# Enviromesh Design Guide Series
## Volume Three
### River & Erosion Protection

**JANUARY 2016**

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**Enviromesh Design Guide Series | Volume Three: River & Erosion Protection | January 2016**
1. Introduction

1.1 Gabions and gabion mattresses

Gabions and gabion mattresses have long been used as a system for erosion protection on inland water courses, providing economical and environmentally acceptable solutions. Water is a powerful force and unless the protection schemes are correctly designed, then potential failure can occur.

Typical applications are as follows:
- Channel Linings
- Bank and bed protection
- Culvert headwall inlet and outlet structures
- Fish habitats
- Protection around bridge piers
- Outfall protection
- River training works

Similarly gabions and gabion mattresses have been used on coastal protection schemes, for example:
- Top of the beach protection
- Sloping revetments
- Gabion walling
- Beach replenishment

For advice or assistance with the design of a gabion wall, please contact Enviromesh direct – details for which can be found below and at the end of this guide.

1.2 Conditions, copyright, limitations

Conditions relating to this design guide
This design guide has been prepared by Cerana Limited trading as Enviromesh.

Copyright
The information, specifications and other supporting documentation included herein are the copyright of Enviromesh. No unauthorised copying or distribution of this document is permitted without the prior written permission of Enviromesh.

Limitations
Whilst every care has been undertaken in the preparation of this guide which is based on gabion materials in accordance with BS EN 20223-3:2013 and BS EN 20223-8:2013, it is the user’s responsibility to satisfy themselves that the information is correct.

For advice or assistance with the design of a gabion wall, please contact Enviromesh direct: Neil Holmes (Commercial Director) on +44 (0)7725 244637, Roger Farmer (Technical Director) on +44 (0)7725 244636, Andrew Fields (Engineering Assistant) on +44 (0)845 136 0101, or general enquiries on +44 (0)845 136 0202. Email them at neil.holmes@enviromeshgabions.co.uk, roger.farmer@enviromeshgabions.co.uk, andy.fields@enviromeshgabions.co.uk, or enquiries@enviromeshgabions.co.uk.
The term gabion refers to a modular containment system that enables rock, stone or other inert materials to be used as a construction material.

The modules or ‘cages’ as they are known, are formed of wire mesh fabric panels, jointed to form square or rectangular shaped units. The main difference between a gabion and a gabion mattress is in the ratio of plan area to height.

- **Gabions** are box-shaped: normally between 0.5m and 1.0m in height.
- **Gabion mattresses** are units which have large plan areas compared to their heights, normally supplied in heights of between 0.17m and 0.5m.

The units are pre-assembled in the factory to form a flat pack system.

These flat packs are then supplied to the customer and formed into the final shaped module on site with the necessary lacing wire or ‘C’ rings as required. Each module has to be connected to adjacent modules to form a monolithic structure.

The types of mesh used must be of a non-ravelling type such as welded steel wire mesh or hexagonal woven wire mesh and provided with corrosion protection to suit the required exposure conditions.

Although gabion mattresses can be manufactured from a welded mesh, this mesh is not as flexible as that manufactured from double twist hexagonal woven wire. Erosion protection schemes generally require units that are flexible, hence it is recommended that the hexagonal woven wire mesh gabion mattresses are used.
1.4 Bi-axial welded mesh gabions

These gabions are manufactured from a square mesh, normally of opening size 75.0mm x 75.0mm where the longitudinal wires are welded to the cross wires at their intersection points.

This type of fabric manufacture, produces a dimensionally stable mesh.

This mesh, is produced in standard sheets which are then cut into the required panel sizes to form the flat pack unit.

This is done by clipping the face, rear, side and diaphragm panels (intermediate dividing panels) to the base panel so that they can rotate to be folded flat.

The lid may be clipped to the front or back panel or left loose dependant upon the unit size. Units can be manufactured in any multiple of the mesh size, but are normally supplied as standard sizes to the industry.

Welded mesh gabions can be readily modified on site by cutting the mesh back to the next transverse mesh wire. Welded mesh gabions are available in a number of wire diameters to suit the application or can be manufactured in a combination of mesh-wire specifications to provide economy in supply.

The resultant gabions’ flexibility is dependant upon the choice of wire diameter.

Welded mesh gabions are available in a number of wire diameters to suit the application or can be manufactured in a combination of mesh-wire specifications to provide economy in supply.

For more information, please refer to Section 3, Gabion specifications and sizes (see pages 18-35).
Hexagonal woven mesh gabions and gabion mattresses

These gabions are manufactured from a mesh that has a hexagonal opening which is formed by twisting pairs of wire together with one and a half turns (sometimes referred to as triple or double twist).

This type of mesh production is continuous. To form panels, the mesh is guillotined across the weave and the cut ends of the wire are wrapped around a heavier wire to form a selvedge end.

The unit is factory fabricated from one main panel which forms the front, base, rear and lid of the unit with additional panels connected to the base section of the main panel to form the diaphragm and end panels.

Dependant upon the manufacturer, the mesh orientation is normally either with the weave horizontal or vertical on the face panel and the connection of the ends and diaphragm to the base is via a spiral wire or pairs of twisted wires, twisted together around the base mesh.

This type of mesh is flexible as it can articulate about the twists. It is normally manufactured from a 2.7mm wire diameter for gabions and 2.0mm for gabion mattresses. The coatings are either galvanised only, or galvanised and PVC coated.

The dimension between the twists is a nominal 80mm for gabions and 60mm for mattresses.

This type of mesh is flexible as it can articulate about the twists. It is normally manufactured from a 2.7mm wire diameter for gabions and 2.00mm for gabion mattresses.

For more information, please refer to Section 3, Gabion specifications and sizes (see pages 18-35).
1.6 Gabion and gabion mattress filling materials

The selection of rock or stone fill is very important, as the performance of gabion structures are dependant not only upon the type of unit but also the filling materials.

Grading of fill

Gabion fill is normally a graded fill of between 100 to 200mm in diameter with a nominal 6% of the stone being smaller or larger.

The grading can be tightened from 80mm to 150mm providing the control of the grading is good. Stones smaller than the mesh will not be contained by it.

The grading is important to ensure that voids within the gabions are minimised, otherwise settlements can occur.

Angularity of fill

For river works, the more angular the gabion fill, the better the interlock of stone within the gabion. This results in less deformation of the face and reduced internal movement under water flow or wave action. Limiting the movement of contained stone reduces the possibility of abrasion to the protected coating.

Stone types

Rounded stone has little interlock and results in greater deformation of the face. It also means that the fill within the cell is more fluid and abrasion of the protective coatings to the wire is more probable. Not recommended for river or erosion protection works.

Crushed concrete, although angular in shape, these do tend to become rounded. They do have greater interlock than rounded stones and therefore 4mm welded wire mesh should be specified. Not recommended for river or erosion protection works.

Quarried stone which is normally angular, is the preferable fill as the interlock is very good.

Blocky stone or flat stone when machined-filled can result in large voids being present which can result in settlements. Care should be taken when machine filling to minimise large voids.

Ideally, all gabions should be fair faced (hand packed on the exposed faces). Where the cost of quarried rock fill is high, the gabions can be filled with two types of fill: a quarried rock or block stone for the exposed face with a cheaper stone fill behind.

To assist in placing of differing fills, an additional cell can be incorporated normally set back 300mm from the face during gabion manufacture to assist in the construction.
1. Introduction

1.7 Gabion filling materials: swatches

COTSWOLD STONE
COBBLES
CARBONIFEROUS LIMESTONE
GRANITE

GRITSTONE
KENT RAGSTONE
HARD SANDSTONE
PORTLAND STONE

RECYCLED BRICK AND CONCRETE
CUT LIMESTONE
CORNISH GRANITE
SLATE
2. Gabion design

2.1 River works

Design: Gabion retaining walls
Gabions used as retaining structures along water courses or as headwalls require designing in such a way as to resist the soil and external forces. Please refer to the Enviromesh design guide series, Volume 1, a design guide for building Gabion Retaining Walls, for the design procedures.

The designer should be aware of the potential for the retained soils to be saturated after flood conditions in the water course, or from the effects of tidal flows. For saturated soils, the design density is taken as the saturated density and it is recommended that the phi value be reduced to 70% of its normal value.

Wherever gabions are used in a water environment, a non-woven type of geotextile should be placed behind and below the gabion structure.

Scour protection
It is important that the design caters for potential scour. This can be achieved in two ways:

- Embed the gabion wall, below the river bed, sufficiently beyond the anticipated scour depth.

- Place a gabion mattress beneath the gabion structure which should extend in front of the structure by a minimum of 1.5 times the anticipated scour depth

Specification
The required gabion specification is dependant on the water quality. PVC/Zinc coated gabions should be specified for brackish water, saline water or where the PH is outside the range of 7 to 10, otherwise galfan gabions can be used.

Ideally for river works a PVC-Zinc 2.7mm mesh or a Galfan coated 3mm mesh is best as the units can accommodate movement or settlement.

Gabions used as retaining structures along water courses or as headwalls require designing in such a way as to resist the soil and external forces.

Aesthetics
If the aesthetics are important, a heavier facing mesh can be used: 3.8mm PVC/Zinc mesh or Galfan 4.0mm mesh, respectively.

Where there is potential for impact from river debris it is also recommended to have a heavier mesh face.
2. Gabion design

2.2 Mattress protection

For gabion mattresses used as either channel linings, sloping revetments, bed protection or scour protection, the design is empirical based on historical use.

The purpose of the mattress is to reduce the water velocity of the stream as the depth increases so that at the interface with the bed the velocity is such that it will not displace the soil particles. As a precautionary measure, a geotextile separator membrane with a pore size smaller than the soil particle size should always be placed below the mattress. It is normally recommended to use a non-woven type of geotextile.

The following table gives typical unit depth requirements for soil types and water velocity (laminar, turbulent flow conditions and where eddy currents exist).

### DETERMINATION OF GABION MATTRESS DEPTHS

<table>
<thead>
<tr>
<th>Flow conditions</th>
<th>Water velocity (metres per second)</th>
<th>Fine-grained soils</th>
<th>Cohesive soils</th>
<th>Coarse-grained soils</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 to 2</td>
<td>0.23</td>
<td>0.23</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>2 to 4</td>
<td>0.30</td>
<td>0.23</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>4 to 6</td>
<td>0.45</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>&gt; 6</td>
<td>0.45</td>
<td>0.45</td>
<td>0.45</td>
</tr>
<tr>
<td>Turbulent Flow</td>
<td>0 to 2</td>
<td>0.30</td>
<td>0.30</td>
<td>0.23</td>
</tr>
<tr>
<td></td>
<td>2 to 4</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>4 to 6</td>
<td>0.45</td>
<td>0.45</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td>&gt; 6</td>
<td>0.45</td>
<td>0.45</td>
<td>0.45</td>
</tr>
<tr>
<td>Locations where</td>
<td>-</td>
<td>0.45</td>
<td>0.45</td>
<td>0.45</td>
</tr>
<tr>
<td>eddies and whirlpools</td>
<td>-</td>
<td>0.45</td>
<td>0.45</td>
<td>0.45</td>
</tr>
<tr>
<td>occur</td>
<td>-</td>
<td>0.45</td>
<td>0.45</td>
<td>0.45</td>
</tr>
</tbody>
</table>

*Note: Where mattress unit depths are 0.45m min., the mattress units are formed from 0.45m min. deep Gabions.*
2. Gabion design

2.3 Sloping revetments

Sloping revetments as coastal protection

All gabions and gabion mattresses for coastal protection works must be PVC coated and their use limited to the following situations:

- Top of the beach defence and not subjected to constant wave action.
- As a secondary defence in sheltered estuary locations.

Gabions must not be considered as a main defence when subjected to continual wave action. A gabion mattress is laid to the slope and should normally extend 2.0m above the maximum tide level to allow for run up.

Where it is not possible to extend the mattress to the required length due to the height of the bank, the revetment should extend over the crest of a sufficient width and with an embedded gabion anchor below to prevent erosion at the crest through overtopping.

For standard gabion mattresses, the maximum slope of the revetment should not exceed 1 in 2.5 for a mattress depth of 0.3m and 1 in 2 for 0.5m deep gabion units used as a revetment.

Non-woven geotextiles (not spun bonded) should be used underneath all revetments. As with all structures used in water courses or as coastal protection schemes, a mattress toe protection or gabion toe is required to prevent under scour.

Sloping revetments to water courses

A gabion mattress is laid to the slope and should normally extend 1.0m above the maximum anticipated flood level in the water course.

For standard gabion mattresses, the maximum slope of the revetment should not exceed 1 in 1.5. The reason for this is to prevent stone migration down the mattress within the cell compartments (the 2.0m dimension of the unit runs along the slope and the 1m cell width runs down the slope).

Where the slope of the required revetment is between a grade of 1 in 1.5 and 1 in 1, then it is recommended to position additional diaphragms within the mattress to reduce the cell width to 0.5m down the slope. This limits the potential for stone migration down steeper slopes. Due to the steep angle, it is recommended that two number anchor pins per 2.0m run of revetment, be installed to prevent the possibility of the entire mattress sliding.

It is not recommended to construct a sloping revetment with slopes that are steeper than 1 in 1. Reveting a steep slope in this way should only be considered where the bank is stable otherwise a stepped revetment or a retaining structure should be designed.

As with all structures in water courses or for use in coastal protection schemes, mattress toe protection or an embedded toe gabion is required to prevent under scour.

To promote growth on revetments soil can be brushed into the filled mattress and a 3D matting or biodegradable matting can be placed beneath the lid.
2. Gabion design

2.4 Stepped revetments and scour protection

The following applies to both water courses and coastal protection.

Stepped revetments are used to protect embankments against erosion where they are steeper than 45 degrees. The embankment should be stable in its own right. Stepped revetments are not an alternative to gabion retaining walls where stability is required.

The stepped revetment can be tied back with geogrids to form a reinforced earth structure where the embankment is not stable in its own right.

In constructing stepped revetments, the construction must follow the cut line and slope. If areas require filling greater than 0.5m wide behind the stepped revetment, the solution should be a retaining structure and not a stepped revetment.

The stepped revetment is created by offsetting each course from the course below, normally 0.5m to the full height of the unit. Each course should have a unit width of at least 1.5 times the unit depth so that the overhang at the rear is not greater than the unit depth. Thereby the unit above bears down onto the unit below by at least twice the unit depth.

For example, a stepped revetment formed using 0.5m deep units stepped back at 0.5m requires unit widths of 1.5m minimum.

A geotextile separator should be placed behind and below the structure to prevent leaching of fine soil particles.

**Scour protection**

As with all structures used in water courses or as coastal protection schemes, a mattress toe protection or gabion toe is required to prevent under scour.

Stepped revetments are used to protect embankments against erosion where they are steeper than 45 degrees.
2. Gabion design

2.5 Scour protection aprons

For retaining structures in water environments, unless the bed material is non erodable, then scour will occur. Although this cannot be readily prevented, the structure must be adequately protected against under scour.

There are two main principle methods of dealing with under scour:

**Mattress toe protection**
At the toe of the embankment revetment, a mattress should be provided on the bed to move the effects of the scour away from the toe. The length of toe mattress provided for most soils is 1 to 1.5 times the anticipated scour depth.

Where soils are extremely erodable or it is a very fast flowing river, then further advice should be sought from Enviromesh.

Scour protection can also be used adjacent to other retaining systems or bridge abutments to prevent under scour from affecting the main structure.

Apron protection can be laid over pipes or services embedded in the water course to prevent them becoming exposed due to scour.

If the toe protection is to a coastal scheme, then the length of protection is normally increased to 2 to 3 times the expected scour or beach level variation movement.

**Embedded gabion toe protection**
Gabion toe protection entails embedding a gabion to a sufficient depth, greater than the anticipated scour depth or beach level variation.

For retaining structures in water environments, unless the bed material is non erodable, then scour will occur.

A geotextile separator should be placed behind and below the scour protection to prevent leaching of fine soil particles.
2. Gabion design

2.6 Gabion outfalls and inlet structures

The following information applies to free-flow outfall pipes and inlet or outlet culverts, discharging at or near bed level.

For pumped discharge outfalls or outfalls discharging at a height above the bed, advice should be sought from Enviromesh.

Discharge from pipes into water courses, results in localised formation of eddy currents and turbulent conditions.

These conditions result in a powerful erodable force, therefore protection locally at the discharge point is required.

The protection required is generally a mattress laid to the bed as an apron and should extend sufficient distance upstream and downstream in the water course and also extend out into the stream. The mattress must be laid on a geotextile separator.

Outfall structures can be constructed from gabions, designed as a retaining wall having the discharge or inlet pipe pass through the retaining wall.

The limits of the protection depend on the discharge velocities from the pipe, the discharge angle of the pipe and the flow conditions in the water course. As a guide, the protection should not be less than given in the following table:

<table>
<thead>
<tr>
<th>DISCHARGE PIPE DIAMETER</th>
<th>MATTRESS BED PROTECTION DEPTH</th>
<th>PROTECTION UPSTREAM OF INLET POINT</th>
<th>PROTECTION DOWNSTREAM OF DISCHARGE POINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>(m)</td>
<td>(m)</td>
<td>(m)</td>
<td>(m)</td>
</tr>
<tr>
<td>0.15 to 0.30</td>
<td>0.30</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>0.30 to 0.50</td>
<td>0.50</td>
<td>1.50</td>
<td>1.50</td>
</tr>
<tr>
<td>0.50 to 1.00</td>
<td>0.50</td>
<td>1.50</td>
<td>2.00</td>
</tr>
</tbody>
</table>

The limits of the protection depend on the discharge velocities from the pipe, the discharge angle of the pipe and the flow conditions in the water course.
2. Gabion design

2.7 Gabion groynes

**River Groynes**
Groynes are structures that extend from the river bank out into the water course. Their purpose is to divert the flow away from the river bank to prevent its erosion. A series of groynes along a bank will encourage deposition of bed material between the groynes, raising the bed level adjacent to the river bank.

At the head of the groyne, the bed scours which results in deepening of the river beyond the limit of the groyne.

Stub or short groynes are often constructed to improve fish habitat in a river as deep pools are formed at the head of the groyne.

The spacing of the groynes to achieve the desired result is dependant on the river regime. Where the bed is very stable, the effect of deepening the main channel may be limited.

A scour protection apron is required around the groyne so that the scour does not undermine the groyne itself.

**Coastal Groynes**
The purpose of sea groynes is to prevent erosion of the foreshore by causing deposition of beach material between the groynes. The groynes, as with river groynes, require an apron protection to prevent scour undermining the groyne itself.

The extent of the mattress protection should be a minimum of two metres around the head of the groyne and three metres back from the head of the groyne as this is where maximum scour will occur.

Normally gabions are not recommended in a regular wave zone, but in the case of coastal groynes this will occur. The type of gabion to be used for coastal gabions must always be the PVC coated flexible woven mesh type. This is because the groyne may be distorted and requires the flexible mesh for the unit to maintain its integrity. It is very important that the units are well packed and constructed otherwise the gabion infill could abrade the protective PVC coating.

In the long term as the beach replenishment is established, it may require the groyne to be increased in height. This can be achieved by adding another course of gabions. A classic example of a very successful sea groyning scheme is at Hunstanton in Norfolk. The use of sea groynes should be limited to sandy beaches. Shingle or rocky beaches will result in abrasion of the mesh coatings.
2. Gabion design

2.8 Cascade structures and weirs

Gabion cascades are used on very steep gradients to dissipate energy. The cascades are a series of steps normally 0.5m or 1.0m high with side gabion walls to confine the flow.

Weirs are designed as retaining walls and can have a rectangular or trapezoidal opening set into the top of the structure to control the water flow control in flood conditions to reduce erosion or where there is a steep gradient used to dissipate energy.

If there is a heavy bed load then the steps of the cascade or crest of the weir can be protected with concrete to prevent damage to the mesh.

It is recommended to use welded mesh gabions to the structures with a mattress or gabion protection down stream to prevent downward erosion due to the turbulent flow conditions. The depth of the protection should be 0.5m minimum for sufficient length until the turbulent conditions subside, this will be dependent on the flow conditions.

In very high flows over weirs it may be necessary to form a stilling pond with a counter weir to reduce the energy further.

The selection of rock or stone fill is very important as the performance of gabion structures are dependant not only upon the type of unit but also the infill. An angular gabion fill is recommended.
2. Gabion design

2.9 Coastal protection

Gabions and mattresses should only be used as a secondary defence, top of the beach protection or in sheltered locations.

Specifications
The specification for gabion and or mattress protection should be PVC / Zinc coated. Gabions and mattresses should not be sited on shingle beaches as it abrades the PVC coating.

Gabion walls as a secondary defence should be analysed as a mass gravity wall and have a stepped face, the gabions should be set down into the beach beyond the depth of variation in level anticipated in the beach.

Mattress protection should be a minimum of 300mm deep and set at a maximum slope of 1 in 3, again the mattress should be embedded in the beach to protect against toe erosion.

A geotextile layer must be placed behind and below gabion structures and beneath the mattress units.

Special considerations
If there is a possibility of the structure being over-topped in extreme conditions then a mattress protection behind the wall or crest of a revetment should be provided.

Above, Chesil beach crest protection scheme to the shingle ridge, which is not normally subject to wave action except in storm conditions. This protection is sacrificial and has been replaced/repaiRed after storm action. This aspect was considered in the original design.
3. Gabion specifications and sizes

3.1 Introduction

Overview
It is important to ensure that the correct specification is used for the gabions / mattresses.

The following sheets give the specifications for:

**BI-AXIAL WELDED MESH**
- Gabion series 333, 444 and 555 (Galfan coated: single wire diameter units) pages 19–20
- Gabion series 3**, 4** and 5** (Galfan coated: dual wire diameter units) pages 21–22
- Gabion series P27, P38 (PVC / Zinc coated: single wire diameter units) pages 23–24
- Gabion series P2738 (PVC / Zinc coated: dual wire diameter units) pages 25–26
- Gabion series 344-D27 (Galfan coated: dual wire diameter units) pages 27–28

**HEXAGONAL WOVEN MESH**
- Gabion series Z27 (Zinc coated) pages 29–30
- Gabion series P27 (PVC / Zinc coated) pages 31–32
- Mattress series P2 (PVC / Zinc coated) pages 33–34

**Aesthetics**
For schemes where visual quality is not important, either woven or welded mesh gabions are acceptable. For prestige schemes where the visual quality is important, the preferred specification is the Gabion 344-D27 system.

**Environmental considerations**
Where the gabions are subject to salt spray, saline water, acidic soils (out of range pH7 to 10) or brackish water, then PVC / Zinc-coated gabions should be specified.
3. Gabion specifications and sizes

3.2 Bi-axial welded mesh gabions – galfan coated

**SINGLE WIRE DIAMETER: GABION 333, 444, 555**

The materials, manufacture and supply of this product shall comply with the requirements of BS EN 10223-8. The supplier must confirm adherence to the specifications for materials and manufacturing requirements.

**MATERIALS**

The wire used in the manufacture of the gabions and installation accessories shall comply with the following:

- **Mesh Fabric**
  The mesh fabric shall be formed by electrically welding at each and every intersection, hard drawn steel line and cross wires into a dimensionally stable bi-axial square metric mesh of size 75mm x 75mm.

- **Weld Strength**
  The weld strength shall be 75% of the minimum ultimate tensile strength of the wire.

- **Wire Diameter**
  The nominal wire diameter for the mesh fabric shall be *(select wire diameter 3.0mm, 4.0mm, 5.0mm)*, all within the tolerances specified in BS EN 10218-2:2012 and shall have a tensile strength that falls within the range of 540 to 770 N/mm².

- **Lacing Wire**
  The lacing wire used for site assembly shall be of a nominal 2.2mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a tensile strength that falls within a range of 350 to 550 N/mm².

- **Helical Binders (where specified, not supplied as standard)**
  Full height helical binders for the vertical joints for gabion installation and assembly shall be of a nominal 3.0mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a minimum tensile strength of 350 N/mm².

**GABION SIZES**

It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes. Designation of sizes: length × width × height.

**CERTIFICATION**

1. All gabion products are manufactured in accordance with the requirements of BS EN 10223-8:2013 where the gabions are considered to have a life expectancy of up to 50 years in a ‘low aggressive C2 environment’ (ref. EN ISO 9223:2012 Table 1).
2. Evidence of relevant certificates of conformity with respect to wire strength, weld strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Gabion specifications and sizes

3.2 Bi-axial welded mesh gabions – galfan coated

SINGLE WIRE DIAMETER : GABION 333, 444, 555

MATERIALS

- Preformed Corner Bracing Ties (where specified, not supplied as standard)
  Preformed corner bracing ties are to be formed from a nominal 3.0mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a minimum tensile strength of 350 N/mm².

- Corrosion Resistance
  All wire used in the mesh fabric or accessories shall be Galfan coated (95% Zinc / 5% Al) in accordance with BS EN 10244-2: 2009 (Class A).

MANUFACTURE / SUPPLY

- Unit Formation
  The gabion is to be formed from mesh panels such that the front, rear, ends and diaphragm panels are connected to the base panel with either Stainless Steel CL35 clips or Galfan coated CL50 ‘C’ rings at a maximum spacing of 225mm for all joints. This process must be undertaken in a factory-controlled environment. The lid may be supplied loose or fixed in the same manner to the rear or face panel. Diaphragm (partitioning panels) spacings should not exceed 1.050m on units orientated as stretchers and 1.65m orientated as headers.

- Supply
  Gabions are to be manufactured and/or supplied by:
  Enviromesh, Garner Street Business Park, Etruria Stoke-on-Trent, Staffordshire, ST4 7BH.
  Telephone +44 (0)845 136 0101  Fax +44 (0)845 136 0202
  Email enquiries@enviromeshgabions.co.uk
  Online www.enviromeshgabions.co.uk

SPECIFIED MESH BI-AXIAL WELDED

Nominal dimensions (x) and (y) : Gabions, 75mm  Mattresses, 75mm

GABION SIZES

It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes. Designation of sizes: length × width × height.

CERTIFICATION

1. All gabion products are manufactured in accordance with the requirements of BS EN 10223-8:2013 where the gabions are considered to have a life expectancy of up to 50 years in a ‘low aggressive C2 environment’ (ref. EN ISO 9223:2012 Table 1).

2. Evidence of relevant certificates of conformity with respect to wire strength, weld strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3.2 Bi-axial welded mesh gabions – galfan coated

**DUAL WIRES DIAMETER : GABION 3**, 4**, 5**

The materials, manufacture and supply of this product shall comply with the requirements of BS EN 10223-8. The supplier must confirm adherence to the specifications for materials and manufacturing requirements.

**MATERIALS**

The wire used in the manufacture of the gabions and installation accessories shall comply with the following:

**Mesh Fabric**

The mesh fabric shall be formed by electrically welding at each and every intersection, hard drawn steel line and cross wires into a dimensionally stable bi-axial square metric mesh of size 75mm x 75mm.

**Weld Strength**

The weld strength shall be 75% of the minimum ultimate tensile strength of the wire.

**Wire Diameter**

The nominal wire diameter for the mesh fabric shall be (select wire diameter 3.0mm OR 4.0mm for the base, lid, ends and diaphragm panels) and (select wire diameter 4.0mm OR 5.0mm for 3.0mm body OR 5.0mm for 4.0mm body for the front panel), all within the tolerances specified in BS EN 10218-2:2012 and shall have a tensile strength that falls within the range of 540 to 770 N/mm². If required the rear panel can also be in a heavier wire diameter, this should be specified if required.

Tensile strengths of less than 540 N/mm² may result in increased deformation of the filled units and a reduction in weld strength shall not be permitted.

**Lacing Wire**

The lacing wire used for site assembly shall be of a nominal 2.2mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a minimum tensile strength of 350 N/mm².

**Helical Binders** (where specified, not supplied as standard)

Full height helical binders for the vertical joints for gabion installation and assembly shall be of a nominal 3.0mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a minimum tensile strength of 350 N/mm².

**GABION SIZES**

It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes. Designation of sizes: length × width × height.

**CERTIFICATION**

1. All gabion products are manufactured in accordance with the requirements of BS EN 10223-8:2013 where the gabions are considered to have a life expectancy of up to 50 years in a "low aggressive C2 environment" (ref. EN ISO 9223:2012 Table 1).
2. Evidence of relevant certificates of conformity with respect to wire strength, weld strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3.2 Bi-axial welded mesh gabions – galfan coated

**DUAL WIRE DIAMETER : GABION 3**, **4**, **5**

**MATERIALS continued**

**Preformed Corner Bracing Ties** *(where specified, not supplied as standard)*
Preformed corner bracing ties are to be formed from a nominal 3.0mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a minimum tensile strength of 350 N/mm².

**Corrosion Resistance**
All wire used in the mesh fabric or accessories shall be Galfan coated (95% Zinc / 5% Al) in accordance with BS EN 10244-2:2009 (Class A).

**MANUFACTURE / SUPPLY**

**Unit Formation**
The gabion is to be formed from mesh panels such that the front, rear, ends and diaphragm panels are connected to the base panel with either Stainless Steel CL35 clips or Galfan coated CL50 ‘C’ rings at a maximum spacing of 225mm for all joints. This process must be undertaken in a factory-controlled environment. The lid may be supplied loose or fixed in the same manner to the rear or face panel. Diaphragm (partitioning panels) spacings should not exceed 1.050m on units orientated as stretchers and 1.65m orientated as headers.

Should units be required to be prefilled and lifted as opposed to filling in situ, additional clips, rings and mesh panels may be required. In such circumstances the manufacturer must be consulted prior to supply to ensure product is suitable for application.

**Supply**
Gabions are to be manufactured and/or supplied by:
Enviromesh, Garner Street Business Park, Etruria Stoke-on-Trent, Staffordshire, ST4 7BH.
Telephone: +44 (0)845 136 0101  Fax: +44 (0)845 136 0202
Email: enquiries@enviromeshgabions.co.uk
Online: www.enviromeshgabions.co.uk

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**SPECIFIED MESH BI-AXIAL WELDED**
Nominal dimensions *(x)* and *(y)*: Gabions, 75mm Mattresses, 75mm

**GABION SIZES**
It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes.
Designation of sizes: length × width × height.

**CERTIFICATION**
1. All gabion products are manufactured in accordance with the requirements of BS EN 10223-8:2013 where the gabions are considered to have a life expectancy of up to 50 years in a low aggressive C2 environment (ref. EN ISO 9223-2012 Table 1).
2. Evidence of relevant certificates of conformity with respect to wire strength, weld strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Gabion specifications and sizes

3.3 Bi-axial welded mesh gabions – PVC/zinc coated

**SINGLE WIRE DIAMETER: GABION P27, P38**

The materials, manufacture and supply of this product shall comply with the requirements of BS EN 10223-8 and have BBA certification. The supplier must confirm adherence to the specifications for materials and manufacturing requirements.

**MATERIALS**

The wire used in the manufacture of the gabions and installation accessories shall comply with the following:

- **Mesh Fabric**
  - The mesh fabric shall be formed by electrically welding at each and every intersection, hard drawn steel line and cross wires into a dimensionally stable bi-axial square metric mesh of size 75mm x 75mm.

- **Weld Strength**
  - The weld strength shall be 75% of the minimum ultimate tensile strength of the wire.

- **Wire Diameter**
  - The nominal wire diameter for the mesh fabric shall be (select wire diameter 2.7mm OR 3.8mm), all within the tolerances specified in BS EN 10218-2:2012 and shall have a tensile strength that falls within the range of 540 to 770 N/mm².

  Tensile strengths of less than 540 N/mm² may result in increased deformation of the filled units and a reduction in weld strength shall not be permitted.

- **Lacing Wire**
  - The lacing wire used for site assembly shall be of a nominal 2.2mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a tensile strength that falls within a range of 350 to 550 N/mm².

- **Corrosion Resistance**
  - All wire used in the mesh fabric or accessories shall be Zinc coated in accordance with BS EN 10244-2:2009 (Class A). An additional nominal thickness is applied of 0.25mm organic polymer powder coating for the mesh fabric and a nominal 0.5mm organic polymer powder coating for the lacing wire. This coating being in accordance with BS EN 10245-1:2011 and BS EN 10245-2:2011.

**GABION SIZES**

It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes. Designation of sizes: length × width × height.

**CERTIFICATION**

1. All gabion materials and accessories must be certified in accordance with British Board of Agrément (BBA) certificate no. 05/4215. This is for current General Building Regulations.

2. All gabion products are manufactured in accordance with the requirements of BS EN 10223-8:2013 where the gabions are considered to have a life expectancy of 120 years.

3. Evidence of current BBA certification and relevant certificates of conformity with respect to wire strength, weld strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Gabion specifications and sizes

3.3 Bi-axial welded mesh gabions – PVC/zinc coated

**SINGLE WIRE DIAMETER : GABION P27, P38**

**MANUFACTURE / SUPPLY**

Unit Formation

The gabion is to be formed from mesh panels such that the front, rear, ends and diaphragm panels are connected to the base panel with either Stainless Steel CL35 clips or Stainless Steel CL50 ‘C’ rings at a maximum spacing of 225mm for all joints. This process must be undertaken in a factory-controlled environment. The lid may be supplied loose or fixed in the same manner to the rear or face panel. Diaphragm (partitioning panels) spacings should not exceed 1.050m on units orientated as stretchers and 1.65m orientated as headers.

Should units be required to be prefilled and lifted as opposed to filling in situ, additional clips, rings and mesh panels may be required. In such circumstances the manufacturer must be consulted prior to supply to ensure product is suitable for application.

Supply

Gabions are to be manufactured and/or supplied by:

Enviromesh, Garner Street Business Park, Etruria, Stoke-on-Trent, Staffordshire, ST4 7BH.

**Telephone** +44 (0)845 136 0101  **Fax** +44 (0)845 136 0202  **Email** enquiries@enviromeshgabions.co.uk  **Online** www.enviromeshgabions.co.uk

**SPECIFIED MESH BI-AXIAL WELDED**

Nominal dimensions (x) and (y) : Gabions, 75mm  Mattresses, 75mm

**GABION SIZES**

It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes. Designation of sizes: length × width × height.

**CERTIFICATION**

1. All gabion materials and accessories must be certified in accordance with British Board of Agrément (BBA) certificate no. 05/4215. This is for current General Building Regulations.

2. All gabion products are manufactured in accordance with the requirements of BS EN 10223-8:2013 where the gabions are considered to have a life expectancy of 120 years.

3. Evidence of current BBA certification and relevant certificates of conformity with respect to wire strength, weld strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Gabion specifications and sizes

3.3 Bi-axial welded mesh gabions – PVC/zinc coated

**DUAL WIRE DIAMETER : GABION P2738**
The materials, manufacture and supply of this product shall comply with the requirements of BS EN 10223-8 and have BBA certification. The supplier must confirm adherence to the specifications for materials and manufacturing requirements.

**MATERIALS**
The wire used in the manufacture of the gabions and installation accessories shall comply with the following:

**Mesh Fabric**
The mesh fabric shall be formed by electrically welding at each and every intersection, hard drawn steel line and cross wires into a dimensionally stable bi-axial square metric mesh of size 75mm x 75mm.

**Weld Strength**
The weld strength shall be 75% of the minimum ultimate tensile strength of the wire.

**Wire Diameter**
The nominal wire diameter for the mesh fabric shall be 3.8mm for the face panel and 2.7mm for the base, rear, ends, diaphragm panels and lid, all within the tolerances specified in BS EN 10218-2:2012 and shall have a tensile strength that falls within the range of 540 to 770 N/mm². If required the rear panel can also be in a heavier wire diameter, this should be specified if required.

Tensile strengths of less than 540 N/mm² may result in increased deformation of the filled units and a reduction in weld strength shall not be permitted.

**Lacing Wire**
The lacing wire used for site assembly shall be of a nominal 2.2mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a tensile strength that falls within a range of 350 to 550 N/mm².

**CERTIFICATION**
1. All gabion materials and accessories must be certified in accordance with British Board of Agrément (BBA) certificate no. 05/4215. This is for current General Building Regulations.
2. All gabion products are manufactured in accordance with the requirements of BS EN 10223-8:2013 where the gabions are considered to have a life expectancy of 120 years.
3. Evidence of current BBA certification and relevant certificates of conformity with respect to wire strength, weld strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.

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**SPECIFIED MESH BI-AXIAL WELDED**
Nominal dimensions (x) and (y) : Gabions, 75mm Mattresses, 75mm
3. Gabion specifications and sizes

3.3 Bi-axial welded mesh gabions – PVC/zinc coated

**DUAL WIRE DIAMETER : GABION P2738**

**MATERIALS continued**

Corrosion Resistance

All wire used in the mesh fabric or accessories shall be Zinc coated in accordance with BS EN 10244-2:2009 (Class A). An additional nominal thickness is applied of 0.25mm organic polymer powder coating for the mesh fabric and a nominal 0.5mm organic polymer powder coating for the lacing wire. This coating being in accordance with BS EN BS EN 10245-1:2011 and BS EN 10245-2:2011.

**MANUFACTURE / SUPPLY**

**Unit Formation**

The gabion is to be formed from mesh panels such that the front, rear, ends and diaphragm panels are connected to the base panel with either Stainless Steel CL35 clips or Stainless Steel CL50 ‘C’ rings at a maximum spacing of 225mm for all joints. This process must be undertaken in a factory-controlled environment. The lid may be supplied loose or fixed in the same manner to the rear or face panel. Diaphragm (partitioning panels) spacings should not exceed 1.050m on units orientated as stretchers and 1.65m orientated as headers.

**Supply**

Gabions are to be manufactured and/or supplied by:

Enviromesh, Garner Street Business Park, Etruria Stoke-on-Trent, Staffordshire, ST4 7BH.

**Telephone** +44 (0)845 136 0101  **Fax** +44 (0)845 136 0202

**Email** enquiries@enviromeshgabions.co.uk

**Online** www.enviromeshgabions.co.uk

SPECIFIED MESH BI-AXIAL WELDED

Nominal dimensions (x) and (y) : Gabions, 75mm  Mattresses, 75mm

**GABION SIZES**

It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes.

Designation of sizes: length × width × height.

**CERTIFICATION**

1. All gabion materials and accessories must be certified in accordance with British Board of Agrément (BBA) certificate no. 05/4215. This is for current General Building Regulations.

2. All gabion products are manufactured in accordance with the requirements of BS EN 10223-8:2013 where the gabions are considered to have a life expectancy of 120 years.

3. Evidence of current BBA certification and relevant certificates of conformity with respect to wire strength, weld strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Gabion specifications and sizes

3.4 Bi-axial welded mesh gabions – galfan coated

**DUAL WIRE DIAMETER : GABION 344-D27**

The materials, manufacture and supply of this product shall comply with the requirements of BS EN 10223-8. The supplier must confirm adherence to the specifications for materials and manufacturing requirements.

**MATERIALS**

The wire used in the manufacture of the gabions and installation accessories shall comply with the following:

- **Mesh Fabric**
  The mesh fabric shall be formed by electrically welding at each and every intersection, hard drawn steel line and cross wires into a dimensionally stable bi-axial square metric mesh of size 75mm x 75mm.

- **Weld Strength**
  The weld strength shall be 75% of the minimum ultimate tensile strength of the wire.

- **Wire Diameter**
  The nominal wire diameter for the mesh fabric shall be 3.0mm for the base, ends, diaphragm panels and lid on the uppermost unit and 4.0mm for the front and rear panels, all within the tolerances specified in BS EN 10218-2:2012 and shall have a tensile strength that falls within the range of 540 to 770 N/mm².

  Tensile strengths of less than 540 N/mm² may result in increased deformation of the filled units and a reduction in weld strength shall not be permitted.

- **Lacing Wire**
  The lacing wire used for site assembly shall be of a nominal 2.2mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a tensile strength that falls within a range of 350 to 550 N/mm².

- **Helical Binders** (where specified, not supplied as standard)
  Full height helical binders for the vertical joints for gabion installation and assembly shall be of a nominal 3.0mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a minimum tensile strength of 350 N/mm².

**CERTIFICATION**

1. All gabion products are manufactured in accordance with the requirements of BS EN 10223-8:2013 where the gabions are considered to have a life expectancy of up to 50 years in a “low aggressive C2 environment” (ref. EN ISO 9223:2012 Table 1).

2. Evidence of relevant certificates of conformity with respect to wire strength, weld strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Gabion specifications and sizes

3.4 Bi-axial welded mesh gabions – galfan coated

**DUAL WIRE DIAMETER : GABION 344-D27**

**MATERIALS continued**

- **Preformed Corner Bracing Ties** *(where specified, not supplied as standard)*
  Preformed corner bracing ties are to be formed from a nominal 3.0mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a minimum tensile strength of 350 N/mm².

- **Corrosion Resistance**
  All wire used in the mesh fabric or accessories shall be Galfan coated (95% Zinc / 5% Al) in accordance with BS EN 10244-2:2009 (Class A).

**MANUFACTURE / SUPPLY**

- **Unit Formation**
  The gabion is to be formed from mesh panels such that the front, rear, ends and diaphragm panels are connected to the base panel with either Stainless Steel CL35 clips or Galfan coated CL50 ‘C’ rings at a maximum spacing of 225mm for all joints. This process must be undertaken in a factory-controlled environment. A lid is supplied loose or fixed in the same manner to the rear or face panel for the unit forming the top of the wall only, for all other courses the base of the unit is extended to form the lid of the unit below. Diaphragm (partitioning panels) spacings are normally at 0.675m centres but should not exceed 1.050m on units orientated as stretchers and 1.65m orientated as headers.

- **Supply**
  Gabions are to be manufactured and/or supplied by:
  Enviromesh, Garner Street Business Park, Etruria Stoke-on-Trent, Staffordshire, ST4 7BH.
  **Telephone** +44 (0)845 136 0101  **Fax** +44 (0)845 136 0202
  **Email** enquiries@enviromeshgabions.co.uk
  **Online** www.enviromeshgabions.co.uk

**SPECIFIED MESH BI-AXIAL WELDED**

Nominal dimensions *(x)* and *(y)*: Gabions, 75mm Mattresses, 75mm

**GABION SIZES**

It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes. Designation of sizes: length × width × height.

**CERTIFICATION**

1. All gabion products are manufactured in accordance with the requirements of BS EN 10223-8:2013 where the gabions are considered to have a life expectancy of up to 50 years in a ‘low aggressive C2 environment’ (ref. EN ISO 9223:2012 Table 1).
2. Evidence of relevant certificates of conformity with respect to wire strength, weld strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Gabion specifications and sizes

3.5 Hexagonal woven mesh gabions – zinc coated

**GABION Z27**

The materials, manufacture and supply of this product shall comply with the requirements of BS EN 10223-3 and have BBA certification. The supplier must confirm adherence to the specifications for materials and manufacturing requirements.

**MATERIALS**

The wire used in the manufacture of the gabions and installation accessories shall comply with the following:

**Mesh Fabric**

The mesh fabric shall be formed by twisting pairs of wires through one and a half turns to form a hexagonal flexible net pattern of nominal size 80mm x 100mm. The end wires of the mesh panel are terminated by being wrapped around a heavy selvedge wire.

The nominal wire diameter for the mesh fabric shall be 2.70mm and 3.40mm for the selvedge wire. All wire is in accordance with BS EN 10218-2:2012 and BS EN 10223-3:2013 with an ultimate tensile strength of between 350 to 550N/mm².

**Lacing Wire**

The lacing wire used for site assembly shall be of a nominal 2.2mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a tensile strength that falls within a range of 350 to 550 N/mm².

**Corrosion Resistance**

All wire used in the gabion production or accessories shall be Zinc or (Zinc 95% Aluminium 5%) coated in accordance with BS EN 10244-2:2009 (Class A).

**MANUFACTURE / SUPPLY**

**Unit Formation**

The gabion is to be formed from mesh panels so that the front, rear, base and lid are formed from one continuous sheet, such that the front and rear faces have the mesh orientated vertically.

**GABION SIZES**

It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes.

Designation of sizes: length × width × height.

**CERTIFICATION**

1. All gabion materials and accessories must be certified in accordance with British Board of Agrément (BBA) certificate no. 00/3682. This is for current General Building Regulations.
2. All mattress products are manufactured in accordance with the requirements of BS EN 10223-3:2013 where the gabions are considered to have a life expectancy of greater than 25 years in a ‘low aggressive C2 environment’ (ref. BS EN 10223:2013 Table A1).
3. Evidence of current BBA certification and relevant certificates of conformity with respect to wire strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Gabion specifications and sizes

3.5 Hexagonal woven mesh gabions – zinc coated

GABION Z27

MANUFACTURE / SUPPLY continued

Diaphragms (partitioning panels) and end panels (all vertically orientated mesh) are connected to the base panel with full length lacing. This process must be undertaken in a factory-controlled environment. Diaphragm spacing’s should not exceed 1.00m. The supply of loose diaphragm panels for fitting on site is not acceptable.

Supply
Gabions are to be manufactured and/or supplied by:
Enviromesh, Garner Street Business Park, Etruria Stoke-on-Trent, Staffordshire, ST4 7BH.

Telephone +44 (0)845 136 0101
Fax +44 (0)845 136 0202
Email enquiries@enviromeshgabions.co.uk
Online www.enviromeshgabions.co.uk

GABION SIZES

It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes. Designation of sizes: length × width × height.

CERTIFICATION

1. All gabion materials and accessories must be certified in accordance with British Board of Agrément (BBA) certificate no. 00/3682. This is for current General Building Regulations.

2. All mattress products are manufactured in accordance with the requirements of BS EN 10223-3:2013 where the gabions are considered to have a life expectancy of greater than 25 years in a ‘low aggressive C2 environment’ (ref. BS EN 10223:2013 Table A1).

3. Evidence of current BBA certification and relevant certificates of conformity with respect to wire strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Gabion specifications and sizes

3.6 Hexagonal woven mesh gabions – PVC/zinc coated

GABION P27
The materials, manufacture and supply of this product shall comply with the requirements of BS EN 10223-3 and have BBA certification. The supplier must confirm adherence to the specifications for materials and manufacturing requirements.

MATERIALS
The wire used in the manufacture of the gabions and installation accessories shall comply with the following:

Mesh Fabric
The mesh fabric shall be formed by twisting pairs of wires through one and a half turns to form a hexagonal flexible net pattern of nominal size 80mm x 100mm. The end wires of the mesh panel are terminated by being wrapped around a heavy selvedge wire.

The nominal wire diameter for the mesh fabric shall be 2.70mm and 3.40mm for the selvedge wire. All wire is in accordance with BS EN 10218-2:2012 and BS EN 10223-3:2013 with an ultimate tensile strength of between 350 to 550N/mm².

Lacing Wire
The lacing wire used for site assembly shall be of a nominal 2.2mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a tensile strength that falls within a range of 350 to 550 N/mm².

Corrosion Resistance
All wire used in the gabion production or accessories shall be Zinc or (Zinc 95% Aluminium 5%) coated in accordance with BS EN 10244-2:2009 (Class A) with an additional extruded organic polymer powder coating (grey) of nominal 0.5mm nominal radial thickness. This organic polymer powder coating is in accordance with BS EN 10245-2:2011.

CERTIFICATION
1. All gabion materials and accessories must be certified in accordance with British Board of Agrément (BBA) certificate no. 00/3682. This is for current General Building Regulations where life expectancy is 120 years.
2. All gabion products are manufactured in accordance with the requirements of BS EN 10223-3:2013.
3. Evidence of current BBA certification and relevant certificates of conformity with respect to wire strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Gabion specifications and sizes

3.6 Hexagonal woven mesh gabions – PVC/zinc coated

**GABION P27**

**MANUFACTURE / SUPPLY**

**Unit Formation**

The gabion is to be formed from mesh panels so that the front, rear, base and lid are formed from one continuous sheet, such that the front and rear faces have the mesh orientated vertically.

Diaphragms (partitioning panels) and end panels (all vertically orientated mesh) are connected to the base panel with full length lacing. This process must be undertaken in a factory-controlled environment. Diaphragm spacings should not exceed 1.00m. The supply of loose diaphragm panels for fitting on site is not acceptable.

**Supply**

Gabions are to be manufactured and/or supplied by:

Enviromesh, Garner Street Business Park, Etruria Stoke-on-Trent, Staffordshire, ST4 7BH.

**Telephone** +44 (0)845 136 0101  **Fax** +44 (0)845 136 0202

**Email** enquiries@enviromeshgabions.co.uk

**Online** www.enviromeshgabions.co.uk

**SPECIFIED MESH DOUBLE TWIST WOVEN**

Nominal dimension (y) : Gabions, 80mm

**GABION SIZES**

It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes. Designation of sizes: length × width × height.

**CERTIFICATION**

1. All gabion materials and accessories must be certified in accordance with British Board of Agrément (BBA) certificate no. 00/3682. This is for current General Building Regulations where life expectancy is 120 years.

2. All gabion products are manufactured in accordance with the requirements of BS EN 10223-3:2013.

3. Evidence of current BBA certification and relevant certificates of conformity with respect to wire strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Mattress specification and sizes

3.7 Hexagonal woven mesh mattresses – PVC/zinc coated

**MATTRESS P2**
The materials, manufacture and supply of this product shall comply with the requirements of BS EN 10223-3 and have BBA certification. The supplier must confirm adherence to the specifications for materials and manufacturing requirements.

**MATERIALS**
The wire used in the manufacture of the mattresses and installation accessories shall comply with the following:

- **Mesh Fabric**
The mesh fabric shall be formed by twisting pairs of wires through one and a half turns to form a hexagonal flexible net pattern of nominal size 60mm x 80mm. The end wires of the mesh panel are terminated by being wrapped around a heavy selvedge wire.

  The nominal wire diameter for the mesh fabric shall be 2.00mm and 2.40mm for the selvedge wire. All wire is in accordance with BS EN 10218-2:2012 and BS EN 10223-3:2013 with an ultimate tensile strength of between 350 to 550N/mm².

- **Lacing Wire**
The lacing wire used for site assembly shall be of a nominal 2.2mm wire diameter in accordance with BS EN 10218-2:2012 and shall have a tensile strength that falls within a range of 350 to 550 N/mm².

- **Corrosion Resistance**
All wire used in the gabion production or accessories shall be Zinc or (Zinc 95% Aluminium 5%) coated in accordance with BS EN 10244-2:2009 (Class A) with an additional extruded organic polymer powder coating (grey) of nominal 0.5mm nominal radial thickness. This organic polymer powder coating is in accordance with BS EN 10245-2:2011.

**SPECIFIED MESH DOUBLE TWIST WOVEN**
Nominal dimension (y): Mattresses, 60mm

**GABION MATTRESS SIZES**
It should be noted that it is industry standard for gabion mattresses to be quoted as overall nominal sizes.

**CERTIFICATION**
1. All gabion materials and accessories must be certified in accordance with British Board of Agrément (BBA) certificate no. 00/3682. This is for current General Building Regulations where life expectancy is 120 years.
2. All gabion products are manufactured in accordance with the requirements of BS EN 10223-3:2013.
3. Evidence of current BBA certification and relevant certificates of conformity with respect to wire strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Mattress specification and sizes

3.7 Hexagonal woven mesh mattresses – PVC/zinc coated

**MATTRESS P2**

**MANUFACTURE / SUPPLY**

**Unit Formation**

The mattress is to be formed from the mesh panels such that the ends and base are formed from one continuous sheet. Diaphragms (partitioning panels) and side panels are connected to the base panel with full length lacing. Diaphragm spacings should not exceed 1.00m along the length of the units. This process must be undertaken in a factory controlled environment.

**Supply**

Gabions are to be manufactured and/or supplied by:

Enviromesh, Garner Street Business Park, Etruria Stoke-on-Trent, Staffordshire, ST4 7BH.

**Telephone** +44 (0)845 136 0101  **Fax** +44 (0)845 136 0202

**Email** enquiries@enviromeshgabions.co.uk

**Online** www.enviromeshgabions.co.uk

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**SPECIFIED MESH DOUBLE TWIST WOVEN**

Nominal dimension (y) : Mattresses, 60mm

**GABION MATTRESS SIZES**

It should be noted that it is industry standard for gabion mattresses to be quoted as overall nominal sizes.

Designation of sizes: length × width × height.

**CERTIFICATION**

1. All gabion materials and accessories must be certified in accordance with British Board of Agrément (BBA) certificate no. 00/3682. This is for current General Building Regulations where life expectancy is 120 years.

2. All gabion products are manufactured in accordance with the requirements of BS EN 10223-3:2013.

3. Evidence of current BBA certification and relevant certificates of conformity with respect to wire strength and coating weights used in the manufacture of the mesh fabric and wire products are to be issued upon request.
3. Gabion specifications and sizes

3.8 Gabion and mattress sizes

Bi-axial welded mesh gabions
It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes. The actual gabion sizing is dependant upon the physical mesh configuration.

<table>
<thead>
<tr>
<th>Standard unit lengths (mm)</th>
<th>Standard unit widths (mm)</th>
<th>Standard unit heights (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>675</td>
<td>450</td>
<td>225</td>
</tr>
<tr>
<td>975</td>
<td>675</td>
<td>300</td>
</tr>
<tr>
<td>2025</td>
<td>975</td>
<td>450</td>
</tr>
<tr>
<td>-</td>
<td>1350</td>
<td>675</td>
</tr>
<tr>
<td>-</td>
<td>1500</td>
<td>975</td>
</tr>
<tr>
<td>-</td>
<td>1650</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: Non-standard sizes are available in multiples of 75mm on request

Hexagonal woven mesh gabions and mattresses
It should be noted that it is industry standard for gabions to be quoted as overall nominal sizes.

<table>
<thead>
<tr>
<th>GABION standard units (metres)</th>
<th>GABION MATTRESSES standard units (metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0 × 1.0 × 0.5</td>
<td>3.0 × 2.0 × 0.17 and 2.0 × 2.0 × 0.17</td>
</tr>
<tr>
<td>1.0 × 1.0 × 1.0</td>
<td>3.0 × 2.0 × 0.30 and 2.0 × 2.0 × 0.30</td>
</tr>
<tr>
<td>1.5 × 1.0 × 0.5</td>
<td></td>
</tr>
<tr>
<td>1.5 × 1.0 × 1.0</td>
<td></td>
</tr>
<tr>
<td>2.0 × 1.0 × 0.5</td>
<td></td>
</tr>
<tr>
<td>2.0 × 1.0 × 1.0</td>
<td></td>
</tr>
</tbody>
</table>