

Installing GEOfabrics' geotextiles in coastal & river applications

Introduction

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 particular application and the contractor must ensure that he uses appropriate methods at all times.

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1. Unloading handling and storage

- Roll can weigh between 300kg (660lbs) and 1320kg (2904lbs) and hence appropriate equipment is required for unloading and handling e.g. front-end loader, back hoe, forklift (pole truck) or crane.
 - Rolls should be lifted by using:
 - 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 fitted with a boom.
- Note: GEO*fabrics* does not supply lifting equipment. Please see the list of suppliers (see 10).
- It should be noted that, in general, deliveries within Europe are made by flatbed trailer allowing rolls 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 boom. As the rolls could have settled during transit, the central roll at the top should be extracted first using a strap & a forklift truck to slide the roll out of position (the plastic sleeving should aid this action). The remaining rolls can then be removed using the forklift.
 - The products will be delivered to site in plastic sleeving to protect them from damage and the effects of weathering, notably degradation by ultra violet light (UV). This sleeving should not be removed until immediately prior to installation. Premature removal can result in damage from UV as well as the geotextile absorbing moisture, creating the potential for further degradation and an increase in the products' weight.
 - If the rolls are to be stored prior to installation, they should be stacked horizontally on level dry ground, not more than five rolls high, and additional materials should not be stacked on top of them.

2. Installation equipment

In addition to conventional personal protective equipment (PPE) when working on site (hard hat, work boots and high visibility coat), the following equipment should be considered for use during installation:

- Gloves
- Safety glasses
- Carpet cutting knife (or Stanley knife)
- Spreader beam, core bar & lifting chains
- Backhoe excavator and rock clamshell grab
- Rebar and wire rope or other form of ballast for underwater installation
- A portable, sack-closing sewing machine, if wide widths are required

3. Method of laying – works above low water



- Rolls can 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. Overlaps – works above low water

Overlap widths are site specific and generally at the discretion of the on-site engineer. Overlaps are required to ensure that all of 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 and the weight of the rock armour. 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

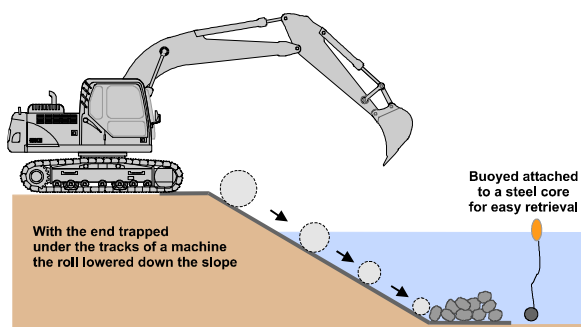
1000mm overlaps for use in the inter-tidal zone with rock armour

- Transverse overlaps (between subsequent rolls/lengths) should be located at least 1m from the toe and crest of slopes. Consider ordering rolls in non-standard lengths to match the site requirements in order to avoid transverse overlaps. 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. Method of laying – works below low water

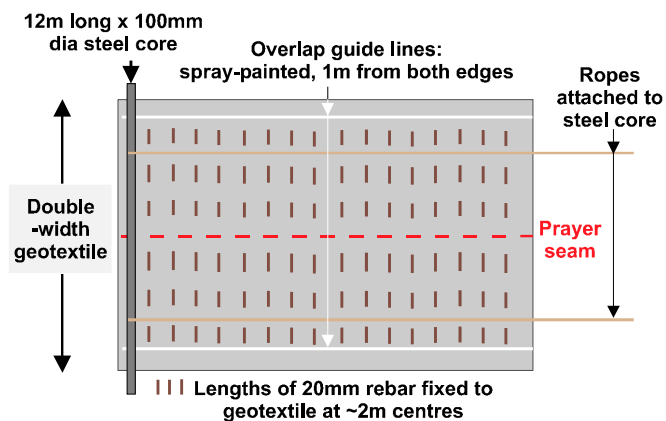
All needle-punched geotextiles will float in seawater and therefore require some form of ballast if they are to be successfully placed below the low-water line. There are a number of ways of achieving this, and many contractors will have developed their own procedures.

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 beneath the tracks of an excavator & the roll can then be lowered into place. The pole can be retrieved once the fabric has been weighted with a quantity of stone.



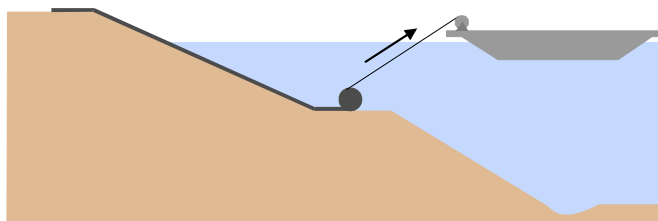
For speed of installation on larger projects, it is possible to join two widths of geotextile using a *prayer seam* formed with a portable, sack-closing, sewing machine. Widths up to 12m can be prefabricated prior to installation. Joints with 60% of the geotextile's strength can be fabricated using grades upto 6mm thick.

Scrap rebar can be used as sacrificial ballast and lengths can be attached to the geotextile at intervals along its length using cable ties, tying wire or tape. Unroll a suitable length of geotextile on level ground away from the installation area. Attach one end of a geotextile length to a suitable steel core. Attach two lengths of rope to the core & lay the lengths along the fabric. Roll the fabric, rebar & ropes onto the core and transport to the installation area.



Use suitable methods to locate the exact position of the previous geotextile length to be placed. Divers may be required or it may be possible, in shallow water, to attach floats to the edges of the geotextile. White lines spray painted onto the fabric to identify the correct overlap position may be suitable in some waters.

The geotextile and core can now be lowered into position by unwinding the ropes. The steel core can be recovered for future use. On long slopes, it may be more effective to place the roll on the slope shoulder and have the ropes hauled from on board a barge.



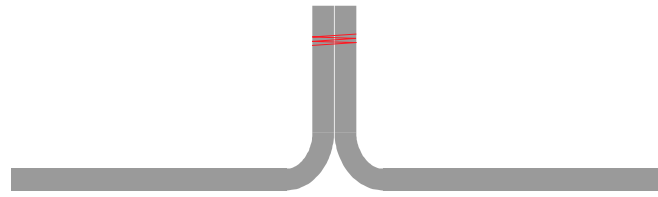
An initial layer of rock should be placed on the fabric immediately to ballast it.

For large projects, where sacrificial ballast would be expensive, it is possible to use a steel-wire net laid out on top of the geotextile in place of the rebar, rope and core. This is wound up inside the fabric and can be fully recovered once an initial layer of ballast (smaller than the steel-wire net apertures) has been placed to ballast the fabric.

6. Overlaps – works below low water

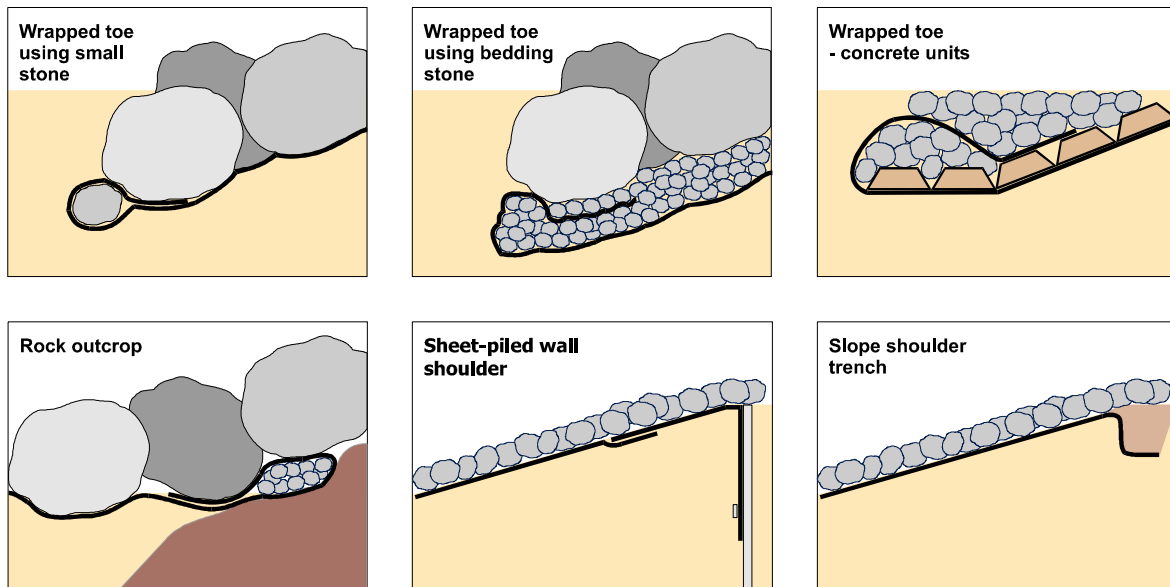
Overlap widths are site specific and generally at the discretion of the on-site engineer. Overlaps are required to ensure that all of the underlying soils are fully covered by the geotextile after any movement has taken place during rock placement. Consider spray painting a line on the fabric to mark the overlap if water is clear enough. A minimum overlap of 1m is recommended for works below water level.

7. Jointing



Prayer seam detail

8. Anchoring and detailing



Anchorage requirements should be in accordance with the project drawings, or be carried out under the guidance of the site engineer. The anchor trench should be backfilled with soil and compacted on completion of the geotextile installation.

9. Backfilling

- *GEOfabrics'* HP (black) products 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. Equipment Suppliers

- **Lifting Equipment (spreader bars)**
Invicta, Leeds (Peter Sharpe) 0113 277 1222
RSU Lifting Services, Milton Keynes (Candy Scott) 01908 649202
- **Lifting Equipment (straps/slings)**
Euroweb Lashing Systems, Eastbourne (Terry Butchers) – 01323 646 925
- **Cutting knives**
Europa Machines Ltd, Cheshire – 01625 536314
- **Sewing Machine**
Eastman Staples Ltd, Huddersfield – 01484 888888

11. 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 Resident Engineer and cross-referenced with quality control certificates supplied separately.

Product	HPS2	HPS3	HPS4	HPS5	HPS6	HPS7	HPS8	HPS9
Approx. roll weight (kg)	298	357	370	460	532	513	610	544
Roll size (m)	200 x 6	175 x 6	150 x 6	150 x 6	150 x 6	125 x 6	125 x 6	100 x 6
Roll diameter (m)	0.83	0.85	0.79	0.88	0.90	0.85	0.87	0.81

Product	HPS11	HPS12	HPS14	HPS17	HPS19	HPS25	HPS30	HPS35	HPS40
Approx. roll weight (kg)	496	537	627	560	600	754	937	1120	1210
Roll size (m)	75 x 6	75 x 6	75 x 6	50 x 6	50 x 6	50 x 6	50 x 6	50 x 6	50 x 6
Roll diameter (m)	0.73	0.74	0.76	0.85	0.86	0.89	0.97	0.96	0.97

Standard shipping information

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

These notes are written in good faith and comprise several years' experience of a number of 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.

The Control of Substances Hazardous to Health, Regulation 1988 from 1 October 1989, (COSHH)

Introduction

This safety sheet outlines the precautions to be taken when handling and storing *GEOfabrics'* geotextiles.

GEOfabrics' geotextiles are manufactured from fibres, filaments and yarns formed by the extrusion of polypropylene or polyethylene, individually or in combination. The handling and storage of *GEOfabrics'* products presents little or no health hazard.

Raw materials

The polymers used to manufacture the fibres - polypropylene and polyethylene - are polyolefins derived from oil and are regarded as chemically and biologically inert.

A lubricant is applied to the fibres during their manufacture to aid the subsequent needlepunching process. This lubricant, a blend of fatty acid esters and diethanolamide, is added in extremely small quantities - 0.4% by weight. The ecological data from the lubricant supplier refers to the lubricant in concentrated form and even then, it is only considered to be moderately toxic to aquatic organisms.

In some situations a *forming* effect may appear on the surface of a geotextile. This is a physical interaction between water and this lubricant. It is a transient effect and has no harmful effects on the environment.

Contact the GEOfabrics Quality Assurance Manager, if you require evidence to support the above statement.

GEOfabrics' products do not contain:

- Chlorofluoro carbons (CFC)
- Pentachloro phenols (PCP)
- Urea formaldehyde or derivatives
- Any product capable of forming dioxin
- Any toxic substance

Potential Hazards

Toxicity: the products are regarded as chemically and biologically inert.

Inhalation: the products do not release any toxic or obnoxious fumes at ambient temperatures. The fibres are long, greater than 50 mm. They cannot normally be inhaled.

Ingestion: the fibres used are inert and regarded as harmless. Certain additives and lubricants may be harmful if ingested in significant quantities. *GEOfabrics'* products do not contain quantities of these materials considered to be significant.

Skin contact: the products will not cause skin irritation under normal conditions. However, precautionary measures must be taken and employees who have a history of skin disease or allergy should receive medical clearance prior to direct contact.

Eye contact: the products are unlikely to come into contact with eye. Loose fibres are not normally released from the products.

Flammability: the products will not ignite easily. Melting will occur when heated in air at 165 - 170°C and decomposition will commence at about 300°C with the release of volatile, lower molecular weight hydrocarbons; carbon monoxide, carbon dioxide, water and carbon. In addition, very low concentrations of oxidation and breakdown products, associated with the additives and lubricants, may be released but are regarded as virtually insignificant. Combustion of *GEOfabrics'* products is similar to most organic materials

e.g. wood, paper and cellulose, thus requiring similar precautions in the event of fire in particular in relation to the carbon monoxide.

Explosion: the products do not present an explosion hazard.

Preventative Measures:

Handling precaution: Operatives involved in normal handling and laying of GEOfabrics' products do not require special protective clothing or equipment. Operatives with sensitive skin or allergies are advised to wear gloves and seek medical advice.

Standard roll weights range from 235 to 650 kg. Mechanical handling and lifting should be used.

Storage: The products may be stored inside or outside without special precaution. No environmental impairment will be caused.

Emergency Action

Fire: Toxic fumes are not produced but breathing apparatus may be required to combat smoke and carbon monoxide particularly in confined spaces. Molten burning droplets require resistant clothing and footwear.

Spillage: Not applicable.

This guidance note was prepared in November 2006. *GEOfabrics'* specifications are subject to continuous review and variation in line with product improvement. However the raw materials used are unlikely to vary significantly.

Please contact *GEOfabrics* Limited if further information is required.

R G Warwick
Managing Director