SP-126017
(NEW)

Iowa Department of Transportation

**SPECIAL PROVISION**

**FOR**

**MODULAR BLOCK WALL (HEAVY)**

**Johnson County**

**STP-U-1557(638)--70-52**

**Effective Date**

**December 17, 2013**

**THE STANDARD SPECIFICATIONS, SERIES OF 2012, ARE AMENDED BY THE FOLLOWING MODIFICATIONS. THESE ARE SPECIAL PROVISIONS AND SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.**

## PART 1 - GENERAL

### 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***
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***
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. 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***
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, and shop drawings prepared and sealed by the Engineer:

## PART 2 – MATERIALS

The wall source and system shall be in accordance with the Iowa DOT Materials IM 445.05 Appendix A and B respectively.

### 2.01 CONCRETE UNITS:

Compressive Strength Requirements

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 7 percent, minus 1 percent plus 1.5 percent.

Sampling and Testing

A. 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.

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

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

2. 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.

3. Air content, slump and water cement ration 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.

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.

**2.02 LEVELING PAD:**

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, it shall be specific backfill 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:**

If required by the construction drawings, fill of concrete units in place shall be Porous Backfill meeting the requirements of Section 4131 of the Standard Specifications.

**2.04 SUBDRAINS:**

The subdrains shall be a minimum of 6 inches in diameter and meet the requirements of Article 4143.01, B, of the Standard Specifications.

Standard Road Plan RF-19C “INTAKE OUTLET” shall be provided and fitted with a Standard Road Plan RF-19E rodent guard “REMOVABLE GRATE”.

**2.05 BACKFILL:**

The fill soil material behind the wall shall be Granular Backfill meeting the requirements of Section 4133 of the Standard Specifications.

### 2.06 CERTIFICATIONS:

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.

## PART 3 - CONSTRUCTION

### 3.01 CONSTRUCTION SUPERVISION:

The modular units' supplier shall provide a qualified and experienced representative on site at beginning of wall construction for up to three 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:

Contractor shall excavate to the lines and grades shown as the reinforced earth zone on the plans. Contractor shall take precautions to minimize over-excavation. Excavation support, if required, shall be designed and at no additional cost to the Contracting Authority.

### 3.03 FOUNDATION SOIL PREPARATION:

Foundation soil shall be excavated as required for base course leveling pad dimensions and limits of reinforced earth zone as shown on the plans.

Foundation soil shall be examined by the Engineer to assure that the actual foundation soil strength meets or exceeds the assumed design bearing strength. Soils not meeting required strength shall be removed and replaced with soil meeting the design criteria.

The earth foundation shall have a density equal to or greater than 90 percent Standard Proctor Density. The earth foundation shall be stepped at the required intervals to keep it a minimum 2 feet below the finished grade.

### 3.04 LEVELING PAD:

The Contractor shall place the leveling pad a minimum of 9 inches in thickness.

The Contractor shall construct the leveling pad to insure 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:

Materials shall be installed at the proper elevation and orientation shown in the plans. The concrete segmental units shall be installed in general accordance with the approved submittals in Article 1.02, C above.

### 3.06 SUBDRAINS:

Subdrains shall be installed as shown in the plans 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.

Porous backfill, in accordance with Article 2.05 above shall be placed around the subdrain to a minimum cover of 3 inches.

### 3.07 BACKFILL PLACEMENT:

The granular backfill shall be compacted in accordance with Article 2107.03, H of the Standard Specifications. The granular backfill shall be placed as shown on the plans in maximum 8 inch lifts and compacted to a minimum 95 percent of standard Proctor density (ASTM D 698). The moisture limits shall be between 3 percent under optimum moisture to not more than the optimum moisture content.

Only hand-operated compaction equipment shall be allowed within 3 feet of the front of the wall face.

## PART 4 – MEASUREMENT AND PAYMENT

### 4.01 METHOD OF MEASUREMENT:

A. **Modular Block Wall (Heavy)**
The Engineer will measure the area of Modular Block Wall (Heavy) in square feet, from measurements 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 guard rail system, coping or cap block.

B. **Granular Backfill Material**
The quantity of granular backfill material hauled and placed will not be measured.

C. **Excavation**
Excavation for preparing the reinforced earth zone for construction of the wall will be classed according to Section 2102 of the Standard Specifications. The quantity will not be measured.

### 4.02 BASIS OF PAYMENT:

A. **Modular Block Wall (Heavy)**
For the quantity of Modular Block Wall (Heavy) constructed, the Contractor will be paid the contract unit price per square foot. This payment shall be full compensation for furnishing all materials, tools, and labor for the performance of all work necessary to construct the wall, in accordance with the contract documents, including the design, excavation, foundation preparation, leveling pad, all backfill, porous backfill, finished grade shaping, and furnishing and placing drainage pipe subdrains.

B. **Granular Backfill Material**
For Contractor furnished granular backfill material for the reinforced earth zone, the Contractor will not be paid for the quantity of material furnished. This will be included in the payment for Modular Block Wall (Heavy).

C. **Excavation**
For the quantity of each class of excavation for preparing the reinforced earth zone for construction of the wall, the Contractor will be not be paid for the quantity removed. This will be included in the payment for Modular Block Wall (Heavy).