**Key components**

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

- **GEOWEB® sections**
- **Call 119 trenchless**
- **Integral high-strength, polymeric tendons**
- **ATRA® Clip-Attachments**
- **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® anchors**

Presto’s ATRA® Anchors provide time and material cost savings during installation of the GEOWEB® system. (1)

1. Power to drive from 4-9 anchors/stakes, significantly improves installation productivity.
2. ATRA® anchors are built to the highest standards.
3. Specialized anchoring products are available to significantly speed the driving of anchors.

**ATRA® restraint clip**

The ATRA® Clip tension load transfer machines when connected to tendons at specific load transfer points. (3)

**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/CD
- Engineering analysis/technical services
- Online SPECSHEET® specification development tool
- Project case studies
- Detailed construction instructions

**SERVICES:**

- Project Evaluation Service: We analyze specific project needs and provide recommended preliminary designs for each project.
- Construction Services: Qualified on-site field support personnel can be available for construction training, and start-up installation supervision.

**UNPARALLELED QUALITY**

Presto’s commitment to quality begins with manufacturing and continues through final installation.

- Quality management systems certified to ISO 9001:2008 and C1 Certification
- Sections manufactured from high quality polyethylene provide consistent and maximum seam weld strength.
- Materials engineered to established geotechnical industry guidelines.
- Sections backed by a 10-year limited warranty.

**distributed by:**

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Appleton, Wisconsin 54912-2399, USA

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**integrated 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, hydrostatic, and buoyancy forces.
- Particularly effective where high flows exist, or when a geosynthetic underlay or base soil/strata prevents anchoring with stakes.

**ATRA® anchors**

Presto’s ATRA® Anchors provide time and material cost savings during installation of the GEOWEB® system. (1)

1. Faster to drive than a fishhook stake, significantly improves installation productivity.
2. Tendons and an ATRA® Anchor array provide additional anchoring in most slanting and/or split flows. (2)
3. Specialized anchoring tools are available to significantly speed the driving of anchors.

**ATRA® restraint clip**

The ATRA® Clip tension load transfer machinery when connected to tendons at specific load transfer points. (3)
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 subjected to erosion conditions ranging from low-to-high flow, either intermittent or continuous.

- • 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.

GEOWEB® system benefits
- Cost-effective structure confines selected fill material to meet anticipated hydraulic flows and associated stresses.
- Supports vegetation in low-to-intermediate flow channels.
- Allows the use of native aggregates in low-to-moderate flow channels, reducing construction costs.
- Topsoil and vegetation within the GEOWEB® system provides a wide variety of hydrological and aesthetic benefits with little to no change in construction time.
- Aggregate is an economical natural option in low-to-moderate flow channels, reducing construction costs.
- Aggregate is an economical natural option in low-to-moderate flow channels, reducing construction costs.
- Aggregate is an economical natural option in low-to-moderate flow channels, reducing construction costs.
- Aggregate is an economical natural option 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:
- sediment and drainage ditches
- storm water drainage or containment
- process water channels or containment
- spillway/drainage channels/drain structures
- outfall/entry
- intermittent or continuous flow by high flow channels

vegetated protection
Treated soil or vegetation within the GEOWEB® system is ideal for areas where low to high intermittent flows occur and can protect in low flow conditions when combined with turf reinforcement mats, or other components. Ideal for sewers, ditches and short flow zones of large flows. The GEOWEB® cell walls form a series of check dams extending throughout 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 on very high flows, a turf reinforcement mat may be recommended over the GEOWEB® system to provide resistance against hydraulic forces up to 30 ft/s (9 m/s).

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

- May allow the use of more economical concrete material
- Less-costly and easier-to-place small aggregate can be used instead of larger rip-rap.
- Aggregate is ideal in and areas where vegetation may not easily develop.

STABILIZING VEGETATED TOPOGRAPHY WITHIN THE GEOWEB® SYSTEM:
- Conforms the upper soil layer and protects channels from hydrological erosion forces.
- Reduces topsoil and vegetation and increases its resistance to erosion forces, protecting the root zone from loss of soil particles.
- Underlying non-woven geotextiles and surface treatment erosion control blankets or turf reinforcement mats may be system components.
- Routes runoff 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
Presto concrete provides hard, durable protection for channels exposed to severe hydraulic or mechanical stresses. More economic than most hard-annodized systems, the GEOWEB® system prevents uncontrolled erosion of the concrete and reduces the potential of piping or undermining. Hydrostatic pressures are relieved by incorporating underlying geotextiles and/or ground water outlet works where needed. Critical velocities, Manning’s “n” and other hydraulic design parameters have been established for the GEOWEB® channel protection system.

SYNOPSIS 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 subgrade movement.
- Controls concrete quantities and costs with an 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 or concrete infill offer a coalesced 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.

Confined face provides additional aesthetics 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 face cells while vegetation is being established.
- A concrete grate or will can be applied to areas of anticipated high water weight impact, or combination of both can be used to accommodate various flow rates.
the GEOWEB® system
LOW-COST CHANNEL PROTECTION SOLUTIONS

The 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 erosive conditions ranging from low-to-high flow, direct impact or continuous:

• Greatly improves the hydraulic performance of conventional protection materials such as rip-rap and topsoil/vegetation by confining them within the cellular structure.
• With concrete still, produces a flexible slab for a long-lasting armored channel living a lower cost than articulating block systems.
• 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.

GEOWEB® system benefits

• Cost-effective structure confines selected still material to meet anticipated hydraulic flows and associated stresses.
• Supports vegetation in low-to-intermediate flow channels.
• Allows the use of on-site aggregates in low-to-moderate flow channels, reducing construction costs.
• Provides protection to geoweb-reinforced channels and containment systems.
• With concrete still, provides flexible, reconfigurable hard-armored protection against severe high-flow conditions, wave action and associated stresses.
• Concrete of various strengths and surface finishes.
• Combinations of the above to meet special conditions.

VEGETATED PROTECTION

Treated soil 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 ditches, ditches and storm flow zones of large channels that the GEOWEB® cell wall is a source of check dams extending throughout the channel protection system. Nutrient and self-seeding, 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 flows, a turf reinforcement mat must be recommend followed by the GEOWEB® system. to provide resistance against hydraulic forces up to 173 kPa (4 ft-c.)

Vegetated protection

• Provides protection to geoweb-reinforced channels and containment systems.
• With concrete still, provides flexible, reconfigurable hard-armored protection against severe high-flow conditions, wave action and associated stresses.
• Concrete of various strengths and surface finishes.
• Combinations of the above to meet special conditions.

INFILL OPTIONS

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

• Topsoil with various selected vegetation.
• Aggregate of various size and production.

TYPICAL APPLICATIONS:

• Evaporative and drainage ditches
• Storm water drainage or containment
• Process water channels or containment
• Cell confinement channels or slope structures
• Surficial fill
• Intermittent or continuous flow high flow channels

For more information on the GEOWEB® system, please contact your local sales representative or visit www.geosyntheticsoil.com

VEGETATION

Roots and vegetation grow between the GEOWEB® cells to provide a natural, biologically complex protective lining system. The natural surface movement of vegetation increases root growth, helping stabilize the structure. The vertical profiles of the GEOWEB® cell walls are low enough to allow vegetation to grow between cells. The surface roughness and hydraulic efficiency of the lining system can be changed to control flow.

REINFORCED INFILL

Infills reinforce the entire GEOWEB® system (the lower channel section is protected by vegetation). Reinforced infills can be used in combination with vegetation to extend the protective system of the GEOWEB® system and protect the underlying system. Infill options can be included to protect the GEOWEB® system from undermining.

CONCRETE STABILITY

Infills can be used to increase the structural stability of the GEOWEB® system. Concrete infills can be used to: (1) prevent undermining; (2) prevent erosion; and (3) increase the overall stability of the GEOWEB® system. Concrete infills can be used in combination with vegetation to protect the GEOWEB® system from undermining.

MULTI-LAYERS REINFORCED INFILL

Multi-layered infills can be used to increase the structural stability of the GEOWEB® system. Multi-layered infills can be used to: (1) prevent undermining; (2) prevent erosion; and (3) increase the overall stability of the GEOWEB® system. Multi-layered infills can be used in combination with vegetation to protect the GEOWEB® system from undermining.
the GEOWEB® system
LOW-COST CHANNEL PROTECTION SOLUTIONS

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 erosive conditions ranging from low-to-high flow, either intermittent or continuous.

• Greatly improves the hydraulic performance of conventional protection materials such as aggregates, rip-rap, and riprap/vegetation by confining them within the cellular structure.
• With concrete still, produces a flexible slab for a long-lasting encased channel living a lower cost than articulating block systems.
• 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.

GEOWEB® system benefits

• Cost-effective structure confines selected still to meet anticipated hydraulic flow and associated stresses.
• Supports vegetation in low-to-intermediate flow channels.
• Allows the use of on-site aggregates in low-to-moderate flow channels, reducing construction costs.
• Selects various sizing and production.

infill options

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

• Aggregate of varying size and production.

vegetated protection

Topped and vegetated within the GEOWEB® system is ideal for areas where low to high intermittent flows occur and can protect in flow conditions when combined with soft reinforcement mats, or other components ideal for washes, ditches and short flow zones of large flows. The GEOWEB® cell wall form areas of check-dams extending through the channel protection system. Rip and roll design, 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 flows, a soft reinforcement mat should be incorporated over the GEOWEB® section to provide resistance against hydraulic forces up to 30 ft/s (9 m/s).

TYPICAL APPLICATIONS:

• Saturate and drain ditches
• Storm water drainage or containment
• Process water channels or containment
• Cell protection (stabilize slope) structures
• Silt outfall
• Intermittent or continuous low by high flow channels

aggregate protection

Aggregate is an economical natural option in low-to-moderate flow channels. Conformed aggregate is more stable than unconfined, allowing use in higher velocity flow channels.

• May allow the use of more economical onsite material
• Less-costly and easier-to-place small aggregate can be used instead of larger rip-rap.
• Aggregate is ideal in and areas where vegetation may not naturally develop.

STABILIZING VEGETATED TOPOLOGY WITHIN THE GEOWEB® SYSTEM:

• Conforms the upper soil layer and protects channels from hydrological erosion forces.
• Reduces topsoil and vegetation and increases its resistance to erosion forces, protecting the root zone 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 performed cell walls, reinforcing and anchoring the entire protection system.
• Conformal seal anchorage of the root structure increases both the channel resistance and the permeable flow duration.

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. Hydrostatic pressures are relieved by incorporating underlying geotextiles and/or ground water outlet pipes 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, non-silt infills or vegetation. Non-silt infills allow for natural drainage to lower flows for short duration. This configuration can tolerate reasonable differential settlement without loss of system integrity, and provides a steeper profile, reducing unwanted consumption of valuable land. Erosion rates are significantly reduced due to attenuation and inertial damping at the soil cell surface while vegetation is being established. A concrete base or silt infill can be applied in areas of anticipated high energy water impact, or combination of both can be used to accommodate various flow rates.
**integrated system components**

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

- **TENDONS**
  - Tendons may be required to be used in various tendon strengths to meet design requirements.
  - **Provide additional stability against gravitational, hydrostatic, and buoyancy forces.**
  - **Particularly effective where high flows exist, or when a geogrids undesirable or hard substrates present, anchoring with stakes.**

**ATRA® ANCHORS**

Presto’s ATRA® Anchors provide two and material cost savings during installation of the GEOWEB® system. (1)

- **Faster to drive than a J-hook stake, significantly improves installation productivity.**
- **Tendons and an ATRA® Anchor array provide additional anchoring in most driving and/or uplift soils.**

- **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® RESTRAINT CLIP**

The ATRA® Clip tensioning load-transfer mechanisms when connected to tendons at specific load-transfer points. (3)
The complete GEOWEB® channel protection system may include one or all of the following:

• GEOWEB® sections
• Geotextiles
• Integral high-strength polymeric tendons
• ATV® Clamps/Clips
• ATV® Key Connection Device
• Surfacing components
• Geocomposite drainage materials
• Geonembrane

The tendons are steel or high-performance polyethylene tendons, connected to tendons at specific load-transfer points. (3)

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 geosynthetic underdrain or hard soil/bulkheads preclude anchoring with staking.

ATRA® ANCHORS

Presto’s ATRA® Anchors provide time and material cost savings during installation of the GEOWEB® system. (1)

• Faster to drive than J-hook staking, significantly improves installation productivity.
• Tendons and/or ATRA® Anchor array provide additional anchoring in most sliding and/or 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)

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