MACCAFERRI

TECHNICAL DATA SHEET

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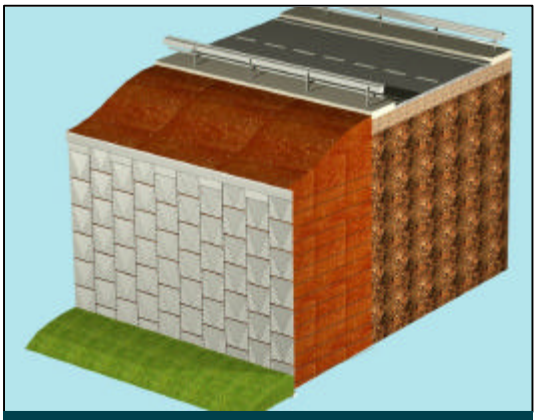
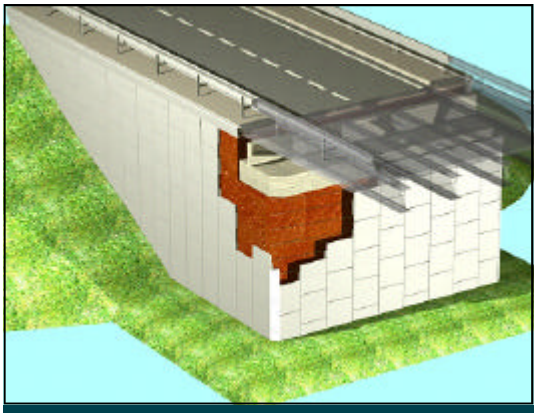
MACRES SYSTEM

REINFORCED SOIL STRUCTURE WITH VERTICAL CONCRETE FACING PANELS

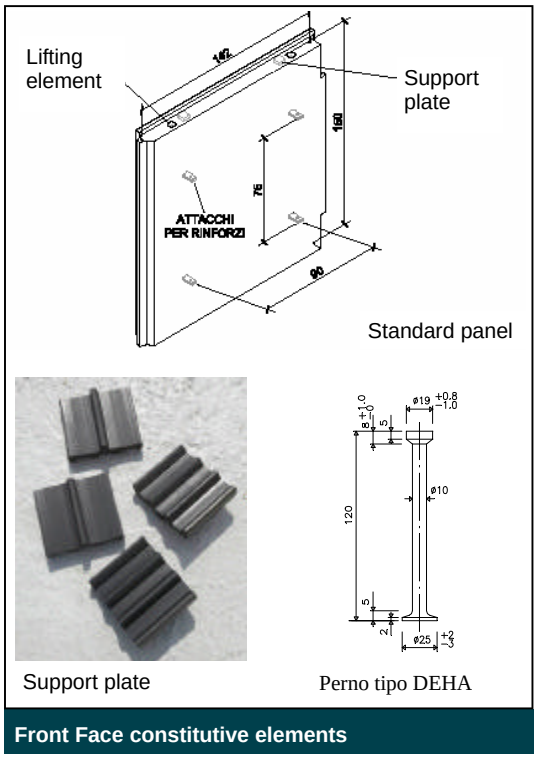
The **MacRes System** comprises of a reinforced embankment with high adherence linear reinforcements, placed in the ground in successive layers and connected to a flexible concrete face.
To adapt to the unique demands of each project, the **MacRes System** offers the possibility of using high adherence galvanised steel or polymeric reinforcement with varied resistance to optimize efficiency. Their characteristics allow the construction of very high structures able to sustain very high loads.
Components include: manufactured concrete facing panels, high adherence steel or polymeric reinforcements, tie strips for connecting the reinforcements to the front face, bolts, plating, locating pins and sleeves, lifting bolts and last but just as important, the material for the backfill.



Retaining wall with MacRes System



Bridge Enbankment with MacRes System



Front Face constitutive elements

Standards and Reference Guide

- **CNR UNI 10006/1963** "Construction and maintenance of roads. Techniques used on the soils" in order to reinforce the embankment;
- **TESTO UNICO** "Technical Guideline for construction", 30 March 2005;
- **AFNOR NF-P 94/220** "Ouvrages en sols rapportés renforcés par armatures ou nappes peu extensibles et souples";
- **BS 8006:1995** " Strengthened / reinforced soils and other fills";
- **EN 10025-2/2004** "Hot Steel laminated products for structural use" for steel reinforcement;
- **UNI 3740/6** "Steel bolts and nuts. Technical regulations. Protective coatings for fastening bolts.
- **UNI EN ISO 1461/99** "Hot dip galvanising of ferrous products and steel items – Trial specifications and methods".

Technical characteristics of constituent components
Front face

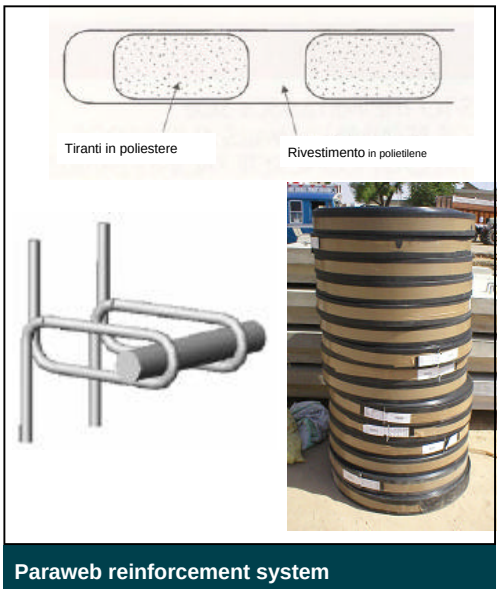
- **Concrete components**
  Concrete with compressive strength > 35 N/mm^2 at 28 days;
- **Reinforcement for reinforced concrete panels (where necessary)**
  High yield steel type Fe B 44 K with the following characteristics
  Resistance at break = 540 N/mm^2;
  Elastic limit = 430 N/mm^2.
- **Locating** steel **pins** and injection mould rigid PVC **sleeves**.
- **Lifting pins**
  In DEHA forged steel having a carrying power equal to 10 kN
- **Bearing pads** in EPDM rubber
- **Horizontal and vertical joints**
- Strips of non woven geotextile supplied in 40 cm height rolls and 250g/m^2 in weight.

Reinforcement System

- **High adherence steel reinforcement**
  Made from steel that conforms to the European standard EN 10025, type S355JO (equivalent to ASTM, type 50 and comparable to Italian Fe 52) having the following characteristics:
  - Resistance at break = 510 N/mm^2;
  - Elastic limit = 355 N/mm^2;
  - Elongation = 22%;
  - High adherence obtained with a projected height equal to approximately 4 mm;
  - Hot dip galvanising: zinc coating conforming to standard UNI 3740/6.
- **Attachments for steel reinforcement**
  Made from steel that conforms to the European standard EN 10025, type S355JO (equivalent to ASTM, type 50 and comparable to Italian Fe 52) having the following characteristics:
  - Resistance at break = 510 N/mm^2;
  - Elastic limit = 355 N/mm^2;
  - Elongation = 22%;
  - Hot dip galvanising: zinc coating conforming to standard UNI 3740/6.
- **Bolts for fixing steel reinforcement**
  The connection between the reinforcement and the panel is secured with Class 8 M12 nuts and Class 8.8 M12x30 bolts conforming to standard UNI 3740/6 having the following mechanical characteristics:
  - Breaking and Traction Tension: = 800 MPa
  - Tension Yield Point: = 640 MPa
  - Elongation at Break: = 12 %

  Hot dip galvanising: zinc coating conforming to standard UNI 3740/6.
- **High Adherence Polymeric Reinforcements**
  Comprised of polyester sheaths protected by a polyethylene coating with increased interlock. The sheaths are concentrated in separate bundles and coated in polyethylene through a “vacuum” process.
- **Attachments for High Adherence Polymeric Reinforcement**
  Made from steel that conforms to the European standard EN 10025, type S355JO (equivalent to ASTM, type 50 and comparable to Italian Fe 52) having the following characteristics:
  - Resistance at break = 510 N/mm^2;
  - Elastic limit = 355 N/mm^2;
  - Elongation = 22%;
  - Hot dip galvanising: zinc coating conforming to standard UNI 3740/6.
- **Material constituting the reinforced embankment**
  Soil from groups A1-a, A1-b, A3, A2-4, A2-5 according to the classification CNR UNI 10006/1963 are to be used as material for backfilling of the reinforced structure.
  The backfill may be lightened by interposing layers of a mixed granular soil or sand, and expanded clay as indicated in the construction plans.

Steel reinforcement system



Paraweb reinforcement system

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