MODULAR GABION SYSTEMS

CONSTRUCTION SPECIFICATION
WIRE MESH GABIONS AND MATTRESSES

1) SCOPE

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

2) TYPES

a) Gabions shall consist of rectangular or square wire mesh formed containers filled with rock. Gabions will conform to the following: Welded wire mesh with a uniform square or rectangular pattern and a resistance weld at each intersection. The welded wire connections shall conform to the requirements of ASTM A185, including wire smaller than W1.2 (0.124 in.); except that the welded connections shall have minimum average shear strength of 70% and minimum shear strength of 60% of the minimum ultimate tensile strength of the wire. The wire mesh shall be galvanized before forming into mesh.

b) ASTM 974 as manufactured by Modular Gabion Systems, Houston, TX or approved equal. Approval must be in writing by the specifying engineer a minimum of one week prior to bid.

Gabions: Gabions shall be furnished as baskets or mattresses. Baskets and mattresses shall be fabricated within a dimension tolerance of plus or minus 5%.

Baskets: Baskets have a height of 12 inches or greater.

Mattresses: Mattresses have a thickness of 12 inches and less.

3) MATERIALS

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

b) 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, and Soft Temper.

TABLE 1 (Minimum Requirements)
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
Lacing Wire		0.086	0.02	0.126	0.70
Welded Mesh	3 x 3 3 x 3	0.118 0.105	None 0.02	0.118 0.145	0.80 0.80
Spiral Binder		0.105	0.02	0.145	0.80

TABLE 2 (Minimum Requirements)*

GABION MATTRESSES – Height 6, 9, or 12 Inches: Length as Specified

Type of Wire	Mesh Size (inches)	Wire Diameter (inches)	PVC Coating (inches)	Total Diameter (inches)	Galvanized Coating oz./SF
Lacing Wire		0.086	0.02	0.126	0.70
Welded Mesh	1½ x 3	0.086	0.02	0.120	0.70
Spiral Binder		0.105	0.02	0.145	0.80

*NOTE: The wire sizes and PVC coating thickness shown are nominal sizes

i) The wire sizes include the galvanizing coating thickness.

ii) When Polyvinyl Chloride (PVC) coated wire is specified, the galvanized wire shall be coated by fusion 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:

iii) Specific Gravity. In the range of 1.30 to 1.40, ASTM D 792.

iv) 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.

v) Brittleness Temperature. Not higher than 15°F, ASTM D 746

vi) Tensile Strength. Extruded Coating (not less than 2,980 psi. ASTM D 412). Fusion Bonded Coating (not less than 2275 psi. at 100 percent strain, ASTM D 638).

vii) Medulus of Elasticity. Extruded Coating (not less than 2,700 psi. at 100 percent strain, ASTM D 412). Fusion Bonded Coating (not less than 1980 psi. at 100 percent strain, ASTM D 638).

viii) Ultraviolet Light Exposure. A test period of not less than 3,000 hours, using apparatus type E at 63 C, ASTM G 23.

ix) Salt Spray Test. A test period of not less than 3000 hours, ASTM B 117.

After the exposure to ultraviolet light and the salt spray test as specified above, the PVC coating shall not show cracks, blisters, splits, nor noticeable change of coloring (surface chalk). In addition, the specific gravity shall not change more than six (6) percent, resistance to abrasion shall not change more than ten (10) percent, and tensile strength shall not change more than 25 percent from their initial values.

The wire sizes shown in Tables 1 and 2 are the size of the wire after galvanizing and before coating with PVC.

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. Test results must be provided to certify that the ring fasteners provide the joint strength required.

Standard fasteners and alternate fasteners must provide a minimum strength of 1,400 lbs. per lineal foot for gabion baskets and 900 lbs. per lineal foot for gabion mattresses. When used to interconnect gabion baskets or mattresses with PVC coating, ring fasteners shall be made of stainless steel and spiral fasteners shall be PVC coated. All fasteners shall meet all of the closing requirements of the gabion manufacturer.

Rock shall conform to the quality requirements as follows and at least 85 percent of the rock particles, by weight, shall be within the predominant rock size range. Recycled concrete may be used in lieu of the specified aggregate at the engineer's discretion.

Gabion Basket or Mattress Height (inches)		Predominant Rock Size (inches)	Minimum Rock Dimension (inches)	Maximum Rock Dimension (inches)
Basket	12” 18” 36”	4 to 8	4	8
Mattress	6” 9” 12”	3 to 5	3	5

At least 30 days prior to delivery to the site, the Contractor shall inform the engineer in writing of the source from which the rock will be obtained, and include the test data and other information by which the material was determined by the Contractor to meet the specification. The Contractor shall provide the engineer free access to the source for the purpose of obtaining samples for testing and source approval.

Bedding or filter material, when specified, shall meet the gradation shown on the plans. Geotextile, when specified shall conform to the requirements specified in the plans or the manufacturer's recommendation.

4) 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 foundation surface area. 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 engineer or the engineer's representative.

Compaction of bedding or filter material will be required per plans and specifications. The surface of the finished material shall be to grade and free of mounds, dips or windrows. Extra care should be taken with foundation preparations in order to ensure a level and smooth surface. Geotextile shall be installed in accordance with the requirements of the plans and specifications.

5) ASSEMBLY AND PLACEMENT

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, crimp the ends to secure the spirals in place. Where ring type alternate 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 required where any inside dimension exceeds three (3) feet for gabion baskets thicker than 12”. Diaphragms will be installed to assure that no open intervals are present that exceeds three (3) feet. For baskets 12” or less rectangular cells are allowed with dimensions 36” in one direction and not to exceed 72” in the perpendicular direction.

Placement. Place the empty gabions on the foundation and interconnect the adjacent gabions along the top, bottom, and vertical edges using lacing wire or spirals. Wrap the wire with alternating single and double half hitches at intervals between four (4) to six (6) inches. Spiral fasteners are commonly used for the assembly and interconnection of welded mesh gabions. Spirals are screwed down at the connecting edges then each end of the spiral is crimped to secure it in place. Lacing may 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.

6) FILLING OPERATION

After adjacent empty wire gabion units are set to line and grade and common sides properly connected, they shall be placed in straight-line tension 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 temporary stakes shall be placed through geotextile material. Connecting lacing wire and other fasteners (as allowed) shall be attached during the filling operation to preserve the strength and shape of the structure.

Internal connecting cross-tile 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 welded mesh gabions these crossties or stiffeners will be placed across the corners of the gabions (at 12 inches from the corners) providing diagonal bracing. Lacing wire or preformed wire stiffeners may be used.

The gabions shall be carefully filled with rock, either by machine or hand methods, ensuring alignment, avoiding bulges, and providing a compact mass that minimizes voids. At no point in the filling process may rock be mechanically placed from a height of over 36” from machine to fill area. Machine placement will require supplementing with handwork 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 leveled to the top edges of the gabions. Lids shall be placed over the rock filling using only approved lid closing tools as necessary. The use of crowbars or other single point leverage bars for lid closing is prohibited due to the potential for damage to the baskets.

The gabion lid shall then be secured to the sides, ends, and diaphragms with spiral binders, approved alternate fasteners, or lacing wire wrapped with alternating single and double half-hitches in the mesh openings.

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.

7) MEASUREMENT AND PAYMENT

Method 1. For items of work for which specific unit prices are established in the contract; the volume of rock will be measured within the neat lines of the gabion structure and computed to the nearest cubic yard. Payment for gabions will be made at the contract unit price, and includes the wire mesh and rock. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to completion of the work.

Method 2. For items of work, for which specific unit prices are established in the contract, the volume of the gabions will be measured within the neat lines of the gabion structure and computed to the nearest cubic yard. Payment for the gabions will be made at the contract unit price, and includes the wire mesh, rock and specified bedding material or geotextile. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

Method 3. For items of work for which specific unit prices are established in the contract, the surface area will be measured within the neat lines of the gabion mattress structure and computed to the nearest square yard. Payment for the gabion mattress will be made at the contract unit price, and includes the wire mesh and rock. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

Method 4. For items of work, for which specific unit prices are established in the contract, the surface area will be measured within the neat lines of the gabion mattress structure and computed to the nearest square yard. Payment for the gabion mattress will be made at the contract unit price, and include the wire mesh, rock and specified bedding material and geotextile. Such payment will be considered full compensation for all labor, materials, equipment and all other items necessary and incidental to the completion of the work.

All Methods The following provisions apply to all methods of measurement and payment. No deduction in volume will be made for any void or embedded item. Compensation for any item of work described in the contract, but not listed in the bid schedule will be included in the payment for the item of work to which it is made subsidiary.