ARIAN KHAK
Iranian

SOIL STABILIZATION

Ariancell

channel protection

OVERVIEW

THE Ariancell SYSTEM

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

Ariancell System Benefits

- Confinement in the **Ariancell** cellular structure greatly improves the hydraulic performance of conventional protection materials such as topsoil/ vegetation, aggregate and concrete.
- Supports vegetation in intermittent flow channels.
- Local aggregates may be used in low-to-moderate flow channels, instead of larger rip-rap.
- With concrete infill, creates a flexible, long-lasting, and lower cost armored channel lining system than reinforced or articulated concrete block systems.
- Provides protection to geomembrane-lined channels and containment systems.

Typical Applications

- Swales and drainage ditches
- Stormwater diversion & containment
- Process water channels and containment
- Spillways and down chutes
- Culvert outfalls and headwalls

DESIGN OPTIONS

Ariancell Infill Options

Ariancell channels may be designed with a variety of infill materials to meet aesthetic requirements and to resist anticipated hydraulic flows and associated stresses.

1 VEGETATED CHANNELS - SINGLE LAYER

2 VEGETATED CHANNELS: MULTI-LAYER

3 AGGREGATE CHANNELS

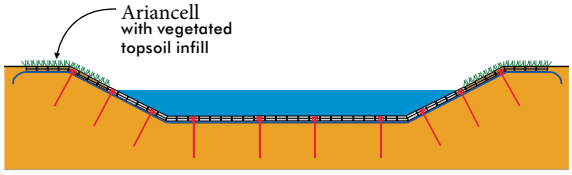
4 HARD-ARMORED CONCRETE CHANNELS

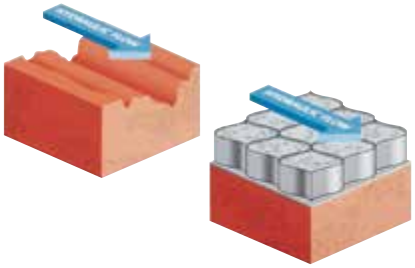
DESIGN OPTION

1 Vegetated Channels - Single-Layer

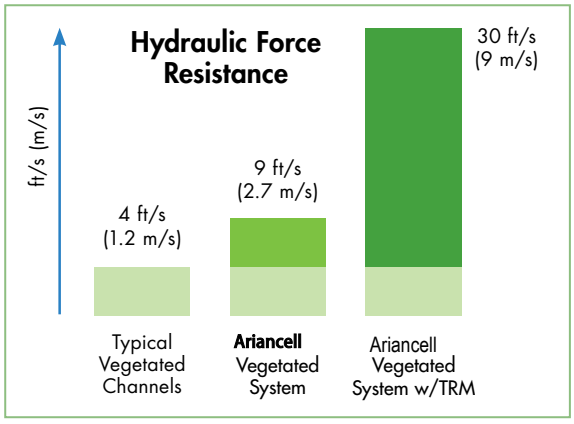
GREEN-ENGINEERED CHANNEL LINING SYSTEMS

Ariancell Vegetated Channels offer protection in continuous low-flow channels, as well as high-flow intermittent channels, allowing lower-maintenance, aesthetically pleasing vegetation in place of rip-rap.





The 3D cellular network creates check-dams that protect the upper soil layer from hydrological erosive forces and resulting erosion that impacts unconfined soils.



With an overlying Turf Reinforcement Mat (TRM), the vegetated Ariancell system can withstand velocities as high as 30 ft/s (9 m/s) and 16 psf shear stresses. The Ariancell channel system doubles performance resistance to shear stress and velocity for TRMs and Erosion Control Blankets (ECBs).

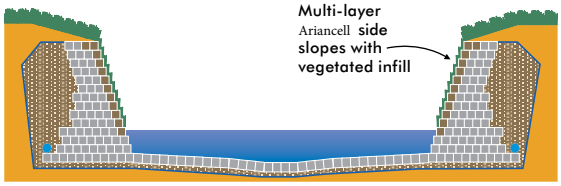
IDEAL APPLICATIONS: Drainage ditches, swales and stormwater channels.

DESIGN OPTION

2 Vegetated Channels - Multi-Layer

NATURAL ALTERNATIVE TO WIRE-FRAMED GABION BASKETS

Ariancell Multi-Layered Channels can withstand higher flows for short durations, allowing naturally vegetated channels to be designed in place of hard armoring (gabions or concrete). Ariancell multi-layered channels tolerate reasonable differential settlement without loss of integrity so they perform well in soft-soil environments.



- Green and tan fascia panel options allow natural blending with the environment.
- Under extreme flows, the system with wrapped-coir fabric offers higher resistance and reduces potential for soil loss.
- With concrete or grout infill (outer cells only), provides greater resistance to highest flows and shear stresses.

IDEAL APPLICATIONS:
Drainage ditches, swales and stormwater channels.

Ariancell Channels Compared to Gabions	 Aesthetics	 Infill Material	 Design Flexibility	 Handling/Equipment/Placement
Ariancell Vegetated Multi-Layered Channels	✓ Creates a natural living green wall. Allows select vegetation type.	✓ Backfill and infill materials can be sourced locally. Allows smaller, less expensive rock in back cells and reinforced zone.	✓ Highly adaptable to varying infill types, landscape contours, curves and obstructions.	✓ No heavy equipment required. Lightweight sections easy to transport, deploy and install, even in difficult-to-access locations.
Gabions	Will always be visible. Collects garbage, weeds, debris. Wire becomes damaged; degrades over time.	Larger rip-rap must be used. More expensive to source and transport. Hard to place.	Large stones with limited design flexibility. Does not conform well to slopes and curves.	Require large equipment to install. Setting baskets may require a crane. Placement challenging in difficult-to-access locations.

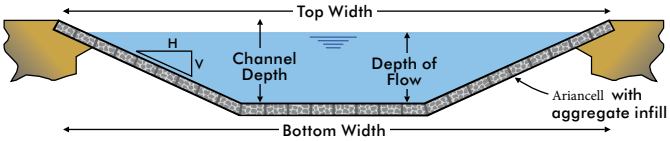
DESIGN OPTION

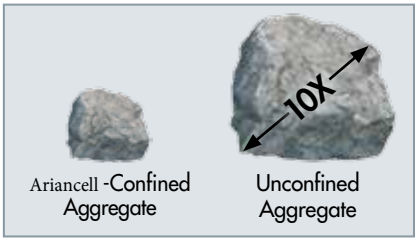
3

Aggregate Channels

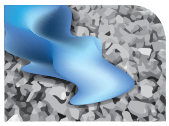
AGGREGATE/RIP-RAP FOR LOW- TO MODERATE-FLOW CHANNELS

Ariancell Aggregate Channels are designed for low-to-moderate flow conditions. Aggregate confined in the Ariancell 3D structure is far more stable than when unconfined.
As a result, smaller, less expensive aggregate can be used instead of large, difficult-to-place rip-rap. Ariancell confinement **reduces the rock size up to 10 times** while still delivering the same protection.





Performance backed by Colorado State University Testing. Ariankhak incorporates research-based thresholds in their design modeling and evaluation tools.

Ariancell Aggregate Channels Compared to RIP-RAP	 Aggregate Size	 Locally Available Rock	 Flow Resistance	 Equipment & Worker Safety
Ariancell Aggregate Channels	✓ Confinement allows less costly, smaller aggregate (up to 10 times) for the same protection.	✓ Allows lower-cost, locally available aggregate. Waste rock may also be used.	✓ Confined aggregate is more stable, allowing use in higher velocity flow conditions.	✓ Smaller aggregate is faster, safer to place with small equipment.
Unconfined Aggregate Channels	Larger rip-rap must be used, which is more expensive and harder to place.	Rock size must be larger for the same protection. Larger rock is not as readily available.	Unconfined rock has a lower flow resistance, resulting in the need for larger, more expensive rock.	✓ Placement of large rock may require specialized lifting equipment and is not as safe for workers.

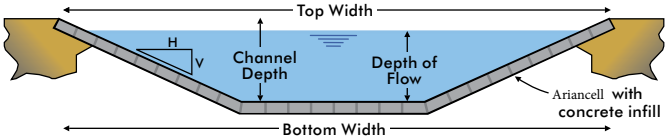
DESIGN OPTION

4 Hard-Armored Concrete Channels

PORTLAND CEMENT CONCRETE FOR CHANNELS WITH HIGH HYDRAULIC STRESSES

Ariancell Concrete Channels are a poured-in-place, hard-armored solution for channels exposed to severe velocities and hydraulic stresses. The system becomes a flexible slab that conforms to minor subgrade movement and is more economical than pre-formed concrete systems or Articulated Concrete Blocks (ACBs).

Ariancell concrete channels are proven* to withstand sustained flow velocities in excess of 36 ft/s (11 m/s)



and shear stresses of 20.9 psf (1.0 kPa). The cellular confinement technology creates a flexible mat of concrete reinforced by the Ariancell interconnected high density polyethylene structure. The Ariancell system acts as a construction form to allow even steep slopes to be constructed using ordinary concrete slump. The system regulates concrete depth, assuring consistent adherence to design specifications. Ariancell channels can be designed to withstand higher velocities and shear stresses with proper cell depth and anchorage.

*Results from research at Colorado State University.

DESIGN MODELS: Critical velocities, Manning's "n" and other hydraulic design parameters have been established for Ariancell channels and are incorporated in Presto's proprietary design modeling tools.

Concrete Channel System Comparisons	 Concrete Slump	 Forms & Reinforcement	 Uniform Concrete Depth	 Heavy Equipment & Worker Safety
Ariancell Channels	✓ Easier-to-pour higher slump concrete can be used, even on steeper channel embankments due to confinement.	✓ No forms or reinforcement required. Installation is fast, efficient and flexible.	✓ The cell wall height assures defined, consistent concrete depth. Allows a thinner cross section.	✓ No heavy-lifting equipment is required. Installation is safe for workers.
Reinforced Concrete	Low slump required especially on steeper channel embankments.	Reinforcement required.	Over pours and short pours are common.	✓ No heavy-lifting equipment required.
Articulated Concrete Block (ACB)	Concrete ACBs are manufactured offsite and transported after curing.	Cable reinforcement required. Requires heavy-lifting equipment to place.	✓ ACB matresses are a consistent depth.	Heavy equipment is required. Worker injury is more likely.

DESIGN CRITERIA

Channel protection details are influenced by the embankment and bed slope length and angle, flow depth and velocity and shear stress. **Presto's free project evaluation service** can help determine suitable cell size and depth for your project.

KEY COMPONENTS

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

TYPICAL COMPONENTS

- Ariancell sections
- Cell infill materials
- Geotextile separation layer
- Ariankhak Key connection device

OPTIONAL COMPONENTS

- Ariankhak Anchors & Speed Stakes
- Polymeric tendons
- Ariankhak Tendon Clips
- Geomembrane

INTEGRAL SYSTEM ACCESSORIES

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

1 Ariankhak KEY CONNECTION DEVICE

For quick and easy connection of Ariancell sections, exclusive Ariankhak keys significantly reduce contractor installation time and provide a 3X stronger connection of Ariancell sections.

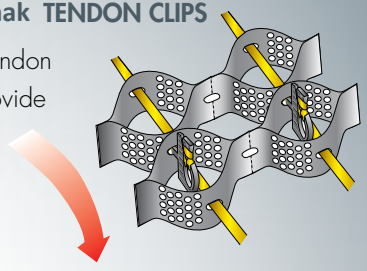
2 Ariankhak ANCHORS

Ariankhak Anchors may be part of the Ariancell channel design solution for internal and crest anchoring.

- Easier to drive than J-hook stakes for faster installation.
- With tendons, provide additional resistance to sliding and/or uplift forces.
- Ariankhak driving tool speeds installation of Ariankhak anchors.

3 TENDONS & Ariankhak TENDON CLIPS

Tendons and Ariankhak Tendon Clips work together to provide a load transfer and suspension system over the Ariancell system.



TENDONS

Tendons in various tensile strengths are available to meet design requirements:

- Suspend Ariancell material over geomembranes, hard surfaces, or steep slopes without anchors.
- Provide additional stability against gravitational, hydraulic, and buoyancy forces.
- Are particularly effective for resisting high flows.
- Type and density are critical to the design strength.

Ariankhak TENDON CLIPS

Ariankhak Tendon Clips transfer the load from the Ariancell cell wall to tendons.

- 2X stronger than other load transfer devices.
- 'Turn-and-lock' design engages Ariankhak Tendon Clips securely with the Ariancell cell wall.
- Allows easier off-slope preassembly.



COMPREHENSIVE SERVICES AND RESOURCES

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

Free Project Evaluation Service:

We analyze specific project needs and provide recommended preliminary designs for each project.

Construction Services:

Qualified on-site field support specialists can be available for construction training, and start-up installation supervision.

RESOURCES:

- Engineering analysis/technical overviews
- SPECMaker® specification development tool
- Technical resources binder/case studies
- Detailed construction guides and videos

Ariankhak GEOSYSTEMS® COMMITMENT — *To provide the highest quality products and solutions.*

Ariankhak GEOSYSTEMS® is committed to helping you apply the best solutions to your soil stabilization problems. Contact Ariankhak GEOSYSTEMS® or our worldwide network of knowledgeable distributors/representatives for assistance.

LEADING-EDGE INNOVATION

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

UNSURPASSED QUALITY

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

- Quality management system certified to ISO 9001:2015 and CE Certification.
- Sections manufactured from high-quality polyethylene provide consistent and maximum seam weld strength.
- Materials engineered to established geosynthetic industry guidelines.
- Sections backed by a 10-year limited warranty.

FIND US:

No. 67, No. 67, 27th St., Yousefabad, Tehran, 3rd floor, Unit 5
phone:

+98 9120204952

+98 21-88009862
+98 21-88003621
+98 21-88005043

Email: info@ariankhak.com • www.ariankhak.com