

Installation Guide

Bentotex® Geosynthetic Clay Liners



- This document describes procedures for the installation of Bentotex® Geosynthetic Clay Liners.
- Directions shown below ensure safe, efficient and continuous material placement. These guidelines can be applicable to any type of lining project.

- Any information in this document should be verified with the project specific design and in case of differences the designer should determine site specific details
- Proper performance of the lining system fully depends on the installation quality.

Quality assurance on the construction site should describe the final procedures to be adopted.

Delivery & Storage

Bentotex® GCL rolls have to be delivered to the job site in original packaging with two straps placed on every roll. Discharge of the truck or container should be made with use of the straps, stinger equipment or spreader bar attached by chains to the beam.

It should be considered that rolls weights can be from 700 to 1500 kgs so proper strength of the materials used has to be ensured.

Bentotex® GCL rolls are labelled and it is critical to verify rolls numbers on the labels with the packing list. Unique roll number is used to trace the product. Bentotex® GCL rolls can be stored at the job site. Original packaging provides sufficient protection of Bentotex® GCL.

In case of the serious damages of the plastic sleeves, rolls should be covered with the plastic wrap. The storage area should be levelled, without standing water and able to support rolls weight. Rolls should be stacked flat in a manner that prevents them from sliding or rolling.



SUBGRADE PREPARATION

Before Bentotex® GCL is placed over soil, the subgrade must be prepared according to this guide, project specific requirements and design. Subgrade consisting of the gravel like material may not be suitable for Bentotex® GCL installation. It is advised that **80% of the soil is finer than 0.25mm**. The subgrade surface should be smooth and free of vegetation, sharp-edged rocks, stones, sticks, construction debris, and other foreign matter that could damage material.

Installation area should be compacted to remove any excessive wheel ruts, footprints, or other abrupt grade changes. The subgrade has to be compacted according to the project requirements.

It should stay with no abrupt elevation changes, voids and cracks, ice, or standing water. All protrusions extending more than 12mm from the subgrade surface shall either be removed, crushed, or pushed into the surface.

Packaging should be removed immediately prior to installation, without damaging the Bentotex® GCL

The orientation of the panels (that is, which side faces up) has to be determined at the design stage. It is recommended that a panels layout plan is prepared before installation work – this is to avoid material losses and proper seaming execution.

When using laminated product (Bentotex® GCL SL), it is recommended to install the laminated geomembrane facing upwards and to install an Ekotex non-woven Geotextile on top to protect the laminated face and to improve interface friction angle between cover soil and Bentotex® GCL SL. In case of laminated product (SL) when cover membrane is welded, welding details should be prepared before installation.

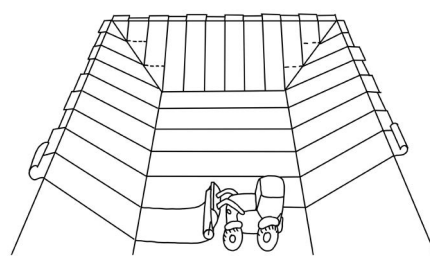
No equipment that could damage material shall be allowed to travel directly on Bentotex® GCL. Acceptable installation, may be accomplished such that material is unrolled in front of the backwards-moving deployment equipment, such as a front-end loader or bulldozer.

Machines with pneumatic wheels (all terrain vehicle) are allowed to move on the surface of Bentotex® GCL.

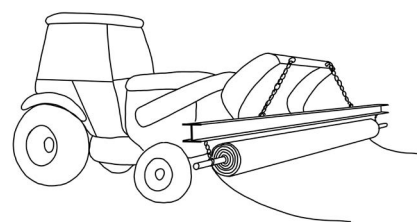
Care must be taken to minimise the extent to which Bentotex® GCL is repositioned across the subgrade in order to minimise damage to the subgrade and to the bottom surface of the material. Panels should be placed so that seams are parallel to the direction of the slope.

Other installation can be adopted according to the site specific conditions but stability of the seams and material has to be ensured. Bentotex® GCL should lie flat on the underlying surface, with no wrinkles or folds, especially at the exposed edges of the panels.

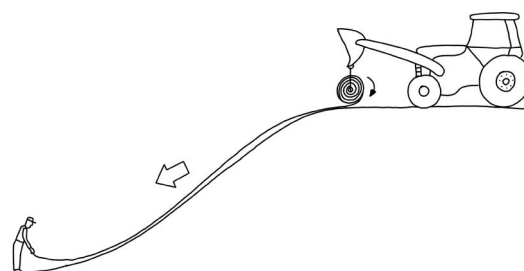
If Bentotex® GCL is placed over geosynthetic, care must be taken as to not damage underlying material with high ground pressure equipment directly on the geosynthetic.



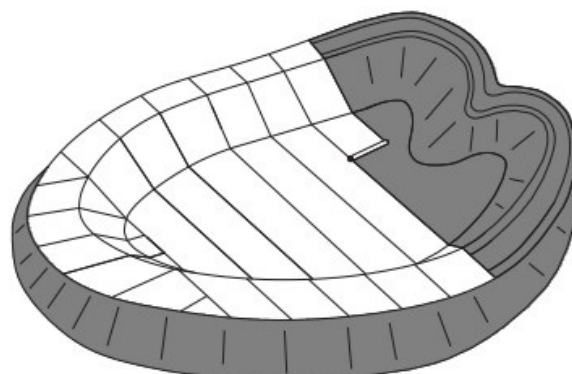
TYPICAL INSTALLATION



TYPICAL UNROLLING



SLOPE INSTALLATION



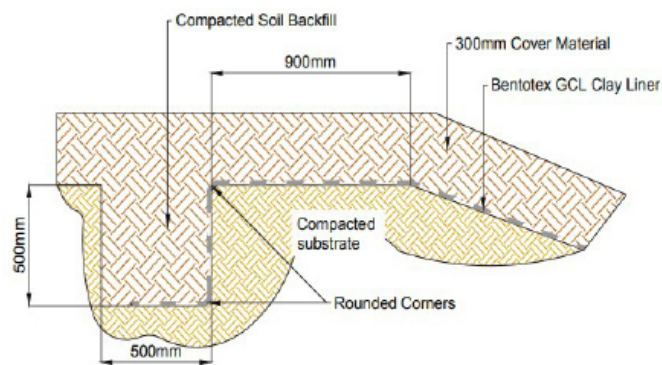
"KIDNEY" INSTALLATION

Installation Guide

ANCHORAGE

At the top of a slope, depending on the project specific condition Bentotex® GCL roll end may be placed in an anchor trench. The front edge of the trench should be rounded so as to eliminate any sharp corners that could cause excessive stress on the material. Dimensions of the trench should be part of the design.

If a trench is used for anchoring the end of the GCL, soil backfill should be placed in the trench to provide resistance against pull-out. The size and shape of the trench, as well as the appropriate backfill procedures, should be in accordance with the project drawings and specifications.



TOP ANCHORAGE

SEAMING

GCL seams should be made by overlapping adjacent edges. Care should be taken to ensure that the overlap zone is not contaminated with loose soil or other debris.

Most of the Bentotex® GCL overlaps don't require treatment of supplemental (powdered or granular) bentonite. Longer edges of the panels are pre-treated at the plant. Short edges should be treated with granular bentonite which is delivered together with Bentotex® GCL.

Required bentonite amount is 200g per linear meter. Geomembrane-based GCLs (laminated Bentotex SL) also may be welded together.

Width of the longitudinal overlap is marked on the panel by two lines should which are positioned 150mm and 230mm of the edge.

The top edge overlap should be positioned between these two lines. End-of-roll overlapped seams should be constructed similarly but the minimum overlap should measure 500mm.

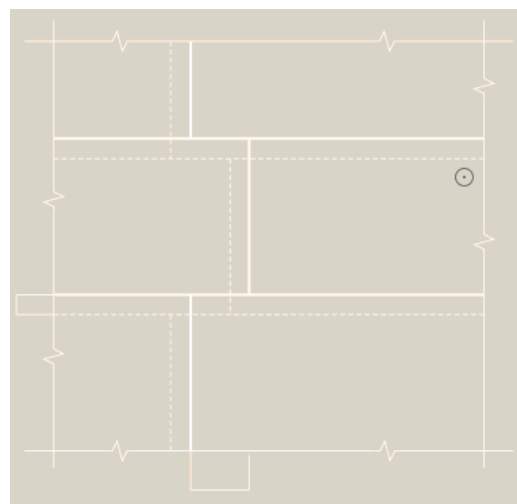
Care should be taken to maintain these overlap dimensions at the time of covering in all climatic conditions. Overlap width can be adopted to the site specific condition. In case differential settlement or if material is expected to stay longer uncovered, wider overlaps should be considered.

Seams should be constructed such that they are shingled in the direction of the grade in a manner that prevents the potential for flow entering the overlap zone.

When Bentotex® GCL is placed in the anchor trench and temporarily ballasted, it will then be installed down the slope in a controlled manner.

The anchor trench will then be backfilled. In case of laminated material it should be done following morning (or in extreme cases, later that night) to control waves or wrinkles.

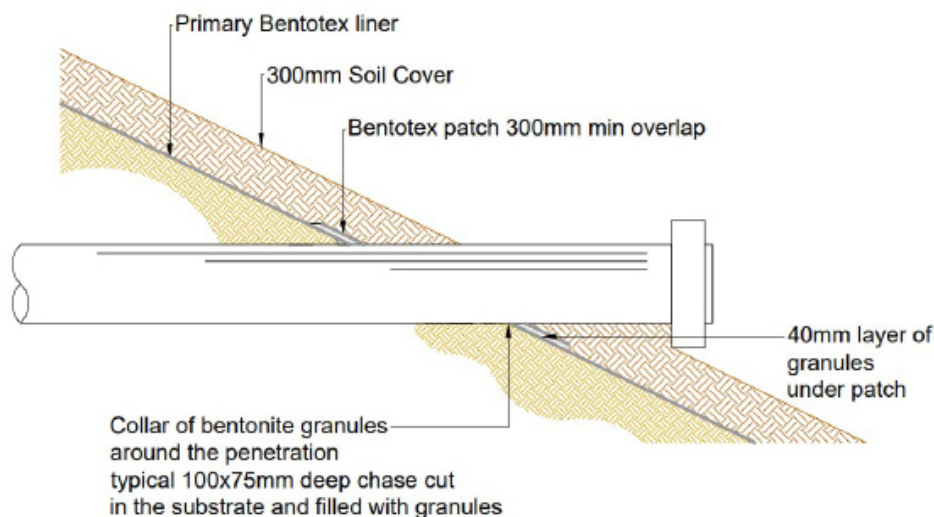
Alternatively anchorage may be obtained by extending the end of the Bentotex® GCL roll back from the crest of the slope, and placing cover soil. The length of this "runout" anchor is project-specific.



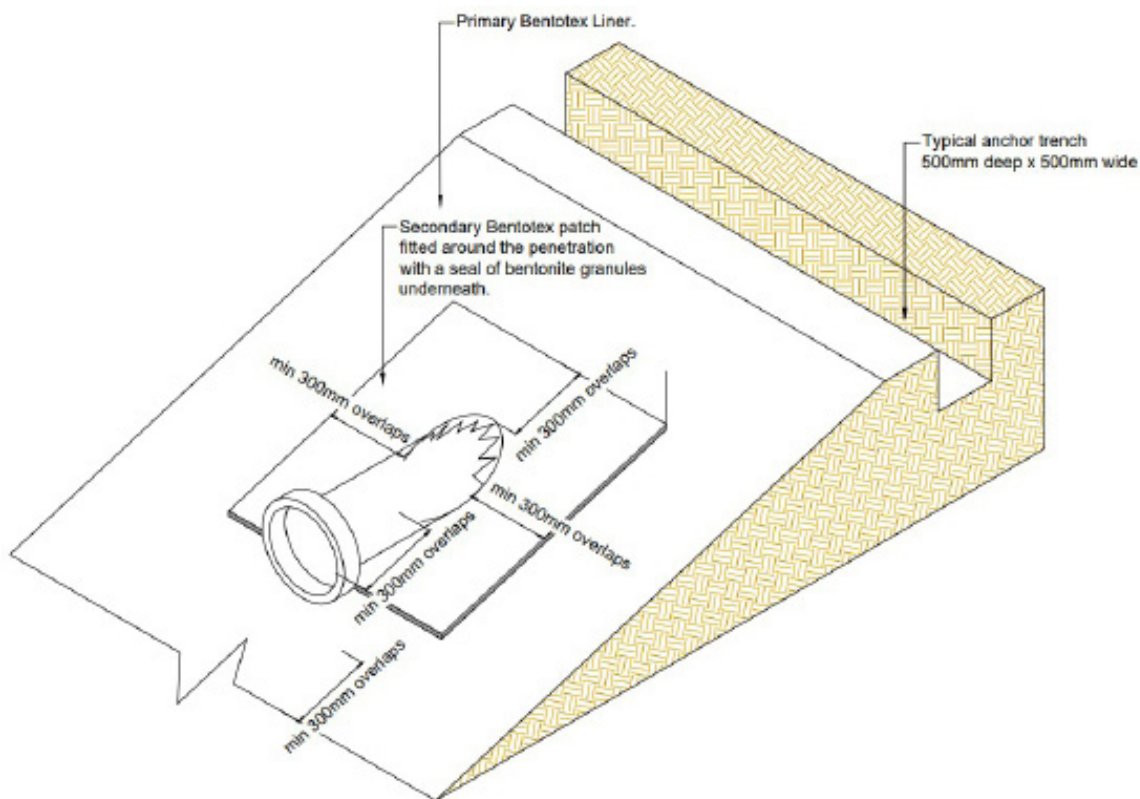
SEAM OVERLAP

SEALING AROUND PENETRATIONS AND STRUCTURES

Cutting the Bentotex® GCL should be accomplished using a sharp utility knife. The GCL shall be sealed around pipe penetrations and structures embedded in the subgrade using granular bentonite, powdered bentonite, or bentonite paste, in accordance with the design drawings or as recommended by the manufacturer.



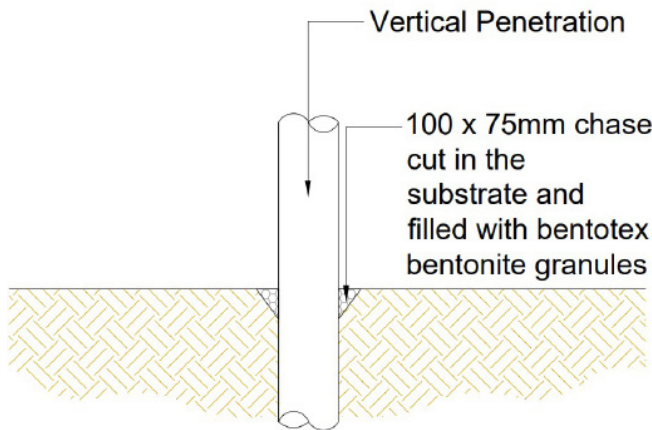
CROSS-SECTION OF HORIZONTAL PIPE PENETRATION



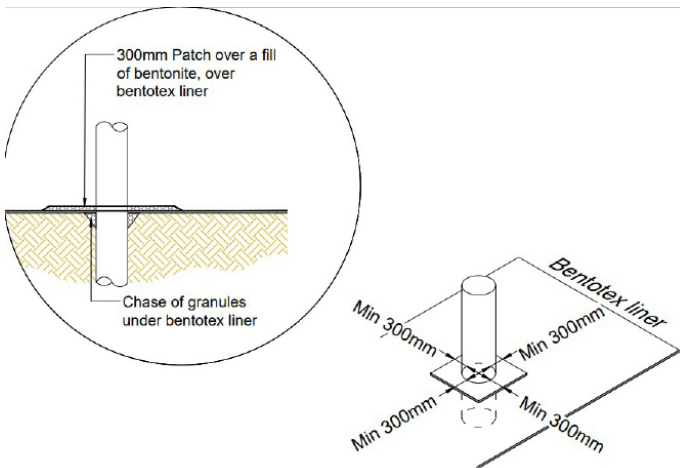
ISOMETRIC VIEW OF COMPLETED HORIZONTAL PIPE PENETRATION

Installation Guide

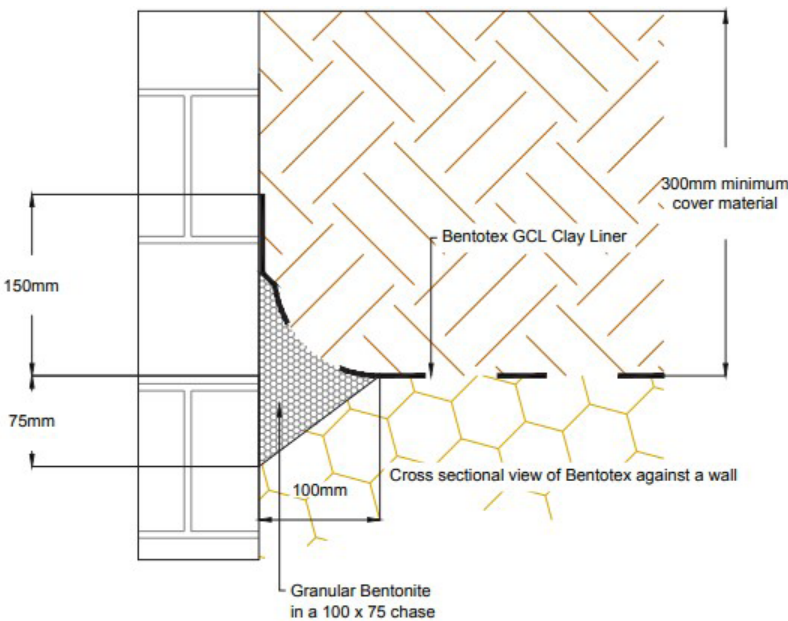
CROSS-SECTION OF VERTICAL PIPE PENETRATION



ISOMETRIC VIEW OF COMPLETED VERTICAL PIPE PENETRATION



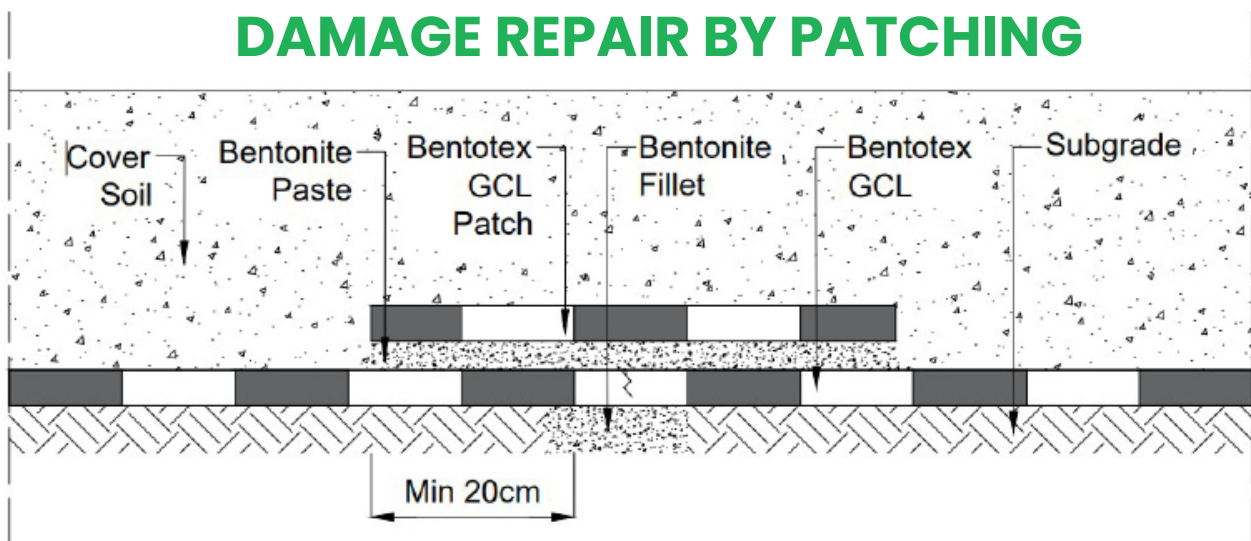
CROSS SECTIONAL VIEW OF BENTOTEX® GCL AGAINST A WALL



If the Bentotex® GCL is damaged (torn, punctured, perforated, etc) either the entire GCL must be replaced, or the affected area must be repaired by cutting a patch to fit above or below the damaged area.

The patch shall be obtained from a new GCL roll and shall be cut to size such that a minimum overlap of 300mm is achieved around all parts of the damaged area. Dry granular or powdered bentonite, or bentonite paste should be applied around the damaged area prior to placement of the patch. It may be desired to use an adhesive or other approved means to affix the Bentotex® GCL Patch.

DAMAGE REPAIR BY PATCHING



Cover Soil & Hydration

Cover soils must be free of angular stones, sharp-edged stones, or other foreign matter that could damage the GCL. Approved materials should have appropriate particle size uniformity, moisture content, and chemical compatibility.

Recommended cover soils can be sand, gravel, or cohesive material that can be compacted (e.g., Cohesive soil Class 2B). They typically have a well-graded particle size distribution ranging between fines and 25 mm, without a high concentration of calcium. Soils with a high content of limestone, dolomite, gypsum, or seashell fragments are not recommended due to the potential for cation exchange between calcium and sodium.

Soil cover shall be placed over the GCL using construction equipment that minimises stresses. To prevent damage, the initial layer(s) of cover soil shall not be compacted in excess of 85% of modified proctor density. A minimum of 300mm of cover must be maintained between the equipment tyres/tracks and the GCL at all times. It's recommended that cover soil is placed from the bottom towards the top of the slope and in a manner that prevents soil from entering the GCL overlap zones.

Direct vehicular contact with the GCL is to be avoided. Lightweight, low ground pressure vehicles (such as 4-wheel all-terrain vehicles) may be used to facilitate the installation of an overlying geosynthetic. A temporary cover (waterproof tarpaulin or plastic sheet) is acceptable to protect the GCL end-of-roll until the next day's construction, provided it is adequately ballasted and water cannot enter from the sides.

PREMATURE HYDRATION

"Premature" hydration may be caused when the Bentotex GCL is uncovered for a long period of time, exposed to rainfall and/or snowfall events, resulting on excessive hydration.

Once a minimum confining cover (min. 300mm cover soil) is applied over the Bentotex® GCL, the bentonite cannot exert enough swelling force to delaminate the product, nor can it absorb enough water to become overly plastic, avoiding the risk of premature hydration. Please refer to the Product Information Sheet for more information about Premature Hydration.

HYDRATION

In projects involving the containment of non-aqueous liquids (secondary containment around above-ground storage tanks), the GCL must be hydrated with clean water prior to use.

The GCL does not function as a barrier until hydration takes place. Hydration is usually accomplished by natural rainfall if the GCL is covered by permeable material. If manual hydration is necessary, water can be introduced the use of a sprinkler system.

About Geosynthetics

About Us

Not just a product supplier, Geosynthetics Limited promotes and leads innovation throughout the UK to deliver sustainable geosynthetic solutions for an improved environment.

Using extensive knowledge of product and applications the company have an enviable reputation for technical excellence and customer service, offering next day delivery and free engineering support to achieve the desired objectives, save time, reduce carbon and cost wherever possible.



Our Best Service



Next Day Delivery

Our fully stocked distribution center established in the East Midlands makes UK direct to site next day deliveries possible.



Free Engineering Service

Our Engineering Department (Staffed by fully qualified civil engineers) has been created to give you free technical support and to provide solutions involving our range of products.



Large Stock Holding

We hold over £2m worth of stock in our East Midlands distribution centre allowing us to enable quick order turnarounds.



Site Visits

Our team includes industry experts offering you support & advice throughout your order process. This enables us to offer services such as site visits to assist you with choosing the best solution for your project.

Get in touch



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