SP-156238
(NEW)

SPECIAL PROVISIONS
FOR
MODULAR BLOCK RETAINING WALL

Johnson County
STP-U-1557(648)--70-52

Effective Date
February 21, 2023

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE A IN THE STANDARD SPECIFICATIONS.

156238.01 DESCRIPTION

1.01 SUMMARY

A. This work includes furnishing and installing a gravity type modular retaining wall, wall fill, and granular backfill to the lines and grades shown on the plans. Gravity type modular retaining walls are defined as system that typically uses larger precast units without requiring mesh or straps behind the block within the backfill.

1.02 DESIGN:

A. WALL DESIGN ENGINEER

1. The wall design shall be performed by a Professional Engineer licensed in the State of Iowa that prepares and seals the design submittals as defined in this Special Provision.

B. MINIMUM DESIGN REQUIREMENTS

1. Retaining walls shall be designed in accordance with ASTM C 90 or ASTM C 1372 and applicable recommendations of the National Concrete Masonry Association (NCMA) Design Manual for Segmental Retaining Walls (latest edition). The following table summarizes the minimum design criteria and is based upon the structure being critical:

External Stability	**Minimum Factor of Safety**
Sliding, FS_{sl}	1.5
Overturning, FS_{ot}	2.0
Bearing Capacity, FS_{bc}	2.0

Local Stability	**Minimum Factor of Safety**
FS_{sl} (Maximum Unreinforced Height)	1.5
FS_{ot} (Maximum Unreinforced Height)	2.0
Shear Facing Units, FS_{sc}	1.5
Facing Connecting Strength, FS_{cs}	1.5
Global Stability	1.5

C. SUBMITTALS

1. Prior to the beginning of wall construction, the Contractor shall, in accordance with Article 1105.03 of the Standard Specifications, submit for review detailed design calculations including soil bearing pressure, construction drawings, global stability analysis, and shop drawings prepared and sealed by the wall design engineer:

156238.02 MATERIALS

The wall source and system shall be in accordance with the Materials I.M. 445.05 Appendix A and B, respectively.

2.01 CONCRETE UNITS:

A. Compressive Strength Requirements

1. Concrete segmental units and cap blocks shall have a minimum 28 day compressive strength of 6000 psi for any one individual unit. A minimum compressive strength of 3500 psi shall be achieved before blocks may be moved and/or transferred to a storage site. Air content in the fresh concrete shall be 6.5%, - 1%, + 1.5%.

B. Sampling and Testing

1. Specimens shall be representative of the whole lot of units. Note: the term “lot” refers to any number of concrete units of any configuration or dimensions manufactured by the producer using the same materials, concrete mix design, manufacturing process and curing method.

2. The minimum required sampling rate for mix design approval is as follows:

a. One sample per mix design, per product type, per year.

b. Sample size shall be a minimum of three sets of three cylinders cast using the mix design. Three cylinders will be broken at 7, 14, and 28 days.

c. Air content, slump and water cement ratio shall be recorded at the time the cylinders are cast.

C. A minimum of three full-size units shall be measured for width, height, and length. Use average measurement to determine the minimum face shell thickness. Overall dimensions for width, height and total length shall not differ by more than ± 1/8 inch from the specified minimum dimensions.

D. Compression Testing – A minimum of one set of three cylinders will be made per week of production and tested to determine compliance with the specified strength. At the Engineer’s discretion cores may be taken from finished units to evaluate specification requirements.

E. Air content and slump shall be tested and recorded at least once per day during production.

F. All units shall be sound and free of cracks and other defects that would interfere with the proper placing, physical appearance and/or impair the strength or long-range performance of the units.

G. Units are to be manufactured with a textured surface similar to limestone. Units are to be stained with a waterborne concrete stain applied per the manufacturer’s recommendations. Work shall include a base coat and two highlights.

H. Units are to be designed and installed to accommodate the ornamental railing and railing base plates as shown in the contract documents.

2.02 LEVELING PAD:

A. The type of materials used for the leveling pad shall be as recommended by the supplier/manufacturer. If granular material is recommended for the leveling pad, use backfill material meeting the requirements of Section 4132 of the Standard Specifications. If unreinforced concrete is recommended for the leveling pad, it shall be Class C concrete meeting the requirements of the Materials I.M. 529 and Section 2403 of the Standard Specifications.

2.03 UNIT FILL:

A. If required by the wall design engineer, fill of concrete units in place shall be porous backfill meeting the requirements of Section 4131 of the Standard Specifications.

2.04 SUBDRAINS:

A. The subdrains shall be a minimum of 6 inches in diameter and meet the requirements of Article 4143.01, B, of the Standard Specifications. Subdrain outlets through the wall shall be installed in accordance with the "Intake Outlet" as shown on Standard Road Plan DR-303 (Note 4 and 5) and fitted with a removable grate rodent guard per Materials I.M. 443.01.

2.05 BACKFILL:

A. When required, use granular backfill material meeting the requirements of Section 4133 of the Standard Specifications.

2.06 TIEBACK REINFORCEMENT:

A. When required, use the type, size, and design as recommended by the supplier/manufacturer.

2.06 CERTIFICATIONS:

A. Contractor shall submit to the Engineer a notarized manufacturer's certification, at least 14 days prior to the preconstruction conference, stating that the modular units meet the requirements of this Special Provision.

B. The producer of certified wet cast retaining wall blocks shall furnish on each shipment day a certified bill of materials or invoice, which identifies the county, project number, contractor's name, and the number of blocks. The certification of compliance shall be signed by a designated or responsible company representative and shall be stated as follows:

"The materials itemized in this shipment are certified to be in compliance with the applicable ASTM and the Iowa Department of Transportation Plans and Specifications, Materials I.M.'s and meet the Buy America requirements as described in Materials I.M. 107 for all steel, iron products and coatings."

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Authorized Signature and Date

C. One copy of the above-described documents shall be forwarded to the Engineer on the day the item(s) are delivered to the project and one copy shall be sent to the respective District Materials Engineer.

D. The fabricator shall also provide summary quantity documentation, as shown in Appendix B of Materials I.M. 445 to the District Materials Office responsible for the project and the Engineer at the completion of the shipments to the project. A designated representative shall sign the certification statement on the summary documentation.

156238.03 CONSTRUCTION

3.01 CONSTRUCTION SUPERVISION:

A. The modular units' supplier shall provide a qualified and experienced representative on site at beginning of wall construction for up to 3 days at no additional cost to the Contracting Authority. The Contractor's field construction supervisor shall have demonstrated experience and be qualified to direct all work at the site.

3.02 EXCAVATION:

A. Excavate according to Section 2102 of the Standard Specifications. This includes benching of the existing roadway foreslopes and the excavation area under the pad line. Do not disturb existing embankment materials beyond what is needed to construct the wall.

B. At locations where the wall is to be constructed adjacent to a fill section, construct and compact the fill to 95% Standard Proctor Density prior to beginning wall construction. After the fill has been constructed, make the cut to permit a minimum of 12 inches beyond the wall to be filled with granular backfill materials meeting the requirements of Section 4131 of the Standard Specifications. Place and compact the granular backfill material on a course-by-course basis.

C. Excavation support, if required, shall be designed and at no additional cost to the Contracting Authority.

3.03 FOUNDATION SOIL PREPARATION:

A. Prepare foundation soil as required for the leveling pad.

B. The Engineer will examine the foundation soil to assure that the actual foundation soil strength meets or exceeds the assumed design bearing strength. Remove soils not meeting required strength and replace with soil meeting the design criteria.

C. Ensure the earth foundation has a density equal to or greater than 90% Standard Proctor Density. Step the earth foundation at required intervals to stay a minimum 1 foot below the finished grade.

D. Place granular backfill material as replacement material for over excavation in the foundation soil. Compact the replacement material according to Article 2107.03, H of the Standard Specifications.

3.04 LEVELING PAD:

A. The Contractor shall place the leveling pad a minimum of 6 inches in thickness. The Contractor shall construct the leveling pad to ensure complete contact of the retaining wall unit with the leveling pad. Gaps shall not be allowed between the retaining wall unit and the leveling pad.

3.05 UNIT INSTALLATION:

A. Materials shall be installed at the proper elevation and orientation shown in the plans and in accordance with the wall design engineer’s drawings. The concrete segmental units shall be installed in general accordance with the approved submittals in Article 1.02, C.

B. The Contractor shall place units side by side for the full length of wall alignment, and ensure units are in full contact with the leveling pad. Alignment may be done by means of a string line or offset from the base line.

C. Install connecting pins and fill units and tamp the fill. Sweep all excess material from top of units and install the next course. Ensure each course is completely filled prior to proceeding to the next course. Place each course so that pins protrude into adjoining courses a minimum of 1 inch or to tolerances recommended by the supplier/manufacturer. Two pins are required per unit. Repeat the above procedure for each course to the top of wall height.

D. When the finished grade slopes along the back side of the wall, the back side of all exposed blocks shall have a finished texture until the grade is sufficient to fully cover the untextured back of a typical wall block.

3.06 SUBDRAINS:

A. Subdrains shall be installed as specified by the wall design engineer to maintain gravity flow of water to outside of the reinforced earth zone. The subdrains shall outlet into a storm sewer access or along a slope at an elevation lower than the lowest point of the pipe within the wall.

B. Porous backfill meeting the requirements of Section 4131 of the Standard Specifications shall be placed around the subdrain to a minimum cover of 3 inches.

3.07 BACKFILL PLACEMENT:

A. Place each course of granular backfill material in maximum 8 inch lifts and compact to a minimum 95% of standard Proctor density (ASTM D 698). Compact granular backfill material according to Article 2107.03, H of the Standard Specifications, and ensure the moisture limits are from 3% under optimum moisture to no more than the optimum moisture content. Place the lifts to closely follow panel erection, and decrease this lift thickness, if necessary, to obtain the specified density.

B. At each level, roughly level the backfill material before placing and connecting reinforcement (if required). Reinforcing shall be placed normal to the face of the wall. Place and compact backfill material without disturbing or distorting the tieback reinforcement or the wall, and do not use tamping type rollers or other rollers that may damage the reinforcing. Use light mechanical tampers to achieve the required compaction in a strip 3 feet wide adjacent to the backside of the wall; however, compaction within this strip will not be subjected to density testing.

C. At the end of each day's operations, shape the last level of backfill material to permit runoff of rainwater away from the wall face.

156238.04 MEASUREMENT AND PAYMENT

A. Measurement for Modular Block Retaining Wall will be in square feet, determined from the area of the front face of the wall in place. The height will be measured from the top of the leveling pad to the top of the wall, including coping or cap block.

156238.05 BASIS OF PAYMENT

A. Payment for Modular Block Retaining Wall constructed will be the contract unit price per square foot.

B. Payment is full compensation for furnishing and erecting the Modular Block Retaining Wall according to the contract documents, including:

1. Design
2. Excavation
3. Foundation Soil Preparation
4. Leveling Pad
5. Concrete Units (Textured)
6. Connector Pins
7. Unit Fill (Inside Blocks)
8. Porous Backfill
9. Granular Backfill Material
10. Finished Grade Shaping Along Wall
11. Waterborne Color Staining and Highlights
12. Furnishing and Placing Subdrain and Outlets
13. Tieback Reinforcement (if required)