

# **GABIONS – PVC Coated**

Product Standard Specifications

Installation Instructions

Method of Measurement and Payment

Update: May 1999



**MACCAFERRI**

ENVIRONMENTAL SOLUTIONS

## FOREWORD

This pamphlet has been issued by MACCAFERRI GABIONS, INC. in response to requests for summarized specifications and methods of measurement and payment. These specifications are laid out in standard DOT format and should serve only as a recommendation.

### NOTES:

The following items have been changed or updated from previous versions. The current date of this specification is May 1999.

The following ASTM standards and specifications have been added or updated:

- ASTM A975-97 Standard Specification for Double-Twisted Hexagonal Mesh Gabions and Revet Mattresses (Metallic-Coated Steel Wire or Metallic-Coated Steel Wire with Polyvinyl Chloride (PVC) Coating)
- ASTM A641-97 Specification for Zinc Coated (Galvanized) Carbon Steel Wire
- ASTM A370-92 Test Methods and Definitions for Mechanical Testing of Steel Products
- ASTM A90-93 Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coating
- ASTM A313-92 Specification for Chromium-Nickel Stainless and Heat-Resisting Steel Spring Wire
- ASTM A764-93 Specification for Steel Wire, Carbon, Drawn Galvanized and Galvanized at Size for Mechanical Springs

## SUMMARY OF SPECIFICATIONS EXPLANATORY NOTES

1. The issue date of these specifications is May 1999. Customers who wish to use them in contract documents are advised to consult with Maccaferri Gabions, Inc. as to any subsequent updates. If so printed, customer assumes all responsibility.
2. This text is written to cover the use of PVC coated gabions.
3. These specifications cover standard materials only. Certain clauses may not apply in their entirety to special materials.
4. The format of these specifications has been configured to the standard specification book format used by State Transportation Departments.

## SECTION 000

### GABIONS – Galvanized and PVC Coated

May 1999

#### 000.1 Description

This work shall consist of furnishing, assembling, and filling woven wire mesh gabions with rock as specified in the contract to the dimensions, lines and grades shown on the plans, or as determined by the engineer. These specifications are in accordance with ASTM A975-97 and include gabions as manufactured by Maccaferri Gabions, Inc.

#### 000.2 Materials

##### 000.2.1 Woven Mesh Gabions

###### 000.2.1.1 Wire :

All test on the wire mesh must be performed prior to manufacturing the mesh.

Tensile strength: both the wire used for the manufacture of gabions and the lacing wire, shall have a tensile strength of 54,000 to 70,000 psi (38-48 kg/mm<sup>2</sup>), in accordance with ASTM A641-97.

Elongation: the test must be carried out on a sample at least 12 in. (30 cm) long. Elongation shall not be less than 12%, in accordance with ASTM A370-92.

Zinc coating: minimum quantities of zinc according to ASTM A641-97, Class III soft temper coating.

Adhesion of zinc coating: the adhesion of the zinc coating to the wire shall be such that, when the wire is wrapped six turns around a mandrel having four times the diameter of the wire, it does not flake or crack when rubbing it with the bare fingers, in accordance with ASTM A641-97.

###### 000.2.1.2 PVC (Polyvinyl Chloride) Coating

Specific gravity: 81-84 pcf (1.30-1.35 kg/dm<sup>3</sup>) in accordance with ASTM D792, Table 1;

Hardness: between 50 and 60 Shore D, according to ASTM D 2240;

Tensile strength: not less than 2,985 psi (20.6 MPa), according to ASTM D412-92;

Modulus of elasticity: not less than 2,700 psi (18.6 MPa), according to ASTM D412-92;

Abrasion resistance: the percentage of the weight loss shall be less than 12%, according to ASTM D1242-92.

Creeping corrosion: max. penetration of corrosion of the wire from a square cut end shall be less than 1 in. (25 mm) when the specimen has been immersed for 2,000 hrs in a 5% solution HCl (hydrochloric acid 12 Be).

The accelerated aging tests are:

Salt spray test: test period 3,000 hours, test method ASTM B117-94;

Exposure to UV rays: test period 3,000 hours at 145°F (63°C), test method ASTM D1499-92a and ASTM G23-93 apparatus Type E;

Brittleness temperature: no higher than 15°F (- 9°C), or lower temperature when specified by the purchaser, when tested in accordance with ASTM D746.

The properties after aging tests shall be as follows:

Appearance of coated mesh: no cracking, stripping or air bubbles, and no appreciable variation in color;

Specific Gravity: variations shall not exceed 6%;

Hardness: variations shall not exceed 10%;

Tensile strength: variations shall not exceed 25%;

Modulus of elasticity: variations shall not exceed 25%;

Abrasion resistance: variations shall not exceed 10%;

Brittleness temperature: shall not exceed + 64°F (+18°C);

**000.2.1.3** Galvanized and PVC coated wire mesh gabions (8 x 10 mesh type):  
*PVC coating thickness*: Nominal – 0.02 in (0.5 mm), Minimum – 0.015 in (0.38 mm)  
*Mesh Wire*: Diameter – 0.106” (2.70 mm) internal, 0.146” (3.70 mm) external  
*Selvedge Wire*: Diameter – 0.134” (3.40 mm) internal, 0.174” (4.40 mm) external  
*Mesh Opening*: Nominal Dimension D = 3.25 inches, as per Fig. 1.

**000.2.1.4** Galvanized and PVC coated lacing wire and internal stiffeners:  
*PVC coating thickness*: Nominal – 0.02 in (0.5 mm), Minimum – 0.015 in (0.38 mm)  
*Lacing wire*: Diameter – 0.087” (2.20 mm) internal, 0.127” (3.20 mm) external  
*Stiffener wire*: Diameter - 0.087” (2.20 mm) internal, 0.127” (3.20 mm) external

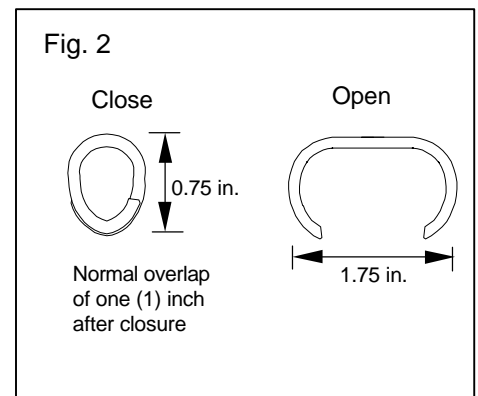
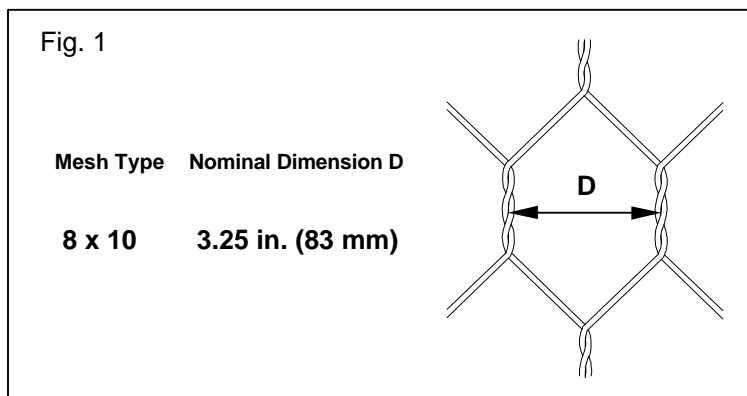
**000.2.1.5** Spenax Fasteners (Overlapping Fasteners):  
 Overlapping stainless steel fasteners may be used in lieu of lacing wire for basket assembly and installation. The spacing of the fasteners during all phases of assembly and installation shall be in accordance with spacing based on 1,200 lbs. pull apart resistance for PVC coated mesh and with a nominal spacing of 4 inches (100 mm), and not to exceed 6 inches (150 mm).  
*Stainless steel Fasteners*: diameter: 0.120 inch (3.05 mm), according to ASTM A313, Type 302, Class I. Tensile strength: 222,000 to 253,000 psi (156 – 178 kg/mm<sup>2</sup>) in accordance with ASTM A313-92.  
 Proper installation of rings: A properly formed Spenax fastener shall have a nominal overlap of one (1) inch after closure (Fig. 2).

**000.2.2 Tolerances**

*Wire*: Zinc coating, in accordance with ASTM A641-97, Class III soft temper coating.

*Gabions*: ± 5 % on the length, width, and height.

*Mesh opening*: Tolerances on the hexagonal, double twisted wire mesh opening shall not exceed ± 10% on the nominal dimension D values (see Fig.1):



### **000.2.3 Fabrication**

Gabions shall be manufactured 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. The ends and diaphragm(s) shall be factory connected to the base. The lid may be a separate piece made of the same type mesh as the basket. All perimeter edges of the mesh forming the basket and top, or lid, shall be selvaged with wire having a larger diameter.

The gabion is divided into cells by means of diaphragms positioned at approximately 3 ft centers. The diaphragms shall be secured in position to the base so that no additional lacing is necessary at the jobsite.

### **000.2.4 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. Gabion rocks shall range between 4 inches (0.10 m) and 8 inches (0.20 m). The range in sizes shall allow for a variation of 5% oversize and/or 5% undersize rock, 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 gabions.

## **000.3 Construction Requirements**

### **000.3.1 Assembly**

Gabions are supplied folded flat and packed in bundles. Larger units may be supplied in rolls. 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 sides are satisfactorily aligned. The four corners shall be connected first, followed by the internal diaphragms to the outside walls. All connections should use lacing wire or fasteners as previously described in Section 000.2.1.4 and Section 000.2.1.5.

The procedure for using lacing wire consists of cutting a sufficient length of wire, and first looping and/or twisting the lacing wire to the wire mesh. Proceed to lace with alternating double and single loops through every mesh opening approximately every 6 inches (150 mm), pulling each loop tight and finally securing the end of the lacing wire to the wire mesh by looping and/or twisting.

The use of fasteners shall be done in accordance with the manufacturer's recommendations as specified in Section 000.2.1.5.

### **000.3.2 Installation**

After initial assembly, the gabions are carried to their final position and are securely joined together along the vertical and top edges of their contact surfaces using the same connecting procedure(s) described in Section 000.3.1. 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) described in Section 000.3.1.

### **000.3.3 Filling**

Gabions shall be filled with rock as specified in Section 000.2.4. During the filling operation some manual stone 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 assure that the sheathing on the PVC coated baskets will not be damaged.

The cells shall be filled in stages so that local deformation may be avoided. That is, at no time shall any cell be filled to a depth exceeding 1-foot (0.30 m) higher than the adjoining cell. It is also recommended to slightly overfill the baskets to allow for settlement of the rock. Behind gabion walls, compact the backfill material simultaneously to the same level as the filled gabions.

#### **000.3.4 Internal Connecting Wires**

Internal connecting wires should be used when a structure requires layers of gabions to be stacked on top of each other. Internal Connecting Wires shall connect the exposed face of a cell to the opposite side of the cell. An exposed face is any side of a gabion cell that will be exposed or unsupported after the structure is completed. Lacing wire or prefabricated internal connecting wires may be used.

##### **000.3.4.1 3 Feet High Gabions**

3 feet high gabions shall be filled in three layers, 1-foot at a time. Connecting wires shall be installed after the placement of each layer, that is, at 1-foot high and 2 feet high.

##### **000.3.4.2 1.5 Feet High Gabions**

1.5 feet high gabions do not require connecting wires unless the baskets are used to build vertical structures. In some cases, these units shall be filled in two layers, 9 inches at a time. Connecting wires shall be installed after the placement of the first layer, which is at 9 inches high.

#### **000.3.5 Lid Closing**

Once the gabion baskets are completely full, the lids will be pulled tight until the lid meets the perimeter edges of the basket. The lid must then be tightly laced and/or fastened along all edges, ends and tops of diaphragm(s) in the same manner as described in Section 000.3.1.

#### **000.3.6 Mesh cutting and folding**

Where shown on the drawings or otherwise directed by the engineer, the gabions shall be cut, folded and fastened together to suit existing site conditions. The mesh must be cleanly cut and surplus mesh either folded back or overlapped so that it can be securely fastened together with lacing wire or fasteners in the manner described in Section 000.3.1. Any reshaped gabions shall be assembled, installed, filled and closed as specified in the previous sections.

### **000.4 Method of Measurement**

**000.4.1** The payment quantities for excavation shall be determined by the outside limits of the gabion structure. Quantities will be determined from cross sections and the linear distance, and paid for under the appropriate excavation bid items.

**000.4.2** The quantity to be paid for "In place gabions" shall be the number of cubic meters or cubic yards of gabions measured in their final position. Project conditions and material availability will determine the actual size of gabions to be used.

**000.4.3** Excavated material beyond the limits of the gabions shall be backfilled with gravel, crushed rock or other material approved by the engineer.

**000.4.4** This bid price shall include the installed in place cost of all materials, equipment, and labor, including gabions, rock, and backfill material.

**000.5** **Basis of Payment**

Accepted gabions will be paid for at the unit price for each pay item included in the contract.