

GABIONS & MATTRESSES

- MODULAR WELDED STEEL WIRE MESH

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

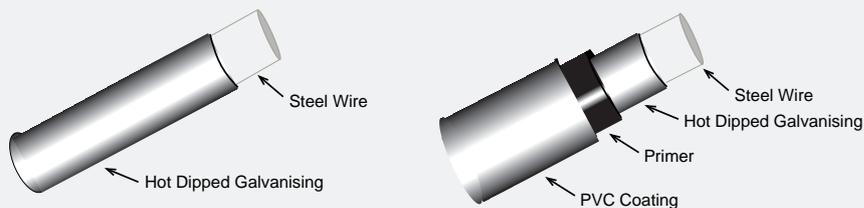
Welded Modular Gabions are used extensively for decorative applications. The gabion structure can provide a means for filtering light and wind, or for aesthetics.

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

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 US Gauge 11 (3.0 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



Welded Steel Wire Mesh Gabions & Mattresses
US Federal Specification QQ-W-461H Class 3
ASTM A-641, ASTM A-90, ASTM A-185

Modular Gabions Construction Specification

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 (3.15 mm.); 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 300 mm or greater. Mattresses: Mattresses have a thickness of 300 mm 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 413 MPa. Galvanized steel wire shall conform to ASTM A 641, Class 3, and Soft Temper.

Table 1 Gabion Baskets (minimum requirements)

GABION BASKETS Height 300, 460, or 910 mm: Length as Specified

Type of Wire	Mesh Size mm	Wire Diameter mm	PVC Coating mm	Total Diameter mm	Galvanised Coating kg /m ²
Lacing Wire		2.18	0.51	3.2	0.214
Welded Mesh	75 x 75	3.0	None	3.0	0.244
	75 x 75	2.67	0.51	3.7	0.244
Spiral Binder		2.67	0.51	3.7	0.244

Table 2 Gabion Mattresses (minimum requirements)

GABION MATRESSES Height 150, 230, or 300 mm: Length as Specified

Type of Wire	Mesh Size mm	Wire Diameter mm	PVC Coating mm	Total Diameter mm	Galvanised Coating kg /m ²
Lacing Wire		2.18	0.51	3.2	0.214
Welded Mesh	38 x 75	2.18	0.51	3.0	0.214
Spiral Binder		2.67	0.51	3.7	0.244

*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 -10 C, ASTM D 746

- » vi) Tensile Strength. Extruded Coating (not less than 20.55 MPa. ASTM D 412). Fusion Bonded Coating (not less than 15.68 MPa at 100 percent strain, ASTM D 638).
- » vii) Modulus of Elasticity. Extruded Coating (not less than 18.6 MPa at 100 percent strain, ASTM D 412). Fusion Bonded Coating (not less than 14 MPa 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 2083 kg per lineal meter for gabion baskets and 1339 kg per lineal meter 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.

Rock Size

Gabion Basket or Mattress Height	Predominant Rock size	Minimum Rock Dimensions	Maximum Rock Dimensions
Basket 300 mm Basket 460 mm Basket 910 mm	100 to 200 mm	100 mm	200
Mattress 150 mm Mattress 230 mm Mattress 300 mm	76 to 125 mm	76 mm	125

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.

Disclaimer

The information presented herein, while not guaranteed, is to the best of our knowledge true and accurate.

While every effort has been made to provide accurate and reliable information, it is up to the user of this brochure to verify all information, including designs it might be based upon, with an independent source. Application of this data must be made on the basis of responsible professional judgement.

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