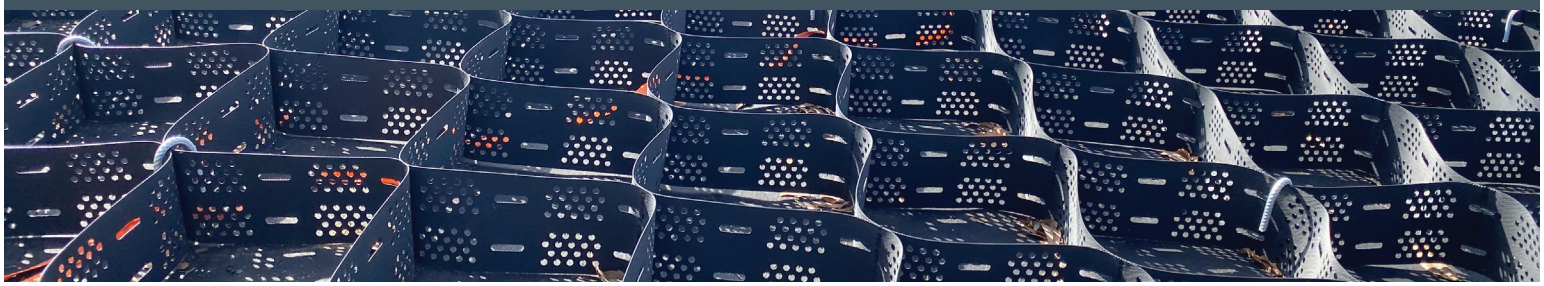
ITL GeoCells | TECHNICAL INFORMATION

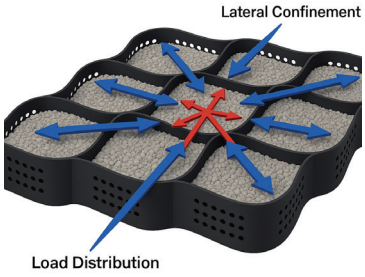


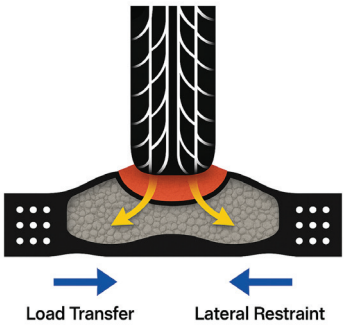
Strength, Stability & Sustainable Solutions.

Geocells are three-dimensional, honeycomb-structured confinement systems manufactured from high-density polyethylene (HDPE). Developed in the late 1970s by the U.S. Army Corps of Engineers, geocells have been used worldwide for more than four decades in transportation, geotechnical, hydraulic, and environmental engineering.

Their performance is based on confinement and load distribution: the interconnected cells prevent lateral movement of infill, improve shear strength, reduce settlement, and enhance resistance against hydraulic and structural loading.

Geocells are manufactured in different cell apertures and depths (2”, 3”, 4”, 6”, 8”), allowing them to be tailored to specific site conditions. Panels arrive collapsed for efficient transport and are expanded on-site into the honeycomb structure.





Engineering Principles

- Confinement: Particles are locked within the cells, which prevent spreading and enhance soil shear strength.
- Load Distribution (Stress Dissipation): Vertical stresses are distributed laterally across adjacent cells, reducing pressure on weak subgrades.
- Interface Friction: Contact between the cell walls, infill, and other geosynthetics creates significant interface shear resistance.
- Flexibility: The cellular structure accommodates differential settlement and minor ground movements without structural failure.
- Hydraulic Resistance: When filled with stone, soil/vegetation, or concrete, geocells resist erosion and hydraulic shear under sustained flows.

Design Guidance & References

For detailed installation, QA/QC, and maintenance practices, refer to ITL’s application-specific installation guides.

These documents provide construction sequencing, compaction requirements, drainage detailing, and quality assurance checklists.

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Base Stabilization & Pavement Support

Geocells are widely used to stabilize weak subgrades and reduce aggregate thickness requirements. A few examples such as in roadways, working platforms, haul roads, railbeds and more.

- Performance Benefits:
- Increase effective California Bearing Ratio (CBR) by 2–5× on weak soils (CBR < 3%).
- Reduce rut depth by >50% under repeated traffic loads.
- Decrease base course thickness requirements by 30–50+%.
- Improve modulus of subgrade reaction, enhancing pavement service life.

Mechanism: The geocell mattress bridges soft soils, distributing wheel loads and preventing shear-induced rutting.

Retaining Walls & Gravity Structures

Geocells are used to construct gravity walls, reinforced retaining walls, and vegetated fascias.

- Embedment: Typically 3 cells (2.85 feet) from fascia to back of panel.
- Setback: 3–5 in. recommended per course for vegetated walls.
- Reinforcement: Uniaxial geogrid layers placed every 3–4 geocell layers, extending 60–110% of wall height (per design).
- Fascia Options: Vegetated, stone-filled, or concrete-filled for higher durability.

These walls provide a flexible, permeable, and sustainable alternative to gabions, modular blocks, and poured-in-place concrete.

Geocells mitigate surficial erosion but do not prevent deep-seated failures.

Slope & Channel Protection

Geocells confine soil or aggregate on steepened slopes and in high-flow channels, preventing surficial erosion.

Slopes: Geocells resist shallow sliding and surficial erosion by anchoring soil. For steep slopes (>45°), additional anchoring (tendons, earth anchors, or deadman trenches) is recommended.

Channels: Geocells filled with different materials provide protection against varying hydraulic conditions.

Hydraulic Performance by Infill Type *(Based on Proven Field Results)*:

- Rock infill: effective up to ~10 ft/s
- Vegetated soil: effective up to ~20 ft/s
- Concrete infill: recommended for velocities >20 ft/s

Note: For slope protection, the underlying slope must already be geotechnically stable. Geocells mitigate surficial erosion but do not prevent deep-seated failures.

Summary

Geocells are a proven geosynthetic solution offering:

- Increased load-bearing capacity for pavements and working platforms.
- Surficial erosion protection for slopes and channels.
- Sustainable, cost-effective alternatives to rigid retaining structures.
- Durability and performance validated by more than 40 years of use worldwide.

They should be designed based on project-specific geotechnical, hydraulic, and structural conditions, with engineering calculations governing reinforcement spacing, infill type, and drainage details.