

GLOBAL INSTALLATION &amp; ENGINEERING FIELD GUIDE

# Geocell Confinement System Installation Manual

A premium technical execution standard for slope protection, channel lining, subgrade stabilization, load support, erosion control and soil retention applications.



**2026**  
Release Version

**5**  
Application Classes

**QA/QC**  
Field Checklist Included

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PURPOSE & SCOPE

# End-to-end geocell installation principles

This guide defines field execution standards for site preparation, material handling, layout, fastening, anchoring, expansion, infill placement, compaction, special transitions and QA/QC verification.

## Slope Protection & Erosion Control

Stabilizes steep embankments, cut slopes and architectural terrain.

## Channel Lining & Hydraulic Protection

Protects canals, drainage channels and spillways against erosive hydrodynamic shear stresses.

## Subgrade Stabilization & Base Reinforcement

Distributes heavy structural loads over weak, saturated or compressible subgrades.

## Load Support & Access

Creates high-modulus cell-stabilized platforms for heavy machinery, roads and logistics yards.

## Soil Retention & Earth Retaining Structures

Supports multi-layered structural gravity walls and steep vegetated faces using engineered non-cohesive backfill.

TOOLS, ACCESSORIES & MACHINERY

# Required equipment for industrial-grade field implementation

## Fastening Systems

Heavy-duty pneumatic staple guns, high-tensile galvanized staples, polymer interlocking keys or approved industrial-grade ties.

## Engineering Lead Generation Note

Custom steel J-hooks, UV-stabilized polymer connection keys and high-tensile engineered tendons can be procured directly from Sylvageo manufacturing facilities.

## Pneumatic Support

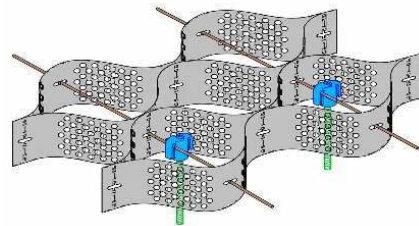
2.0 HP compressor, mobile generator, 4.5 Bar / 65 PSIG hoses and air-line lubricators.

## Anchoring & Layout

Steel J-hooks, wood stakes, high-tensile polymeric tendons, marking ropes, laser levels, survey stakes and chalk lines.

## Heavy Equipment

Dump trucks, excavators, loaders, water trucks, compactors, rollers, chutes and concrete pumps.



TOOLS, ANCHORS, TENDONS AND FASTENING ACCESSORIES

# Multi-application technical reference matrix

Application Category	Cell Height (mm)	Weld Spacing (mm)	Min. Strip Seam Strength	Approved Infill	Compaction Methodology
Slope Protection / Erosion Control	75-100	330-445	1,420	Topsoil / clean granular aggregates	Light tamping, track-walking or hydroseeding moisture integration.
Channel Lining / Hydraulic Flow	100-150	330	1,420	Angular crushed stone / concrete mix	Mechanical troweling, vibratory screeding or manual tamping.
Subgrade Stabilization / Base	150-200	445-660	1,840	Well-graded base aggregates / recycled concrete	Heavy smooth-drum vibratory rolling to $\geq 95\%$ Modified Proctor Density.
Load Support / Unpaved Access	150-200	330-445	1,840	High-modulus angular road aggregates / pit run	Multi-pass pneumatic or smooth-drum rolling to structural deformation limits.
Soil Retention / Wall Structure	150-200	330	2,100	Coarse sand / non-cohesive backfill	Controlled thin-lift mechanical plate compaction behind wall face.

**Engineering note:** For specialized architectural designs, custom slope variations  $\geq 1:1$  or hydraulic flow velocities  $>6.0$  m/s, request an individual project calculation package from Sylvageo Engineering.

**Project Tendon Assessment:** If the project includes puncturable geomembrane underlay, solid rock/non-penetrative face, or hydraulic velocity above 4.0 m/s, standard stakes may be insufficient. Request tendon calculations for continuous tensioned restraint design.

## EXECUTION PROTOCOL

# Step-by-step field installation workflow

### 01 Structural Site Preparation

1. Grade, clear and excavate the treatment area to established design levels.
2. Compact native soil subgrade to a uniform, unyielding surface.
3. Excavate crest or perimeter anchor trench as detailed in drawings.
4. Lay specified non-woven geotextile smoothly with 300-500 mm overlaps.
5. Remove standing water, soft pockets, sharp objects and unsuitable soils.

**NOTE:** The prepared surface shall be accepted by the Engineer before geocell installation begins.

### 02 Section Expansion & Tensioning Layout

1. Transport collapsed geocell bundles to the work zone and place along anchor trench or baseline.
2. Stretch the collapsed section down slope or across subgrade until maximum engineered expansion is reached.
3. Drive temporary stakes into perimeter corner cells to hold the section fully expanded.
4. Use rigid timber planks over cells to provide safe walking platforms.
5. Verify uniform symmetrical geometry before permanent pinning.

**CAUTION:** Vehicles shall not be operated directly on exposed empty geocells.



PREPARED CONSTRUCTION SUBGRADE AND ANCHOR TRENCH



FIG 02 - EXPANSION GEOMETRY AND PINNING

## 03 Fastening & Inter-Section Connection

1. Align adjacent expanded sections edge-to-edge or end-to-end.
2. Use pneumatic staple gun or Sylvageo polymer interlocking keys to lock adjoining cell walls.
3. For heavy-duty projects, install fasteners at every cell node interface.
4. For standard slope applications, apply fasteners at maximum intervals of 150 mm vertically down the seam profile.
5. Pull-test randomly selected joints to confirm resistance against infill placement stresses.

NOTE: Incorrect connector quantity or poor placement may cause separation and system failure.



GEOCELL SEAM FASTENING CONNECTION DETAIL

## 04 Standard Mechanical Anchoring vs. Specialized Suspension Tendon Systems

Anchoring method must be selected according to penetrability, liner sensitivity, hydraulic load and soil pull-out resistance. Standard stakes are the universal baseline for ordinary soil applications. Tendon systems are specialized non-penetrative solutions for high-risk boundaries.

### Standard Mechanical Anchoring

Used for standard soil slopes  $\leq 1:1.5$ , road subgrades, load support platforms and standard embankment erosion control where anchors can be driven into stable compacted subgrade.



FIELD INSTALLATION OF MECHANICAL ANCHORS

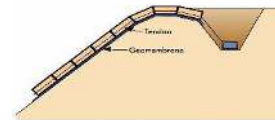
- Confirm no underground utilities before driving anchors.
- Drive permanent J-hooks, structural pins or wood stakes according to layout.
- Verify alignment with string line, survey marking or chalk reference.



STANDARD J-HOOK SOIL ANCHORING DETAIL

### Specialized Suspension Tendon Systems

Specified where penetrative stake systems are unsafe, impossible or structurally insufficient. Applicable to geomembrane caps, hard rock/non-penetrative slopes, or high-velocity hydraulic flows.



NON-PENETRATIVE TENDON INSTALLATION

- Thread tendons through pre-punched cell slots before final expansion.
- Secure tendon heads to a continuous concrete beam or heavy structural pipe at crest.
- Keep tendons aligned, untwisted and evenly tensioned.
- Terminate base with engineered stop knots, clamps or clips.

## 05 Multi-Application Infill Placement & Compaction

Mechanically or manually backfill geocell sections with approved material in compliance with project specifications. Suitable infill includes topsoil, sand, gravel, crushed stone, aggregate, concrete or low-strength flowable fill.

### Vegetated Slopes

Overfill cells with fertile topsoil 25-50 mm above rims. Lightly compact, track-walk as specified, then apply hydroseeding, turf reinforcement mats, mulch or plantings.



VEGETATED SLOPE TOPSOIL INFILL

### Load Support

Backfill with high-density angular aggregates. Dump outside expanded zones or on previously filled cells. Maintain minimum 50 mm overfill, then compact to a rigid platform.



AGGREGATE INFILL FOR LOAD SUPPORT

### Channel Lining

Place concrete or angular stone into cell pockets. Use rakes, vibratory tools or screeds to eliminate voids. Provide control joints and weep holes as specified.

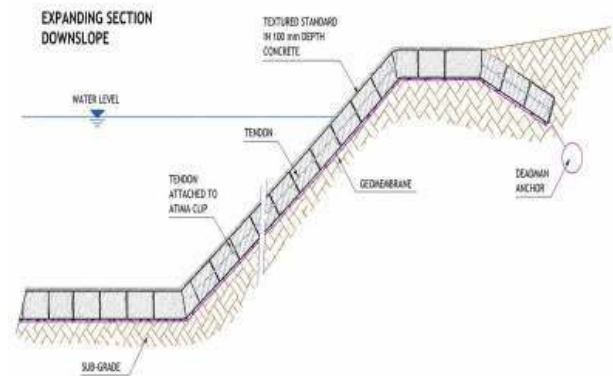


CONCRETE CHANNEL LINING INFILL

Mandatory field rule: Never drive machinery directly onto empty geocells. Equipment shall operate only on previously placed infill or approved access paths.

## 06 Curves, Channels, Transitions & Repairs

- **Curves:** Over-expand outer cells and under-expand inner cells within permitted tolerance.
- **Tapered sections:** Overlap, cut diagonally, align cell walls and fasten adjoining sections.
- **Channels:** Anchor upstream end, shoulders and side slopes; protect from flowing water until complete.
- **Transitions:** Secure exposed edges with anchors, trenches, curbs, restraints or buried terminations.
- **Repairs:** Cut damaged cells, insert matching material, fasten, replace infill and record QA/QC.



CHANNEL EDGE RESTRAINT AND TRANSITION DETAIL

# Pre-installation & QA/QC checklist system

## Pre-Installation Compliance Checks

<p><b>Subgrade Engineering Approval</b></p> <p>Cross-sections, clearing width, density metrics and moisture levels certified.</p>	<p><b>Material Quality Verification</b></p> <p>Part numbers, cell sizes, heights and quantities verified.</p>
<p><b>Accessory Adequacy</b></p> <p>Staples, compressors, guns, J-hooks, tendons and connectors ready.</p>	<p><b>Environmental Conditions</b></p> <p>No heavy rain, sub-zero conditions, active flooding or unsafe runoff.</p>
<p><b>Layout Confirmation</b></p> <p>Limits, anchor trenches, overlaps, transitions and drainage structures marked.</p>	<p><b>Installation Team Training</b></p> <p>Crew understands orientation, fastening, anchoring, expansion and infill rules.</p>

## Site Labor and Safety Profiles

Role	Qty	Primary Responsibility	Status
Site Engineer / Project Manager	1	Technical alignment, daily quality reports and Sylvageo hotline communication.	■
Installation Supervisor	1	Field logistics, section expansion ratios and stapling density enforcement.	■
Installation Crew	4-6/team	Deploy bundles, fasten sections, drive stakes and maintain alignment.	■
Heavy Equipment Operators	As required	Operate excavators, loaders, water trucks and rollers around geocell boundaries.	■
QA/QC Inspector	1	Cell geometry, anchor density, joint pull-testing and compaction compliance.	■
Safety Officer	1	PPE compliance, toolbox meetings and machine exclusion zones.	■

## Installation Equipment Checklist

■ Geocell sections	■ Geotextile / geogrid / liner	■ Pneumatic stapler or fastening tool
■ Staples, clips, ties or connectors	■ Compressor and generator	■ Air-pressure hose and fittings
■ Anchor stakes, pins or J-hooks	■ Tendons or cables, if specified	■ Survey and marking equipment
■ Planks or boards for access	■ Compaction equipment	■ Safety equipment and PPE

## Sylvageo Infrastructure & Ecological Engineering

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### Engineering Disclaimer & Field Application Constraints

This technical installation manual is provided solely for general informational and engineering guidance purposes. Site-specific geotechnical parameters vary extensively. This document does not substitute for site-specific engineering analysis. All geocell layout designs, structural cross-sections, anchor spacing and infill selections must be reviewed, verified and formally approved by a certified, registered Professional Engineer. Sylvageo assumes no legal liability for failures or damages resulting from improper site evaluation, uncertified design modifications or deviations from standard field engineering practices.