**THE CHALLENGE**

The bulk material-handling site located adjacent to the deep-water channel in the Jacksonville seaport was plagued by mucky, unstable subgrade material. The site, a storage and transport facility for 80 ft. high cones of stockpiled crushed limestone used for road construction, needed to be stabilized before it could support heavy vehicle access.

The 4.4 acre (1.78 hectares) area would be required to handle 40,000 lb. wheel loads from dump trucks and vehicles accessing the area. The GEOWEB® load support system was chosen to stabilize the yard and support sustained heavy vehicle loads.

**THE RESULTS**

The stabilized roadway area was constructed with 1,200 GEOWEB® sections placed over a geotextile separation layer and infilled with limestone gravel. The Jacksonville Port Authority continues to be pleased with the condition of the yard area and the performance of the GEOWEB® system and its ability to handle the yard’s repeated heavy traffic loads.

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**THE GEOWEB® LOAD SUPPORT SYSTEM**

Constant weight of parked trailers, stacked containers and heavy traffic patterns can cause your intermodal or port facility yard’s surface and subbase materials to degrade. Ruts, potholes, and even pavement failure are often the result of instability in or failure of the base materials. These surface problems can require continual, costly maintenance and significant interruption of facility operations, as well as create loss of income from usable space.

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**THE STABLE SOLUTION**

Solve your unstable yard problems and put the marketability of your facility back on stable ground. Presto’s GEOWEB® load support system offers a cost-effective solution to yard stability problems that has high environmental benefit with low environmental impact.
case study 1
HIGH STEEL • STEEL FABRICATOR • LANCASTER, PENNSYLVANIA • 2002

THE CHALLENGE
Heavy traffic patterns and constant weight from single axle loads up to 150-tons caused severe rutting of the existing gravel pavement at the steel fabricator’s facility. The rutting led to costly maintenance problems for both the gravel pavement and machineries. The challenge was to design a low-maintenance pavement with a permeable surface to control surface rutting and storm water runoff as well as distribute heavy wheel loads.

THE RESULTS
The aggregate-filled GEOWEB® load support system was constructed with conventional equipment, materials and methods. Offering a more economical solution than concrete, the permeable pavement functions as a natural storm water retention system allowing collection of storm water in the aggregate’s voids and natural percolation. The stability created by the confined infill created an effective load support system that handles the repeated dynamic vertical pressures and lateral stresses of the heavy loads at this facility.

case study 2
DOLE FRESH FRUIT • CONTAINER FACILITY • PUERTO BARRIOS, GUATEMALA, CENTRAL AMERICA • 1997

THE CHALLENGE
The site planned for a new intermodal facility to service Dole’s container-handling equipment, materials and methods. Offering a more economical solution than concrete, the permeable pavement functions as a natural storm water retention system allowing collection of storm water in the aggregate’s voids and natural percolation. The stability created by the confined infill created an effective load support system that handles the repeated dynamic vertical pressures and lateral stresses of the heavy loads at this facility.

THE RESULTS
Installation of the load support structure began by placing a woven geotextile over 2.3 ft (700 mm) of a crushed aggregate subbase. Next, perforated GEOWEB® sections were placed and infilled with crushed stone. A rock-filled GEOWEB® system was also installed to protect the side slopes of the perimeter drainage ditch.

ECONOMIC BENEFITS OF THE GEOWEB SYSTEM
REDUCED COST OF INSTALLATION
• Reduces the overall depth of required structural fill by 50% or more.
• Eliminates the need for complicated structural elements and costly, time-consuming construction techniques.

REDUCED COST OF MAINTENANCE
• Minimizes vertical deflection and resulting surface rutting.
• Facilitates storm water runoff so harmful ponding will not weaken subbase materials.
• Distributes contact pressure from dynamic and static loadings.
• Controls differential settlement.

STABLE SURFACE FOR STORAGE AND TRAFFIC AREAS
• Allows higher stacking of containers.
• Reduces damage to trailers caused by unstable yard surfaces.

BENEFITS OF AGGREGATE-CONFINED GEOWEB® SYSTEM
Comparison testing shows significant benefits of confining aggregate in the GEOWEB® system vs. conventional unconfined aggregate:

• Increase in the Number of Load Cycles: The subgrade materials may withstand more than 12-15 times the number of load cycles applied before accumulating the same amount of permanent deflection.
• Increase in Shear Strength: Results of large-scale triaxial compression tests show that cellular confinement significantly increases the stiffness and strength of granular materials. The effect of confinement and increased shear strength can be equated to an "apparent cohesion" of 3,000-4,000 psi.

case study 3
SANTA FE RAILROAD • INTERMODAL FACILITY • HOUSTON, TEXAS • 1989

THE CHALLENGE
The Sante Fe Railroad intermodal yard was plagued with rutting, mud seepage and loss of grade despite repeated overlays with granular material. Soft expansive clay subgrade posed a considerable load support design challenge. Loads from yard tractors, forklifts and container-handling equipment overstressed the underlying native clay soil. Even loads imposed by parked trailers and container chassis caused excessive settlement resulting in surface drainage problems. Concerned with subsequent surface rutting and potential pavement failure, Santa Fe engineers implemented the GEOWEB® system, infilled with crushed, reclaimed concrete for a three-acre (1.21 hectares) portion of the yard.

THE RESULTS
The area stabilized with the GEOWEB® system was compared to the unrefined area. The stabilized area maintained its grade and showed no indication of rutting or mud seepage. The unrefined area sustained grade variances and significant rutting and mud seepage. Years after the installation, the GEOWEB®-stabilized area has retained its structural integrity and requires significantly less maintenance than unrefined areas.
**case study 1**

**HIGH STEEL • STEEL FABRICATOR • LANCASTER, PENNSYLVANIA • 2002**

**THE CHALLENGE**

Heavy traffic patterns and constant weight from single axle loads up to 150-tons caused severe rutting of the existing gravel pavement at the steel fabricator’s facility. The rutting led to costly maintenance problems for both the gravel pavement and machinery. The challenge was to design a low-maintenance pavement with a permeable surface to control surface rutting and storm water runoff as well as distribute heavy wheel loads.

**THE RESULTS**

The aggregate-filled GEOWEB® load support system was constructed with conventional equipment, materials and methods. Offering a more economical solution than concrete, the permeable pavement functions as a natural storm water retention system allowing collection of storm water in the aggregate’s voids and natural percolation. The stability created by the confined infill created an effective load support system that handles the repeated dynamic vertical pressures and lateral stresses of the heavy loads at this facility.

**case study 2**

**DOLE FRESH FRUIT • CONTAINER FACILITY • PUERTO BARRIOS, GUATEMALA, CENTRAL AMERICA • 1997**

**THE CHALLENGE**

The site planned for a new intermodal facility to service Dole’s expanding distribution operations consisted of poor soils and areas of standing water. The site was situated over a deep deposit of soft marine clay (CBR value of 1.5%) close to the ocean and 5 ft (1.6 m) above sea level. The yard would be required to support loads from 90 ton (100 metric ton) container lift equipment.

**THE RESULTS**

Installation of the load support structure began by placing a woven geotextile over 2.3 ft (700 mm) of a crushed aggregate subbase. Next, perforated GEOWEB® sections were placed and infilled with crushed stone. A rock-filled GEOWEB® system was also installed to protect the side slopes of the perimeter drainage ditch.

**case study 3**

**SANTA FE RAILROAD • INTERMODAL FACILITY • HOUSTON, TEXAS • 1999**

**THE CHALLENGE**

The Sante Fe Railroad intermodal yard was plagued with rutting, mud seepage and loss of grade despite repeated overlays with granular material. Soft expansive clay subgrade posed a considerable load support design challenge. Loads from yard tractors, forklifts and container-handling equipment overstressed the underlying native clay soil. Even loads imposed by parked trailer and container chassis caused excessive settlement resulting in surface drainage problems. Concerned with subsequent surface rutting and potential pavement failure, Santa Fe engineers implemented the GEOWEB® system, infilled with crushed, reclaimed concrete for a three-acre (1.21 hectares) portion of the yard.

**THE RESULTS**

The area stabilized with the GEOWEB® system was compared to the un reinforced area. The stabilized area maintained its grade and showed no indication of rutting or mud seepage. The un reinforced area sustained grade variances and significant rutting and mud seepage. Years after the installation, the GEOWEB®-stabilized area has retained its structural integrity and requires significantly less maintenance than unreinforced areas.

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**The GEOWEB® Load Support Solution**

Cellular confinement technology is a proven solution for heavy static and dynamic loads that are typical of intermodal and port operations. The benefits are most evident where weak or inconsistent subgrade materials are present.

**ECONOMIC BENEFITS OF THE GEOWEB SYSTEM**

**REDUCED COST OF INSTALLATION**

- Reduces the overall depth of required structural fill by 50% or more.
- Eliminates the need for complicated structural elements and costly, time-consuming construction techniques.

**REDUCED COST OF MAINTENANCE**

- Minimizes vertical deflection and resulting surface rutting.
- Facilitates storm water runoff so harmful ponding will not weaken subbase materials.
- Distributes contact pressure from dynamic and static loadings.
- Controls differential settlement.

**STABLE SURFACE FOR STORAGE AND TRAFFIC AREAS**

- Allows higher stacking of containers.
- Reduces damage to trailers caused by unstable yard surfaces.

**BENEFITS OF AGGREGATE-CONFINED GEOWEB® SYSTEM**

Comparison testing shows significant benefits of confining aggregate in the GEOWEB® system vs. conventional unconfined aggregate:

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- **Increase in Shear Strength:** Results of large-scale triaxial compression tests show that cellular confinement significantly increases the stiffness and strength of granular materials. The effect of confinement and increased shear strength can be equated to an “apparent cohesion” of 3,000-4,000 psf.

**THE GEOWEB® GRANULAR PAVEMENT SYSTEM**

Permatex’s GEOWEB® system significantly improves load distribution characteristics on paved and unpaved yards. The system’s cellular network creates an effective load support system that handles dynamic vertical pressures and lateral stresses.

A stable surface- and subgrade-support system makes economic sense for maintaining consistent and dependable operations while reducing long-term maintenance costs.

**PERFORMANCE BENEFITS OF THE GEOWEB® SYSTEM**

- Improves load distribution
- Reduces pressures on underlying weak soils.
- Minimizes bearing failure potential of underlying weak soils.

**THE GEOWEB®-stabilized area has retained its structural integrity and requires significantly less maintenance than unreinforced areas.**
case study 4

**JACKSONVILLE PORT AUTHORITY • BULK MATERIAL HANDLING FACILITY**

**JACKSONVILLE, FLORIDA • 1995**

**THE CHALLENGE**
The bulk material-handling site located adjacent to the deep-water channel in the Jacksonville seaport was plagued by mucky, unstable subgrade material. The site, a storage and transport facility for 80 ft. high cones of stockpiled crushed limestone used for road construction, needed to be stabilized before it could support heavy vehicle access.

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