

SECTION 316616-A2 – SMART SLOPE LIVING RETAINING WALL SYSTEM (WALL NO. 2):

**Part 1- General**

Scope:

Work includes furnishing and installing concrete living wall 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 block 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 Manufacturer’s installation manual ([www.smartslope.com](http://www.smartslope.com)). Following the finished lines and grades designated on the drawings, work shall include:

- a. Submittals.
- b. Foundation.
- c. Module block units.
- d. Backfill.
- e. Drainage.
- f. Compaction.
- g. Plantable unit infill (SmartMedia).
- h. Geosynthetic Reinforcement (SmartGrid).
- i. Surface applied stain.
- j. Native plantings.
- k. Related system accessories per specification.

1.01 Related Sections:

- a. Site Preparation and Earthwork: SECTION 312000.

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### 1.02 References:

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

### 1.03 Definitions:

- a. Living Retaining Wall System Design: a design that includes geotechnical, structural, general civil engineering and landscape architectural elements that blends a slope structure into the environment by covering completely with native plantings. Design will include all drainage elements required to maintain the system and include global stability analysis.
- b. Module (also known as Block): 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.
- c. Geosynthetic Reinforcement: SmartGrid polymeric strapping reinforcement material mechanically connected to modules per engineering design.
- d. 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.
- e. Drainage aggregate: Free-draining, easily compacting material similar to AASHTO #57 stone, behind the modules and/or under reinforced backfill zone.
- f. Filter Fabric: Used to separate soils, aggregates and/or around drain pipes.
- g. Backfill (Reinforced) Zone: Area behind the plantable facing that is backfilled with design compliant material, reinforced as required by wall designer, and compacted to specified density.
- h. Backfill material: Missouri limestone aggregate will be used as the backfill material on the project.
- i. Native Plantings and Stewardship: Included as part of the material package provided by SmartSlope. Contractor will control the planting and maintenance of the wall. Contractor will be responsible for installing and backfilling blocks as well as a temporary planting matrix. Contractor will handle the planting of the permanent matrix and maintenance. Plants native to the state of Missouri or Illinois and suitable for the location and micro-climate of the Living Retaining Wall System shall be used.

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Refer to the list supplied in this specifications. Seeds shall come from within a 250-mile radius of this project. **No cultivars shall be used on this project.**

- j. Method of Measurement: 100% Permanent Matrix Cover by the end of the 3<sup>rd</sup> year, Temporary Matrix should consist of a cover crop of 75% Regreen Engineered Cover Crop and 25% seed oats.

**Part 2- System Products**

**SmartSlope® Living Retaining Wall Block Modules**

- a. Modules made of wet-cast concrete weighing approximately 80 lbs.
- b. Minimum compressive strength of 5,000 psi at 28 days with air entrainment.
- c. Colored with a water-based stain.
- d. Block to include mechanical connections to reinforcement.
- e. The block polypropylene liner contains 100% post consumer recycled material by SmartSlope®.

**SmartGrid:**

- a. Rolls of inextensible structural straps ranging in width between 2-inches to 4-inches.
- b. Strengths varying in strength from 20 kiloNewton to 30 kiloNewtons by strength.
- c. Material shall be composed of high tenacity polyester yarns placed in tension, then co-extruded with polyethylene to form a polymeric strap.

**SmartMedia:**

- a. Blended growth media specified to match the planting list for the project.
- b. Material shall be supplied by SmartSlope® in order to facilitate successful grow-out and long-term coverage of the completed wall.
- c. The material may be delivered in bulk or packaged in bags for precise, modular placement within each module and the space between each module.

**2.01.1 Submittals:**

- a. Shop Drawings: Plan views, elevation views, and details for retaining walls prepared and sealed by a registered Professional Engineer having two plus years of experience designing a living retaining wall system. Wall designer shall retain in project files for a period of five years the design calculations, including global stability, internal stability and external stability calculations. Wall designer shall supply copies of

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- project files available to Engineer, Owner or Construction Manager for use at any time during the five year period.
- b. Product Data: Material description for all components listed in section 1.03 of this document to include, composition, Material Safety Data Sheets, manufacturer certifications and installation information for each product specified as part of the system.
  - c. Installer’s Qualification Information shall be submitted for approval.
  - d. Optional module block submittal. Contractor shall submit colored modules for review prior to installation of the Living Retaining Wall System.
  - e. Planting Plan: The following components shall be placed on the planting plan:
    - i. Plant list with elevation views.
    - ii. Seasonal requirements for permanent matrix planting shall be as follows: April 1<sup>st</sup> through June 15<sup>th</sup> and September 1<sup>st</sup> through October 30<sup>th</sup>.
    - iii. Plant coverage target shall be 100% (75% for temporary matrix and 100% for permanent matrix).
    - iv. Methods of measurement to determine 100% grown out plant coverage.
    - v. Erosion control plans addressing living retaining wall site runoff during and after construction.
    - vi. Maintenance plan: plan to address number of maintenance visits, intervals and what the work is planned to be performed at that time.
    - vii. Consider minimum planting coverage of 100% when completeing this Planting Plan.
  - f. The following native plants are approved for use at this site. Contractor shall use a diverse planting selection and include the following. Contractor shall determine placement based upon exposure of the structure.

<b>Code</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Exposure</b>
ALLCER	Allium cernuum	Nodding Onion	Part Shade/Sun
AQUCAN	Aquilegia canadensis	Columbne	Part Shade/Sun
ASTERI	Aster ericoides	Heath aster	Sun
BOUGRA	Bouteloua gracilis	Hairy Grama	Sun
CAMROT	Campanula rotundifolia	Hare Bells	Shade/Sun
CLEVIR	Clematis virginiana	Devil's darning needles	Part

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			Shade/Sun
CORPAL	Coreopsis palmata	Prairie coreopsis	Sun
DALCAN	Dalea candidum	White prairie clover	Sun
DALPUR	Dalea purpurea	Purple prairie clover	Sun
ECHPUR	Echinacea purpurea	Purple coneflower	Sun
ERASPE	Eragrostis spectabilis	Purple love grass	Sun
GEUTRI	Geum triflorum	Prairie smoke	Sun
			Part
HEURIC	Heuchera richardsonii	Prairie alumroot	Shade/Sun
	Liatrix scariosa		Part
LIASCN	nieuwlandii	Savanna blazing star	Shade/Sun
			Part
PENDIG	Penstemon digitalis	Foxglove beard tongue	Shade/Sun
		Showy Black-eyed	
RUDSPE	Rudbeckia speciosa	susan	Sun
RUEHUM	Ruellia humilis	Wild petunia	Sun
SPOHET	Sporobolus heterolepis	Prairie Dropseed	Sun
ZIZAUR	Zizia aurea	Golden alexanders	Sun
FRAVIR	Fragaria Virginiana	Wild Strawberry	Sun
ANDSCO	Andropogon Scoparius	Little Bluestem	Sun
CXPRA	Carex Pragracilius	Tollway Sedge	Sun
CLEVIR	Clematis Virgiana	Virgin's Bower	Sun

2.01.2 Delivery, Storage & Handling:

- a. Contractor shall check the materials upon delivery to assure the proper materials have been received.
- b. Exposed faces of concrete modules are to be free of chips, cracks, stains and other imperfections and additional materials are free of defects.
- c. Contractor shall protect the materials from damage, as damaged materials shall not be used in the project (ASTM C 1372).
- d. SmartMedia shall be covered with tarps prior to installation if delivered in bulk.

2.01.3 Manufacturer:

SmartSlope, LLC.  
 3430 2nd Street, Suite 300  
 Baltimore, Maryland 21225  
 St. Louis Office Contact (below)  
 (314) 574-2887 (office)  
 (314) 961-6281 (fax)  
 e-mail: [markw@smartslope.com](mailto:markw@smartslope.com)

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2.01.4 Qualified Installers:

- a. Installers shall have bonding capacity.
- b. Installers shall be Metropolitan Saint Louis Sewer District qualified.
- c. Installers shall demonstrate experience in Riparian construction and Ecological restoration.
- d. Installers shall provide references for ten (10) such jobs utilizing native plantings or be certified SmartSlope Partners.
- e. Pre-qualified installers are as follows:

Native Landscape Contractors, LLC.  
190 West Lincoln Highway  
Unit B  
Waterman, IL 60556  
(815) 498-4407 (office)  
(314) 780-2512 (local office)  
e-mail: [stevenb@nativelc.com](mailto:stevenb@nativelc.com)  
[www.Nativelc.com](http://www.Nativelc.com)

Ideal Landscape Group, Inc.  
6264 Lemay Ferry Road  
St. Louis, MO 63129  
(314) 892-9500 (phone)  
(314) 892-6459 (fax)  
e-mail: [buckle.dave@ideallandscape.com](mailto:buckle.dave@ideallandscape.com)  
[www.ideallandscape.com](http://www.ideallandscape.com)

**Part 3- Execution**

3.01 Excavation:

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

3.02 Leveling Pad:

- a. 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.
- b. 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

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pressure and that the base of the excavation is free of loose soil, non-compacted fill, water, or frozen material.

- c. Contractor shall undercut any unsuitable soil.
- d. Undercut areas shall be filled with crushed limestone and compacted to at least 95% of the material's standard Proctor maximum dry density.
- e. Construct the crushed rock leveling pad to the lines and grades as indicated in the Living Retaining Wall design completed as part of this work.

3.03 Base Course:

- a. Base pad itself should be leveled such that modules placed on it are level.
- b. Install the first course of modules on the leveling pad.
- c. Modules shall be level side-to-side and front-to-back.
- d. The modules shall be placed 14" apart in accordance with the diagrams to yield a 34" center-on-center spacing for straight run sections.
- e. Modules shall not be pounded with a hammer or mallet as a means of leveling.
- f. 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.

3.04 Unit Installation:

- a. Units shall be installed according to SmartSlope's (i.e. Manufacturer) requirements. These requirements include the following:
  - i. Each module straddles two modules on the course below creating a checker board pattern of planting pockets.
  - ii. 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.
  - iii. On any given lift, always fill the entire course of modules with plantable unit infill before placing mass backfill.**
  - iv. 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.
  - v. 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.

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- vi. Each course of modules must be stacked and completely backfilled before the next course is placed.**
- vii. No stacking of multiple courses before filling shall be allowed.
- viii. 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:

- a. Reinforcement shall be installed according to SmartSlope's (i.e. Manufacturer) requirements. These requirements include the following:
  - i. 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.
  - ii. SmartSlope Living Retaining Wall Systems are designed to be reinforced with a woven and coated polymer strap reinforcement called SmartGrid.
  - iii. 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.
  - iv. 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 (as per the Manufacturer's requirements). This may be facilitated by placing a minimum 12" of easily compacted material directly behind the facing column.
  - v. 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.

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- vi. 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.
- vii. **Construction equipment other than rubber-tired or rubber-tracked shall not be operated directly on the SmartGrid.**
- viii. 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:

- a. 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.
- b. No compaction equipment other than vibratory plates may be operated within 3-feet of the rear of the modules.
- c. Backfill shall be placed, spread and compacted in such a manner that minimizes wrinkles and movement of the reinforcement.
- d. Field density testing shall be conducted by a qualified soils technician to verify that the minimum degree of compaction is being obtained.
  - i. Tests shall be performed on the backfill placed behind each row of block.
  - ii. A soils technician shall be present during the entire back filling operation and provide documentation that the wall was constructed in accordance with the designer’s plans and specifications.
  - iii. Documentation includes daily field reports with a description of the work performed on the wall and the results of compaction tests for each lift.
  - iv. Testing to be provided by Contractor.
- e. 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 and to prevent water from running over the face of the wall.

3.07 Planting:

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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.

- a. The Living Retaining wall system that will be covered in vegetation once completed. 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.
- b. Live plants should be centered in the “sun receiving” area of the pocket (not under the upper module).
- c. Plants must be watered in accordance with the project plans.
- d. Maintenance of the plant material shall be required for a two year (24-months) period in order to ensure proper grow-in and achievement of target grow in percentages.

3.08 Irrigation:

- a. No irrigation shall be included in this Living Retaining Wall System.

3.09 Maintenance:

- a. Maintenance shall be completed as part of this item for a period of at least 24-months.
- b. Maintenance and care of the vegetated portions of the wall system is required at least until the vegetation is established (grown in).
  - (1) Contractor shall supply photographs of retaining wall to Owner at quarterly intervals after planting the wall. Photos to be supplied electronically immediately after planting and every 3-months post-planting thereafter, up to the target measurement period.
  - (2) The photos taken at the 24 month interval will be used to evaluate the wall coverage. If the Owner determines that the minimum **100% coverage** is not completed, the Contractor shall provide additional plantings as required to achieve the cover. The Contractor shall take and supply photos every 3-months until the planting goal is achieved as determined by the Owner.
  - (3) **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

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at least 14 days prior to the start of construction if technical representatives are needed during the installation process.

3.10 Warranty:

- a. Contractor shall warranty the retaining wall for a period equivalent to the Manufacturer's warranty on the retaining wall material. This warranty shall be a minimum duration of at least 24-months, 2-years.
- b. Reference the planting requirements in Section 3.09 and the photo documentation required.

END OF SECTION 316616-A2