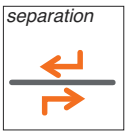
Reinforced earth



Separation and filtration of material layers

▲ to separate, filter, and improve bearing capacity, the layers of granular material shall be separated by a thermally bonded, needle-punched nonwoven geotextile of the **bontec NW optim** type, with an optimal 40% to 50% elongation at break, and a modulus of resistance 20 kN/m for 100 grams at failure, as per NFENISO 10319.

▲ thanks to the thermally bonded structure, the pore size in the soil shall be stable for controlled filtration.

▲ the surface of the product shall be slightly rough to increase the “grip” with the soil and improve the bearing capacity.

▲ the manufacturer, with ISO 9001 certification, shall have an engineering department capable of advising the designer and installer.

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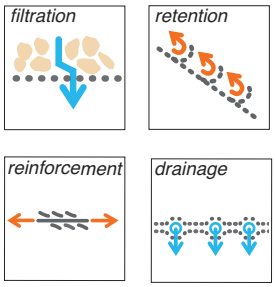

Reinforced earth backfills

▲ the construction of stiffened embankments and backfill retaining structures shall be executed by the reinforced earth technique, with alternating layers of compacted materials and reinforcing geotextiles, and a cladding. A drainage system shall be installed between the reinforced mass and the surrounding ground.

▲ the reinforcing geotextile shall be a high-modulus woven polyester sheet relatively insensitive to creep, of the **bontec Force HS** type, of ultimate tensile strength 100 to 600 kN/m as per NFE-NISO 10319, 10% elongation at break, and modulus of resistance 1000 to 6000 kN/m. The pore sizes shall be less than 400 µm.

▲ in a long-term application, the design working load must not exceed one-third of the product's nominal strength: verify the sizing in accordance with the XP G 38-064 standard.

▲ in the case of a soil that is lime-treated or aggressive for polyester, the **bontec Force SG** product range shall be in woven polypropylene, with an ultimate tensile strength of 16 to 340 kN/m as per NFENISO 10319, and an elongation at break of 8% to 26%. The pore sizes shall be less than 540 µm.

▲ in a long-term application, the design working load must not exceed one-sixth of the product's nominal strength: verify the sizing in accordance with the XP G 38-064 standard.

▲ in the case of a soil showing high mechanical damage for the woven geotextile reinforcement on compacting, or in the case of a soil requiring filtration and drainage, the reinforcing sheets used shall be in the form of a geocomposite of the **teraforce** type, reinforced with high-modulus polyester reinforcing cables, protected on either side by a nonwoven polypropylene sheet performing the hydraulic functions of filtration and flow rate capacity, and the mechanical function of protection from puncturing and damage.

▲ the nonwoven mass shall be 400 g/m² and the elongation at break less than 10%.

▲ the product shall be sized in accordance with the XP G38-064 standard.

▲ the cladding shall be executed with wire mesh panels of dimensions 400 cm x 144 cm bent to an appropriate angle for the project, supplemented by a geogrid capable of holding the cladding earth in position between the wire mesh links. The cladding can then be vegetated by spray hydroseeding.
Other claddings are possible and are also plantable, such as recycled tyres or concrete blocks.

▲ a draining geocomposite of the **teradrain** type shall be placed between the reinforced mass and the surrounding ground, consisting of a network of regularly spaced perforated mini-drains of diameter 20 mm, incorporated in a draining and filtering needle-punched, nonwoven, composite sheet. The filters shall be supported at all points by the nonwoven draining core, and the whole system shall be self-healing in the event of localized tearing.

▲ the ultimate tensile strength shall be 28 kN/m, the filtration opening 78 µm, and the flow capacity in the plane 720 litres/hour/mini-drain (i=1, vertical).

▲ the circular shape of the mini-drains shall enable them to resist very high pressures of 900 kPa in the soil, and not collapse in the long term.

▲ the mass per unit area shall be 650 g/m².

▲ the product must be sized by computation.

▲ the manufacturer, with ISO 9001 certification, shall have an engineering department capable of advising the designer and installer.