

# GABIONS & MATTRESSES

## **Description**

Gabions and mattresses have proven to be a lasting solution around the world against soil erosion. The use of gabions dates back to ancient Egypt around 7000 years ago.

Our welded steel gabions are either supplied in ready made kits which are easily erected on-site, or in roll form for fabrication by the contractor. In both cases we supply the complete kit, including stiffeners, spirals, etc.



Gabions have the advantage as a hard armour system due to the fact that the rocks within the system dissipate energy of wave action, floods, etc. Silt and vegetation will eventually collect within the gabion wall forming an environmentally friendly and sound structure which is, for the most part, completely maintenance free. Installation is fast and easy and can be done using unskilled labour. Rocks can be found locally.

Modular Gabions are often pre-assembled at the Permathene factory in Auckland, allowing for faster installation.

Gabion units are supplied in stainless steel, Galfan, or galvanised and coated with durable, fusion bonded PVC (especially for use in coastal works, or where the atmosphere contains corrosive elements, or wherever abrasion may be prevalent).

## **Applications**

### **• Retaining walls**

Gabion walls can be built with speed and economy in all circumstances and are particularly suitable for landslide control in mountainous countries and in areas with persistently bad ground conditions. Where ground is liable to subside, the capacity of gabions to deform makes them preferable to a concrete wall which would crack and collapse.

### **• Weirs**

Gabion weirs, drop structures, and check dams are constructed across water courses as grade control structures, energy dissipaters, sediment collectors, as well as to form reservoirs, for water irrigation, and water supply in general. Gabion weirs are normally provided with a gabion scour protection apron both on their downstream side and at the upstream approach zone. The weir's crest or crown is always protected with a thin layer of concrete for abrasion protection to the steel wire.

### **• Revetments**

As a protective covering to slopes, riverbanks, channels, etc., to prevent erosion by weather or water, gabions will withstand alternative tension and compression without losing structural passage of water throughout the structure.

### **• Flexible Aprons**

Designed to protect superstructures against the undermining action of river or sea water, gabion aprons will closely follow the changing contours of the bed as scouring progresses, until eventually the erosion is completely sealed off. Conventional structures necessitate deep foundations taken down below the maximum scour level, and there is no guarantee that settlement of the river or sea bed will not ultimately lead to their partial or total collapse.

### **• River Works**

Originally introduced for this purpose gabions meet all the requirements for river works structures. These are to prevent erosion, reclaim land already eroded, and to protect land or property. A river wall must withstand alternating pressures from the water in front and the retained earth behind; changes in ground pressure following fluctuations in the moisture content of the soil; changes in the ground beneath it; and any attempt to undermine. In silt carrying rivers, the stonework contained by the gabions gradually becomes matted with soil and plant growth. In time the roots will penetrate through the structure and bind the stones together so effectively that a permanent and solid wall is formed. In a well designed system of gabion groins to redirect river flow, the outer ends of the groins determine the line of the new bank, and the spaces between groins will be gradually filled with deposited material until the gabion works virtually disappear. A gabion dike or wall, across the front of an eroded area will collect silt left behind by

flood waters. The silt gradually builds up until the required reclamation is met without any financial outlay. Channel linings built of gabions offer self drainage, the ability to withstand thrust, flexibility, and durability. The same qualities are used to advantage in weir construction.

### • Coastal Defences

The pervious structure of gabions gives two advantages over impervious structures. First, when pounded by heavy masses of water, the impact, instead of being taken instantaneously, is gradually absorbed. Again, flexibility offers distinct advantages in coastal defences.

### • Soil Conservation

Gabion are applied here as (a) terracing on steep slopes to retain the top soil, (b) linings for the beds and sides of water courses, (c) check dams for grade reducing weirs in steeply sloping gullies or valleys.

### • Decorative

Welded Modular Gabions are used extensively for decorative applications. The gabion structure can provide a means for filtering light and wind, or for aesthetics.

## **Advantages of Welded Steel Modular Gabions**

Corrosion Resistance	Fuse bonded PVC powder coating prevents corrosive liquids from attacking galvanised wire, even in salt water
UV Durability	PVC powder coating is bonded uniformly to welded mesh after fabrication in a process that eliminates residual stress in the coating thus reducing the damaging effect of UV radiation
Joint Abrasion Resistance	Wire connections in welded mesh do not rub against themselves at the joints so there is no internal wire abrasion between the wires to accelerate coating damage
Repairability	Damaged sections of welded mesh can be cut out and replaced without reducing the strength of the structure, plus damaged areas will not unravel
Versatility	Any size or shape can be constructed from a roll, no reason to various sizes
Value	Less material and less labour is required to build the structures
Strength	Strong. 4463 kg/ lineal meter in both directions
Flexibility	Tests show modular gabions have equal flexibility
Installation Speed	Spiral connectors and dimensional accuracy eliminate time consuming hand tying of baskets so welded baskets assemble in roughly half the time
Material Utilisation	Modular panel construction eliminates the redundant panels at basket connections thus reducing material requirements by as much as 25%
Dimensional Accuracy	Assembled baskets have dimensional accuracy of better than 0.5%
Ease of Installation	Flat panels or rolls are quickly assembled without kinks
Appearance	Clean, more consistent lines which remain flat and won't bulge



## **Modular Gabions Specification**

### **• Material**

Gabions shall be made of welded steel wire mesh of a nominal size of 75 mm x 75 mm. Note: other sizes can be specified.

### **• Dimensions**

Gabions shall be supplied in various lengths and heights. The length shall be in multiples of the width. The width shall not be less than 0.915 m. Dimensions for heights, widths and lengths are subject to a tolerance of  $\pm 5\%$  of manufacturer's stated sizes.

### **• Fabrication**

Gabions shall be fabricated in such away that the base, sides, lids, ends, and diaphragms can be assembled at the construction site into a rectangular unit of the specified size. The lid shall be a separate unit of the same mesh and wire specifications as the body. The weld shear strength shall comply with ASTM A-185-90a. Where the length of the gabion exceeds its width, the gabion shall be divided by diaphragms into cells of equal length. The wire mesh shall be made of galvanised steel wire having a diameter of 3 mm or 2.7 mm. All wire used in the fabrication of the gabion and in the wiring operations shall conform to US federal specification QQ-W-461H and possess a soft tensile strength with a class 3 finish 5 zinc coating in accordance with ASTM A-641. Preformed steel wire spiral binders with a 75 mm pitch are used to assemble and interconnect empty gabions and shall meet the same specification as the wire used in the mesh. After assembly, the individual gabion units are interconnected to each other as per manufacturer's instructions and then filled with clean, hard stone from 100 mm - 200 mm in diameter. The lids are then closed and joined to the top edges of the individual gabions and diaphragms. The use of expedient clips or hog rings for this purpose is not permitted. Twist ties maybe used in lieu of lacing wire for forming individual baskets and joining empty baskets together. A twist tie shall be provided at intervals of about 150 mm. The connection shall be accomplished by turning the twist tie through 1.5 turns. The use of twist ties for final lid closure must be approved by the Contracting Officer. In order to receive approval, the Contractor shall demonstrate that the lids and panels meet closely without gaps and that the twist ties will provide a tight joint at all panels and diaphragms. Lacing wire can be used in lieu of spiral binders in the lid closing operations.

### **• Certification**

Each shipment of gabions to a job site shall be accompanied by a certification that the material conforms to the requirements of the specifications. The certification shall be on company letterhead and shall be signed by an officer of the company.

**• PVC Coated Gabions**

The same specifications as above for galvanised gabions apply except for the additional Poly Vinyl Chloride (PVC) which will be fuse bonded onto the welded mesh as follows:

Mesh Wire core only 2.7 mm	Spiral Binders core only 2.7 mm	Lacing Wire core only 2.2 mm
PVC Coating 0.4 mm minimum per side 0.55 nominal per side		

**• Resistance of the Coating**

The protective coating must be resistant to the destructive effects of immersion in acidic, salt, or polluted water; exposure to ultra violet light; and abrasion; and shall retain these characteristics after a period of not less than 3,000 hours under tests in accordance with ASTM G-23.

**• Stone Diameters**

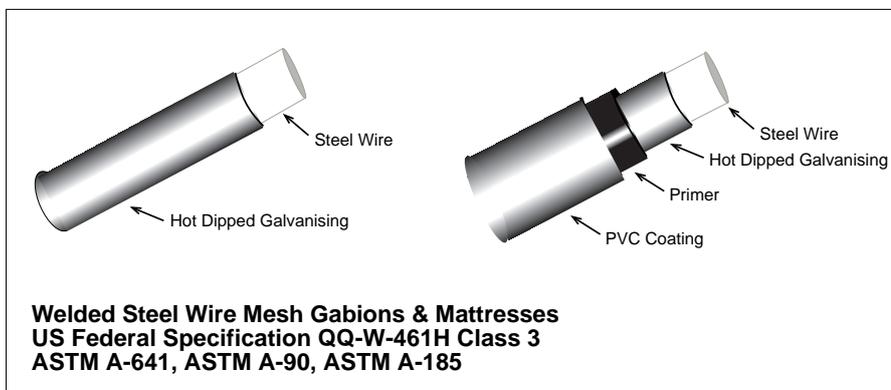
100 mm - 200 mm

Notes:

1. A nonwoven geotextile such as Syntex polypropylene may be used behind the wire to prevent migration of fines.
2. When abrasion is prevalent, Al-Ten coated alloy gabions may be used.

**Gabion Specifications**

Property	Galvanised	PVC Coated
Mesh Opening	75 mm x 75 mm	75 mm x 75 mm
Mesh Wire	US Gauge 12 (2.7 mm) US Gauge 11 (3 mm)	US Gauge 12 (2.7 mm) plus PVC coating
Lacing Wire	US Gauge 13.5 (2.2 mm)	US Gauge 13.5 (2.2 mm) plus PVC coating
Spiral Binders	US Gauge 12 (2.7 mm)	US Gauge 12 (2.7 mm) plus PVC coating
Zinc Coating	ASTM A-90	ASTM A-90
PVC Coating	-	Minimum coating 0.4 mm per side Nominal coating 0.55 mm per side



## **Modular Mattress Specification**

### **• Material**

Mattresses shall be made of welded steel wire mesh of a nominal size of 38 mm x 75 mm.

### **• Dimensions**

Mattress shall be supplied in various lengths. The thickness shall be 150 mm or 230 mm. The horizontal width shall be 1.83 m. Dimensions for heights, widths and lengths are subject to a tolerance of  $\pm 5\%$  of manufacturer's stated sizes.

### **• Fabrication**

Mattress units shall be fabricated in such a way that the base, sides, lids, ends, and diaphragms can be assembled at the construction site into a rectangular unit of the specified size. The lid shall be a separate unit of the same mesh and wire specifications as the body. The weld shear strength shall comply with ASTM A-185-90a. The mattress unit length shall be subdivided into .91 m compartments by the insertion of diaphragms made of the same mesh as the rest of the mattress. The wire incorporated into the mesh constituting the body of the mattress shall be made of galvanised steel wire having a diameter of 2 mm. Preformed steel wire spiral binders with a 75 mm pitch are used to assemble and interconnect empty mattress and shall meet the same specification as the wire used in the mesh. All wire used in the fabrication of mattresses and in the wiring operations shall conform to US federal specification QQ-W-461H and possess a soft tensile strength with a class 3 finish 5 zinc coating in accordance with ASTM A-641. After assembly, the individual mattress units are interconnected to each other as per manufacturer's instructions and then filled. The lids are then placed and spiralled to the top edges of the individual mattresses and diaphragms. The use of expedient clips or hog rings for this purpose is not permitted. Twist ties may be used in lieu of lacing wire for forming individual baskets and joining empty baskets together. A twist tie shall be provided at intervals not to exceed 75 mm. The connection shall be accomplished by turning the twist tie through 1.5 turns. The use of twist ties for final lid closure must be approved by the Contracting Officer. In order to receive approval, the Contractor shall demonstrate that the lids and panels meet closely without gaps and that the twist ties will provide a tight joint at all panels and diaphragms. Lacing wire can be used in lieu of spiral binders in the lid closing operations.

### **• Certification**

Each shipment of gabions to a job site shall be accompanied by a certification that the material conforms to the requirements of the specifications. The certification shall be on company letterhead and shall be signed by an officer of the company.

## • PVC Coated Gabions

The same specifications as above for galvanised gabions apply except for the additional Poly Vinyl Chloride (PVC) which will be fuse bonded onto the welded mesh as follows:

Mesh Wire core only 2.0 mm	Spiral Binders core only 2.7 mm	Lacing Wire core only 2.2 mm
PVC Coating 0.4 mm minimum per side 0.55 nominal per side		

## • Resistance of the Coating

The protective coating must be resistant to the destructive effects of immersion in acidic, salt, or polluted water; exposure to ultra violet light; and abrasion; and shall retain these characteristics after a period of not less than 3,000 hours under tests in accordance with ASTM G-23.

## • Stone Diameters

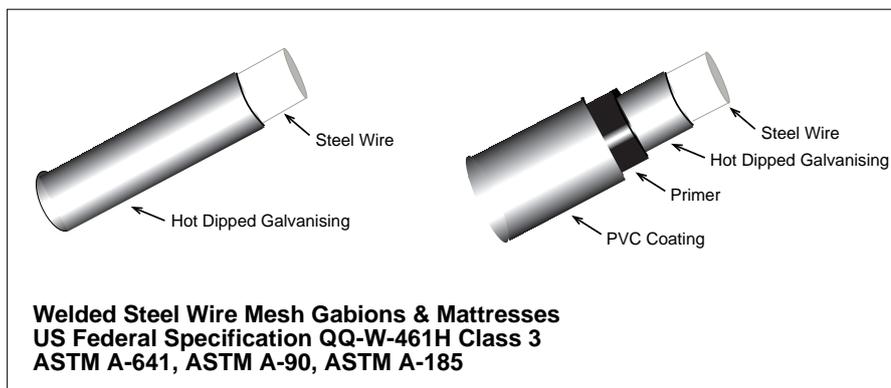
100 mm - 200 mm

Notes:

1. A nonwoven geotextile such as Syntex polypropylene may be used behind the wire to prevent migration of fines.
2. When abrasion is prevalent, Al-Ten coated alloy gabions may be used.

## **Mattress Specifications**

Property	Galvanised	PVC Coated
Mesh Opening	38 mm x 75 mm	38 mm x 75 mm
Mesh Wire	US Gauge 14 (2.0 mm)	US Gauge 14 (2.0 mm) plus PVC coating
Lacing Wire	US Gauge 13.5 (2.2 mm)	US Gauge 13.5 (2.2 mm) plus PVC coating
Spiral Binders	US Gauge 12 (2.7 mm)	US Gauge 12 (2.7 mm) plus PVC coating
Zinc Coating	ASTM A-90	ASTM A-90
PVC Coating	-	Minimum coating 0.4 mm per side Nominal coating 0.55 mm per side



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