



Section _____ (323223- Segmented Retaining Walls)

Part 1- General

Scope:

Work includes furnishing and installing concrete retaining wall units to the lines and grades designated on the construction drawings and as specified herein.

Description:

The SmartSlope C185 System is a **wet-cast** concrete modular retaining wall and slope system comprised of individual 20" wide by 8" high x 15" deep modules, each having a **polymer liner** bonded to the interior surfaces and having a unique **olive green** stain applied to the exposed exterior surfaces. Modules allow **mechanical connection** to reinforcement, accept system **accessories** and are comprised of a face wall, two side walls and a **solid bottom** wall, thus creating a large, accurate fill receiving trough which is open and unbounded at the rear. The modules are segmented facing units designed as planting containers providing two functions – structural wall or slope facing and plant growth. SmartSlope Living Retaining Wall System is designed to be installed in accordance with these specifications and the installation manual (www.smartslope.com). Following the lines and grades designated on the drawings/plans, work shall include foundation, drainage, compaction, plantable unit infill, reinforcement, irrigation components (optional), surface applied stain, approved plants and related system accessories per specification.

1.01 Related Sections:

1. Site Preparation
2. Earthwork

1.02 References:

1. Block: ASTM C 1372-03 and C 140, ASTM D 698
2. Geosynthetic reinforcement: ASTM D 4355, D 4595, D 5262 D 5397, D 6637
3. Blended Media as Plantable Unit Infill: USEPA CFR 503, USCC TMECC 04.11B and 02.02B

1.03 Definitions:

1. **Module:** SmartSlope modules are wet cast composite concrete/polymer, formed in molds to produce uniform units that are stained to yield a unique olive green color.
2. **Geosynthetic Reinforcement:** SmartGrid polymeric strapping reinforcement material mechanically connected to modules per engineering design.
3. **Plantable Unit Infill:** Blended growth media, appropriate to the site and the plant list, placed in each facing module, in accordance with the planting plan.
4. **Irrigation Components:** Drip tubing of approximately ½"(inch) diameter with emitters, installed into receptor slots of each module on an irrigated course.
5. **Drainage aggregate:** Free-draining, easily compacting material similar to AASHTO #57 stone, behind the modules and/or under reinforced backfill zone.
6. **Filter Fabric:** Used to separate soils, aggregates and/or around drain pipes.
7. **Backfill Zone:** Area behind the plantable facing that is backfilled with design compliant material and compacted to specified density.

Part 2- System Products

SmartSlope Living Retaining Wall Modules (as locally produced by a licensed manufacturer)

Modules made of wet-cast concrete weighing approximately 80 lbs, maintain minimum compressive strength of 5,000 psi at 28 days with air entrainment appropriate to the region, are colored with a water-based stain, facilitate mechanical connection to reinforcement and system accessory parts and The polypropylene liner and all accessory parts contain 100% post consumer recycled material.

SmartGrid:

Rolls of inextensible structural straps varying in width between 2"-4" by strength, composed of high tenacity polyester yarns placed in tension, then co-extruded with polyethylene to form a polymeric strap.

SmartMedia:

Blended growth media specified to match the planting list for the region of use, in order to facilitate successful grow-out and long-term coverage of the completed wall or slope system. Documentation of composition can be provided on request. The material may be delivered in bulk or packaged in bags for precise, modular placement within each module and the space between each module.

SmartBatter:

Small form fitted blocks that provide a consistent register at both 50 and 60 degrees of batter.

SmartShields:

Form fitted pieces used between modules to dissipate energy and inhibit soil wash-out, which are intended for use in areas subjected to occasional water immersion.

SmartRadius:

Polypropylene trusses that drop into receptors in each module when turning tight radiuses. The trusses broaden the bearing surface which is needed when stacking radii that shifts bearing points away from the side rails.

2.01.1 Submittals:

1. Shop Drawings: Retaining wall design calculations, including global stability analysis and drawings are to be stamped by a registered Professional Engineer licensed in the state of the project.
2. Product Data: Material description for all components listed in **section 1.03** of this document to include, composition, MSDS sheets, manufacturer certifications and installation information for each product specified as part of the system.
3. Planting and Irrigation Plan: Plant list with elevation views, approved suppliers, seasonal requirements for planting, fertilization, plant coverage targets, methods of measurement, erosion control plans addressing site runoff during and after construction, maintenance agreements
4. LEED Compliance: All information pertaining to categories, points and documentation

2.01.2 Delivery, Storage & Handling:

1. Contractor shall check the materials upon delivery to assure the proper materials have been received.
2. Exposed faces of concrete modules are to be free of chips, cracks, stains and other imperfections and additional materials are free of defects.
3. Contractor shall protect the materials from damage, as damaged materials shall not be used in the project (ASTM C 1372).

2.01.3 Manufacturer:

SmartSlope, LLC. / 3430 2nd Street, Suite 300 / Baltimore, Maryland 21225
443-874-7465 (office) / 443-874-7466 (fax) / info@smartslope.com

Part 3- Execution

3.01 Excavation:

Contractor shall excavate to the lines and grades shown on the construction drawings. Use care when excavating to prevent disturbance of the base beyond the lines shown. Contractor shall follow all local, state, and federal laws regarding earthwork.

3.02 Leveling Pad:

Foundation soil shall be excavated as required for the leveling pad to the depths and locations shown on the plan sheet or as directed by the design engineer. The exposed foundation soil shall be observed by the on-site soils engineer prior to construction to verify that the exposed material is suitable for the net design bearing pressure and that the base of the excavation is free of loose soil, non-compacted fill, water, or frozen material. Undercut any unsuitable soil. Undercut areas shall be filled with crushed limestone and compacted to at least 95% of the material's standard Proctor maximum dry density. Construct the crushed rock leveling pad to the lines and grades on the plans.

3.03 Base Course:

Install the first course of modules on the leveling pad. Modules should be level side-to-side and front-to-back. The modules shall be placed 14" apart in accordance with the diagrams to yield a 34" center-on-center spacing for straight run sections. Base pad itself should be leveled such that modules placed on it are level. **Modules shall not be pounded with a hammer or mallet as a means of leveling.** Fill below grade units and spaces between units, with free draining granular infill to a level even with the tops of the side rails in accordance with manufactures installation guidelines. See website (<http://www.smartslope.com/installation/index.html>) for the most up to date information.

3.04 Unit Installation:

Each module straddles two modules on the course below creating a checker board pattern of planting pockets. Pull the units forward into contact with either the rear face of the lower module or the desired SmartBatter spacer to establish a (70, 60 or 50) degree wall batter. On any given lift, always fill the entire course of modules with plantable unit infill before placing mass backfill. **On reinforced courses care must be taken to ensure straps are flat, without wrinkles and lay horizontal to the connection elevation at the rear of the module.** Backfill and compact behind the modules to the cut embankment or ends of the straps and continue construction in sequence per site specific design and plans. Each course of modules must be stacked and completely backfilled before the next course is placed. **No stacking of multiple courses before filling shall be allowed.** Radius walls may require smaller or larger spacing between the units to maintain the running bond. When off-bond (upper module not evenly straddling lower module), then addition of the SmartRadius supports may be installed in order to ensure peak performance of the system. Drain pipes are to be installed as specified and run to daylight at low points and/or periodically along wall alignment as shown on plans.

3.05 Reinforcement:

Where reinforcement is required, SmartSlope Living Retaining Wall System includes a true mechanical connection through the module itself (no need for additional pins, rods, pipes, or other means of attachment) creating high connection values regardless of wall height or fill. SmartSlope Living Retaining Wall Systems are designed to be reinforced with a woven and coated polymer strap reinforcement called SmartGrid. Once the modules of a reinforced course have been placed on the wall column, the tag end of the SmartGrid shall be inserted from the top (inside the trough) through the connection aperture in the bottom of each module and pulled through to the mid-point of its total length, prior to filling of module. The SmartGrid may now be

pulled evenly into the backfill zone for each connected module on the course, at the elevations shown on the plans. **In order to prevent vertical forces on the straps and tails of modules, great care must be taken to ensure that the straps lay horizontal at the same elevation as the top surface of the connection aperture inside of trough. This may be facilitated by placing a minimum 12” of easily compacted material directly behind the facing column.** Terminal ends of the strap should be at the same distance from the module and spread apart no more than the center-to-center width of the modules, which is 34”. SmartGrid placed outside a plus or minus 4” zone of the placement design elevation will not be accepted. Slack in the SmartGrid shall be removed prior to placing backfill. **Modules shall be filled with plantable unit infill then mass backfill shall be placed and /or pushed in a rearward direction, starting from the modules moving toward the rear of the fill zone.** Construction equipment other than rubber-tired or rubber-tracked shall not be operated directly on the SmartGrid. *SmartSlope installation manual must be consulted prior to installation and any deviations from methods shown must be approved by the wall design engineer prior to construction.*

3.06 Backfill:

Backfill zone material shall be placed in maximum 8” lifts and compacted to at least 95% of the material’s maximum dry density as determined by the standard Proctor method. **No compaction equipment other than vibratory plates may be operated within 3 feet of the rear of the modules.** Backfill shall be placed, spread and compacted in such a manner that minimizes wrinkles and movement of the reinforcement. Field density testing shall be conducted by a qualified soils technician to verify that the minimum degree of compaction is being obtained. **The finished grade above the structure should include a drain swale and must be sloped in such a manner to drain all water away from the wall unless it has been specifically designed to accept site runoff water.** (Go to the SmartSlope website <http://www.smartslope.com/designcenter/index.html> for views and details).

3.07 Planting:

SmartSlope Living Retaining Walls were designed from their inception to be planted and grown over. The system is intended to be the most reliable means available for creating strong, economical structures that quickly disappear into the natural landscape. All of our design efforts have gone into making a system that will disappear once complete and yield an end-product that blends into the surrounding landscape as opposed to separating it. Once complete, the face of the finished system should be brushed off to dislodge any over-filling of the pockets which would quickly slough off on its own. If planting live plugs instead of seeding, planting must start from the top course and continue down the face of the wall until every pocket is filled with at least one plant to yield a **minimum coverage of 540 plants per 1000 sf of exposed face area.** The planting pocket is designed large and the fill volume is high, so each pocket can accommodate multiple plugs or larger potted species. Live plants should be centered in the “sun receiving” area of the pocket (not under the upper module). As an alternative, modules can be either hydro-seeded or seeds can be hand sown. (Hand sowing is the most efficient) Plants must be watered in and fertilized in accordance with the project plans. Maintenance of the plant material should be required for the first year in order to ensure proper grow-in. Walls are low to no maintenance thereafter. **Always consult with the owner and/or their representatives early in the project to determine all responsible parties with regard to plants, quantity, design, maintenance and feeding.**

3.08 Irrigation (If needed):

The modules have been designed to allow ½” drip irrigation tubing to be placed in the receptor on each side rail to run a continuous water line. (See website details and specs @ <http://www.smartslope.com/designcenter/index.html>)

3.09 **Maintenance:**

The modules themselves do not require maintenance.

Maintenance and care of the vegetated portions of the wall system is required at least until the vegetation is established (grown in). The initial and continuing maintenance required will depend on the plantable unit infill, type of vegetation, local weather conditions and exposure. SmartSlope, LLC may, at its discretion, provide maintenance review visits for the purpose of documenting the progress and condition of the completed system. At such regular visits within the first 24 months from completion, reports will be generated and shared with stakeholders as a tool to facilitate successful grow-out. Any provisions, by and for, the project owner in addition to those listed above, such as % plant coverage by calendar date, shall be placed in a separate document and included with the plans and specifications of the project prior to bidding and selection of installer.

Technical Support

SmartSlope, LLC staff is available for specification assistance and jobsite review of various installation stages at (443) 874-7465 or e-mail tech-support for information and technical advice. SmartSlope, LLC should be contacted at least 14 days prior to the start of construction if technical representatives are needed during the installation process.

Availability and Cost

SmartSlope Living Retaining Wall Systems are available through the manufacturer, SmartSlope, LLC. (443) 874-7465

3.10 **Warranty:**

SMART SLOPE, LLC warrants to its customers that each SmartSlope retaining wall Module is manufactured in accordance with current ASTM standards on compression strength, and absorption for concrete masonry Modules for 3 years after it is properly installed. If a Module does not meet this warranty standard, the customer shall notify SMART SLOPE, LLC in writing and, pursuant to Smart Slope's directions, such customer shall return the applicable Modules to the manufacturer or destroy them. SMART SLOPE, LLC shall ship to its customer, as applicable, at SMART SLOPE's expense, replacement Modules which shall be SMART SLOPE's sole remedy for breach of this warranty. SMART SLOPE, LLC shall have no obligation to install such replacement Modules.

This Warranty shall not apply to any Module which is damaged or defective or fails to meet the warranty standard due to the manner in which it was installed, any chemicals coming in contact with the Module, the design of the structure in which a Module is used, excessive or unforeseen site conditions, soil conditions, manufacturing defects, or other conditions beyond SMART SLOPE LLC's control. THE ABOVE SETS FORTH THE SOLE WARRANTY FROM SMART SLOPE LLC REGARDING THE PRODUCT AND IS MADE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND SMART SLOPE, LLC SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Warranty information should be sent to:

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Baltimore, MD 21225
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