

Product Guide Specifications

Cellular Confinement System

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Specifier Notes: This product guide specification is written according to the Construction Specifications Institute (CSI) 3-Part Format, including MasterFormat, SectionFormat, and PageFormat, contained in the CSI Manual of Practice. The section must be carefully reviewed and edited by the Architect or Engineer to meet the requirements of the project and local building code. Coordinate this section with other specification sections and the drawings. Delete all "Specifier Notes" when editing this section.

SECTION 02375

CELLULAR CONFINEMENT SYSTEM

Specifier Notes: This section covers Three-Dimensional Cellular Confinement System. Consult Soil Stabilization Products Company, Inc. for assistance in editing this section for the specific application.

PART 1 GENERAL

1.1 SECTION INCLUDES

Specifier Notes: Edit the following sentence as required for the project.

- A. Cellular confinement system (geocells) for [slope protection] [earth retention] [channel protection] [load support].

1.2 RELATED SECTIONS

Specifier Notes: Edit the following list as required for the project. List other sections with work directly related to this section.

- A. Section 02300 - Earthwork.
- B. Section 02315 - Excavation and Fill: Infill material.
- C. Section 02330 - Embankment.
- D. Section 02340 - Soil Stabilization: Geotextiles.
- E. Section 02370 - Erosion and Sedimentation Control.
- F. Section 03300 - Cast-in-Place Concrete: Concrete infill.

1.3 REFERENCES

Specifier Notes: List standards referenced in this section, complete with designations and titles. This article does not require compliance with standards, but is merely a listing of those used.

- A. ASTM D 1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique.
- B. ASTM D 1603 - Standard Test Method for Carbon Black In Olefin Plastics.
- C. ASTM D 1693 - Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics.
- D. ASTM D 5199 - Standard Test Method for Measuring the Nominal Thickness of Geosynthetics.

- E. US Army Corps of Engineer (USACE) Technical Report GL-86-19, Appendix A.

1.4 SUBMITTALS

- A. Comply with Section 01330 - Submittal Procedures.
- B. Product Data: Submit manufacturer's product data and installation instructions.
- C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, cell depth, and system components.
- D. Samples: Submit manufacturer's sample of geocells.
- E. Certificate of Compliance: Submit manufacturer's certificate of compliance indicating geocells comply with specified requirements.
- F. Quality Assurance Certification: Submit manufacturer's ISO 9001:2000 quality assurance certification.
- G. Warranty: Submit manufacturer's standard warranty.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Field Representative Qualifications: Experienced in cellular confinement system installation.
- B. Installer's Qualifications: Experienced in cellular confinement system installation.

Specifier Notes: Describe requirements for a meeting to coordinate the installation of the geocells and to sequence related work. Delete the following paragraph if not required.

- C. Pre-installation Meeting: Convene pre-installation meeting [2 weeks] [_____] before start of installation of geocells. Require attendance of parties directly affecting work of this section, including Contractor, Engineer, installer, and manufacturer's representative. Review preparation, installation, and coordination with other work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original,

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unopened pallets and packaging, with labels clearly identifying product name and manufacturer.

- B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions.
- C. Handling: Protect materials during handling and installation to prevent damage.

PART 2 PRODUCTS

2.1 MANUFACTURER

Soil Stabilization Products Company Inc. P.O. Box 2779, Merced, CA 95344-0779; toll free (800) 523-9992, phone: (209) 383-3296, fax: (209) 383-7849, web: www.sspco.com

2.2 CELLULAR CONFINEMENT SYSTEM

Specifier Notes: Specify SSP Geocell GC20V, SSP Geocell GC30V, SSP Geocell GC40V.

A. Model: SSP Geocell GC20V.

Specifier Notes: Specify cell depth.

1. Cell Depth: [75 mm (3.0 inches)] [100 mm (4.0 inches)] [150 mm (6.0 inches)] [200 mm (8.0 inches)] [As indicated on the drawings].
2. Nominal Expanded Cell Size: 259 mm (10.2 inches) wide by 224 mm (8.8 inches) long.
3. Nominal Expanded Cell Area: 289 cm² (44.8 square inches).
4. Nominal Expanded Section: 2.56 m (8.4 feet) wide by 6.52 m (21.4 feet) long.
5. Cells per Section: 10 cells wide by 29 cells long.
6. Nominal Expanded Section Area: 16.7 m² (180 square feet).
7. Weld Spacing: 355 mm plus or minus 3 mm (14.0 inches plus or minus 0.12 inch).

B. Model: SSP Geocell GC30V.

Specifier Notes: Specify cell depth.

1. Cell Depth: [75 mm (3.0 inches)] [100 mm (4.0 inches)] [150 mm (6.0 inches)] [200 mm (8.0 inches)] [As indicated on the drawings].
2. Nominal Expanded Cell Size: 320 mm (12.6 inches) wide by 287 mm (11.3 inches) long.
3. Nominal Expanded Cell Area: 460 cm² (71.3 square inches).
4. Nominal Expanded Section: 2.56 m (8.4 feet) wide by 8.35

m (27.4 feet) long.

5. Cells per Section: 8 cells wide by 29 cells long.
6. Nominal Expanded Section Area: 21.4 m² (230 square feet).
7. Weld Spacing: 446 mm plus or minus 3 mm (17.5 inches plus or minus 0.12 inch).

C. Model: SSP Geocell GC40V.

Specifier Notes: Specify cell depth.

1. Cell Depth: [75 mm (3.0 inches)] [100 mm (4.0 inches)] [150 mm (6.0 inches)] [200 mm (8.0 inches)] [As indicated on the drawings].
2. Nominal Expanded Cell Size: 508 mm (20 inches) wide by 475 mm (18.7 inches) long.
3. Nominal Expanded Cell Area: 1,206 cm² (187 square inches).
4. Nominal Expanded Section: 2.56 m (8.4 feet) wide by 13.72 m (45 feet) long.
5. Cells per Section: 5 cells wide by 29 cells long.
6. Nominal Expanded Section Area: 35.14 m² (378 square feet).
7. Weld Spacing: 711 mm plus or minus 3 mm (28.0 inches plus or minus 0.12 inch).

Specifier Notes: The following material properties apply to all SSP Geocell.

D. Material Properties:

1. Material: Virgin, non-thermally degraded, high-density polyethylene (HDPE).
2. Minimum Polymer Density, ASTM D 1505: 0.940 g/cm³ (58.7 lb/ft³).
3. Environmental Stress Crack Resistance, ASTM D 1693: 3,400 hours.
4. Minimum Carbon Black Content, ASTM D 1603: 1.5 percent by weight.
5. Nominal Sheet Thickness, ASTM D 5199: 1.25 mm (50 mils) plus or minus 5 percent.

Specifier Notes: Include seam peel strength based on specified cell depth.

6. Seam Peel Strength, USACE Technical Report GL-86-19, Appendix A:
 - a. Cell Depth 75 mm (3.0 inches): 1,065 N (240 pounds).

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- b. Cell Depth 100 mm (4.0 inches): 1,420 N (320 pounds).
 - c. Cell Depth 150 mm (6.0 inches): 2,130 N (480 pounds).
 - d. Cell Depth 200 mm (8.0 inches): 2,840 N (640 pounds).
1. Seam Hang Strength: 102-mm (4.0-inch) weld joint supporting load of 72.5 kg (160 pounds) for 30 days minimum or for 7 days minimum while undergoing temperature change from 23 degrees C (74 degrees F) to 54 degrees C (130 degrees F) on 1-hour cycle.
 2. Flexural Strength: 15 layers of a 102mm (4.0 in) perforated material shall be tested for flexural strength (simply supported beam) per ASTM D 790 modified. Minimum value EI per unit width of 5000 (lb-in²/in), cross-head speed 0.5, in/min, EI = PL³/48fc

Specifier Notes: Specify solid or perforated cell wall.

- E. Cell Wall: Solid.
- F. Cell Wall: Perforated.
 1. Perforations measure .500" (12.7 mm) diameter.
 2. Vertical rows spaced 1.75" (44.5 mm) measured centerline to centerline.
 3. Vertical spacing between perforations measure .500" (12.7 mm),
 4. Measuring vertically, edge of cell wall to closest edge of perforation measures .250" (6.4 mm).
 5. Measuring horizontally, the tangent point measurement of perforations is 1.25" (31.8 mm).
 6. Welds are centered vertically between perforations with a measurement of .875" (22.2 mm) from weld centerline to perforations tangent point.
 7. Perforations remove 11.2% of cell wall sheet area.

Specifier Notes: Specify section length. Determine section length by using 0.74-foot cell length for SSP Geocell GC20V, 0.95-foot cell length for SSP Geocell GC30V, and 1.55-foot cell length for SSP Geocell GC40V.

- G. Section Length: _____ m (_____ feet).

Specifier Notes: Specify color of the geocells. Black with carbon black is standard. Consult Soil Stabilization Products Company, Inc. for availability of custom colors. A colored strip stabilized with HALS can be substituted to blend in with the surrounding

environment for retaining wall colored fascia strips. Delete fascia strips if they are not required.

H. Color: [Black] [_____].

I. Fascia Strips: [Black] [Green] [Tan] [_____].

2.3 ACCESSORIES

Specifier Notes: Consult Soil Stabilization Products Company, Inc. for assistance in specifying accessories for the specific application.

A. J-Hooks:

1. Material with sufficient strength to support and anchor geocells.
2. Steel Reinforcing Bars: [Uncoated] [Galvanized] [Epoxy coated].
 - a. Diameter: [10 mm (0.375 inch)] [12 mm (0.500 inch)] [16 mm (0.625 inch)] [20 mm (0.75 inch)] [As indicated on the drawings].
 - b. Length: As indicated on the drawings.
 - c. Hook: [180-degree bend] [45-degree bend] [As indicated on the drawings].
3. Fiberglass Reinforced Polymer (FRP) Reinforcing Bars:
 - a. Diameter: [12 mm (0.500 inch)] [As indicated on the drawings].
 - b. Length: As indicated on the drawings.
 - c. Hook: As indicated on the drawings.
 - d. Tensile Strength: 100 kpsi.

B. Straight Stakes:

1. Material with sufficient strength to support and anchor geocells.
2. Material: [Steel reinforcing bars, uncoated] [Steel reinforcing bars, galvanized] [Steel reinforcing bars, epoxy coated] [Wood].
3. Diameter: As indicated on the drawings.
4. Length: As indicated on the drawings.

Specifier Notes: The Engineer must choose the tendon material. Tendons are manufactured to specific tensile and elongation requirements determined by the Engineer. Consult Soil Stabilization Products Company, Inc. for additional information. Specify polyester tendons when using all infill materials, except concrete. Specify polypropylene tendons when concrete is used as the infill material.



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C. Tendons:

1. Tensile Strength: Sufficient to support total theoretical load.
2. Material: High-tenacity, [polyester] [polypropylene] fibers woven into webbing.

2.4 INFILL MATERIAL

Specifier Notes: Cellular confinement systems allow the use of various types of infill materials for unique and aesthetic applications. Consult Soil Stabilization Products Company, Inc. for additional information. Specify the required infill material. Provide the section number.

- A. Infill Material: [Sand] [Granular fill] [Top soil] [Soil mix] [Top soil and sand mix] [Gravel] [Crushed stone] [Concrete] [_____] as specified in Section _____ .

Specifier Notes: Include the following if non-woven geotextiles are required by the design. Consult Soil Stabilization Products Company, Inc. for additional information.

2.5 OTHER GEOSYNTHETIC COMPONENTS

- A. Woven or Non-woven Geotextiles: As specified per Design Engineer in Section 02340.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine area to receive geocells. Notify Engineer if area is not acceptable. Do not begin preparation or installation until unacceptable conditions have been corrected.

Specifier Notes: Many variables affect the preparation, installation, and performance of cellular confinement systems (geocells), including slope grade, subsurface stability, infill material, rainfall, artificial watering, hydraulic characteristics of the ground water flow, and subbase anchoring quality. Due to the large number of factors, it is difficult to apply exact parameters to individual applications without depending on engineering, design, and environmental inputs of on-site professionals.

3.2 PREPARATION

- A. Prepare site by removing vegetative cover, debris, and unacceptable soils from area where geocells will be installed.
- B. Replace removed soils with acceptable materials.
- C. Complete earthwork, including toe-in trenches when required for slope or channel lining applications, as specified in Section 02300.

Specifier Notes: Include the following sentence if nonwoven geotextiles are required by the design.

- A. Install nonwoven geotextiles as specified in Section 02340.

3.3 INSTALLATION

- A. Install geocells in accordance with manufacturer's instructions at locations indicated on the drawings.
- B. Anchor geocell sections as necessary to resist sliding due to gravitational forces and sheet flow.
- C. Ensure top edges of adjoining cell walls are flush with each other and in proper alignment.
- D. Deliver infill material to geocells from top of slope or channel to bottom in accordance with manufacturer's instructions.
- E. Limit drop height of infill material to a maximum of 1 m (3 feet) to prevent damage to geocells.

Specifier Notes: Include the following two sentences when using all infill materials, except concrete.

- F. Overfill expanded geocell sections by 25 to 50 mm (1 to 2 inches) to allow for settling and compaction, when using granular infill materials.
- G. Compact granular infill materials to top of geocells to a minimum of 95 percent SPDD. Where specified by Design Engineer uncompacted infill may be utilized (e.g. soil infill for vegetated slopes)

Specifier Notes: Include the following sentence when using concrete as the infill material.

- H. Manually rake and machine finish concrete infill material.

