### Key components

The complete GEOWEB® channel protection system may include one or all of the following:

- **GEOWEB® sections**
- **Call-out network**
- **Integral high-strength polymeric tendons**
- **ATRA® Anchor**
- **ATRA® Key Connection Device**
- **Turf Reinforcement Mats**
- **Geocomposite drainage materials**
- **Geosynthetic materials**

### comprehensive tools and services

Presto GEOSYSTEMS® and our distributors/representatives offer the most complete services in the industry to support project design and installation requirements.

**TOOLS:**

- Technical resources binder
- Engineering analysis/technical overviews
- SPECMAKER® specification development tool
- Project case studies
- Detailed construction instructions

**SERVICES:**

- Project Evaluation Services: We evaluate specific project needs and provide recommended preliminary designs for each project.
- Construction Services: Quick on-site field support specialists can be available for construction planning and start-up installation supervision.

### integral system components

The following components may be integrated to facilitate and expedite construction or to meet design requirements.

**TENDONS**

Tendons may be required and are available in various tendon strengths to meet design requirements:

- Provide additional stability against gravitational, hydrodynamic, and buoyancy forces.
- Particularly effective where high flows exist, or when a geomembrane underlayer or hard soil/rock prevents anchoring with stakes.
- Tendons and an ATRA® anchor arm provide additional anchoring in most sliding and uplift forces. (2)
- Specialized driving tools are available to significantly speed the driving of anchors.

**ATRA® KEY CONNECTION DEVICE**

For quick and easy connection of GEOWEB® sections, the exclusive ATRA® key device reduces contractor installation cost and provides three-times stronger connections. (4)

### ATRA® TENDON CLIP

The ATRA® tendon clip is an efficient hard load transfer device to transfer loads from the GEOWEB® wall to the tendon. Fully engaged clips allow easier passability. (2)

### DISTRIBUTED BY:

Presto GEOSYSTEMS® F.D. Box 2399 670 North Pinheiro Street Appleton, Wisconsin 54912-2399 USA
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- www.prestogeo.com

**Genuine GEOWEB® invented and made in the USA.**

**LEADING-EDGE INNOVATION**

Presto is the original developer of the cellular confinement technology and leads the industry in research and development resulting in meaningful product improvements, innovative features, advanced engineering methodologies, proven field results and ultimately long-term solutions to challenging problems.

Presto is committed to quality begins with manufacturing and continues through final installation.

- Quality management systems certified to: ISO 9001:2008 and CE Certification
- Sections manufactured from high-quality polyethylene provide consistent and maximum seawall strength.
- Materials engineered to established geosynthetic industry guidelines.
- Sections backed by a 10-year limited warranty.

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**GLOBAL LEADER • GLOBAL PARTNER**

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**PROFESSIONAL • EXPERIENCED • VALUABLE**

Presto has the most complete services in the industry to support project design and installation requirements.

**Creating sustainable environments®**

Presto has the most complete services in the industry to support project design and installation requirements.
the GEOWEB® system
LOW-COST CHANNEL PROTECTION SOLUTIONS

The Presto GEOWEB® system provides a wide variety of economical, flexible protection treatments for open channels and hydraulic structures. The system provides stability and protection of channels exposed to erosive conditions ranging from low-to-high flows, either intermittent or continuous.

- Greatly improves the hydraulic performance of conventional protection materials such as aggregate, rip-rap, and riprap/vegetation by confining them within the cellular structure.
- With concrete infill, produces a flexible slab for a long-lasting, amortized channel lining at a lower cost than conventional blocks.

GEOWEB® system benefits
- Cost-effective structure confines selected infill material to meet anticipated hydraulic flows and associated stresses.
- Supports vegetation in low-to-high intermittent flow channels.
- Allows the use of various aggregate in low-to-moderate flow channels, reducing construction costs.

infill options
A variety of infill materials can be used with the GEOWEB® system based upon the requirements of the specific project/problem.
- Topsoil with various selected vegetation.
- Aggregate of varying size and production.

TYPICAL APPLICATIONS:
- Scour and drainage ditches
- Storm water drainage or containment
- Process water channels or containment
- Rock or riprap check dams or drop structures
- Riffles or riffle areas
- Riprap or riprap/vegetation areas
- Silt curtains
- Intermittent or continuous flow by high-flow channels

APPLICATIONS:
- Culvert outfalls
- Process water channels or containment
- Riprap/vegetation areas
- Silt curtains
- Intermittent or continuous flow by high-flow channels

vegetated protection
Topsoil and vegetation within the GEOWEB® system is ideal for areas where low-to-high intermittent flows occur and can protect in high flow conditions when combined with turf reinforcement mats, or other components. Ideal in swales, ditches and storm flow zones of large channels.
- The GEOWEB® cell wall forms areas of check-dams extending throughout the channel protection system. Rip and fill development, produced when concentrated flow cuts into the soil, is controlled since flow is continuously redirected to the surface. In cases of possible concentrated or very high flows, a turf reinforcement mat may be recommended over the GEOWEB® sections to provide resistance against hydraulic forces up to 30 ft/s (9 m/sec).
- Concrete of various strengths and surface finishes.
- Confinement of the upper soil layer and protects channels from loss of soil particles.
- Underlying non-woven geotextiles and surface treatment of erosion control blankets or turf reinforcement mats may be optional components.
- Roots interlock through the perforated cell walls, reinforcing and anchoring the entire protection system.
- Confinement and anchorage of the root structure increases both the shear resistance and the permissible flow duration.

aggregate protection
Aggregate is a non-environmental option in low-to-moderate flow channels. Confined aggregate is more stable than unconfined, allowing it to perform in higher velocity flow conditions.
- May allow the use of more economical onsite material.
- Less costly and easier-to-place smaller aggregate can be used instead of larger rip-rap.
- Aggregate is ideal in and around areas where vegetation may not naturally develop.

STABILIZING VEGETATED TOPSOIL WITHIN THE GEOWEB® SYSTEM:
- Confines the upper soil layer and protects channels from hydraulic erosion forces.
- Reinforces topsoil and vegetation and increases its resistance to erosive forces, protecting the root zone from loss of soil particles.
- Underlying non-woven geotextiles and surface treatment of erosion control blankets or turf reinforcement mats may be optional components.
- Roots interlock through the perforated cell walls, reinforcing and anchoring the entire protection system.
- Confinement and anchorage of the root structure increases both the shear resistance and the permissible flow duration.

armoring: concrete protection
Found concrete provides hard, durable protection for channels exposed to severe hydraulic or mechanical stresses. More economical than most hard-armored systems, the GEOWEB® system prevents uncontrolled scouring of the concrete and reduces the potential of piping or undermining. Hydraulic stresses are relieved by incorporating underlying geocell mats and/or ground water outlet ports where needed. Critical velocities, Manning’s “n” and other hydraulic design parameters have been established for the GEOWEB® channel protection system.

SYSTEM BENEFITS WITH CONCRETE INFILL:
- More cost-effective than articulating concrete blocks.
- Reduces construction costs by eliminating the need for conventional structural forms. Installation is fast, efficient and flexible, and requires no heavy equipment to construct.
- Develops a flexible slab that conforms to minor substrate movements.
- Controls concrete quantities and costs with a uniform system-defined cell depth.
- Accommodates the concrete quality, surface finish and thickness to meet specific design needs.

multi-layered protection
Stacked GEOWEB® sections along channel side slopes with vegetative over-cell infill offers a natural appearance and the ability to withstand higher flows for short durations. This configuration can tolerate measurable differential settlement without loss of system integrity, and provides a steeper profile, reducing unwanted consumption of valuable land.

- Colored face panels add natural aesthetically to the system to blend with the environment.
- GEOWEB® sections can be wrapped with coir fabric to reduce potential for soil loss in the outer sides, while vegetation is being established.
- A concrete or gravel infill can be applied in areas of anticipated high energy water impact, or combination of infills can be used to accommodate various flow rates.

A multi-layered protection system can be used. A layer of GEOWEB® channels can be used along channel sides with vegetative over-cell infill. A turfed reinforcement mat may be recommended over the GEOWEB® sections to provide resistance against hydraulic forces up to 30 ft/s (9 m/sec).
the GEOWEB® system
LOW-COST CHANNEL PROTECTION SOLUTIONS

The Presto GEOWEB® system provides a wide range of economical, flexible protection treatments for open channels and hydraulic structures. The system provides stability and protection of channels exposed to severe conditions ranging from low-to-high flows, either intermittent or continuous.

• Can be designed for specific site conditions based upon compatibility with local environmental, ecological and aesthetic requirements, maximum anticipated flow conditions, and associated hydraulic stresses.

• Provides protection to geomembrane-lined channels and containment systems.

• With concrete infill, provides flexible, inexpensive hydraulic protection against severe high flow conditions, wave action and associated stresses.

• Surface roughness and hydraulic efficiency of the lining surface can be changed to control flow.

GEOWEB® system benefits

• Cost-effective structure confines selected infill material to meet anticipated hydraulic flows and associated stresses.

• Supports vegetation in low-to-intermittent flow channels.

• Allows the use of on-site aggregates in low-to-moderate flow channels, reducing construction costs.

• Aggregate is ideal in arid areas where vegetation may not naturally develop.

Infill options

A variety of infill materials can be used with the GEOWEB® system based upon the requirements of the specific project/problem.

• Topsoil with various selected vegetation.

• Aggregate of various size and production.

• Can be designed for specific site conditions based upon compatibility with local environmental, ecological and aesthetic requirements, maximum anticipated flow conditions, and associated hydraulic stresses.

• Provides protection to geomembrane-lined channels and containment systems.

• With concrete infill, provides flexible, inexpensive hydraulic protection against severe high flow conditions, wave action and associated stresses.

• Surface roughness and hydraulic efficiency of the lining surface can be changed to control flow.

vegetated protection

Topsoil and vegetation within the GEOWEB® system is ideal for areas where low-to-high intermittent flows occur and can protect in high flow conditions when combined with turf reinforcement mats, or other components. Ideal for swales, ditches and storm flow zones of large channels. The GEOWEB® cell walls form a series of check-dams extending through the channel protection system. Rill and gully development, produced when concentrated flow cuts into the soil, is controlled when flow is continuously redirected to the surface. In cases of possible concentrated or very high flow, a turf reinforcement mat may be recommended over the GEOWEB® to provide resistance against hydraulic forces up to 20 ft/s (6 m/sec).

Concrete is an economical natural option in low-to-moderate flow channels.

• May allow the use of more economical on-site material.

• Less costly and easier-to-place small aggregate can be used instead of larger rip-rap.

• Aggregate is ideal in dry areas where vegetation may not naturally develop.

armoring: concrete protection

Poured concrete provides hard, durable protection for channels exposed to severe hydraulic or mechanical stresses. More economical than most hard-armored systems, the GEOWEB® system prevents uncontrolled cracking of the concrete and reduces the potential of piping or undermining. Hydraulic pressures are relaxed by incorporating underlying geotextiles and/or ground water outlet ports where needed. Critical velocities, Manning’s “n” and other hydraulic design parameters have been established for the GEOWEB® channel protection system.

SYSTEM BENEFITS WITH CONCRETE INFILL:

• More cost-effective than articulating concrete block systems.

• Reduces construction costs by eliminating the need for conventional structural forms. Installation is fast, efficient and flexible, and requires no heavy equipment to construct.

• Deforms a flexible slab that conforms to minor subgrade movement.

• Controls concrete quantity and costs with a uniform system-defined cell depth.

• Accommodates the concrete quality, surface finish and thickness to meet specific design needs.

multi-layered protection

Stacked GEOWEB® sections along channel side slopes with vegetative covers still offers a natural appearance and the ability to withstand higher flows for short durations. This configuration can tolerate reasonable sedimentation without loss of system integrity, and provides a steeper profile, reducing unwanted consumption of valuable land.

Colored face panels add natural aesthetics to the system to blend with the environment.

• GEOWEB® sections can be wrapped with corrugated fabric to reduce potential for soil loss in the outer facia cells while vegetation is being established.

• A concrete grout or infill can be applied in areas of anticipated high energy water impact, or combination of infills can be used to accommodate various flow rates.

TYPICAL APPLICATIONS:

• Exposed and drainage ditches

• Storm water diversion or containment

• Process water channels or containment

• Cell Infill/Cell Dividers/Channel structures

• Seawall

• Intermittent or continuous/low to high flow channels

spring flow channels or containment

• Supports vegetation in low-to-intermittent flow channels.

• Allows the use of on-site aggregates in low-to-moderate flow channels, reducing construction costs.

• Aggregate is ideal in dry areas where vegetation may not naturally develop.

AGGREGATE PROTECTION

Aggregate is an economical natural option in low-to-moderate flow channels. Confined aggregate is more stable than unconfined, allowing it to be used in higher velocity flow conditions.

• May allow the use of more economical on-site material.

• Less costly and easier-to-place small aggregate can be used instead of larger rip-rap.

• Aggregate is ideal in dry areas where vegetation may not naturally develop.

STABILIZING VEGETATED TOPSOIL WITHIN THE GEOWEB® SYSTEM:

• Controls the upper soil layer and protects channels from hydrological erosion forces.

• Reinforces topsoil and vegetation and increases its resistance to erosion forces, protecting the rootzone from loss of soil particles.

• Underlying non-woven geotextiles and surface treatment erosion control blankets or turf reinforcement mats may be system components.

• Roots interlock through the perforated cell walls, reinforcing and anchoring the entire protection system.

• Confinement and anchorage of the root structure increases both the shear resistance and the permeable flow duration.
The GEOWEB® system provides a wide variety of economical, flexible protection treatments for open channels and hydraulic structures. The system provides stability and protection of channels exposed to severe hydraulic or mechanical stresses. More economical than most hardened annular systems, the GEOWEB® system prevents uncontrolled cracking of the concrete and reduces the potential of piping or undermining. Hydrostatic pressures are relayed by incompressible stabilizing geotextiles and/ or ground water outlet ports where needed. Critical velocities, Manning’s “n” and other hydraulic design parameters have been established for the GEOWEB® channel protection system.

**System Benefits with Concrete Infill:**
- More cost-effective than articulating concrete block systems.
- Reduces construction costs by eliminating the need for conventional structural forms. Installation is fast, efficient and flexible, and requires no heavy equipment to construct.
- Develops a flexible slab that conforms to minor subsurface movement.
- Controls concrete quantities and costs with a uniform system-defined cell depth.
- Accommodates the concrete quality, surface finish and thickness to meet specific design needs.

**Multi-Layered Protection:**
Stacked GEOWEB® sections along channel side slopes with vegetative over-cell infill offers a natural appearance and the ability to withstand higher flows for short durations. This configuration can tolerate reasonable differential settlement without loss of system integrity, and provides a steeper profile, reducing unwanted consumption of valuable land.

**Concrete Face Protection:**
A concrete face provides added natural aesthetics to the system to blend with the environment.
**GEOWEB® Sections can be wrapped with geotextile to reduce potential for soil loss in the outer face cells while vegetation is being established.
- A concrete gravel or soil infill can be applied in areas of anticipated high energy water impact, or combination of infills can be used to accommodate various flow rates.

**Aggregate Protection:**
Aggregate is an economical natural option in low to moderate flow channels. Confined aggregate is more stable than unconfined, allowing it use in higher velocity flow conditions. This can reduce the use of more expensive concrete material.
- Less costly and easier-to-place small aggregate can be used instead of larger rip-rap.
- Aggregate is ideal in sin areas where vegetation may not naturally develop.

**Vegetated Protection:**
Topsoil and vegetation within the GEOWEB® system is ideal for areas where flow to high intermittent flows occur and can protect in flow conditions when combined with turf reinforcement mats, or other components. Ideal for swales, ditches and storm flow zones of large flows.
- The GEOWEB® cell wall forms a series of check dams extending within the channel protection system. Rill and gully development, produced when concentrated flow cuts into the soil, is controlled since flow is continuously redirected to the surface. In cases of possible concentrated or very high flows, a turf reinforcement mat may be recommended over the GEOWEB® to provide protection against hydraulic forces up to 30 ft/s (9 m/sec).
- Concrete of various strengths and surface finishes.
- Combinations of the above to meet special conditions.

**Aggregate Infill Options:**
A variety of infill materials can be used with the GEOWEB® system based upon the requirements of the specific project/problem.
- Topsoil with various selected vegetation.
- Aggregate of varying size and production.

**Typical Applications:**
- Evade and drainage ditches
- Storm water drainage or containment
- Process water channels or containment
- Canal/irrigation channel/ditch/ship structures
- Heap/kip/fill
- Intermittent or continuous/low to high flow channels

**Sizing and Selection:**
- Can be designed for specific site conditions based upon compatibility with local environments, ecological and aesthetic requirements, maximum anticipated flow conditions, and associated hydraulic stresses.
- Surface roughness and hydraulic efficiency of the lining system can be changed to control flow.
- Can be designed for specific site conditions based upon compatibility with local environments, ecological and aesthetic requirements, maximum anticipated flow conditions, and associated hydraulic stresses.
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**GEOWEB® System Benefits:**
- Cost-effective structure confines selected fill materials in most anticipated hydraulic flows and associated stresses.
- Supports vegetation in low-to-moderate intermittent flow channels.
- Allows the use of on-site aggregates in low-to-moderate flow channels, reducing construction costs.
- Provides protection to geomembrane-lined channels and containment systems.
- With concrete infill, provides flexible, inexpensive hard-armored protection against severe high flow conditions, wave action and associated stresses.
- Greatly improves the hydraulic performance of conventional flows, either intermittent or continuous.
- With concrete infill, produces a flexible slab for a long-lasting armored channel living a lower cost than articulating block systems.
- Topsoil with various selected vegetation.
- Aggregate of varying size and production.

**Aggregate Protection:**
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**Infill Options:**
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- Topsoil with various selected vegetation.
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**In situ Protection:**
A variety of in situ protection treatments can be used with the GEOWEB® system.
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**ATRA® ANCHORS**

Presto’s ATRA® Anchors provide time and material cost savings during installation of the GEOWEB® system.

1. The ATRA® Anchor is an efficient load transfer device to transfer loads from the GEOWEB® cell wall to the tendon. Fully engaged clips allow easier passability. (2)

2. ATRA® Anchor with Tendons

3. ATRA® Section Clip

4. ATRA® Section Clip

**ATRA® KEY CONNECTION DEVICE**

For quick and easy connection of GEOWEB® sections, the exclusive ATRA® key device reduces contractor installation cost and provides three-times stronger connections. (4)

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**PRESTO GEOSYSTEMS® COMMITMENT**

To provide the highest quality products and solutions.

Presto GEOSYSTEMS® is committed to helping you apply the best solutions to your soil stabilization problems. Our solution-focused approach to solving problems adds value to every project. Rely on the leaders in the industry when you need a solution that is right for your application. Contact Presto GEOSYSTEMS® or our worldwide network of knowledgeable distributors for assistance.

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**PRESTO GEOSYSTEMS®**

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Printed in the U.S.A. 2013

**AP-5045 R3**

**GLOBAL LEADER • GLOBAL PARTNER**

**MADE IN THE USA**

eco-economic solutions for channel protection

creating sustainable environments®

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**Key components**

The complete GEOWEB® channel protection system may include some or all of the following:

- **GEOWEB® sections**
- **Call-out network**
- **Integral high-strength polyethylene tendons**
- **ATRA® Clamps/anchors**
- **ATRA® Key Connection Device**

**ATRA® KEY CONNECTION DEVICE**

For quick and easy connection of GEOWEB® sections, the exclusive ATRA® key device reduces contractor installation cost and provides three-times stronger connections. (4)

**ATRA® TENDON CLIP**

The ATRA® "tendon clip" is an efficient load transfer device to transfer loads from the GEOWEB® cell wall to the tendon. Fully engaged clips allow easier passability. (2)

**Integral system components**

The following components may be integrated to facilitate and expedite construction or to meet design requirements.

- **Geocomposite drainage materials**
- **Geomembrane**
- **Turf Reinforcement Mats**
- **Geotextiles**
- **Erosion Control Blankets**
- **Turf Reinforcement Mats**
- **Geocomposite drainage materials**
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**DISTRIBUTED BY:**

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