Varden Plastic Block Retaining Wall System: Technical Specifications and Environmental Performance

System Overview

The Varden Plantable Retaining Wall System is a modular segmental retaining wall (SRW) composed of injection-molded polypropylene (PP) facing units designed to integrate soil, vegetation, and standard geotechnical design practices into a single coherent system. Each unit functions as both a structural facing element and a vegetated planting pocket, enabling the wall to serve as living green infrastructure rather than inert hardscape.

Primary applications:

- Residential and commercial landscape retaining walls
- Erosion control and slope stabilization with integrated vegetation
- Green infrastructure and LEED-targeted site design
- Projects requiring reduced material mass and transport emissions

Material Specifications

Facing Units:

- Material: Structural-grade polypropylene (PP) resin
- Additives: UV stabilizer package (7-year rated), impact modifiers, mineral pigments
- Colors: Gray, tan, brown, green (other colors available on request)
- Unit weight: Approximately 3 lb per 1 sq ft module
- Coverage: 1 block = 1 sq ft of wall face

Material Properties (PP):

- Density: ~0.90–0.91 g/cm^3
- Tensile strength: High (varies by formulation and additive package)
- Water absorption: <0.01% (essentially non-porous)
- Freeze-thaw resistance: Excellent (no internal water to freeze and expand)
- Chemical resistance: Inert to typical soils, fertilizers, and irrigation water
- UV stability: Stabilized for outdoor exposure; in-service UV load minimal due to soil cover and vegetation shading

Expected service life: Multi-decade performance (order of 100+ years) when installed per design standards with proper drainage, backfill, and vegetation cover.

Product warranty: 2-year limited warranty on facing units (manufacturing defects); does not limit expected system service life.

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Design and Installation Standards

Varden wall systems are designed and installed in accordance with standard SRW practice, consistent with:

- NCMA (National Concrete Masonry Association) segmental retaining wall guidelines
- ASTM standards for modular retaining wall units and geosynthetic reinforcement
- Local building codes and geotechnical engineering requirements

Key design considerations:

1. Base preparation: Minimum 6-inch compacted gravel base (¾" crushed stone, ASTM No. 57 or equivalent).
2. Sand placed to average depth of 2" on top of compacted base for levelling
3. Drainage: 4-inch perforated drainpipe at base, minimum 12-inch gravel drainage layer behind facing units, wrapped with geotextile filter fabric.
4. Backfill: Clean, free-draining granular material. Compact in lifts; do not stack more than 12 inches of wall before backfilling.
5. Geogrid reinforcement: Required for walls exceeding maximum unreinforced height or where soil conditions, surcharges, or slopes dictate. Consult geotechnical engineer for grid type, length, and vertical spacing per project-specific loads.
6. Batter and setback: Verify unit geometry provides appropriate setback per course to achieve stable batter angle (typically 20 degrees from vertical).

Maximum unreinforced height: Consult local codes and Verdtech engineering support; typically, 3 feet in favorable soil conditions. Taller walls up to 8-10' require geogrid and site-specific design.

Global and internal stability: Must meet minimum safety factors per AASHTO, FHWA, or NCMA design methodologies (typically FS ≥ 1.5 for sliding, overturning, bearing; FS ≥ 1.3 for global and compound stability).

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Transport and Embodied Impact Advantages

Varden's lightweight modular design yields measurable project-level benefits:

Mass per square foot of wall:

- Varden: ~3 lb of PP per sq ft of face, plus soil and vegetation fill
- Conventional concrete SRW units: 50–100 lb per unit; aggregated mass typically 10–20× higher per sq ft of wall

Shipping efficiency:

- One 48" × 48" pallet: 250 blocks, ~800 lb total, 250 sq ft coverage
- Equivalent concrete coverage often requires full flatbed truck (20,000–40,000 lb)
- Implications:
- Reduced fuel consumption and transport-related CO_2 per square foot of installed wall
- Lower on-site handling requirements; reduced need for heavy equipment
- Easier staging and access in constrained or sensitive sites

Embodied carbon context:

Concrete retaining wall units embody significant CO_2 due to:

- Portland cement production (~0.8–0.9 kg CO_2 per kg cement)
- Aggregate extraction, processing, and multiple transport legs
- High unit mass and associated hauling emissions

While PP production also carries embodied energy, the far lower mass per functional unit of wall, combined with reduced transport impacts, often results in lower total cradle-to-gate emissions per square foot of wall delivered and installed.

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Green Infrastructure and Carbon-Cycle Benefits

Unlike conventional SRW systems, Varden walls are designed as integrated soil-plant-structure systems:

Soil organic carbon storage:

- Each unit pocket contains substantial soil or compost volume
- Soil organic matter represents long-term carbon storage
- Root exudates and decaying plant material contribute to stable soil carbon pools over time

Annual plant carbon sequestration:

- Vegetation in wall pockets photosynthesize and store carbon in biomass and roots
- Studies of green/living walls show measurable annual CO_2 uptake per square meter of planted surface

Microclimate and stormwater benefits:

- Vegetated surfaces reduce local temperatures via evapotranspiration
- Planted pockets intercept rainfall, slow runoff, and support infiltration
- Enhanced habitat and biodiversity compared to bare masonry surfaces

Long-term carbon balance:

Over a multi-decade service life, the combination of avoided concrete impacts, reduced transport emissions, soil organic carbon storage, and annual plant sequestration can yield a net carbon benefit relative to conventional concrete SRW systems—especially when the wall remains vegetated and maintained.

LEED and Sustainability Documentation

Varden systems can support multiple LEED v4/v4.1 credit pathways when properly documented:

Materials and Resources (MR):

- Contribution to embodied carbon reduction strategies via lightweight, lower-mass alternative to cement-intensive concrete units
- Product transparency and life-cycle documentation support (EPD development possible on request)

Sustainable Sites (SS):

- Heat island mitigation through vegetated vertical surfaces
- Support for site ecology and habitat restoration goals
- Stormwater management credit support via increased vegetated surface area and infiltration capacity

Innovation:

- Integration of structure and living vegetation as single coherent system
- Demonstrable carbon storage in soil and plant biomass over project life

Verdtech can provide project-specific documentation, material data sheets, and coordination support for design teams pursuing LEED or other green building certifications.

Performance and Maintenance

Structural:

- No freeze-thaw degradation (unlike porous concrete masonry)
- Impact-resistant and fatigue-resistant under typical wall loading
- Not susceptible to efflorescence, spalling, or surface weathering common in concrete units

Vegetation:

- Plant selection should consider climate, sun/shade exposure, irrigation availability, and aesthetic goals
- Periodic trimming, fertilization, and replanting as needed (similar to any landscape planting)
- Irrigation recommended for establishment and optimal long-term performance, especially in arid climates

Maintenance:

- Inspect drainage outlets annually
- Monitor vegetation health and replace failed plants as needed
- No structural maintenance typically required if wall designed and built correctly

Technical Support and Resources

For project-specific engineering support, installation guides, CAD details, product data sheets, and LEED coordination, contact:

www.verdtech.com | info@verdtech.com | 314-298-8905

Verdtech provides:

- Preliminary design assistance and wall cross-sections
- Collaboration with project geotechnical engineers for reinforced wall layouts
- Material specifications and product documentation for bid packages
- On-site installation training and support (available on request)

Summary

The Varden Plantable Retaining Wall System offers design professionals a structurally sound, environmentally advantageous alternative to conventional concrete SRW systems. By combining durable, lightweight PP facing units with engineered soil and vegetation, Varden enables retaining walls to function as long-life green infrastructure—reducing embodied carbon, lowering transport impacts, storing carbon in soil and plants, and delivering measurable microclimate and ecological benefits over multi-decade service lives.

Specify Varden when projects call for:

- Reduced material mass and transport footprint
- Green infrastructure and LEED credit support
- Living, vegetated retaining wall systems
- Durable, freeze-thaw resistant facing units
- Innovative, sustainable site design solutions