GEOfabrics®

River & Coast

Installation Guidance

High-performance geosynthetics

Installing Geofabrics Geotextiles in Coastal and River Applications

This document covers the general installation of Geofabrics non-woven geotextiles in coastal applications. Further attention may be required to address site-specific requirements and conditions. These guidelines are intended as an aid for the installer and to promote the most efficient and effective installation, whilst maintaining quality, maximising the geotextiles' performance, and without compromising health and safety.

No warranty is made or implied as to the suitability of these guidelines in any application and the contractor must ensure that he always uses appropriate methods.

1. Unloading, Handling & Storage

Roll weights can be between 300kg (660lbs) and 1320kg (2904lbs) and hence appropriate equipment is required for unloading and handling e.g. front-end loader, backhoe, forklift (pole truck) or crane.

Rolls should be lifted by using one of the following:

- Lifting straps capable of lifting twice the anticipated load. Straps should be located 1/3 of the way in from the roll ends.
- A spreader beam attached, by lifting chains, to a core bar inserted through the centre of the roll.
- A forklift truck with a pole/boom.

Note: Geofabrics does not supply lifting equipment. Please see suppliers' list in section 11.

It should be noted that, in general, deliveries within Europe are made by flatbed trailer allowing them to be unloaded by any of the above methods. Deliveries outside Europe are made by freight container, which should be unloaded by forklift truck fitted with a pole/boom attachment. A strap should be wrapped around the top, centre roll in the container which will be the first roll to be removed. The strap should then be used to gently slide the roll from the container. The remaining rolls can then be removed using the forklift.

The products will be delivered to site in plastic packaging that protects them from physical damage and the effects of weathering, notably degradation by UV light. This packaging should not be removed until immediately prior to installation. Removal of this packaging can result in damage from UV as well as the geotextile absorbing moisture increasing the products' weight and making installation more challenging.

If it is necessary for the geotextiles to be stored prior to their installation they should be stacked on level dry ground, not more than five rolls high with no other material stacked on top.

2. Installation Equipment

In addition to conventional PPE, the following equipment should be considered for use during installation where appropriate:

- Protective gloves
- Safety glasses
- Carpet cutting knife (or Stanley knife)
- Hot air welding gun with hand roller or bag stitcher
- Mobile generator
- Protexia Ballast Bags, sand filled bags or tyres
- A393 Steel reinforcement mesh or T20 scrap rebar (to act as ballast for below water applications)
- Waterproof tape
- Rope
- White/yellow marker paint
- Buoy (to aid roll visibility in below water installations)
- 100mm diameter steel bar (for rolling the textiles below water)

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Fig. 1: Lifting and placement of HPS - Withernsea

Fig. 2: Lapped joint

3. Laying HPS Geotextiles

Above water

- Rolls should be transferred to the working area using site plant and the sleeving removed without causing damage to the geotextile.
- Decide upon the best layout for the geotextile: for revetments the material should be unrolled down the slope and for groynes, the material can be placed along the length of the structure or transverse to the centreline as suits the method of rock placement.
- Either use a spreader beam to support the product and unroll directly into position or manually unroll suitable lengths on level ground, away from the end position, and cut each piece to the required length.
- Place lengths with suitable allowance for longitudinal and transverse overlaps. Clamshell grabs can be used to manoeuvre the heavier grades of geotextile (HPS14 and heavier).
- Once laid, the geotextile should be covered with an initial layer of rock before the first tide.

4. Overlapping HPS Geotextiles

Above water

Overlap widths are site specific and generally at the discretion of the Design Engineer. Overlaps are required to ensure that all the underlying soils are fully covered by the geotextile after any movement has taken place during rock placement. The actual overlap will therefore depend upon the firmness of the subgrade, the weight of the rock armour and risk of displacement by wind/water. However, the following may be used as a guideline for coastal projects:

- 300mm minimum recommended overlap for work above high-water level on firm subsoil with stone pitching or concrete mats.
- 500mm minimum recommended overlap for work above high-water level on firm subsoil directly below rock armour.
- 1000mm overlaps for use in the inter-tidal zone with rock armour.
- Transverse overlaps (between subsequent rolls/ lengths) should be located at least 2m from the toe and crest of slopes. The lapped joint can be thermally bonded using a hot air gun or for HPS6 and below a bag closer can be used to create a prayer seam. Consider ordering rolls in non-standard lengths to match the site requirements to avoid transverse overlaps if possible. Geofabrics can manufacture roll lengths to order in increments of 5m.
- Longitudinal overlaps (between adjacent roll lengths) should be formed down, not along, slopes.

5. Laying HPS Geotextiles

Below water

All needle-punched geotextiles will float in water and therefore require some form of ballast if they are to be successfully placed below the low-water line. Whilst blending a polypropylene with a heavier fibre may increase its combined density a textile naturally traps air within its composition creating buoyancy. There are several ways of supressing the buoyancy, with many specialist marine contractors developing their own mechanised methods.

As with many challenging installation procedures good preparation pays dividends especially on large projects where a set routine can be repeated to create an efficient, safe, and timely installation. Our below water installation guide has been developed over several years using the feedback of numerous contractors. The guidance is generic, and we respect that each site presents unique challenges that should be considered. If you have any site specific questions relating to installation, we would be happy to speak with you.

Fig. 3: Site guidance

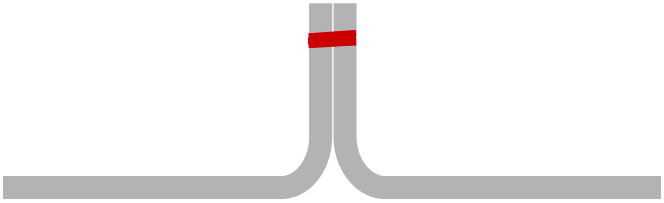

Fig. 4: Prayer Seam

Fig. 5: Lapped joint assisted with marker paint

Preparation

Establish the roll length ensuring that the additional textile required to form the toe has been allowed for.

In a below water application a minimum lap may have been specified. Whilst typically a 1m lap is employed it may be worthwhile seeking confirmation in advance of installation. The lap can be measured and using a spray paint a margin created which will help when aligning textiles below water.

For some projects it may be advantageous to create a wider textile by lining up and joining two adjacent textiles along their length. For HPS6 and below a prayer seam can be created using a mobile bag closer. For heavier grades, a hot air gun will be required to create a thermal bond between the lapped textiles.

Ensure all the necessary ancillaries and equipment are onsite before commencing works. The cost of buoys, rope and temporary ballast are minimal when compared with lost hours and risk encountered when struggling to locate and position textile below water.

Fig. 6: Bag Closer

Shallow water installation

In shallow water, where it is possible for a machine to reach the full extent of the works, the geotextile can be rolled onto a steel pole with a buoy attached at one end. The leading edge is anchored in place or held temporarily beneath the tracks of the excavator and the roll can then be lowered into place. The pole can be retrieved once the fabric has been weighted with stones.

Fig. 7: Shallow water installation - Morecambe

Fig. 8: Shallow water rock placement - Morecambe

Fig. 9: Shallow water application – Southsea

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Deeper water installation

The technique described for shallow water is not suitable for many projects. Often temporary or permanent ballast is required to locate textile below water prior to the placement of the final armour or structure.
We have identified four methods of textile placement using ballast:

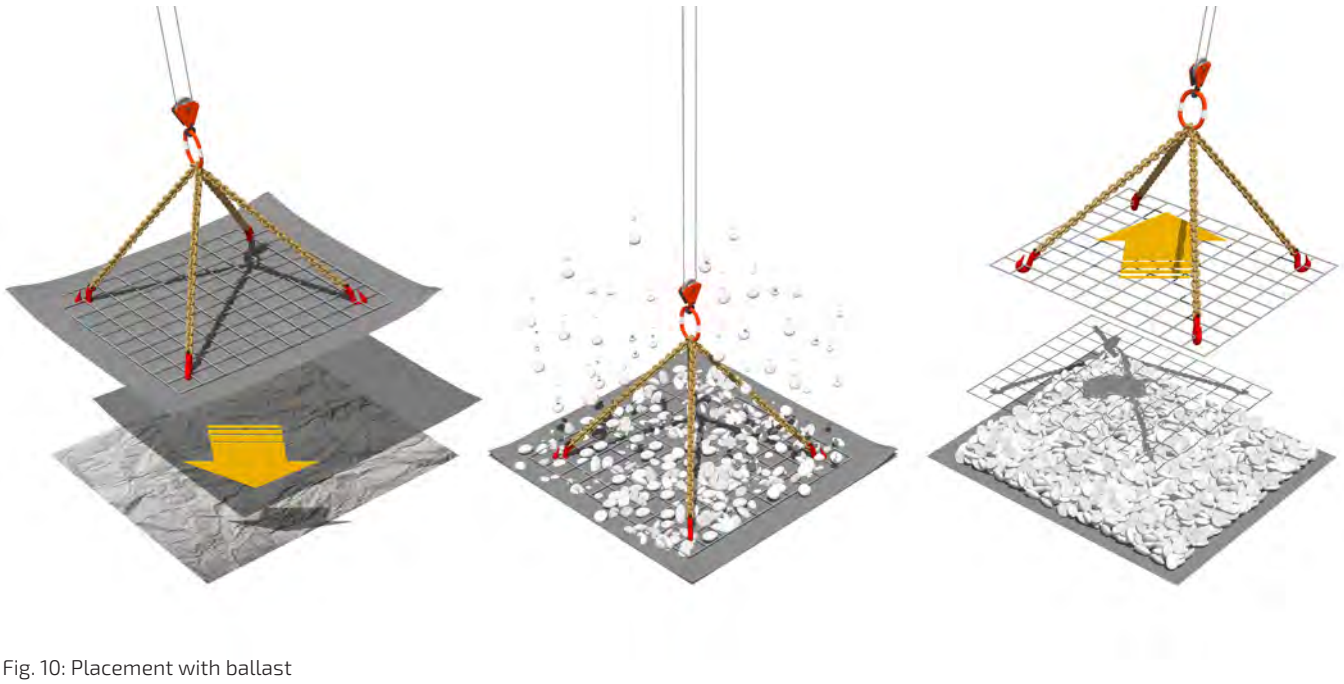

Fig. 10: Placement with ballast

a) **A393 steel reinforcement mesh** is used as temporary ballast. The mesh can be used to manoeuvre the textile in place where required and withdrawn using ropes once permanent ballast is placed over the top. The 200x200mm mesh apertures allow suitably graded stone to be placed on to the textile while ropes attached to the mesh enable its easy withdrawal.

b) **Protexia Ballast Bags** are used to negate buoyancy of the textile by filling them with locally sourced sand or gravel. Their bright orange fabric aids location and retrieval. Manufactured using the same HPS geotextile technology with 100 year durability, it can be an option, subject to the Designer's consent, to leave the bags in place.

Fig. 11: Ringaskiddy, Port of Cork – mesh framework used for placement

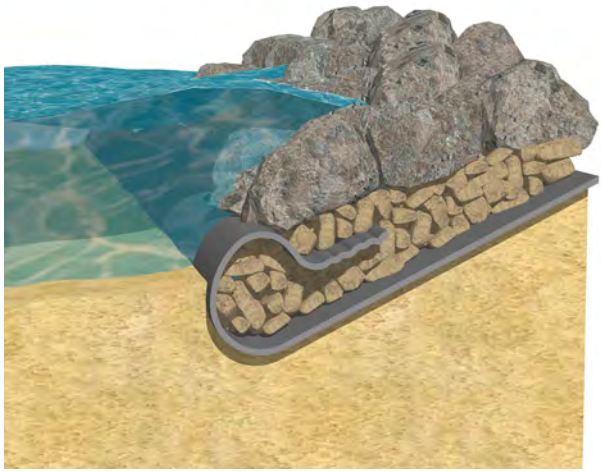

Fig. 12: Positioning with framework

Fig. 13: Rebar used as ballast

c) **Stone Ballast** can be put down directly over the textile to hold it in place before placement of the larger armour layer.

d) **T20 steel rebar** can be used in 500mm approx. lengths attached by waterproof tape at 2000mm centres. This method has been successfully employed for coastal defence projects across the world. Scrap rebar can typically be sourced at low cost.

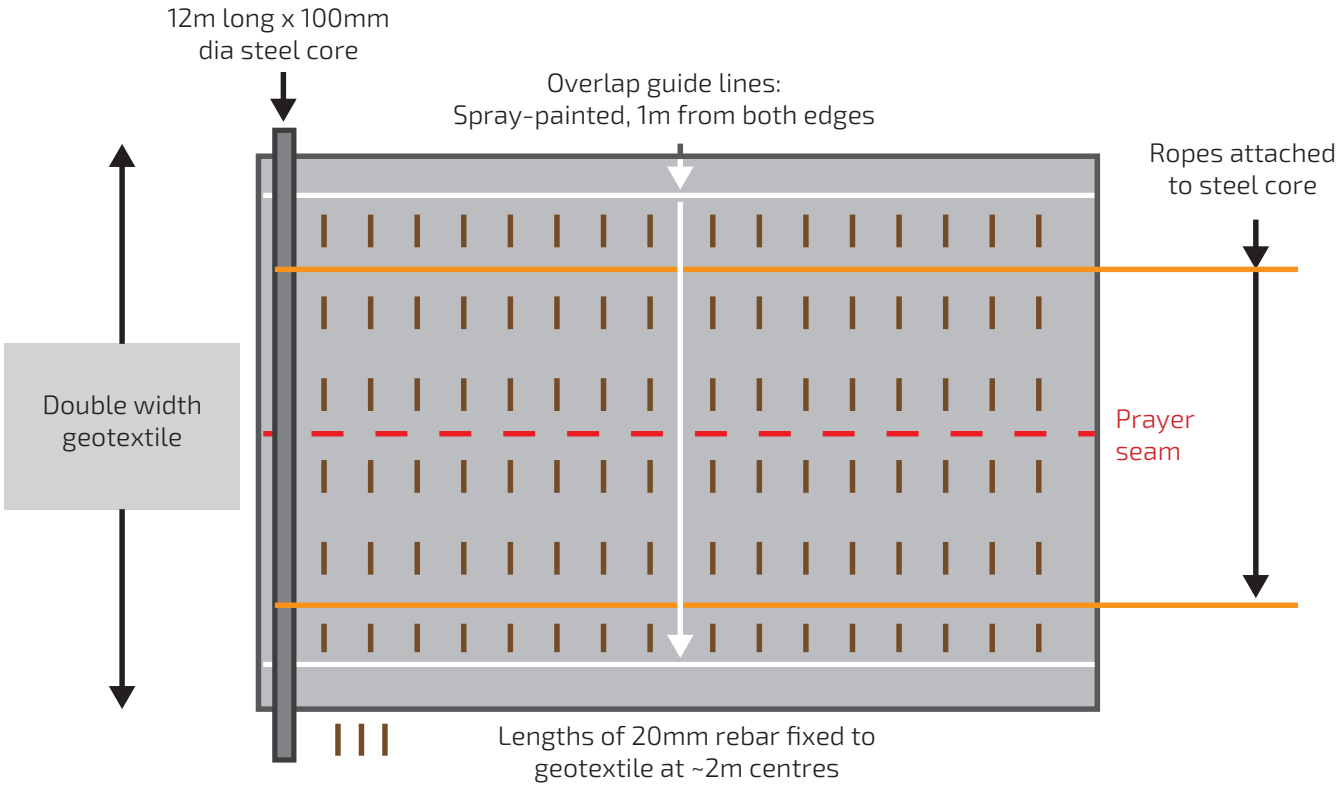

Fig. 14: Steel rebar used as ballast

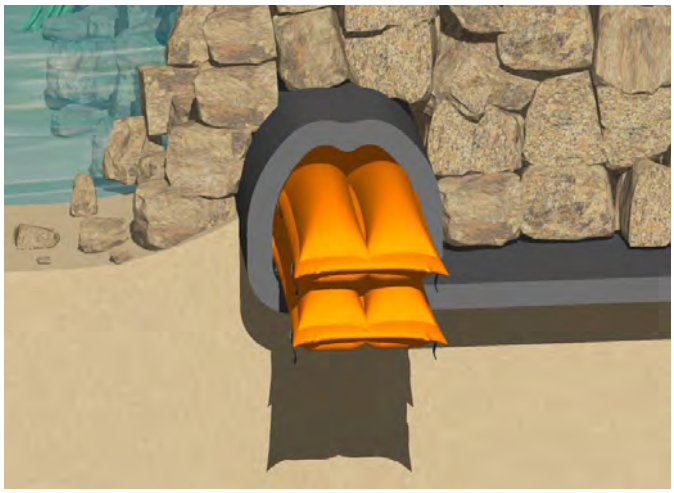

Fig. 15: Protexia Ballast Bags

Fig. 16: Fluvial protection – Walton le Dale

6. Protexia Ballast Bags

Protexia Ballast Bags are multifunctional and should be installed inline with their intended application. To minimise risk, bags should be filled as close to their point of placement as possible. The two lifting loops closest to the bags open end should be secured safely when the bag is being filled.

Do not over fill the bags. When the fill becomes level with the handles stop filling, fold the bag's open end and stitch to close using a bag closer. When the bag is filled and closed it can be lifted using the 4 lifting loops.

It is the responsibility of the Contractor to define a safe placement method considering the weight of the filled bag.

Filled bags should be inspected for any damage prior to lifting/placement. Mechanical lifting and placement should be used where possible. It is recommended that filled bags should not be carried or lifted over areas where harm or damage could be caused should the bag's structure fail, and its contents be spilt.

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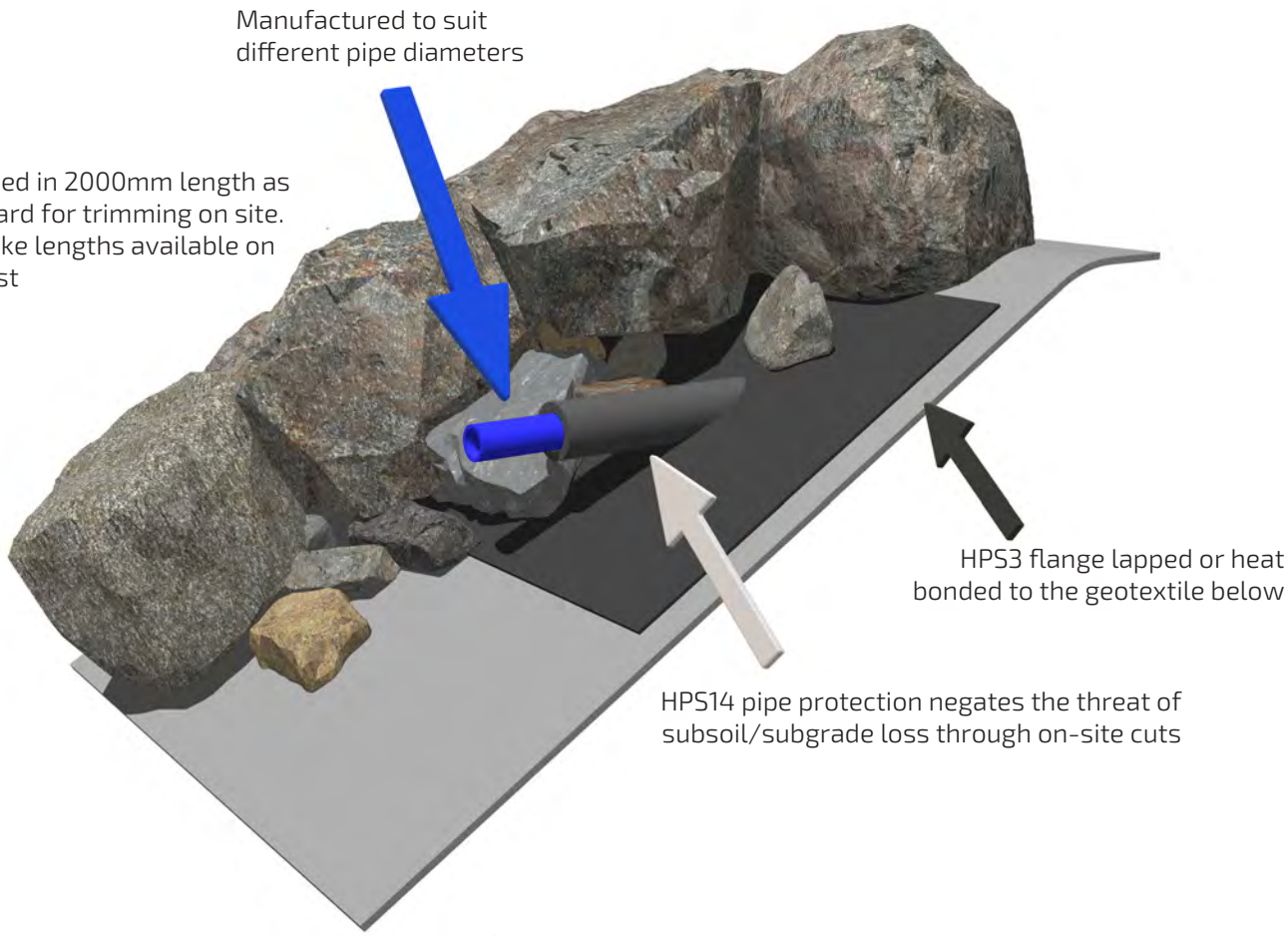
7. Outfall Protection Collar

The Protection Collar is available in diameters to suit most pipes. The pipe protection comes in 2m length as standard – should a shorter or longer length be required please advise Geofabrics at the time of order. If the trunk requires trimming, cut the excess using a sharp utility knife, safely, and on a flat surface. Avoid trimming the trunk when the Outfall Protection Collar is in place.

Slide the protection collar over the pipework allowing the flange to meet with the HPS geotextile in place on the slope. The 2x2m flange will naturally provide a 1m lap over the base textile to prevent any washout of subsoil from the cuts around the pipework. Should the Designer have any concerns regarding displacement the flange can be secured by thermally bonding to the HPS layer below. For this procedure, a hot air gun should be used inline with the manufacturer's recommendations. Every care should be taken to avoid damage to pipework during installation of rock armour around the pipework.



14kN CBR geotextile provides protection from attrition of surrounding rocks.
Please note that this product will not protect from rock/load surcharge

Fig. 17: Outfall Protection Collar

8. Anchoring & Detailing

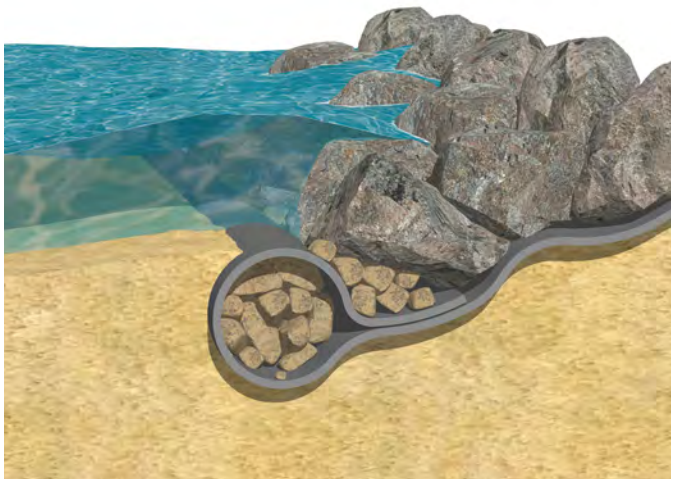


Fig. 18: Wrapped toe using small rock

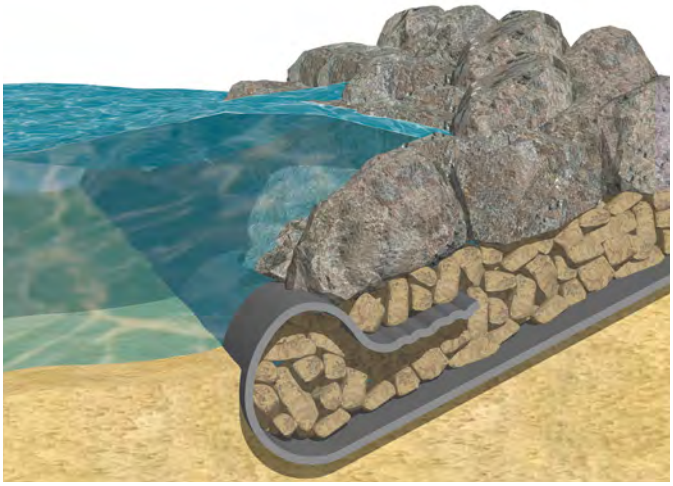


Fig. 19: Wrapped toe using bedding stone

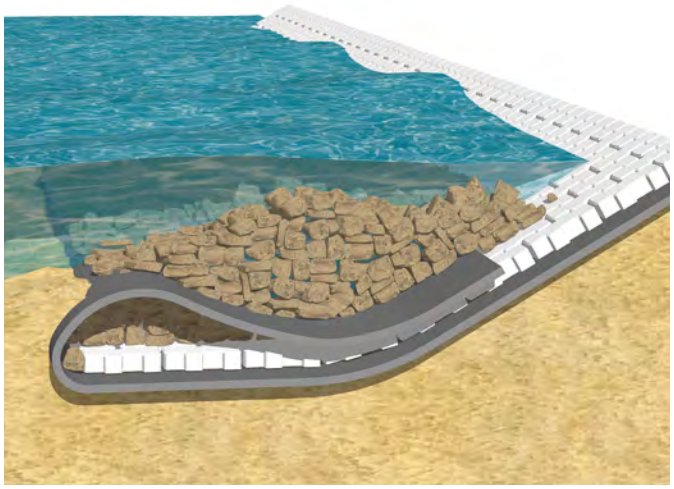


Fig. 20: Wrapped toe – concrete units

Fig. 21: Rock outcrop

Anchorage requirements should be in accordance with the project drawings or be carried out under the guidance of the Consulting Engineer.

The anchor trench should be backfilled with soil and compacted on completion of the geotextile installation.

8. Anchoring & Detailing cont.

Fig. 22: Sheet-piled wall shoulder

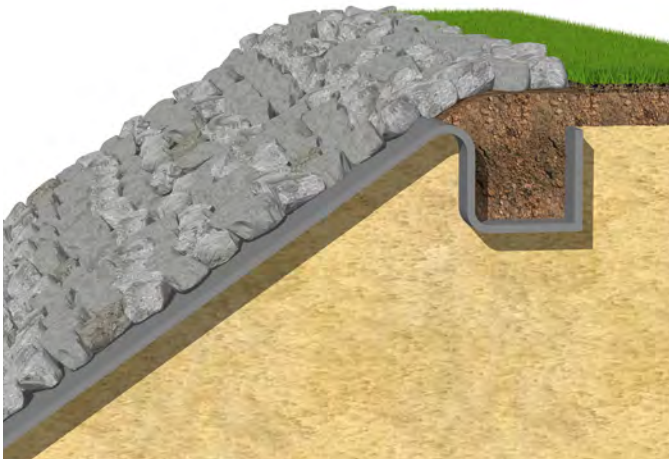


Fig. 23: Slope shoulder trench

Fig. 24: Grasscrete detail

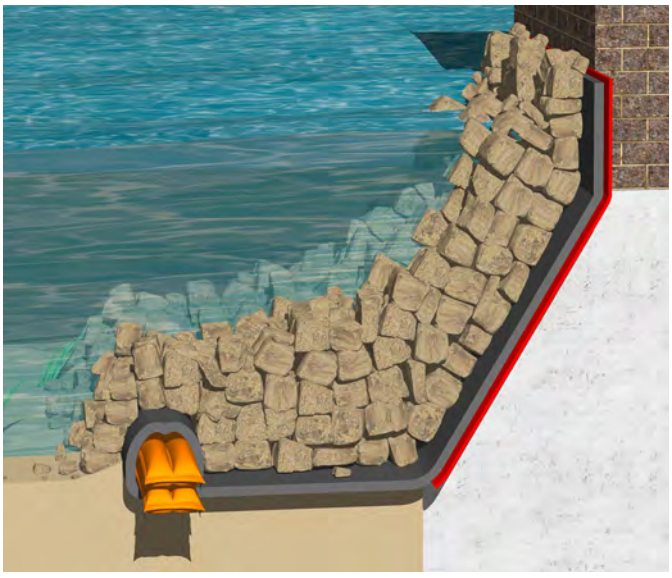


Fig. 25: Bridge abutment scour protection

Anchorage requirements should be in accordance with the project drawings or be carried out under the guidance of the Consulting Engineer.

The anchor trench should be backfilled with soil and compacted on completion of the geotextile installation.

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9. Maximising Durability

- Geofabrics HPS products (in black) contain 1% carbon black to provide UV resistance. However, it is recommended that these products should be covered within 1 month of installation to avoid any risk of degradation.
- It is recommended that the front profile of an anchor trench is rounded and smooth to reduce stress on the geotextile.
- Site or other equipment should never be driven directly on any geosynthetic product.

10. Geotextile Characteristics and Properties

- All Geofabrics' non-woven geotextiles are manufactured from polypropylene staple fibre and quality assured by a UKAS accredited laboratory to comply with the published data, within a prescribed tolerance range.
- The products are typically delivered to site as 6m wide rolls within the UK and 5.9m wide rolls outside the UK. Narrower roll widths can be manufactured.
- The core of each roll comprises a cardboard tube with an internal diameter of 120mm and an external diameter of 136mm.
- All geotextiles are delivered to site in protective plastic sleeving. Shipping labels are placed both on the inside and outside of the packaging. Shipping labels include product details such as product name, length, width, roll number, roll weight and date of manufacture. This information should be retained for the Consulting Engineer and cross-referenced with quality control certificates supplied separately.

11. Equipment Suppliers

- **Lifting Equipment (spreader bars)**

  Invicta, Leeds
  0113 277 1222
  www.invicta-attachments.co.uk

- **Lifting Equipment (straps/slings)**

  Euroweb Lashing Systems, Eastbourne
  01323 646925
  www.euroweb.co.uk

- **Hot Air Guns**

  Forstoff via Barnes Plastic Welding Equipment
  Liam Flynn 01254 660910
  www.plasticweldingequipment.co.uk

  Leister via Welwyn Tools
  01707 331111
  www.welwyntoolgroup.co.uk

- **Cutting Knives**

  Martor UK, Ossett
  01924 281333
  www.martor.com

- **Sewing Machines**

  Hobkirk Sewing Machines, Blackburn
  Mark Hobkirk 01254 693555
  www.hobkirk.co.uk

- **Adhesives (fixing Geotextiles to hard surfaces)**

  Kenyon Group, 18-20 Miles Street Oldham,
  Lancashire OL1 3NU
  Andrew Barnes 0161 627 1001
  www.kenyon-group.co.uk

Further information can be found at www.geofabrics.com and enquiries can be e-mailed to info@geofabrics.com.

These notes are written in good faith and comprise several years' experience of several different installers. While it is intended to provide the best practice for installation, these guidelines offer no guarantee for the quality and performance of the installation.