RETAINING WALLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Broken Concrete Retaining Walls

B. Limestone Retaining Walls

C. Railroad Tie Retaining Walls

D. Landscape Timbers

E. Modular Block Retaining Walls

F. Combined Retaining Wall-Sidewalk

1.02 DESCRIPTION OF WORK

A. Furnish and install retaining walls and all related materials required for the construction to lines and grades as shown on the plans and as specified herein.

B. Prepare foundation soils, leveling pad, and backfill to lines and grades as shown on the plans.

1.03 SUBMITTALS

Follow the General Provisions (Requirements) and Covenants.

1.04 SUBSTITUTIONS

Follow the General Provisions (Requirements) and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Follow the General Provisions (Requirements) and Covenants.

1.06 SCHEDULING AND CONFLICTS

Follow the General Provisions (Requirements) and Covenants.

1.07 SPECIAL REQUIREMENTS

None.

1.08 MEASUREMENT FOR PAYMENT

A. Retaining Wall: The height of the wall, except for combined retaining wall-sidewalk, shall be measured from a line parallel to and 6 inches below the finished grade at the bottom of the wall to the top of the wall. The length shall then be measured and the face area shall be computed, in square feet.

B. Combined Retaining Wall-Sidewalk: The height of the wall shall be measured from the top of the wall to the top of the sidewalk or vice-versa. The portion of sidewalk constructed as part of the retaining wall is considered a combined retaining wall-sidewalk and the sidewalk will not be measured or paid for as sidewalk. The length of the wall shall then be measured and the face area computed, in square feet.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Broken Concrete: The material shall be non-reinforced, broken concrete slabs of uniform thickness. The material shall be subject to the Engineer's approval. The broken concrete shall have a nominal thickness of not less than 3 1/2 inches and a minimum dimension of 8 inches in both length and width.

B. Limestone: The stone shall be Lannon Limestone or an equivalent subject to the Engineer's approval. Stone shall be of variable thickness as supplied by the quarry, and no stone shall measure less than 8 inches in both length and width.

C. Railroad Ties: Railroad ties shall be #1 grade ties, and shall be approved by the Engineer prior to being incorporated into the wall. Ties shall be straight or slightly bowed, and have at least three good sides. The ties shall be solid with no visible dry rot, only a minor amount of splitting or cracking, and no plates or spikes attached.

D. Landscape Timbers: Landscape timbers shall be #1 grade timbers, and shall be approved by the Engineer prior to being incorporated into the wall. Timbers shall be straight and have at least three good sides. The timbers shall be solid with no visible dry rot, only a minor amount of splitting or cracking.

E. Modular Block Walls:

1. Concrete wall units shall comply with:
   a. ASTM C 90 - Loadbearing Concrete Masonry Units
   b. ASTM C 140 -Sampling and Testing Concrete Masonry Units

2. Concrete wall units shall have a minimum 28 day compressive strength of 3000 psi in accordance with ASTM C 90.

3. The concrete shall have adequate freeze/thaw protection with maximum moisture absorption of 8%.

4. Exterior dimensions may vary in accordance with ASTM C 90.

5. Acceptable Materials: All colors shall be factory standard selections, approved by the Engineer. The following wall systems are approved:
   a. Keystone Retaining Wall Systems:

Color:	Tan (Factory Standard Selections)
Face Pattern:	Straight Rockface
Block Size:	
Bottom Course:	Standard Unit (8"H x 18"W x 24"D)
Middle Courses:	Compact Unit (8"H x 18"W x 12"D)
Top Courses:	Standard Mini Cap Unit (4"H x 18"W x 12"D)
Wall Setback (Batter):	Standard (3/4" Setback per Course)
Unit Interlock:	1/2" Diameter Nylon/Fiberglass Pins

   b. Versa-Lok Retaining Wall Systems:

Color:	Tan (Factory Standard Selections)
Face Pattern:	Straight, Split Rockface
Block Size:	
Lower Courses:	Standard Unit (6"H x 16"W x 12"D)
Top Course:	Cap Block (3 5/8"H x 14"W)
Wall Setback (Batter):	Standard (3/4" Setback per Course)
Unit Interlock:	1/2" Diameter Nylon/Fiberglass Pins

2.01 MATERIALS (Continued)

c. Rockwood Classic Retaining Wall System:

Color:	Sandstone, Concrete Gray, Dark Brown, Charcoal (Factory Standard Selections)
Face Pattern:	Straight Split Face
Block Size:	
Lower Courses:	Standard Unit (6"H x 18"W x 12"D)
Top Course:	Cap Block (4"H x 18"W x 12"D)
Wall Setback (Batter):	Standard (3/4" per course)
Unit Interlock:	1/2" Diameter Nylon/Fiberglass Pins

d. Anchor Diamond Retaining Wall System:

Color:	Factory Standard Selections
Face Pattern:	Straight; Split/Rock Face
Block Size:	
Lower Courses:	Straight Unit (6"H x 17 1/4"W x 12"D)
Top Course:	Cap Unit (3"H x 17 1/4"W x 10"D)
Wall Setback Batter:	1 1/8" per course
Unit Interlock:	Integral Concrete Shear Connections

e. Allan Block Retaining Wall System:

Color:	Factory Standard Selections
Face Pattern:	Straight Rock Face
Block Size:	
Lower Courses:	Straight Unit (8"H x 18"W x 12"D)
Middle Courses:	Compact Unit (4"H x 18"W x 12'D)
Top Course:	Cap Unit (4"H x 18"W x 12"D)
Unit Setback (Batter):	1" per course
Unit Interlock:	Integral Concrete Shear Connections

f. Venture Retaining Wall Systems:

Color:	Grey, Buff, Brown
Face Pattern:	Smooth, Split Rock Face
Block Size:	
Lower Courses:	Standard Unit (8”H x 18” W x 12” or 18 3/4” D)
Top Courses:	Cap Unit (2 5/8” H x 18” W x 8” D)
Wall Setback (Batter):	Standard (1/2” per course)
Unit Interlock:	Anchor Bar Assembly

g. An equal system can be used with the prior approval of the Engineer.

6. Geogrid: The geogrid shall be a regular grid structure of high density polyethylene (HDPE) or polyester. Geogrid shall be a horizontal layer of high strength high modulus grid capable of creating a composite soil/geogrid mass that acts as a monolithic gravity structure in conformance to Iowa DOT Article 4196.01, B.

F. Combined Retaining Wall-Sidewalk:

1. **Portland Cement Concrete:** Materials to conform to Section 7010. Portland Cement Concrete coarse aggregate may be Class 2.

2. **Reinforcing steel:** Materials shall conform to Section 7010, 2.01.

3. **Expansion Joint:** Materials shall conform to Section 7010, 2.01.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Non "Modular Block" Walls:

1. At locations where the wall is to be constructed against earth fill, the fill shall be constructed and compacted to a minimum of 95% of maximum Standard Proctor Density ASTM D 698 prior to beginning wall construction.

2. After the fill has been constructed, the cut shall be made to permit a maximum of 4 inches behind the wall.

3. At locations where the wall is to be constructed in cut, the contractor shall not over-excavate more than 4 inches beyond the alignment of the back of the wall.

4. No payment for over-excavation. Replacement material shall be compacted earth fill.

B. Modular Block Walls:

1. At locations where the wall is to be constructed adjacent to a fill section, the fill shall be constructed and compacted to a minimum of 95% of maximum Standard Proctor Density ASTM D 698 prior to beginning wall construction.

2. After the fill has been constructed, the cut shall be made to permit a minimum of 12 inches behind the wall to be backfilled with granular materials that meet the requirements of Iowa DOT Section 4131. If drain tile is shown on the plans the tile shall conform to Section 4020.

3. Granular material shall be placed and compacted on a course-by-course basis.

4. Contractor shall excavate to the lines and grades shown on the plans.

5. No payment for over excavation. Replacement material shall be granular material with 12 inches of topsoil on the surface.

3.02 FOUNDATION

A. Install walls on a 6 inch thick leveling pad of compacted granular material that meet the requirements of Iowa DOT Section 4132 crushed stone.

B. The leveling pad shall be placed upon a horizontal undisturbed or compacted earth foundation compacted to a density equal to or greater than a minimum of 95% of maximum Standard Proctor Density ASTM D 698.

C. The earth foundation below the leveling pad shall be stepped at the required intervals to keep it a minimum of 6 inches below the finished foundation grade.

3.03 INSTALLATION (Refer to Figures 9070.1 to 9070.6)

A. Stone Walls and Broken Concrete:

1. Stone shall be laid horizontal. Selected soil shall be placed between each course as shown on the Standard Detail Plates.

2. Vertical joints in adjacent courses shall be staggered to prevent a vertical plane of weakness.

3.03 INSTALLATION (Refer to Figures 9070.1 to 9070.6) (Continued)

3. Care shall be taken to prevent bunching of material of the same size. Large material shall be selected for use in corners and ends of the wall.

4. All exposed material in the wall shall be split or broken edges of uniform appearance.

5. After each course is laid, any voids behind the wall shall be filled and compacted to a density equal to or greater than the existing soil behind the wall.

B. Railroad Tie Walls and Landscape Timbers:

1. All ties shall be laid horizontal with proper pitch from front to back to create the required batter on the face of the wall with only a minor offset at each course.

2. Vertical joints in adjacent courses shall be staggered to prevent a vertical plane of weakness.

3. Ties shall be sorted so that only ties and timbers of the same thickness are used in each course.

4. The best edge of each tie shall be used for the face of the wall.

5. After each course is laid, any voids behind the wall shall be filled and compacted to a density equal to or greater than the existing soil behind the wall.

6. All ties shall be securely fastened to the ties below with 12 inch by 3/8 inch nails approximately one foot from each end of the tie. Deadmen shall be fastened to the ties below in a similar fashion.

7. To facilitate installation, a 3/8 inch diameter pilot hole can be drilled in the upper tie for the nail.

C. Modular Block Walls:

1. Installation shall be as per manufacturer's recommendations.

2. Contractor shall arrange a meeting with the authorized technical representative, the Contractor, and the Engineer to review the manufacturer's recommendation prior to construction.

3. Courses shall be placed horizontally.

4. The bottom of the wall shall be a minimum of six inches below the finished grade line.

5. Wall courses shall be connected with nylon pins or integral concrete shear connection pins to maintain batter on face of wall as recommended by the manufacturer.

6. Cap block shall be fastened to the top of the wall using recommended adhesive to hold cap block in place.

3.03 INSTALLATION (Refer to Figures 9070.1 to 9070.6) (Continued)

D. Combined Retaining Wall-Sidewalk:

1. Set reinforcement and forms as per Figure 9070.6.

2. Unless specifically required on project plans, the wall does not require the back of the wall to be formed, installation of weep holes, or the placing of porous backfill, Iowa DOT Section 4131. Where forming the back of the walls is not done and sloughing occurs, the loose material will be removed and replaced with concrete at no additional expense to the Jurisdiction. The Engineer may require the back of the wall to be formed if deemed necessary. Refer to project plans for method of determining excavation requirements for individual locations.

3. For walls more than 3 feet high, weep holes approximately 3 inches in diameter at 8 foot intervals are required unless otherwise indicated on project plans. Weep holes are to be formed with an approved rustproof device backed with copper screening or galvanized hardware cloth.

3.04 CHARACTERISTIC

A. Wall Heights:

1. Broken Concrete and Limestone Wall: 3 feet maximum height.

2. Railroad Tie Wall and Landscape Timber Wall: 6 feet maximum height.

3. Modular Block: 4 feet maximum height.
   a. Utilize 6 inch block for walls up to 3 feet in height.
   b. Utilize 8 inch block for walls greater than 3 feet in height.

4. Combined Retaining Wall-Sidewalk:
   a. Type "A": 3 feet maximum height.
   b. Type "B": 5 feet maximum height.

5. Any walls greater than the above heights need special design certified by a Structural Engineer.

B. Face Projections: For limestone and broken concrete walls, the maximum projections of material beyond the normal pitch lines shall be not more than 1 inch. Offset a minimum of 10% of stones in a limestone wall in a random pattern for texturing.

C. Appearance: The finished wall shall have a neat, pleasant appearance and be constructed at a uniform alignment.

END OF SECTION