretch under a given load_

Geogrids have a high Tensile Modulus Compared to Fabrics

TENSILE MODULUS
_What Type of Reinforcing Would You Use?_

- Steel Rebar
- A Bungee Cord of Equal Strength

_The High Tensile Modulus Steel - of Course!

TENSILE MODULUS
_Subgrade Soils are Like Concrete_

• Weak in Tension
• Fail with very little Stretching

_Therefore-_ Reinforcement Must have a High Modulus
Field Proof

TENSAR Geogrid Fabric

Note how the Fabric Ruts

DISTINCTIONS

Apertures

Mechanical Interlock Confinement

DISTINCTIONS

Flexural Rigidity

Stiffness helps protect existing subgrade strength

Structural Capabilities

These properties allow biaxial geogrids to provide Structural Value

Less Stone and Less Cost -vs- Fabrics and Chemical Treatments

BX Geogrid

Reinforcement Capabilities

Even works where you think it's not needed i.e. good subgrades

Proven by Research and..... In-ground Performance

1984 University of Waterloo - Test Results

Extended Service Life (Higher SN Value)
**1984 University of Waterloo - Test Results**

[Graph showing traffic benefit ratio (TBR) and test configurations]

Reduced Aggregate Thickness - Maintains Same Service Life

**Traffic Benefit Ratio (TBR)**

*Ratio of the number of loads to failure with Geogrid vs. without Geogrid*

**1984 University of Waterloo**

*The Bottom Line*

- Traffic Benefit Ratio (TBR) = 3.0 or an increase to 300% of original service life
- Up to 50% Reduction in Base Course Thickness

**Summary of Research**

- University of Waterloo
  - BX1100 TBR = 3
- Corps of Engineers
  - BX1100 TBR = 2.7  BX1200 TBR = 4.7
- University of Alaska
  - BX1100 TBR = 2-3  BX1200 TBR = 2-10
- Montana State University
  - Verifies a Minimum BX1100 TBR = 3

*TBR Varies Some with Base Thickness*

**1992 US Army Corps of Engineers**

- USDOT/FAA commissioned study for reinforcing airfield pavements
- Phase I - Geotextile Literature Review

**1992 US Army Corps of Engineers**

Phase I - Geotextile Literature Review states that...

"...geogrids have more potential than geotextiles for reinforcement of flexible pavements."

Also

"...if geotextiles are included in the structure, no structural support should be attributed to geotextiles."
1992 US Army Corps of Engineers
Phase II - Geogrid Literature Review

"Geogrids perform better than geotextiles in base layer reinforcement mainly because of grid interlock with aggregate particles. Poor friction properties of geotextiles do not allow good interlock with aggregate particles."

-Therefore-
Full Scale Testing of Geogrids was Recommended

1992 US Army Corps of Engineers
Phase III - Geogrid Reinforcing Full Scale Test

Full Scale Test Report on all commercially available geogrids

1992 US Army Corps of Engineers
Several Grids Tested

Not All Geogrids Perform The Same

COE Results

Why the Difference in Performance???

Common Material Properties
• Tensile Strength and Modulus
• Aperture Size
• Junction Strength
• Stiffness

COE Enlist the Help of Dr. Kinney

Soil Particle Movement

Direction of Wheel Path

Fishhook Pattern
How Properly Designed Geogrids Work

CONFINEMENT

Aggregate Restraint

University of Alaska & COE
Torsional Rigidity Modulus

A Measure of the Resistance to:
• In-plane Rotation
• Fishhook Particle Movement

Correlates to In-Ground Performance

In-Ground Performance is Predicted by Torsional Rigidity

TORSIONAL RIGIDITY

“Not all Geogrids are Equal”

Specifications Sheet Comparisons DO NOT Prove Equivalence

Biaxial Geogrids

Two Basic Applications
Good Subgrades

&

Poor Subgrade

BX Geogrid Applications

Base Reinforcement & Subgrade Improvement Combination
Subgrade Improvement
Soft Soil Reinforcement
Cost Effective Solution
Immediate Results

THE PROBLEM!

THE SOLUTION!

Subgrade Improvement Mechanisms
Are Similar to Base Reinforcement

Design Tools

Good Subgrades
Structural Pavement Reinforcement
Reduce Aggregate Thickness for Immediate Economy
Increased Service Life for Long-Term Economy
Base Reinforcement

Economic Benefits

- Reduced Initial Construction Cost
- Quicker Construction
- Up to 50% Less Aggregate Base Required

Less Expensive Pavement

Structural Geogrids

Proven Performance & Economy in Good Subgrade Conditions

Proven Performance & Economy in Poor Subgrade Conditions

BX Geogrid Applications

Base Reinforcement & Subgrade Improvement Combination

BX Installation

- Easy to Install
- Cost Effective
- No special equipment

- Immediate Results
- Readily Available

BX Installation

One-Step Application
- No mixing
- No waiting

Environmentally Friendly
- No Dust to drift or breathe

Design Tools