

SECTION 02372

WIRE ENCLOSED RIPRAP

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Materials and procedures for wire enclosed riprap.

1.2 DEFINITIONS

- A. Connecting wires: Internal galvanized wires used to prevent the walls of the deeper basket units from bulging.
- B. Diaphragms: The internal galvanized wire mesh partitions that divide the baskets into smaller cells.
- C. Hop Rigs: Heavy wire elements. Precut and performed to fit application tools and serve a similar function to lacing or binding wire.
- D. Lacing or binding wire: The galvanized wire used to assemble and join the individual basket modules to each other to form a monolithic structural unit.
- E. Reinforcing wires: The thicker galvanized wires incorporated into the wire mesh faces during fabrication of the baskets.
- F. Selvedges of the basket structures: The thicker perimeter and edge galvanized wires to which the wire mesh faces of the baskets are securely tied.
- G. Wire enclosed riprap: Modular galvanized steel wire mesh box-shaped baskets of varying sizes. Baskets filled with stone on site.

1.3 RELATED SECTIONS

- A. Section 02056: Common Fill
- B. Section 02075: Geotextiles
- C. Section 02316: Roadway Excavation
- D. Section 02324: Compaction

- E. Section 03211: Reinforcing Steel and Welded Wire.

1.4 REFERENCES

- A. AASHTO M 288-96: Geotextile Specification for Highway Applications
- B. AASHTO T 104: Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate.
- C. ASTM A 116: Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.
- D. ASTM A 641 : Zinc Coated (Galvanized) Carbon Steel Wire.
- E. ASTM C 535: Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.

1.5 SUBMITTALS

- A. Manufacturer's product data including typical construction details and procedures.

1.6 QUALITY ASSURANCE

- A. Construct to the line and grade as shown in the plans.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Stone:
 - 1. Sound, clean, angular, well-graded rock, free of seams or cracks.
 - 2. No stone greater than 10 inches in size.
 - 3. Retain 95 percent or more of the stone on a square screen having openings whose areas are equivalent to those areas presented by the unstretched or deformed wire mesh from which the basket modules are fabricated.
 - 4. Maximum 40 percent wear. AASHTO C 535.
 - 5. Maximum 16 percent weighted loss when subjected to five cycles of sodium sulfate. AASHTO T 104.
- B. Wire:
 - 1. Use not less than the following minimum gauges.
 - 2. Use wire that meets ASTM A 641 M, Class 3.
 - 3. Salvage wires: 9 gauge.

4. Lacing wire: 13 gauge.
 5. Hog rings: 9 gauge
 6. Connecting wires: 13 gauge.
 7. Reinforcing wires: 13 gauge.
 8. Finish a wire coated with polyvinyl chloride (PVC) with a nominal thickness of 0.022 inches and nowhere less than 0.015 inches over the required galvanization when the pH of the liquid or of the native soil in contact is greater than 10.
- C. Wire Mesh:
1. Use not less than 11 gauge wire.
 2. Furnish non raveling wire mesh that maintains its overall support function when a single wire in a section of mesh is damaged or cut.
 3. Protect the wire elements with a galvanized coating of not less than 0.85 ounces per square foot of wire surface. ASTM A 116, type A (ASTM A 641 M, class 3).
 4. Openings in the wire mesh are not to exceed 4 inches.
 5. Must be capable of stretching in length a minimum of 10 percent without reducing the tensile strength of the individual wire strands making up the mesh to values less than those for similar wire, one gauge smaller in diameter.
- D. Anchor Rods:
1. Provide 3/4 inch minimum diameter steel rods; reinforcing bars allowed following Section 03211.
 2. Use 3 foot long anchor rods with a 3 inch hook bend or a 6 inch "T" welded to the top of the rod.
- E. Accessories
1. When required in the plans, furnish Stabilization/Separation Geotextile as specified in AASHTO M 288-96 and as approved by the Engineer.

PART 3 EXECUTION

3.1 PREPARATION

- A. Remove all brush, trees, stumps, and other objectionable materials.
- B. Remove unacceptable material to a 1 foot depth. Refer to Section 02316.
- C. Replace with granular borrow material bringing the grade to the base of the wire enclosed riprap structure. Refer to Section 02056.

- D. Provide a firm foundation by excavating to a dressed uniform surface conforming to the lines and grades shown in the plans and the finished depth of the wire baskets.
- E. Compact with two passes of a vibratory roller on 3:1 or flatter slopes. Refer to Section 02324.
- F. Do not over excavate or disturb compacted foundations or undisturbed soils outside of the required lines and grades shown on the plans. Secure approval from the Engineer before backfilling or installing geotextiles.
- G. When indicated on the plans, install required geotextile fabric. Refer to Section 02075.

3.2 PLACING WIRE ENCLOSED RIPRAP

- A. Install all proprietary materials according to manufacturer's recommendations.
- B. Assemble individual baskets for all revetment designs in such a manner that the failure and loss of stone fill from any single basket will not cause the failure and loss of stone fill in the adjoining baskets.
- C. Assemble the wire mesh bases, lid, ends, and sides into a single units.
 - 1. Securely selvedge all discontinuous perimeter edges with continuous lacing wire.
 - 2. Tie all untied edges with binding wire. Tightly loop binding wire around every other mesh opening along the seams in such a manner that single and double loops are alternated.
 - 3. Connect all common edges of face elements so that the strength and flexibility at the connecting edge is at least equal to that of the mesh faces of the boxes.
 - 4. The joints formed by tying must have the same strength as the body mesh.
- D. Place a diaphragm of the same mesh and gauge as the body of the wire basket module when the length of the basket exceeds one and one-half times its horizontal width. Divide the diaphragms into cells whose lengths do not exceed the horizontal width of the basket. Secure the diaphragm in the proper position to the base section so that no additional tying will be required at this point in assembly.
- E. Stretch the baskets if needed only after the empty baskets have been placed into position as indicated in the contract drawings and each empty wire basket module

is complete and securely tied to the adjoining basket modules along with vertical reinforced edges and the top selvages.

- F. Place the stone in the wire baskets according to the manufacturer's recommendations.
 - 1. Protect wire from being broken.
 - 2. Protect sides and ends from being crushed and kinked. If necessary use a loading frame to support the wire fabric while placing rocks.
 - 3. Hand place stone fill on exposed vertical faces so that a satisfactory face graduation and loss of smaller stone fill through mesh openings.

- G. Insert connecting wires in the cells of baskets deeper than one foot in the following manner:
 - 1. For baskets of three feet in depth: uniformly fill adjacent cells first with stone to a height of 12 inches.
 - 2. Place one connecting wire in each direction along the center and secure it to the opposite faces of each cell by looping it around two mesh openings. Twist the ends to the wire to prevent opening.
 - 3. Fill the baskets with a further depth of 12 inches of stone and tie the two connecting wires at this level.
 - 4. Fill the basket uniformly to the top and bend the lid over by hand until it meets the front and ends of the basket module. Tightly bind the lid to the edges of the basket with lacing wire along all edges and also along internal cell diaphragm top edges with binding wire. Tightly loop the binding wire around every other mesh opening along the seams in such a manner that single and double loops are alternated.
 - 5. Connecting wires are not required in wire enclosed riprap baskets of 18 inches or less in depth unless they are being used to build vertical structures; in this case, two connecting wires, one in each direction, at 9 inches from the base will be placed and the lid secured in the same manner as described above.
 - 6. Connecting wires are not required in wire enclosed riprap baskets of 12 inches or less in depth.

- H. Begin assembly and stone placement at the lowest layer or row of wire structures.

- I. Tie each subsequent layer or row to the one below and tie adjoining structures.

- J. Use wire equal to that required for selvage wire.

- K. Install anchors according to manufacturer's recommendation.

END OF SECTION