

**1.0 GENERAL**

A segmental gravity retaining wall is a gravity retaining wall constructed of segmental retaining wall (SRW) units and a cast-in-place unreinforced concrete footing. Design and construct segmental gravity retaining walls based on actual elevations and dimensions in accordance with the contract and accepted submittals. For this provision, “block wall” refers to a segmental gravity retaining wall, “blocks” refer to SRW units and “cap blocks” refer to SRW cap units.

**2.0 BLOCK WALL DESIGN SUBMITTAL**

Submit 11 hard copies of working drawings and 3 hard copies of design calculations and an electronic copy (PDF on CD or DVD) of each for the block wall design submittal. Provide the submittal at least 30 calendar days before conducting the block wall preconstruction meeting. Do not begin block wall construction until the design submittal is accepted.

The Retaining Wall Plans show plan views, typical sections, details, notes and elevation or profile views (wall envelope) for each block wall. When noted on plans and before beginning block wall design, survey existing ground elevations shown on the plans and submit a revised wall envelope for review and acceptance. Use the accepted revised wall envelope for design.

Design block walls in accordance with the plans and Section 5.9 of the *AASHTO Standard Specifications for Highway Bridges* unless otherwise required. Design block walls to meet minimum clearances shown on the plans. Do not locate blocks or footings beyond right-of-way or easement lines.

Use 12 inch (300 mm) thick cast-in-place unreinforced concrete footings beneath blocks that extend a minimum of 6” (150 mm) in front of and behind bottom row of blocks. Unless required otherwise on the plans, embed bottom of footings a minimum of 2 ft (0.6 m) below where finished grade intersects the front face of block walls.

Fill block core spaces with no. 57 stone, if applicable. Assume a unit weight of 100 pcf (15.7 kN/m<sup>3</sup>) for stone. Fill between and behind blocks with no. 57 stone for a horizontal distance of at least 12” (300 mm). Place separation fabric between stone and backfill, natural ground or overlying aggregate. When a subdrain pipe is required with a note on plans, use a 4” (100 mm) dia. continuous perforated subdrain pipe in the no. 57 stone behind the bottom row of blocks.

At the Contractor’s option, use SRW cap units or reinforced concrete coping at top of walls unless required otherwise on the plans. Attach cap blocks with adhesive and extend top of walls with cap blocks a minimum of 4” (100 mm) above where finished grade intersects the back of block walls. Use coping with dimensions shown on the plans and extend top of walls with coping a minimum of 6” (150 mm) above where finished grade intersects the back of block walls. At the Contractor’s option, connect coping to blocks with dowels or

extend coping down the back of blocks. When barriers are required above block walls, use concrete barrier rails with moment slabs in accordance with the plans and design walls for impact loads applied to top of walls as shown on the plans.

Submit working drawings and design calculations for review and acceptance in accordance with Article 105-2 of the *Standard Specifications*. Submit working drawings showing plan views, wall profiles with maximum applied bearing pressures, typical sections, separation fabric locations and details of footings, blocks, coping, etc. If necessary, include details on working drawings for concrete barrier rails with moment slabs and obstructions extending through walls. Submit design calculations for each wall section with different surcharge loads, geometry or material parameters. When using a software program for design, provide a hand calculation verifying the analysis of the tallest wall section. Have block walls designed, detailed and sealed by a Professional Engineer registered in North Carolina.

### **3.0 MATERIALS**

#### **A. Segmental Retaining Wall (SRW) Units**

Use blocks with a minimum depth (front face to back face) of 12” (300 mm). Unless required otherwise on the plans, provide blocks with a vertical split face and a concrete gray color with no tints, dyes or pigments. Before beginning block production, obtain approval of sample blocks of the type, face and color proposed for the project.

Load, transport, unload and store blocks such that they are kept clean and free of damage. Damaged blocks with excessive discoloration, chips or cracks as determined by the Engineer will be rejected. Label each pallet of blocks with the information listed in Article 1077-13 of the *Standard Specifications*. Do not transport blocks away from the casting yard until the concrete strength reaches 4000 psi (27.6 MPa) and a period of at least 5 days elapses after casting unless otherwise approved.

Provide certifications in accordance with Article 106-3 of the *Standard Specifications*. Provide Type 4 Certified Test Reports for all block properties with the exception of durability. When a note on plans requires freeze-thaw durable blocks, provide Type 5 Typical Certified Test Reports for durability.

Use blocks meeting the requirements of ASTM C1372 with the exception of absorption, compressive strength and durability requirements. Test blocks in accordance with ASTM C140 with the exception of the number of units in a lot. For testing blocks, a lot is defined as 5000 units or a single day’s production, whichever is less, and 6 blocks are required per lot. Provide blocks with a maximum absorption of 5%.

A minimum compressive strength of 4000 psi (27.6 MPa) at 28 days is required for blocks with the exception of freeze-thaw durable blocks. When a note on plans requires freeze-thaw durable blocks, a minimum compressive strength of 5500 psi (37.9 MPa) at 28 days is required.

Test freeze-thaw durable blocks in accordance with ASTM C1262. Test specimens in water. Freeze-thaw durable blocks are acceptable if the weight loss of each of 4 of the 5 specimens after 150 cycles does not exceed 1% of its initial weight.

B. SRW Cap Units

Use cap blocks meeting the requirements of the SRW units above with the exception of the minimum block depth. Use cap blocks with a minimum depth (front face to back face) of 8" (200 mm).

C. No. 57 Stone

Use standard size no. 57 stone meeting the requirements of Class VI Select Material in accordance with Section 1016 of the *Standard Specifications*.

D. Wall Drainage Systems

Wall drainage systems consist of subdrain pipes and outlet components. Use subsurface drainage materials meeting the requirements of Section 815 of the *Standard Specifications*.

E. Separation Fabrics

Use separation fabrics meeting the requirements of Type 1 Engineering Fabric in accordance with Section 1056 of the *Standard Specifications*.

F. Footings and Coping

Provide cast-in-place concrete footings and coping meeting the requirements of Section 1000 of the *Standard Specifications*. Use Class A Concrete in accordance with Article 1000-4 of the *Standard Specifications*. Provide reinforcing steel for coping meeting the requirements of Section 1070 of the *Standard Specifications*.

G. Adhesive

Provide adhesive in accordance with the block vendor's recommendations. Store adhesive in accordance with the manufacturer's instructions.

H. Concrete Barrier Rails with Moment Slabs

Provide concrete barrier rails with moment slabs meeting the requirements of Section 1000 of the *Standard Specifications* and reinforcing steel meeting the requirements of Section 1070 of the *Standard Specifications*.

Use Class A Concrete for moment slabs and Class AA Concrete for concrete barrier rails in accordance with Article 1000-4 of the *Standard Specifications*.

## I. Joint Materials

Use joint materials in accordance with Section 1028 of the *Standard Specifications*.

### 4.0 BLOCK WALL PRECONSTRUCTION MEETING

Before starting block wall construction, conduct a preconstruction meeting to discuss the construction and inspection of the block walls. Schedule this meeting after all block wall submittals have been accepted. The Resident or Bridge Maintenance Engineer, Bridge Construction Engineer, Geotechnical Operations Engineer, Contractor and Block Wall Installer Superintendent will attend this preconstruction meeting.

### 5.0 CONSTRUCTION METHODS

Control drainage during construction in the vicinity of block walls. Direct run off away from block walls, no. 57 stone and backfill. Contain and maintain stone and backfill and protect material from erosion.

Perform all necessary clearing and grubbing in accordance with Section 200 of the *Standard Specifications*. Excavate as necessary for block walls in accordance with the accepted submittals. Notify the Engineer when foundation excavation is complete. Do not place concrete for footings until obtaining approval of the excavation depth and foundation material.

Construct cast-in-place concrete footings at elevations and with dimensions shown in the accepted submittals and in accordance with Section 420 of the *Standard Specifications*. Cure footings a minimum of 24 hours before placing blocks.

Place blocks with no negative batter (wall face leaning forward) such that the final position is as shown in the accepted submittals. Stagger vertical block joints to create a running bond when possible unless shown otherwise in the accepted submittals. Place blocks with a maximum joint width of ½ inch (13 mm). Construct block walls with a horizontal tolerance of ¾ inch (19 mm) when measured with a 10 ft (3 m) straight edge and a vertical tolerance within 2 degrees of the batter shown in the accepted submittals.

If a subdrain pipe is required, construct wall drainage systems as shown in the accepted submittals and in accordance with Section 815 of the *Standard Specifications*. Provide subdrain pipes with positive drainage towards outlets. Place no. 57 stone between and behind blocks in 8 to 10 inch (200 to 250 mm) thick lifts. Compact stone with hand operated compaction equipment. Overlap separation fabric a minimum of 18" (450 mm) at seams. Backfill for wall construction behind no. 57 stone in accordance with Article 410-8 of the *Standard Specifications*.

Place cap blocks as shown in the accepted submittals. Set cap blocks with a ½ to 1-½ inch (13 to 38 mm) overhang. Do not install cap blocks if the surface to receive caps is wet or frozen or the air temperature measured at the wall in the shade away from artificial heat is below 40°F (4°C). Before applying adhesive, clean the surface the caps will adhere to and

ensure it is dry and free of oil, grease, dust and debris. Attach cap blocks using adhesive in accordance with the manufacturer's instructions.

Construct concrete coping in accordance with the accepted submittals. Construct cast-in-place concrete coping and moment slabs in accordance with Section 420 of the *Standard Specifications*. Do not remove forms until concrete achieves a minimum compressive strength of 2400 psi (16.5 MPa). Provide a Class 2 Surface Finish for cast-in-place concrete coping in accordance with Article 420-17 of the *Standard Specifications*. Construct concrete barrier rails with moment slabs in accordance with the plans and concrete barrier rails in accordance with Subarticle 460-3(C) of the *Standard Specifications*.

Construct coping joints at a maximum spacing of 10 ft (3 m). Half-inch (13 mm) thick expansion joints in accordance with Article 420-10 of the *Standard Specifications* are required every third joint. Half-inch (13 mm) deep grooved contraction joints in accordance with Subarticle 825-10(B) of the *Standard Specifications* are required for the remaining joints. Stop coping reinforcement 2" (50 mm) from either side of expansion joints. Seal joints above and behind block walls between coping and ditches with joint sealer as shown on the plans.

## 6.0 MEASUREMENT AND PAYMENT

*Segmental Gravity Retaining Walls* will be measured and paid for in square feet (meters). Block walls will be measured as the exposed face area with the wall height equal to the difference between the top and bottom of wall elevation. The top of wall elevation is defined as the top of cap blocks or coping unless shown otherwise on the plans. The bottom of wall elevation is defined as where the finished grade intersects the front face of the block wall. No payment will be made for portions of block walls below bottom of wall elevations.

The contract unit price bid for *Segmental Gravity Retaining Walls* will be full compensation for design, submittals, furnishing labor, tools, equipment and materials, excavating, backfilling, providing footings, blocks, no. 57 stone, wall drainage systems, fabrics, cap blocks, coping and any incidentals necessary to design and construct block walls in accordance with this provision.

*Concrete Barrier Rail* will be measured and paid for in accordance with Article 460-4 of the *Standard Specifications*. The contract unit price bid for *Concrete Barrier Rail* will be full compensation for providing concrete barrier rails with moment slabs in accordance with the contract and no separate payment for moments slabs will be made.

Payment will be made under:

<b>Pay Item</b>	<b>Pay Unit</b>
Segmental Gravity Retaining Walls	Square Foot (Meter)