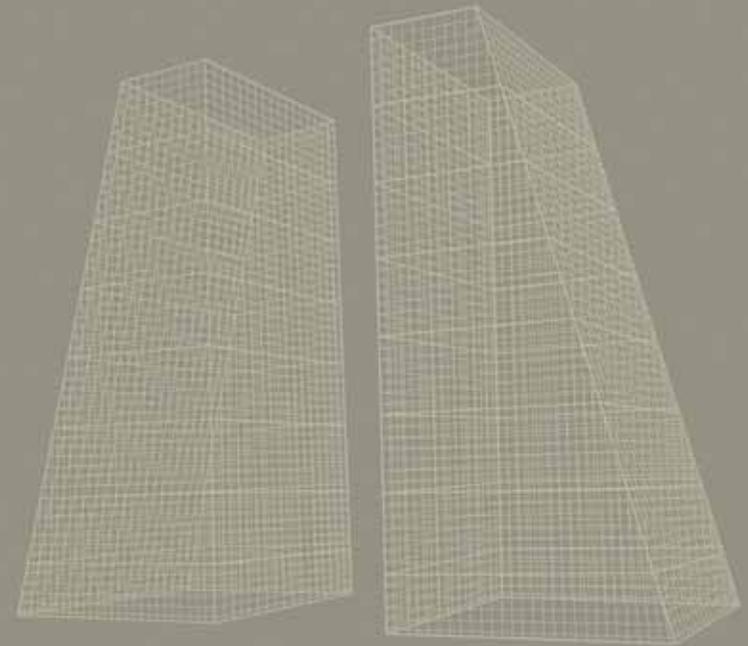


BETA BETAFENCE

steel and stone
a really creative relationship



Gabion



BETA BETAFENCE

Ridgeway

103 Airport Road Belfast

Belfast

BT3 9ED

Telephone: +44 (0) 2890 4899

Facsimile: +44 (0) 2890 4896

info@ridgewayonline.com

www.ridgewayonline.com

The Betafence Group is the European leader in physical perimeter fencing systems and access control.

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Betafence Group reserves the right to modify products and their application.

April 2006

Gabion
product overview

welcome

BETA FENCE



Culvert Lining, A4 Krzywa, Poland :: constructed 2005.



New National Railway Museum, England :: constructed 2004.

- 125 years of excellence.
- 450 million euro turnover.
- Approx' 1860 employees.
- 90 countries - sales and service.
- 25 sales offices and agencies.
- 10 plants worldwide.
- Europe's number one fencing manufacturer.



Sound Barrier, Den Haag, Holland :: constructed 2005.



McDonalds, Chantier, France :: constructed 2004.



Jersey Airport, Channel Islands :: constructed 1968.

high quality

strong relationships

Welcome to the Betafence Group, a leading manufacturer of wire and wire products in Europe.

This guide has been created to provide information and application details for Hesco Concertainer® Gabions, an industry leading land reinforcement and constructional product.

Gabions are well established across the civil engineering and building industries, having been deployed in a number of high profile projects across Europe. These include the perimeter walls for the Gillette factory in Lodz, Poland, and sound barriers utilising volcanic rock filled Trapijons at Den Haag, Holland.

Hesco Concertainer® Gabions provide architects and developers with strong aesthetic qualities. These can be seen in many landmark builds, such as the ground breaking Eden Project and the new National Railway Museum in County Durham, England.

Betafence is well established across Europe. The head office is located centrally in Belgium and is supported by further large manufacturing plants in the U.K., Italy, Germany and Poland. The company has enjoyed consistent growth over the last few years and our strong presence in the Union helps considerably with larger projects. Betafence design, develop,

manufacture and sell a wide range of welded mesh products for reinforcement, landscaping, agricultural, building, public and industrial applications. The company also produce high quality physical perimeter fencing and access control systems.

Betafence develop and maintain strong relationships with customers through our sales network and an excellent design and technical support service. With European resources on call and experienced regional distribution partners, we continue to expand our business across continental Europe and in particular the developing regions of Eastern Europe and the Balkans.

Our focus today is to support customers with continuing product development and greater efficiency - accelerating innovation with regular improvements to our range.



"Betafence now looks to the future with a renewed energy and commitment to growth ready to conquer developing markets and to push product innovation to new heights. For Betafence, boundaries are limitless"

Geo Pijl - executive chairman.

Gabions steel and stone

a really creative relationship

The use of Gabions as an effective solution to combat erosion and to stabilise and strengthen embankments and water courses has been in evidence for several centuries.

Rivers, coasts, roads and railways can all be subject to continuous or fluctuating erosion, demanding planned defences which counteract the forces of nature involved. Betafence Hesco Concertainer® Gabion systems are used in many modern civil engineering schemes to provide an economic and effective solution. They are manufactured from welded wire mesh and can be quickly erected and filled without the need for special skills or machinery, thereby keeping your costs to an absolute minimum.

In recent years Betafence has concentrated on developing higher grade materials, efficient manufacturing processes and new, innovative design and installation techniques. This has increased the use of Gabions, not just for civil engineering and landscape applications, but also for architectural projects where both quality and aesthetics are paramount.

This programme has been carried out in conjunction with Hesco Bastion Limited, who have been responsible for developing and patenting the unique Hesco Concertainer®



Mass gravity Gabion wall - 19m high and constructed in 1968 to support Jersey airport in the Channel Islands.

“The fundamental qualities of strength, longevity and economy inherent in Betafence Gabion Solutions have great appeal to civil engineers dealing with land erosion and reinforcement projects”.

range of systems which Betafence support and deploy.

As with any other civil engineering material, the life span and integrity of the actual structure depends on many factors, including design, environmental conditions, workmanship,

supervision and the choice of materials. No single system can claim to meet all the conditions on every occasion, but it has been proved that Gabions, either Zincaalu Super+ or pvc coated, offer an economic solution to many stabilisation and erosion problems.

“Architects, builders, developers and urban planners are beginning to discover the broad aesthetic qualities of Gabions beyond the products basic purpose. The relationship between steel and stone can now be a truly creative one.”

Betafence Gabion Solutions, in conjunction with Hesco Bastion Ltd, manufacture a large variety of sizes and types of Concertainer® Gabions, Bastions, Trapions®, and Mattress units. These are all manufactured from high strength steel wire which is electrically welded at every intersection.

When filled, Weldmesh® units have sufficient flexibility to allow some movement and change in shape should subsidence or settlement occur, whilst retaining their strength and

structural integrity. Gabion structures are naturally porous and do not normally require the incorporation of an expensive additional drainage system.

In addition to supplying the Weldmesh® products, Gabion Solutions can offer design support including the provision of calculations and layout drawings for checking by a suitably qualified and competent structural engineer on site prior to construction.



Key benefits of the Concertainer® system are;

- Speed of construction.
- Available in lengths up to 5m.
- Patented system.
- Supplied unlined for use with Gabion stone or geotextile lined for use with compacted granular fills.
- Joint strength of helicals.
- Unique pinning system for joining Gabions.
- Range of accessories to improve the installation process.
- Supplied in box shape or trapezoidal to suit the given application.
- Flat packs for ease of transportation.
- BBA certified.



Gravity retaining wall at Europe's largest Tesco superstore, Coventry, England. Constructed 2004.



Shore protection using Weldmesh® Mattresses, Czeszow, Poland. Constructed 2005.



Channel lining constructed with Gabions and Mattresses, Graigfechan, Wales. Constructed 2000.



Architectural cladding to Dunceue Scrubber Water Treatment Works, Belfast, N. Ireland. Constructed 2004.



Gravity retaining wall supporting a helipad at Turro Hospital, England. Constructed 2004.



Culvert lining using Mattresses to the A465 heads of the Valley Road, South Wales. Constructed 2004.



Hesco Weldmesh® Concertainer® Gabions

Hesco Weldmesh® Concertainer® Gabions are wire mesh baskets formed by connecting individual panels of mesh with helical spirals on the vertical edge wires creating an open series of box compartments that fold in a concertina fashion to be flat packed. Lids and bases are sometimes supplied loose with helical spiral binders to connect the top and bottom of the open cells along one edge. Alternatively they may be factory fitted where practical for ease of transportation.

Gabions are engineered retaining structures designed as mass gravity walls to hold back earth or other solid materials without overturning, sliding or foundation failure. All designed, Gabion walls should be checked by a suitably qualified structural engineer on site prior to construction.

The modular structure of these walls allows for variation in section to be accommodated as the height increases. The inherent strength of the units ensures structural and dimensional stability whilst a degree of flexibility accommodates ground movement and settlement where necessary.

Hesco Weldmesh® Concertainer® Bastions

Hesco Weldmesh® Concertainer® Bastions are formed in a similar fashion to Hesco Concertainer® Gabions but are factory lined internally with a non woven geotextile membrane to the perimeter mesh panels of the unit allowing for the use of suitable selected granular fills to ensure compaction of the materials without settlement.

These units are modular in section and fold in a concertina fashion for ease of transportation and erection on site. They are available in a variety of different sizes and lengths to suit the application. Bastions can be used as temporary or permanent structures on civil engineering construction sites or as rapid deployment flood protection barriers in place of sandbags in certain circumstances.

When used for permanent or temporary works they should be properly engineered as gravity retaining walls. For permanent retaining structures a suitable drainage fill should be incorporated through the structure at regular intervals along the wall length to prevent build up of hydrostatic pressure. Bastions are not free draining like stone filled Gabion structures. The inserted Bastion comprising a 300mm unlined compartment should always be specified for permanent works. This cell, which is filled with a Gabion stone, not only dresses the front of the wall for aesthetic purposes, but also serves to bury the geotextile face and prevent its UV degradation.

Hesco Weldmesh® Concertainer® Trapions™

Hesco Concertainer® Trapions™ are a form of Gabion manufactured from welded wire mesh panels with either one or both faces inclined at varying angles to the horizontal dependant upon the unit's height. They are supplied in lengths of 1, 2 or 3m or part lengths thereof and pre-assembled with helical spirals for flat packing and ease of transportation to site.

Hesco Concertainer® Trapions™ are engineered for dimensional rigidity and stability in structural applications. Inclination of the walls, normally at around 8% degrees from the vertical, is essential for the stability of these gravity systems. They are trapezoidal in section to permit easy construction of free standing flush faced (non stepped) tapered walls to act as either sound bunds alongside roads and railways dependant upon what they are filled with or as simple decorative perimeter walls. The wall ends are terminated with prefabricated trapezoidal shaped Weldmesh® panels.



Double Twisted Woven Wire and Weldmesh® Mattresses

Mattresses are large in plan compared to their height and supplied in multiples of the mesh aperture typically up to 300mm high. They are subdivided with internal diaphragms placed at 1m intervals to give maximum internal compartment sizes of 2m x 1m.

Where water flow is high, additional internal diaphragms may be placed to reduce the compartment sizes and prevent movement or migration of stone. The correct grade of stone is essential as well as packing of the compartments to reduce the potential for movement.

Mattresses are available manufactured from double twist woven hexagonal wire mesh or from welded steel wire mesh. The lids are often left loose for transportation purposes as well as packing down for storage and ease of handling. Mattresses are manufactured from lighter wire diameters to increase their flexibility for erosion control purposes.

Double Twisted Woven Hexagonal Rock Netting

During demanding soil cutting works, the use of retention structures is more frequent. Multiple alternatives are available for these structures, such as those that avoid the loss of stability of the slope (retaining structures) and those that are in charge of guiding loose material that may detach from the rock or slope face. Hexagonal rock netting is used to resolve these types of problems. In all instances, professional engineering advice should be sought to define an appropriate solution.

Woven wire rock netting is supplied in roll format, being produced by double twisting plastic coated galvanised mesh into hexagonal shaped apertures. The fabric of the netting is manufactured from a 2.7mm wire diameter and terminated onto a heavier 3.40mm seldedge wire.

Accessories - fastening and bracing

Gabion Solutions can supply a range of accessories for fastening and bracing Gabions, Bastions, Trapions™ and Mattresses. All have been subject to stringent laboratory tests and will perform satisfactorily under normal operating conditions. To ensure the correct fastening method for specific applications, please contact the Gabion Solutions Technical Department for further advice.

CL50 Hog Pneumatic Ring Tool and Clips - For use in clipping lids to mattresses instead of lacing them with wire, or for joining the lids and bases to Gabions (instead of using helicals).

Helicals - Additional coils can be purchased for joining the lids and bases instead of lacing with wire. This can speed up the construction process considerably.

Internal Bracing Ties - Pre-cut length wire ties can be supplied (instead of the traditional method using the lacing wire supplied) to help prevent the basket from bulging once filled with stone.

Extended Product Information - online support

Product information can change with short notice. For the latest information and a great deal more including downloadable PDFs, fitting instructions and detail specifications please visit our web site at www.betafence.com. Please look under the category 'Gabions'.



Civil Engineering & Construction

Civil engineering and the construction industry are the core markets for the Gabion range of products. The economy, strength and flexibility of the product lend it to a wide variety of applications including, but not limited to road, rail, rivers and canals, house building, retail parks and commercial property development.

Gabion and Bastion retaining walls

These are engineered structures designed to hold back earth or other solid materials without overturning, sliding or any foundation failure. The modular structure of these walls allows for variations in section to be easily accommodated as the height increases.

Walls of this type are normally built at an inclination of six degrees. Hesco Weldmesh® Concertainer® Gabion and Bastion walls can be constructed in stepped or flush-faced configurations depending on individual requirements. For further details please contact the Gabion Solutions Technical Department.



! Mass gravity Gabion retaining wall at Daresbury Business Park, England. Constructed 2000.



! Retaining wall, Score Project, London, England. Constructed 2004



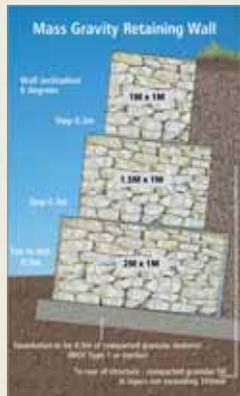
! Gabion as an integral part of a drainage structure. Constructed N.Ireland 2002



! Retail park application - retaining boundary wall.



! Highway application, A1 Kettering, England.



! Typical section illustration - not for construction.

Our Gabion and Mattress products are particularly useful as an integral part of hydraulic protection schemes - embankment stabilisation work on rivers, shore protection, reed beds, canals and channel linings.

Rivers

The durability and permeability properties of Hesco Concertainer® Gabions and Mattresses make them an excellent solution for bank protection, the realignment of rivers, to resist scour and for the prevention of land loss. They provide easy maintenance and can promote the smooth flow of water.

Canals

Hesco Concertainer® Gabion Systems are an excellent solution for the restoration and maintenance of canals where they can provide protection against wave damage from powered leisure craft.

Reservoirs

Hesco Weldmesh® Gabion Systems are highly suitable for the creation and maintenance of reservoirs where they can be used to conserve and protect natural shorelines, resisting erosion by wind and wave action.

Prefabricated Drainage Channel

Hesco Concertainer® Gabions and Mattresses can be used for the fast and effective construction of high capacity drainage channels for the rapid dispersal of flood waters from high risk, flood-prone areas.

Reed Beds

Reed Bed Treatment is an environmentally acceptable method of water purification that has gained much popularity in recent years.

The use of semi-rigid Hesco Concertainer® Gabions in both standard and non-standard sizes, is a fast, environmentally sound and cost-effective method of establishing the necessary inlet and outlet perimeter walls.



! Mass gravity retaining wall with Mattress erosion protection, Bristol, England. Constructed 2004.



! Concrete filled Bastion flood wall construction, Collier Street, Scotland. Constructed 2001.



! Typical illustration section - not for construction.



! Typical illustration section - not for construction.

Architectural & Landscaping

Architects, property developers and landscape garden companies have begun to discover the flexibility and broad aesthetic qualities of the 'Steel and Stone' offered by Hesco Weldmesh® Concertainer® Gabion products. The nature of the product particularly suits those architectural projects that seek to embody and expose the integral structure in harmony with the local environment.

Generally, claddings are applied to the external surfaces of buildings, either Trapions™ (normally free standing structures) or Gabions tied back using third party bolting systems.

Free standing perimeter boundaries and sound walls (earth filled and vegetated or stone filled) employ both Gabions and Trapions™.

Gabion product can also be used creatively to form monuments, pillars, signage plinths and seating.



! Earth Centre, England. An environmentally friendly development which took full advantage of Trapion™ walls with a graded, crushed concrete fill. Constructed 2000.



! The Eden Project - an imaginative architectural development that sought to integrate buildings more closely to nature. England. Constructed 2001.



! Den Haag, Holland - detail of railway inspired free standing wall. Constructed 2005.



! Glass blocks and local stone fill an unusual maze development in Kielder Forest, England.



! Trapions™ form a sound barrier at the ECOS Centre, Northern Ireland. Constructed 1999.



! Free standing Trapions™ clad a multi-storey car park. Clarence Dock, Leeds England. Constructed 2004.



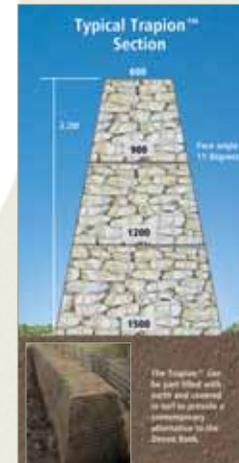
! A free standing, internally supported perimeter wall provides strength and durability for the new Gillette factory in Lodz, central Poland. Constructed 2005.

Aesthetic Considerations

With visual attributes becoming an ever increasing consideration in civil engineering design, Gabion solutions can offer a wide variety of cladding, planting and finishing treatments to suit most project environments.

These systems are designed to soften the look of constructions without interfering with the structural integrity of the retaining wall. The nature of Gabion construction allows the inclusion of soil and planting actually within the wall structure itself if necessary.

Devon Bank Alternative
Devon banks were originally formed from an outer layer of turf with a soil infill producing a natural roadside barrier. By employing the Hesco Weldmesh® Concertainer® Trapion™ as a base unit, a similar construction can be made without the high degree of skill and labour required with the traditional approach and construction method.



! Typical section illustration - not for construction.



! Retaining wall planted with vines and creepers. England - constructed 1986.



! Shopping Centre boundary with concrete colour inserts. England - constructed 1998.

parallel lines

nature and engineering in tune

Locomotion, the National Railway Museum in the north of England, is part of the National Museum of Science and History and represents a major public build project with a total cost exceeding £11.3 million.

The museum was built during 2003/4 in the town that gave birth to passenger rail travel across the world, Shildon. Architects, Austin Smith Lord of Warrington, were tasked with developing a building which was highly ecologically friendly: the roof is made of solar panelling, it has its own wind turbine which also provides power to the National Grid and an on-site biodiesel bus

for transporting visitors around the site with minimum harm to the environment.

Balfour Beatty were the main contractors and Betafence provided a free standing Trapion™ wall design which was not tied to the main building construction.

The sole objective was to create a natural and visual architectural finish for which Trapions™ proved ideal. The finished project was subsequently shortlisted as one of the final five contenders in 'The Gulbenkian Prize' which is the largest arts prize on offer in the United Kingdom.

Sans Pareil comes home.

On September 27th 1825, the world's very first passenger train made its first journey from Shildon to Darlington on the Stockton and Darlington Railway. The train, hauled by Locomotion No 1, was unlike modern trains. It was slow, and took 2 hours to complete the 12 mile trip. The Locomotion Museum is sited near the original railway works.

It was anticipated that the museum would bring 60,000 visitors a year to Shildon. However, during its first six months, it pulled in a staggering 94,000 visitors. It is home to more than 60 locomotives from the National Railway Collection including Timothy Hackworth's 'Sans Pareil'. This engine was used in the original trials to decide who operated the intercity passenger railway between Liverpool and Manchester. After 175 years of absence from the town, residents were delighted at her return. The Sans Pareil now sits proudly at the entrance of Locomotion - the first engine visitors will see.



Locomotion Museum front entrance facade with Trapion™ walls and yellow limestone fill.



Locomotion Museum internal walkway - the limestone was filled by hand.



NRM Project Details:

Architects - Austin Smith Lord, Warrington.
Main Contractor - Balfour Beatty, NE Region.
Installer - Norman Moore (private contractor, Cumbria, England).

Installation time - 6 weeks.

Wall configuration: 75mm x 75mm x 4.55mm Trapions. Vertical back, inclined face (5.7 deg), free standing. 5 no. courses @ 609mm (24" high). Top width 0.525m (21") base width 0.9m (36").

Wire finish: ZA Super+ (95% Zn / 5% Al).
Stone fill: 100 - 150mm in diameter.

The Trapion™ walls were free standing and not tied to the main building. The sole objective was to create a visual architectural finish.

The project was commenced at feasibility stage in 2001. Trial walls were constructed in 2002 to meet the planners approval. Betafence secured the project in 2003. Constructed early 2004.

Volume - approx 900 cu.m.

Stone fill - hand placed yellow limestone.

Quality Assurance

Gabion Solutions is a fully trading division of the Betafence Group, Europe's leading manufacturer of fencing and other welded mesh products. The company's products comply with the following British and European Quality Standards:

BS EN ISO 9001:2000 - Quality Systems. Model for quality assurance in production, installation and servicing.

Standards - for wire products
Gabion Solutions products comply with the following standards and specifications:

BS EN 10218-2
Steel wire and wire products - general part 2: Wire dimensions and tolerances.

BS EN ISO 1461
Hot dip galvanized coatings on fabricated iron and steel articles specifications and test methods.

BS EN 10244-2
Steel wire and wire products - non ferrous metallic coatings on steel wire - part 2: Zinc or Zinc Alloy coatings.

BS 8002 (1994)
Code of practice for earth retaining structures.

BS EN 10016-2
Nonalloy steel rod for drawing and/or cold rolling - part 2: specific requirements for general purpose rods.

BS EN 10223-3
Steel wire and wire products for fences - part 3: hexagonal steel wire netting for engineering purposes.

BS EN 10245-2
Steel wire and wire products - organic coatings on steel wire - part 2: PVC finished wire.

BS EN 10088-1
Stainless steels - part 1: List of stainless steels.

ASTM A 975-97
Standard specification for double-twisted hexagonal mesh gabions and revet mattresses (metallic-coated steel wire or metallic-coated steel wire with Poly (vinyl chloride) (PVC) coating).

ASTM A 974 -97
Standard specification for welded wire fabric gabions and gabion mattresses (metallic-coated or Polyvinyl chloride (PVC) coated).

NB:
BS EN 10223 - 3 is the standard that is relevant to rock netting. Section 3.8 refers:
"The tight helical winding of two wires around each other measured as each revolution of the two wires over 180 deg; the wires rotate only in one direction; the minimum number of twists is three."

Design & Technical support

Betafence can provide you with a design suggestion service for all Weldmesh® Gabion, Bastion, Trapion™ and Mattress applications. In addition, technical support is available to specifiers from feasibility through to the construction.

Information you provide to us.
Any design response we provide MUST always be checked and approved by an on site competent structural engineer.

Training

Betafence can provide on request, on site training to contractors.



Betafence employ the latest technology to support your project.



Certificate No. 00/3683

Roads & Bridges
Certificate No. 99/R118

Hesco Weldmesh®
Concertainer® Gabions
& Traditional Weldmesh®
Gabions & Mattresses



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Durability & Corrosion Protection Protective Coatings

Two types of coating options are available:

Zincalu Super+
Zincalu Super+ is a zinc-aluminium alloy surface coating which can offer up to three times the corrosion resistance of conventional galvanised coatings. The coating weight of 350g/m² (min. av. mean) is applied to the wire prior to fabrication of the mesh.

Zincalu Super+ coated wire is used widely as a highly durable alternative to traditional PVC coatings and it has the advantage of being available in a much greater range of wire diameters.

Zincalu Super+ Advantages

- a more homogeneous, ductile and smoother coating than pure zinc.
- improved corrosion protection - up to 3 times better than a zinc coating in salt spray tests and approximately twice as good in a SO₂ atmosphere.
- no deterioration in corrosion protection at weld intersections.

Chemically bonded PVC on zinc coated wire to BS EN 10244-2

Suitable for more aggressive environments, PVC coated gabion units are chemical and abrasion resistant. The combination of PVC bonded on to a galvanised wire to BS EN 10244-2 provides protection even in highly humid conditions. This type of composite coating can provide a design life of up to 120 years in non-aggressive environments.

Standard Sizes - custom fittings may be available (please see * below)

Product	Unit Lengths	Unit Widths	Unit Depths	Wire Diameter
Hesco Weldmesh® Concertainer® Gabions Zincalu Super+ Coated	1.0m - 5.0m	0.5, 1.0, 1.5, 2.0m	0.3, 0.5, 1.0m	3.0mm, 4.55mm
Hesco Weldmesh® Concertainer® Gabions PVC Coated On Galvanised Wire	1.0m - 5.0m	0.5, 1.0, 1.5, 2.0m	0.3, 0.5, 1.0m	2.7 (3.2mm overall) 3.8 (4.3mm overall)
Hesco Weldmesh® Concertainer® Bastions Zincalu Super+ Coated	1.0m - 10.0m	0.5, 1.0, 1.5, 2.0m	0.3, 0.5, 1.0m	4.55mm
Hesco Weldmesh® Concertainer® Bastions PVC Coated On Galvanised Wire	1.0m - 10.0m	0.5, 1.0, 1.5, 2.0m	0.3, 0.5, 1.0m	3.8 (4.3mm overall)
Double Twist Woven Wire Mattress PVC Coated On Galvanised Wire	2.0m, 3.0m, 4.0m	2.0m	0.17, 0.23, 0.3m	2.2mm
Weldmesh® Mattresses Zincalu Super+ Coated	3.0m - 6.0m	2.0m	0.15, 0.225, 0.3m	3.0mm, 4.55mm
Weldmesh® Mattresses PVC Coated On Galvanised Wire	3.0m - 6.0m	2.0m	0.15, 0.225, 0.3m	2.7 (3.2mm overall) 3.8 (4.3mm overall)

* Please note: non-standard unit sizes are available to order in increments of a nominal mesh size, 76.2mm on height, width and depth for welded products. For details of Hesco Weldmesh® Concertainer® Trapians™ please contact the Betafence Gabion Solutions Technical Department.

All of the wire mesh products from Betafence are manufactured from steel wire mesh electro-welded at every intersection to provide a minimum average weld shear strength of 70% of the minimum ultimate tensile strength of the wire. The inherent strength of Betafence units ensure structural and dimensional stability whilst a degree of flexibility accommodates ground movement and settlement where necessary.



Betafence offer these key benefits to our customers

- provider of a complete answer to large needs for security
- wide product range for a variety of applications
- more focus on innovation in core business
- project orientated structure
- strong distribution and partnership programmes
- industrial know how and large production capacities
- the reference point at Betafence is quality