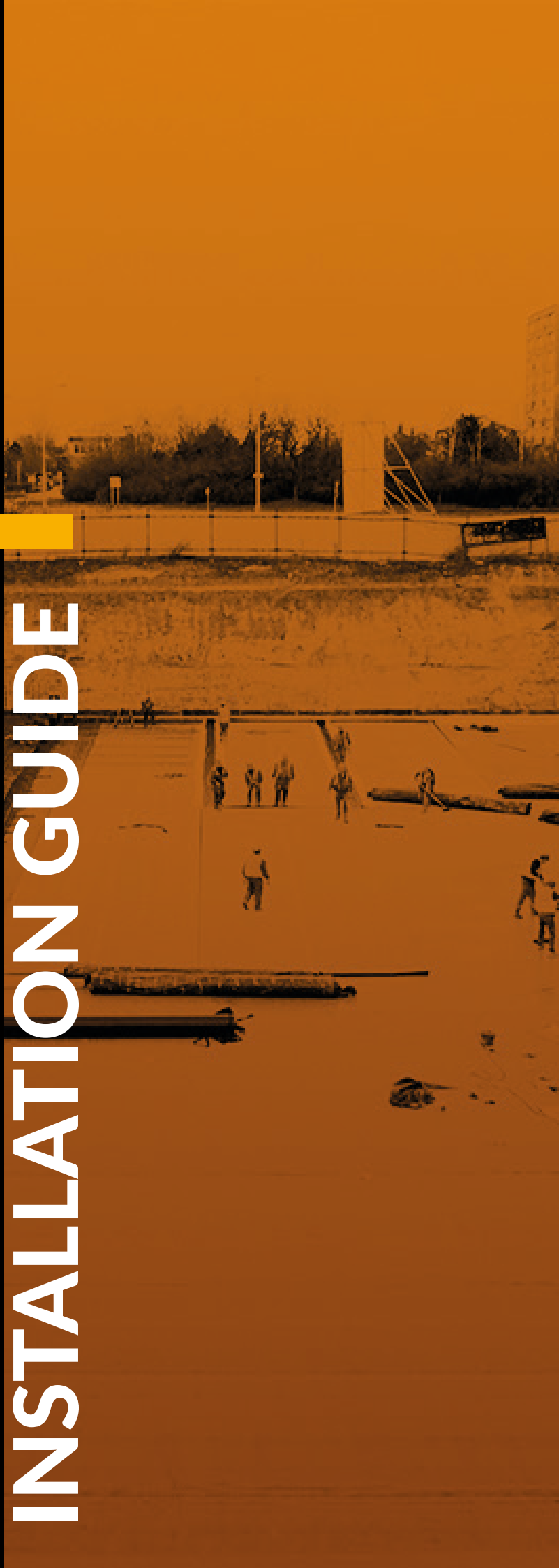




Construction

INSTALLATION GUIDE



WHAT IS EUROBENT MAT?

EUROBENT is a geosynthetic clay liner produced by sandwiching a layer of bentonite, a clay mineral which expands when saturated with water, between two or more layers of geotextiles.

Bentonite absorbs water from the surrounding soil. Its free expansion is blocked by geotextiles on both sides creating an impermeable lining material able to be used as a containment barrier.

EUROBENT replaces all traditional mineral sealants, offering better sealing performance. It is more cost-effective and eco-friendly.

WHAT IS EUROBENT C MAT?

EUROBENT C is a highly effective bentonite waterproofing mat. It is a composite of 3 materials, bentonite, woven and non-woven polypropylene geotextiles. The integrity of these components is ensured due to a patented needling process.

EUROBENT C is dedicated to structural waterproofing. It has enhanced mechanical properties thanks to use of stronger geotextiles in a manufacturing process. A remarkable, safe, and natural alternative that can be used for the convectonal sealing of buildings.

WHAT IS EUROBENT CS MAT?

EUROBENT CS is an isolating non-permeable product which is composed of two parts:

1. PE, PP, PVC film - which permanently protects the product against water penetration and leaching of toxic substances.
2. Geosynthetic Clay Liner (GCL) - with excellent absorption properties of bentonite that makes the GCL impermeable. The self-sealing properties of the bentonite layer secures the integrity of the product in the event of damage to the geosynthetic layers or the polymer film. This distinguishes EUROBENT CS from other products that also use bentonite as a main component.

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SCOPE

01

1. SCOPE

The following installation recommendations are general guidelines for GCL installation. They are provided as a general statement and are not a direct substitute for specifications for the project. In the event of a discrepancy, the project specification will override these recommendations.

These installation guidelines are not intended to establish a specific procedure for all climatic, geographic, hydraulic, or topographic conditions that may exist at a particular installation site. Appropriate installation procedures for unusual site conditions should be modified as necessary to maintain the integrity of the GCL and adjacent site. The information contained in this document has been prepared by Eurobent Sp. z o.o. and is, to the best of our knowledge, true and accurate.



The manual is based on experience and standards:

- ASTM D5888 (Standard Guide For Storage and Handling of GCLs)
- ASTM D 6102 (Standard Guide For Installation of GCLs),
- ASTM D 5889 (Standard Practise for Quality Control of GCLs),
- ASTM D 6072 (Standard Guide for Obtaining Samples of GCLs),

which should be considered as supplementary to the manual.

The user of these guidelines should establish appropriate safety and health practices and determine the applicability of legal restrictions prior to use.

Final determination of suitability for the intended application rests solely with the user, who is responsible for proper installation of the GCL. This information is subject to change without notice.

Eurobent does not warrant or assume responsibility for the results obtained from these installation guidelines or for the proper application of GCL in any project, as it is the designer's responsibility to determine what material is appropriate for a particular project.

These instructions should be read in relation to the contract specifications and drawings. They are intended to provide guidance in normal installation situations and are provided on the request. If you have questions about the design, unusual installation problems, or any concerns, contact your designer or Eurobent for further advice. In all situations, the installer is responsible for the installation.



ABOUT EUROBENT

02

2. ABOUT EUROBENT

Eurobent Sp. z o.o. is a Polish company from Lower Silesia.

Eurobent is a producer of Geosynthetic Clay Liners (GCL), also called bentonite mats, serving as a sealing barrier specialized in a permanent protection against water penetration and leaching of toxic substances. A typical GCL construction consists of two layers of geosynthetics needlepunched together enclosing a layer of bentonite. A polymer membrane can also be coated on the GCL.

Eurobent entered the GCL production market in 2008. The company is a team of young, dynamically developing people. Thanks to the high standards of its products and the professional service Eurobent has earned the trust and respect of one of the largest GCL consumers in the European market and beyond. At the same time, thanks to many years of experience in the field of geosynthetics production, the company has been able to develop invaluable knowledge in the production of bentonite mats, which has enabled them to become an innovative and acknowledged competitor on the international market.

The company consists of skilled staff committed to provide the best service and products available on the international marketplace.

Eurobent's laboratory technicians constantly undertake numerous tests on our products to ensure that their high standards are constantly maintained.

Eurobent is committed to constantly reviewing the service we provide, thus ensuring that we not only meet all of our customers' needs and requirements but exceed them. The company aims to provide the highest quality product that can be produced in the field of GCL in Europe and also ensure that it would be manufactured, stored and transported in the way to minimize their impact on the environment. The customers can be sure that they purchase an environmentally friendly product from a company that is dedicated and committed to environmental protection.



The excellent absorption properties of bentonite renders the GCL impermeable.

The self-sealing properties of the bentonite layer secures the integrity of the product in the event of damage to the geosynthetic layers. This distinguishes offered product from other sealants available on the market. It also has the following additional advantages: enhanced mechanical and waterproofing parameters, extreme toughness and durability, a double lining system, self-healing properties, puncture resistance, eco-friendliness, verified and proven track record for quality.

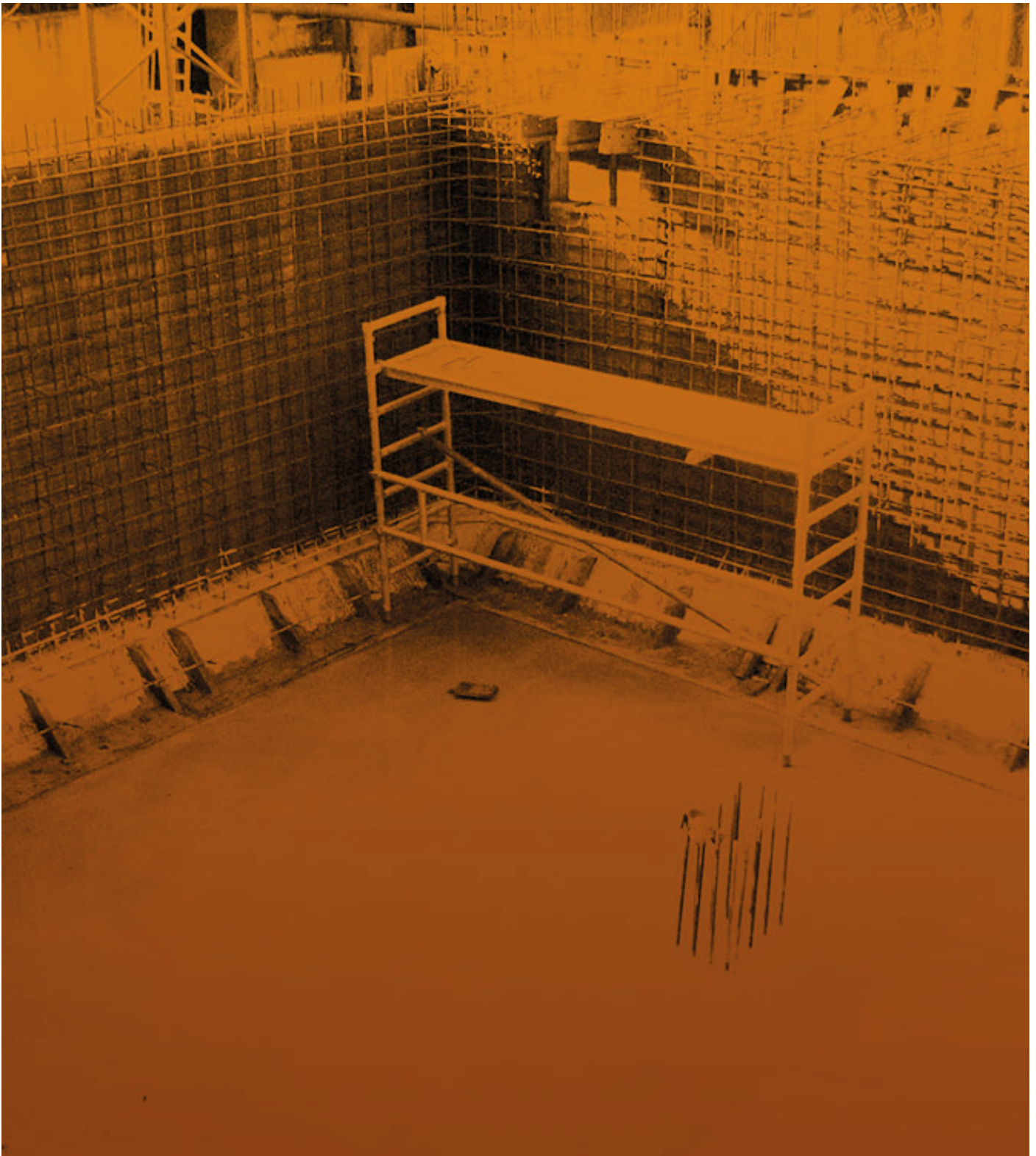
ENVIRONMENTAL IMPACT

03

3. ENVIRONMENTAL IMPACT

All materials used for the production of EUROBENT bentonite mats do not contain any hazardous or toxic substances and do not affect the environment in any way. No harmful substances are released from the EUROBENT bentonite mat in case of fire hazard.

Eurobent products are manufactured under the supervision of an Integrated Quality Management System, meeting the requirements of ISO 9001, certified by an independent body. We are also certified for compliance with the environmental management standard ISO 14001.



**SUPPLY,
PACKAGING
AND LABELLING**

04

4. SUPPLY, PACKAGING AND LABELLING

The GCL is labelled according to EN ISO 10320 for easy identification after unloading and during installation. Each roll shall be marked with the following information:

1. Manufacturer's name
2. Product identification
3. Roll number

EUROBENT is usually provided in rolls with a width of 5,1 m and a length of 40 m. Rolls can be also offered in other dimensions, depending on customer needs. The range of possible widths is 1 m to 5.1 m, and they can have the length specified by the customer. Average roll diameter is approximately 60 cm, and the weight is approximately 1000 kg. Eurobent GCL are wound on plastic tubes with an inner diameter of 100 mm. Every roll is packed in a plastic UV resistant sleeve.

Eurobent supplies a 20 kg bag of bentonite powder for each roll 5,10 x 40 m. For rolls with prefabricated overlaps we supply one bag to every 3 rolls. The bag is meant for application in the overlapping areas.

Each roll is equipped into a set of two belts. It is recommended while unloading from the truck to put a steel pipe inside to prevent bending of the roll.



SUPPLY, PACKAGING AND LABELLING

UNLOADING, STORAGE AND TRANSPORTATION

05

5. UNLOADING, STORAGE AND TRANSPORTATION

Unloading

The party directly responsible for unloading the rolls should refer to this manual prior to arrival of the material in order to make sure they have proper unloading equipment and know the procedure. The unloading and on-site handling should be appropriately supervised. During the unloading procedure all material lot and roll numbers should be recorded and compared to the packing list. In addition, each roll of GCL should also be visually inspected to determine if there is no perforation in the packaging or other visual material damage.

Accumulation of some moisture within roll packaging is normal and does not affect the product quality.

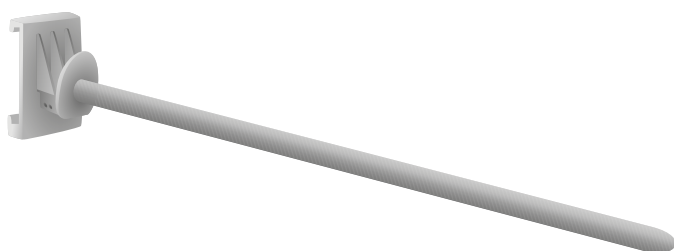
The exact nature and extent of the damage should also be indicated on the CMR / Bill of Lading along with the specific lot and roll numbers of the damaged materials. Photos of the damaged goods on the truck are required.

Unloading the truck at the construction site is carried out either by forklifts, wheel loaders, excavators or by means of built-in truck cranes.

A suitable crossbeam can be used also for the unloading. The crossbeam pipe (with a maximum diameter of 8 cm) is thrust through the core of the rolls and attached at the ends with chains, belts or ropes to the crossbeam. The unloading is carried out upwards.

If there is no crossbeam available, at least 2 belts are wound around the rolls. The unloading is carried out smoothly upwards or laterally via e.g. crane.

Another unloading option is a forklift, to which a stable mandrel is attached. The truck is unloaded from the back in this manner. Under no circumstances should the rolls be dragged from the truck since the geosynthetic clay liner may be damaged significantly.



The GCL may also be delivered in shipping containers. In these cases, different unloading equipment and techniques must be employed. Because of limited access to the GCL rolls, it is usually necessary to utilize an extendable-boom forklift with a pole carpet (stinger) attachment.

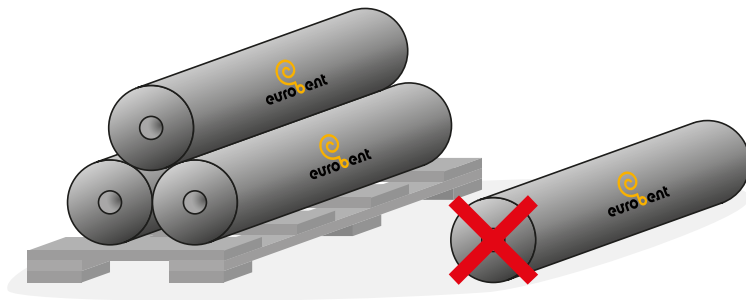
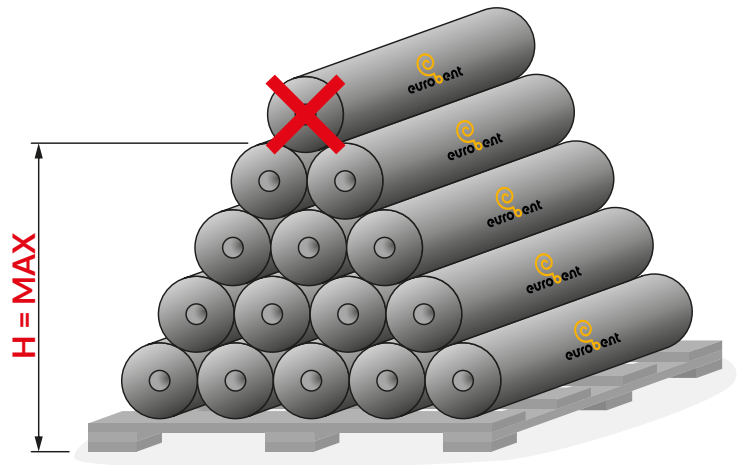
The rolls are removed by inserting the stinger through the roll cores and lifting/pulling the rolls from the container. To each container we add several loading straps - thanks to that rolls can be tied up - it makes it easier to remove the rolls from the container.

Storage

The GCL may be stored at a project site indefinitely, provided that proper storage procedures are followed.

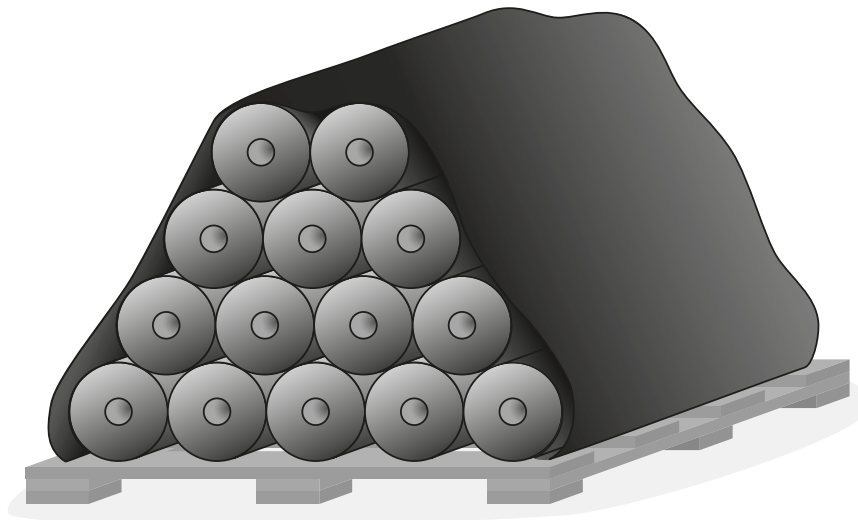
Firstly, a dedicated storage area should be identified. This area should be leveled, dry, well drained, and located away from high-traffic areas of the job site. In the warehouse and on site, bentonite mats should be placed on underlying material (wooden beams, pallets, plastic profiles etc.) to avoid unnecessary material wetting by rain during storage.

Rolls should not be stacked in more than 4 rolls high.



Long-term storage of material in a warehouse or on a construction site requires periodic inspection of the condition of the packaging. The polyethylene sleeves of the GCL rolls should be examined for any obvious rips or tears. Sleeve damage should be repaired immediately with adhesive tape or additional plastic sheeting. At this point it is also recommended to examine the labels - if they were displaced in transit, they should be taped to the roll.

EUROBENT should not be directly exposed to the elements during the storage. Cover all rolls with a plastic sheet or a tarpaulin. Do not remove the plastic sleeves prior to installation.



NOTE:

The temperature of the surrounding environment has no degrading effect on the quality of EUROBENT mats even when stored for long periods.

AFTER DELIVERY INSPECTION

06

6. AFTER DELIVERY INSPECTION

1. Each roll shall be visually inspected when unloaded to determine if any packaging or material has been damaged during transit.
2. Repairs to damaged GCL shall be performed in accordance with installation manual:
 - a. Rolls with visible damage shall be marked and set aside for closer examination during deployment.
 - b. Minor rips or tears in the plastic packaging shall be repaired with moisture resistant gluing tape prior to being placed in storage to prevent moisture damage.
 - c. GCL rolls delivered to the project site shall be only those indicated on GCL manufacturing internal test reports.
 - d. In the case of GCL, the presence of flowing water in the package requires the removal of water from the roll package. Free flowing water in the packaging of unreinforced GCL is not a reason to reject the roll.

Take care to maintain the integrity and legibility of the labels on the rolls.



AFTER DELIVERY INSPECTION

**EQUIPMENT
RECOMMENDED
ON SITE**

07

7. EQUIPMENT RECOMMENDED ON SITE

The CQA inspector shall verify if there is appropriate equipment for handling, that does not pose a risk to the installation personnel nor a risk of damage or deformation to the liner material itself. Appropriate handling equipment is described below:

1. Spreader Bar Assembly – a spreader bar assembly shall include both a core pipe or bar and a spreader beam. The core pipe shall be used to uniformly support the roll when inserted through the GCL core while the spreader bar beam will prevent chains or straps from chafing the roll edges;
2. Stinger – a stinger is a rigid pipe or rod with one end directly connected to a forklift or other handling equipment. If a stinger is used, it should be inserted to its full length into the roll to prevent excessive bending of the roll when lifted;
3. Straps – a properly structured and supported pole or “carpet puller” can be used to unload GCL Rolls onsite. As an alternative, straps with appropriate lifting capacity, located across the roll, can be used as one of the method of lifting and unload GCL rolls;
4. Excavator (tracked or wheeled) or front-end loader. Equipment should be suitable for the anticipated load;
5. Sealing paste - EUROPASTE preferred;
6. Carpet knife or safety knife;
7. Felt pens or other pens to write on geotextiles;
8. Measuring tape;
9. Broom;
10. Tape;
11. Geomembrane welding machine.



PERSONAL PROTECTIVE EQUIPMENT

08

8. PERSONAL PROTECTIVE EQUIPMENT

Respiratory, eye, hand and body protection may be recommended when working with EUROBENT GCL. Safety is key, so taking the necessary safety precautions is a must.



Safety Eye protection



Dust mask



Safety Hazard Clothing



Glove



PERSONAL PROTECTIVE EQUIPMENT

QUALIFICATION FOR INSTALLER

09

9. QUALIFICATION FOR INSTALLER

Recommendations:

The installation team must be familiar with EUROBENT installation guidelines and be trained in GCL installation.

Installer shall have experience installing GCLs on at least 5 projects and have installed a minimum of 500 thousand m² of GCL materials.



The manual is based on experience and standards:

- The suitability of the materials used as documented by certificates and statements from authorized testing institutes.
- Documentation of the specific attestations or delivery notes of the materials used at the construction site.
- Control during the execution itself according to the manufacturer's technology:
 - visual inspection of the underlayment before the actual installation,
 - visual inspection of the connections with inspection of the width of the coverage of the EUROBENT bentonite mats,
 - visual inspection of detail workmanship,
 - step-by-step handing over of the insulation system as a covered structure before installation of the following layers.



WEATHER CONDITIONS FOR INSTALLATION

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10. WEATHER CONDITIONS FOR INSTALLATION

Light rainfall should not affect the EUROBENT installation provided that the deployed panels are covered and protected with 300 mm of topsoil (or equivalent) within 2 hours of first contact with light rain. During heavy rainfall EUROBENT panels shall be covered with a tarpaulin or plastic sheet if there is not enough time to complete the top layer deployment on the mat.

Avoid placing EUROBENT panels in areas where water runs off unless the panels can be immediately covered (with 300 mm soil cover or equivalent).

In the event of EUROBENT GCL gets wet before it is covered, it is best to contact Eurobent team to determine if the GCL may still be useful. It depends on the degree of swelling of the bentonite inside the mat.



Before reinforcement placing, sweep away puddles and place wide boards in places of high human traffic.

It is possible to walk on wet bentonite mats during reinforcement placing, but this should be minimized as much as possible. After the reinforcement placing, i.e. before foundation plate concreting, standing water may be sucked off, or left and eliminated during concreting.

Special care must be taken to ensure that the panels have not shrunk, thereby reducing the overlap area. If this is the case the overlaps must be filled in following the guidelines of the repair section GCL of this manual.

As demonstrated by freeze-thaw, and heat and rain tests, GCL does not change its properties under their influence.

SUBGRADE PREPARATION

11

11. SUBGRADE PREPARATION

Horizontal surface

1. The horizontal waterproofing EUROBENT system is placed on the concrete base or compacted fine sand (fine-grained gravel) with grain size less than 4 mm.
2. The concrete base must be flat, free of sharp projections larger than 5 mm. Before acceptance and placement, the concrete surface must be swept clean, i.e. free of dirt, stones, surface water (puddles, standing water, snow etc.) or other soil. The space where the waterproofing is installed will be closed to the customer until the partial delivery.
3. Sharp edges and outer corners must be bevelled (chamfered) under 45° to form a surface at least 3.0 cm wide. Inner corners must be rounded (chamfered) or filleted under 45° to form a surface at least 3.0 cm wide, except for cases when the bentonite mat is inserted right into the external formwork – see Detail No. 3 (foundation plate with extension to the vertical formwork).
4. Projections higher than 5 mm must be cut (grounded), if possible to the concrete surface level.
5. Rough concrete base structure with pores over 20 mm must be levelled using cement grout with the necessary strength depending on the structure load.
6. Surface depressions (flatness) with a slow “buckling” not greater than 1 : 5 do not affect the waterproofing quality. Depressions at piles or above the pile head should be assessed individually depending on their size and depth under the concrete base level. The waterproofing must be in contact with the concrete base, either by levelling this place to the concrete base level (the material used should be consulted with the structural designer), or by creating a slow, splayed surface between the concrete base and pile surfaces sloped at 1 : 5.
7. Install the peripheral foundation plate formwork where the waterproofing is anchored at about the foundation base height, at least at 20 cm.
8. Acceptance of the subgrade for waterproofing placement must be recorded in the building log.
9. Partial work acceptance by the customer must also be recorded in the building log.



Vertical surface

1. Installation on the soldier pile (wood lagging)

The subgrade consisting of timber and bearing steel I-profiles (braces) must form a continuous surface. Subgrade irregularities that might affect the work quality must be removed or at least minimized. For the most part, the following irregularities occur:

- a) Brace deflection: eliminate the I-profile and brace thrust by underlying geotextile thickening – use 2 geotextiles 500 g/m². If the thrust is greater than 15 mm, make slow splayed edges sloped at 1 : 5, or reinforce them with a reinforcing bentonite mat sheet, foil or metal plate. Assess these places and size of irregularities individually; have the solution approved and recorded in the building log.
- b) Irregularities less than 10 mm from the bracing timber thrust are eliminated using 500 g/m² geotextile over the whole surface. Irregularities under 15 mm should be eliminated by underlying geotextile thickening – use 2 geotextiles 500 g/m². If the thrust is greater than 15 mm, make slow splayed edges sloped at 1 : 5, or reinforce them with a reinforcing bentonite mat sheet. Staggers over 30 mm should be assessed individually and eliminated using Cetris boards or wooden boards with various thicknesses that will form a slow slope. This solution should be approved and recorded in the building log. Holes greater than 30 mm between the balks should be filled with concrete or suitable grout, holes less than 30 mm should be filled with insulation foam.
- d) In extreme cases of extensive irregularities, use shotcrete for levelling, or use wood-cement chipboards over the whole surface.
- e) Planar flatness is not decisive for waterproofing installation. Requirements of the cast-in-situ structure contractor must be followed to keep the minimum concrete cover thickness on the reinforcing iron as required by the structural designer.
- f) Any hollows behind the timber must not cause timber deformation during concreting, and if found, the hollows must be filled with concrete.
- g) Irregularities over 15 mm must be repaired by the building pit timbering supplier before starting the waterproofing installation.

2. Installation on the concrete wall

The concrete subgrade must be flat, with concrete structure under 5 mm, free of sharp projections and edges. Irregularities that might affect the work quality must be removed or eliminated. For the most part, the following irregularities occur:

- a) Concrete irregularities at formwork section contact points and at the concrete construction joint. Irregularities over 10 mm should be ground or levelled with cement grout.
- b) Formwork rod holes must be blinded, preferably with plugs.



SUBGRADE PREPARATION

GENERAL INFORMATION

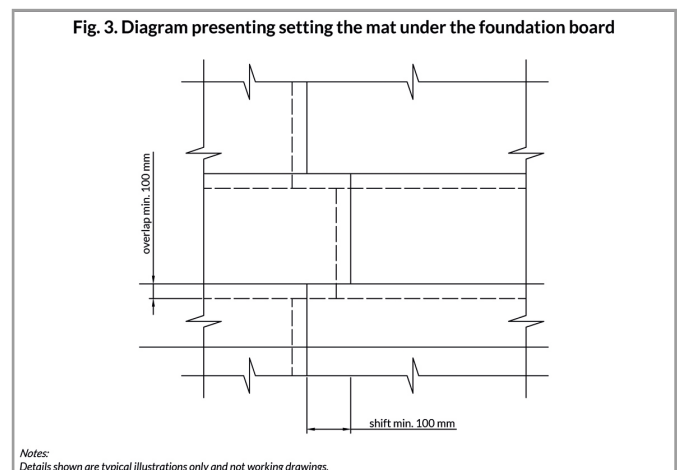
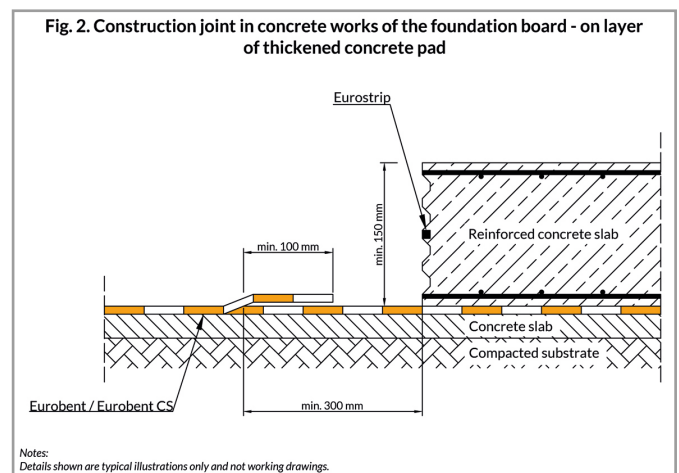
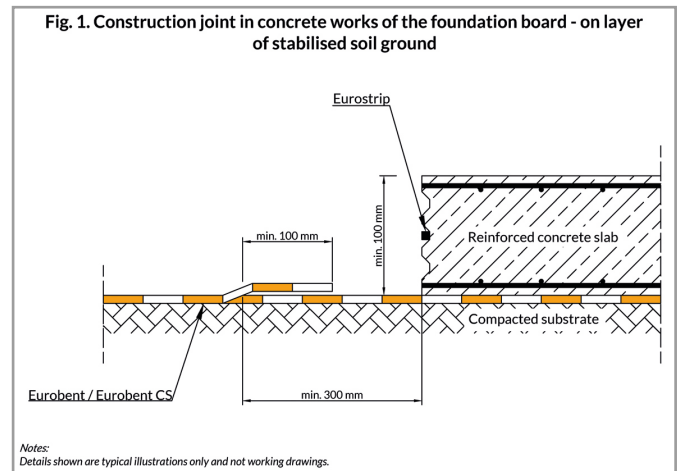
12

12. General information

EUROBENT is a mat consisting of three elements (two geotextile layers and a layer of bentonite) bound by needle punching process. Due to the used materials and as a result of the applied production technology, EUROBENT has a very good sealing and mechanic parameters. As a result of strong needle punching, the bentonite is so pressed between the geosynthetic materials that, upon installation of the mat, it cannot swell freely. This is why the hydrated mat, e.g., in an excavation, can increase its thickness only slightly. Apart from that, in case of mat damage during works or upon their completion, the damaged spots are closed and sealed automatically due to the bentonite's self-healing properties. Another feature resulting from the applied technology and materials is the lack of dislocation of bentonite inside the liner. Furthermore, the bentonite cannot be flushed out. The outcome of the above properties is the possibility to install the liner even in difficult atmospheric conditions. Due to the use of geo-textiles, the material has great breaking strength and is resistant to significant deformation. EUROBENT CS is laminated with PE foil on one side.

EUROBENT (also CS) is designed to be used under reinforced concrete slabs, at least 10 cm thick - in case of its installation directly on thickened soil. If lean concrete is used as a substrate, thickness of the pressing reinforced concrete slab must be at least 15 cm. The mat is an insulation against water. EUROBENT/EUROBENT CS is used for erection of new buildings and in repair works. The order of works is as follows: prior to EUROBENT installation, it is necessary to prepare the ground in a proper manner. Lift pits, wells, chambers, board ribs and pile heads shall be insulated in advance, leading out EUROBENT overlaps from these elements for the purpose of continuous, uninterrupted insulation belt. During works, the desired size of the overlap must be controlled at the penetrations under the expansion joints, technological joints and continuous joints of the horizontal and vertical insulation.

EUROBENT is installed with its darker side facing the insulated element (e.g. in the case of insulation under a slab, with its darker side upwards). EUROBENT CS is laid with the foil facing pressing water side, e.g. in the case of foundation insulation - with foil from the ground side. The subgrade for EUROBENT (also CS) can be concrete substrate, stabilized soil ground, thickened soil or layer of thickened aggregate. The ground soil of aggregate layer must be levelled and thickened. In the case of thickened aggregate grounds, aggregate with variable continuous granulation and maximal grain size below 18 mm must be used. The ground can be moist and even wet. No offsets exceeding 5 mm are allowed. Unevenness is levelled by means of cement mortar or bentonite putty. In case of soil grounds, it is also possible to use sand.



HORIZONTAL SETTING

13

13. Horizontal setting

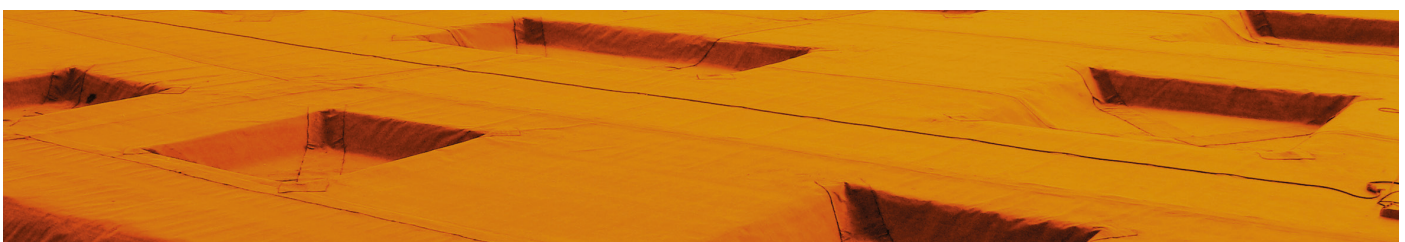
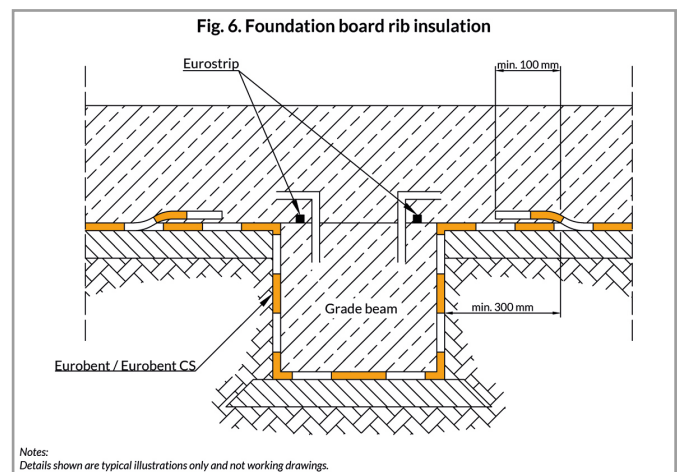
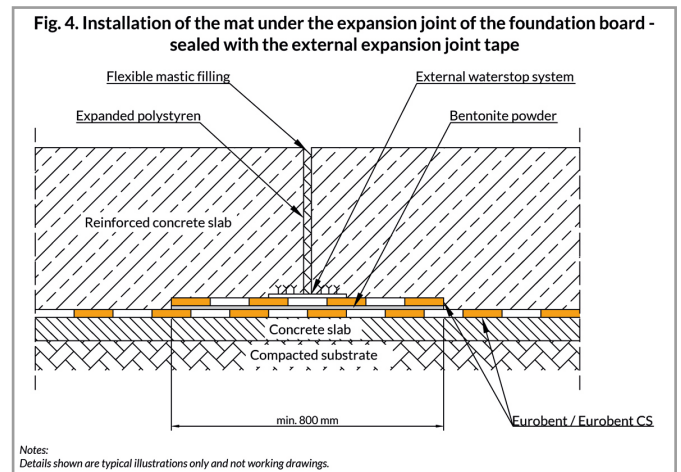
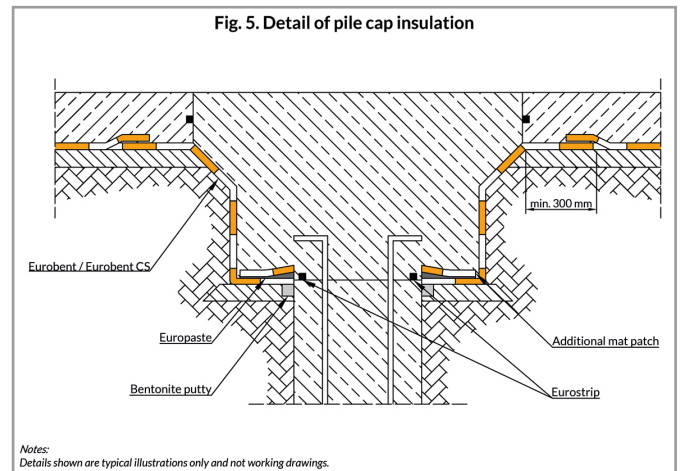
Under continuous footings or foundation board, EUROBENT (EUROBENT CS) must be set on properly prepared ground (fig. 1, 2). The adjacent panels must be set in longitudinal overlaps of min. 10 cm. The transversal overlaps of the ends of the panels must be shifted against each other by at least 30 cm (fig. 3). In order to provide protection against drawing apart or contamination of the overlaps, it is recommended to nail the mat to the ground along with overlaps by means of nails and washers during reinforcement and concrete works. The span between the nails must be 40 cm.

If the board is made in stages, EUROBENT from the previous stage must protrude at least 30 cm over the edge of the already set board. This will allow to make the overlap and provide proper connection with the insulation under the next board section. In case of installation of EUROBENT CS, the mat is set similarly, however the foil is peeled off from the mat within the overlap area. The overlap must have the foil-foil / mat-mat form (layers from the bottom).

In case of penetration under an expansion: it is recommended to set an additional mat strip, at least 80 cm wide (40 cm on both sides of the expansion joint), along the expansion joint (fig. 4). The GCL panel providing basic insulation must be led outside the expansion joint patch from above, protruding for at least 60 cm. EUROBENT (EUROBENT CS) does not provide sealing of the expansion joint breaks. All construction joints in concrete works must be secured with EUROSTRIP.

13.1. Pile caps and foundation board ribs

EUROBENT (EUROBENT CS) should not be installed directly on the piles. It must be properly cut in order to adjust it to the pile shape (fig. 5). Having EUROBENT set, the place of its contact with the pile must be covered with plenty of bentonite putty. A ring must be made from the putty around the pile with triangular cross section, catheti of which must be at least 5 cm long. On top of the pile, around the protruding reinforcement, set a continuous strap of EUROSTRIP. In the case of ribbed foundation boards, the entire rib must be covered with EUROBENT. This is made by lining the interior of the rib planking with EUROBENT prior to placement of reinforcement (fig. 6). At least 30 cm of excess EUROBENT material must be led out, allowing for further connection to the basic board insulation.



13.2. Lift pits

Lift pits and other types of building elements, located the deepest, must be carefully covered with EUROBENT from the soil side, providing continuity of insulation and binding to the basic horizontal insulation (fig. 7). In the cases where the walls of the lift pit excavation are stable, as much as necessary.

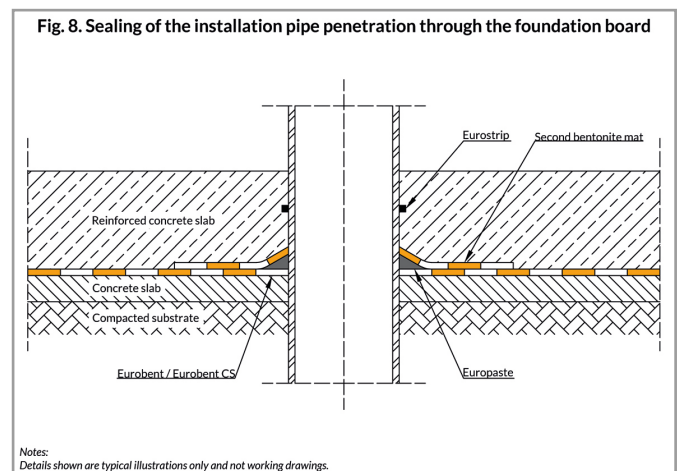
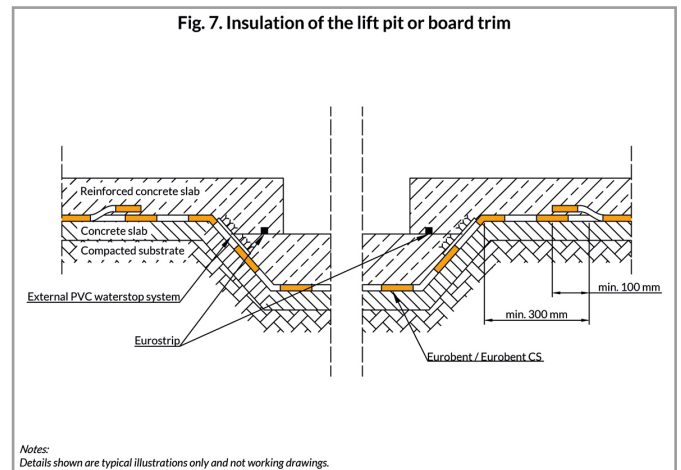
EUROBENT can be set directly on the soil. If the walls of excavation pit chip off, they must be planked and EUROBENT must be set on the retaining wall. A masonry wall or properly set concrete elements can also be used as a ground for EUROBENT bentonite mat. EUROBENT can also be fitted to the internal surface of the external wall formwork. In all cases, the GCL panel must be led out onto the horizontal surface for the purpose of proper connection to the basic board insulation. The width of the excess must be at least 30 cm.

EUROSTRIP stripes must be installed in all construction joints of the concrete works. In the case of water pressing, in addition to the EUROSTRIP tape, external polymer sealing tapes or injection hoses are often used. If the insulation route goes through vertical corners (inner and outer), the material must be set in such a manner that the vertical edge of the strap is located at the distance of at least 30 cm from the corner.

13.3. Installation penetrations through the boards

During installation of EUROBENT (EUROBENT CS), the shape of the penetrating duct must be cut out in the panel. The place of penetration on the entire circumference of the pipe or duct must be covered with bentonite putty (fig. 8). The putty must protrude over the duct and EUROBENT by ca. 4 cm. In order to secure this sealing, it is recommended to set an additional EUROBENT patch of size 80 x 80 cm (the size refers to pipes with diameter up to 400 mm). An opening must be cut in the patch, corresponding to the shape of the penetrating duct. Putty must be placed on the edges of the patch, between the proper insulation and the patch. It is recommended to nail the patch or cover it with putty.

In the areas where the board is penetrated by a group of ducts close to each other, cutting openings for each of them might prove impractical (fig. 9). It is then more beneficial to adjust the cut to the external circumference of the duct group and cover the space between them with a layer of bentonite granulate, at least 1 cm thick. All this must be finished with a thick layer of bentonite putty. In order to provide additional sealing, it is recommended to wrap the installation ducts with EUROSTRIP.



13.4. Transition from the horizontal insulation to the vertical surfaces

When the horizontally installed EUROBENT reaches the edge of the board, it must be flanged and fixed onto its formwork (fig. 10, 11, 12). Next, it must be cut, leaving at least 30 cm of spare material. After dismantling the formwork, the excess left will be used for the purpose of continuous connection with vertical insulation. The width of such an overlap should not be less than 10 cm. It is also acceptable to cut the EUROBENT led out to the vertical surface below the upper edge of the board. In such situation, in order to make the insulation continuous, vertical insulation of the walls must overlap previously made insulation, forming an at least 30 cm wide overlap.

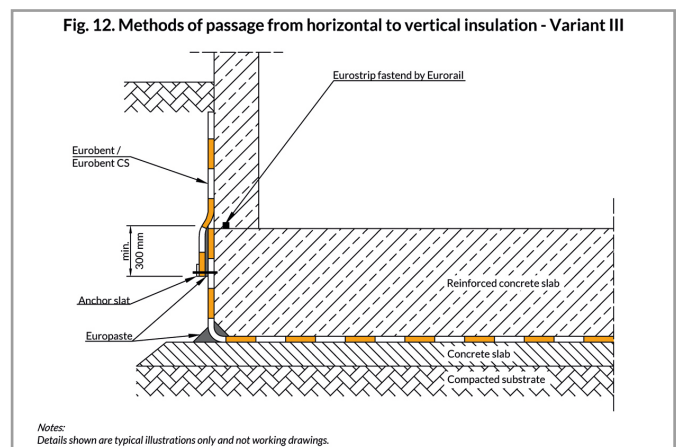
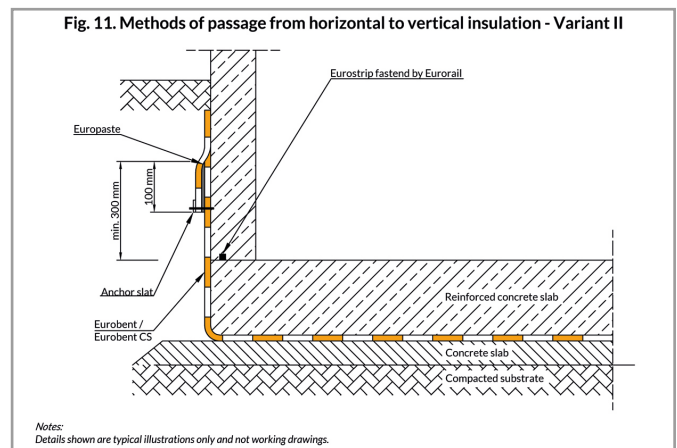
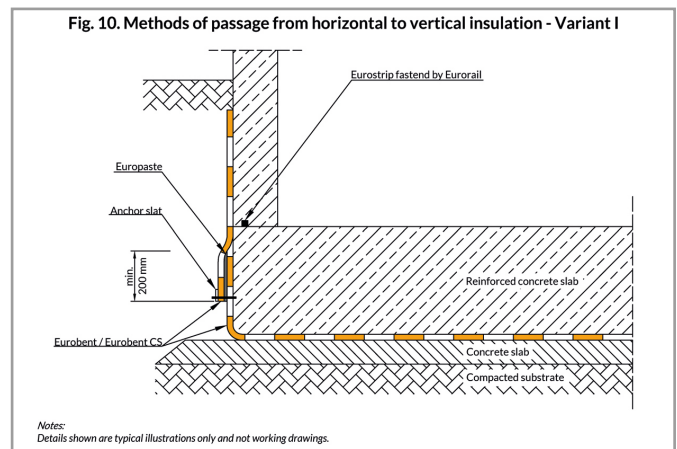
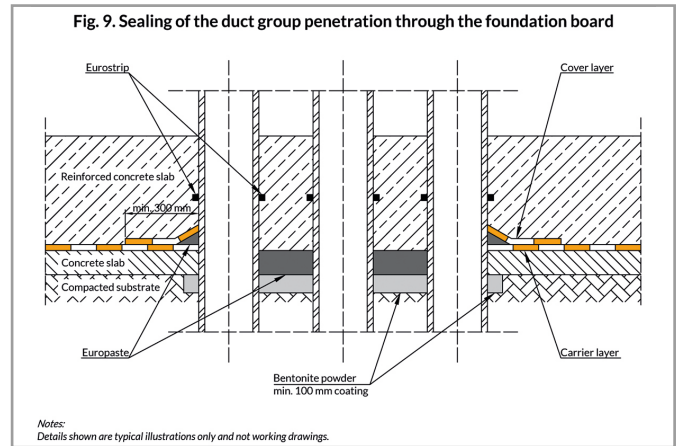
If the horizontal insulation flanged onto the formwork is damaged, or the insulation in the bottom corner of the board is damaged, proceed as follows: make a furrow in the ground, along the board edge, and fill it with bentonite granulate. The furrow size must be at least 10 x 10 cm (fig. 13). The bottom end of installed vertical panel of EUROBENT must be placed inside the prepared furrow filled with bentonite granulate.

In the corners EUROBENT must fully adhere to the ground and surface of the formwork. It cannot be stretched or protrude. In the inner and outer corners, the mat should be properly cut in order to adjust it to the corner shape. The cutting line must be abundantly covered with bentonite putty. If possible, set patches on these lines, nailing them or covering them with putty. The size of the patch must be sufficient to extend over the cut by at least 20 cm in each direction.

If the mat is not flanged onto the board formwork, it can be led out horizontally under the formwork, leaving at least 30 cm of spare material. In this case, special attention must be given to secure the mat against damage. The mat is then fixed to the vertical surface according to the instructions provided in the section 14.5 Structure coverage.

The mat is fixed to the formwork with a wire or nails. After dismantling the formwork, the fixing spot shall be treated with a putty and, if needed, fitted with patches. In the connection spots of the board and wall, along the entire circumference, install the EUROSTRIP bentonite tape. It is acceptable to use additional external sealing tape (fig. 14, 15, 16).

In the case of use the retaining walls, such as Berliner walls, sheet pile walls or pile walls, serving also as planking of the structure, EUROBENT set horizontally must be led out upwards onto the wall, with at least 30 cm over the upper surface of the board (fig. 17). It is essential to leave 30 cm of spare EUROBENT as there will be no access to the external edge of the board after it is covered with concrete. Another method, e.g. in the case of steel sheet pile walls, is to cut the EUROBENT set horizontally evenly with the corrugated wall surface (fig. 18). Then, in the spot of contact of EUROBENT and the wall, a triangular 4x4 cm plaster cove is made of granulate or bentonite putty. In the end, vertical panels of EUROBENT, properly cut on the bottom side, are fixed to the wall, with 30 cm overlap joints with the horizontally set EUROBENT.



VERTICAL SETTING

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14. Vertical setting

EUROBENT (EUROBENT CS) is also designed to perform insulations of vertical surfaces of underground parts of buildings. It can also be used as a moisture protection. EUROBENT CS is used for erection of new buildings and during renovation works. In the first case, the mat is set in traditional manner on the already prepared structure. It is fixed by nailing to the wall. The other method consists in fixing the mat to the surface of the external formwork of the foundation wall or fixed excavation cover development as well as coverage in concrete together with the wall. In such a case, the mat is bound with the structure element covered with concrete.

EUROBENT is installed with its darker side facing the insulated element. EUROBENT CS is set with its geomembrane from the side of pressing water, e.g. in case of insulation of foundations – foil facing the soil. The mat can also be installed on fresh concrete, directly after wall planking. The order of works is as follows: clean and prepare the ground prior to installation of EUROBENT. Next, the mat is laid. Remember to set the mat with overlaps with the already made horizontal insulation in such a manner as to create a continuous, uninterrupted insulation layer. During works, pay attention to preservation of the desired size of the overlap at the penetrations through expansion and construction joints.

14.1. Surface preparation

The surfaces of the walls must be smooth and durable enough, free from sharp concave and convex spots that could damage EUROBENT after it is pressed with the soil filling the excavation. Sharp protrusions (over 1 cm) must be removed and levelled with the wall surface. Sharp edges of the outer corners must be chamfered. Trims and unevenness must be filled with cement mortar or bentonite putty.

Holes created after removing ties must be filled with shrink-free cement mortar and covered with bentonite putty. When filling the opening for the purpose of additional sealing, use EUROSTRIP (fig. 19). Fragments of the strip are placed between the filling mortar layers, with the strip lagged by the putty of min. 7.5 cm. Offsets and other elements must be thoroughly cleaned, so that the EUROPASTE and EUROBENT have direct contact with the surface.

Fig. 13. Providing continuance of the horizontal and vertical insulation by means of setting in the groove filled with bentonite granulate

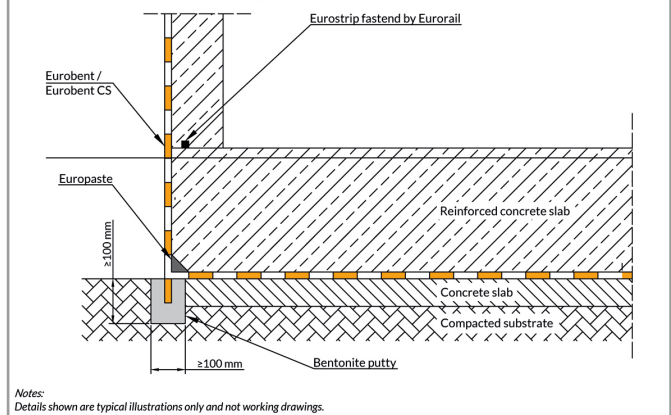


Fig. 14. Passage of the horizontal insulation onto the foundation wall in case of a board with offset - Variant I

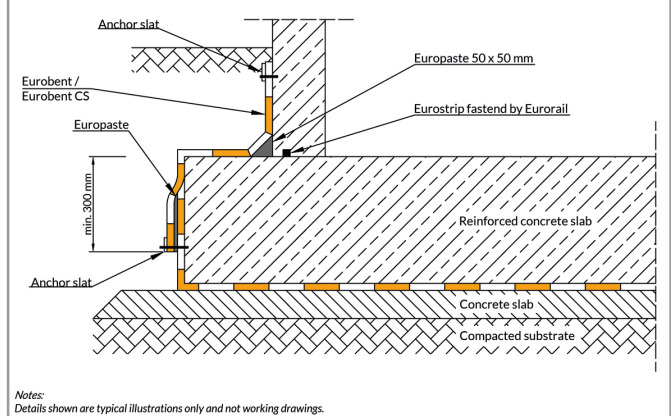
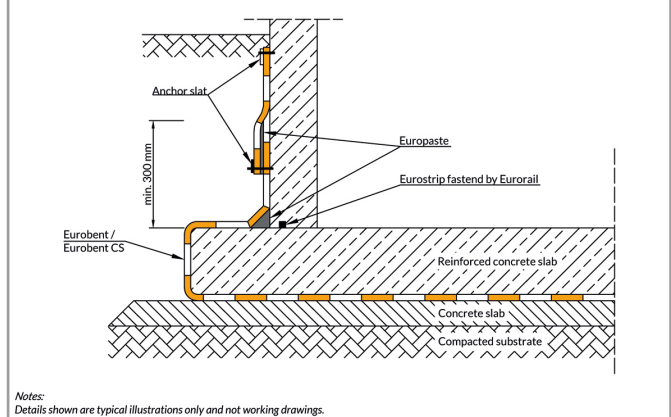


Fig. 15. Passage of the horizontal insulation onto the foundation wall in case of a board with offset - Variant II



14.2. Installation

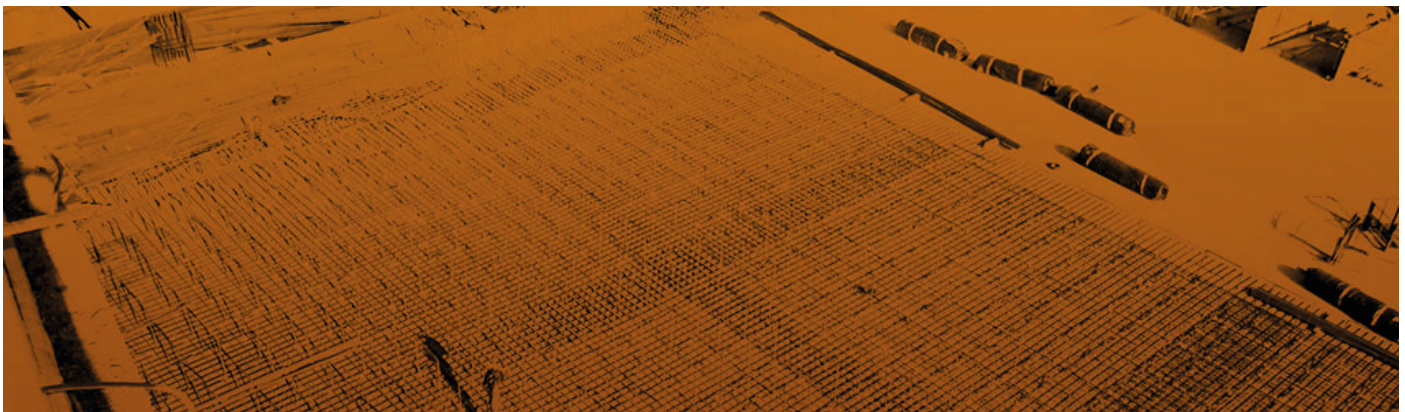
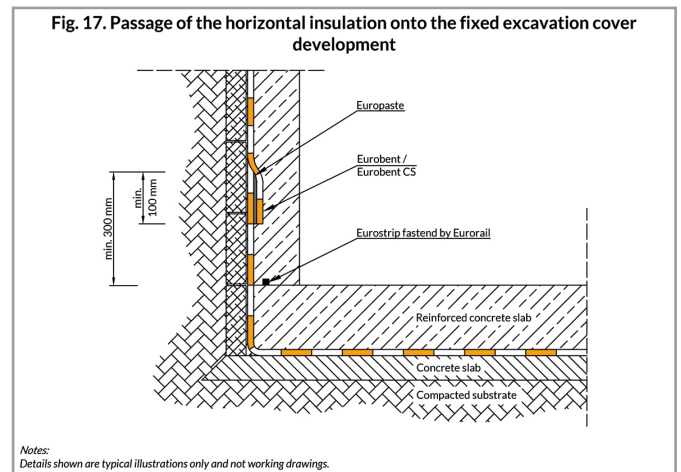
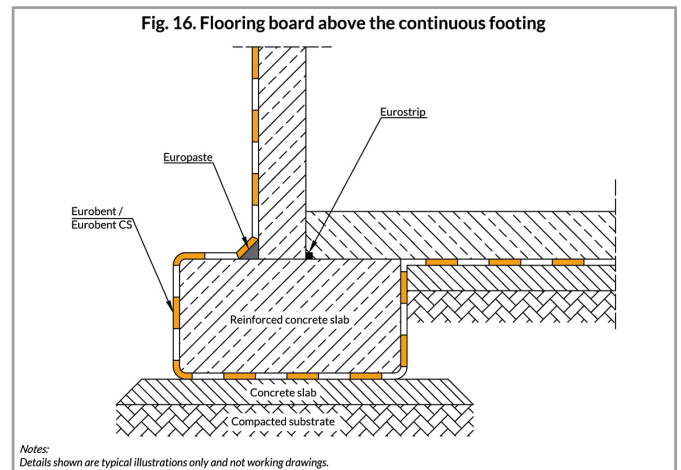
EUROBENT is fitted to the foundation walls by nailing or by using wall plugs with washers. The mat is nailed along the overlaps and the distance between the fixing elements must be 30-40 cm. The inner corners (e.g. in the place of the plinth at the contact spot of the wall and foundation bench) must be covered with bentonite putty, forming a rounded facet. The GCL panels can be set horizontally or vertically. The EUROBENT installation starts from one of the external wall corners. In each case, the mat edge must protrude over the inner or outer corner by at least 30 cm. In the corners, EUROBENT must adhere closely to the ground. It cannot be overstretched or protrude. In order to adjust the shape of the corner, the mat can be cut. The cut places must be abundantly covered with bentonite putty. It is recommended to place a patch in the corner, fitting it by means of putty or nails. It is necessary to place patches in the outer corners. The patch size must be sufficient to overlap the cut by at least 20 cm in each direction.

The next panels of EUROBENT must be set in overlaps, of min. 10 cm. The width of the overlap on the connection with the already installed vertical insulation with excess material led out of the horizontal insulation must not be less than 10 cm, in certain situations - 30 cm (as shown in the proper drawings). The EUROBENT overlaps in the consecutive rows must be shifted against each other by at least 30 cm. They must be made in a manner preventing folding or contamination during coverage with concrete or aggregate.

In case of horizontal installation of EUROBENT panels, after laying the row, fill the foundation excavation, creating an installation bridge for the consecutive higher panels. The material filling the excavation must be properly thickened.

If the GCL is set in direct contact with the gravel aggregate of the drainage systems, it is necessary to use EUROBENT CS. In the case of installation of EUROBENT CS, the mat is set similarly, however the foil is unstuck from the mat in the overlap area. The overlap must have the foil-foil/mat-mat layout (layers from the outside) (fig. 20). Upon consultation with the manufacturer or distributor, it is possible to make the overlaps as in case of the mat without the foil (EUROBENT), i.e. without peeling off the foil from the mat.

In the case of setting of EUROBENT patches on the proper insulation, it is recommended to treat the edges with paste and then fix the patches with nails.



VERTICAL SETTING

14.3. Installation penetrations through walls

The procedure is almost identical as in case of penetrations through horizontal insulation. The shape of the penetrating duct must be cut out in it, and the place of contact on the entire circumference of the pipe or duct must be covered with bentonite putty. The putty must protrude over the duct and EUROBENT by ca. 4 cm (fig. 20). In order to secure this sealing, it is recommended to place an additional GCL patch, size 80 x 80 cm (the size refers to pipes with diameter up to 400 mm). An opening must be cut in the patch, corresponding to the shape of the penetrating duct. Putty must be placed on the edges of the patch, between the proper insulation and the mat. It is recommended to nail the patch or cover it with putty. In the areas where the board is penetrated by a group of ducts close to each other, cutting openings in EUROBENT for each of them might prove impractical. It is then more beneficial to adjust the cut to the external circumference of the duct group and cover the space between them with a layer of bentonite putty, at least 2 cm thick (fig. 21). In order to provide additional sealing, it is recommended to wrap the installation ducts with swelling EUROSTRIP tape.

14.4. Finishing at the ground surface

Prior to installation of the last panels of the GCL, it is necessary to support the wall with moisture insulation led over the ground level. Overlap between EUROBENT and the insulation must be at least 15 cm. Installation of EUROBENT on the wall must be finished at the depth of ca. 20 cm below the ground level. Within the area of the overlap with moisture insulation, the wall must be covered with bentonite putty, forming a 5 mm thick layer. Then, fit linearly the upper edge of the mat by means of anchor slats. The upper edge of EUROBENT and the slat must be covered with a layer of bentonite putty (fig. 22). Details of finishing treatment are presented in corresponding drawings.

14.5. Structure coverage

The mat shall be covered in stages, along with completion of the particular stages of works. The fill must be made in layers of 20-30 cm, carefully thickened. The thickening of the particular layers must be controlled (recommended density level of at least ID 0.8). The fill can be made of any soil approved by the supervision, with the following restrictions. The material used must be a non-cohesive soil, it must have variable continuous granulation and cannot contain rubble, sharp stones, roots, etc. It is not recommended to use soil with high calcium content. The maximal grain size is 25 mm. In case of mat damage during covering, the damaged spot must be immediately cleaned and repaired. Use of the EUROBENT mats (EUROBENT CS) does not require any pressing walls or mats, or other protective elements.

Fig. 18. Connection of the horizontal and vertical insulation set on sheet piles

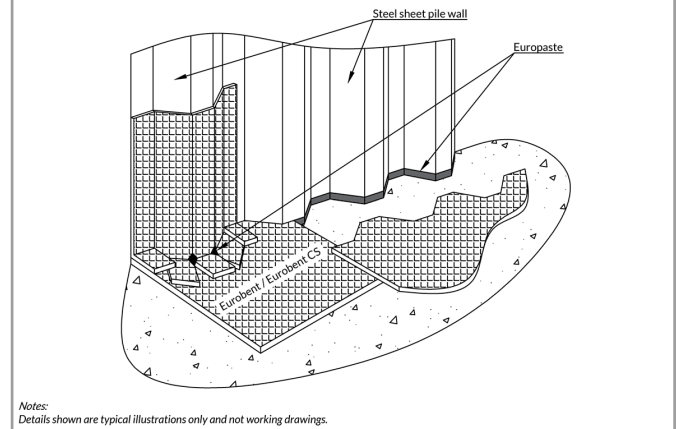


Fig. 19. Sealing detail in the area of openings remaining after framework stays

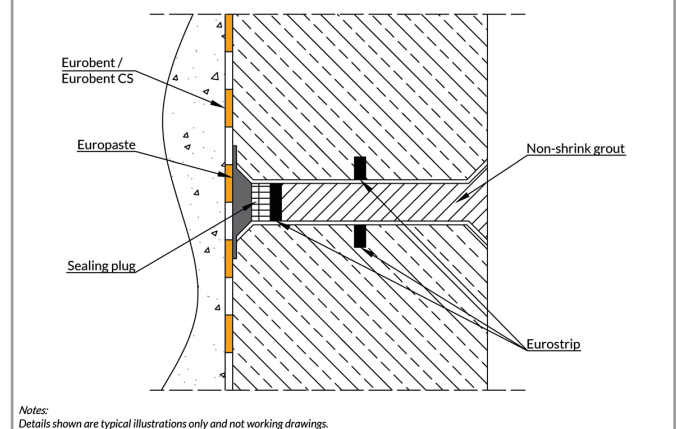
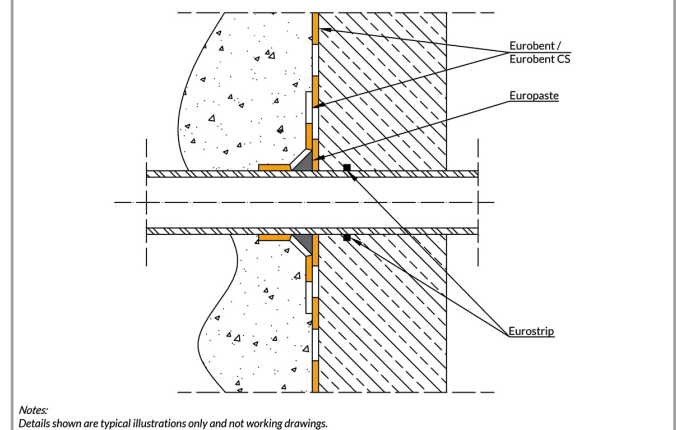
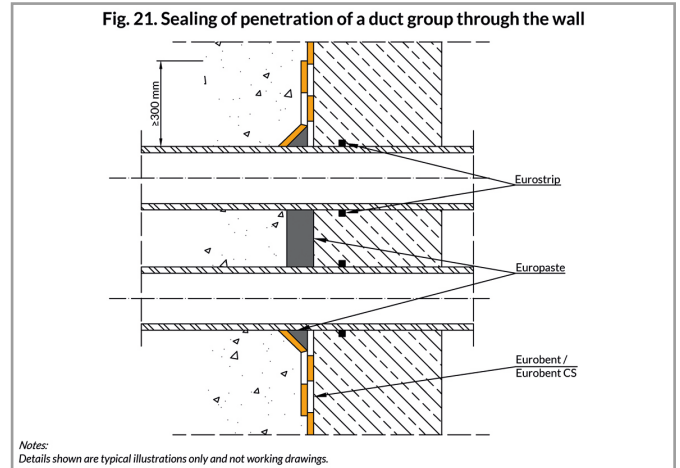


Fig. 20. Sealing of the installation pipe penetration through the foundation wall



14.6. Masonry walls

If lime or cement-lime mortar is used for masonry works, it must be removed up to the depth of 2 cm. The resulting grooves as well as entire surfaces must be levelled by means of cement mortar. Further installation must be conducted according to the instructions provided in previous paragraphs, and in the case of masonry walls, it is recommended to use EUROBENT CS.



VERTICAL SETTING

INSTALLATION ON FIXED EXCAVATION ENCLOSURES

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15. Mat installation on fixed excavation cover developments

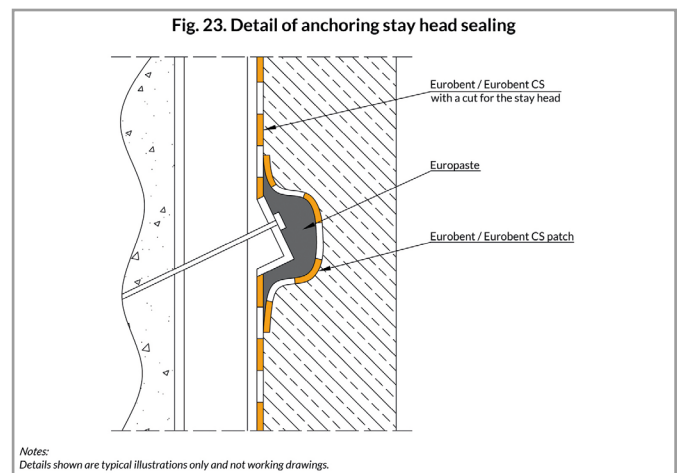
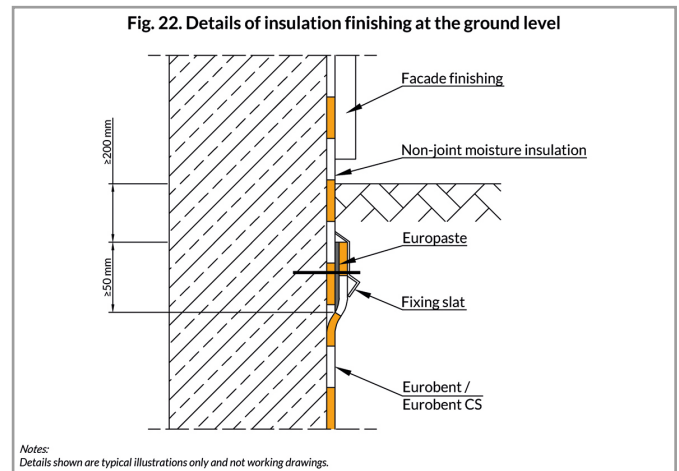
The use of construction methods described in this section allows to erect structures with external dimensions almost equal to the building plot dimensions.

EUROBENT is the most effective solution to provide water insulation for the building when the housing of the foundation trench serves also as the structure planking. These are Berliner walls, steel sheet pile walls, cavity walls, drilled pile walls, etc. In the particular cases, it is necessary to refer to the corresponding points of this section, containing information regarding ground preparation and detailed installation instructions. Similarly to housing of the foundation trench, the mat is installed performing as an insulation of the underground parts of the buildings.

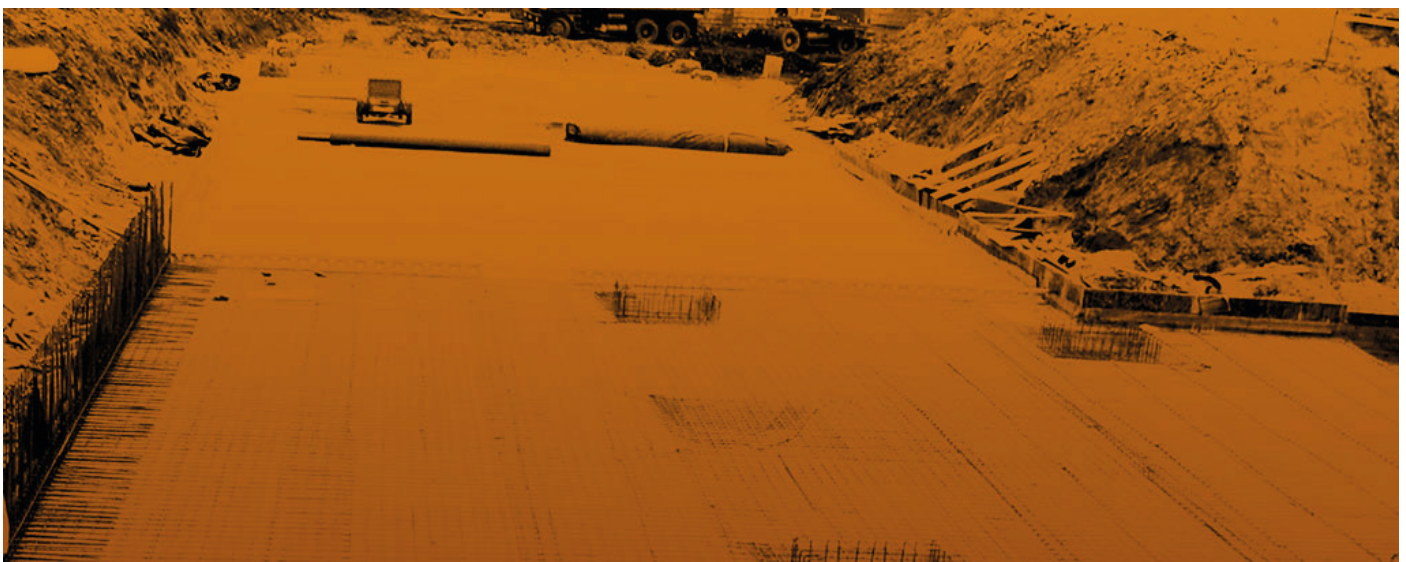
The adjacent bands of EUROBENT are set in overlaps of at least 10 cm, and fixed to the cover with nails or studs. It is necessary to nail the mat at least on the vertical and horizontal edges. The span of the fixing elements is ca. 30 cm. The overlaps in certain direction (horizontal or vertical) must be shifted against each other in such a manner that they are not drawn apart during concrete works. EUROBENT installed on vertical surfaces must be joined on overlaps with the mat led out from beneath the board. The width of the overlap on the joint of the vertical insulation with the excess material led out from the horizontal insulation cannot be less the 10 cm.

In order to provide penetration for the installation ducts and heads of the tie anchors through EUROBENT, proper cuts must be made in EUROBENT. After EUROBENT is carefully fitted, the contact spot must be covered with bentonite putty, filling the free spaces between the penetrating element and the mat. In the case of penetration of a group of ducts, cutting holes for the particular duct is improper. In such case it is necessary to make a cut corresponding to the external circumference of the duct battery, and the space between them must be covered with a layer of bentonite putty, min. 2 cm thick, reaching each pipe. In order to provide additional sealing, it is recommended to wrap the installation ducts with EUROSTRIP bentonite tape.

In the spots of penetration of the heads of the tie anchors, cut the mat in "x" letter shape. Then, the heads must be



covered with a layer of bentonite putty, at least 2 cm thick, protruding onto the EUROBENT by at least 5 cm (fig. 23). Place a patch cut out from a separate piece of EUROBENT onto the covered with EUROPASTE head, where the overlaps with the primary EUROBENT should be at least 20 cm. The overlaps and all cuts must be thoroughly covered with EUROPASTE.



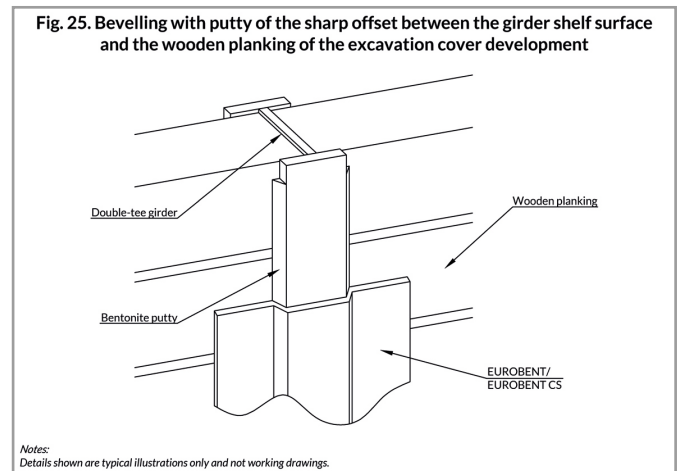
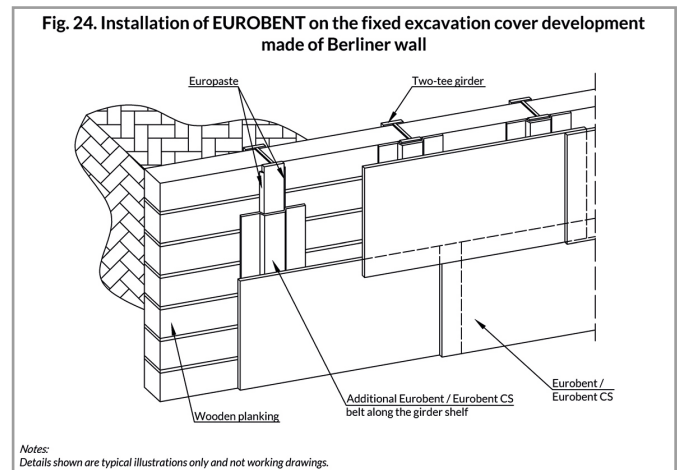
INSTALLATION ON FIXED EXCAVATION ENCLOSURES

15.1. Berliner walls

The spaces between the boards cannot exceed 2.5 cm. In the cases where they are wider, they must be filled with cement mortar. If a ground water penetrates through the planking, it is necessary to cover the planking with polyethylene foil, 0.15 mm thick, prior to setting of EUROBENT, or install EUROBENT CS. On surfaces with wider spaces between the boards (5-10 cm), install OSB type chipboards on their surfaces. The trims along the edges of the double T girder shelves and the board cover must be levelled by filling them with bentonite mortar.

The provided drawings present installation methods for EUROBENT with various planking positions in relation to the double T girder shelves (fig. 24, 25, 26, 27, 28).

Upon performance of the excavation, in the case of hollow spots or sharp protrusions exceeding 2 cm on the surface of the cavity wall, they must be levelled with the wall surface. Then, the surface must be evened with cement mortar. EUROBENT can also be set on vast, relatively shallow and mild concave surfaces of the wall. EUROBENT is installed on the prepared ground according to the instructions provided in p. 3.1. Set a pressing layer on the insulated surface.



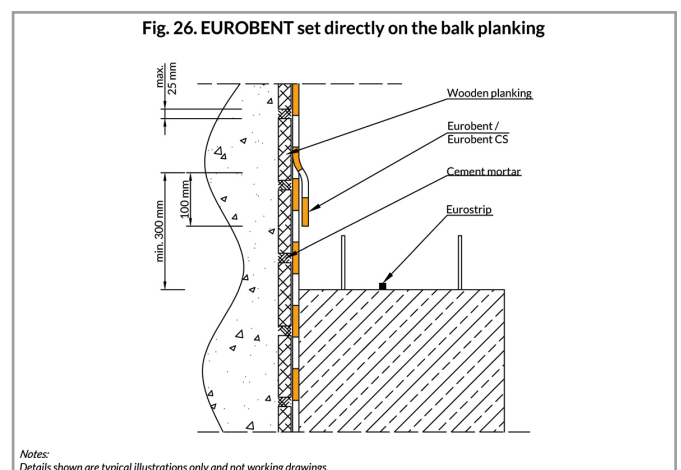
15.2. Steel sheet pile walls

All joints of sheet piles and tie anchor heads must be covered with bentonite putty (ca. 2 cm). In case of water leakage through the sheet pile joints, the water leakage must be stopped by means of bentonite putty or cement

mortar injection (fig. 29). EUROBENT is set on the wall surface according to the convex and concave surfaces and fixed to the sheet piles by means of gun-studding using large washers.

15.3. Drilled pile walls

Due to the significant unevenness of surface of such a structure, it is usually covered with a layer of sprayed concrete. Shotcrete, as the substrate for EUROBENT, can also be set directly on the vertical walls of the excavation if the soil type allows to do so (fig. 30). In all cases, EUROBENT must adhere to the ground on its entire surface: it is inadmissible, for instance, to fix it in convex places of the ground and stretch it over concavities. As in the other cases, here also: the more even the ground, the more efficient and simple the installation of EUROBENT is (fig. 31). Make a pressing layer on the insulated surface.



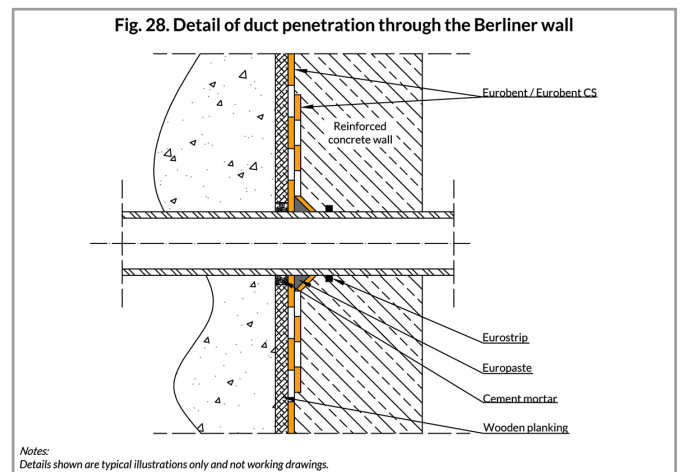
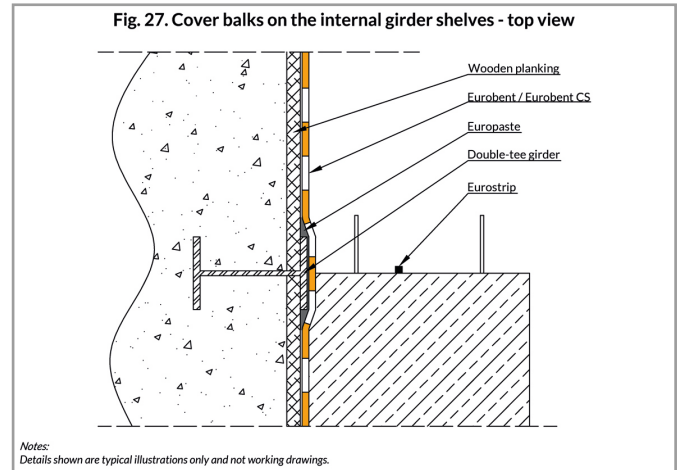
15.4. Variant with plywood planking

When choosing this variant, the ridges of the sheet piles are fitted with planking that will provide a substrate for the

set EUROBENT. The slits in the planking must be filled with cement mortar or bentonite putty.

15.5. Installation on foundation wall formworks

EUROBENT (EUROBENT CS) can be installed on the internal surface of the external foundation wall formwork and covered with concrete together with the structure. The mat is installed by nailing it to the formwork. The mat must be installed with surplus (along the bottom and one of the side edges), used to make overlaps in order to keep continuity of the insulation (e.g. with insulation led out from beneath the board). Then, the formwork board is transported to the place of installation. During concrete works and concrete binding, the mat is bound to the structure. After removing of the formwork, the mat is already installed. It is necessary to carry out a control of the overlaps. In order to secure them against drawing apart, the loose bands of the mat must be nailed to the structure and the nailing place must be covered with bentonite putty. The openings left after the fixing elements of the formwork boards must be filled according to the instructions provided in p. 3.1. The openings in the mat must be covered with EUROBENT patches, fitted with nails to the structure. If the upper edge of the mat is left loose, it must be fixed and finished properly. Proceed according to instructions from p. 3.1.



INSTALLATION ON FIXED EXCAVATION ENCLOSURES

TUNNELS AND SLAB ROOFS COVERED WITH SOIL

16

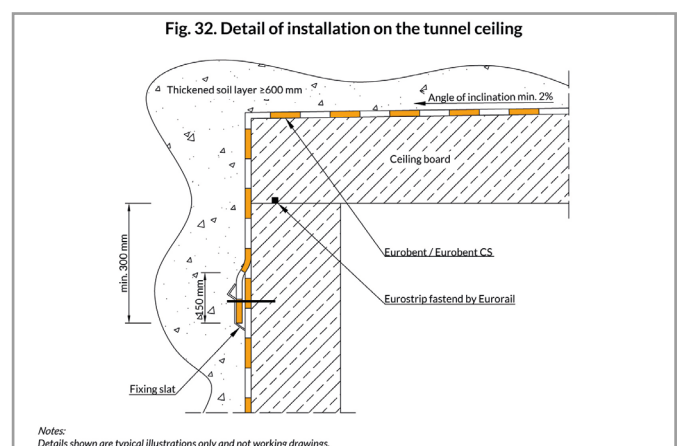
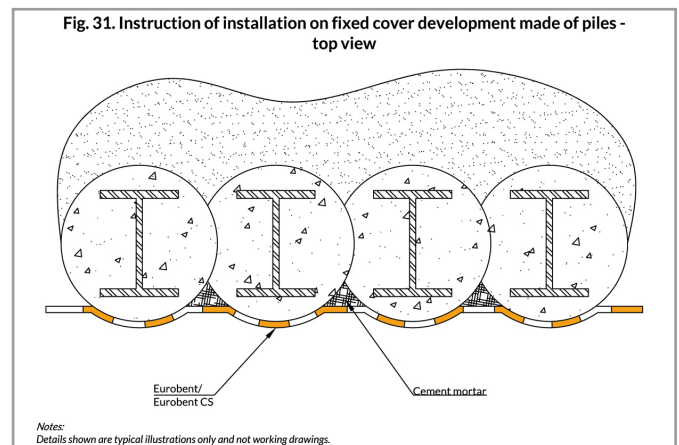
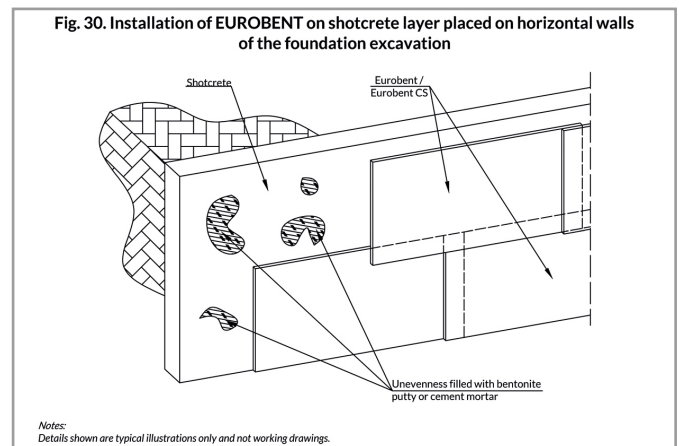
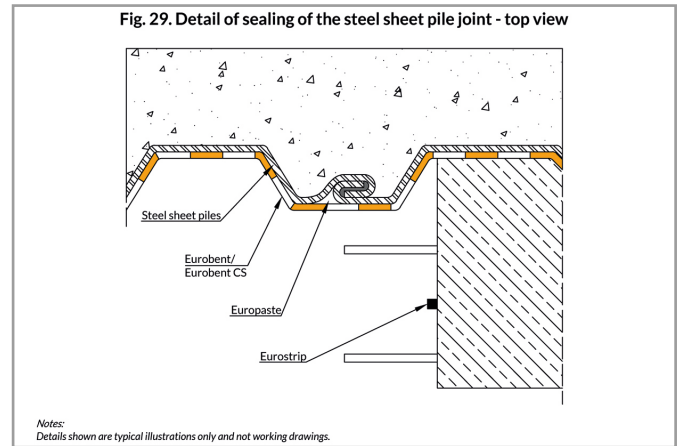
16. Tunnels and slab roofs covered with soil

This section covers the principles regarding execution of insulation of tunnels made in open excavations. In case of tunnels made by means of mining techniques, in order to develop the proper technology, consult the Manufacturer. It is recommended to use EUROBENT CS for the insulation of tunnel ceilings. The mat installed on the tunnel ceiling is continuation of the panels previously installed under the foundation and on the external walls. EUROBENT CS on the ceiling must be installed with the foil facing the soil. In the described application, EUROBENT requires pressing with a concrete layer, 20 cm thick, or thickened soil, 60 cm thick. Horizontal installation under the board and vertical insulation on the walls is discussed in points 2 and 3 of this catalogue.

In case of installation of EUROBENT CS on surfaces with slight inclination, prior to its setting it is necessary to distribute a layer of EUROBENT bentonite granulate, at least 3 mm thick, on the entire surface of the ceiling. Then, immediately proceed with setting the insulation (fig. 32).

Setting of EUROBENT CS is carried out from the lowest to the highest point, installing it transversely to the inclination, to obtain a tile system of the consecutive panels. The adjacent panels must be set in overlaps, min. 10 cm. In case of EUROBENT CS installation within the overlap area, the foil is peeled off from the mat. The overlap must have a foil-foil / mat-mat layout (layers from the top). Upon consultation with the Manufacturer or Distributor, it is admissible to make overlaps, as in case of mat without the foil (EUROBENT), i.e. without peeling of the foil from the mat. Transverse overlaps must be shifted against each other by at least 30 cm. In order to secure the overlaps against drawing apart or contamination, it is recommended to nail the mat to the ground along the overlaps, with nails with washers. Distance between the nails - 40 cm.

The mat set on the ceiling must be led out to the vertical wall surfaces. Its bottom edge must be located at least 30 cm below the contact spot of the ceiling and the wall. This insulation must be led out with at least 15 cm overlap onto the previously made vertical wall insulation. Direct motion of the equipment on the mat is inadmissible during refilling. When applying the pressing layer of soil or aggregate, it is necessary to use material with variable continuous granulation and maximal grain size below 25 mm. It is recommended to make a 5 cm concrete layer directly on the mat. Then, the next covering layers are set. In order to provide proper pressure and protection, it is necessary that the soil layer thickness is at least 60 cm. The pressing layer must be properly thickened.



OVERLAPPING

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17. Overlapping

One of the most important parts of the GCL assembly is connecting the individual panels together. In order to maximize the performance, the joints shall be made properly. Here we will focus on joining GCL CS panels to each other.

Two scenarios can occur during installation and assembly of the GCL CS:

In the first, we have the GCL laid with a geomembrane on the bottom.

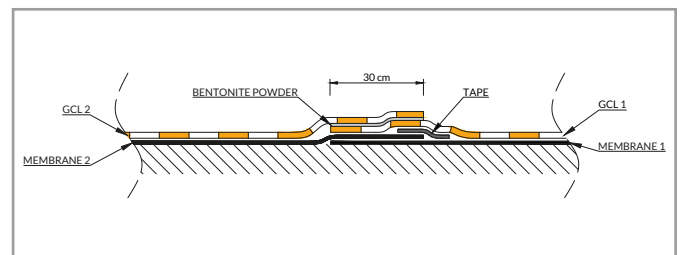
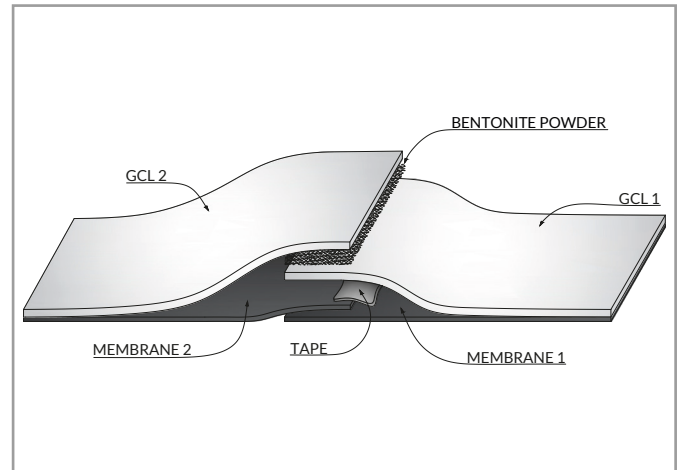
In the second, we have a GCL stacked with a geomembrane on top.



OVERLAPPING

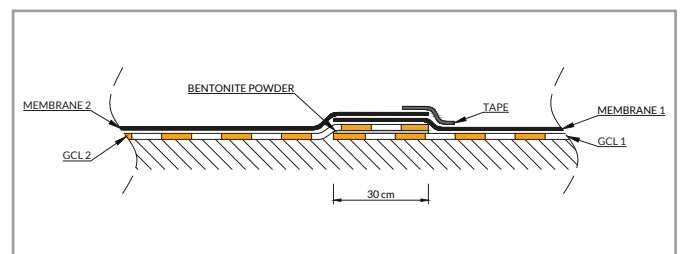
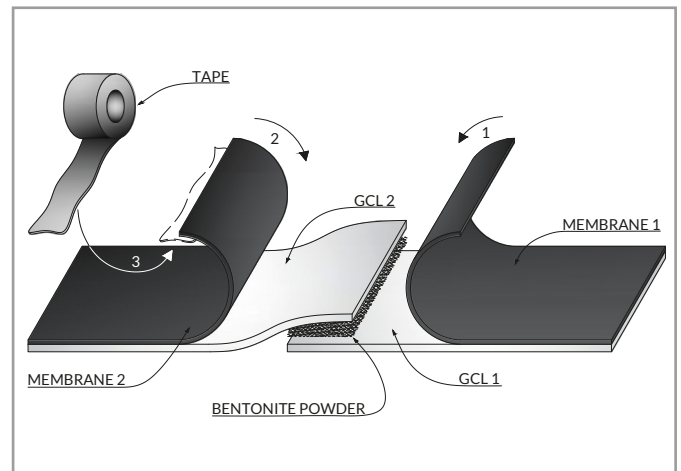
17.1. Geomembrane on the bottom

1. The GCL shall be folded so that the geomembrane can be visible.
2. The surface of the geomembrane shall be cleaned using acetone or similar preparation. This action secures the integrity of combining. Clean membrane surface before combining is a must.
3. The geomembrane of the panel 1 shall be covered with geomembrane of the panel 2, creating overlap.
4. The tape shall be placed along the line of contact, so that the half of the tape shall be on side 1 and the other half on the side 2 of the combining line.
5. After combining the geomembranes, left GCL shall be unfolded, covering the geomembranes.
6. The bentonite shall be poured on the edge of one panel (in this case panel 1).
7. The panel 2 shall be unfolded, covering the layer of bentonite and left panel.
8. Now the panels are ready for the next phase of the combining. There shall be some space without bentonite for the leister.
9. The overlap shall be leistered in order to secure the integrity of the combining, and avoid the separation.



17.2. Geomembrane on the top

1. To combine the two panels, the foil shall be folded. Both edges of the liner are not glued, so there shall be no problem with folding the whole panel (40m). The width of the glue-free margin is 300mm.
2. The bentonite shall be poured on the edge of one panel (in this case on panel 1).
3. The panels shall be combined by placing the panel 2 on the margin of panel 1. Between those two panels is a layer of bentonite. Now the panels are ready for phase two of combining.
4. The surface of the foil shall be cleaned with acetone or similar cleaning agent.
5. This action secures the integrity of combining. Clean membrane surface before combining is a must. The membranes of the two panels shall be overlapped in the same order. First the membrane from the panel 1 and then from the panel 2.
6. The tape shall be placed in the middle of the combining spot, so that the half of the tape shall be on a left side and the other half on the right side of the combining line.



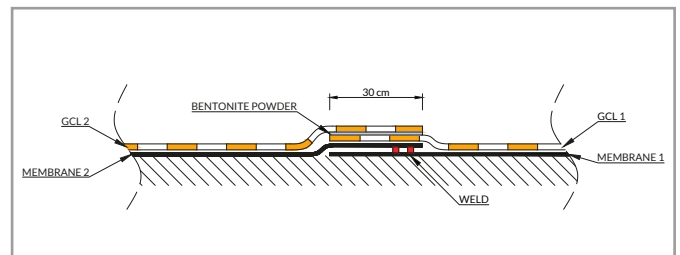
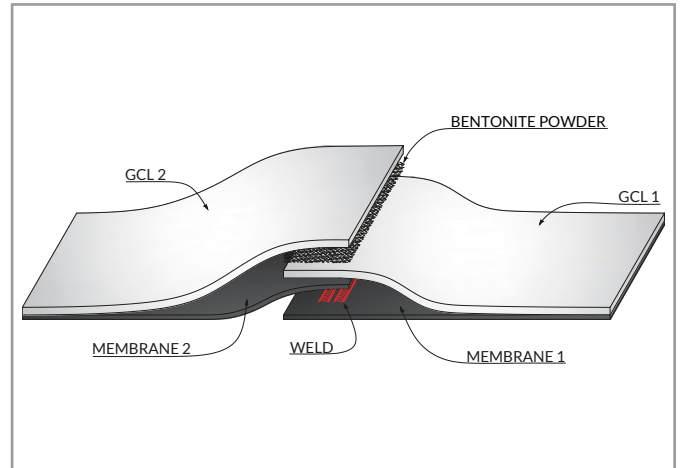
17.3. Geomembrane welding

When using GCL with a geomembrane that is thick enough to be welded (at least 0,5 mm), follow the instructions above with scenarios one or two. In principle, the steps for laying

the individual layers do not change, only the form of joining the geomembrane is different.

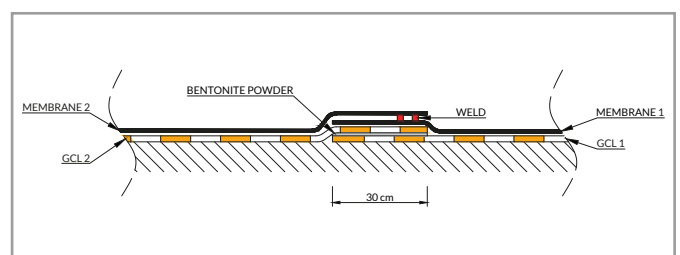
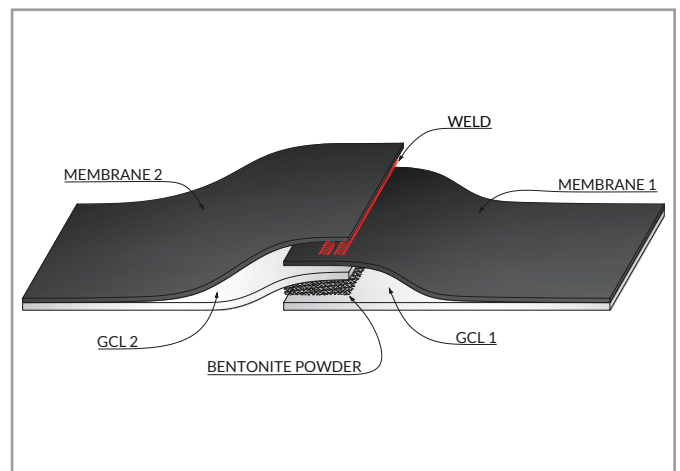
17.4. Geomembrane on the bottom - welding

1. The GCL shall be folded so that the geomembrane is visible.
2. The surface of the geomembrane shall be cleaned with acetone or similar cleaning agent. This action secures the integrity of combining. Clean membrane surface before combining is a must.
3. The geomembrane of the panel 1 shall be covered with geomembrane of the panel 2, creating an overlap.
4. Welding shall be done in accordance with geomembrane welding principles.
5. After combining the geomembranes, left GCL shall be unfolded, covering the geomembranes.
6. The bentonite shall be poured on the edge of one panel (in this case panel 1).
7. The panel 2 shall be unfolded, covering the layer of bentonite and left panel.
8. Now the panels are ready for the next phase of the combining. There shall be some space without bentonite for the leister.
9. The overlap shall be leistered in order to secure the integrity of the combining, and avoid the separation.



17.5. Geomembrane on the top - welding

1. To combine the two panels, the foil shall be folded. Both edges of the liner are not glued, so there shall be no problem with folding the whole panel (40m). The width of the glue-free margin is 300mm.
2. The bentonite shall be poured on the edge of one panel (in this case on panel 1).
3. The panels shall be combined by placing the panel 2 on the margin of panel 1. Between those two panels there is a layer of bentonite. Now the panels are ready for phase two of combining.
4. The surface of the foil shall be cleaned with acetone or similar cleaning agent.
5. This action secures the integrity of combining. Clean membrane surface before combining is a must. The membranes of the two panels shall be overlapped in the same order. First the membrane from the panel 1 and then from the panel 2.
6. Welding shall be done in accordance with geomembrane welding principles.



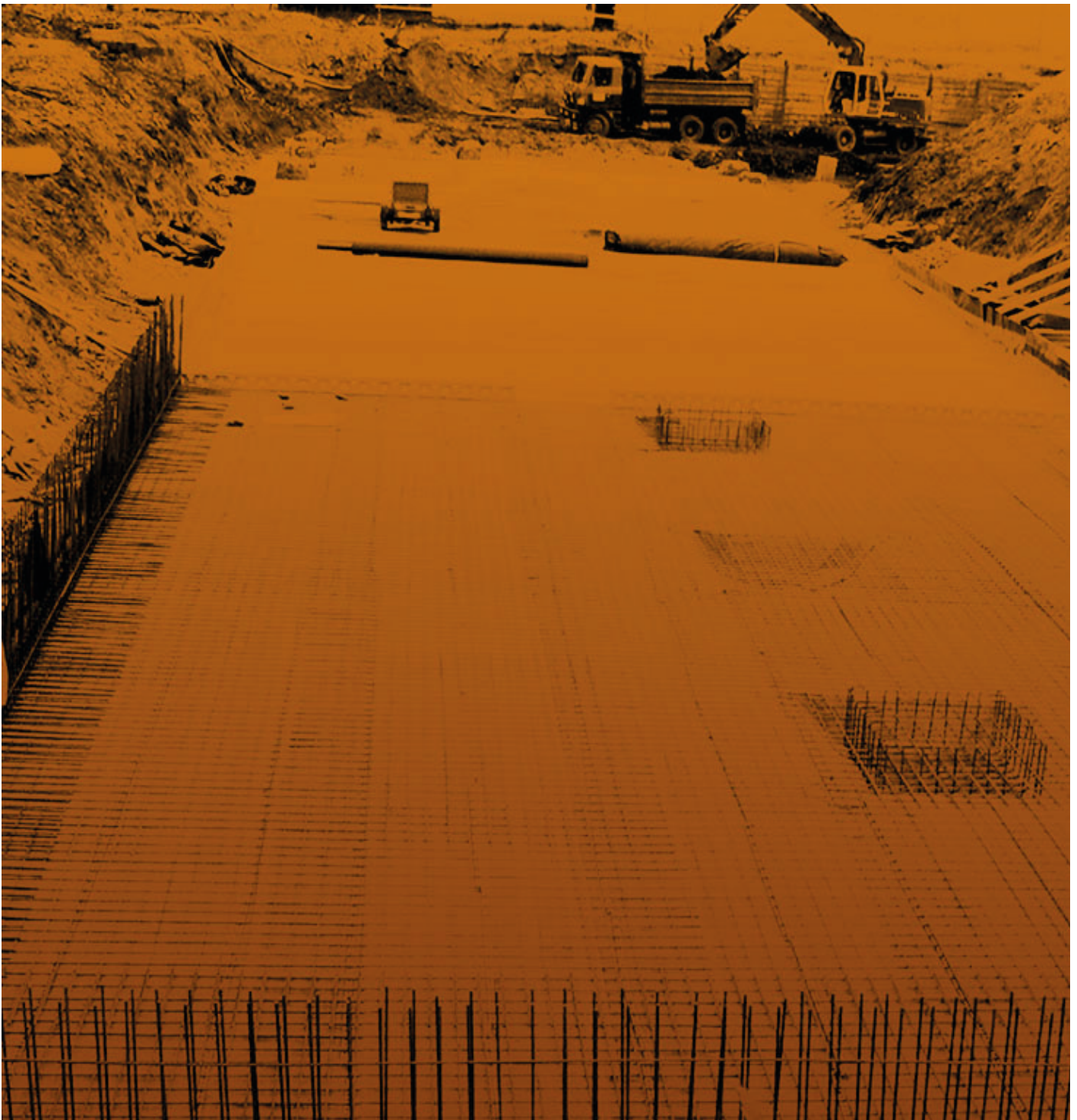
**TAILORED
PRODUCTS FOR
AGGRESSIVE
ENVIRONMENTS**

18

18. Tailored products for aggressive environments

At the seaside, in coastal regions, or, for instance, in industry degraded areas, the ground waters can contain high concentrations of salt or other chemical compounds. If it is suspected that ground waters are contaminated with acids or bases in excess of standards, or if the proper conductivity of the electrolyte exceeds 10,000 $\mu\text{S}/\text{m}$ (e.g. high salt concentrations), the water from the excavation must be tested. In order to perform the ground water sample tests, they must be delivered to the EUROBENT Distributor in a clean non-breaking container. Upon performance of tests, a report is drawn up, stating the degree of water contamination

and its impact on the properties of standard EUROBENT as well as potential special installation recommendations (e.g. selection of proper mat type). It must be, however, noted that due to modification with proper polymers of bentonite used for production of the EUROBENT, the mat is highly resistant to impact of aggressive environments. In the case of performance of horizontal insulation on soil ground or a layer of aggregate with high calcium concentration, it is recommended to use EUROBENT CS or lay the mat on a layer of lean concrete. Using filling with high calcium content in direct contact with the mat is not recommended.



ADDITIONAL INFORMATION

INSPECTION

19

19. INSPECTION

After placement an authorized person should perform a thorough visual inspection of the EUROBENT GCL rolls and seams. This should be done immediately after placement is completed.

The inspection should cover overlaps, alignment, penetrations, joints, detection of any defects including installation damage. Detected improperly installed areas should be marked and fixed. Repairs should be inspected and approved by the project engineer or authorized person.

The inspection/repair process should be carried out as soon as possible to ensure that no defective area is left unrepaired.

Once the inspection is completed, the next layer of geosynthetics can be laid or the soil can be spread in a manner that is not detrimental to the installed GCL.



INSPECTION

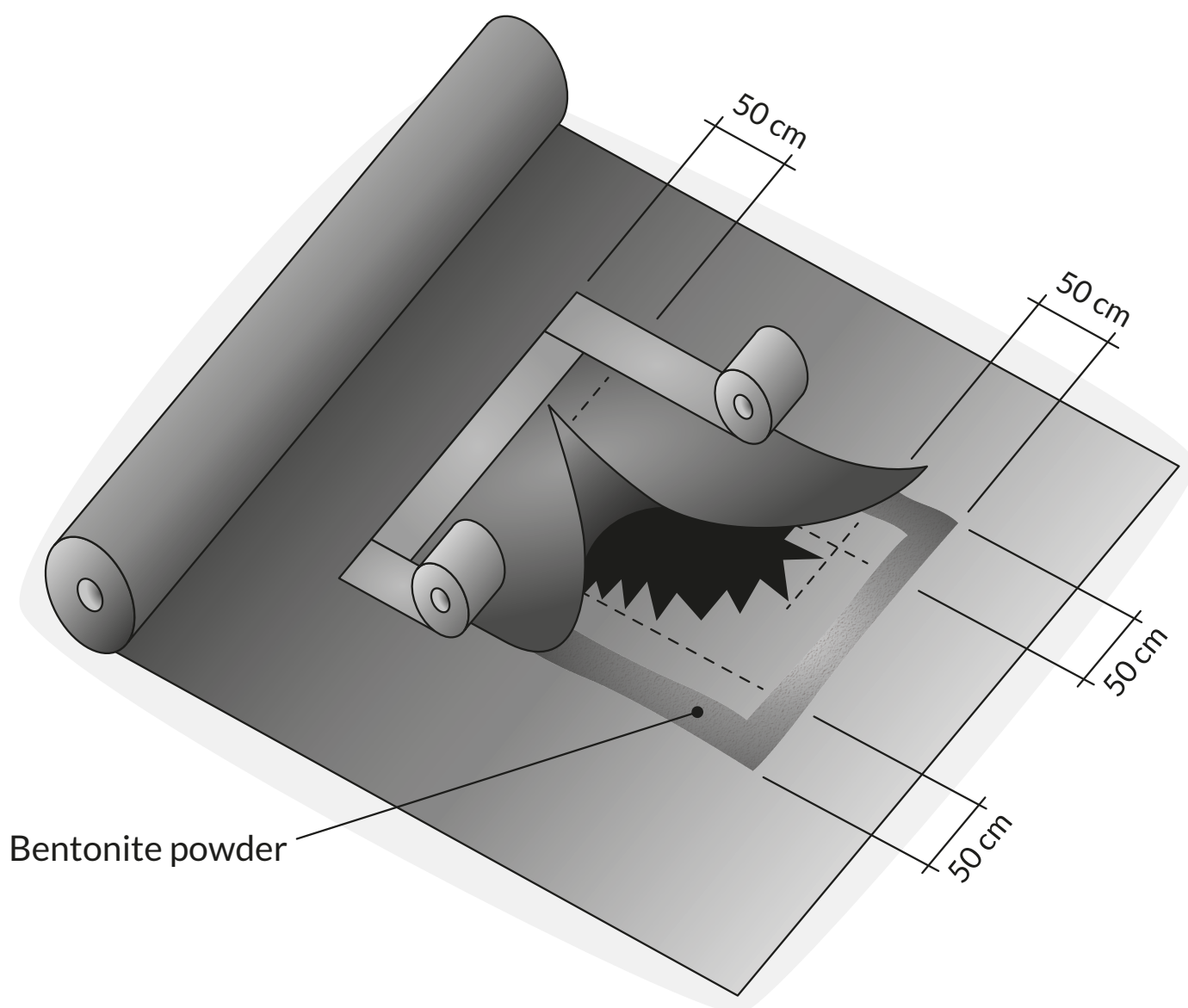
DAMAGE REPAIR

20

20. DAMAGE REPAIR

Even if installation is carried out with utmost care, the liner may be damaged in the process. Due to the swelling properties of the bentonite, minor defects will heal and seal themselves. More serious defects should be marked immediately and repaired by cutting a patch of EUROBENT GCL large enough to allow an overlap of at least 30 cm on all edges. Place the bentonite powder on the repaired area and cover it with the patch.

Depending on site conditions, it may be necessary to use an adhesive, such as wood glue, to fix the patch in place to prevent its movement during installation of cover layer. Smaller patches may be tucked under the damaged area to prevent patch movement.



HYDRATION

21

21. HYDRATION

In most cases, hydration of the GCL is achieved by natural rainfall or water absorbed from the ground. In some cases, however, it is necessary to activate the GCL before it begins to work. This may be the case in dry regions where the groundwater level is too low and there is no rainfall.

At landfill openings, the GCL also needs to be activated before the landfill is filled so that the GCL will start working with uncontaminated water.

If it is necessary to hydrate the GCL, it is best to do so after the topsoil is covered so that adequate counterbalance and confining pressure is provided.

Hydration can be done with both hydration systems and water sprinkling. However, avoid strong jets of water that could damage/displace the topsoil.

Hydration of the GCL before covering with topsoil does not necessarily mean that it needs to be replaced. Make sure that:

- GCL has not been damaged or torn
- GCL has not swollen to a thickness that may suggest both geotextile layers are not bonded together
- GCL overlaps are made in a proper way
- Bentonite powder on overlaps has not been washed out
- There was no excessive movement on the wet GCL



TERMS & CONDITIONS

22

22. TERMS & CONDITIONS

The engineering design for a specific site should be done after the site survey has provided all necessary information.

The evaluation of appropriate safety factors for each specific project must always remain the responsibility of the design engineer.

This manual includes two forms that are helpful for daily installation reports and for GCL inspection.

Forms 1 & 2 are attached to the manual.



22.1. Installation form

| INSTALLATION FORM | |
|----------------------------|--|
| Project Name/Number | |
| Installation date | |
| Weather conditions | |
| Numbers of installed rolls | |

| INFORMATION ABOUT CONDITIONS OF STORAGE IN A YARD AND ON-SITE | |
|---|--|
| Rolls covered | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Rolls labeled | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Standing water present | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Packaging damage | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Rolls damage | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Subgrade surface acceptable | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Installation area dry | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Anchor trenches acceptable | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Cover soil acceptable | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Anchor trench fill compacted | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| All seams visually inspected | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| Seam bentonite added (as applicable) | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| All detail work inspected | Yes <input type="checkbox"/> No <input type="checkbox"/> |
| All mat covered at end of day | Yes <input type="checkbox"/> No <input type="checkbox"/> |

*If there are defects or deficiencies that need to be noted, use the Remarks section

REMARKS



KEEP ROLLING



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