

DIVISION 2 - SITE WORK

**Conditions of Use/ Responsibility of Data**

These “guideline” specifications are to be used by the A/E as a base document in the development of project/site-specific Division 2 – SITE WORK specifications for Montgomery County Public Schools Construction Projects. They may or may not be complete, correct and/or appropriate for use for any given project. It is the responsibility of the A/E to review these “guideline” specifications and to edit and/or supplement them as required to ensure that they represent the full, complete, correct and code-compliant specifications required for all construction of the project to which they apply. The use of these “guideline” specifications, and/or any information herein, in no way releases the A/E from their contractual responsibility to prepare and provide the full, complete and correct code-compliant contract documents, plans and/or specifications required for construction.

Review and editing of these “guideline” specifications shall be performed by appropriately licensed Maryland professional engineer. Specifications are to be prepared in Microsoft Word, edited using the “Track Changes” feature of that software and submitted to MCPS electronically on a compact Disk for review.

**SECTION 02834 - SEGMENTAL RETAINING WALLS**

**PART 1 – GENERAL:**

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 DESCRIPTION OF WORK:

- A. This Section includes the following:
  - 1. Modular block retaining wall system.
  - 2. Precast concrete retaining wall caps.

1.3 RELATED SECTIONS:

- A. Division 2, Section 02100, "Earthwork"

1.4 PERFORMANCE REQUIREMENTS:

- A. Employ a qualified professional engineer to design all segmental block retaining walls in accordance with wall Manufacturer’s specifications and based upon information, including, but not limited to, soil properties, bearing capacities, and existing and proposed construction provided in project Geotechnical Engineering Report and shown on Contract Drawings, plans, profiles, details and notes. Review and request clarification of any information provided prior to submittal of bid to ensure that all Work costs are included in Contractor’s bid

- B. Design and construct segmental block retaining walls to withstand and resist applied soil, hydrostatic, or other pressures. Provide wall construction, wall materials, backfill materials, geo-grid and/or other soil/wall reinforcement materials required to accomplish this.
- C. Design and construct all segmental block retaining walls to lines and grades indicated on the Contract Drawings and to other dimensions and depths required so as not to de-stabilize or be de-stabilized by, or undermine or be undermined by, adjacent construction.
- D. Install segmental retaining walls without damaging existing buildings, pavements, and other adjacent site improvements.
- E. Obtain building permit for segmental retaining walls from authorities having jurisdiction.

#### 1.4 SUBMITTALS:

- A. Product Data: Include data for proposed materials, method of installation, and list of materials proposed for use.
  - 1. Include location of product manufacture.
- B. Shop Drawings, System Designs and Calculations: Prepared by or under direct supervision of a qualified professional engineer who is experienced in design of proposed segmental retaining wall system. Include drawings and comprehensive engineering analysis that shows system's compliance with specified requirements. System designs, materials, calculations and shop drawing must be signed and sealed by qualified professional engineer responsible for their preparation and must be submitted to, reviewed by, and bear approval stamp of authorities having jurisdiction prior to their submittal for review and approval by Architect, Project Engineer and/or Owner.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of concrete units required shall be submitted to Architect and Owner for review and approval.
- D. Samples for Verification: Full-size units of each type of concrete unit for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and Owners, and other information specified.

#### 1.5 QUALITY ASSURANCE:

- A. Installer Qualifications: An experienced installer who has completed segmental retaining wall installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Obtain each type of concrete unit from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

- C. Engineering Responsibility: Contractor shall engage a qualified professional engineer who will be responsible for preparation of designs and data for segmental retaining walls including drawings and comprehensive engineering analysis that shows system's compliance with specified requirements.
- D. Professional Engineer Qualifications: A professional engineer, in good standing, who is legally qualified and currently licensed to practice in State of Maryland and who is experienced in providing engineering services for designing segmental retaining walls that are similar to those indicated for this Project in material, design, and extent.
- E. Arrange for and obtain any required inspections and certifications by authorities having jurisdiction.
- F. Provide as-built information as required by Contract and by authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING:

- A. Protect materials during storage and construction from earth and other materials. Protect segmental retaining wall materials from damage. Do not incorporate damaged materials into retaining wall structure.

**PART 2 – PRODUCTS:**

2.1 MANUFACTURERS:

- A. Available Manufacturers: Subject to compliance with requirements, Manufacturers offering products that may be incorporated into Work include, but are not limited to, the following, giving preference to products manufactured within a 500-mile radius of Project Site:

- 1. Available Manufacturers:
  - a. Versa-Lok Retaining Wall Systems
  - b. Keystone Retaining Wall Systems, Inc.
  - c. Anchor Wall Systems
  - d. Tensar Earth Technologies, Inc.
  - e. Rockwood Retaining Walls, Inc.
  - f. Cornerstone Wall Solutions, Inc.

2.2 COLORS AND TEXTURES:

- A. Colors and Textures:
  - 1. Modular Block Retaining Wall Units: As selected by Architect and approved by Owner from Manufacturer's full range.
  - 2. Precast Concrete Retaining Wall Caps: Match color of color-conditioned concrete retaining wall.

2.3 MODULAR CONCRETE RETAINING WALL SYSTEM:

- A. Modular Concrete Retaining Wall System: Use wall system materials and construct in accordance with wall engineer's design and wall Manufacturer's specifications to meet performance requirements set forth in this specification.
- B. Concrete Units: Comply with ASTM C1372 and following requirements:
  - 1. Face Finish: Sculptured rock face in angular tri-planar configuration or as otherwise approved by Owner.
  - 2. Strength: Minimum 28-day compressive strength of 3000 psi.
  - 3. Maximum Moisture Absorption: 8 percent.
  - 4. Concrete Units: Provide concrete units, mini, cap and end units provided by wall Manufacturer for use with selected wall system and as required to meet performance requirements set forth in this specification.
- C. Base Leveling Pad Material: Provide and install continuous footing or base material required by wall Manufacturer and wall engineer for use with selected wall system to meet performance requirements set forth in this specification. Do not exceed soil bearing limitations.
- D. Unit Fill: Provide and install unit fill material required by wall Manufacturer and wall engineer for use with selected wall system to meet performance requirements set forth in this specification.
- E. Backfill Material: Provide and install backfill material required by wall Manufacturer and wall engineer for use with selected wall system to meet performance requirements set forth in this specification. Where possible use site excavated soils. Do not use unsuitable soil for backfill, such as heavy clays or organic soils. Comply with Division 2 Section "Earthwork" for backfill requirements.
- F. Soil and Wall Reinforcement/Stabilization: Provide and install temporary and/or permanent soil and wall reinforcement and stabilization materials required by wall Manufacturer and wall engineer for use with selected wall system to meet performance requirements set forth in this specification. Such materials include, but are not limited to, high density polyethylene expanded sheet, polyester woven fiber materials, mechanical anchors, sheeting, shoring and bracing specifically fabricated for use as soil reinforcement.
- G. Non-Corrosive Connectors: Provide pins, clips, or bars to connect successive horizontal rows of concrete blocks, possessing a verifiable strength and durability consistent with design calculations of wall as a whole and required by wall Manufacturer and wall engineer for use with selected wall system to meet performance requirements set forth in this specification.
- H. Adhesive: Construction adhesive complying with ASTM 2339 or other material required by wall Manufacturer and wall engineer for use with selected wall system to meet performance requirements set forth in this specification.

#### 2.4 PRECAST CONCRETE RETAINING WALL CAPS

Except as otherwise required or recommended by wall Manufacturer and Contractor's wall engineer for use with selected wall system and to meet performance requirements set forth in this specification, retaining wall caps will meet following minimum specifications:

- A. Structural Performance:

1. Provide precast concrete wall cap units and connections capable of withstanding design loads within limits and under conditions indicated.
2. Provide cap block capable of accepting guard rail and/or fence. See paragraph 2.5 below.
3. Where cap block extends above grade and is exposed on both sides both sides must be finished and cap must cover entire section of concrete wall units.
4. Where asphalt paving abuts segmental retaining wall, wall face is to be continuous flat surface.
5. Provide ½ inch premolded expansion joint filler between wall and any abutting concrete.

B. Materials: Comply with PCI MNL 117 and following:

1. Molds: Provide molds and, where required, form-facing materials of metal, plastic, wood or another material that is nonreactive with concrete and dimensionally stable to produce continuous and true precast concrete surfaces within fabrication tolerances and suitable for required finishes.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
3. Portland Cement: ASTM C 150, Type I or III.
4. Normal-Weight Aggregates: Washed, inert, natural sand, or well-graded crushed stone or gravel complying with ASTM A 33 and matching aggregate used in cast-in-place retaining wall.
5. Lightweight Aggregates: ASTM C 330.
6. Air-Entraining Admixture: ASTM C 260, certified by manufacture to be compatible with other required admixtures.

C. Accessories:

1. Dowels: Round stainless steel bars complying with ASTM A 276, Type 304, ½-inch diameter.

D. Concrete Mix: Prepare design mixes for each type of concrete required. Design mixes may be prepared by a qualified independent testing agency or by qualified precast plant personnel.

1. Compressive Strength (28 Days): 5000 psi.
2. Maximum Water-Cement Materials Ratio: 0.45.

## 2.5 RETAINING GUARD RAILS:

- A. Guard Rail or Fence shall be placed directly into cap of retaining wall as indicated on drawings. Engineer will be responsible for designing wall to account for loading onto guardrail or fence that will be mounted into cap. Placing guard rail or fence outside of cap will not be accepted or approved.

## PART 3 – EXECUTION:

### 3.1 PREPARATION:

- A. Place leveling materials upon approved foundation to a minimum thickness of 6 inches. Compact material to provide a level surface. Compaction shall be 95 percent of Standard

Proctor for sand or gravel type materials. Prepare leveling pad to ensure complete contact of retaining wall unit with base.

### 3.2 SEGMENTAL RETAINING WALL INSTALLATION:

- A. Install segmental retaining walls according to modular concrete unit Manufacturer's written instructions and approved shop drawings. Use wall system materials and construct in accordance with wall engineer's design and wall Manufacturer's specifications to meet performance requirements set forth in this specification.
- B. Except as otherwise required or recommended by wall Manufacturer and Contractor's wall engineer for construction of selected wall system to meet performance requirements set forth in this specification, retaining wall construction will meet following minimum specifications:
  - 1. Place first course of concrete wall units on base leveling pad. Check units for levelness and alignment. Ensure that units are in full contact with base.
  - 2. Place units side by side for full length of wall alignment. Install non-corrosive connectors and fill voids at units with unit fill material as required by Manufacturer. Tamp fill.
  - 3. Sweep excess material from top of units and install next course. Ensure each course is complete unit filled and compacted prior to proceeding to next course.
  - 4. Install Soil and Wall Reinforcement/Stabilization system, backfill and continue to lay up wall according to modular concrete unit Manufacturer's written instructions and approved shop drawings. When using geogrid, lay geogrid soil reinforcement horizontally on compacted backfill and connect to concrete wall units as indicated on Manufacturer's shop drawings. Pull geogrid taut and anchor before backfill is placed on it.

### 3.3 PRECAST CONCRETE WALL CAP INSTALLATION:

- A. Except as otherwise required or recommended by wall Manufacturer and Contractor's wall engineer for construction of selected wall system to meet performance requirements set forth in this specification, installation of precise wall cap will meet following minimum specifications:
  - 1. Install precast concrete wall caps as indicated. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.
  - 2. Anchor precast units in position as indicated. Remove temporary shims, wedges, and spacers as soon as possible after anchoring and grouting are completed.

### 3.4 CONSTRUCTION TOLERANCES:

- A. Except as otherwise required or recommended by wall Manufacturer and Contractor's wall engineer for construction of selected wall system to meet performance requirements set forth in this specification, the installation of precise wall cap will comply with following as-built construction tolerances:
  - 1. Vertical Alignment: Do not vary from plumb by more than 1-1/2 inches over any 10-ft distance.

2. Wall Batter: Do not vary more than 1 degrees of design batter.
3. Horizontal Alignment: Do not vary more than 1-1/2 inches over any 10-ft distance.
4. Corners, Bends and Curves: Do not vary 1-ft to theoretical location.
5. Maximum Horizontal Gap Between Erected Units: 1/2-inch.

3.6 FIELD QUALITY CONTROL:

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to provide quality assurance and testing services during construction. Quality testing shall include foundation soil inspection, soil and backfill testing, and observation of construction.

**END OF SECTION**