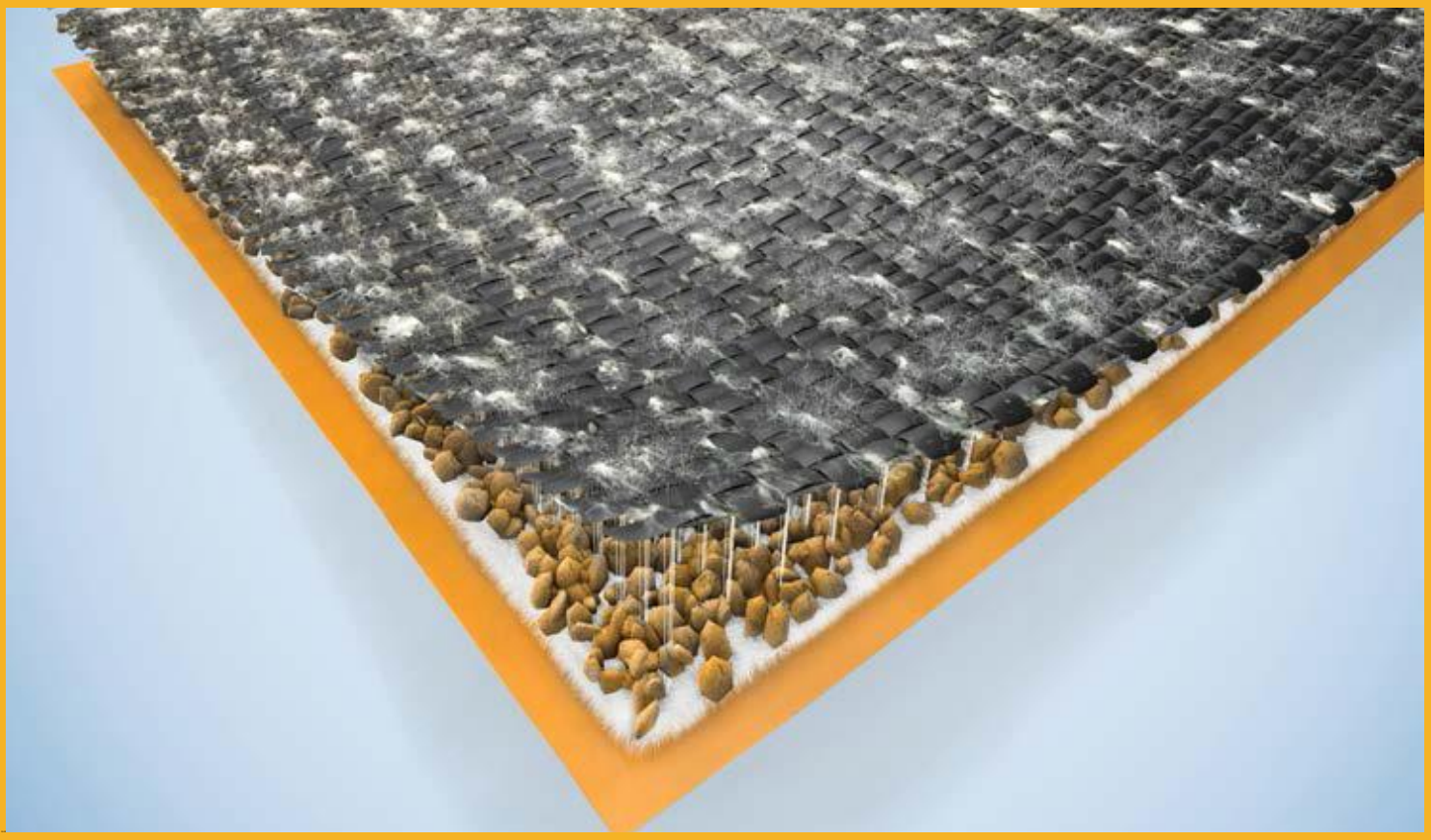

METHOD STATEMENT
Sika BentoShield Max LM

1 DEC 2016 / 2 / SIKA UK / ALEX BURMAN

WATERPROOFING

BUILDING TRUST

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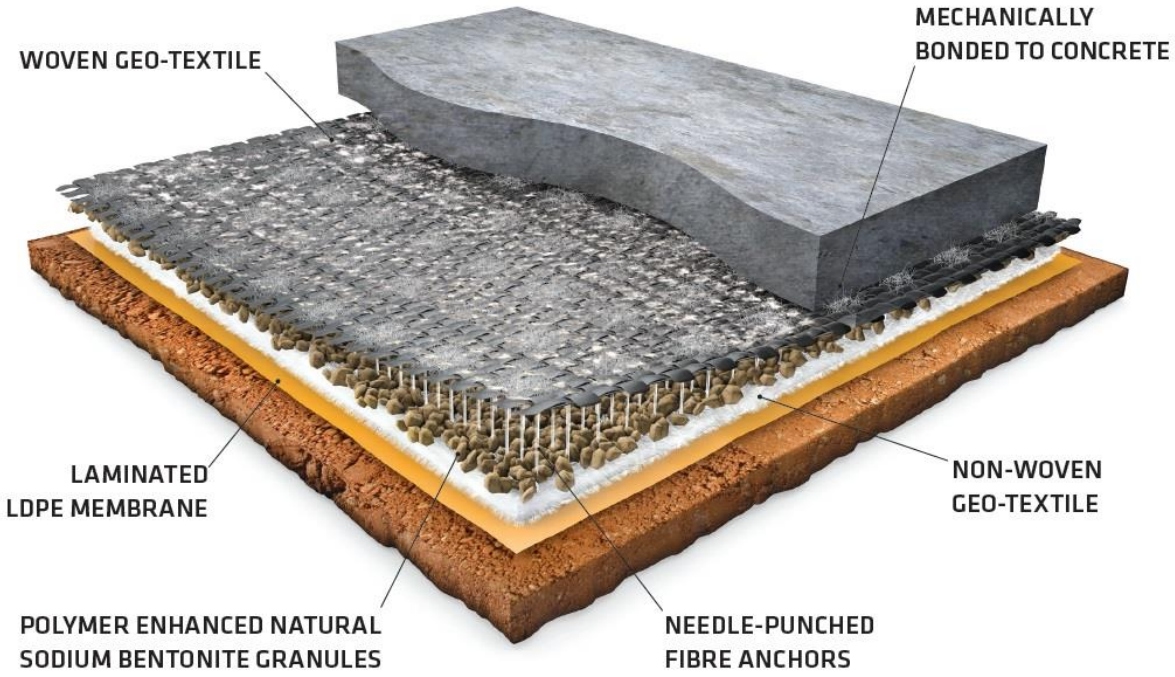
1 SCOPE

This method statement describes the step by step procedure for installing the Sika BentoShield Max LM range of products for use in below ground waterproofing structures.

2 SYSTEM DESCRIPTION

Sika BentoShield MAX LM is a self-healing waterproofing membrane that's resistant to contaminated soils, forming an automatic mechanical bond to freshly poured concrete it virtually eliminates the possibility of water movement between the membrane & structure. Approximately 6.5 mm thick, consisting of two polypropylene geotextiles, a woven fabric and non-woven fabric, enclosing pre-hydrated homogeneous layer of granular sodium bentonite at a minimum weight of 5000g/m². The two geotextiles are interlocked by a needle-punching process forcing fibres from the non-woven layer through and beyond the woven layer. This process contains and confines the polymer modified bentonite granules and forms a physical link between the geotextiles. A flexible polyethylene layer is integrally bonded to the non-woven geotextile.



2.1 USES

Damp proofing, waterproofing, tanking membrane for horizontally and vertical applications where buildings are expected to be subject to hydrostatic water pressure.

- Below ground reinforced concrete structures
- Effective against diaphragm wall constructions.
- Direct application onto ground retaining concrete piling when placed within the piling - concrete interface
- Direct application within steel sheet piling – concrete interface
- Can be placed within the formwork.
- Below structural reinforced concrete slabs.

2.2 CHARACTERISTICS/ ADVANTAGES

- Qualified waterproofing tanking membrane in accordance with BS8102: 2009
- Water tightness of the laps tested to BS EN 1928.
- Designed to offer protection in areas subject to changing geological conditions such as flood plains, areas of soil settlement and brown field constructions.
- Application ensures performance stability in high water table environments and constructions which are subject to future alterations in water levels such as flood plains and city centre constructions.
- An effective barrier against ground water in saline environments.
- Easy to install, no primers required.
- Easy to install, no protection boards required.
- Can be applied in temperatures below 0°C
- Will self-heal when subjected to a head of water[1].
- Can be applied during conditions of high humidity, precipitation and condensation.

2.3 REFERENCES

- Conforms to the requirements of BS EN 1928 (24h/60 KPa) watertightness to liquid water
- Declaration of performance CPR-0554-MAXLM-25-07
- CE Certificate No. 1301 – CPD - 0554
- EN 13491:2007 - Geosynthetic barriers “Characteristics required for use as a fluid barrier in the construction of tunnels and underground structures
- EN 13492:2004 - Geosynthetic barriers “Characteristics required for use in the construction of liquid waste disposal sites, transfer stations or secondary containment”
- EN 13493:2007 - Geosynthetic barriers “Characteristics required for use in the construction of solid waste storage and disposal sites”
- EN 13361:2004 - Geosynthetic barriers “Characteristics required for use as a fluid barrier in the construction of reservoirs and dams”
- EN 13362:2006 - Geosynthetic barriers “Characteristics required for use in the construction of Canals

2.4 LIMITATIONS

- Sika Bentoshield MAX LM should only be applied after the successful preparation of the substrate is completed.
- The membrane is designed to work under confinement.
- When placing Sika Bentoshield MAX LM inside the formwork, the formwork should be removable. If the formwork is the stay in-situ variety contact your local Sika specialist for confirmation prior to application.
- Sika Bentoshield MAX LM products are not designed to be installed over ice or in standing water. Should the ground water contain strong acids, alkalis, or has a conductivity of 2,500 µmhos/cm or greater, water samples should be submitted to the Sika for compatibility testing

3 CHAPTER 3

3.1 SYSTEM COMPONENTS

Sika BentoShield Max LM system consists of the following components:

a) SikaBentoShield Max LM membrane
b) SikaBentoShield Granules and Paste
c) Detailing tapes and termination strip
d) Fixing system

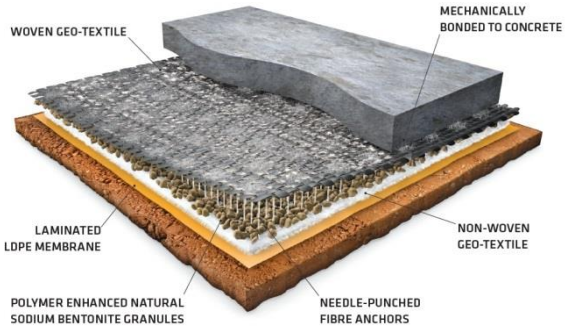
[1] Damaged area size less than 2mm. Self-healing varies subject to moisture, confinement and compression levels.

e) SikaDrain 850 Geo protection / drainage membrane (if required by the design)

a) SikaBentoShield Max LM membrane

Polymer modified sodium bentonite granules fixed between needle-punched woven and non-woven geotextile sheets, with a PE sheet laminated to the back.

Supplied in 1.1 x 5m width rolls
Material Code: 516975



Total sheet thickness [mm]	Nominal 6.5mm
Bentonite Density	5.00 Kg/m^2 +/-10%
Roll length [m]	5m
Roll width [m]	1.1m
Roll weight [kg]	33kgs +/-10%

b) SikaBentoShield Granules and Paste (required system components)

SikaBentoShield Granules
Sika Bentoshield Granules are polymer modified natural sodium bentonite granules, these granules when wetted form a dense waterproof paste.

Supplied in 25 kgs bags
Material Code: 516976

SikaBentoShield Paste
Thixotropic trowel grade bentonite compound, used as a detailing mastic around penetrations, corner transitions and ground level terminations.

Supplied in 15 litre pails
Material Code: 516977

c) Detailing tapes and termination strip

SikaBentoShield SS50 Bonding Tape

High-tack synthetic rubber bonded to LDPE, for sealing overlaps in SikaBentoShield Max LM applications to be backfilled.

Supplied in 50mm wide x 25m rolls
Material Code: 517877

SikaBentoShield Termination Strip

Galvanised steel bonding strip with 5mm holes at 15mm centres. Typically used for fixing and sealing the top edge of SikaBentoShield waterproofing membrane when lapping with Damp Proof Courses along ground level wall sections

Supplied in 12mm x 10m rolls
Material Code: 517878

d) Fixing system

Trak-It C5 Gas Fixing Tool

The Trak-It C5 gas fastening system was developed for use in light-duty static applications, including attaching drywall track to concrete, block or steel, lath to concrete or block, furring strips to concrete or block, and plywood to concrete or block base materials. The system is designed for speed, efficiency and consistency. Operation of a gas fastening system does not require licensing.

Used in conjunction with Trak-It C5 38mm nails, SikaBentoShield Nose Piece and SikaBentoShield Fixing Washers, the C5 allow faster installation of the BentoShield membrane.

Trak-It C5 is standard delivered in a durable carry case, 2 batteries, battery charger, ear plugs, safety glasses and a jam clear tool.

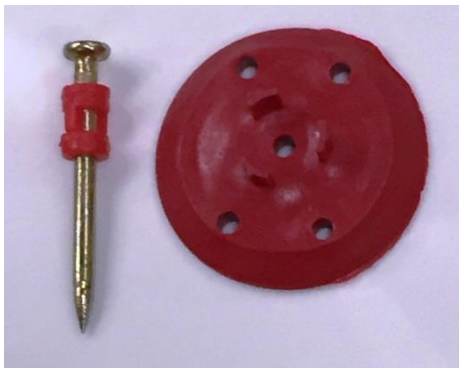
Material Code: 517848

SikaBentoShield Fixing Nose Piece PC

Designed to support the washer on the end of the gun and hold it in place for safe and correct fixing of the SikaBentoShield membrane system.

One needed per gun.
Material Code: 517903

SikaBentoShield Fixing Washers /800 PC



Special plastic washers use to fix SikaBentoShield membrane to vertical surfaces and horizontal laps. Used with Track-It C5 and 38mm nail into concrete and other substrates when installing bentonite waterproofing membranes.

Supplied in bags of 800 washers.
Material Code: 517904

Trak-It C5 Nails 38mmx3mm /800 PC

38mm x 3mm Extra Hard Nails for use with Track-It C5 gas fixing tool. Used to fix nail and washers into concrete and other substrates when installing bentonite waterproofing membranes.

Supplied in boxes of 800 nails, including one fuel cell.
Material Code: 517849

Trak-It C5 Fuel Cell PC

Spare fuel cells to power the Track-it C5 gas fixing tool. Each fuel cell contains enough gas to install over 800 fasteners.

Supplied individually. One fuel cell is also included in each box of nails.
Material Code: 517847

e) SikaDrain 850 Geo protection / drainage membrane

SikaDrain-850 Geo (Roll 2,44/12,5) M2

Protection / drainage layer that can be combined with a range of waterproofing solutions to prevent damage to the waterproofing membrane. High resistance geotextile layer, 10mm thickness, high drainage capacity.

Note: Does not form part of the waterproofing membrane, is

required as good practice or when design dictates in accordance with the relevant standards.

Supplied in 2.44m x 12m rolls
Total coverage of 30.5m2
Material Code: 514907

Thickness	10.0 (+/- 1.0) mm
Unit weight	850 (+/- 5%) g/m2 (Dimpled Sheet) 125 (+/- 20%) g/m2 (Geotextile)
Resistance to Dynamic Perforation	24 (+/- 2.4) mm (geotextile, cone drop test)
Compression Resistance	400 (+/- 80) kPa (short term)
Drain Flow Capacity	
Horizontal application at 20 kPa	0.60 l/(m*s) - 20%
Vertical application at 20 kPa	3.5 l/(m*s) - 20%

4 ENVIRONMENT, HEALTH & SAFETY

4.1 PERSONAL PROTECTION EQUIPMENT (PPE)

For the installation of **SikaBentoShield membrane** system there is no special PPE (personal protection equipment) or safety equipment required. Excepting to comply with any specific local regulations or requirements.

When using the C5 gas fixing tool the installer should follow the recommended manufacturer's guidelines with regard to health and safety. Eye protection and ear protection is recommended to prevent injury from flying debris.

Always wash hands and exposed skin with suitable soap and water after handling chemical products and before food consumption.

In the event of any contact with the eyes, always seek medical advice immediately after rinsing and cleaning the eyes with a professional eyewash kit or at the minimum with clean water. Safety glasses or other eye protection obviously reduce the risk but they can also create a false sense of security.

4.2 WASTE DISPOSAL

The generation of waste should be avoided or minimized wherever possible. For further information about specific products, please refer to the respective current Material Safety Data Sheet.

Any waste from **SikaBentoShield membrane** sheets and the ancillary tapes produced from synthetic polymers, plus the packaging material (cardboard and liners) can all be recycled and/or disposed of in accordance with local regulations.

4.3 CLEANING OF TOOLS

Tools and equipment must be cleaned with suitable cleaner immediately after use.

5 SUBSTRATE PREPARATION

Substrates shall be well levelled and compacted to a minimum of 85% modified proctor density to form a uniform base as support for the waterproofing membrane. Concrete under-blinding should be used as part of the site control of ground water or to ensure no membrane is displaced during the re-bar & concrete application, but is not otherwise a requirement for the SikaBentoShield Max LM membrane. A pre-con site survey will be required & written approval by the Sika Field Services Team & Client RE prior to the omission of the under-blinding requirement.

Horizontal installation surfaces shall be free of excessive standing water, particularly where concrete underblinding is not utilised. SikaBentoShield Max LM can be installed in most inclement weather conditions, providing the quality / accuracy of the installation is not affected, for example SikaBentoShield Max LM floating, SikaSwell Hydrophilic Strip submersed, Waterflowing through laps subject to flash freezing.

Concrete surfaces shall be free of large voids or projections. Voids and pits in excess of 20 mm diameter, cracks and joints, shall be parged to flush condition using cement grout, SikaBentoShield Paste or SikaBentoshield Granules mixed with water into a paste. Projections greater than 20 mm shall be smoothed flush.

All through concrete tiebar holes, etc., must be filled from the outside using Sika X-Plugs and covered in a “mushroom” of SikaBentoShield Paste, either prior to SikaBentoShield Max LM (post-fix) application, or prior to backfilling (pre-fix /fully-bonded application), where additional SikaBentoShield Max LM patching will be required.

All applicable expansion joints must be treated with the correct Sika joint protection as specified by the Consultant Engineer and/or Architect. SikaBentoShield Max LM and accessories may be installed over properly installed expansion joint materials.

Where chalk or limestone bearing soil/backfill is encountered, or ground contamination is evident/suspected, consult Sika Technical Services.

All packaging tape shall be removed from the rolls of SikaBentoShield Max LM prior to their installation.

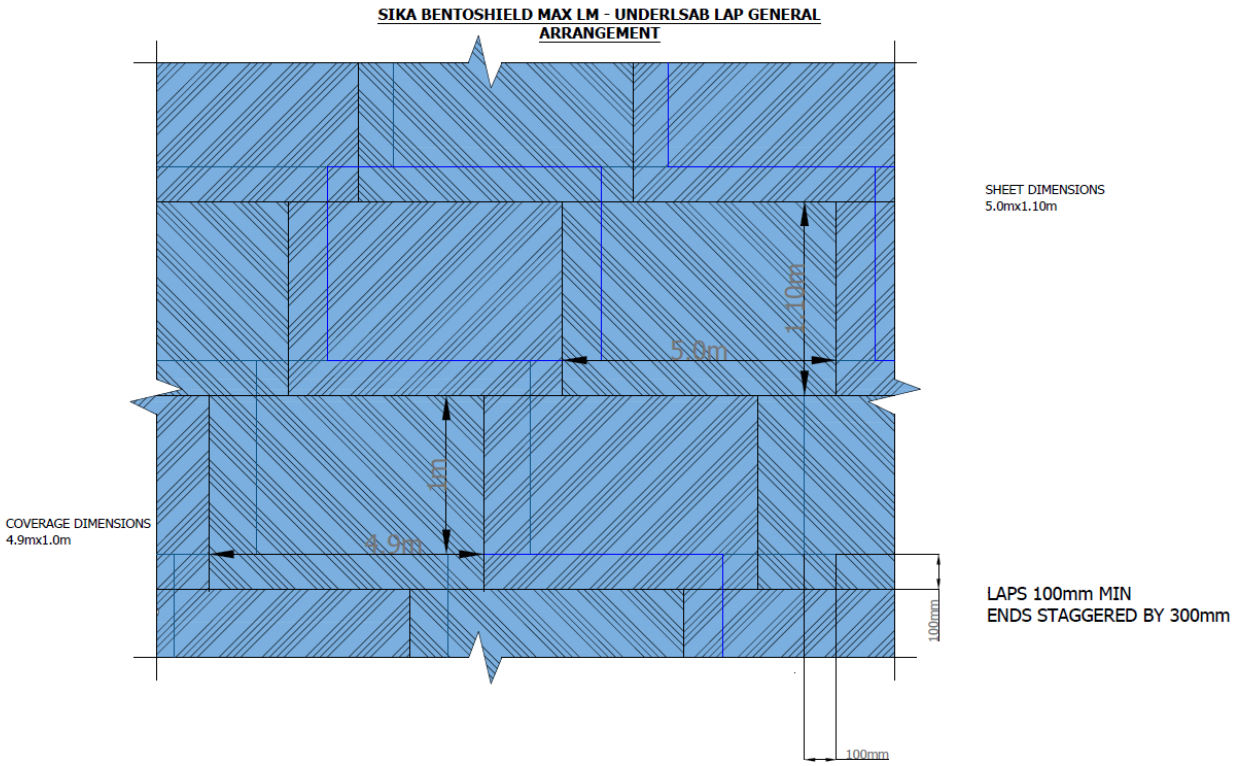
6 GENERAL INSTALLATION GUIDELINES

Install SikaBentoShield Max LM Waterproofing system in strict accordance with manufacturer’s instructions as applicable to project conditions, and as indicated by the Sika representative. Please refere to the current Product Data Sheet for technical data.

Install SikaBentoShield Max LM Waterproofing System with the dark grey / woven side of the geotextile liner facing the concrete to be waterproofed in both horizontal and vertical applications.

Install SikaBentoShield Max LM under all footings, elevator pits, ground beams, pile caps and pad foundations, to form a completely impervious, continuous envelope.

SikaBentoShield Max LM shall be lapped 100 mm at all edges. End laps shall be staggered to avoid corner build-up of more than three layers.

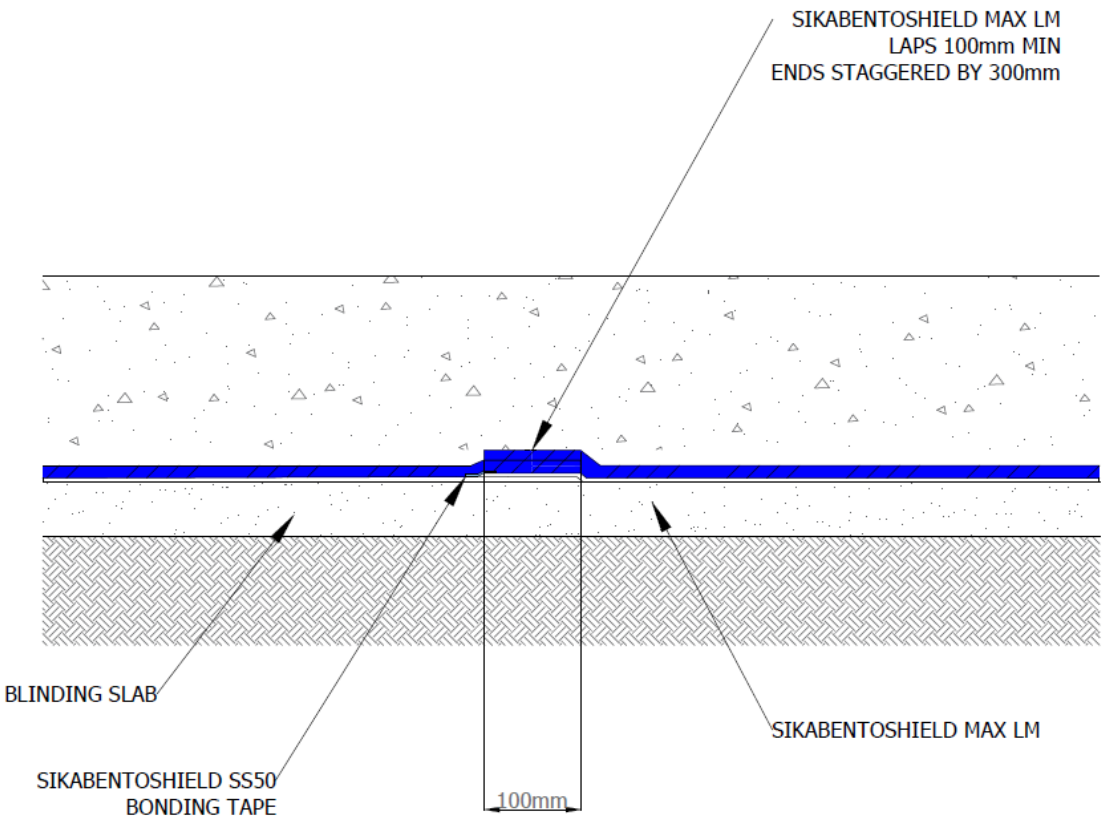


All vertical lap joints are sealed with Sika BentoShield SS50 Bonding Tape. Where accessible externally (ie. applications to be backfilled) this can be applied externally to the PE layer.

For underslab or property-line applications, mechanical fasteners in the form of 'soft-washer' fixings (see Fixing System) are to be used throughout the installation for securing SikaBentoShield Max LM (mainly at overlaps) as required. Nails are to be applied at 300mm c/c.

SikaBentoShield Max LM should form a secure lap detail, the PE layers are peeled away from the geotextile by 200mm, the PE layers are then over lapped by 100mm, the PE layers are then bonded using the SikaBentoShield SS50 Bonding Tape inside the lap. The bentonite membrane layers are lapped by 100mm and sealed using further Bentonite Granules.

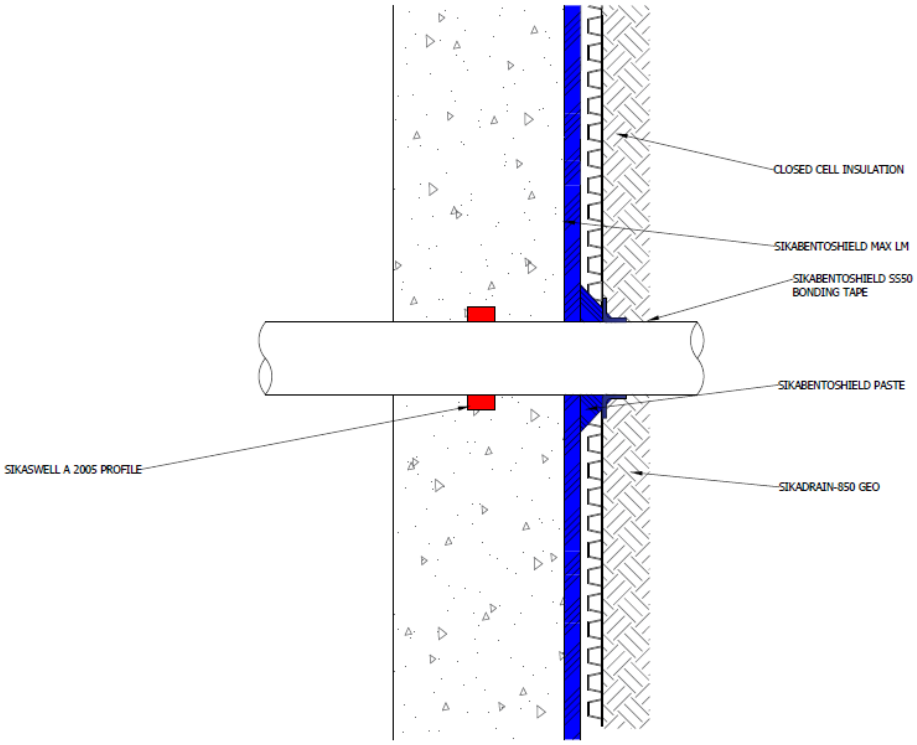
Alterntively horizontal lap joints can be sealed a 5 mm x 50 mm fillet of Sika BentoShield Granules or a similar fillet of Sika BentoShield Paste.



SikaBentoShield Max LM membrane should be applied inside the formwork, prior to the casting of concrete, to facilitate the fully-bonded property of the SikaBentoShield Max LM membrane to the concrete. Care shall be taken when striking the formwork, to prevent undue damage to the fully-bonded SikaBentoShield Max LM.

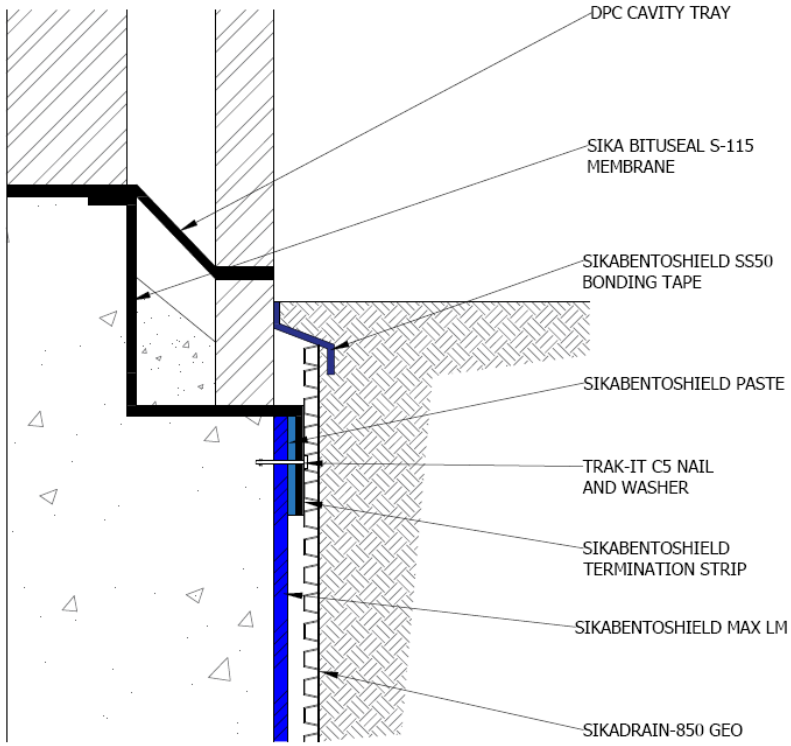
Detail SikaBentoShield Max LM membrane to provide a snug fit around all applicable penetrations (pipes, piles, etc.). Detail all penetrations with a 40 mm fillet of a paste, made from SikaBentoShield Granules and water, around the penetration on top of the SikaBentoShield Max LM. Where concrete underblinding is not used, detail an additional 50 mm chase filled with SikaBentoShield Granules around the penetration, under the SikaBentoShield Max LM.

SIKA BENTOSHIELD MAX LM - BACKFILLED WALLS
PENETRATION PIPE CAST IN WITH SIKADRAIN-850 GEO



Terminate SikaBentoShield Max LM at ground level, etc., integrating the SikaBentoShield Max LM with a damp-proof course/cavity tray (as per architects arrangement), by extending the DPC to overlap SikaBentoShield Max LM a minimum of 150mm. The SikaBentoShield Max LM /DPC lap should be closed by a 5 x 50mm fillet of SikaBentoShield Paste placed central inside the lap. The whole lap is then secured using SikaBentoShield Termination Strip.

SIKA BENTOSHIELD MAX LM - TERMINATION TO DPC
PRE-APPLIED BELOW GROUND LEVEL CAVITY
SIKADRAIN-850 GEO



Backfill material shall be of compactable soils and free of construction debris. Backfill shall be clean, well graded and compacted every 300mm to 85% modified proctor (as defined by ASTM 1557) and meet these general specifications:

- No rocks, stones or boulders larger than 50mm
- 90% minimum soil particles smaller than 5mm
- 10% maximum soil particles finer than 74 micron (200 mesh)

Inspect the finished SikaBentoShield Max LM installation and repair any damaged material prior to placing either concrete or backfill on/against the membrane. Ensure the SikaBentoShield Max LM is not disturbed during placement of concrete or backfill. Wherever possible, ensure lap orientation faces away from the flow of covering materials.

Pre-hydration of SikaBentoShield Max LM (which creates forced bentonite activation) may be required, particularly where conditions of ground contamination exist. SikaBentoShield Max LM can be sprayed with fresh water from a hosepipe prior to placement of concrete.

All vertical and horizontal construction joints are to be sealed with SikaSwell A2010 Hydrophilic Strip, installed with a minimum of 75 mm concrete cover on all sides. SikaSwell Hydrophilic Strip A2005 shall be used as a puddle-flange to seal around applicable penetrations. SikaSwell S-2 hydrophilic mastic shall be used to secure SikaSwell Hydrophilic Strips.

Further installation details and advice can be found on the Sika website (www.sikawatperproofing.co.uk) or by contacting the Sika Technical Support Team (01707 358570) prior to the installation.

For green roof installations, podium decks, whole envelope solutions, please consult your local Sika Specification Manager for guidance.

7 FIXING SYSTEM

7.1 MINIMUM FIXING REQUIREMENTS

- Mechanical fixing using “Soft washer”, minimum diameter of 36mm, impact resistant.
- 38mm long, corrosion resistant nails. For fixings into steel sheet piling please contact Sika Technical Support for advice.
- Installed at a minimum of 300mm centres

7.2 SIKA RECOMMENDED FIXING SYSTEM

Sika recommends the following fixing system to ensure that SikaBentoShield Max LM is installed correctly and with minimum issues. If this system is not used, then an equivalent system must be used to the standard below. The Sika BentoShield Fixing System enables:

- Fast installation, reduction in labour costs, earlier completion of contract
- Consistent quality of fixing - fewer leaks, less product waste
- Greater control of the installation procedure
- Successful fixing into the hardest concrete
- No licence required for use of the tool
- Health & safety benefits

The Sika BentoShield fixing system comprises:

- Trak-it C5 Gas Fixing Tool
- Trak-it C5 nails (typically 38mm Extra Hard nails)
- Sika BentoShield fixing washers - red, high impact resistant washers
- SikaBentoShield fixing nose piece




7.3 TRAK-IT C5 GAS FIXING TOOL

The C5 is the lightest and most compact gas-nailer available but is the most powerful in its class. Additional power, quality and gauge of nails ensure successful fixing in the hardest concrete.

Shortest contact arm and swing trigger for ease of use, computer controlled fan, 2 x batteries each fire 5,700 nails, new metal mesh filters for best dust protection, single action magazine change, easy depth adjustment dial, direct fuel injection system offers easy installation and better working at hot and cold temperatures.

The additional power allows firing of the longer extra hard nails which are only available for the Trak-It gas fixing tool.

In addition to being light and compact it is also well balanced allowing the operator to work comfortably for long periods. There is very little recoil.

No Licence is required and it offers many health and safety benefits, particularly useful in tunnel or other sensitive installations.

Used together with the special BentoShield Nose Piece the BentoShield Washers are held securely in place, will not fall out or flip off and offer additional health & safety benefits.

Although no Licence is required for the C5 Gas Fixing Tool, it is recommended that training is given on the proper use of the tool as experience shows that this prolongs service intervals, longevity of the tool, ensures correct usage and highlights best health and safety practice. Most sites appreciate this additional service and a few will still request the issue of a training certificate.

Due to site conditions and heavy usage, this type of tool requires regular servicing to ensure it is correctly maintained and it is recommended that the contractor has an appropriate number of tools available to avoid delays.

When using the C5 gas fixing tool the installer should follow the recommended manufacturer's guidelines with regard to health and safety. Eye protection and ear protection is recommended to prevent injury from flying debris.

7.4 TRAK-IT C5 NAILS 38MMX3MM

- The first gas nails to achieve ETA Type 1 approval
- A wider range of Extra Hard nails from 17mm to 38mm can be supplied on special request. Lead times will apply.
- The additional power of the C5 allows firing of the longer extra hard nails which are only available for the Trak-It gas fixing tool.
- As the longer 38mm Extra Hard nail is suitable for SikaBentoShield installation on the majority of sites it helps to standardise the product range and installation procedure

7.5 SIKABENTOSHIELD FIXING WASHERS

Designed to fit the special BentoShield Nose Piece the washers have been manufactured from high impact polypropylene and are resistant to cracking.

Allows washer to be supplied with the nails as a complete system.

The large 36mm diameter brightly coloured red washers are distinctive and can be readily seen for on-site inspection.

Used together with the special BentoShield Nose Piece the BentoShield Washers are held securely in place, will not fall out or flip off and they offer additional health & safety benefits.

8 INSPECTION, QUALITY CONTROL

Sika Site attendance is necessary to qualify for a Sika guarantee and is free of charge to contractors using the Sika below-ground structural waterproofing products.

8.1 PLANNING

A planning meeting should be held with the site management and, if needed, the design team to discuss:-

- Programme
- Waterproof Product requirements
- Check mix design provided by the ready-mix supplier
- Detailing
- Joint layout and appropriate Sika solution for sealing joints
- Service entry points and appropriate Sika solution for sealing
- Person(s) to be main points of contact between Sika and site
- 48 hours' notice if possible, is required to ensure site attendance of a Sika Waterproofing team member

8.2 TOOL BOX TALKS

Before concrete works commence on site, the following should be covered with site staff and a Sika operative:

- Best practice for installation of Sika waterproofing products
- General membrane practice
- General concrete practice: placing, compaction and curing methods.
- Substrate preparation: Joint rebates, surface retarders, scabbling
- Joint system installation including a physical demonstration
- Detailing of penetrations and tie holes

Note: Only site personnel, who have received a tool box talk, should install Sika products. The names of these personnel should be recorded

- Should the 48 hour notice period not be provided, it is the Contractors responsibility to provide photographs of the applicable area of works detailing the materials installed and their location e.g. grid-lines
- Should the Sika Waterproofing Site Attendance procedure not be followed, the project may not qualify for the Sika Performance warranty

8.3 ATTENDANCE

Sika operatives do not generally watch concrete being poured or membrane being applied (although on large pours/sections we may visit). Site attendance by Sika is focused on material and joint installation and proper detailing. Site attendance will be limited to 2 hours per visit unless otherwise agreed. Please speak to Sika to obtain the full Sika Site Attendance Procedure document

Waterproofing Hotline number: 01707363875 or waterproofing@uk.sika.com

An attendance log MUST be completed for each site visit and distributed as agreed. This attendance log will cover:

- General practice
- Material installation
- Detailing
- Highlight any issues identified
- Recommended remedy for issues identified
- Any repairs carried out

8.4 NON-CONFORMITIES

Any non-conformity must be rectified for the project to qualify for the Sika Performance warranty. Sika operatives must witness the corrective action or proof given by the Contractor that the corrective action has been undertaken.

8.5 FINAL INSPECTION

A final inspection by Sika has to take place for the Sika guarantee to be issued. Sika must be notified prior to commencing internal works, i.e. plastering or covering over the concrete. The areas must be clear, dry and accessible for the final inspection. Any non-conformity stated in the site inspection reports must be completed before final inspection.

9 LEGAL NOTE

The information, and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. in practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the products suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

Sika UK
Concrete and Waterproofing

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