BIANCHINI INGENIERO
MACCAFERRI

GABIARQ®: WELDED MESH GABIONS

GABIARQ®: BIANCHINI'S WELDED MESH GABIONS

A. Bianchini Ingeniero has manufactured gabions in Spain since 1908, but it has been only in the last few years that, following the European tendency, the welded mesh gabions have entered our market thanks to its aesthetics and its multiple possible combinations in terms of gabion dimensions and mesh sizes.

The welded mesh gabions are prismatic cages, whose panels or faces are connected through high resistance rings (1700 MPa) and reinforced by means of tie bars made of the same material with a ratio of 6 tie bars per m^2 of facing.

ADVANTAGES
They do not require a concrete foundation, even though it is advisable to build up the walls with a base of lean concrete or graded aggregate for a perfect linearity of the wall.
Draining
Easy design
Quick installation
Flame retardants
Aesthetical pleasant
Multiple choices on the filling material in decorative gabions (not in gravity walls): Gravel, inert wastes, recycled material
Wide range on dimensions and mesh size
Durability

APPLICATIONS
Soil containment
Retaining walls
River channelling
Erosion control system
Slope retention
Acoustic barriers
Barriers and fencing
Architecture and landscaping
Façade cladding
Bioengineering

MESH TYPES, DIAMETERS AND SIZE

MESH 75X75-D4 mm: This mesh size is frequently used for architectonic claddings.

MESH 100x50-D4 y 4,5mm: It is called the anti-scalable mesh because of the vertical orientation of the mesh, especially used for security walls. The smaller size of the mesh (50mm) allows the use of smaller stones without the risk they came out of the gabion.

MESH 100x100-D4 y 4,5mm: The prime squared mesh type. It gives highly visibility to the stones. It is perfect to work with river stones or other types of gravel with diameters bigger than 150mm.

PANEL DIMENSIONS WITH MESH SIZE 100X50 & 100X100		MESH 75X75	
3000x1000	1500x1000	1950x975	975x975
3000x500	1500x500	1950x450	975x450
2500x1000	1000x1000	1500x975	450x450
2000x1000	1000x500	1500x450	1350x225
2000x500	500x500	1350x675	675x225

Other panel dimensions or mesh sizes are possible. Please contact us to check availability.

APPLICABLE REGULATION

The UNE EN 10223-8:2013 standard describes the features of the welded mesh gabions and their connecting and bracing elements.

One of the main highlights of this standard is to determine the alloy that should be used, and which will be the durability in accordance with the environmental classification defined in the standard ISO 9223:2012.

The ISO 9223 classifies the atmospheric corrosivity into six categories, and for each one, EN 10223-3 and 8 establish the "PRODUCT LIFETIME" depending on the quality of the coating used.

ATMOSPHERIC CORROSIVITY CATEGORIES	
CATEGORIES	CORROSIVITY
C1	Very low
C2	Low
C3	Medium
C4	High
C5	Very high
CX	Extreme

The concept of "Product lifetime" requires a deeper explanation: in paragraph 3.2, Table 2 of the Guide Document of the EUROPEAN DIRECTIVE 89/106/CEE about the construction products, a definition is given (extracted from Table footnote A.1 of EN 10223-3:2013).
LIFETIME (OF THE PRODUCT): it is the period of time during which the product preserves its performances at a level that allows the correct functioning of an asset correctly designed and installed in order to respect the basic requirements (meaning, the essential characteristics of a product meet or exceed the minimum acceptable values, without incurring significant costs to repair or replacement). The lifetime of a product depends on its inherent durability and of a regular installation and maintenance.
The European Directive for construction products 89/106/CEE (mandatory in the whole European Union) establishes that for permanent structures, the minimum durability of the structure must be 50 years.

The table below shows the relationship between the different types of environments and the durability of the wire according to the metallic coating used.

Environment Classification (according to ISO 9223)	Coating	Class (EN 10224-2)	Durability (years)
Low Aggressivity (C2) Dry Conditions Temperate Zone with low contamination: rural zones, small villages 100 m above sea level. Dry or cold zones, with an environment slightly humid. Desert or subarctic zones.	Zn	A	25
	Zn95Al5	A	>50
	Zn90Al10	A	>120
Median Aggressivity (C3) Dry Conditions Temperate Zone with medium contamination and presence of chlorides: coastal zones with chlorides deposition, urban zones. Subtropical and tropical zones with low contamination.	Zn	A	10
	Zn95Al5	A	25
	Zn90Al10	A	50
High Aggressivity (C4) Humid Condition Temperate Zones with high contamination and high presence of chlorides: coastal zones with chloride deposition, urban zones contaminated, industrial zones with contaminated atmosphere. Subtropical and tropical zones.	Zn95Al5	A	10
	Zn90Al10	A	25
	Zn90Al10 + Organic Coating	A	>120

These types of environments are the most common ones, except for the cases of direct proximity to the sea and/or extreme level of contamination, which shall be classified as C5 and CX. In these two cases, it is only possible to use alloys with organic coatings such as Polyvinyl Chloride (PVC) so that we can assure a durability over 120 years. Another possibility will be the use of stainless steel.

As clearly shown in the table, in case of a C3 environment, in transit roads with gas emissions coming from combustion, or in medium size cities, GalMac® 4R Zn90Al10 is the only alloy that guarantees a durability of the work higher than 50 years.

CE MARKING

All our elements that configure the welded mesh gabions have the CE marking. When adding the CE marking on a product, the manufacturer declares, under its own exclusive responsibility, the product performances in accordance with the legal requirements that are demanded by the UE and assures the validity of the product.

ITeC Institut de Tecnologia de la Construcció de Catalunya

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CERTIFICADO

CONFORMIDAD CONTROL DE PRODUCCIÓN EN FÁBRICA

1220-CPR-1005

En cumplimiento del Reglamento (UE) 305/2011 del Parlamento Europeo y del Consejo del 9 de marzo de 2011 (Reglamento de Productos de la Construcción o CPR), este certificado aplica al producto de construcción:

Gaviones de malla hexagonal y de malla electrosoldada

Fabricado y comercializado por: A. Bianchini Ingeniero SA

En el centro de fabricación: **Gran Vial 8, Pol. Ind. CIV**
ES-08170. Montornès del Vallès. Barcelona

GALMAC® 4R: ALLOY Zn90Al10

GalMac® 4R is an alloy 90% of high purity Zinc (Zn) with 10% of Aluminium (Al). The corrosion resistance that this alloy brings is higher than the one achieved with a steel wire with traditional reinforced zinc coating or the alloy Galfan® (Zn95Al5).

Since January 2015, in continuity with our commitment to quality, Bianchini – Maccaferri has replaced the production of Galfan® wire (Zn95Al5) for the alloy Zn90Al10 with 275 gr/ m^2 of coating to get better performances in terms of durability depending on the implementing environment in which the product will be placed, following the criteria specified by the standards 10223-3 and 10223-8.

We have tested our materials made with the GalMac® 4R alloy in a saline chamber in accordance to EN ISO 9227. The 10223-3 and 8 standards quote that, when submitting the samples to the saline mist test following the procedures described by EN ISO 9227, the samples shall not show more than 5% of DBR (rust) after an exposure period of 2000 hours.
In our materials coated with the new GalMac® 4R alloy, small points of rust began to appear after 3500 hours in the salt chamber, but always with a percentage lower than 5% of DBR.

GABIARQ® INOX: MAXIMUM DURABILITY

We offer our clients the possibility to supply gabions, welded panels and their components (tie bars and rings) with stainless steel AISI 304 and 316, as well as gabions with organic coatings. These characteristics are the only ones recommended in C5 and CX environments.

TECHNICAL CHARACTERISTICS OF OUR GABIONS

Certified Manufacturing according to EN ISO 9001

Wire Diameter: 4 and 4,5 ±0,08mm (EN 10218-1-2 Table 1)

Wire Mean Resistance: 700 MPa (EN 10218-1-2)

Minimum Coating: 275g/sqm Galmac 4R® 10%Aluminium (EN 10244-2 Class A Table 2)

150 g/sqm Green Galmac 4R 10% Aluminium.

Tolerance on mesh size: ±3 mm (EN 10223-8 Paragraph 7.3. Table 3)

Tolerance on panel size: ±3 mm/m (EN 10223-8)

Welding Point Shear Resistance: on average higher than the 75% of the ultimate load of the wire with the lowest section, and individual values not below 50% (EN 10223-8 Paragraph 7.5).

Tolerance on gabion size: ±35 mm (EN 10223-8)

Corrosion by Dioxide: less than 5% of the surface with red rust after 56 cycles (EN ISO 6988)

Salt Corrosion: less than 5% of the surface showed rust after 3500 hours of exposure (EN ISO 9227).

Durability:
C2 environment: > 120 years
C3 environment: > 50 years
C4 environment: > 25 years

SPECIAL PIECES

Trapezoidal, triangle or obliquely finishing. We can produce elements of every kind of geometry and it is also possible to modify their shape directly on the jobsite if the adequate tools are available.

STONES FILLING AND RECYCLABILITY

Almost every type of stones can be used to fill the gabion. In decorative gabions, as long as they do not form a gravity wall, it is possible to use any type of inert element or vegetation, with amazing results.

GRAVITY WALLS

Gravity Walls are the main, although not the sole, application for these gabions, thanks to its aesthetics and functionality. Building, urbanism, roads and all kinds of infrastructures are benefitted by this type of solution. On the rear part of these walls it is suggested the installation of a Geotextile as Mactex® H1400 or H1900 to avoid the contamination of the facing with fine aggregates. If presence of water is expected it is very important to install a drainage system such as Macdrain® W1051 between the backfill and the natural soil as well as a waterproofing barrier as the HDPE membrane Macline® SDH on the top of the wall. All gravity walls are checked with our internal softwares Gawacwin® and Macstars®, supporting the designer with the calculation, technical specifications sheet and drawings in Autocad®.

Work: Martorelles cemetery (Barcelona)
Mesh: 100x50-4,5 Anti-scalable. Volume: 1800 m^3
Stone: ShaleTagamanent. stone manually placed on the front side

Work: Pago de Carraovejas winery, Peñafiel (Valladolid)
Mesh: 100x100-4,5. Volume: 2200 m^3
Stone: White shale stone Sillería manually placed on the front side

Work: Avenida Meridiana - Pont de Sarajevo (Barcelona)
Mesh: 50x100-4,5 Landscape, Volume: 1100 m^3
Stone: Granodiorite, mechanical dump

Work: Carril Ciclable Esplugues de Llobregat (Barcelona)
Mesh: 100x50-4,5 Anti-scalable. Volume: 2450 m^3
Stone: Shale stone manually placed on the front side

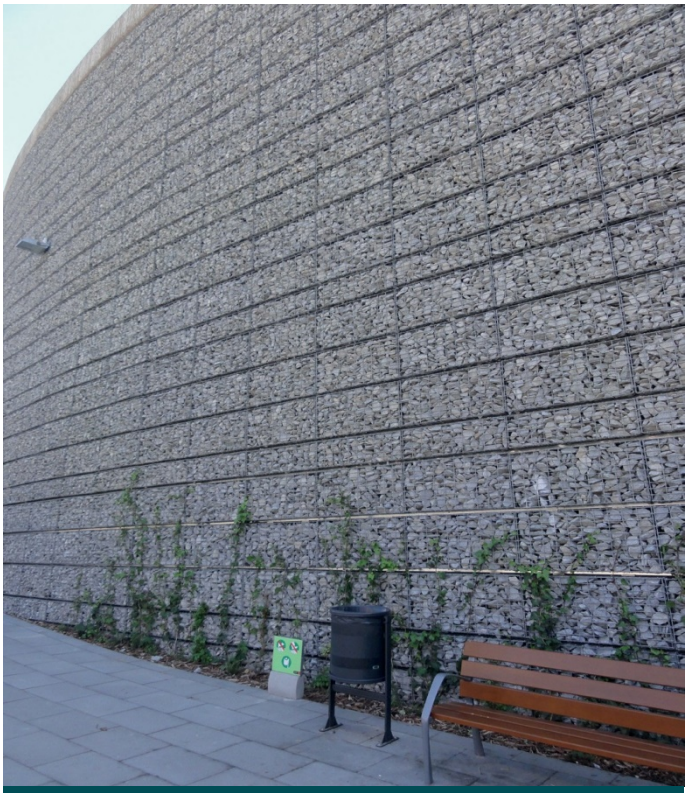
Work: Rambla de Cartagena (Murcia)
Mesh: 100x100-4,5. Volume: 6000 m^3
Stone: Limestone. manually placed on the front side

Work: IES La Talaia, Segur de Calafell (Tarragona)
Mesh: 100x50-4,5 Anti – scalable. Volumen: 900 m^3
Stone: Granodiorite, mechanical dump

ARCHITECTURAL CLADDING

Adding a cladding system to a concrete wall through a combination of gravel and steel is an innovative and highly aesthetic solution. The rigidity of the welded mesh provides a very planar and linear appearance. The fixing system consists of galvanized plates and mechanical or chemical anchors in a ratio of 5 plates per each back panel.

Work: Collado Villalba hospital (Madrid)
Mesh: 100x50-4,5 Anti-scalable. Surface 4000 m^2
Stone: Granite, mechanically dump



Work: Meridiana Avenue – Sarajevo bridge (Barcelona)
Mesh: 50x100-4,5 Landscape. Surface: 1400 m^2
Stone: Granodiorite, mechanically dump

Work: ADIF Redondela station (Pontevedra)
Mesh: 75x75-4. Surface: 2200 m^3
Stone: Porriño white Granite manually placed on the front side

Work: Palma Carrefour & Shopping Centre S'Estada (Palma de Mallorca)
Mesh: 50x100-4,5 Landscape. Surface: 450 m^2
Stones: Limestone.,manually placed on the front side

Work: Red Eléctrica building La Coruña
Mesh: 100x100-4,5 Volume: 1300 m^2
Stone: Porriño granite manually placed on the front side

Work: Faiground Huetor Vega (Granada)
Mesh: 100x100-4,5 . Volume: 800 m2
Stone: Limestone manually placed on the front side

SLOPE STABILIZATION AND EMBANKMENT PROTECTION

The stabilisation of a slope by means of a wall is the most common procedure in Civil Engineering and Geology. Our job consists on assisting the designer in the best solution to face the stabilization problem. One of the main causes of slope instability is the presence of water in the rock or soil; gabions, as draining walls par excellence are the best solution in those cases. In other situations, it could be possible that the most suitable solution would be a simple wall at the slope toe and a reshaping of the rear part decreasing the slope inclination till reaching the friction angle characteristic of the material which forms the slope.

Work: Accesses and bridge above Mogent, Montornès del Vallès (Barcelona)
Mesh: 100x50-4,5 Anti-scalable. Volumen: 1200 m^3
Stone: Granodiorite, mechanically dump

Work: Copper mine Las Cruces (Sevilla)
Mesh: 100x100-4,5 Landscape. Volume: 250 m^3
Stone: Mine granitic rejection stone, manually placed on the front side

Work: One family house, La Cerdanya (Barcelona)
Mesh: 100x100-4,5 . Volume: 600 m^3
Stones: Granodiorite stone manually placed on the front side

Work: Girona Technological park . Defence and stabilisation
Mesh: 50x100-4,5 Landscape. Volume: 450 m^3
Stones: River stones. Stone manually placed on the front side

Work: Parque Benedicta, Portugalete (Vizcaya)
Mesh: 100x100-4,5 l. Volume: 1500 m^3
Stones: Black limestone, manually placed on the front side

Work: Casa de Las Aguas Montcada i Reixach (Barcelona). Mesh: 100x50-4,5 Anti-scalable. Volume: 1650 m^3 Stones: Granodiorite, mechanically dump

FENCES, PERIMETRAL WALLS AND ARCHOLOGICAL RESTORATION

Monolithic perimetral walls. The coronation can be done with empty gabions in order to create an open-plan area or with gardening gabions to get a triple effect between steel, stones and vegetation. Gabions are also used in archaeological restoration zones as they exactly simulate stone walls. In easy accessible areas the best choice is the 100x50- 4,5 mesh, also so-called anti-scalable since in this mesh size there is not enough space for a foot or a hand to pass through.

Work: Spanish Oceanographic Institute, Santa Cruz de Tenerife Mesh: 100x100-4,5 INOX AISI 316. Volume: 1500 m^3
Stone: Black Basalt, manually placed on the front side

Work: Perimeter wall Valdebebas urbanization (Madrid)
Mesh: 100x100-4,5 . Volume: 3018 m^3
Stone: Granodiorite stone manually placed on the front side

Work: Wall Restoration Sant Martí de Liemana (Barcelona)
Mesh: 100x100-4,5 Volumen: 150 m^3
Stones: Sandstones. Manually placed on the front side

Work: Single familiy home fencing in Viana (Portugal)
Mesh: 100x100-4,5 landscape. Volume: 50 m^3
Stones: Granite. stone manually placed on the front side

Work: Bernedo wall restoration (Alava)
Mesh: 100x100-4,5 A. Volume: 200 m^3
Stones: Limestone manually placed on the front side

Work: Perimeter walls Tavil S.A., Olot (Girona)
Mesh: 50x100-4,5 Landscape. Volume: 1800 m^3
Stones: Black Basalt, Stone manually placed on the front side

ACOUSTIC BARRIERS

Acoustic barriers with a green or mineral surface, in monolithic or trapezoidal shapes. On the green walls and at the top of the barrier, vegetal soil is placed as well as climbing plants in order to cover the whole surface until the toe of the structure. On both sides, it can be planted the same type of vegetation so that in a short period of time the entire barrier became green. The durability of our alloy Galmac 4R® (Zn90 Al10) assures a lifetime higher than 50 years in C3 environment.

Work: Caixa Forum Zaragoza.
Mesh: 100x50-4,5 anti-scalable. Surface: 850 m^2
Stones: river stones, mechanically dump

Work: Autzagane alternative (Vizcaya).
Mesh: 75x75-4,5. Surface: 750 m^2
Stone: Artificial compacted aggregate. Planter on the base and on the crest

Work: Motorway Bilbao airport, Derio (Vizcaya).
Mesh: 75x75-4,5 . Surface: 1200 m^2
Filling: Compacted aggregates. Plante ron the base and at the crest

Work: Motorway A-8 Bilbao (Vizcaya).
Mesh: 75x75-4,5 . Surface: 1200 m^2
Filling: Compacted aggregates. Planter on the base and at the crest

Work: Padel courts screens on Sant Feliu de Llobregat (Barcelona).
Mesh: 50x50-4. Volume: 300 m^3
Stone: Tossa granodiorite and granite. Mechanically dump.

Work: Añana salt mines (Álava).
Mesh: 100x50-4,5 Anti-scalable. Volume: 400 m^3
Stone: Balck limestone, Stone manually placed on the front side

EROSION CONTROL

The versatility of gabion walls allows to create slopes with berms with the aim of controlling the erosion of the slope. In addition, its conformation avoids the direct impact of the rain and the water runoff minimizing this way the loss of fine aggregates; this effect is particularly important in very steep slopes or in slopes with very thin layers of soil.

Work: Shopping Centre: Puerto Venecia (Zaragoza).
Mesh: 100x100-4,5 . Volume: 1800 m^3
Stone: Limestone manually placed on the front side

Work: Thau School in Barcelona .
Mesh: 50x100-4,5 . Volume: 1100 m^3
Stone: Granodiorite, mechanically dump

Work: Urban gardens Alcobendas (Madrid).
Mesh: 100x100-4,5 Volumen: 250 m^3
Stone: Sandstone, manually placed on the front side

Work: Can Duran park, Montcada i Reixach (Barcelona).
Mesh: 100x100-4,5. Volume: 300 m^3
Stone: Granodiorite, manually placed on the front side

Work: Sant Agnes de Malanyanes river (Barcelona).
Mesh: 50x50-4. Volume: 200 m^3
Stones: Granodiorite, mechanically dump

STREET FORNITURE, GARDENING, BIOENGINEERING AND ARCHITECTURE

The aesthetics of the welded mesh gabions confers a unique beauty very appreciated in projects that involve landscaping and architecture. The combination of stones and steel in a linear structure is amazing, and when we add the possibility to include the vegetation we reach impressive results due to the integration and the contrasts of regular shapes and colours.

Work: La Caixa data privacy centre, Cerdanyola (Barcelona).
Mesh: 75x75-4. Surface: 1100 m^2
Stone: Granodiorite, manually placed on the front side

Work: Alcalá de Henares roundabout (Madrid).
Mesh: 100x100-4,5 Volume: 250 m^3
Stone: Different types of stones manually placed on the front side

Work: Pago de Carraovejaswinery gardens (Valladolid).
Mesh: 100x100-4,5. Volume: 350 m^3
Stone: Limestone, manually placed on the front side

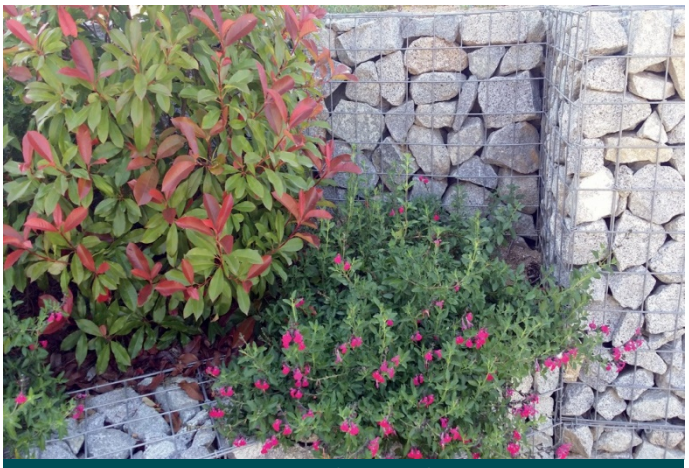
Work: Getafe roundabout (Madrid).
Mesh: 100x50-4,5 Anti -scalable. Volume: 200 m^3
Stones: Macael white river stone, manually placed on the front side

Work: Les Franqueses del Valles park (Barcelona).
Mesh: 100x100-4,5 Volume: 380 m^3
Stones: Granodiorite, manually placed on the front side

Work: Single familiy house in Castellvell del Camp (Tarragona).
Mesh: 100x100-4,5 l. Volume: 1150 m^3
Stone: Limestone manually placed on the front side

Work: Ciudad de la Cultura, Santiago de Compostela (A Coruña).
Mesh: 100x100-4,5 . Volume: 1100 m^3
Stone: Shale and treated eucalyptus, planter on the crest

Work: San Sebastián de los Ballesteros swimming-pool (Córdoba).
Mesh: 75x75-4, Volume: 450 m^3
Stones: river stones, manually placed on the front side



Work: Joaquín Seiró park, Martorelles (Barcelona).
Mesh: 100x100-4,5. Volume: 350 m^3
Stones: Granite, manually placed on the front side

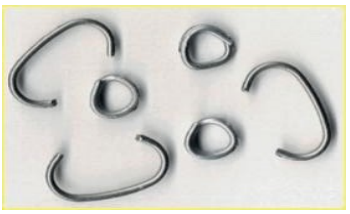
Work: Oficinas A. Bianchini Ingeniero hall (Barcelona).
Mesh: 75x75-4. Volume: 200 m^3
Stones: Limestone, manually placed on the front side

Work: Hotel Spa Monasterio de Valbuena (Valladolid).
Mesh: 75x70-4 . Volume: 400 m^3
Stones: White limestone manually placed on the front side

Gabions are delivered in packages containing the panels, tie bars and rings necessary to assemble the elements in situ, so that all gabions could be perfectly connected among each other. The necessary amount of geotextile Mactex® N to be installed between the back panel and the backfill in order to avoid the contamination of fine material into the gabion front side will be also sent.

In the case of architectural claddings, the fixing system made of plates and anchors (5 units per square meter of solution) is also supplied. The connection between the different panels is done be means of high resistance rings applying a minimum of one ring each 15 cm with a pneumatic stapler; the use of the stapler makes the gabion assembling faster and at the same time it guarantees the required connection resistance between the panels.

The tie bars, both the perpendicular and the orthogonal ones, have to grab the node of the square mesh to assure the correct installation. It is advisable to go then through each tie bar and close the hook with a specific tool.



The gravel used as gabion filling will be natural or coming from crushing. It cannot contain any kind of corrosive agents in its composition and they must withstand water and weathering action. Materials used will be of high density, and erosion and ice resistant. For these reasons, it is suggested to avoid porous material such as loam, claystones or travertine.

Stones will be regular and big enough so that their length will vary within the range of 15-20cm. The material shall be graduated between both intervals with a tolerance of ±5% on their sizes. For these stones, the wear coefficient of Los Angeles determined in accordance to UNE EN 1097-2, will be less than 50, while the water absorption capacity will be less than 2% in weight determined in accordance with UNE 83134.

The installation productivity of this type of solution is highly variable, since it depends on the site access, typology and volume of the wall or cladding. In architectonic claddings, a team of 3 installers and a machine operator can reach a productivity of 20 m^2/day, placing all the stones manually. In case of gravity walls, the performances can vary between 30 and 50 m^3/day, while in gabions that the placement of the stone must be done manually on both sides, for example in the case of separation walls or wall coronation, the performances decrease to 8-10 m^3/day.

Profile

A. Bianchini Ingeniero S.A. is the subsidiary of Officine MACCAFERRI in the Iberian Peninsula.

Since its foundation, in 1908, and the depart from the wire production, A. Bianchini Ingeniero S.A. initially dedicated to gabions production and promotion, mainly for their application in embankment protection and soil stabilization. Nowadays, the company deals with all the solutions developed by the Italian group Maccaferri, and it is present on all geotechnical areas such as slope stabilization, sow barriers, waterproofing, drainage or/and landfill sealing, pavement reinforcement or acoustic barriers in urban areas.

Bianchini offers to the designer assistance on the solution design, stability checks, support during the project redaction and assistance on site during the execution of the work to guarantee a service of a high quality.

Training

«Engineering a Better Solution»

A. Bianchini Ingeniero S.A. has a technical office composed by a team of engineers and geologists who provide their expertise on the solution design by using the calculation software developed by Maccaferri in accordance to the main calculation standards.

In response to our clients, we offer and organize technical training sessions in our offices or in the client's ones. They are dynamic and adaptable, and they can include one or more topics developed by our specialized engineers.

These workshops are carried out by the different leaders of the several Maccaferri solution application areas: gabions and soil reinforcement, geosynthetics (reinforcing, drainage, waterproofing, and erosion control), rockfall protection, hydraulic works and coastal protection.

To get further information, please contact us at: bianchini@abianchini.es

Consulting and Partnership

A. Bianchini Ingeniero does not only provide the products, but work together with the clients, suggesting the best versatile, cost-effective and environmentally friendly solution.

A. Bianchini Ingeniero responds effectively to the engineering problems proposing solutions for a sustainable development: economic and environmental integration. Our aim is to add special value to our clients, devising, developing and proposing a better solution for each situation, all that according to our global experience, our technical know-how and local contact to build mutually beneficial relationships.

At the same time, A. Bianchini Ingeniero can recommend their clients trustworthy installers who have an extensive experience to assure the success in any project.

Innovation

Officine Maccaferri Group created in 2015 the MIC (Maccaferri Innovation Center), in Belluno (Italia) with the mission of designing new products and innovative technical solutions applied to the Geotechnical Sector.

INNOVATION CENTER
MACCAFERRI

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