

Drainage Maintenance & Management Statement

Angels Nursery, Yapton Road, Barnham

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Issue	Issue date	Compiled	Checked
Planning Issue	6 March 2020	MR	GO
Second issue	5 June 2020	MR	GO
Third issue	26 June 2020	MR	GO
Fourth issue	8 July 2020	MR	GO

Report by: Martin Roberts IEng, ACIWEM, MCIHT

Checked by: Gavin Owens

1 Introduction and Description of system

- 1.1 The drainage system has been designed to drain positively to a single point of discharge to the local ditch to the southern boundary via an open pond which provides water treatment and storm water storage.
- 1.2 The final rate of discharge to the ditch is restricted via a flow control device situated downstream of the outfall headwall to the pond in a manhole. This will require regular maintenance as outlined in the following sections to ensure the site is freeflowing and to prevent flooding.
- 1.3 Upstream of the pond water is collected from roofs via traditional rainwater pipework and gullies, draining into either a piped system to the pond or adopted surface water sewer, or to 'distribution tanks' into the stone sub-base of the permeable paved driveways. Distribution tanks are cellular plastic tanks which allow water to permeate into the stone.
- 1.4 Water from the permeable driveways is collected in cellular tanks, then into a small 600mm diameter plastic control catchpit chamber on the drainage layouts. These have a small orifice flow control inside which also needs to be regularly checked as per the following schedule. These then discharge to the main surface water sewer in the road.
- 1.5 The main loop road water is collected via traditional road gullies, which drain into a water authority adopted surface water sewer under the road, which then drains into the pond.
- 1.6 Foul drainage is collected by gravity from each plot via small 450mm diameter plastic inspection chambers, which then drain into a main water authority owned foul sewer in the loop road. This drains north to connect to a Southern Water sewer close to the northern boundary.
- 1.7 The following sections detail the main drainage items used within the scheme and details the maintenance requirements for each item.
- 1.8 To ensure ongoing compliance with the requirements of the maintenance schedule, an Estate Management Company will be set up by the Client to maintain the private elements of the drainage system.

- 1.9 The Estate Management Company will seek financial contributions (in the form of service charges), at regular intervals, from the leaseholders/owners of the development to include for the regular costs of the maintenance of the site drainage. A separate sinking fund will be maintained to provide for the anticipated replacement cost of the major components at the end of the manufacturer's design life. These funds are to be held in bank client accounts kept separate from the bank account of the Estate Management Company.

2 Permeable Paving

- 2.1 The Regular inspection and maintenance is important for the effective operation of pervious pavements. Maintenance responsibility for the pervious pavements and its surrounding area will be for the Management Company.
- 2.2 Before handing over the facility to the client, it should be inspected for clogging, litter, weeds and water ponding and all failures should be rectified. After handover, the facility should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.
- 2.3 Pervious surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capability. Experience in the UK is limited, but advice issued with permeable precast concrete paving has suggested a minimum of three surface sweepings per year. Manufacturers' recommendations should always be followed.
- 2.4 A brush and suction cleaner, which can be a lorry-mounted device or a smaller precinct sweeper, should be used and the sweeping regime should be as follows:
- 1 End of winter (April) – to collect winter debris.
 - 2 Mid-summer (July/August) – to collect dust, flower and grass-type deposits.
 - 3 After autumn leaf fall (November).
- 2.5 Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material. Any lost material should be replaced.
- 2.6 The likely design life (or period before pavement rehabilitation is required) has yet to be established for the UK. However, it should be no different from standard paving

assuming that an effective maintenance regime is in place to minimise risks of infiltration clogging.

2.7 If reconstruction is necessary, the following procedure should be followed:

1. Lift surface layer and laying course.
2. Remove any geotextile filter layer.
3. Inspect sub-base and remove, wash and replace if required.
4. Renew any geotextile layer.
5. Renew laying course, jointing material and concrete block paving.

2.8 Permeable paving maintenance and monitoring requirements

Maintenance Schedule	Action	Frequency
Regular Maintenance	Brushing and vacuuming.	Three times per year at end of winter, mid-summer, after autumn leaf fall, or as required based on specific observations.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required.
Remedial Actions	Remedial work to any depressions, rutting and cracked or broken blocks or deformations in the permeable paving (if applicable) considered detrimental to the structural performance.	As required.
	Rehabilitation of surface and upper structure.	As required
Monitoring	Initial Inspection	Monthly for 3 months after installation.
	Inspect for evidence of poor operation and / or weed growth.	3 monthly & 48hrs. after large storms.
		Annually.

	Inspect silt accumulation rates and establish appropriate brushing techniques	
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3 Drains, Sewers Manholes, Gullies, Silt Pits

- 3.1 Regular inspection and maintenance is required to ensure the effective long-term operation of private drains, manholes, gullies & silt pits.
- 3.2 Prior to construction: a CCTV survey to be carried out on all existing sewer systems (not being demolished as part of the scheme) and any downstream receiving systems, prior to connection with adopted sewers.
- 3.3 Post Completion: a CCTV survey to be carried out on all new and retained existing drainage systems and any downstream receiving systems, prior to connection with adopted sewers.
- 3.4 The report will be used to prove the integrity of the as-built drainage system prior to issue of practical completion certificate and will be handed over to the Client & Management Company for future reference.
- 3.5 Ongoing maintenance responsibility for all Section 104 sewers will be the responsibility of Southern Water (marked SWS and FWS on the drainage layout)
- 3.6 Highway drainage (marked HWD on plan) will be the responsibility of West Sussex County Council under the Section 38 highway adoption agreement.
- 3.7 Foul and surface water drainage within the conveyance boundary of an individual house will be the responsibility of the homeowner.
- 3.8 The outfall from the pond and hydrobrake control manhole is the responsibility of the management company to maintain. This is the most important manhole to maintain as the small orifice in the hydrobrake may become easily blocked. This should be checked every 6 months.
- 3.9 All other private drainage outside of individual house owners conveyance will be the responsibility of the Management Company. Operation and maintenance requirements for all sewers manholes, gullies and silt pits are described in the following table.

Maintenance Schedule	Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action. Especially outfall manhole to pond with hydrobrake. Common yard & car park & other hard standing areas to be swept clear of debris, to prevent possibility of blockages to the receiving drainage systems. Debris removal from gullies & silt pits, channel drains (where may cause risks to performance). Lift and inspect receiving manholes to check for any blockages.	6 Monthly intervals. Weekly. 6 Monthly intervals, after autumn leaf fall, or as required based on specific observations. Monthly.
Remedial Actions	Repair any damaged gully gratings or silt pit covers. Replace / fix any loose channel drain covers.	As required. As required.
Monitoring	Carry out full CCTV survey to confirm ongoing integrity of all drains. Inspect all gullies and silt pits & drainage channels during the survey.	10-yearly intervals.

In all instances, inspection and cleaning should be carried out only by a specialist contractor and in accordance with the guidelines given in 'Safe Working in Sewers and at Sewage Works' published by National Joint Health and Safety Committee for the Water Services.

4 Catchpits

4.7 Inspection Frequency: Annually

4.8 Function: Allow silt to settle out of runoff prior to discharge to sewer.

4.9 Maintenance Requirements: The sumps within the catchpits should be emptied of silt on each inspection.

5 Control manholes/orifice chambers.

5.7 Inspection Frequency: 6 months

5.8 Function: To restrict surface water flows

5.9 Maintenance Requirements: Open all control chambers every 6 months and check that each orifice plate and hydrobrake is clean and free of debris. Clean out as necessary. Check hydrobrake bypass door opens and closes smoothly and the control wire can be secured just below the manhole cover.

Carefully check for blockage each of the orifice openings on the control chambers noted on the SUDS maintenance drawing, which control flow from areas of permeable paving. The sump to the control chambers should be free of silt and the orifice should be clearly seen and unobstructed.

It is vitally important to the smooth running of the drainage system and to prevent flooding that all control manholes are regularly checked as above and free flowing.

6 Eastern Boundary French Drain

6.7 Inspection Frequency: 12 months

6.8 Function: To convey land drainage in the location of a previous boundary ditch.

6.9 Maintenance Requirements: Check outfall from land drain into ditch in south eastern corner of the site is free flowing and clear of debris and undergrowth. Clear as necessary.

6.10 Walk length of French drain in back gardens where it travels through to ensure there is no ponding along the length. If there is arrange remedial works with homeowner to ensure water passage through to stone under.

7 Pond

7.7 Function: water treatment and storm water storage

7.8 The pond has a lower section in the base set 250mm lower than the outfall. This is to provide a wet area for reed bed planting to provide water treatment and an area for siltation so the outfall doesn't block regularly.

7.9 The pond has been specified with an impermeable liner which functions both to hold the water, and also to prevent high water table ingress. Refer to manufacturers details in appendix B for installation and maintenance.

7.10 The pond is also designed with a clay fill below the pond surface to prevent floatation. Information in Appendix B on the type of material and placement should be considered prior to construction or any remedial works undertaken.

7.11 Inspection Frequency and Maintenance Requirements: as per table below.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass- public areas	Monthly (during growing season)
	Cut the meadow grass	Half yearly (Spring, before nesting season, and Autumn)

	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May - October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay	Every 1-5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
Occasional Maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, e.g. every 25-50 years
Remedial Actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Remove any tree saplings which may take root in the pond	As required
	Aerate pond when signs of eutrophication are detected	As required

	Repair / rehabilitate inlets, outlets and overflows	As required
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8 On Site Ditches

- 8.1 Function: water conveyance from on and off site.
- 8.2 Responsibility: The management company has legal riparian responsibility for ensuring the ditches on site are freeflowing. The ditches within the management company responsibility are the southern boundary ditch and the south eastern boundary ditch and land drain.
- 8.3 Inspection Frequency and Maintenance Requirements: as per table below. NOTE: Take note of bird nesting season when carrying out these maintenance items – some may need to be postponed until after this.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect vegetation coverage	Monthly for six months, quarterly for two years, then half yearly
	Inspect inlets/outlets and ditch base for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or reseedling	As required
	Remove silt in the ditch base	As required
	Relevel uneven surfaces and reinstate design levels	As required

	Remove and dispose of oils or petrol residues using safe standard practices	As required

9 Contamination or Dilution of Spillage

9.7 In the event of a spillage it is the responsibility of the resident to clear up any spillage before it enters the drainage system. The primary method of dealing with any spillage of hydrocarbons should be using sand to soak up the leak and prevent any hydrocarbons entering the drainage system. Once sand has been contaminated it should not be washed into the drainage system but disposed of by a Licensed Contractor.

9.8 Environment Agency – Emergency Contact Number

In the event of a spillage the Environment Agency should be contacted to notify the event and seek advice. The Environment Agency Incident Hotline is 0800 80 70 60 (Freephone 24hrs).

- End of Report -

Appendix A

Site Drainage Ownership Plan

Legend

Section 104 adoptable foul water sewer maintained by Southern Water

Section 104 adoptable surface water sewer maintained by Southern Water

Foul Water Drainage maintained by management company

Surface Water Drainage maintained by management company

Highway Drain maintained by West Sussex County Council highways

Private foul Drain maintained by homeowner

Private Surface Water Drainage maintained by homeowner

Existing Foul Sewer

Site Boundary

Attenuation Pond maintained by management company

Location of flow control to be regularly maintained

Existing Ditch to be maintained by management company where within site boundary

Permeable paving maintained by management company

GENERAL NOTES:

- DIMENSIONS ON THIS DRAWING SHALL NOT BE SCALED. ALL DIMENSIONS TO BE CHECKED ON SITE. ALL DETAILS AND DIMENSIONING RELATING TO SUB-CONTRACTOR'S OR SUPPLIER'S WORK MUST BE CHECKED AND AGREED BETWEEN THE SUB-CONTRACTOR OR THE SUPPLIER AND THE GENERAL CONTRACTOR.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S AND ENGINEERS DRAWINGS AND SPECIFICATION.
- THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SITE DIMENSIONS BEFORE COMMENCING WORK.
- THE MAIN CONTRACTOR IS RESPONSIBLE FOR ENSURING THE STABILITY OF THE STRUCTURE WHILST THE WORKS ARE IN PROGRESS.
- DIFFERENCES BETWEEN THIS DRAWING AND THE SITE CONDITIONS ENCOUNTERED MUST BE REPORTED TO THE ENGINEER.

NOTATION:-
T.O.S. - TOP OF STEEL
F.S.L. - FINISH GROUND LEVEL
T.O.C. - TOP OF CONCRETE
F.L. - FORMATION LEVEL
S.S.L. - STRUCTURAL SLAB LEVEL
F.F.L. - FINISHED FLOOR LEVEL

2	05.06.20	Updated to LFPA comments						SDL	MR	GO
1	06.03.20	INITIAL ISSUE						SDL	MR	GO
REV	DATE	DESCRIPTION						BY	CHK/APP	

Gyoury Self
CONSULTING ENGINEERS

16/17 BOUNDARY ROAD, HOVE,
EAST SUSSEX BN3 4EF
TELEPHONE 01273 414413
E-MAIL: mail@gphone.co.uk
Website: www.gyouryself.com
Also at Fareham and St Albans

CLIENT	REDROW HOMES
ARCHITECT	RH PARTNERSHIP
JOB TITLE	ANGELS NURSERY YAPTON ROAD BARNHAM

DRAWING TITLE	DRAINAGE MAINTENANCE RESPONSIBILITIES LAYOUT
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JOB No.	SCALE @ A1	DATE	
H19377	1:500	JULY 2018	
DRAWN	ENGINEER	CHECKED	APP
SDL	S.LAMPRELL		

STATUS	DRAWING SUBMITAL	
A1	-	-
REVISION	RBA STATUS	
2	STAGE 3 - DEVELOPED DESIGN	
DRAWING No.	19377-CS-Z1-XX-DR-C-1025	

PRELIMINARY

APRIMA DISTRICT COUNCIL - BARNHAM

Appendix B

Pond installation manufacturers information

Subsoil Ponds



Subsoil:

Any earthen surface upon which the GCL is installed shall be prepared and compacted in accordance with the project specifications and drawings. The surface must be smooth, compacted to 96 % proctor, and free of:

- Void spaces.
- Sticks.
- Sharp rocks.
- Construction Debris.
- Vegetation.
- Standing water.
- Cracks larger than 6 mm in width.
- Frozen ground and ice.
- Sharp edges and abrupt elevation changes.
- Any other foreign matter that could contact the GCL.

It is crucial that the subgrade surface do not consist of granular soils or gravel, this due to their large void fraction and puncture potential. In high water head applications, such as ponds and wastewater lagoons, it is important that the subgrade soil is possessed with a particle size distribution such as at least 80 percent of the soil is finer than a 0.250 mm sieve.

Prior to GCL deployment, the subgrade shall be final-graded to fill in all voids or cracks and then smooth-rolled to provide the best practicable surface for the GCL. No wheel ruts or other irregularities shall exist in the subgrade. Protrusions extending more than 12 mm from the surface shall either be removed, or in other ways smoothed out. Some responsible party should certify acceptance of the subgrade before GCL placement.

Inform the installer of his responsibility to control subgrade before installation.

INTRODUCTION

THIS DOCUMENT DESCRIBES PROCEDURES FOR THE INSTALLATION OF **ActiMat**. 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 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 FINAL PROCEDURES TO BE ADOPTED.

ActiMat DELIVERY AND STORAGE

ActiMat 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 I-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. **ActiMat 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. **ActiMat rolls** can be stored at the job site. Original packaging provides sufficient protection of **ActiMat**. 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

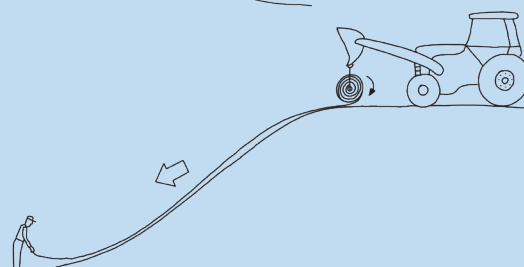
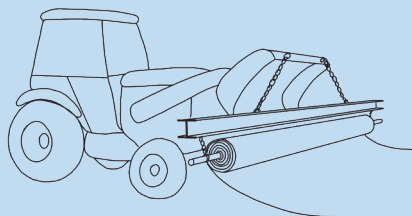
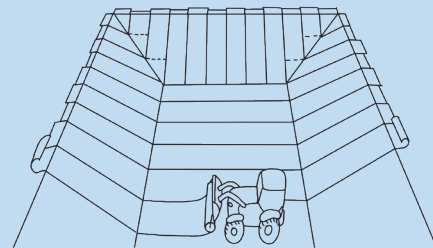
Before **ActiMat** is placed over soil, the subgrade must be prepared according to this guide, project specific requirements and design. Subgrade consisting of the gravel like material may not be suitable for **ActiMat** installation. It is advised that 80% of the soil is finer than 0,25 mm. The subgrade 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 12 mm from the subgrade surface shall either be removed, crushed, or pushed into the surface.

ActiMat DELIVERY AND STORAGE

Packaging should be removed immediately prior to installation, without damaging the **ActiMat**. The orientation of the panels (that is, which side faces up) has to be determined at the design stage. It is recommended that panels layout plan is prepared before installation work – this is to avoid material losses and proper seaming execution. In case of laminated product (**ActiMat C**) when cover membrane is welded, difficult welding details should be prepared before installation.

No equipment that could damage material shall be allowed to travel directly on **ActiMat**. 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 (allterrain vehicle) are allowed to move on the surface of **ActiMat**.

Care must be taken to minimize the extent to which **ActiMat** is repositioned across the subgrade in order to minimize 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. **ActiMat GCL** should lie flat on the underlying surface, with no wrinkles or folds, especially at the exposed edges of the panels. If **ActiMat** is placed over geosynthetic, care must be taken as to not damage underlying material with high ground pressure equipment directly on the geosynthetic.



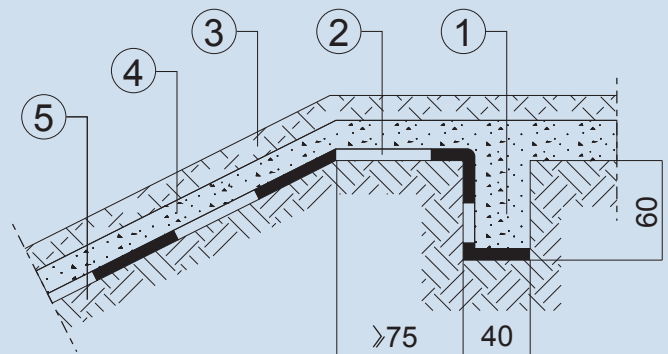
ANCHORAGE:

At the top of a slope, depending on the project specific condition **ActiMat 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.

When **ActiMat** 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 **ActiMat roll** back from the crest of the slope, and placing cover soil. The length of this „runout” anchor is project-specific.

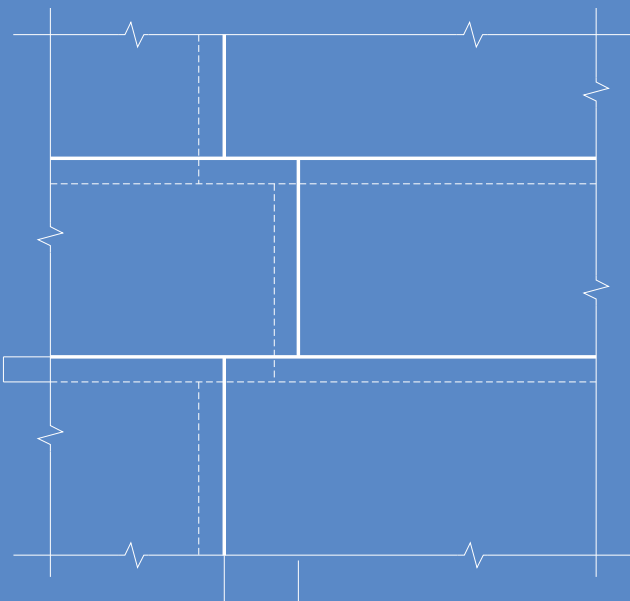


1. Anchor trench
2. ActiMat
3. Coversoil – humus (if needed)
4. Coversoil – sand
5. Subgrade

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 **ActiMat** 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 **ActiMat**.

Required bentonite amount is 200g per linear meter. Geomembrane-based GCLs also may be welded together.

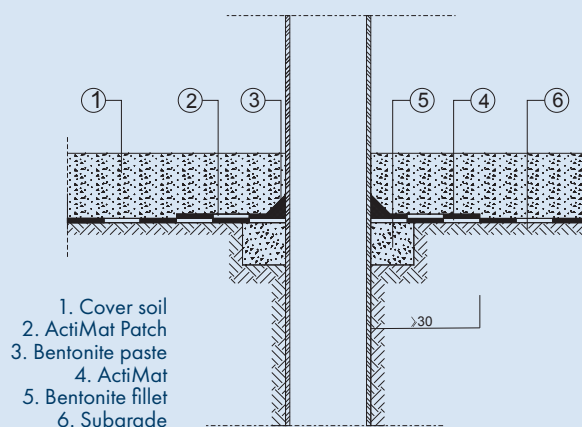
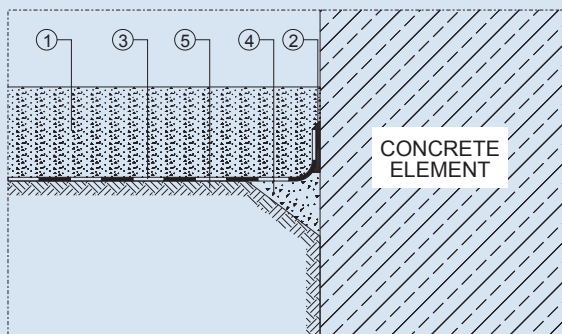


Width of the longitudinal overlap is marked on the panel by two lines which are positioned 150 mm and 230 mm of the edge. The top edge overlap should be positioned between these two lines. End-of-roll overlapped seams should be constructed similarly but the minimum overlap should measure 500 mm. Care 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.

SEALING AROUND PENETRATIONS AND STRUCTURES

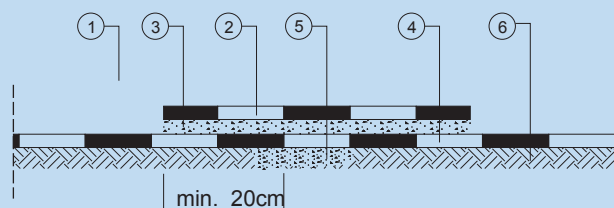
Cutting the **ActiMat** should be accomplished using a sharp utility knife. The GCL shall be sealed around pipe penetrations and structures embedded in the subgrade using granular bentonite, powdered bentonite, or bentonite paste, in accordance with the design drawings or as recommended by the manufacturer.

1. Cover layer
2. Bentonite paste
3. ActiMat
4. Cover soil
5. Subgrade



DAMAGE REPAIR

If **ActiMat** is damaged (torn, punctured, perforated, and so forth) 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 300 mm 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



1. Cover soil
2. ActiMat Patch
3. Bentonite paste
4. ActiMat
5. Bentonite fillet
6. Subgrade

COVER PLACEMENT

Cover soils shall be free of sharp-edged stones or other foreign matter that could damage the GCL. Cover soils should be an approved material with respect to particle size uniformity, moisture content, and chemical compatibility. Recommended cover soils typically have a well-graded particle size distribution ranging between fines and 25 mm. In case coarser material protection geotextile may be used. Soil cover shall be placed over the GCL using construction equipment that minimizes stresses on the GCL. A minimum of 300 mm of cover shall be maintained between the equipment tires/tracks and the GCL at all times during the covering process. It is recommended that cover soil is placed from the bottom towards top of the slope. Soil cover should be placed in a manner that prevents the soil from entering the GCL overlap zones. A temporary cover consisting of a waterproof tarpaulin or plastic sheet to protect GCL end-of-roll until construction the next day is acceptable, provided that the sheet is adequately ballasted and that water cannot enter from the sides. When another geosynthetic material is placed over the GCL, care must be taken to avoid using equipment and construction practices that could damage the GCL. 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 the overlying geosynthetic. In case cover soil contains materials producing high conductivity leachate, its effect on **ActiMat** should be verified.

Bentotex® 50

Product Data Sheet

Product Description

Bentotex is a high specification geosynthetic clay liner, comprising of high quality natural sodium bentonite encapsulated between two woven and non-woven needlepunched polypropylene geotextiles.

Bentotex adopts unique self-seaming overlaps technology which doesn't require any additional treatment of its longitudinal edges.

Material properties	Test method	Typical value
Physical properties		
Total mass per unit area ¹	EN 14196	5500 g/m ²
Bentonite mass per unit area ¹	EN 14196	5200 g/m ²
Bentonite mass per unit area ³	EN 14196	4640 g/m ²
Thickness ^{6, 7}	EN 9863-1	7.5 mm
Hydraulic properties		
Flux index ²	EN 16416	3*10 ⁻⁹ m ³ /m ² /s
Permability ⁹	DIN 18130 / ASTM 5887	1*10 ⁻¹¹
Water Absorption		600 %
Montmorillonite content ⁸	XRD	80%
Mechanical properties		
Peel Strength	ASTM D6496	1000 N/m
Tensile strength ⁴	EN ISO 10319	11 kN/m
Static puncture resistance (CBR) ⁵	EN ISO 12236	2.0 kN
Textiles (PP)		
Non woven mass / unit area ⁸	EN ISO 9864	200 g/m ²
Woven mass / unit area ⁸	EN ISO 9864	100 g/m ²

1 - Average, at 12% moisture content, tolerance 4%

2 - Average, tolerance 0,5x10⁻⁹ m³/m²/s

3 - Average, at 0% moisture content, tolerance 4%

4 - Average, tolerance 2,0 kN

5 - Puncture resistance (CBR) with tolerance – 0.2 kN

6 - Material is fully saturated and it is this measured at 2kPa pressure

7 - Average, tolerance 10 %

8 - Certified by supplier

9 - Average tolerance 0,5*10⁻¹¹ m/s

Application:

- Water reservoirs, dams and river embankments
- Liquid wastes disposals sites, transfer stations, secondary containment
- Transport infrastructure
- Canals
- Solid wastes storage and disposal sites

Advantages:

- Self-healing
- Robust construction
- Limited preparation work
- Easy and quick installation
- Long performance
- All weather installation, including wet and frozen subgrades

Installation:

- Unrolled on smooth and compacted subgrade
- Subsequent panels lapped 300mm at leading edges

Packaging:

Bentotex is produced in 5m wide x 40m long panels, rolled onto a 100mm internal diameter central core, and protected with a plastic sleeve. Other panel sizes are available on request.

Storage:

Provided the rolls are kept inside their protective plastic sleeves, further on-site protection is not required.

Safety Instruction

There are no special safety measures required for the handling and installation of Bentotex, other than those normally implemented on construction sites.