

Specifications

Geofirma Retaining Wall System

Part 1 General

1.01 Summary

A. Section Includes

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

B. Related Sections

1. Section:(____ - ____) -Geosynthetic Wall Reinforcement
2. Section:(____ - ____) -Backfill (if required)
3. Section:(____ - ____) -Drainage Fill (if required)
4. Section:(____ - ____) -Landscaping Turf (if required)
5. Section:(____ - ____) -Drain Tile (if required)

1.02 References

A. American Society of Testing and Materials

1. ASTM C90-90; Hollow Load Bearing Masonry Units
2. ASTM C666-90; Mod.;Test Method for Resistance of Concrete to Rapid Freezing and Thawing (modified to 50 cycles)
3. ASTM C698-91; Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort
4. ASTM D1557-91; Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort
5. ASTM D448-86; Standard Specification for sizes of Aggregate for Road and Bridge Construction
6. ASTM 4253,D4254; Standard Test Methods for Max.and Min. Index Density
7. ASTM C33-90; ;Standard Specification for Concrete Aggregates

1.03 Submittals

A. Submit the following in accordance with Section 01300:

1. Manufacturer's literature: Materials description and installation instructions.
2. Shop drawings: Retaining wall system design including wall heights, reinforcement and drainage provisions.
3. Samples
 - a. Furnish one (1) unit in the color and face pattern specified if

requested by the Architect. If approved, unit may be used in the finished work.

b. 12" square or larger piece of geotextile fabric reinforcing specified

4. Manufacturer's certification and test reports stating moisture absorption and compressive strength in accordance with ASTM C90-90 requirements in Section 1.02.

5. Substitutions: Substitutions shall be submitted for approval 10 days prior to bid openings for acceptance.

1.04 Delivery, Storage and Handling

A. The Contractor shall check the materials upon delivery to assure that proper material has been received.

B. Deliver and handle materials in such manner as to prevent damage. Store above ground on wood pallets and blocking. Remove damaged or otherwise unsuitable material, when so determined, from the site.

1. Faces of the concrete units shall be free of chips, cracks, and stains.

2. The Contractor shall prevent excessive mud, wet cement, epoxy and like material, which may affix themselves, from coming in contact with the materials.

1.05 Extra Materials

A. Furnish Owner with three (3) replacement units identical to those installed on the Project.

1.06 Definitions

A. Geosynthetics are a high density polyethylene, polypropylene or polyester material specifically fabricated for use as a soil reinforcement.

B. Concrete retaining wall units are as detailed on the drawings and are specified under Section 02276: Geofirma Retaining Wall Units.

C. Free draining aggregate is material used around and behind the concrete units.

D. Backfill is the soil which is used as fill behind the free draining aggregate and within the reinforced soil mass if applicable.

E. Foundation soil is the soil mass supporting the leveling pad and reinforced zone of the retaining wall system.

Part 2 Products

2.01 Materials

A. High strength density concrete units, freeze-thaw resistant with rear alignment flange providing a 1-1/8" set back from plane with each course, Geofirma Retaining Wall Units shall be supplied by Landscape and Patio Supply 937-885-1948

1. Concrete wall units shall meet requirements of ASTM C90-90 except compressive strength shall be an average minimum of 3,000 psi and

the maximum water absorption shall be limited to an average 7.0 %.

2. The concrete shall have adequate freeze thaw resistance in accordance with ASTM C666-90, modified to 50 cycles.

3. Exterior dimensions may vary. Concrete wall units are required to have a minimum of 0.67 square foot of face area.

4. Color as selected by Architect from manufacturer's standard selection.

5. Face pattern: Geometry: Beveled or Straight

Texture: Split Face

6. The concrete units shall be positively interlocked.

7. Geofirma unit dimensions shall not vary more than + 1/16 inches from that in any molded dimension.

B. Geosynthetic reinforcement: Polyester woven fiber geogrid or premium polypropylene woven geotextile for use as soil reinforcement.

C. Base: Material for footing shall consist of compacted sands, gravel and/or concrete as shown on the construction drawings. A minimum of 6 inches of compacted base is required.

D. Drainage aggregate: Fill between units shall consist of free-draining, course aggregate in accordance with ASTM D448-86; Standard Classification for Sizes of Aggregate for Road and Bridge Construction, designation 57, 67, 7, or 8. Drain tile shall be used if required by project engineer.

E. Backfill: Material shall be approved as suitable for project by a registered professional engineer. Unsuitable soil as determined by the Engineer for backfill shall not be used within the reinforced soil mass.

1. Where additional fill is required, the Contractor shall submit sample and specifications to the Engineer to determine if acceptable.

2. Cap backfill with impervious material.

Part 3 Execution

3.01 Examination

A. Examine the areas and conditions under which the retaining wall is to be erected and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 Foundation Excavation

A. The Contractor shall excavate to the lines and grades shown on the construction drawings. Overexcavation shall not be paid for and replacement with compacted fill and/or wall system components will be required at the Contractor's expense. The Contractor shall be careful not to disturb base beyond the lines shown.

3.03 Foundation Preparation

A. Foundation soil shall be excavated as required for footing or base dimension shown on the construction drawings, or as directed by Engineer.

B. Foundation soil shall be examined by the Engineer to ensure that the actual foundation soil strength meets or exceeds assumed design

strength meets or exceeds assumed design strength. Soil not meeting the required strength shall be removed and replaced with acceptable material.

C. Over-excavated areas shall be filled with compacted backfill material.

D. Foundation soil shall be proof-rolled prior to fill and geogrid placement.

3.04 Base Course Preparation

A. Base material shall be placed as shown on the construction drawings with a minimum thickness of 6 inches.

B. Base materials shall be installed upon undisturbed soils.

C. Material shall be compacted so as to provide a level, hard surface on which to place the first course of units. Compaction will be performed to specifications as required by the project architect or engineer.

D. Base materials shall be prepared to ensure complete contact of retaining wall unit with base. Gaps shall not be allowed.

E. Base materials shall be to the depths and widths shown. Where a reinforced footing is required, placed below the frost line.

3.05 Erection

A. Erect units in accordance with manufacturer's recommendations and as specified herein.

B. First course of concrete wall units shall be placed on the prepared base. Units shall be checked for level and alignment. The top of all units in base course shall be the same elevation.

C. Ensure that units are in full contact with base.

D. Concrete wall units shall be placed side by side for full length of wall alignment. Alignment may be done by using a string line or offset of wall line.

E. Fill all voids between and within concrete wall units with free-draining aggregate.

F. A minimum of 12 inches of free-draining aggregate shall be placed behind the concrete wall units.

G. Remove all excess fill from top of units and install next course. Ensure drainage aggregate and backfill are compacted before installation of next course.

H. Lay each course with the lip of the units placed against the back of the preceding course. Pull units forward as far as possible. Backfill and compact soil behind the units in maximum 6 inch lifts. Repeat procedure to the top of the wall.

I. Install geosynthetic reinforcement in accordance with geosynthetic reinforcement manufacturer's specifications and as per approved engineered plans and specifications.

3.06 Cap Unit Installation

A. Apply construction adhesive to the top surface of the unit below and place the cap unit into desired position.

- B. Cap units may need to be cut to maintain the proper fit.
- C. Backfill and compact to finish grade.

3.07 Adjusting and Cleaning

- A. Damaged units should be replaced with new units during construction.
- B. Contractor shall remove debris caused by this construction and leave adjacent paved areas broom clean.

3.08 Measurement and Payment

- A. Measurement of concrete retaining wall is on a square foot basis computed on the total area of wall. Area is taken from the top of the footing to the top of wall, times the applicable length of section.
- B. Payment for the wall will be made on a square foot basis at the contract unit price.
 - 1. Payment shall be considered full compensation for all labor, materials and equipment to install units, drainage fill, back fill, footings and cleaning.
 - 2. Quantities may vary from that shown on construction drawings depending on existing topography. Changes to the total quantity of materials will be at the contract unit price bid.
 - 3. Square footage of wall shall be computed by measuring the total square foot of wall face area measured from the top of the foundation leveling pad and to the top of wall elevation as shown on the plans.

Concrete Interlocking Turfstones

Part 1 General

1.01 Section Includes

- A. Furnish and place sand laying course.
- B. Furnish and install concrete interlocking turfstone in the quality, shape, thickness and color as specified.
- C. Furnish and install all accessory items as required by the Contract.

1.02 Related Sections

- A. Section:(___ - ___) -Preparation of sub-base
- B. Section:(___ - ___) -Furnish and install base course materials.
- C. Section:(___ - ___) -Grass seeding and installation of topsoil in turfstone.

1.03 Submittals

- A. Manufacturer's product data.
- B. Documentation of installer's experience.
- C. Manufacturer's installation instructions.

D. Substitutions: Substitutions shall be submitted 10 days prior to bid opening for acceptance.

1.04 Quality Assurance

A. Manufacturer: Company specializing in the manufacturing of concrete interlocking turfstone for a period of five (5) years.

B. Installer: Company specializing in the installation of concrete interlocking turfstone with three (3) years documented experience.

1.05 Mock-Ups

A. Provide mock-ups of turfstone under the provisions of Section [01400] [01405]

B. Size of mock-ups shall be determined based on extent of pattern to be adequately shown.

1.06 Delivery, Storage and Handling

A. Deliver turfstones on pallets and bound in such a manner that no damage occurs during shipping, handling, unloading, and storage.

1.07 Project Conditions

A. Install turfstones only under conditions stipulated in manufacturer's instructions.

1.08 Sequencing and Scheduling

A. Coordinate installation of pavers with work specified in Section[].

1.09 Warranty

A. Installation:

1. Installer shall provide a one(1) year written guarantee.

B. Turfstones

1. Manufacturer shall provide a one(1) year written guarantee against latent manufacturing defects.

Part 2 Products

2.01 Manufacturer

A. Turfstone units shall be supplied by Landscape & Patio Supply. Centerville, OH (937) 885-1948

B.

1. Style: Turfstone

2. Thickness: 4"(10cm) and 8 cm

3. Color: Pewter (Natural Gray).

2.02 Materials

A. Turfstone:

1. Cementitious Materials:

a. Portland Cements shall conform to ASTM Specification C-150.

2. Aggregates:

a. Aggregates shall conform to ASTM Specification C-33 for Normal Weight Concrete Aggregate (no expanded shale or lightweight aggregates), except that grading requirements shall not necessarily apply.

3. Other Materials:

a. Coloring pigments, air entraining agents, integral water repellants, finely ground silica, etc., shall conform to ASTM standards where applicable, or shall be previously established as suitable for use in concrete.

B. Sand Laying Course:

1. The sand laying course shall be a well-graded, clean, washed sand with 100% passing a 3/8" sieve size and a maximum of 3% passing

a No. 200 sieve size. Limestone screenings shall not be used.

2. The sand laying course is the responsibility of the turfstone installer.

C. Edge Restraint:

1. All edges of the installed turfstone shall be restrained. The type of edge restraint shall be approved at locations as notes on plans.

2. Edge restraint can be:

a. Buildings

b. Concrete curb or sidewalk (cast-in-place)

c. Other suitable methods of preventing movement of edge stones.

2.03 Physical Requirements

A. Compressive Strength:

1. At the time of delivery to the work site, the average compressive strength shall not be less than 4,000 psi with no individual strength less than 3,000 psi, with testing procedures in accordance with ASTM Standard C-140.

B. Absorption:

1. The average absorption shall not be greater than 7% with no individual unit absorption greater than 10%.

C. Proven Field Performance:

1. Satisfying field performance is indicated when units similar in composition, and made with the same manufacturing equipment as those to be supplied to the Owner, do not exhibit objectional deterioration after at least one (1) year.

2.04 Visual Inspection

A. All units shall be sound and free of defects that would interfere with the proper placing of unit or impair the strength or permanence of the construction.

B. Minor cracks incidental to the usual methods of manufacture, or chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection.

2.05 Sampling and Testing

A. Manufacturer shall provide access to lots ready for delivery to the Owner or his authorized representative for testing in accordance with ASTM C-140 for sampling of material prior to commencement of paver placement.

B. Manufacturer shall provide a minimum of three (3) years testing backup data showing manufactured products that meet and exceed ASTM 936- 82 when tested in compliance with ASTM C-140.

C. Sampling shall be random with a minimum of nine (9) specimens per 20,000 sq. ft. per product shape and size, with repeated samples taken every additional 20,000 sq. ft. or a fraction thereof.

2.06 Rejection

A. In the event the shipment fails to conform to the specified requirements, the manufacturer may sort it, and new test units shall be selected at random by the Owner from the retained lot and tested at the expense of the manufacturer. If the second set of test units fails to conform to the specified requirements, the entire lot shall be rejected.

2.07 Expense of Tests

A. The expense of inspection and testing shall be borne by the Owner.

Part 3- Execution

3.01 Preparation

A. A suitable base shall be prepared as specified in related sections of this specification.

B. The base course shall be shaped to grade and cross section with an allowable tolerance of 1/4" (5mm).

C. The prepared base shall be 4" to 4-1/2" below final grade for the 4" (10 cm) turfstone.

3.02 Sand Laying Course

A. Contractor shall inspect and approve the finished base course prior to placement of the sand laying course.

B. Spread the sand evenly over the area to be paved.

C. Screed the sand to a level that will produce a 1/2" thickness when the turfstones have been placed.

D. In addition, provide the proper level of sand such that the final elevation of turfstones will be slightly higher than the adjacent curb, gutters, other paving, etc. to allow for any minor settling that may occur within the base.

E. Do not disturb this sand laying course once screeding and leveling to the desired elevation is achieved.

3.03 Placement

A. The turfstones shall be placed in the approved pattern as noted or shown on the drawings. (Note: Herringbone is recommended for vehicular traffic).

B. The turfstones shall be placed in such a manner that the desired pattern is maintained.

C. Joints between turfstones on average shall be between 1/16 in. and 3/16 in.

D. Use string lines to hold all patterns true.

E. The gaps at the edge of the turfstone surface shall be filled with standard turfstones cut to fit.

F. The cutting of stones, using a double-headed breaker or a masonry saw shall leave a clean edge.

G. Apertures of the turfstones shall be filled with the designated top soil to within 1/2" of top, seeded and maintained as per specifications.

H. Upon completion of work covered in this section, the Contractor shall clean up all work areas by removing all debris, surplus material and equipment from the site.