



South Village Shopping Mall, Kirrawee

build and can look great. By using different rocks and materials a gabion wall can stand out. Useful to breakup areas of garden or park into separate areas. A low wall of 1m or less can be built to curve around a seating area for example. Also great for acoustic walls by using sound absorption materials within the wall with rocks on the outsides.

• **Retaining Walls**

Gabion has been traditionally been used for retaining walls due to its low cost compared to conventional methods. They can be built as either mass gravity walls (relying on the weight of rock to retain the earth) or as mechanically stabilised walls (which use geogrids or earth anchors to hold the wall in place).

• **Cladding and Columns**

Architectural gabion is perfect for cladding an otherwise ugly concrete facade or column. They can be built to a depth of only 200mm. Often used in front of woven (hex mesh) gabion which is cheap but unattractive. By building an architectural gabion facade in front of a saggy woven wall a designer can achieve both cost savings and a fantastic looking building or wall.



Gardener Park, Banksia

Architectural gabion is welded mesh which is either mild steel coated with 300gsm of 10% aluminium and 90% zinc or 316L Stainless Steel.

We stock a wide range of gabion products and accessories including C rings and gabion tools.

• **Rock Walls**

Gabion makes ideal garden walls for any landscaping project. They have the advantage of being easy to



Kingstone Forshore, ACT

ASTM 974-97 is the only standard for welded gabion. The standard states that the minimum requirement for a gabion weld mesh is that if it is a mild steel it must have a minimum coating of 275 gsm (4mm wire). It should be noted that standard galvanised weld mesh DOES NOT meet this standard and is usually closer to 60 grams or less of coating. In an ideal situation a standard galvanised mesh can still last 10-25 years but is severely affected in any aggressive environment.

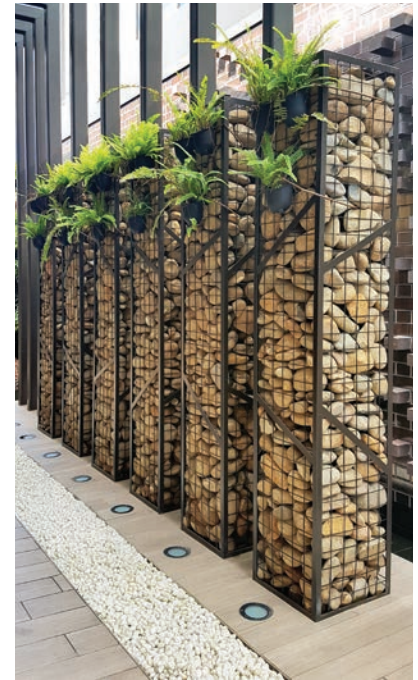
AL-TEN® (mild steel mesh) Gabion

Manufactured in mild steel to a minimum wire coating of 290 grams per m² which is Aluminium 10% and Zinc 90%. The mesh is manufactured in Australia to meet gabion specification ASTM 974-97.

AL-TEN® has a high Aluminium content (10%) coating which over time turns the mesh into a darkish grey colour. This has the benefit of absorbing light rather than reflecting it. Especially apparent when viewing a wall from an angle, the rock is more visible and the mesh less so. Using a highly reflective finish such as plain gal, stainless steel or PVC results in the mesh being more visible to the eye when viewing at angles.

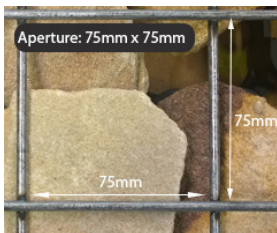
Standard ex-stock grades

Aperture: The aperture is the distance from the centre of one wire to the centre of the next both horizontally and vertically. We are currently producing as standard products both 4mm and 5mm mesh in 75mm x 75mm aperture and 4mm in 100mm x 50mm aperture.

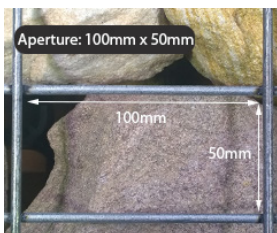


RSL, Rooty Hill

75mm x 75mm aperture, the most common size. When calculating cage sizes take into account that all lengths, widths and heights will be in increments of 75mm. Overall it is easier working with a square aperture than a rectangular one, however a rectangular aperture can have a stunning look.



100mm x 50mm aperture, When calculating cage sizes take into account that lengths, widths will be usually be in increments of 100mm and heights 50mm. This is based upon it being more common for 100mm in the horizontal plane.



Sometimes it is desirable to place the 100mm vertically (e.g. if a high wall this may be done to deter climbing).

Aperture	4mm diameter	5mm diameter
50mm x 50mm	custom	custom
75mm x 75mm	standard	standard
100mm x 50mm	standard	custom
100mm x 100mm	custom	custom

Custom manufacturing to different aperture sizes, for example 50mm x 50mm, 100mm x 100mm in both 4mm and 5mm diameter wire.

Specification:

	4mm	5mm
Wire diameter (average)	4.01	4.98
Wire diameter tolerance	+/- 0.08mm	+/- 0.05mm
Wire coating (average)	337g/m ²	317g/m ²
Ultimate tensile strength (wire, average)	442 MPa	427 MPa

Permathene gabion meets or exceeds ASTM 974-97 for welded mesh gabions which specifies:

Tensile Strength: The steel wire used shall have a tensile strength between 350-750N/mm².

Elongation: Elongation shall not be less than 10%.

Weld Shear Strength: The depth of the weld pot to be not less than 15% of wire ID.

Weld shear strength to reach a minimum of 50% of wire tensile strength.

Minimum metallic coatings: As per BS443 EN10244-2:2001, Table 2, Class A. 4mm (minimum coating 275g/m²).

Estimated Lifespan:

Although difficult to predict as lifespan of all steels is largely dependant upon the environment. Generally you can expect 20 years life for galvanised wire, and 2-3 times longer life span for Galfan, AL-TEN®, PVC coated and stainless steel.

The mesh life is dependant upon no damage to the coating during installation or during the lifetime of the wall. Because the wire is a coated mild steel any damage to the mesh which removes the Zinc/ Aluminium coating will eventually corrode. If upon inspection damage to the coating is seen or corrosion has occurred it needs to be rectified.

Other considerations when determining lifespan is soil PH levels if the product is placed directly on the earth. A geotextile fabric such as Syntex nonwoven 145gsm may be used as a separation layer. Some rock such as limestone has a high PH (alkaline) which may have a detrimental effect on the mesh.

Rock cleaning or other chemicals including acids and caustic solutions which come into contact with a Galfan, Galvanised, Stainless Steel mesh may have a detrimental effect to metal surfaces and may cause premature corrosion and breakdown at areas of contact. It is recommended to not use any chemicals and to wash immediately with water should contact occur. If exposure to corrosive type chemicals to Zinc and Aluminium is expected alternative systems should be considered following analysis of potential problems. Once corrosion has occurred it may be necessary to apply a rust remover and to then apply either a cold galv or zinc/aluminium paint to affected areas.



Ballast Point Balmain

The table is based upon test data of the wire during simulated laboratory testing.

AGGRESSIVITY OF ENVIRONMENT	AL-TEN
C1: Very Low (Internal buildings with clean atmospheres)	100 years +
C2: Low (Low level of pollution, mostly rural areas)	100 years +
C3: Medium (Urban and industrial atmospheres, moderate sulphur dioxide pollution, coastal areas with low salinity)	93 years
C4: High (Industrial areas and coastal areas with moderate salinity)	47 years
C5: Very High (Industrial areas with high humidity and aggressive atmosphere, coastal and offshore areas with high salinity)	25 years
CX: Extreme (Extreme industrial areas, coastal and offshore areas with occasional contact with salt spray)	<10 years

Anticipated lifetime years until 5% dark brown rust

Stainless Steel 316L Gabion:

Manufactured in rust resistant 316L Stainless Steel and used where salt water is likely to come into contact with the gabion or where customers prefer the look of stainless steel.

There are 3 standard grades of common stainless steels. 302, 304, 316. Our 316 is manufactured in the more resistant 316L grade. The L designates it is a low carbon stainless and is considered to be more suited as a marine grade steel. The advantage with 316L is that the welds are more resistant to corrosion.

Aperture	3mm diameter	4mm diameter
50mm x 50mm	custom	custom
75mm x 75mm	custom	standard
100mm x 50mm	custom	custom
100mm x 100mm	custom	custom

standard: ex-stock

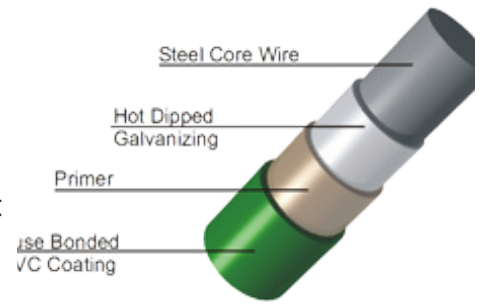
custom: can be manufactured although minimums will apply



Malahang Reserve
Stainless steel gabion incorporated with corten steel

PVC Coated Weld Mesh Gabion:

USA made PVC coated gabion which incorporates a steel wire which is hot dipped galvanised followed by a coating of primer and then a fuse bonded, powder coated PVC. This is the maximum protection for a gabion and is superior to all others in severe environments where the gabion is in contact with salt water. This type of gabion is supplied in roll form.



Fuse bonded PVC powder coating of welded mesh gabions is bonded uniformly to mesh after welding to form a super skin. This prevents corrosive liquids from attacking the galvanized core wire – even in salt water. The fuse-bonding coating process eliminates residual stresses in the coating inherent in the extrusion process used by other gabion types so the PVC retains its UV protection and prevents infiltration by water or other liquids and thus prevents any subsequent migration of those liquids along the core wire. The single wire strands of welded mesh cannot move at the joint so there is no internal wire abrasion to damage the coating.



PVC coated mesh is supplied in rolls of 0.99m wide x 91.44 length.



***NZ Omaha Beach
PVC coated gabion***



Gabion Accessories:



C rings connection:

- This connection method requires a gabion C ringer tool (available for rental or purchase)
- 3mm diameter x 45mm (widest point)
- Tensile strength 1700-1900 N/mm²
Mild steel coated Galfan
5% Al, 95% Zn
- Made in Japan



Spiral connection:

- Spirals are one method to connect panels to build a gabion cage.
- Spirals are the strongest connection method
Spiral cage joiners are also supplied (larger diameter than standard spirals)



Stiffener (braces):

- Stiffeners are placed inside the cage to give cage rigidity
- In addition to stiffeners we offer lacing wire

Gabion C Ringer:

The Meihotech gabion C Ring tool is one of the most reliable hog ringers available today. Made in Japan it will work where others fail. Highest quality, in stock always. This is a pneumatic tool and requires a compressor. Air consumption is relatively low at under 9.9 litres (0.7Mpa), increase compressor size if working at heights. The compressor needs to maintain a constant pressure of 90-100 psi for standard gabion C rings (Galfan coated mild steel), or 110 psi for stainless steel. Meihotech C ringers have a 12 month warranty. Service is provided by Permathene.

This C ringer is for gabion and uses C rings which are 3mm in diameter and 45mm at the widest point.

We also offer other C ringers (fencing, bird netting, shade cloth), see General Products section on our website.



Meihotech model M-500

Gabion Wall Construction Specification:

1) Scope

The work shall consist of supply, construction of cages and filling with rock.

2) Types

Permathene Gabions shall consist of square or rectangular welded mesh constructed to form containers filled with rock. The gabion mesh supplied to site shall conform to ASTM 974-97. The weld shear strength is meet a minimum of 50% of wire tensile strength. The wire shall be mild steel coated with 280 gsm (min) Al 10%, Zn 90%. The wire shall have a tensile strength between 350-750 N/mm².

3) Materials

All connections including spirals and stiffener wires shall be manufactured in Galvan coated mild steel to the same diameter as the mesh. C rings shall be Meihotech, Galvan coated, 3mm diameter, 45mm opening, tensile strength 1700-1900 N/mm².

Gabion Wall Installation Guide:

1) Foundation preparation

The foundation on which the gabions are to be placed shall be cut or filled and graded as required. Surface irregularities, loose material, vegetation, and all foreign matter shall be removed from foundation surface area. Gabions and bedding or specified geotextiles shall not be placed until the foundation preparation is completed, and the subgrade surfaces have been inspected and approved by the engineer or the engineer's representative. Compaction of bedding or filter material will be required per plans and specifications. The surface of the finished material shall be to grade and free of mounds, dips or windrows. Extra care should be taken with foundation preparations in order to ensure a level and smooth surface. Geotextile shall be installed in accordance with the requirements of the plans and specifications.

2) Assembly

- **Modular Gabions**

Gabion walls can be constructed in a modular way. This is a continuous gabion wall without separate cages. You can either eliminate an end panel for each section or leave it in place. We prefer to leave it in place as it adds a great deal more strength to the wall system.

If you decide to eliminate a panel on each end you will still need internal diaphragms at least every metre. This can apply to the lids also but only if the cage above is the same size as the cage below. This is a slightly cheaper construction method. When building a modular gabion wall you will need to consider access behind the wall when connecting spirals. If constructing using gabion C rings this method is extremely easy as you will be able to construct separate cages outside of the work area and then join them together using C rings (C rings have an ID of up to 18mm).



5 Sense Garden, Rhodes Park

panels joined together).

1) Separate cages

Note: Do not close the spiral ends until the cage is square with all panels (apart from lid).

The quickest way to construct a cage using spirals is to begin with an end panel and a back panel. Join this with a vertically placed spiral. Then connect the other end to this also using a vertically placed spiral. Continue until the frame is made with no top or bottom. Place diaphragm (middle panel for 2m length cages) with spirals. Attach a top panel. Ensure cage is square. At this point the spiral ends can be closed. Turn the cage upside down and put into place.

Stiffener placement and rock filling

Place the lower stiffeners (the number and orientation will depend upon cage size) 300mm from the bottom. The stiffeners ends should be closed.

3) Placement

Place the empty gabions on the foundation and interconnect the adjacent gabions along the top, bottom, and vertical edges using spirals or C rings.

- **Individual Cages**

The advantage of using separate cages is that they can be assembled outside the work area and then placed. Individual cages do not share any common connections (C rings or Spirals) and are simply placed up to each other.

- **Spiral Connection**

Spirals are the strongest gabion connection method and require no tools apart from pliers to bend over the ends following assembly. To construct a cage using spirals first consider whether you want 1) separate cages slightly apart for aesthetics or 2) separate cages joined using a common spiral cage joiner or 3) cages joined together in a modular method (with no two



Tramshed, Harold Park

4) Filling operation

After adjacent empty wire gabion units are set to line and grade and common sides properly connected, they shall be placed in straight-line tension to gain a uniform alignment. Staking of the gabions may be done to maintain the established proper alignment prior to the placement of rock. No temporary stakes shall be placed through geotextile material. Connecting lacing wire and other fasteners (as allowed) shall be attached during the filling operation to preserve the strength and shape of the structure.



Charlestown Oval

Internal connecting cross-tie (stiffener) wires shall be placed in each unrestrained gabion cell, including gabion cells left temporarily unrestrained. Two internal connecting wires shall be placed concurrently with rock placement, at each 300 mm interval of depth. In welded mesh gabions these crossties or stiffeners will be placed across the corners of the gabions (at 300 mm from the corners) providing diagonal bracing. Lacing wire or preformed wire stiffeners may be used.

The gabions shall be carefully filled with rock, either by machine or hand methods, ensuring alignment, avoiding bulges, and providing a compact mass that minimizes voids. At no point in the filling process may rock be mechanically placed from a height of over 1m from machine to fill area. Machine placement will require supplementing with handwork to ensure the desired results. The cells in any row shall be filled in stages so that the depth of rock placed in any one cell does not exceed the depth of rock in any adjoining cell by more than 300 mm. Along the exposed faces, the outer layer of stone shall be carefully placed and arranged by hand to ensure a neat, compact placement with a uniform appearance.



Sydney Park, St Peters

The last layer of rock shall be uniformly leveled to the top edges of the gabions. Lids shall be placed over the rock filling using only approved lid closing tools as necessary. The use of crowbars or other single point leverage bars for lid closing is prohibited due to the potential for damage to the baskets. The gabion lid shall then be secured to the sides, ends, and diaphragms with spiral binders, approved alternate fasteners, or lacing wire wrapped with alternating single and double halfhitches in the mesh openings.

Any damage to the wire or coatings during assembly, placement and filling shall be repaired promptly in accordance with the manufacturer's recommendations or replaced with undamaged gabion baskets.

Cladding Components

• Eye Bolts:

Bolts shall be galvanized, Class 4.6, 6mm threaded eye bolts for mild steel mesh and stainless steel 316 for stainless steel mesh. Bolts are drilled 60mm into the concrete wall with epoxy. Eye bolts with washer and nuts to be fastened to the mesh by means of a heavy galvanised plate for mild steel mesh and stainless steel plate for stainless steel mesh. Typically the plate is wide enough to cover one full aperture vertically and 3 or more apertures horizontally. For example a 75mm x 75mm aperture cladding may be held at the back panel with a 100mm wide x 200mm length heavy gal or stainless steel. This example would use two bolts placed at points to maximise holding. The addition of washers may be required between outside of the plate and the wall due to the C rings in order to prevent bending of the panels.

Spacing of plates shall be 300mm from the ground vertically and 125mm from ends of wall and 1000mm centre to centre horizontally.



Shell Cove, Shell harbour

• Stiffeners:

Stiffener wires (pre-formed) of required length or lacing wire shall be of the same material type as the cladding. Placement, in the case of a 300mm depth cladding) are to be 2 for every 975mm length x 525mm height section. To provide diagonal bracing two stiffeners are placed across the corners of each section, including diaphragms, midway between the base and the top, forming a “X” between each diaphragm and ends.

• “C” Ring Fasteners:

1. Al-Ten coated mild steel gabion cages.
Shall be formed from galfan wire. A minimum strength of 1700N/mm². “C” Ring fasteners must have a minimum wire diameter of 3mm.

2. Stainless Steel 316L gabion cages.

Shall be formed from stainless steel 302 wire. A minimum strength of 1600-1800N/mm². “C” Ring fasteners must have a minimum wire diameter of 3mm.

“C” ring fasteners with a maximum spacing of 150mm. Internal diaphragms must be placed every metre. Connect “C” rings in the same method.

Assembly

Based upon the example, unit sizes of 300mm depth x 525mm height (75mm x 75mm aperture mesh). 525mm x 300mm diaphragms are placed every metre. If using different aperture sizes the depth will alter accordingly.

Starting on the ground level place gabion back panels into position and connect using eye bolts and plates. Place and connect the base panels using “C” rings. Place and connect diaphragms every meter. Place and connect front panels by the same method. Complete stiffener wire connections to face panels concurrently with rock placement.

Each section of wall is based upon length of wall at 525mm heights. The base wall is complete and subsequent sections are built on top of the base. The method is modular and requires no two panels to be connected to each other unless it is for aesthetics, so the lid of the base wall becomes the base of the next level and so on. The length is built using the same method, the diaphragms divide each section, with no two panels connecting to each other. Once each 525mm height section is complete and level the next section is built on top.

Filling

Following panel assembly with all base and side connections made, ensure gabions are lined up and straight (temporary stakes may be used). Gabions shall be carefully filled with rock by either hand or machine, ensuring mesh is not damaged or bent in the process. If placement by machine rock must not be dropped from a height greater than 400mm. Align ensuring there are no bulges. Bulges, if seen, must be rectified by additional stiffeners or lacing wire. Voids should be minimised. Rocks are best hand placed with flat surfaces against the mesh to ensure a uniform appearance for all exposed faces.

Rock must be placed uniformly in every cell. This will help ensure the gabion is not distorted due to uneven stresses.



The last placement of rock for each section is levelled to the cell height to allow placement of lid with no voids. No tools may be used which may damage the gabion mesh and coating system. Lids are placed over the rock and closed using “C” rings prior to commencing the next level.

West Epping Park, Epping