LINK MIDDLE EAST Ltd.

Linked world over

GABION BOXES & MATTRESSES

BBA BRITISH BOARD OF AGREMENT

CERTIFICATE NO : 00/3682

CERTIFICATE NO : 99/R117

INTERTEK ISO 9001:2008 CERT NO. 13034

UKAS QUALITY MANAGEMENT 010

Introduction

For over a century, triple twist hexagonal mesh has been used with success in construction work worldwide. Boxes and mattresses made of hexagonal mesh fabric, known as protector gabions, are a valid and effective technical solution in the design, construction and maintenance of a variety of protective flexible structures.

Gulf Fencing Industry offers a viable alternative to costly import of gabions and also specializes in complete fencing systems. The logistics involved in shipping and transformation of these systems mean cost effectiveness and timely supply.

This brochure attempts to take a brief look at the many applications of protector gabions and different protection methods. Illustrations are reproduced from various projects where protector gabions were supplied by Link Middle East Ltd. from Gulf Fencing Industry, Dubai.

We are convinced of the technical and commercial advantages offered by protector gabions – a first choice which is cost effective and therefore preferable to alternative solutions.

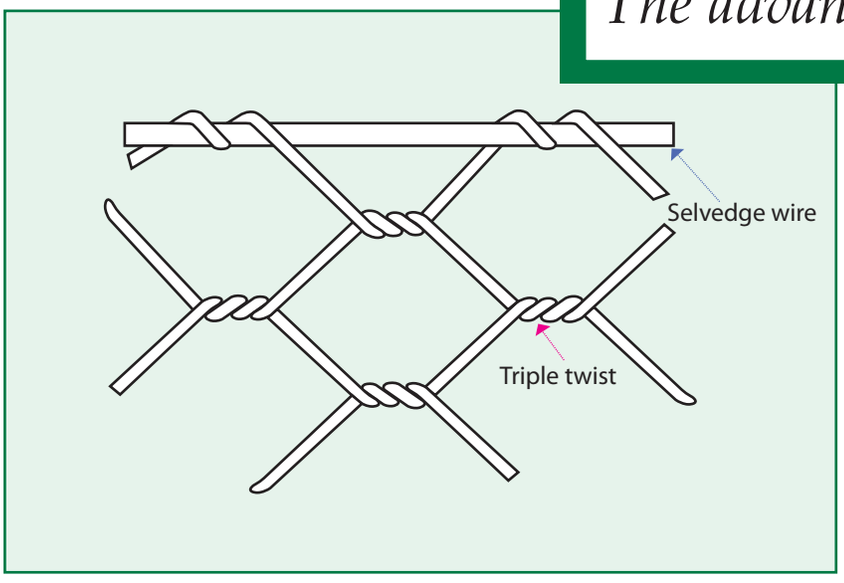
Gabions, by virtue of their matchless strength, excellent engineering adaptability and proven reliability, have become the chosen building material for a tremendous variety of construction works.

These include road construction, river training, weirs, control and training of natural and flood waters, earth retaining structures, water recharge dams, retaining walls, rock slide protection, Irish crossings, coastal defense, harbor works, soil erosion protection and bridge protection.

With a proven track record of being in the Gabion business for over two decades our hexagonal mesh products have a reputation of being the best in quality. Conforming to major international standards specified, these products have been certified by BBA-UK, AFNOR-France & Copro-Belguim, making these a choice of consultants and contractors alike.

Link Middle East has the ability to assist with the technical and design support in projects involving use of protector gabions and welcomes all enquiries from clients in the techno - commercial evaluation of their projects.

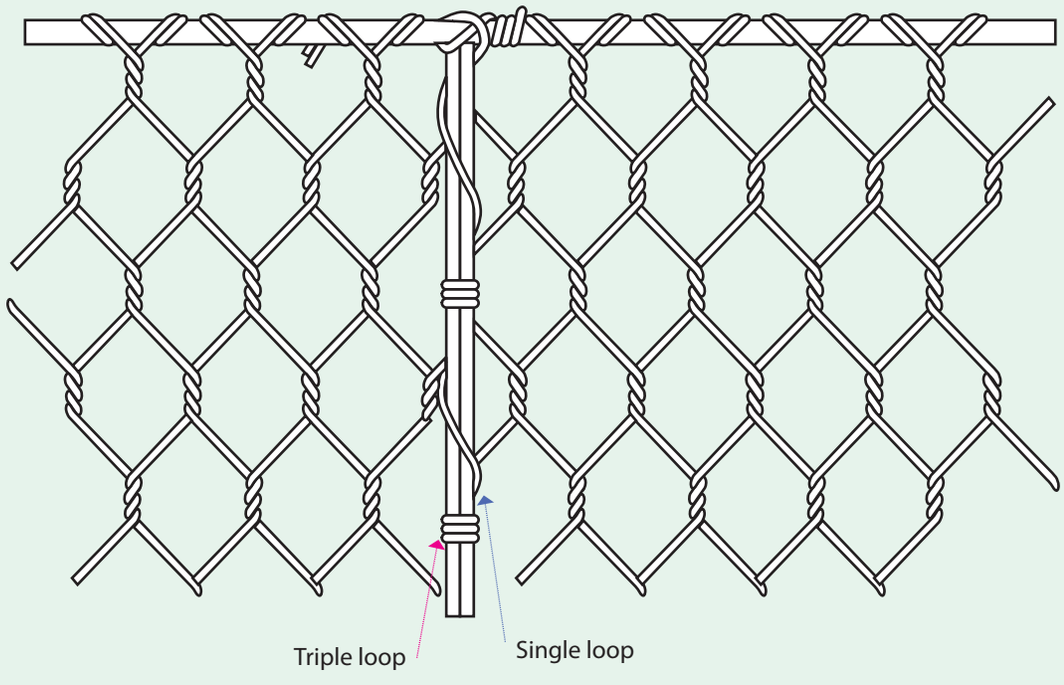
The advantages of using gabions



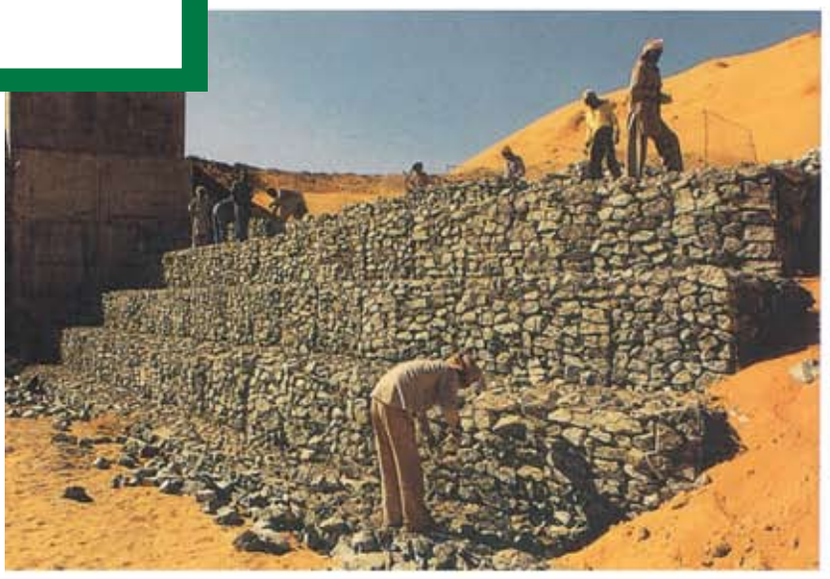
Protector gabion boxes and mattresses are made of triple twist hexagonal mesh fabric. The fabric is woven netting made of mild steel wires. Steel mesh fabric possesses high mechanical strength, and triple twist weaving of wire prevents unravelling. The wires strictly conform to major International standards for hot dip galvanising and GALFAN (Alu-Zinc) coating, ensuring a long life. These hot dip galvanised and GALFAN(Alu-Zinc) (95%Zn + 5% Al) coated wires can be PVC (poly-vinyl chloride), PP (polypropylene) or PE (polyethylene) coated to safeguard against corrosion and other weathering effects, especially when the gabions are to be used in salty and highly polluted environments.

It is of vital importance that the construction materials chosen meet high standards with regard to engineering requirements - and at the same time are environmentally friendly. Protector gabions stand out as the simple, efficient and economical solution, as the cages are simply filled with natural stone. Protector gabions have the following positive advantages:

- Ability to deform without cracking allowing the structure to withstand any unpredictable moment or settlement without loss of stability.
- Higher resistance to natural forces due to better tensile strength.
- Simple installation procedure using natural or quarried stones obtained locally.
- Majority of manpower need not be skilled.
- The gabion structure bends easily and harmoniously with natural surroundings.
- The speed at which the work is carried out is unparalled in civil engineering, besides making it cost effective.
- Ease of repair to any damaged cages, with minimal expense.



Retaining walls

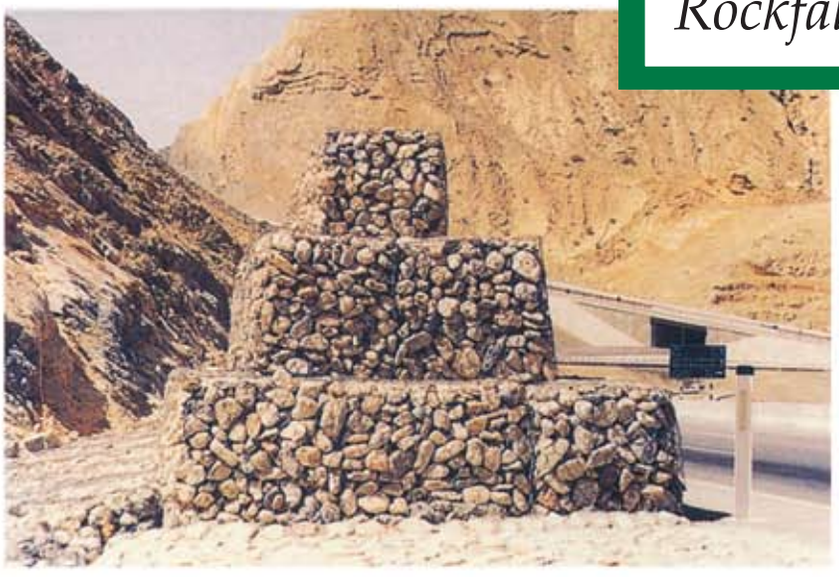


Flexible gabion structures used in the construction of retaining walls are a simple, functional solution. These structures can withstand harsh environmental and climatic conditions. The mechanical strength of the gabion structures is fairly ductile and deforms considerably before final failure.
Perfect permeability close to the inner face of the wall functions as an efficient drainage method by not allowing hydrostatic pressure to build up. Retaining walls are built as gravity structures and their overall performance can be greatly enhanced by anchoring them into the soil by using lid covering extensions.

Protection of Highways

Highways are infrastructures representing heavy investment. It is therefore vital to protect them from environmental disasters. Gabion mattresses are used to stablise the slopes protecting the shoulders of highways that are particularly susceptible to erosion and scour.

Highway protection work also includes Irish crossing, rockfall protection, retaining structures, culvert protection and bridge protection, where mesh fabric, gabion boxes or mattresses are used depending on the situation.



Rockfall Protection

Protection against rockfall from slopes can be guaranteed by using various structural solutions or by merely using gabion mesh fabric as a passive measure.
The gabion mesh obstructs rockfall and protects infrastructures. This is achieved by joining together rolls of mesh fabric with lacing wire and using it as a blanket to cover the slopes. Alternatively gabion retaining walls are built which stop falling rocks from damaging infrastructures.

Protection of culverts & bridges

An unconfined flow of water causes erosion and may result in costly damage to main structures. In order to prevent this potential danger, gabion boxes and mattresses are used to guide the flow of water.
These gabion boxes and mattresses are used extensively in the construction of culverts.

Irish crossings

Gabion boxes and mattresses are also used to construct low-level river crossings or Irish crossings. These are typical structures designed for protection, thus avoiding costly repairs and replacement.

Channel lining

The main function of gabion structures is to control and guide the course of water through water channels and wadis and prevent erosion of the banks. Due to the flexibility and permeability of these structures, they permit the natural moment of ground water.

Over a period of time silt deposits in the voids, encouraging the growth of flora and fauna, restoring balance to the eco-system.

Ground water recharge dam

In arid lands, water has a low percolation rate through the earth. This means that it is very difficult for the ground water level to be maintained. Also, water flows very rapidly through the wadis, often washing the fertile topsoil into the sea.

Water recharge dams, built with gabion boxes and mattresses, help check the speed of the water. They store the water temporarily to allow it sufficient time to percolate. Thus, water recharge dams protect the environment whilst encouraging and restoring growth throughout the arid areas.

Soil erosion protection

Both the static and geotechnical properties of gabion structures are well suited for their eventual integration into the natural surroundings.

Gabions are both flexible and permeable, and their use means that the state of the land can be controlled and even improved. This especially applies to the land that has been subjected to environmental and other degradation, and makes gabions the ideal construction material for the reconstruction and conservation of soil.

Marine works

Special polyvinyl coated wires, highly resistant to corrosion and other environmental effects are used in the manufacture of gabions for marine works. Beach protection, marinas, retaining walls, ramps, piers and especially small jetties can be built at great speed with the minimum of cost.
Gabions allow wave energy to be dissipated thus conserving beaches and preventing erosion. Other important features and structures on the shoreline can also be protected.

Sac / cylindrical gabions

Sac gabions or cylindrical gabions are used to build dykes and groynes, as well as guiding and regulating water flow in river and marine structures.
The cores of sac/cylindrical gabions are filled on land ensuring greater speed of construction. They are then transported to the site where they are to be used.

River training

The most crucial problem with watercourses and rivers is the friction on the banks, causing a change of course and therefore destroying valuable land and property. The friction during monsoons also results in erosions and the carrying away of fertile soil. Hence, training of riverbanks in critical areas with both gabions boxes & mattresses is essential. With the use of check dams, energy steps and bank protection, damage can be minimized or totally prevented.

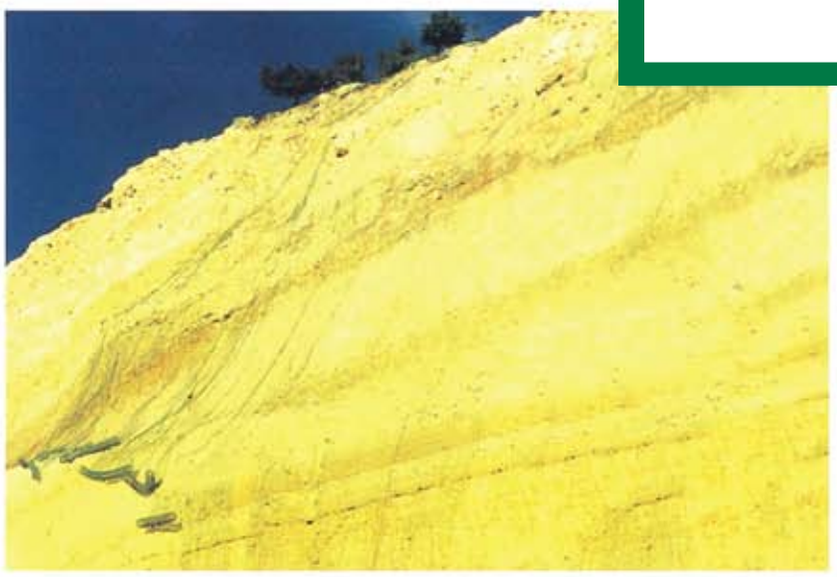
Canal lining

Canals are usually permeable, and the consequent loss of water due to this factor is high – resulting in unnecessary loss of valuable resources. It is therefore necessary to line the bed and sides of canals, otherwise the unprotected sides will suffer from erosion and the watercourse will silt up. By protecting the canals with mattresses, the life period of canals can be extended to a great extent, and water resource will also be conserved.

Protection of islands

Island, both natural and man-made have consistent problems with their shores, where constant wave action results in erosion. Protection with gabion boxes and mattresses can prevent the shoreline deteriorating and can stabilize the landmass of the island.

Slope protection

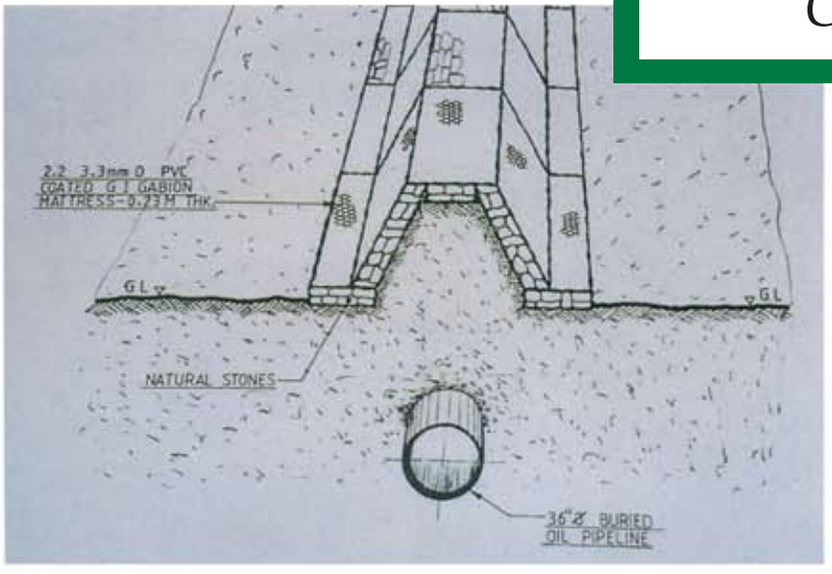


An economic and efficient solution for slope stabilization is to use protector gabion mattresses. Various structural modifications can be implemented, depending on the nature of the slope.
A wide range of mesh fabric is available to solve each specific problem. The netting can be used in both single and double layers, and also can be reinforced with cables and vertical, flexible catch fences. Further vegetation can therefore be encouraged to grow, thus stabilizing the loose soil and rocks.

High security fencing

Where security is of prime importance, gabion mesh fabric can replace fencing fabric. First of all, the triple twist fabric has high mechanical strength and secondly, when a wire cut either by accident or on purpose, the mesh does not unravel, hence intrusion is made more difficult. The wires conform to ASTM, BS, EN standards – ensuring higher weatherability. There is also the option of using PVC coated wires which provide a better safeguard against corrosion.

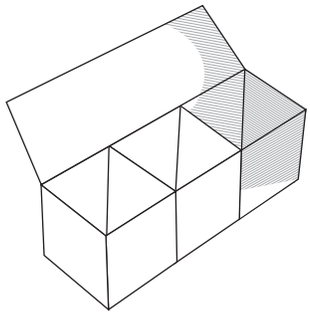
Oil pipeline protection



Oil pipelines, which are buried just below ground level, are usually protected by earthen mounds. Often during sand storms, the mounds are degraded by the strong wind. In order to stabilize the soil it is normal practice to periodically spray it with oil. This practice is environmentally harmful, as well as being expensive in long term. Pipelines can be protected with gabion mattresses, which not only stabilize the earthen mounds, but are also environmentally friendly.

Specifications

Galvanised / Alu-zinc coated gabion boxes mesh size 100 x 120mm



Length (m)	Width (m)	Height (m)	Diaphragms	Approx. weight in kg 2.7mm	3.0mm
1	1	1	-	8.00	9.00
1.5	1	1	-	11.00	12.50
2	1	1	1	15.00	16.50
3	1	1	2	21.50	23.50
4	1	1	3	28.50	31.00
2	1	0.5	1	10.50	12.00
3	1	0.5	2	15.00	17.00
4	1	0.5	3	19.50	21.50
2	2	0.5	1	17.50	19.50
3	2	0.5	2	26.00	28.50
4	2	0.5	3	34.00	37.50
5	2	0.5	4	42.00	46.50
3	2	1	2	35.00	39.00
4	2	1	3	46.00	51.00
5	2	1	4	57.00	63.00

PVC/PP coated (Galvanised / Alu-zinc) gabion boxes – mesh size 100 x 120mm

Length (m)	Width (m)	Height (m)	Diaphragms	Approx. weight in kg 2.7mm / 3.7mm
2	1	0.5	1	12.00
3	1	0.5	2	17.50
4	1	0.5	3	23.00
2	1	1	1	17.50
3	1	1	2	25.50
4	1	1	3	33.50
3	2	0.5	2	21.00
4	2	0.5	3	40.00
5	2	0.5	4	49.50
3	2	1	2	41.50
4	2	1	3	54.00
5	2	1	4	67.00

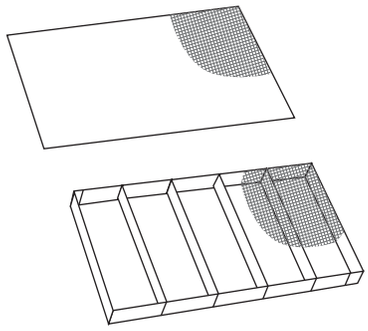
Galvanised / Alu-zinc coated gabion boxes- mesh size 60 x 80mm

Length (m)	Width (m)	Height (m)	Diaphragms	Approx. weight in kg 2.2mm	2.7mm
2	1	0.5	1	10.50	15.00
3	1	0.5	2	15.00	22.00
4	1	0.5	3	20.00	29.00
1.5	1	1	-	11.00	16.00
2	1	1	1	15.00	22.00
3	1	1	2	22.00	32.00
4	1	4	3	28.50	41.00

Specifications

Galvanised / Alu-zinc gabion mattresses - mesh size 60 x 80mm

Length (m)	Width (m)	Height (m)	Diaphragms	Approx. weight in kg 2.0mm	2.2mm
3	2	0.23	2	17.50	21.00
4	2	0.23	3	23.00	27.00
5	2	0.23	4	28.00	34.00
6	2	0.23	5	34.00	40.00
3	2	0.30	2	18.50	22.00
4	2	0.30	3	24.00	29.00
5	2	0.30	4	30.00	36.00
6	2	0.30	5	36.00	43.00
3	3	0.23	2	25.00	30.00
4	3	0.23	3	33.00	40.00
5	3	0.23	4	39.00	46.50
6	3	0.23	5	49.00	59.00
3	3	0.30	2	26.50	32.00
4	3	0.30	3	35.00	42.00
5	3	0.30	4	43.50	52.00
6	3	0.30	5	52.00	62.00

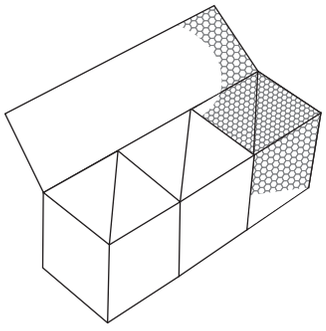


PVC/PP coated (Galvanised / Alu-zinc) gabion mattresses – mesh size 60 x 80mm

Length (m)	Width (m)	Height (m)	Diaphragms	Approx. weight in kg 2.0 / 3.0mm	2.2 / 3.3mm
3	2	0.23	2	23.00	26.00
4	2	0.23	3	30.00	34.00
5	2	0.23	4	37.50	42.50
6	2	0.23	5	45.00	51.00
3	2	0.30	2	24.00	27.50
4	2	0.30	3	32.50	36.50
5	2	0.30	4	40.00	45.00
6	2	0.30	5	48.00	54.00
3	3	0.23	2	33.00	37.50
4	3	0.23	3	44.00	50.00
5	3	0.23	4	51.50	58.50
6	3	0.23	5	65.00	74.00
3	3	0.30	2	35.00	39.50
4	3	0.30	3	46.00	52.50
5	3	0.30	4	57.50	65.00
6	3	0.30	5	67.00	78.00

Specifications

Galvanised / Alu-zinc coated gabion boxes mesh size 80 x 100mm



Length (m)	Width (m)	Height (m)	Diaphragms	Approx. weight in kg 2.4mm	2.7mm	3.0mm
1	1	1	-	7.50	9.50	12.00
1.5	1	1	-	9.50	12.50	16.00
2	1	1	1	13.50	17.00	21.00
3	1	1	2	19.50	24.00	32.00
4	1	1	3	25.00	32.00	41.00
1	1	0.5	-	5.00	6.50	8.00
2	1	0.5	1	9.00	12.00	16.00
3	1	0.5	2	13.50	17.50	22.00
4	1	0.5	3	17.50	23.00	29.00
2	2	0.5	1	15.50	21.00	26.00
3	2	0.5	2	23.00	30.00	38.00
4	2	0.5	3	30.00	40.00	50.00
5	2	0.5	4	37.00	49.00	62.00
3	2	1	2	31.00	41.50	52.00
4	2	1	3	41.00	53.50	68.00
5	2	1	4	51.00	67.00	84.00

PVC/PP coated (Galvanised / Alu-zinc) gabion boxes – mesh size 80 x 100mm

Length (m)	Width (m)	Height (m)	Diaphragms	Approx. weight in kg 2.0mm / 3.0mm/	2.2mm/ 3.3mm/	2.4mm 3.4mm
2	1	0.5	1	8.00	10.00	10.50
3	1	0.5	2	12.00	14.50	15.50
4	1	0.5	3	15.50	19.00	20.50
1.5	1	1	-	8.50	10.50	11.50
2	1	1	1	12.00	14.50	15.50
3	1	1	2	17.00	21.00	23.00
4	1	1	3	22.00	27.50	30.00
3	2	0.5	2	20.00	25.00	27.00
4	2	0.5	3	27.00	33.00	35.50
5	2	0.5	4	33.00	41.00	43.50
3	2	1	2	28.00	34.00	37.00
4	2	1	3	36.00	44.50	48.00
5	2	1	4	45.00	55.00	59.50

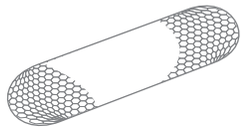
PVC/PP coated (Galvanised / Alu-zinc) gabion boxes – mesh size 60 x 80mm

Length (m)	Width (m)	Height (m)	Diaphragms	Approx. weight in kg 2.0mm/ 3.0mm	2.2mm 3.2mm
2	1	0.5	1	11.00	13.00
3	1	0.5	2	17.00	19.00
4	1	0.5	3	22.00	24.50
1.5	1	1	-	12.00	13.50
2	1	1	1	16.50	19.00
3	1	1	2	24.00	27.00
4	1	1	3	31.50	35.50

Specifications

Sac gabions
Galvanised / Alu - Zinc coated - 80 x 100mm

Length (m)	Diameter meter	capacity m3	Approx. weight with 3.0 mm wire
2	0.65	0.65	8.00
3	0.65	1.00	12.00
2	0.95	1.40	12.00
3	0.95	2.15	18.00

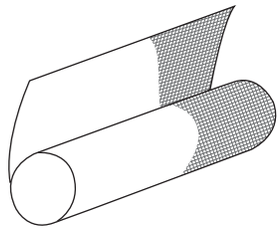


Sac gabions
PVC / PP coated (Galvanised / Alu-Zinc)- 80 x 100mm

Length (m)	Diameter meter	capacity m3	Approx. weight with 3.0 mm wire
2	0.65	0.65	10.00
3	0.65	1.00	14.50
2	0.95	1.40	14.50
3	0.95	2.15	21.50

Hexagonal Rockfall Netting.
Galvanised / Alu-Zinc

Mesh size	Wire size Diameter mm	Approx. weight kg/m2	Roll width meter
80mmx100mm	3.0	2.00	1-2-3
	2.7	1.55	1-2-3
	2.4	1.20	1-2-3
60mmx80mm	2.7	2.00	2-3
	2.2	1.35	2-3
	2.0	1.13	2-3



Steel wire & mesh conforms to values and tolerances mentioned in EN 10223-3 & ASTM 975 for physical & dimensional characteristics. Mass of Zinc / Galfan Coating will correspond to BS443 / EN 10244-2 Class A / ASTM 975 / as per requirement. Products confirming to other standards can be supplied on request subject to conditions.

Product weights listed are nominal, without tie(lacing) wire. Tie (Lacing) wire / C-Rings & other options are available with supply of gabions for securing Gabions during installation.

Overall Sizes - Unless specified otherwise, Gabion boxes will have a dimensional tolerance of 5% on height, width & length. In addition, in case of Gabion mattresses, the thickness of the matresses will have a tolerance of +/- 2.50cm.

Assembly & Errection of gabions

a) Gabion boxes/mattresses are packed in convenient numbers per bundle, in folded flat form. This makes them easy to handle and transport from factory sites. Normally, top lid are packed and supplied separately, as they are to be secured to bottoms only after the filling of stones is completed.

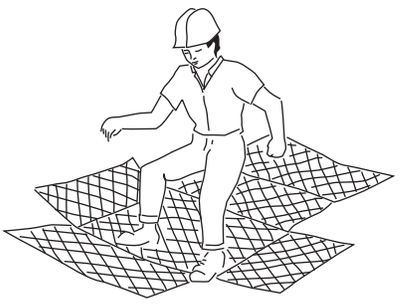


Fig 1

b) Individual sheets are straightened flat, without any creases, and laid to form the required boxes/mattresses (Fig.1).

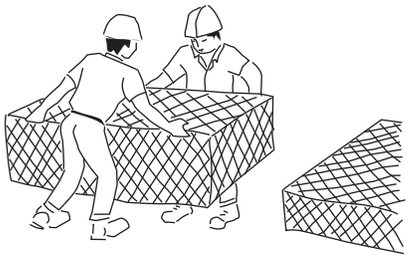


Fig 2

c) The sheets are now connected with lacing wires in a continuous sequence.

d) The sheets are then systematically folded. Care is taken at this stage to ensure that the boxes/mattresses are rectangular, by maintaining an exact distance between each panel (Fig 2).

Fig 3

e) Gabions should be filled with hard natural stones. The natural or quarried stones should be of non-variable texture, weather resistant and preferably of high density. The size of the stones should be at least twice the size of the mesh, so that they are retained within the mesh even at high pressure. Stones are to be packed tightly, with minimum VOIDS space between. Care is taken to level stones at different stages, and connecting wires are used to retain original size and shape. This prevents bulging (Fig 3).

Fig 4

f) The bracing wires are used at regular intervals of 300mm (as shown in Fig 4) in order to retain the original shape and prevent bulging. Where "jumbo"boxes/mattresses are required, diaphragms are placed and connected with tie wire at regular one meter intervals (Fig 4).

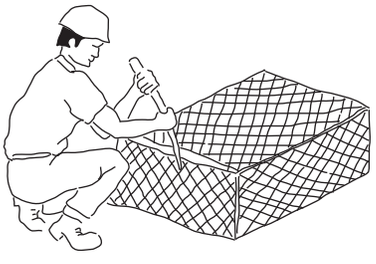


Fig 5

g) At the time of erection of the gabions on site, large numbers of boxes and mattresses are used. It is necessary to tie and connect them in series, so as to form one integrated structure. Tie wires are used to connect selvedge wires of adjoining gabions at regular three to four inch intervals. The loose ends of the tie wires are then fully secured to the selvedge wire, by triple loops, for full security (Fig 5 & 6).

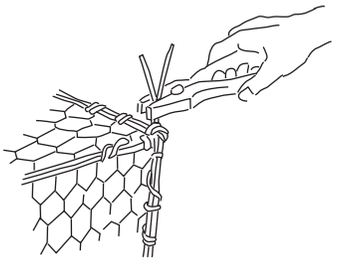


Fig 6

h) A booklet on the detailed methods of fixing gabions at site is available on request. We also assist clients who need training by sending our experienced engineers to train personnel on site.

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