Construction Specification
017 Wire Mesh Gabions and Mattresses

SCOPE

The work shall consist of furnishing, assembling and installing rock filled wire mesh gabion baskets and mattresses.

TYPES

Gabions shall consist of rectangular wire mesh formed containers filled with rock. Gabions will conform to one of the following mesh types:

Woven Mesh - Non-raveling double twisted hexagonal wire mesh, consisting of two wires twisted together in two 180 degree turns.

Welded Mesh - Welded-wire mesh with a uniform square or rectangular pattern and a resistance weld at each intersection. The welded wire connections shall conform with the requirements of ASTM

A 185, including wire smaller than W1.2 (0.124 in.); except that the welded connections shall have a minimum average shear strength of 70% and a minimum shear strength of 60% of the minimum ultimate tensile strength of the wire.

Gabions shall be furnished as baskets or mattresses, as shown in the construction plans. Baskets have a height of 12 inches or greater. Mattresses have a thickness of 12 inches or less.

Baskets and mattresses shall be fabricated within a dimension tolerance of plus or minus 5 percent, except that the mattress height shall be within 10 percent.

MATERIALS

Gabions shall be fabricated, assembled and installed in accordance with the nominal wire sizes and dimensions found in Tables 1 and 2.

Wire for fabrication and assembly shall be hot-dipped galvanized. The wire shall have a minimum tensile strength of 60,000 psi. Galvanized steel wire shall conform to ASTM A 641, class 3, soft temper.

Spiral binders are the standard fastener for welded-mesh gabion baskets and mattresses, and shall be formed from wire meeting the same quality and coating thickness requirements as specified for the gabion baskets and mattresses. Alternate fasteners for use with wire mesh gabions, such as ring

fasteners, shall be formed from wire meeting the same quality and coating thickness requirements as specified for the gabions.

Gabion baskets or mattresses with PVC coating shall be interconnected using ring fasteners made of stainless steel or PVC-coated spiral fasteners. All fasteners shall meet the closing requirements of the gabion manufacturer.

Table 1* Gabion Baskets Height 12, 18, or 36 inches; Length as specified

Type of Wire	Mesh Size Inches	Wire Diameter Inches	PVC Coating Inches	Total Diameter Inches	Galvanized Coating oz./sf.
Woven Mesh	3 ¼ x 4 ½	0.118	None 0.02	0.118	0.80
	3 ¼ x 4 ½	0.105		0.145	0.80
Selvage		0.153	None 0.02	0.153	0.80
		0.132		0.172	0.80
Lacing and Internal Connecting Wire		0.086	0.02	0.126	0.7
Welded Mesh	3 x 3	0.118	None 0.02	0.118	0.80

Type of Wire	Mesh Size Inches	Wire Diameter Inches	PVC Coating Inches	Total Diameter Inches	Galvanized Coating oz./sf.
	3 x 3	0.105		0.145	0.80
Spiral Dinder		0.105	0.02	0.145	0.80

Table 2* Gabion Baskets Height 12, 18, or 36 inches; Length as specified

Type of Wire	Mesh Size Inches	Wire Diameter Inches	PVC Coating Inches	Total Diameter Inches	Galvanized Coating oz./sf.
Woven Mesh	2 ½ x 3 ¼	0.086	0.02	0.126	0.70
Selvage		0.105	0.02	0.145	0.80
Lacing and Internal Connecting Wire		0.86	0.02	0.126	0.70
Welded Mesh	1 ½ x 3	0.08	0.02	0.12	0.70
Spiral Dinder		0.105	0.02	0.145	0.80
NOTE: The wire sizes and PVC coating thickness shown are nominal sizes. The wire diamter includes the galvanizing coating thickness.					

When Epoxy or Polyvinyl Chloride (PVC) coated wire is used, the galvanized wire shall be coated by fusion bonded epoxy; or fusion bonded, extruded, or extruded and bonded PVC material. The wire coating shall be colored black, gray, green or silvery; and the initial properties of the PVC coating shall meet the following requirements:

1. Specific Gravity. In the range of 1.25 to 1.35, ASTM D 792.
2. Abrasion Resistance. The percentage of weight loss shall be less than 12%, when tested according to ASTM D 1242, Method B at 200 cycles, CSI-A Abrader Tape, 80 Grit.
3. Brittleness Temperature. Not higher than 15 oF, ASTM D 746.
4. Tensile Strength. Extruded Coating (not less than 2,980 psi., ASTM D 412). Fusion Bonded Coating (not less than 2,275 psi., ASTM D 638).
5. Modulus of Elasticity. Extruded Coating (not less than 2,700 psi. at 100 percent strain, ASTM D 412). Fusion Bonded Coating (not less than 2050 psi. at 100 percent strain, ASTM D 638).
6. Ultraviolet Light Exposure. A test period of not less than 3000 hours, using apparatus Type E at 63 oC, ASTM G 23.
7. Salt Spray Test. A test period of not less than 3000 hours, ASTM B 117.

Rock shall conform to the quality requirements in Wisconsin Construction Specification 9, Loose Rock Riprap, unless otherwise specified in the construction plan. At least 85 percent of the rock particles, by weight, shall be within the predominant rock size range shown in Table 3.

Table 3 Rock Requirements

Gabion Basket or Mattress Height	Predominant Rock Size Inches	Minimum Rock Dimention Inches	Maximum Rock Dimention Inches
18 or 36 inch Basket	4 to 8	4	9
12 inch Basket or Mattress	4 to 6	3	8
6 or 9 inch Mattress	3 to 6	3	6

Prior to delivery to the site, the Contractor shall inform the Technician in writing of the source from which the rock will be obtained, and provide the test data by which the material was determined by the Contractor to meet the specification.

Bedding or filter material, when specified, shall meet the gradation shown on the plans or as specified in Wisconsin Construction Specification 8, Drainfill.

Geotextile, when specified, shall conform to the requirements specified in Wisconsin Construction Specification 13, Geotextiles.

FOUNDATION PREPARATION

The foundation on which the gabions are to be placed shall be cut or filled and graded to the lines and grades shown on the drawings. Surface irregularities, loose material, vegetation, and all

foreign matter shall be removed from foundations. When fill is required, it shall consist of materials conforming to the specified requirements. Gabions and bedding or specified geotextiles shall not be placed until the foundation preparation is completed, and the subgrade surfaces have been inspected and approved by the Technician.

Compaction of bedding or filter material will be required as specified in Wisconsin Construction Specification 8, Drainfill. The surface of the finished material shall be to grade and free of mounds, dips or windrows. Geotextile shall be installed in accordance with the requirements of Wisconsin Construction Specification 13, Geotextiles.

ASSEMBLY AND PLACEMENT

Unless otherwise specified in the construction plan, the assembly and placement of gabions shall be in accordance with the following procedures:

Assembly - Rotate the gabion panels into position and join the vertical edges with fasteners for gabion assembly. Where lacing wire is used, wrap the wire with alternating single and double half- hitches at intervals between four (4) to five (5) inches. Where spiral fasteners are used for welded- wire mesh, crimp the ends to secure the spirals in place. Where ring type fasteners are used for basket assembly, install the fasteners at a maximum spacing of 6 inches. Use the same fastening procedures to install interior diaphragms where they are required.

Interior diaphragms will be installed to assure that no open intervals are present that exceed three (3) feet.

Placement - Place the empty gabions on the foundation and interconnect the adjacent gabions along the top, bottom, and vertical edges using lacing wire, spiral fasteners, or ring fasteners. Wrap the wire with alternating single and double half-hitches at intervals between four (4) to six (6) inches. Ring fasteners shall not be spaced more than six (6) inches apart. Spirals are screwed down at the connecting edges, then each end of the spiral is crimped to secure it in place. Lacing wire will be used as needed to supplement the interconnection of welded mesh gabions, and the closing of lids.

Interconnect each layer of gabions to the underlying layer of gabions along the front, back, and sides. Stagger the vertical joints between the gabions of adjacent rows and layers by at least one-half of a cell length.

FILLING OPERATION

After adjacent empty woven wire gabion units are set to line and grade and common sides properly connected, they shall be placed in straight line tension and stretched to remove any kinks from

the mesh and to gain a uniform alignment. Staking of the gabions may be done to maintain the established proper alignment prior to the placement of rock. No stakes shall be placed through geotextile material.

Internal connecting cross-tie wires shall be placed in each unrestrained gabion cell greater than 18 inches in height, including gabion cells left temporarily unrestrained. Two internal connecting wires shall be placed concurrently with rock placement, at each 12-inch interval of depth.

In woven mesh gabions, these cross-ties will be placed evenly spaced along the front face and connecting to the back face. All cross-tie wires shall be looped around two mesh openings and each wire end shall be secured by a minimum of five 180 degree twists around itself after looping.

In welded mesh gabions, these cross-ties or stiffeners will be placed across the corners of the gabions (at 12 inches from the corners) providing diagonal bracing. Preformed hooked wire stiffeners will be used.

The gabions shall be carefully filled with rock, either by machine or hand methods, maintaining alignment, avoiding bulges, and providing a compact mass that minimizes voids. Machine placement will require supplementing with hand work to ensure the desired results. The cells in any row shall be filled in stages so that the depth of rock placed in any one cell does not exceed the depth of rock in any adjoining cell by more than 12 inches. Along the exposed faces, the outer layer of stone

shall be carefully placed and arranged by hand to ensure a neat, compact placement with a uniform appearance.

The last layer of rock shall be uniformly overfilled 1-2 inches for gabions and 0.5-1 inch for gabion mattresses to allow for rock settlement. Lids shall be stretched tight over the rock fill using only approved lid closing tools. The use of crowbars or other single point leverage bars for lid closing is prohibited. The lid shall be stretched until it meets the perimeter edges of the front and end panels. The gabion lid shall then be secured to the sides, ends, and diaphragms with spiral binders or lacing wire wrapped with alternating single and double half-hitches in the mesh openings. Ring fasteners spaced not more than six (6) inches apart may be used for lid closure.

Any damage to the wire or coatings during assembly, placement and filling shall be repaired promptly in accordance with the manufacturer’s recommendations or replaced with undamaged gabion baskets.

Specific Site Requirements