

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes furnishing and installation of modular interlocking concrete masonry units bearing the TERRASTOP® denomination, together with all reinforcement and related earthwork as specified in the construction documents.

1.2 DEFINITIONS

- A. **Modular Unit** - A concrete wall interlocking element, machine made from portland cement, water and aggregates.
- B. **Drainage Layer** - Stone aggregate which is placed in the backfill, immediately behind the modular concrete units to facilitate drainage.
- C. **Structural Geogrid** - Structural fabric formed by a regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock or earth and function primarily as tensile reinforcement.
- D. **Reinforced Backfill** - Compacted soil which is placed within the backfill volume reinforced by the structural geogrid as outlined on the plans.

1.3 SUBMITTALS

- A. **Samples:** Submit three samples not less than 4"x4"x8" in size of each selected color for review and acceptance by architect.
- B. **Shop Drawings:** Submit TERRASTOP® work plans prepared by a registered architect or engineer. The engineering designs shall be performed in accordance with TERRASTOP® published Design Manual and with National Concrete Masonry Association (NCMA) Design guidelines for Segmental Retaining Walls (SRW's) using the following minimum safety factors: 1.5 for tension, 1.5 for external sliding and 2.0 for overturning. The contractor shall submit the construction drawings and design calculations to the architect/ engineer of record for approval prior to construction.
- C. **Quality Control:** TERRASTOP® interlocking concrete masonry units shall bear testing certification from a recognized laboratory, corresponding to a minimum compressive strength of 4,000 psi and all other quality control requirements established by the TERRASTOP® System specifications.

1.4 JOB MOCK-UP

- A. Upon the request of the project architect, and prior to construction of walls using the interlocking concrete masonry units hereunder, the Contractor shall erect a mock-up using materials and construction specified for the final work. This mock-up shall show the features specified and shall be built at the site location directed by the architect as part of the structure, constructed in full thickness and approximately 4' long. Mock-up shall be large enough to illustrate the proposed color range, textures and workmanship to be expected in the complete work.

1.5 DELIVERY, STORAGE & HANDLING

A. **Storage and Protection:**

1. Store modular concrete units above ground on level platforms which allow air circulation under stacked units.
2. Prevent excessive contact with mud, wet cement and similar substances that may adhere to the modular wall units.
3. Protect geogrid materials from freezing and from contact with materials or chemicals which may impair their strength and/or anchorage capacity.

PART 2 - PRODUCTS

2.1 MODULAR UNITS

- A. **Landscaping walls** shall be constructed of solid, interlocking concrete masonry units meeting the specifications of TERRASTOP® System 3, as currently published by the Rapid Building Systems Division of Synthesis International, Inc., PO Box 3335, Reston, VA 20195, (tele) 703.471.4082, (fax) 703.471.4083.
- B. **Material Requirements:** Landscaping wall units shall meet all applicable requirements of the NCMA for segmental retaining walls (SRW) and as follows.
1. Interlocking concrete TERRASTOP® units shall conform to the Specifications of ASTM C-1372, as applicable for Normal Weight Segmental Retaining Wall Units, manufactured with aggregates classified as ASTM-C 33.
 2. Compressive Strength of modular units at 28-days from date of manufacture shall not be less than 4,000 psi. (three (3) unit average)
 3. Absorption: 8 percent maximum (6 percent in northern states) for standard weight aggregates.
 4. Integral pigments shall not exceed 10% of the cement weight in the mix.
 5. Minimum gravity Wall Weight attainable, without the use of site-applied wall fills of any type, shall be 180 lb. per square ft. of wall face area.
 6. TERRASTOP® units shall contain a parallel set of two continuous two-way interlock keys at every course, each providing a minimum shear capacity of 10,000 lb. per foot of wall length in either direction normal to said length, without the use of dowels, pins, or inserts of any kind.
 7. Modular Interlocking Unit characteristics:
 - a) Unit exposed face area = 32 in².
 - b) Unit dimensions: 4" high x 8" wide x 16" deep.
 - c) Unit weight: 40 pounds.
 - d) Units per square foot: 4.5.
 - e) Wall thickness: 16 inches.
 8. Wherever applicable, grout for piers and bond beams within TERRASTOP® walls shall meet requirements of ASTM-C476, and reinforcing steel those of ASTM of A615 or A616.

C. Special Features:

1. Modular Interlocking Units shall feature architecturally finished faces on two opposite sides.
2. The interlocking TERRASTOP® stretcher (common) units shall contain concealed vertical and horizontal drainage grooves providing a continuous network of weeping channels for moisture disposal that obviates the requirement of drainage fill stones.
3. Unit interlock shall permit construction of zero batter (vertically plumb) walls, as well as inclined walls, and shall also allow step-backs in 4" increments at any course.
4. Integral unit interlock will be configured to allow building of curved walls with minimum concave and convex radii of 9'-0" (System 3). Unit interlock will also permit full engagement and continuous, non-concentrated mechanical connection of geogrid to wall without the use of pins or inserts.
5. TERRASTOP® landscape concrete wall units shall be designed to permit the modular execution of fully interlocked 90° corners with staggered (running bond) courses, through the use of standard system units, as detailed in *TERRASTOP® System 3 Design Manual*.

D. Architectural Requirements: TERRASTOP® retaining wall assemblies shall conform to the following architectural requirements:

1. **Finish:** Contrasting (rock/brick), architectural concrete block textures available on opposite unit faces, suitable for reversible exposure.
2. **Bond:** Running bond with vertical joints nominally located at midpoint of previous course units.
3. **Surface Quality:** Exposed surfaces of units shall be free of chips, cracks or other imperfections noticeable from a distance of 20' under diffuse light.
4. **Color:** As selected by architect from manufacturer's standard color palette.

2.2 BASE PAD MATERIALS

- A. Leveling pad material shall consist of a 3/4 inch maximum diameter crushed stone base or non-reinforced concrete as shown on the construction drawings. The leveling pad shall be a minimum of 6 inches thick. As an option, lean concrete may be used with a compacted granular base for a total thickness of 12 inches.

2.3 DRAINAGE LAYER

- A. Drainage layer behind the wall shall consist of 3/4 inch ϕ maximum free draining, clean, crushed stone or crushed gravel. Drainage layer shall extend behind the wall a minimum of 8 inches to within 12 inches of final grade above.

2.4 BACKFILL

- A. Backfill shall exclude high expansion clays, debris and organic soils per *TERRASTOP® Backfill Soil Guidelines*. Additionally, aggregate content for Reinforced Backfill shall be limited to 3/4 inch maximum size.

2.5 GEOGRID REINFORCEMENT

- A. **REINFORCEMENT:** Geogrid utilized to transfer lateral forces from TERRASTOP® walls to earth anchorage, shall consist of a polyethylene or polyester, biaxial open grid, with a minimum tensile strength of 1,600 lb/ft in the main direction - i.e. perpendicular to the length of the wall - and manufactured specifically as a soil reinforcement product.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Excavate to the elevations and profiles shown on the drawings, and as required by OSHA regulations, but not less than 12" below finish grade, as wall Base does not normally require installation below frost line. Base for the Modular Interlocking Wall Units shall be granular pad, as described in 2.2 above, installed over undisturbed soil of appropriate bearing capacity. Use TERRASTOP® integral footings whenever required to distribute wall loads to correspond with soil bearing capacity.

3.2 BASE LEVELING PAD

- A. Leveling pad materials shall be placed to the lines and the grades indicated on the Contract Drawings. Secure acceptance of geotechnical engineer prior to placement of leveling materials or fill soils.
- B. Soil leveling pad materials shall be compacted by means of mechanical plate compactor.
- C. Leveling pad shall be prepared to ensure full contact with and support of the bottom surface of the modular units.

3.3 INSTALLATION - MODULAR CONCRETE UNITS

- A. **Start wall construction at lowest grade point of wall section being built.** Integral wall footing units shall be placed as shown on the drawings, and for retaining walls, battered to counteract initial wall rotation at 1/8" to 1/4" per foot towards backfill depending on wall height. Use rubber mallet to seat and level each unit on granular foundation pad, and to align engagement of interlock grooves.
- B. Starting at corners or piers, proceed with installation of wall units while checking level in the longitudinal and transverse directions for each unit, taking care to brush debris from bed joints to ensure that male/female interlocks are completely engaged. Allow +/- 1/16" play between vertical joint surfaces to align each succeeding course so that the head joints coincide with the center of the preceding course units. (Running bond pattern)
- C. When using reinforced piers or bond beams, install deformed vertical bar reinforcement as called for, and fill cavity with grout.
- D. Top wall structurally with 4" high TERRASTOP® solid, interlocking cap units set on two continuous beads of all-weather adhesive. For installations receiving rain runoff, 3 inch Ø PVC weep shall be installed at wall face grade level at intervals not exceeding 20 ft., and a perforated plastic drain pipe encased in filter fabric must be provided longitudinally at the base of the wall as shown on the drawings.

- D. (Cont'd.) Minimum perforated drain diameter shall be 4", and pipe must slope at least at 1/4" per foot with unrestricted flow towards outlets and suitable discharge means, away from the wall and its backfill.

3.4 INSTALLATION - STRUCTURAL GEOGRID

- A. **INSTALLATION:** Geogrid layers shall be cut to the lengths called for in the plans taking special care to ensure that main direction of grid strands (higher tensile strength) is perpendicular to wall length. Geogrid shall be laid on compacted fill as indicated on the drawings, and connected to TERRASTOP® by a minimum embedment of 12" into bed joints, taking care to conform geogrid around TERRASTOP® interlock keys in order to produce a continuous mechanical anchorage along the entire length of the wall joint.

Maintain geogrid taut before backfill by pulling free end over temporary stakes, and by rolling it over fill, while providing a shallow depression for stretching each layer with the weight of the succeeding layer of soil.

Inspect and verify adequate grid tautness prior to installation of fill over each layer. Geogrid layers with slack shall be reset and re-tensioned, before proceeding further.

3.5 INSTALLATION - REINFORCED BACKFILL

- A. Backfill starting with drain fill layer directly behind the TERRASTOP® wall, taking care to avoid any movement in the previously installed geogrid layer, which may result in loss of tautness. Do not allow vehicular traffic over exposed geogrid. Use of wheeled and skid-steer equipment on reinforced backfill shall not be permitted. In general, **heavy equipment should be kept at least 8 feet away from load side of retaining walls.**
- B. Backfill every two courses using site soil selected at the discretion of the Engineer, and compact in 6" to 8" increments using a manually operated plate tamper able to attain a minimum soil density of 95% Standard Proctor (ASTM D 698) within a moisture content of 2% optimum, and leaving a vertical layer of granular drain layer in contact with the wall inside face as shown on the shop drawings. A geotextile filter fabric may be installed in contact with the buried face of the wall, in front of the drain fill per plans.

3.6 STORM WATER PRECAUTIONS

- A. **SRW's are not intended to act as storm water management structures.**
The reinforced backfill will not function properly when saturated by surface water. Contractor must therefore grade behind the wall, including during wall construction, so as to divert ground water away from the placed backfill through swales and sloping. Ensure that any storm water flow on the completed backfill is isolated by an impermeable top layer and/or grade sloping.

3.7 FINISH AND CLEANUP

- A. After completion of backfill, inspect walls to verify that all units are fully locked in place, and that caps, steps, corners and ends are securely adhered and properly terminated as detailed in the plans. The drainage weeps, pipe outlets and completed installation may then be cleaned of grout droppings, soil and other obstructions.
- B. Remove all stakes, poles, strings, and equipment; clean up debris, refuse and surplus materials, and remove from the premises.

END OF SECTION