

## **Section 2430. Modular Block Retaining Wall**

### **2430.01 DESCRIPTION.**

Furnish and install modular block retaining wall units, wall fill, and granular backfill material to the lines and grades shown in the contract documents. Modular block retaining walls are defined as systems that usually do not require mesh or strips in the backfill material behind the wall facing to limit backfill material stresses by reinforcing the soil structure.

### **2430.02 DESIGN AND MATERIALS.**

#### **A. Design.**

##### **1. Wall Design Engineer.**

The Wall Design Engineer is required to be a Professional Engineer licensed in the State of Iowa.

##### **2. Submittals.**

Prior to the beginning of the wall construction, submit for approval, according to [Article 1105.03](#), detailed design calculations including soil bearing pressure, construction drawings, and shop drawings prepared and sealed by the Wall Design Engineer. If required, submit a detailed explanation of the design properties and quality control test limits for the geogrid reinforcement with the design.

#### **B. Materials.**

Furnish a wall manufactured by a company on the approved manufacturer's list in [Materials I.M. 445.04](#).

##### **1. Concrete Units.**

- a. Exterior dimensions may vary. Each unit is required to have a minimum of 0.5 square feet ( $0.046 \text{ m}^2$ ) of face area and an 8 inch (200 mm) maximum vertical dimension.
- b. Block faces are to be straight, with split face texture.
- c. Angled sides are to be capable of attaining concave and convex alignment curves of minimum radius of 5.0 feet (1.5 m).
- d. Units are to be interlocked:
  - Either with: 1) connector pins of the type, size, and design recommended by the supplier/manufacturer for the type of masonry unit and backfill reinforcement material used in the wall; or 2) by integrally cast shear lugs.
  - To provide minimum of 1/4 inch (6 mm) of setback for each course of wall height.
- e. Meet the requirements of [Article 2431.02, B, 1](#).
- e. Apply [Section 2419](#).

##### **2. Leveling Pad.**

Use supplier/manufacturer recommended leveling pad materials. If granular material is recommended for the leveling pad, use backfill material meeting the requirements of [Section 4132](#). If unreinforced concrete is recommended for the leveling pad, use Class C concrete meeting the requirements of the [Materials I.M. 529](#) and [Section 2403](#).

**3. Unit Fill.**

Unit fill is the granular material that is within the concrete facing units. Use porous backfill material meeting the requirements of [Section 4131](#).

**4. Backfill Material.**

When required, use granular backfill material meeting the requirements of [Section 4133](#).

**5. Tieback Reinforcement.**

When required, use the type, size, and design the supplier/manufacturer recommends.

**2430.03 CONSTRUCTION.**

**A. Excavation.**

1. Excavate according to [Section 2102](#). 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.
2. 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 (300 mm) beyond the wall to be filled with granular backfill materials meeting the requirements of [Section 4131](#). Place and compact the granular backfill material on a course by course basis.

**B. Foundation Soil Preparation.**

1. Prepare foundation soil as required for the leveling pad.
2. 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.
3. Ensure the earth foundation has a density equal to or greater than 90% Standard Proctor Density. Step the earth foundation at the required intervals to keep it a minimum 1 foot (300 mm) below the finished grade.
4. Place granular backfill material as replacement material for over excavation in the foundation soil. Compact the replacement material according to [Article 2107.03, H](#).

**C. Leveling Pad.**

1. Minimum of 6 inches (150 mm) thick.

2. Construct the leveling pad to ensure complete contact of the retaining wall unit with the leveling pad. Gaps will not be allowed between the retaining wall unit and the leveling pad.

#### **D. Unit Installation.**

1. Ensure units are in full contact with the leveling pad.
2. Place units side by side for the full length of wall alignment. Alignment may be done by means of a string line or offset from the base line.
3. Install connecting pins and fill units, and tamp the fill.
4. 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.
5. Place each course so that pins protrude into adjoining courses a minimum of 1 inch (25 mm) or to tolerances recommended by the supplier/manufacture. Two pins are required per unit. Repeat the above procedure for each course to the top of wall height.
6. At the end of each course where the wall changes elevation, turn the units into the backfill material. Place units to create the minimum radius possible. Install a minimum of 3 units into the grade. Ensure only the front face of the units is visible from the side of the wall.

#### **E. Backfill Material Placement.**

1. Place each course of granular backfill material for the reinforcing following the erection of each lift of wall. At each level for reinforcing, roughly level the backfill material before placing and connecting the reinforcement. Place reinforcing normal to the face of the wall. Place the lifts to closely follow panel erection. Decrease this lift thickness, if necessary, to obtain the specified density.
2. 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.
3. Compact granular backfill material according to [Article 2107.03, H](#). Ensure the moisture limits are from 3% under optimum moisture to no more than the optimum moisture content.
4. Place and compact backfill material without disturbing or distorting the tieback reinforcement or the wall. 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 (1 m) wide adjacent to the backside of the wall; however, compaction within this strip will not be subjected to density testing.

**F. Tieback Reinforcement Installation For Retaining Walls, Where Specified.**

1. Place the tieback reinforcement horizontally on compacted backfill material, connect it to the concrete wall units, and embed it a minimum of 12 inches (300 mm). Hook reinforcement over pins, pull taut, and anchor before backfill material is placed on the tieback reinforcement.
2. Remove slack in the tieback reinforcement at the wall unit connections.
3. Place tieback reinforcement at the proper elevation and orient it as recommended by the supplier/manufacturer.
4. Correct orientation (roll direction) of the tieback reinforcement, if applicable, as recommended by the supplier/manufacturer.
5. Tieback reinforcement may be secured in place with staples, pins, sand bags, or backfill material depending on the fill properties, fill placement procedures, and weather conditions.
6. Overlaps:
  - a. Overlapping uniaxial tieback reinforcement in the across-the roll direction is not required, except to contain the fill at the slope face when wrap around facing is used. Overlap uniaxial tieback reinforcement a minimum of 48 inches (1.2 m) in the roll direction.
  - b. Spread a layer of compacted backfill material, a minimum of 4 inches (100 mm) in thickness, between uniaxial tieback reinforcement layers in the area to be overlapped.

**2430.04 METHOD OF MEASUREMENT.**

Measurement for Modular Block Retaining Wall will be in square feet (square meters), 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 cap block.

**2430.05 BASIS OF PAYMENT.**

- A. Payment for Modular Block Retaining Wall constructed will be the contract unit price per square foot (square meter).
- B. Payment is full compensation for furnishing and erecting the modular block retaining wall according to the contract documents, including:
  - Design,
  - Excavation,
  - Foundation soil preparation,
  - Leveling pads,
  - Concrete units,
  - Connector pins,
  - Unit fill for inside the blocks,
  - Granular backfill material, and
  - Tieback reinforcement if required.