

GABION RETAINING WALL**(SPECIAL)****GENERAL****A. Description**

The work in this Special Provision governs the construction of the Gabion Retaining Wall in accordance with the details and dimensions shown on the plans and this special provision. The term Gabion is used generically in this special provision to refer to any proprietary system able to satisfy this special provision and the contract plans.

Gabions are baskets manufactured from 8x10 double twisted hexagonal woven steel wire mesh, as per ASTM A975-97. Gabions are filled with stones at the project site to form gravity retaining walls. The gabion is divided into cells by diaphragms positioned at approximately 3 foot (0.9 m) centers. To reinforce the structure, all mesh panel edges are selvedged with a wire having a greater diameter. The steel wire used in the manufacture of the Gabions is heavily zinc coated soft temper steel. A Polyvinyl Chloride Coating (PVC) coating is then applied to a nominal thickness of 0.02 inc. (0.50 mm) to provide additional protection.

Gabions are manufactured and shipped with all components mechanically connected at the production facility.

B. Work Experience

Assign a field supervisor with experience on at least three (3) projects of similar scope to this project, completed over the past five (5) years. The on-site foreman must have completed three (3) projects within the last five (5) years involving Gabion installations of similar scope and size. The Department may suspend the retaining wall construction work if the Contractor substitutes unqualified personnel and the Contractor shall be liable for additional costs resulting from the suspension.

Submit the above experience qualifications list and personnel list to the Engineer for approval at the Pre-construction conference..

C. Preconstruction Meeting

Conduct a retaining wall preconstruction meeting with the field supervisor, the on-site foreman, the Resident Engineer and/or his or her representatives, the Area Roadway Engineer and the Geotechnical Operations Engineer to discuss construction and inspection of the Gabion Retaining Wall.

MATERIALS

All materials are to be as specified or better, and as approved by the Engineer. Submit requests for substitutions to the Engineer 14 days before intended installation. The materials used for the construction of the Gabion Retaining Wall must satisfy the following requirements:

A. Wire

Use wire for the manufacture of the gabions and lacing wire, that has a maximum tensile strength of 75,000 psi (515 MPa) as per ASTM A641/A641-03. Perform all tests on the wire prior to manufacturing the mesh. Use wire that complies with ASTM A975-97, style 3 coating, galvanized and PVC coated steel wire.

B. Woven Wire Mesh Type 8x10

Use mesh and wire for the manufacture of the gabions with characteristics that meet the requirements of ASTM A975-97 Table 1., Mesh type 8x10 and PVC coated. The nominal mesh opening, D = 3.25 in. (83 mm.) The minimum mesh properties for strength and flexibility should be in accordance with the following:

- 1) A minimum Mesh Tensile Strength of 2,900 lb/ft (42.3 kN/m) when tested in accordance with ASTM A975-97 section 13.1.1 is required
- 2) A minimum Punch Test resistance of 5,300 lb (23.6 kN) when tested in compliance with ASTM A975-97 section 13.1.4 is required.
- 3) A minimum Connection to Selvedges of 1,200 lb/ft (17.5 kN) when tested in accordance with ASTM A975-97 is required.

C. Polyvinyl Chloride Coating (P.V.C.)

The technical characteristics and the resistance of the PVC to aging should meet the relevant standards. The main values for the PVC material are as follows:

- 1) The initial property of the PVC coating shall be in compliance with ASTM A975-97 section 8.2.
- 2) Prior to UV and abrasion degradation, the PVC polymer coating shall have a projected minimum durability of 60 years when tested in accordance with *UL 746B Polymeric Material – Long Term Property Evaluation* for heat aging test.

D. Fabrication at Manufacturing Facility

1) Gabion

Manufacture and ship gabions with all components mechanically connected at the production facility. The front, base, back, and lid of the gabions shall be woven into a single unit. Factory connect the ends and diaphragm(s) to the base. Selvedge all perimeter edges of the mesh forming the basket and top, or lid, with wire having a greater diameter. The gabion is divided into cells by means of diaphragms positioned at approximately 3 foot (1 m) centers. Secure the diaphragms in position to the base so that no additional lacing is necessary at the jobsite.

2) Lacing Wire

Use lacing wire meeting all of the physical characteristics outlined in Section 2A, 2B, and 2C and having a minimum diameter of 0.127 in. (3.20 mm).

3) Ring Fasteners

Stainless steel ring fastener may be used instead of, or to compliment the lacing wire. Use ring fasteners meeting the requirements of ASTM A975-97 section 6.3. Use ring fasteners with a minimum open dimension of 1.75 in (44 mm), a maximum closed diameter of 0.75 in (19 mm), and a nominal overlap of 1 in. (25 mm) after closure. Do not exceed a spacing of 6 in. (150 mm) for between each ring fastener.

4) Preformed Stiffeners

Preformed stiffeners manufactured for supporting the exposed face of a gabion. The exposed face is any side of a gabion cell that will be exposed or unsupported after the structure is completed.

5) Cross Tie/ Stiffener Wire

Cross tie/stiffener wire may be used instead of, or to compliment the preformed stiffeners. Use cross tie/stiffener wire (lacing wire) meeting all of the physical characteristics outlined in Sections 2A, 2B, and 2C and having a minimum diameter of 0.127 in. (3.20 mm).

6) Rock

The rock for gabions shall be hard, angular to round, durable and of such quality that they shall not disintegrate on exposure to water or weathering during the life of the structure. Not more than 5 percent by weight of clean spalls resulting from loading and shipment will be allowed in any truckload. The rock may be unwashed quarry material provided it meets

all requirements of these special provisions and is placed in conformance with all requirements of the Department's construction permits (including water quality requirements). Prior to construction, submit testing results and certification that all proposed construction materials meet all requirements of the Standard Specifications to the Resident Engineer. The minimum unit weight of the rock shall be 164 pounds per cubic foot (saturated surface dry) and the absorption shall be less than 4 percent. Rock containing organic matter or soft, friable particles in quantities considered objectionable to the Engineer will be rejected. Only crystalline rock obtained by quarrying with the following size limitations will be allowed:

a. Rock for Gabions

Use rock that ranges in dimension from a minimum of 4 in. (0.10 m) to a maximum of 8 in. (0.20 m). The range in sizes shall allow for a variation of 5% oversize and/or 5% undersize stone, provided it is not placed on the gabion exposed surface. The size shall be such that a minimum of three layers of rock must be achieved when filling the gabion.

7) Geotextile

Where indicated on the plans, place Type 4 Geotextile in accordance with Section 1056 of the Standard Specifications. Overlap all seams a minimum of 18", or as directed by the Engineer.

3.0 CONSTRUCTION REQUIREMENTS

Use reasonable care in handling, assembling and installing the gabions to prevent damage including damage to the PVC coating. Gabions damaged will be repaired in a manner satisfactory to the Engineer or replaced at no cost to the Department.

A. Assembly

Gabions are supplied folded flat and packed in bundles. The units are assembled individually by erecting the sides, ends, and diaphragms, ensuring that all panels are in the correct position, and the tops of all the sides are aligned. First, connect the four corners, followed by the internal diaphragms to the outside walls. Use lacing wire or fasteners, as described in Section 2.0, for all connections.

The procedure for using lacing wire consists of cutting a sufficient length of wire, and first looping and/or twisting to secure the lacing wire to the wire

mesh. Proceed to lace with alternating double and single loops through every mesh opening approximately every 6 in (150 mm), pulling each loop tight and finally securing the end of the lacing wire to the wire mesh by looping and/or twisting.

B. Installation

After initial assembly, the gabions are carried to their final position and are secured joined together along vertical and top edges of their contact surfaces using the same connecting procedure(s) previously described. Whenever a structure requires more than one layer, the upper empty baskets shall also be connected to the top of the lower layer along the front and back edges of the contact surface using the same connecting procedure(s) previously described.

C. Filling Gabions

Fill gabions with rock specified in Section 2.0. During the filling operation some manual rock placement is required to minimize voids. The exposed faces of vertical structures may be carefully hand-placed to give a neat, flat and compact appearance. Care shall be taken when placing fill material to ensure that the sheathing on the PVC coated baskets is not damaged.

Fill the cells in stages so that local deformation is avoided. Do not fill any one cell to a depth exceeding 1 foot (300 mm) higher than an adjoining cell. It is also recommended to slightly overfill the baskets by 1 to 2 in. (25 to 50 mm) to allow for settlement of the rock. Behind gabion walls, compact the backfill material simultaneously to the same level as the filled gabions.

D. Preformed Stiffeners/Internal Connecting Wires

For gabions, use preformed stiffeners or lacing wire as internal connecting wires when a structure requires more than one layer of gabions to be stacked on top of each other. Connect internal connecting wires to the exposed face of a cell to the adjacent side of the cell. Preformed stiffeners are installed at 45 degree to the face/side of the unit, extending an equal distance along each side to be braced (approximately 1 ft. (300 mm)). Cross tie/stiffener wire (lacing wire) may be used instead of, or to compliment the preformed stiffeners. An exposed face is any side of a gabion cell that will be exposed or unsupported after the structure is completed.

E. 3 Feet (1 m) High Gabions

Fill 3 feet (1 m) gabions in three layers, 1 foot (300 mm) at a time. Install preformed stiffeners/connecting wire after the placement of each layer, that is, at 1 foot (300 mm) high and 2 feet (600 mm) high.

F. 1.5 Feet (0.5 m) High Gabions

1.5 feet (0.5 m) high gabions do not require preformed stiffeners/connecting wire unless the baskets are used to build vertical structures and turned on their side. In some cases, these units shall be filled in two layers, 9 in. (230 mm) at a time. Connecting wires shall be installed after the placement of the first layer, which is 9 in. (230 mm) high.

G. Lid Closing

Once the gabion baskets are completely full, pull the lids tight until the lid meets the perimeter edges of the basket. A tool such as a lid closer can be used. Tightly lace and/or fasten the lid along all edges, ends, and tops of diaphragm(s) in the same manner previously described.

H. Mesh cutting and folding

Where shown on the plans or other directed by the Engineer, cut the gabion, fold and fasten together to suit the existing site conditions. Cleanly cut the mesh, fold back the surplus mesh, and neatly wire to an adjacent basket face. Securely fasten the cut edges of the mesh with lacing wire or fasteners in the manner previously described. Assemble, install, fill and close any reshaped gabion or mattress as specified in the previous sections.

4.0 MEASUREMENT AND PAYMENT

Gabion retaining walls will be measured and paid for as the actual number of square feet of exposed face area incorporated into the completed and accepted wall. The wall height is measured as the difference between the top and bottom of the wall. The bottom of wall is defined as the point where the finished grade intersects the front of the wall. The top of the wall is defined as the top elevation of the completed wall including any height from the concrete coping.

The price and payment will be full compensation for all items required to provide the Gabion Retaining Walls including but not limited to those items contained in this special provision.

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Payment will be made under:

Gabion Retaining WallsSquare Foot (Square Meter)

