625-R-194 GABIONS

(Revised 12-07-07)

The Standard Specifications are revised as follows:

SECTION 625, BEGIN LINE 1, INSERT AS FOLLOWS:

SECTION 625 – GABIONS

625.01 Description

This work shall consist of riprap filled wire mesh cages, constructed in accordance with 105.03.

MATERIALS

625.02 Materials

Materials shall be in accordance with the following:

All wire used in the manufacture and assembly of the mesh shall be in accordance with or shall exceed the requirements of ASTM A 641 including Finish 5, Class 3 weight of zinc coating.

All wire used in the manufacture and assembly of PVC coated gabions and mattresses shall, after zinc coating, having extruded onto it a coating of polyvinyl chloride. The coating shall be gray in color, of nominal thickness of 0.02165 in. (0.5499 mm). The coating thickness shall not be less than 0.015 in. (0.381 mm). The coated wire shall be capable of resisting deleterious effects of salt spray, UV rays, and abrasion. It shall not show significant material difference in its initial characteristics after 3000 hours of accelerated exposure in accordance with ASTM B 117, ASTM D 1499, and ASTM G ~~23~~152~~, and after 200 cycles in accordance with ASTM D 1242, Method B~~.

Galvanized wire mesh for gabions of cage thickness of 12 in. (300 mm) or greater shall be nominal 11 gage soft temper steel made of hexagonal double twist mesh. The wire mesh shall be nominal 12 gage with PVC coating.

Wire for mattress mesh of cage thickness up to 12 in. (300 mm) shall be nominal 13.5 gage soft tempered steel woven into a hexagonal triple twist mesh. The finish diameter of PVC coated wire shall be nominal 0.1299 in. (3.3 mm).

Samples for testing shall include at least one sample of each component of the mesh.

Tie and connecting wire shall be supplied for the secure fastening of all edges of the wire mesh cages and diaphragms. Tie and connecting wire shall be nominal 13.5 gage minimum. Gabions used for vertical structures shall be filled to a depth of 12 in. (300 mm). For end units, two connecting wires in each direction shall be tightly tied to opposite faces of the end gabion cell. Internal compartments shall have two connecting wires, front face to back face of the gabion, on the exposed face. Gabions shall be filled

to a further depth of 12 in. (300 mm). Two connection wires shall similarly be tied at this level. Gabions shall then be filled to the top. The gabion shall not be underfilled.

All wire used, including tie and connecting wire, shall be certified by mill test reports showing compliance with specification requirements.

Alternate methods and fasteners for assembling baskets and interconnecting adjacent baskets in lieu of lacing wire shall be acceptable to the gabion manufacturer, and shall be in accordance with the requirements herein. The wire fasteners shall be fabricated from either minimum 11 gage galvanized, hard drawn steel wire in accordance with ASTM A 764, ~~Type~~ Coating Class 3; or minimum 11 gage type 302, stainless steel wire in accordance with ASTM A 313, Class 1. Stainless steel fasteners shall be used with PVC coated gabions.

625.03 Mesh Openings

The maximum linear dimension of the opening shall not exceed 5 in. (125 mm). The area of the mesh opening shall not exceed 10 sq in. (625 mm^2).

625.04 Wire Mesh

Wire mesh shall be woven so as to be non-raveling and to have elasticity. ~~Tests for compliance with these and the following properties shall be in accordance with Colorado Procedure I 6130. A certified test report, showing the required results and information shall be supplied.~~

~~The mesh for gabions shall show no raveling beyond the mesh opening in which a break occurs once the loading is continued after the first break. The test shall be conducted with the pull parallel to the axis of the wire twist.~~

~~For wire mesh cages, when pulled parallel to the axis of the wire twist and deformation is controlled by spreader bars, no wire shall break until the mesh has been stretched at least 4.5%. The pull test shall be performed both parallel and perpendicular to the axis of the wire twist. In either case, the first wire break shall not occur until the loading on the table shown in 625.05 has been reached.~~

Wire mesh shall meet the strength requirements of ASTM A 975.

The edge wire connection strength for both gabions and mattresses shall be similar to that of the mesh.

The selvedge on each sheet of mesh for both gabions and mattresses shall be galvanized steel wire as described above. Selvedge wire for gabions without PVC coating shall be nominal 9 gage minimum. Selvedge wire for gabions with PVC coating shall be nominal 10 gage minimum. Selvedge wire for mattresses with or without PVC coating shall be nominal 12 gage minimum.

The field connection between adjacent wire baskets shall be made while the gabions are empty. Each unit shall be adjoined along the vertical reinforced edges and the top using alternating single and double loops at nominal spacing of 4 in. (100 mm).

All joint materials shall develop a connection with a minimum strength of 1,400 lbs/lft (20 431 N/m) for galvanized gabions and 1200 lbs/lft (17 512 N/m) for PVC coated gabions, when subjected to a pull-apart resistance test.

A type A certification in accordance with 916 for the wire mesh shall be furnished prior to use of the materials.

625.05 Pull-Apart Resistance Test

A set of two identical rectangular gabion panels, each with a width of about 10 mesh openings along a selvedge wire, shall be jointed by means of properly installed wire fasteners along the two selvedge wires so that each fastener confines two selvedge wires and two mesh wires. If the fasteners are also to be used to joint two individual empty gabion baskets, two additional selvedge wires, which are each mechanically wrapped with mesh wires shall be included so that each fastener confines four selvedge wires and four mesh wires. A properly installed fastener shall be in accordance with the requirements as follows:

(a) Each interlocking fastener shall be in a locked and closed position.

(b) Each ring fastener shall be closed. The free ends of the fastener shall overlap a minimum of 1 in. (25 mm).

The jointed panels shall be mounted on a loading machine with grips or clamps such that the panels are uniformly secured along the full width. The grips or clamps shall be designed to transmit only tension forces. The load will then be applied at a uniform rate of 50 lbs (225 N) per second until failure occurs. Failure will be defined as either of the following occurrences.

(a) The maximum load is reached and a drop in strength is observed with subsequent loading.

(b) An opening of greater than 2 in. (50 mm) appears along the panel width between two selvedge wires in a fastener confining either two or four selvedge wires.

The strength of the jointed panels at failure shall be a minimum of 1,400 lbs/lft (20 431 N/m).

TABLE FOR MINIMUM STRENGTH TESTS FOR GABION AND MATTRESS BASKETS

PART	*MINIMUM STRENGTH Lb/lft (N/m)*		
	GABIONS		*MATTRESSES*
	WITHOUT PVC	*WITH PVC*	*WITH OR WITHOUT PVC*
Mesh pulled parallel to wire twist	*2000 (29 188)*	*2000 (29 188)*	*2000 (29 188)*
Mesh pulled perpendicular to wire	*1000 (14 594)*	*1000 (14 594)*	*1000 (14 594)*

Connection of selvedge wire to mesh	*1400 (20 431)*	*~~1400~~ 1200 (17 512)*	*900 (13 135)*

Gabions or mattresses shall be as shown on the plans and uniform in size.

All gabion and mattress dimensions will be subject to a tolerance limit of ± 5% of the manufacturer's stated sizes. However, a tolerance of ± 10% will be permitted for the height of mattresses.

A type A certification in accordance with 916 for the gabions or mattress shall be furnished prior to use of the materials.

625.06 Riprap

Riprap for filling wire mesh cages shall be in accordance with the applicable requirements of 904 except as follows:

(a) Riprap shall consist of hard, dense, sound, rough fractured stone or local sandstone, as nearly cubical as practicable. Thin slab type stones and flaking rock shall not be used.

~~(b) Stones shall have a specific gravity of at least 2.25 and shall be resistant to the action of air and water. Flaking or fragmental rock will not be permitted.~~

(b) The sizes of riprap stone for gabions shall be 3 to 6 in. (75 to 150 mm) for a gabion thickness of 12 in. (300 mm) or greater, and 3 to 6 in. (75 to 150 mm) for a mattress thickness of less than 12 in. (300 mm).

625.07 Soil Anchor Stakes

Soil anchor stakes for wire mesh mattresses shall be steel and shall include the components as follows:

(a) Steel pipe of 2 in. (50 mm) in size, either black or galvanized, in accordance with ~~ASTM A 120~~ ASTM A53.

(b) Structural steel angles L 3 x 3 x 3/8 in. (L 76 x 76 x 9.5 mm) in accordance with ASTM A 36.

A type A certification in accordance with 916 for the soil anchor stakes shall be furnished prior to use of the materials.

CONSTRUCTION REQUIREMENTS

625.08 Construction

Gabions and mattresses shall be placed as shown on the plans. Riprap shall be placed in close contact in the wire mesh cage units so that maximum fill is obtained. The units may be machine filled with sufficient handwork to accomplish the requirements herein.

The vertical exposed faces of the gabions shall be hand filled with larger stones. An effort shall be made to place the stones so as to limit basket distortion as much as possible.

Where the length of the unit exceeds 1.5 times its horizontal width, the cage shall be equally divided with diaphragms of the same mesh and gage as the body into cells whose length does not exceed the horizontal width. The unit shall be furnished with the necessary diaphragms secured in proper position on the base section such that no additional fasteners or tie wire at such juncture will be necessary.

All perimeter edges of gabion cages shall be securely selvedged or bound such that the joints formed by tying the selvedges have a minimum strength of 1400 lbs/lft (20 431 N/m) for galvanized gabions, and 1200 lbs/lft (17 512 N/m) for PVC gabions.

After the foundation soils have been excavated to the width, line, and grades specified and the Engineer determines that a suitable foundation exists for installation of the geotextiles and subsequent construction of the gabions, the Contractor shall install the geotextiles in accordance with 616.11. The gabions shall then be founded on the geotextile lined bed and laid to the lines and dimensions specified or as directed.

Excavation for toewalls or cut-off walls shall be made to the neat lines shown on the plans.

All wire mesh cage units shall be tied together each to its neighbor along all contacting edges in order to form a continuous connecting structure.

625.09 Method of Measurement

This work will be measured by the cubic yard (cubic meter) of riprap required to fill the gabions or mattresses, or as directed, in place. Geotextiles will be measured in accordance with 616.12.

625.10 Basis of Payment

The accepted quantities of riprap measured as set out above will be paid for at the contract unit price per cubic yard (cubic meter) for gabions. Geotextiles will be paid for in accordance with 616.13.

Payment will be made under:

Pay Item	***Pay Unit Symbol***
Gabions	*CYD (m3)*

The cost of furnishing the wire mesh cages, tie and connecting wire, selvedges, riprap material for filling the wire mesh cages, soil anchor stakes for the wire mesh cages, and all labor, materials, equipment, and earthwork shall be included in the cost of the pay item.