SECTION 02834

MODULAR CONCRETE RETAINING WALLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Modular concrete retaining wall units to the lines and grades designated on the construction drawings and as specified herein.

1.2 RELATED SECTIONS

A. Section 02300 - Earthwork: Excavating, backfilling and compacting.

B. Section 02900 - Planting.

C. Section 02620 - Subdrainage.

1.3 UNIT PRICES

A. Measurement of segmental retaining wall shall be on an installed square foot basis computed on the total face area of installed wall. Face area is from bottom of base course to top of wall.

B. Payment for retaining wall will be made on a square foot basis at the Contract Unit Price.
   1. Payment shall be considered full compensation for labor, materials, equipment, and testing required to install retaining wall in accordance with drawings and these specifications.
   2. Quantities may vary from that shown on drawings, depending on existing topography; change to total quantity of wall face area will be paid or withheld at the Contract Unit Price.

1.4 REFERENCES

A. ASTM C 90 - Standard Specification for Load-Bearing Concrete Masonry Units.

B. ASTM C 140 - Test Methods of Sampling and Testing Concrete Masonry Units.

C. ASTM C 666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.

D. ASTM D 448 - Standard Classification for Sizes of Aggregate for Road and Bridge Construction.

E. ASTM D 698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

F. ASTM D 1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

1.5 DEFINITIONS

A. Backfill: Soil used as fill behind drainage aggregate and within the reinforced soil mass, if applicable.

B. Drainage aggregate: Material used around and directly behind concrete wall units.

C. Foundation soil: Soil mass supporting the leveling pad and reinforced zone of the retaining wall system.

D. Geosynthetic reinforcement: Material specifically fabricated for use as a soil reinforcement.

E. Wall fill: Free-draining aggregate material used within and around concrete retaining wall units.

1.6 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's printed product literature, including installation instructions.

C. Shop Drawings: Retaining wall system design including wall heights, geosynthetic reinforcement and drainage provisions.
   1. Prepared and signed by a registered Professional Engineer retained by the Installer and licensed in the State of wall installation.

D. Samples:
   1. Furnish one unit in the color and face pattern specified; approved unit may be used in the work.

2. 12 inches square or larger piece of geosynthetic reinforcing specified.

E. Test Reports: Submit test reports from an independent laboratory demonstrating compliance of concrete units with reference standards.
1. Water absorption and compressive strength tested in accordance with ASTM C 140, Sections 6,8, and 9.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inspect the materials upon delivery to assure that specified products have been received.

B. Deliver and handle materials in manner that will prevent damage.
1. Store above ground on wood pallets or blocking.
2. Remove damaged or otherwise unsuitable material, when so determined, from the site.
3. Faces of the modular concrete units shall be free of chips, cracks and stains.

C. Prevent wet cement, epoxy, excessive mud, etc., from coming in contact with the materials.

1.8 EXTRA MATERIALS

A. Furnish Owner with matching replacement units comprising 1 percent of those installed on the Project.

B. Furnish Owner with three replacement units identical to those installed on the Project.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide products fabricated under license from Anchor Wall Systems, Inc., 6101 Baker Road, Suite 201, Minnetonka, MN 55345; ASD. Tel: (800) 473-4452 or (612) 933-8855, FAX: (612) 933-8833.

2.2 MATERIALS

A. Modular Concrete Retaining Wall Units: High strength, high density concrete units, freeze-thaw resistant with top locator providing a 4 degree set back from plane with each course.

1. Acceptable Product: "Anchor Vertica Pro Retaining Wall Units".
2. Acceptable Product: "Anchor Vertica Retaining Wall Units".
3. Comply with ASTM C 90 except provide minimum compressive strength of 3,000 psi and maximum water absorption of 7.0 percent.
4. Freeze thaw resistance: In accordance with ASTM C 666, modified to 50 cycles.
5. Provide units that are positively interlocked with integral shear connections adequate for design.
6. Minimum weight: 100 pounds per square foot of wall face, including fill within the units.
7. Minimum exposed face area (Anchor Vertica units): 0.94 square feet.
8. Minimum exposed face area (Anchor Vertica Pro units): 0.94 square feet.
9. Provide units whose dimensions do not vary more than plus or minus 1/16 inch from that specified, in any molded dimension.
10. Face geometry: Beveled.
11. Face geometry: Straight.
12. Texture: Smooth.
13. Texture: Rockface.
14. Color: As selected by Architect from manufacturer's standard selections.

B. Modular Concrete Retaining Wall Units: High strength, high density concrete units, freeze-thaw resistant.
   1. Acceptable Product: "Anchor Diamond Retaining Wall Units".
   2. Acceptable Product: "Anchor Diamond Pro Retaining Wall Units".
   3. Comply with ASTM C 90 except provide minimum compressive strength of 3,000 psi and maximum water absorption of 7.0 percent.
   4. Provide units with an integral concrete shear connection flange along the lower rear edge.
   5. Minimum exposed face area (Anchor Diamond units): 0.67 square feet.
   6. Minimum exposed face area (Anchor Diamond Pro units): 0.94 square feet.
   7. Unit height: Not more than plus or minus 1/16 inch variation from that specified.
   8. Face geometry: Beveled.
   9. Face geometry: Straight.
   10. Texture: Smooth.

11. Texture: Split rock face.
12. Color: As selected by Architect from manufacturer's standard selections.

C. Geosynthetic Reinforcement: Woven polyester fiber geogrid, expanded polyethylene sheet geogrid, or woven polypropylene geotextile.

D. Base:
1. Drainage aggregate.
2. Sand, specified in Section _____.
3. Concrete, specified in Section 03300.

E. Drainage Aggregate: Free-draining, coarse aggregate complying with ASTM 448, size no. 57, 67, 6, 7 or 8.
F. Unit Fill: Same materials as drainage aggregate.
G. Backfill: On-site soils unless otherwise indicated on the drawings; where additional backfill is required, submit sample and specifications to project Geotechnical Engineer for approval.
H. Foundation Drain: Perforated or slotted PVC pipe or corrugated HDPE pipe, covered with geotextile filter fabric.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which retaining walls are to be erected.
1. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work.
2. Notify the Architect in writing of site conditions which may affect wall performance or may require reevaluation of wall design.

B. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 EXCAVATION

A. Excavate to the lines and grades shown on the drawings. Over-excavation will not be compensated for and replacement with compacted fill or wall system components

will be required at Contractor's expense. Take care not to disturb base beyond the lines shown.

3.3 FOUNDATION PREPARATION

A. Excavate as required for footing or base dimension shown on the drawings, unless otherwise directed.

B. Obtain the Geotechnical Engineer's approval of subgrade to ensure that the actual soil strength meets or exceeds that required.

C. Remove soil not meeting the required strength, and replace with acceptable material.

D. Fill over-excavated areas with compacted backfill material.

E. Proof-roll foundation soil prior to fill and geosynthetic reinforcement placement.

3.4 BASE COURSE PREPARATION

A. Place granular base materials as indicated on the Drawings, but not less than 6 inches thick.

B. Place and compact base materials to the depths and widths indicated on the drawings.

C. Place base materials upon undisturbed soils or on foundation soils properly backfilled.

D. Compact base material to a level, hard surface on which to place the first course of units.
   1. Compact to 95 percent standard proctor (ASTM D 698).

E. Prepare base materials to ensure complete contact of retaining wall unit with base material. Do not allow gaps.

3.5 ERECTION

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

B. Place first course of concrete wall units on the prepared base material. Check units for level and alignment. Ensure that the top of all units in base course are at the same elevation.

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

D. Place concrete wall units 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 drainage aggregate.

F. Place at least 12 inches of free-draining aggregate behind the concrete wall units.

G. Place at least 6 inches of free-draining aggregate behind the concrete wall units.

H. Install drain tile at lowest elevation possible to maintain gravity flow of water to outside reinforced zone. "Daylight" drainage collection pipe to an approximate location away from wall system at each low point or at 50 foot intervals along wall.

I. Remove excess fill from top of concrete wall units and install next course. Ensure that drainage aggregate and backfill are compacted before installation of next course.

J. Install each succeeding course so the side slots are in contact with the locator. Pull the units forward until the side slot of the unit touches the back of the locator of the previous course.

K. Pull each unit forward as far as possible until the locating surface of the unit contacts the locating surface of the unit in the preceding course.

L. Backfill as each course is completed.

M. Install geosynthetic reinforcement in accordance with retaining wall manufacturer's design recommendations and as indicated on drawings.

3.6 BACKFILL PLACEMENT

A. Place, spread, and compact reinforced backfill in a manner to minimize slack in reinforcement.

B. Place and compact fill in the reinforced zone.

1. Lifts not exceeding 6 to 8 inches in loose thickness where hand-operated compaction equipment is used.
2. Lifts not exceeding 12 inches in loose thickness where heavy, self-propelled compaction equipment is used.

C. Compact fill placed in reinforced zone to minimum 95 percent of soil's standard Proctor density (per ASTM D 698) or as recommended by project Geotechnical Engineer.

D. Allow only lightweight hand-operated equipment within 4 feet of back of retaining wall units, or one-half the wall height, whichever is greater.

3.7 CAP UNIT INSTALLATION

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

B. Cut cap units if necessary to obtain the proper fit.

C. Backfill and compact to finish grade.

3.8 FIELD QUALITY CONTROL

A. Retain a qualified independent third party to verify correct installation of materials in accordance with drawings and these specifications.

B. Owner, at his own expense, may retain a qualified professional to perform random quality assurance checks.

C. Correct work found deficient and not in accordance with drawings and these specifications.

D. Retaining wall will not be considered complete until accepted by Architect or duly appointed representative of the Owner.

3.9 ADJUSTING AND CLEANING

A. Replace damaged units prior to Substantial Completion.

B. Remove debris and scrap from the site.

C. Leave adjacent paved areas broom clean.

END OF SECTION