

SECTION 610

GABIONS

610.1 GENERAL

This work shall consist of furnishing, transporting, and constructing wire mesh gabions in compliance with the construction plans and these specifications. Installation of the gabions shall be at the locations shown on the plans.

610.2 REFERENCES

610.2.1 ASTM

A 116	C 88
A 239	C 131
B 117	D 1557

610.2.2 ANSI

1010
1015

610.2.3 This publication

SECTION 109

610.2.3.1 This specification covers the use of galvanized steel wire mesh baskets filled with stone used as retaining walls, slope paving, river back protection, outfall structures, weirs and drop structures, etc.

610.3 DEFINITIONS

610.3.1 Gabions are defined as galvanized steel wire mesh box-shaped baskets, of various sizes. The baskets are filled on site with clean-hard stones.

610.3.2 The selvages of the gabions are the thicker perimeter and edge wires to which the wire mesh is securely tied to withstand sudden or gradual stress from any direction.

610.3.3 Reinforcing wires are the thicker wires incorporated into the netting during fabrication.

610.3.4 The diaphragms are internal wire mesh partitions which divide the gabion into equal-sized cells.

610.3.5 Lacing or binding wire is the wire used to assemble and join the gabion units.

610.3.6 Connecting wires are the internal wires used to prevent the gabions from bulging.

610.4 MATERIALS FOR WIRE MESH BASKETS

610.4.1 FABRICATION:

610.4.1.1 Gabions shall be fabricated so that the sides, ends, lid, and partitions can be assembled at the construction site into rectangular baskets of the specified sizes. Gabions shall be of single unit construction. The base, ends, and sides shall be woven into a single unit, or one edge of these members shall be connected to the base section of the gabion so that strength and flexibility at the point of connection is at least equal to that of the mesh.

610.4.1.2 Where the length of the gabion exceeds one and one-half its horizontal width, the gabion shall be equally divided by partitions, of the same mesh and wire diameter as the body of the gabions, into cells whose length does not exceed the horizontal width. The gabion shall be furnished with the necessary partitions secured in proper position on the base section so that no additional tying at this juncture will be necessary.

610.4.1.3 Perimeter edges shall be securely selvaged or bound so that the joints formed by tying the selvages have approximately the same strength as the body of the mesh. Ties used for this purpose shall be spaced at not more than 6-inch centers.

610.4.2 DIMENSIONS: Gabions shall be supplied as specified in various lengths and heights shown on the plans. See Table 610.3.2 for standard sizes.

610.4.3. TOLERANCES: Gabion dimensions are subject to a tolerance limit of ± 3 percent of manufacturer's published sizes.

610.4.4 WIRE:

610.4.4.1 Wire used in the body of the mesh shall be approximately 0.12 inch in diameter, (after galvanization). Wire used in the mesh shall equal or exceed ASTM A 116, finish 5, medium hardness, Class 3 coating. Samples for testing shall include at least one sample of each component of the mesh. Uniformity of coating shall equal or exceed 10 one-minute dips by the Preece Test, ASTM A 239. A certification of

resistance to corrosion may be substituted in lieu of requirements for Class 3 coating as follows: A section of mesh, including twists or fastenings forming the mesh, shall be exposed to a salt spray fog test (ASTM B 117) for at least 200 hours before failure to any part of the mesh.

610.4.4.2 Tie and connection wire shall be supplied in sufficient quantity for securely fastening all edges of the gabion and diaphragms and to provide for four cross-connecting wires in each cell 1/2 unit high and 8 connecting wires in each cell 1 unit high. Selvedge or perimeter basket frame wire shall be of a heavier gauge than the mesh wire with a minimum diameter of 0.150 inches (US gauge 9) after galvanization. Lacing and connecting wire shall meet the same specifications as the wire used in the gabion body except that its diameter shall be of 0.0866 inches (US gauge 13 1/2) after galvanization.

610.4.4.3 All of the above wire diameters are subject to tolerance limit of $\pm 2 \frac{1}{2}\%$.

610.4.5 MESH OPENINGS: Opening of the mesh shall not exceed 4 inches in the longest dimension.

610.4.6 NON-RAVELING CONSTRUCTION: The wire mesh shall be fabricated so as to be non-raveling. This is defined as the ability to resist pulling apart at any of the twists or connections forming the mesh when a single wire strand in a section of mesh is cut and the section of mesh is then subjected to the load test described in Load Test Number 1.

610.4.7 MESH ELASTICITY: The wire mesh shall have elasticity sufficient to permit elongation of the mesh equivalent to a minimum of 10 percent of the length of the section of mesh under test without reducing the diameter or tensile strength of individual wire strands to values less than those for similar wire 0.01 inch smaller in diameter.

610.4.8 METHOD OF SAMPLING, INSPECTION, AND TEST:

610.4.8.1 Mesh: A section of mesh 6 feet in length and not less than 3 feet in width, after first being subjected to the elongation test described in Subsection 610.3.7, shall withstand a load test of 6,000 pounds applied to a 1-square foot area approximately in the center of the section. This test is more specifically described in Load Test Number 1.

610.4.8.2 Load Test No. 1: A uncut section of mesh, 6 feet in length, not less than 3 feet in width, and including all selvedge bindings, shall be the ends securely clamped for 3 feet along the width of the sample. When the width of the section under test exceeds 3 feet the clamps shall be placed at the center of the width, and the excess width shall be allowed to fall free on each side of the clamped section. The sample shall then be subjected to tension sufficient to cause 10 percent elongation of the sample section between the clamps. After elongation and while clamped, as described above (and otherwise unsupported), the section shall be subjected to a load applied to a 1-square foot area in the approximate center of the sample section between the clamps and in a direction perpendicular to the direction of the tension force. The sample shall withstand, without rupture of any strand or opening of any mesh fastening, an actual load, so applied, equaling or exceeding, 6,000 pounds.

610.4.8.3 The fan head used in the test shall be circular and have its edges beveled or rounded to prevent cutting of the wire strands.

610.4.8.4 Inspection and Certification: The CONTRACTOR shall furnish a certified report of tests made by a approved testing laboratory showing that the product to be supplied equals or exceeds these specifications.

610.4.9 MARKING: Each gabion shall be clearly marked by color code or some other readily identifiable means to indicate size.

610.5 ROCK FILLER MATERIAL

610.5.1 Rock used in filling gabions shall be as shown in Table 610. Rock shall meet the requirements of Section 109 Riprap Stone.

610.6 CONSTRUCTION REQUIREMENTS

610.6.1 Gabions shall be constructed and erected in accordance with the manufacturer's published procedures or, as a minimum, as specified herein.

610.6.2 The foundation under the gabions shall be prepared as shown on the drawings, but as a minimum, the top six inches of the gabion soil foundation shall be compacted to no less than 95 percent of maximum density, as determined by ASTM D 1557.

TABLE 610.4.2

STANDARD GABIONS

Size Code	Dimensions L x W x H	No. of Cells	Capacity Cu. Yds.	Filler Rock
A	6'x3'x3'	2	2	Type L
B	9'x3'x3'	3	3	Type L
C	12'x3'x3'	4	4	Type L
D	6'x3'x1'x6"	2	1	Type L
E	9'x3'x1'x6"	3	1.5	Type L
F	12'x3'x1'x6"	4	2	Type L
G	6'x3'x1'	2	0.666	Type VL
H	9'x3'x1'	3	1	Type VL
I	12'x3'x1'	4	1.33	Type VL

610.6.3 The aggregate shall be placed within the baskets in such a manner as to eliminate as many open pockets as possible. Gabions may be filled by hand or by mechanical means. Every effort shall be

made to keep voids and bulges in the gabions to a minimum in order to ensure proper alignment and a neat, compact, square appearance. Exposed surfaces shall be hand placed to provide an aesthetic appearance.

610.6.4 ASSEMBLING AND PLACING

610.6.4.1 Each gabion shall be assembled by tying all untied edges with binding wire. The binding wire shall be tightly looped around every other mesh opening along the seams in such a manner that single and double loops are alternated.

610.6.4.2 A line of empty gabions shall be placed into position according to the contract drawings and binding wire shall be used to securely tie each unit to the adjoining one along the vertical reinforced edges and the top selvages. The base of the empty gabions placed on top of a filled line of gabions shall be tightly wired to the latter at front and back.

610.6.4.3 To achieve better alignment and finish in retaining walls, gabion stretching is recommended.

610.6.4.4 Connecting wires shall be inserted during the filling operation in the following manner:

610.6.4.4.1 36" Gabions

- I. Gabions shall be filled to a depth of twelve (12) inches.
- II. One connecting wire in each direction shall be tightly tied to opposite faces of each gabion cell at a height of twelve (12) inches above the base.
- III. Gabions shall be filled with a further depth of twelve (12) inches, and two connecting wires shall similarly be tied at this level.
- IV. Gabions shall be filled to the top.

610.6.4.4.2 18" and 12" Gabions

610.6.4.4.3 Connecting wires are not necessary unless the 18" size is used to build vertical structures; in this case, two wires, one in each direction, at 9" from the base, must be placed as above.

610.6.4.5 The gabions in any row shall be filled in stages so that local deformations may be avoided. That is, at no time shall any gabion be filled to a depth exceeding one foot more than the adjoining gabion.

610.6.4.6 When a gabion has been filled the lid shall be bent over by hand until it meets the front and ends. Then the lid shall be tightly bound to

the rest of the basket with the lacing wire along all edges and internal cell diaphragms in the same manner described above for assembly.

610.7 MEASUREMENT AND PAYMENT

610.7.1 Gabions shall be measured by the cubic yard in place, based on basket dimensions shown on the plans, and shall include excavation, baskets, rock filler, and removal of waste materials. Payment will be made at the unit price per cubic yard as specified in the Bid Proposal.

610.7.2 No direct payment will be made for excavation and disposal of material required for placement of gabions or for backfill and compaction behind the gabion walls, and the cost thereof will be considered incidental to the completion of the work.