U.S. Version
Release 4.1

Verti-Block Material Spec

Section 6





VERTI BLOCK®

www.verti-block.com

SPECIFICATION FOR VERTI-BLOCK™
GEOSYNTHETIC REINFORCED
Mechanically Stabilized Earth (MSE) SYSTEM

1 GENERAL

1.1 Description

The work consists of supplying and installing all aspects of the Verti-Block™ Precast Mechanically Stabilized Earth (MSE) units as specified in the construction drawings or as established by the Owner, Architect or Engineer.

1.1.1 Related Work
1.1.1.1 Section 02100 Site Preparation
1.1.1.2 Section 02200 Earthwork
1.1.1.3 Section 02070 Geosynthetic Reinforcement Walls
1.1.1.4 Section 02832 MSE Walls
1.1.1.5 Section 01270 Unit Prices

1.2 Reference Standards

1.2.1 Engineering Design
- AASHTO M288 Geotextile Specification for Highway Applications
- AASHTO LFRD, version 6, Standard Specifications for Highway Bridges
- ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- ASTM C666 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

1.2.2 Geosynthetic Reinforcement
- ASTM D 4595 Tensile Properties of Geosynthetics by the Wide Width Strip Method
- ASTM D 5262 Evaluating the Unconfined Creep of Geosynthetics
- ASTM D 6638 Grid Connection Strength (MSEU-1)
- ASTM D 6916 Grid Shear Strength (MSEU-2)
- GRI GG 1 Single Rib Geogrid Tensile Strength
- GRI GG 4 Determination of Long Term Design Strength of Geogrids
- GRI GG 5 Determination of Geogrid (soil) Pullout
- GRI GG 6 Determination of Geotextile (soil) Pullout

1.2.3 Soils
- ASTM D 698 Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort
- ASTM D 422 Gradation Analysis of Soil Particles
- ASTM D 4318 Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils
- ASTM D 51 Testing Methods for Measuring pH of Soil
- ASTM D 2487 Standard Classification of Soils (Unified Soil Classification System)

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1.2.4 Drainage Pipe

- ASTM D 3034 Specification for Type PSM Polyvinyl Chloride (PVC) pipe
- ASTM D 1248 Corrugated Plastic Pipe
- The Owner or Owner's Representative shall determine the final application if the specifications and reference documents conflict.

1.2.5 Concrete

- ACI 211 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- ACI 304 Guide for Measuring, Mixing, Transporting and Placing Concrete.
- AASHTO T-22
- AASHTO T-23
- AASHTO T-119
- AASHTO T-141
- AASHTO T-152
- AASHTO T-196

1.3 Design Submittals

1.3.1 Material installation and description data should be submitted for each product specified.

1.3.2 The MSE designs and drawings should include geosynthetic layout, bottom and top of wall elevation, drainage details and any other unique applications.

1.3.3 Design Method and Calculations should be in accordance with the AASHTO LRFD Specifications for Highways or NCMA current editions. Global stability analysis should be calculated as part of the final design.

1.3.4 Samples of the MSE units, color and texture should be submitted as per design specifications. Geosynthetic sample should also be furnished as per design.

1.3.5 All test reports should be performed by an independent laboratory.

1.3.6 Delivery, Storage and Handling

- The Contractor shall inspect all materials delivered to the site to ensure proper type and grade of materials have been received as per the project specifications.
- The Contractor shall ensure proper storage, handling and protection from damage of the materials. Damaged materials shall not be used in the construction of the Mechanically Stabilized Earth structure.
- The Contractor shall prevent excessive mud, wet concrete, and like materials from coming in contact with the wall materials.

2 MATERIALS

2.1 Concrete Mechanically Stabilized Earth (MSE) units

MSE concrete units shall be Verti-Block™ units as manufactured by licensed producer in accordance with NPCA, ASTM or AASHTO standards and conform as per project engineer specifications.

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2.1.1 Verti-Block™ units shall have a minimum 28 days compressive of equal to 4,000 psi (27.6 MPa) (or greater if specified).

2.1.2 Verti-Block™ units shall satisfy the following dimensional tolerances:
a. Height: +/- 1/8 inch (3mm)
b. Width: +/- 1/2 inch (13mm)
c. Depth: +/- 1/2 inch (13mm); excludes variable depth of the textured face

2.1.3 Color for the Verti-Block™ units shall be _____.

2.1.4 ASTM C 666 for freeze-thaw durability shall be standard for areas subject to repeated freeze-thaw cycles, or an approved DOT mix design shall be used.

2.1.5 The Verti-Block™ 2-4 units shall have a face area of 8 sq ft (.75 sq m) and Verti-Block™ 1-4 units shall have a face area of 4 sq ft (.37.5 sq m).

2.1.6 The Verti-Block™ standard unit weight (without gravel infill) is approximately 1700 lbs.

2.1.7 The Verti-Block™ units shall be sound and free of cracks, chips or other defects that may prevent the contractor from properly installing the wall units or reduce the long term strength of the wall structure.

2.1.8 Verti-Block™ capping units shall be the 6 inch solid cap unit cable attached to the unit below for a positive connection.

2.1.9 Concrete sample in accordance with AASHTO T-141, Compression test in accordance with AASHTO T-23 and AASHTO T-22, Air content testing in accordance with AASHTO T-152 or AASHTO T-196, Slump test in accordance with AASHTO T-119, 28 day testing in accordance with AASHTO T-23 and AASHTO T-22 or as specified by the project engineer.

2.2 Geosynthetic Reinforcements

2.2.1 Geosynthetic reinforcements shall be high tensile Geogrid or Geotextile manufactured for soil reinforcement applications that have been tested and have the appropriate design parameters established with the Verti-Block™ product.

2.2.2 The construction design and drawings shall show the type, strength and location of the geosynthetics. Manufactures specifications shall be used for test data and installation procedures.

2.2.3 Geosynthetics shall be evaluated in accordance with AASHTO specifications.

2.3 Foundation Soil

2.3.1 Foundation soils should be suitable, relatively undisturbed native soils approved by the design engineer or placed on a specific thickness of properly placed and compacted structural fill as recommended by the design engineer.

2.3.2 The foundation soils shall be approved by a design engineer before installing base leveling gravel.

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2.3.3 Unsuitable foundation soils shall be removed and replaced with structural fill or otherwise stabilized as specified by the design engineer.

2.4 Backfill Soil

2.4.1 Backfill soils shall be free of organic materials and other unsuitable materials.

2.4.2 Soils classifying as GP, GM, GP-GM, GW, GP-GW, SP, SM, SP-SM, SW, SW-SM or in accordance with ASTM D 2487 should be suitable. Other classifications may be acceptable upon approval from the design engineer. All backfill soils should be approved by the design engineer.

2.5 Base Leveling Materials

2.5.1 A minimum 6 inch thick crushed stone leveling pad should be used. Alternate materials such as low-strength, unreinforced concrete may be used at the discretion of the design engineer or DOT requirements.

2.5.1.1 AASHTO specifications will be followed when constructing concrete footing for DOT projects.

2.6 Drainage and Unit Infill Aggregate

2.6.1 Drainage Aggregate shall be clean crushed gravel meeting the gradation in accordance with ASTM D 448.

2.6.2 Drainage Aggregates shall be placed in all unit voids with uniform particle size less than 1" (25mm) and not more than 5% passing through the No. 200 sieve.

2.7 Drainage Pipe

2.7.1 Drainage pipe shall be perforated PVC or corrugated HDPE pipe with a minimum size of 3" in diameter.

2.8 Geotextile Fabric

2.8.1 Geotextiles, if required by the design engineer, shall be a non-woven, permeable material.

2.9 AASHTO

2.9.1 When constructing DOT projects all AASHTO and ASTM specifications should be followed unless otherwise specified by the design engineer.

3 WALL DESIGN

3.1 Design Standard

3.1.1 The wall design engineer and/or geotechnical engineer shall consider the internal, local stability, external stability, bearing capacity and global stability of the soil mass above, behind and below the wall structure.

3.1.2 Geosynthetic reinforcement vertical spacing shall not exceed 4 feet or 2 Verti-Block™ units.

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3.1.3 Geosynthetic reinforcement shall be 100% horizontal coverage parallel to the length of the wall unless specified by the design engineer.

3.1.4 If designing the Verti-Block™ wall system in accordance with the Design Manual for Mechanically Stabilized Earth walls, according to AASHTO LRFD methodology, version 6, the minimum CDR shall be a minimum of the following:

- External Stability; Base Sliding = 1.0, Eccentricity = L/3 [9/20L internal units], Bearing Capacity = 1.0, Global Stability = 1.3
- Internal Stability; Tensile Overstress = 1.0, Pullout = 1.0, Internal Sliding = 1.0
- Local Stability; Facing Shear = 1.0, Connection = 1.0

3.1.5 If designing the Verti-Block™ wall system in accordance with the Design Manual for Segmental Retaining Walls, NCMA, 3rd Edition the minimum Factors of Safety shall be:

- Static; Sliding = 1.50, Overturning = 2.00, Bearing Capacity = 2.0
- Seismic; 75 percent of static values
- Reinforcing FoS; Uncertainties = 1.50, Pullout = 1.50
- Local Stability; Shear = 1.50, Bending = 1.50

3.2 Soil Standards

3.2.1 The following soil design parameters shall be used (or specified by design engineer)

3.2.1.1 Drainage/Unit Fill;

- Soil Unit Weight = ____pcf (KN/m3),
- Friction Angle = ____degree,
- Cohesion = ____lbs/sq ft (0 kPa)

3.2.1.2 Reinforced Backfill;

- Soil Unit Weight = ____lb/cub ft (KN/m3),
- Friction Angle = ____ degree,
- Cohesion = ____ lbs/sq ft (0 kPa)

3.2.1.3 Base Leveling Pad;

- Soil Unit Weight = ____pcf (KN/cub m),
- Friction Angle = ____degree,
- Cohesion = ____lb/sq ft (0 kPa)

3.3 Project Design

3.3.1 The site grades and information will determine the length, height and overall elevations for the Verti-Block™ retaining wall requirements.

3.3.2 The design height (H) shall be measured from the top of the base leveling pad to the top of the wall cap units.

3.3.3 The slopes above and below the wall details will be on the site construction drawings.

3.3.4 The minimum embedment depth of the wall shall be H/10 but no less than 6”.

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3.3.5 Reinforcement minimum length shall be specified by the design engineer but not be less than 70% of the height of the wall (0.7H) measured from the block face.

4 CONSTRUCTION

4.1 Qualifications

4.1.1 Contractor and site supervisor shall have proven qualified experience to complete the installation of the Mechanically Stabilized Earth system.

4.2 Excavation

4.2.1 The contractor shall excavate to the lines and grades shown on the project grading plans.

4.2.2 Over excavated or filled areas shall be well compacted and inspected by a design engineer.

4.3 Foundation Preparation

4.3.1 Foundation trench shall be excavated to the dimensions indicated on the construction drawings.

4.3.2 The reinforced zone and leveling pad foundation soil shall be approved by the design engineer to ensure proper bearing strength.

4.3.3 Unsuitable soils shall be removed and replaced with structural fill.

4.3.4 Structural fill material shall be approved by the design engineer and shall be compacted to a minimum of 95% Modified Proctor dry density, before placing leveling pad. (ASTM D 1557)

4.4 Base Leveling Pad

4.4.1 The granular leveling pad shall be a minimum 6 inches thick and 1 foot wider than the depth of the wall unit and shall be placed and compacted to a minimum of 95% Modified Proctor dry density or greater.

4.4.2 The base leveling pad shall be level horizontally and back to front to ensure the first course of units are level.

4.4.3 Top of base leveling pad elevation and installation of granular materials shall be in accordance of the specifications and construction drawings. The toe of the wall burial depth shall be constructed as shown on the construction drawings.

4.4.4 A reinforced concrete footing, when used, should be placed below the frost level and constructed in accordance to the specification and construction drawings.

4.5 Units Installation

4.5.1 The first course of Verti-Block™ units shall be carefully placed on the leveling pad.

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4.5.2 The first row of units shall be level from unit to unit and from back to front.

4.5.3 A string line can be used to align a straight wall or PVC flex pipes can be used to establish smooth convex or concave curved walls.

4.5.4 Use the smooth back of the units for alignment and measuring to ensure smooth curves and straight walls.

4.5.5 The second course of units shall have the concrete connecting lugs in the unit voids and pulled backward resting the lugs against the front edge of the upper unit voids.

4.5.6 All units shall be laid snugly together and parallel to the straight or curved lines.

4.5.7 The Verti-Block™ units shall be swept clean of all dirt or rocks before installing the next layer of units or placing the geosynthetics.

4.5.8 After laying each course, perform a visual or string line straightness check.

4.6 Geosynthetic Reinforcing Installation

4.6.1 The geosynthetic reinforcement shall be installed at the wall height, horizontal location, and to the extents as shown on the design drawings..

4.6.2 The geosynthetic reinforcement shall be laid horizontally on compacted infill and the concrete Verti-Block™ units.

4.6.3 Correct orientation (roll direction) of the geosynthetic reinforcement, to ensure the principal design strength direction is perpendicular to the wall face, shall be verified by the Contractor, prior to Verti-Block™ and Unit Fill placement.

4.6.4 After the geosynthetic is installed, place the next course of Verti-Block™ units and Unit Fill.

4.6.5 The geosynthetic should then be pulled taut and free of wrinkles prior to placement of soil fill. The geosynthetic may be secured in place with staples, pins or fill. Type of geosynthetic restraint will be based on fill properties, fill placement procedures, weather conditions; or as directed by the design engineer.

4.6.6 The procedure for tensioning geosynthetic reinforcement shall be uniform throughout wall length and height.

4.6.7 Overlaps:

4.6.7.1 Overlap of the geosynthetic in the design strength direction will not be permitted. The design strength direction is that length of geosynthetic perpendicular to the wall face and shall be one continuous piece of material.

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4.6.7.2 In general, butting of adjacent roll edges of reinforcement is acceptable. If required, overlaps of adjacent rolls shall be in accordance with manufacturer's recommendations and shall occur only in the reinforced (infill) soil zone. An overlap within the Verti-Block™ Unit or Unit fill is prohibited. Geosynthetic reinforcement will be continuous throughout wall length, except for curves, see drawings

4.7 Fill Placement over Geosynthetic

4.7.1.1 Reinforced infill soil material shall be placed in maximum 12-inch compacted lifts on the geosynthetic according to the requirements of Section 4.8, or as directed by the design engineer

4.7.1.2 The geosynthetic shall be pre-tensioned by hand to remove wrinkles. Tensioning is usually facilitated by the use of steel rakes. Apply constant tension to each section of geosynthetic until soil fill has been placed. Soil fill shall be placed, spread, and compacted in such a manner that prevents the development of wrinkles and/or movement of the geosynthetic.

4.7.1.3 Only hand-operated compaction equipment shall be allowed within 3 feet of the front of wall face.

4.7.1.4 If possible, soil fill shall be placed from the wall face outward to ensure that the geosynthetic remains taut. Soil shall be placed in uniform lifts.

4.7.1.5 Tracked construction equipment shall not be operated directly on the geosynthetic. A minimum fill thickness of 8 inches is required prior to operation of tracked vehicles over the geosynthetic. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geosynthetic.

4.7.1.6 If in accordance with manufacturer's recommendations, rubber-tired equipment may pass over the geosynthetic reinforcement at slow speeds, less than 10 MPH. Sudden braking and sharp turning shall be avoided.

4.7.1.7 Surface drainage during, and after each day of construction of the wall shall be sloped away from wall face and provided to minimize water infiltration in the reinforced soil zone.

4.7.1.8 The General Contractor shall be responsible for securing the site against any water that could enter into the wall construction zone.

4.8 Drainage Gravel

4.8.1 Verti-Block™ unit voids shall be filled with a free-draining granular material as described in Section 2.6.

4.8.2 Drainage gravel shall be placed into the unit voids each course before placing the geosynthetic reinforcement layer.

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4.9 Backfill

4.9.1 The reinforced backfill materials shall be placed in maximum lifts of 12" and shall be compacted to a minimum 95% Modified Proctor density, in accordance with ASTM D 1557

4.9.2 Only hand-operated compaction equipment shall be used within 3 feet of the back of the wall.

4.9.3 Soil density testing shall not be taken within the 3 foot area.

4.9.4 The backfill shall be smooth and level so that the geosynthetic lays flat with no dips or bumps.

4.9.5 The toe of the wall shall be filled and compacted as the wall is being constructed.

4.10 Cap Installation

4.10.1 The Verti-Block™ full size cap units should be placed in the same installation procedures as the regular Verti-Block™ units.

4.10.2 A non-woven geotextile should be used as a soil separator between the final layer of backfill and drainage materials and the top soil materials to prevent fines from migrating into the drainage gravel or through the wall face.

4.10.3 A special Verti-Block™ 6" high cap can be used to complete the top of the wall. Concrete adhesive should be used to glue the cap units to the regular units.

5 CONSTRUCTION QUALITY CONTROL AND ASSURANCE

5.1 Construction Quality Control

5.1.1 The project wall installer is responsible to ensure that all installation and materials meet the quality specified in the construction drawings.

5.1.2 A qualified independent party may be responsible to verify that installation procedures have been installed in accordance with the specifications and construction drawings.

5.1.3 All site construction tolerances for vertical alignment, horizontal locations for elevations, corner and radius locations, wall batter and minimum bulging will be within AASHTO/NCMA specifications.

5.2 Quality Assurance

5.2.1 The owner is responsible to engage testing and inspection services to provide independent quality construction assurance.

5.2.2 Compaction testing of the reinforcement backfill soils shall be performed every 2 vertical feet of material installation or more frequent.

5.2.3 The tests shall be done a minimum of every 50 lineal feet along the wall at each level of testing.

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5.2.4 Testing shall not be closer than 3 feet from the back of the wall and done at a variety of locations to cover the entire reinforced soil zone.

5.2.5 Independent inspection professionals shall ensure all parameters and construction specifications have been followed in accordance to the design drawings and specifications.

6 PAYMENT

Payment for the installation of the Verti-Block™ wall shall be based on the unit price per square face foot (square face meter) of wall product installed. The shipping and delivery slips shall be verified by both Contractor and Owner or Owner representative at the time of product delivery to the site and this will be the bases of the final count or product used.

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SPECIFICATION FOR VERTI-BLOCK™
Gravity Wall
Segmental Retaining Wall (SRW) SYSTEM

1 GENERAL

1.1 Description

The work consists of supplying and installing all aspects of the Verti-Block™ Precast Segmental Retaining Wall (SRW) units as specified in the construction drawings or as established by the owner, architect or design engineer.

1.1.1 Related Work

1.1.1.1 Section 02100 Site Preparation

1.1.1.2 Section 02200 Earthwork

1.1.1.3 Section 01270 Unit Prices

1.2 Reference Standards

1.2.1 Engineering Design

- AASHTO M288 Geotextile Specification for Highway Applications
- AASHTO LFRD, version 6, Standard Specifications for Highway Bridges
- ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- ASTM C666 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

1.2.2 Soils

- ASTM D 698 Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort
- ASTM D 422 Gradation Analysis of Soil Particles
- ASTM D 4318 Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils
- ASTM D 51 Testing Methods for Measuring pH of Soil
- ASTM D 2487 Standard Classification of Soils (Unified Soil Classification System

1.2.3 Drainage Pipe

- ASTM D 3034 Specification for Type PSM Polyvinyl Chloride (PVC) pipe
- ASTM D 1248 Corrugated Plastic Pipe
- The Owner or Owner's Representative shall determine the final application if the specifications and reference documents conflict.

1.2.4 Concrete

- ACI 211 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
- ACI 304 Guide for Measuring, Mixing, Transporting and Placing Concrete.
- AASHTO T-22
- AASHTO T-23

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- AASHTO T-119
- AASHTO T-141
- AASHTO T-152
- AASHTO T-196

1.3 Design Submittals

1.3.1 Material installation and description data should be submitted for each product specified.

1.3.2 The SRW designs and drawings should include bottom and top of wall elevation, drainage details and any other unique applications.

1.3.3 Design Method and Calculations should be in accordance with the AASHTO LRFD Specifications for Highways or NCMA current editions. Global stability analysis should be calculated as part of the final design.

1.3.4 Samples of the SRW units, color and texture should be submitted as per design specifications.

1.3.5 All test reports should be performed by an independent laboratory.

1.3.6 Delivery, Storage and Handling

- The Contractor shall inspect all materials delivered to the site to ensure proper type and grade of materials have been received as per the project specifications.
- The Contractor shall ensure proper storage, handling and protection from damage of the materials. Damaged materials shall not be used in the construction of the Mechanically Stabilized Earth structure.
- The Contractor shall prevent excessive mud, wet concrete, and like materials from coming in contact with the wall materials.

2 MATERIALS

2.1 Concrete Segmental Retaining Wall (SRW) units

SRW concrete units shall be Verti-Block™ units as manufactured by licensed producer in accordance with NPCA, ASTM or AASHTO standards and conform as per project engineer specifications.

2.1.1 Verti-Block™ units shall have a minimum 28 days compressive of equal to 4,000 psi (27.6 MPa) (or greater if specified).

2.1.2 Verti-Block™ units shall satisfy the following dimensional tolerances:

a. Height: +/- 1/8 inch (3mm)
b. Width: +/- 1/2 inch (13mm)
c. Depth: +/- 1/2 inch (13mm); excludes variable depth of the textured face

2.1.3 Color for the Verti-Block™ units shall be _____.

2.1.4 ASTM C 666 for freeze-thaw durability shall be standard for areas subject to repeated freeze-thaw cycles, or an approved DOT mix design shall be used.

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2.1.5 The Verti-Block™ 2-4 units shall have a face area of 8 sq ft (.75 sq m) and Verti-Block™ 1-4 units shall have a face area of 4 sq ft (.37.5 sq m).

2.1.6 The Verti-Block™ standard unit weight (without gravel infill) is approximately 1700 lbs.

2.1.7 The Verti-Block™ units shall be sound and free of cracks, chips or other defects that may prevent the contractor from properly installing the wall units or reduce the long term strength of the wall structure.

2.1.8 Verti-Block™ capping units shall be the 6 inch solid cap unit cable attached to the unit below for a positive connection.

2.1.9 Concrete sample in accordance with AASHTO T-141, Compression test in accordance with AASHTO T-23 and AASHTO T-22, Air content testing in accordance with AASHTO T-152 or AASHTO T-196, Slump test in accordance with AASHTO T-119, 28 day testing in accordance with AASHTO T-23 and AASHTO T-22 or as specified by the project engineer.

2.2 Foundation Soil

2.2.1 Foundation soils should be suitable, relatively undisturbed native soils approved by the design engineer or placed on a specific thickness of properly placed and compacted structural fill as recommended by the design engineer.

2.2.2 The foundation soils shall be approved by a design engineer before installing base leveling gravel.

2.2.3 Unsuitable foundation soils shall be removed and replaced with structural fill or otherwise stabilized as specified by the design engineer.

2.3 Backfill Soil

2.3.1 Backfill soils shall be free of organic materials and other unsuitable materials.

2.3.2 Soils classifying as GP, GM, GP-GM, GW, GP-GW, SP, SM, SP-SM, SW, SW-SM or in accordance with ASTM D 2487 should be suitable. Other classifications may be acceptable upon approval from the design engineer. All backfill soils should be approved by the design engineer.

2.4 Base Leveling Materials

2.4.1 A minimum 6 inch thick crushed stone leveling pad should be used. Alternate materials such as low-strength, unreinforced concrete may be used at the discretion of the design engineer or DOT requirements.

2.4.1.1 AASHTO specifications will be followed when constructing concrete footing for DOT projects.

2.5 Drainage and Unit Infill Aggregate

2.5.1 Drainage Aggregate shall be clean crushed gravel meeting the gradation in accordance with ASTM D 448.

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2.5.2 Drainage Aggregates shall be placed in all unit voids with uniform particle size less than 1" (25mm) and not more than 5% passing through the No. 200 sieve.

2.6 Drainage Pipe

2.6.1 Drainage pipe shall be perforated PVC or corrugated HDPE pipe with a minimum size of 3" in diameter.

2.7 Geotextile Fabric

2.7.1 Geotextiles, if required by the design engineer, shall be a non-woven, permeable material.

2.8 AASHTO

2.8.1 When constructing DOT projects all AASHTO and ASTM specifications should be followed unless otherwise specified by the design engineer.

3 WALL DESIGN

3.1 Design Standard

3.1.1 The wall design engineer and/or geotechnical engineer shall consider the external stability, bearing capacity and global stability of the soil mass above, behind and below the wall structure.

3.1.2 The minimum design Factors or Safety shall be:
- Static; Sliding = 1.50, Overturning = 2.00, Bearing Capacity = 2.0
- Seismic; 75 percent of static values

3.2 Soil Standards

3.2.1 The following soil design parameters shall be used (or specified by design engineer)

3.2.1.1 Drainage/Unit Fill;
- Soil Unit Weight = ____pcf (KN/m3),
- Friction Angle = ____degree,
- Cohesion = ____lbs/sq ft (0 kPa)

3.2.1.2 Reinforced Backfill;
- Soil Unit Weight = ____lb/cub ft (KN/m3),
- Friction Angle = ____ degree,
- Cohesion = ____ lbs/sq ft (0 kPa)

3.2.1.3 Base Leveling Pad;
- Soil Unit Weight = ____pcf (KN/cub m),
- Friction Angle = ____degree,
- Cohesion = ____lb/sq ft (0 kPa)

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3.3 Project Design

3.3.1 The site grades and information will determine the length, height and overall elevations for the Verti-Block™ retaining wall requirements.

3.3.2 The design height (H) shall be measured from the top of the base leveling pad to the top of the wall cap units.

3.3.3 The slopes above and below the wall details will be on the site construction drawings.

3.3.4 The minimum embedment depth of the wall shall be H/10 but no less than 6”.

4 CONSTRUCTION

4.1 Qualifications

4.1.1 Contractor and site supervisor shall have proven qualified experience to complete the installation of the Segmental Retaining Wall system.

4.2 Excavation

4.2.1 The contractor shall excavate to the lines and grades shown on the project grading plans.

4.2.2 Over excavated or filled areas shall be well compacted and inspected by a design engineer.

4.3 Foundation Preparation

4.3.1 Foundation trench shall be excavated to the dimensions indicated on the construction drawings.

4.3.2 The reinforced zone and leveling pad foundation soil shall be approved by the design engineer to ensure proper bearing strength.

4.3.3 Unsuitable soils shall be removed and replaced with structural fill.

4.3.4 Structural fill materials shall be approved by the design engineer and shall be compacted to a minimum of 95% Modified Proctor dry density or greater, before placing leveling pad. (ASTM D 1557)

4.4 Base Leveling Pad

4.4.1 The granular leveling pad shall be a minimum 6 inches thick and one foot wider than the depth of the wall unit and shall be placed and compacted to a minimum of 95% Modified Proctor dry density or greater.

4.4.2 The base leveling pad shall be level horizontally and back to front to ensure the first course of units are level.

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4.4.3 Top of base leveling pad elevation and installation of granular materials shall be in accordance of the specifications and construction drawings. The toe of the wall burial depth shall be constructed as shown on the construction drawings.

4.4.4 A reinforced concrete footing, when used, should be placed below the frost level and constructed in accordance to the specification and construction drawings.

4.5 Units Installation

4.5.1 The first course of Verti-Block™ units shall be carefully placed on the leveling pad.

4.5.2 The first row of units shall be level from unit to unit and from back to front.

4.5.3 A string line can be used to align a straight wall or PVC flex pipes can be used to establish smooth convex or concave curved walls.

4.5.4 Use the smooth back of the units for alignment and measuring to ensure smooth curves and straight walls.

4.5.5 The second course of units shall have the concrete connecting lugs in the unit voids and pulled backward resting the lugs against the front edge of the upper unit voids.

4.5.6 All units shall be laid snugly together and parallel to the straight or curved lines.

4.5.7 The Verti-Block™ units shall be swept clean of all dirt or rocks before installing the next layer of units.

4.5.8 After laying each course, perform a visual or string line straightness check.

4.6 Fill Placement

4.6.1.1 Infill soil material shall be placed in maximum 12-inch compacted lifts according to the requirements of Section 4.8, or as directed by the design engineer

4.6.1.2 Only hand-operated compaction equipment shall be allowed within 3 feet of the front of wall face.

4.6.1.3 Soil shall be placed in uniform lifts.

4.6.1.4 If in accordance with manufacturer's recommendations, rubber-tired equipment may pass over the backfill zone at slow speeds, less than 10 MPH. Sudden braking and sharp turning shall be avoided.

4.6.1.5 Surface drainage during, and after each day of construction of the wall shall be sloped away from wall face and provided to minimize water infiltration in the backfill zone.

4.6.1.6 The General Contractor shall be responsible for securing the site against any water that could enter into the wall construction zone.

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4.7 Drainage Gravel

4.7.1 Verti-Block™ unit voids shall be filled with a free-draining granular material as described in Section 2.6.

4.7.2 Drainage gravel shall be placed into the unit voids each course before moving on to the next course.

4.8 Backfill

4.8.1 The backfill materials shall be placed in maximum lifts of 12" and shall be compacted to a minimum 95% Modified Proctor density, in accordance with ASTM D 1557

4.8.2 Only hand-operated compaction equipment shall be used within 3 feet of the back of the wall.

4.8.3 Soil density testing shall not be taken within the 3 foot area.

4.8.4 The backfill shall be smooth and level.

4.8.5 The toe of the wall shall be filled and compacted as the wall is being constructed.

4.9 Cap Installation

4.9.1 The Verti-Block™ full size cap units should be placed in the same installation procedures as the regular Verti-Block™ units.

4.9.2 A non-woven geotextile should be used as a soil separator between the final layer of backfill and drainage materials and the top soil materials to prevent fines from migrating into the drainage gravel or through the wall face.

4.9.3 A special Verti-Block™ 6" high cap can be used to complete the top of the wall. Concrete adhesive should be used to glue the cap units to the regular units.

5 CONSTRUCTION QUALITY CONTROL AND ASSURANCE

5.1 Construction Quality Control

5.1.1 The project wall installer is responsible to ensure that all installation and materials meet the quality specified in the construction drawings.

5.1.2 A qualified independent party may be responsible to verify that installation procedures have been installed in accordance with the specifications and construction drawings.

5.1.3 All site construction tolerances for vertical alignment, horizontal locations for elevations, corner and radius locations, wall batter and minimum bulging will be within AASHTO/NCMA specifications.

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5.2 Quality Assurance

5.2.1 The owner is responsible to engage testing and inspection services to provide independent quality construction assurance.

5.2.2 Compaction testing of the reinforcement backfill soils shall be performed every 2 vertical feet of material installation or more frequent.

5.2.3 The tests shall be done a minimum of every 50 lineal feet along the wall at each level of testing.

5.2.4 Testing shall not be closer than 3 feet from the back of the wall and done at a variety of locations to cover the entire reinforced soil zone.

5.2.5 Independent inspection professionals shall ensure all parameters and construction specifications have been followed in accordance to the design drawings and specifications.

6 PAYMENT

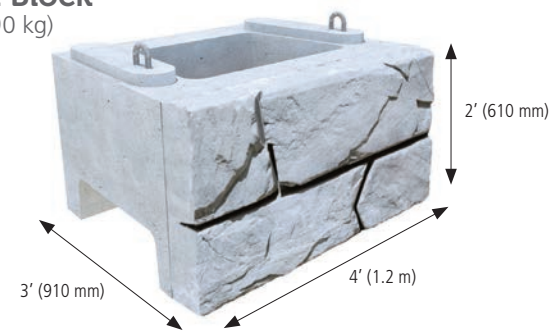
Payment for the installation of the Verti-Block™ wall shall be based on the unit price per square face foot (square face meter) of wall product installed. The shipping and delivery slips shall be verified by both Contractor and Owner or Owner representative at the time of product delivery to the site and this will be the bases of the final count or product used.

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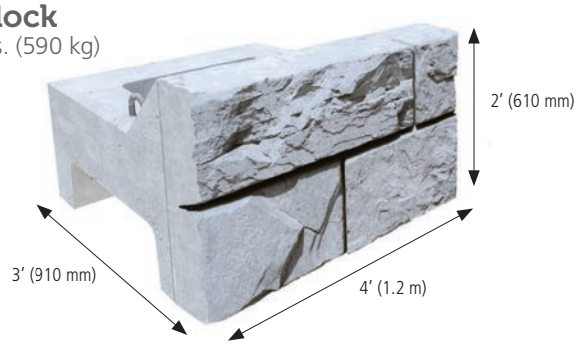
Verti-Block Units

Verti-Block is available in a range of shapes to accommodate all your landscape design needs

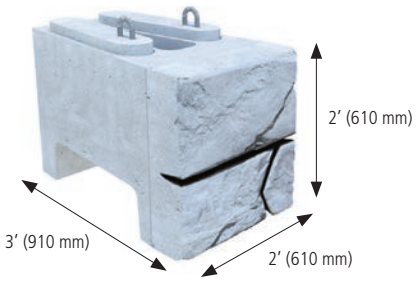
Standard Block
1,755 lbs. (790 kg)



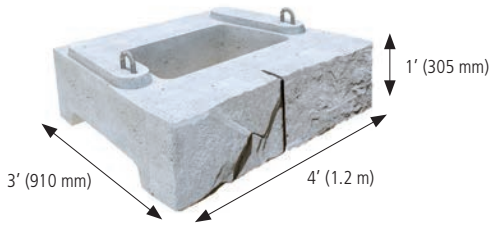
Top Block
1,308 lbs. (590 kg)



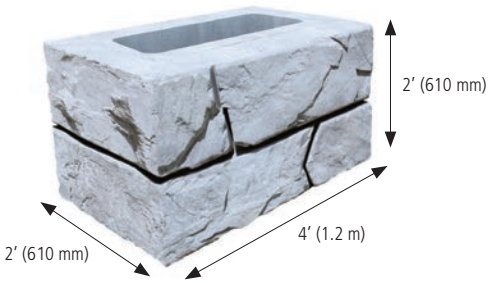
Half Block
1,066 lbs. (480 kg)



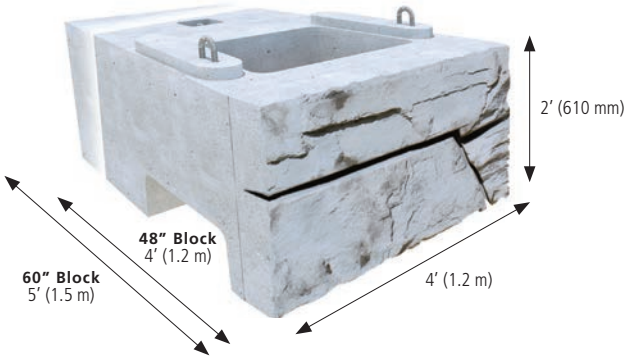
Half Step Block
973 lbs. (440 kg)



Corner Block
1,596 lbs. (720 kg)



Mass Extender
48″ Block 2,674 lbs. (1,210 kg)
60″ Block 3,509 lbs. (1,590 kg)



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Verti-Block Units

Recognized worldwide for outstanding aesthetics and a patented system that produces top-quality construction materials, Verti-Block continues to help contractors, developers, and property owners with smart precast solutions.

Verti-Block may be purchased through a local, licensed Verti-Block manufacturer. Please call 801-571-2028 to find a producer near you.