



Section _____ (323223- Segmented Retaining Walls)

Part 1- General

Scope:

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

Description:

The Varden Block System is a **Polymer** modular retaining wall and slope system comprised of individual 15" wide by 6" high x 13" deep modules, each having open side walls and an open cell bottom that creates a trough for the insertion of Vardensok®. Modules allow **connection** to reinforcement, accept system **accessories** and are comprised of a hollow face wall, two side wall receptors and a **rigid 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. Varden Block Living Retaining Wall System is designed to be installed in accordance with these specifications and the installation manual. Following the lines and grades designated on the drawings/plans, work shall include foundation, drainage, compaction, plantable unit infill, reinforcement, irrigation components (optional), 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:** Varden modules are injection molded polypropylene with additives for UV stabilization, impact resistance and color.
- 2. Geosynthetic Reinforcement:** Typical Geogrid reinforcement material connected to modules or traditional geogrids per engineering design.
- 3. Plantable Unit Infill:** Contained blended media in Vardensok® or loose 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 1/4"(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.

Part2- System Products

VardenLiving Retaining Wall Modules (as produced by a licensed manufacturer) Modules made of injection molded polypropylene weighing approximately 2.5 lbs., made with UV stabilization for a minimum of 7 years, additives for impact resistance, are colored internally and facilitate mechanical connection to reinforcement and system accessory parts.

Reinforcement Strap:

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.

Growth Media:

Contained in Vardensok, GardenSoxx or uncontained, loose media specified to match the planting list for the region of use, to facilitate successful grow-out / 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 **Vardensok** for precise, modular placement within each module.

Side Rails:

Polypropylene accessories that drop into receptors in each module when turning tight radiuses or when using loose Growing Media. The rails broaden the bearing surface which is needed when stacking radii that shifts bearing points away from posts at rear of module face.

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 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: Verdtech, Inc. (see below)

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. The compacted levelling pad should be topped with 2-3" of sand to facilitate levelling of the individual modules.

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 9" apart** in accordance with the diagrams to yield a **24" center-on-center spacing** for straight run sections. Base pad itself should be leveled such that modules placed on it are level once pressed into the sand topping. **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 for the most up to date information.

3.04 Unit Installation:

Each module straddles two modules on the course below creating a checkerboard pattern of planting pockets. Pull the units forward into contact with either the rear face of the lower module to establish a 70 degree wall batter. On any given lift, always fill the entire course of modules with a 2' Vardensok/GardenSoxx or 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 unless Vardensok/GardenSoxx are installed.** 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 Side Rail accessory 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, Varden 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. Varden Living Retaining Wall Systems are designed to be reinforced with a woven and

coated polymer strap reinforcement Strap. Once the modules of a reinforced course have been placed on the wall column, the tag end of the Strap 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 Strap 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, 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.** 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 24". Polymer Strap placed outside a plus or minus 4" zone of the placement design elevation will not be accepted. **In sequence, modules shall be filled with Vardensok or 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 Strap. *Varden 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 12" 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 Verdtech, Inc. website page for views and details).

3.07 Planting:

Varden Living Retaining Walls were designed from their inception to be planted and grown over. 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. This is not needed when Vardensok are utilized. 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 1 plant per sf of exposed face area.** The planting pocket is designed large and the fill volume is high, so each pocket can accommodate multiple plugs. Live plants should be centered in the "sun receiving" area of the pocket (not under the upper module). As an alternative, Vardensok can be pre-grown or internally seeded or

pockets can be hand seeded after installation. Plants must be watered 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 if this plan is completely followed. **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 flat drip tape or 1/4" drip irrigation tubing to be placed in the Soxx or running from module to module through the side rails in order to run a continuous water line. (See website details and specs on downloads page)

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.

International 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

Verdtech, Inc. staff are available for specification assistance and jobsite review of various installation stages at 314-279-8905 or e-mail info@verdtech.com for information and technical advice. Verdtech 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

Varden Living Retaining Wall Systems are available through the manufacturer, Verdtech, Inc.: 314-279-8905 and info@verdtech.com.

3.10 Warranty:

Verdtech provides complete living wall systems and all warranties will be by project specific agreement regarding plants, stewardship and wall coverage targets established for each project. All living walls are made possible by the use of GreenWay P100 modules and their matched components. Therefore, a warranty on the modules themselves is provided by Verdtech, Inc. and it can be reviewed on its website.

Warranty information requests should be sent to:

Verdtech, Inc., P.O.Box 221387, Saint Louis, MO 63122

