

CUBIMAC

Pre-filled double twisted steel wire mesh gabion with high abrasion resistant (Polimac®) coated wire Mesh Type 8x10, Wire Diameter 3.4 mm

applicable to European Countries only

PART 1 – PRODUCT

1.1 DESCRIPTION

This technical specification covers pre-filled gabions to be used for the construction of retaining walls, channel linings, and weirs for erosion control projects.

Pre-filled gabions have been specifically developed for their use in construction sites where the in-situ filling is not possible or inconvenient (i.e. installation underwater).

Prefilled gabions are delivered to the site filled with stones ready for use and equipped with polyester round slings.

The units are manufactured in compliance with The Construction Products (Amendment etc.)(EU Exit) Regulations 2020 and have UKCA marking on the basis of UKAD 200019-00-0102 and UKTA-0836-22/0019.

[For Republic of Ireland: The units are manufactured in accordance with Construction Product Regulation CPR 305/2011 and have a CE marking in compliance with EAD 200019-00-0102].

The management and production system of the supplier shall be certified in compliance with ISO 9001.

All listed performances must be verifiable on laboratory test reports conducted by independent research institutes, the relevant documentation shall be submitted to the supervisor for the acceptance of the material

Pre-filled gabions are units made of hexagonal double twisted steel wire mesh type 8x10, wire diameter 3.4/4.4 mm as per BS EN 10223-3 (fig. 1, table 1).

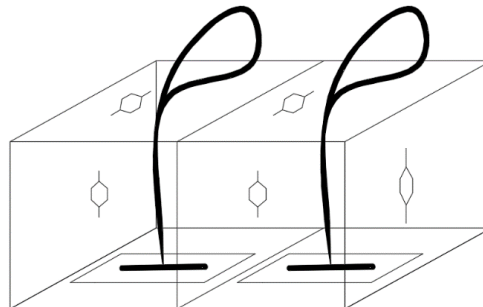


Fig. 1

Table 1. Standard Mesh-Wire				
Type	Mesh size M (mm)	Tolerance (mm)	Internal Wire Diameter (mm)	External Wire Diameter (mm)
8x10	80	-0/+10	3.40	4.40

The steel wire used for manufacturing pre-filled gabions shall be heavily galvanized with Zn-Al alloy in compliance with BS EN 10244-2, Table 2, Class A.

The metallic coated wire core shall be protected with a high abrasion-resistant polymer coating (Polimac® or equivalent), with a nominal thickness of 0.5 mm, resulting in a nominal overall diameter of 4.40 mm.

The standard pre-filled gabion is made by assembling different wire mesh panels. All connections are made with stainless C-Rings to ensure the longest durability to the units.

Pre-filled gabions shall be divided into uniformly partitioned cells, with maximum sizes of 1x1.5m, by internal diaphragms (Fig. 1).

The bottom side of the gabion will be equipped with polyester round slings having a capacity of 3 tons, to enable easy handling using standard lifting devices (i.e. crane).

Each gabion will be pre-filled with stones using a special frame combined with a vibrating table to ensure the

stones are compact by vibration and to achieve a minimum specific weight of 17 kN/m³. The rock will not be sensitive to water and to frost/defrost cycles.

1.2 FUNCTIONAL CHARACTERISTICS

In order to allow for the design at both Ultimate (ULS) and Serviceability (SLS) limit states, the gabion manufacturer shall provide the following characteristics:

- Mesh Tensile strength: 85 ± 5 kN/m; tests carried out according to BS EN 10223-3.
- Punch resistance of the wire mesh: 35 ± 2 kN; tests on 1x1 m sample laterally constrained following the ASTM A975-21 test methodology.
- Long-term (120 years) degradation effects on wire mesh due to chemical and environmental effects, installation damage, UV-ray exposure, and abrasion.

1.3 MATERIALS

The double twisted steel wire mesh shall be manufactured with hexagonal 8x10 mesh type (BS EN 10223-3, Table 2), woven with a drawn steel wire core of 3.40 mm in diameter, with a minimum quantity of 265 g/m² of Zn-Al metallic coated alloy, in accordance with BS EN 10244-2, Table 2, Class A.

The double twisted steel wire mesh shall be resistant to outwearing accelerated ageing when subject to test in a Sulphur dioxide environment (ISO 22479): after 28 cycles of discontinuous tests, the mesh shall not show more than 5% of DBR (Dark Brown Rust).

The metallic coated wire core shall be protected with a high abrasion-resistant polymer coating (Polimac® or equivalent), with a nominal thickness of 0.5 mm, resulting in a nominal overall diameter of 4.40 mm.

1.4 POLYMER COATING

The polymer coating shall comply with the following requirements:

- Long-term durability: service life greater than 125 years at 25 °C
- Outwearing accelerated ageing in salt spray (ISO 9227): after 20,000 hours of exposure, the mesh shall not show more than 5% of DBR (Dark Brown Rust).
- Abrasion resistance in wet conditions (ISO 22182): after 40,000 abrading cycles the weight loss shall not be greater than 3%
- Abrasion resistance in dry conditions (ASTM A975): after 550 cycles the polymer coating shall not expose the metal wire.
- Resistance to UV radiation (ISO 4892-3, type 1A): after 2,500 hours of exposure to QUV-A the tensile strength and elongation at break of the base compound shall not change more than 25% from the initial test results.
- Brittleness temperature: lower than -35°C (ASTM D746).
- Corrosion spread test (ASTM A975): after 2,500 hours immersion of the wire sample in a HCl solution the maximum corrosion length shall be less than a mesh repetition.

1.5 LACING

The steel rings used for fastening operations shall be made of stainless steel and have the following characteristics:

Diameter: 3.00 mm

Tensile strength > 1,550 MPa

Pull-apart strength > 2.0 kN

1.6 ENVIRONMENTAL AND SUSTAINABILITY PROPERTIES

1.6.1 Environmental Product Declaration

The gabion units shall have a Type III Environmental Product Declaration (EPD) registered and certified in accordance with ISO 14025 and BS EN 15804, to evaluate the environmental impact and give the possibility to calculate the Life Cycle Assessment (LCA) of the designed technical solution.

Such sustainability performances/requirements have to be reported in the Type III EPD certificate; certifications of not authorised bodies or self-certificates issued by the manufacturer, are not allowed.

The value shall be declared, as per Table 2, in terms of Global Warming Potential (GWP 100 years) and expressed in kg CO₂-Equiv./kg.

Table 2 – Environmental and sustainability properties

Global Warming Potential (GWP 100 years)	ISO 14025 EN 15804	certified numeric value	[kg CO ₂ -Equiv./kg]
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1.6.2 Environmental Harmlessness

The polymer coated steel wires shall be tested to ensure their Environmental Harmlessness according to the following procedures:

- Synthetic Precipitation Leaching Procedure (SPLP) preparation as per EPA 1312 and Metals in Water by ICPMS (low level) as per EPA 6020B in which the presence or not of 31 different metals shall be analysed using atomic spectroscopy.
The results shall be in compliance with: (a) Water Framework Directive 2000/60/EC; (b) CCME Water Quality Guidelines for the Protection of Aquatic Life, Freshwater; (c) U.S. EPA National Recommended Water Quality Criteria (Aquatic Life, Freshwater), 2006.
- PFAS test in water by SPE/LCMS as per EPA 537.1 in which the presence or not of 28 different PFAS shall be analysed, showing that the polymer coated steel wires are PFAS free. Resulting in a concentration lower than 2 ng/L of PFOS and PFOA and < 4 ng/L for other PFAS.
- ELUATE Tests on the environmental safeness, conducted as per M GEOK E:2016, shall ensure that the polymer coating is not critical for the environment.
- Smoke toxicity tests conducted as per ISO 5659-2 and EN 17084 shall ensure a Gases Conventional Index of Toxicity after 8 minutes sampling CIT_G (8) < 0.10 and a HCl concentration < 36 ppm

1.7 STANDARD DIMENSIONS AND WEIGHTS

Sizes for pre-filled gabions to be used in construction shall be as per Table 3. All sizes and dimensions are nominal; tolerances of ± 5% of the width, length and height shall be permitted.

Table 3. Sizes for pre-filled gabions				
L=Length (m)	W=Width (m)	H=Height (m)	# of cells	Nominal Weight in the air (t) *
1.0	1	0.5	1	1
2.0	1	0.5	2	2
1.0	1	1	1	2
2.0	1	1	2	4

* The actual weight may vary depending on the unit weight of the filling stones

PART 2 – EXECUTION

The product's conformity shall be certified by a third-party Notified Body, according to the The Construction Products (Amendment etc.)(EU Exit) Regulations 2020, which shall assess the quality control process at the supplier's production facility.

[For Republic of Ireland: The product's conformity shall be certified by a third party Notified Body, according to CPR 305/2011, who shall assess the quality control process at the supplier's production facility.]

The stone fill material shall be provided in the proper sizes and quality. Rocks shall be hard, angular to round, durable and of such quality that they shall not disintegrate on exposure to water or weathering during the life of the structure.

The Contractor must carefully select the lifting devices to be used for the installation works, as their choice depends on various factors: units' weight, handling distance, etc.

To avoid deformations of special preassembled gabions (CubiMac) during lifting, the units shall be uniformly hooked to distribute the load evenly, using all the polyester round slings available on the top of the units.

For these reasons, a proper lifting frame, specifically designed for pre-filled gabion units, shall be used.