



BENTOLINER® SW STRUCTURAL WATERPROOFING SYSTEM SOLUTION

INSTALLATION GUIDELINES

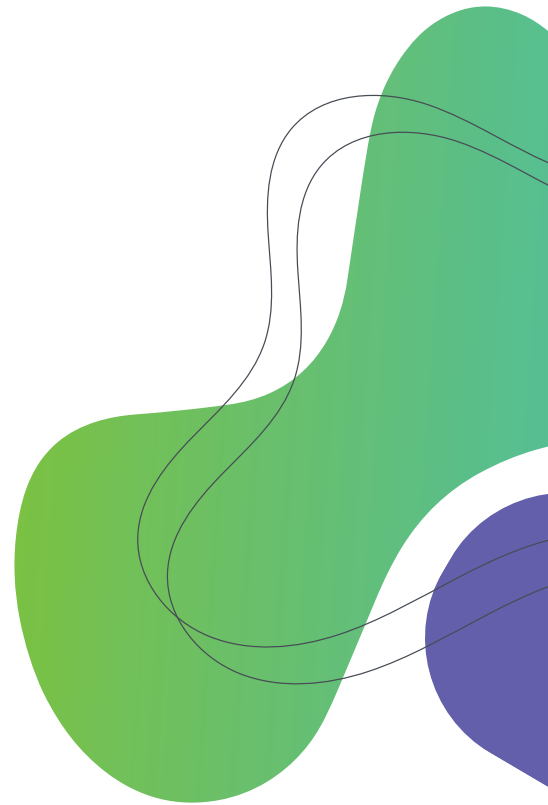


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INTRODUCTION

This guide provides an overview of the Solmax Installation Quality Assurance procedures consistent with industry accepted practices to ensure that the geosynthetic products installed will perform for their intended purpose. In addition, all installation work will be performed in strict accordance with the customer's specifications.

Please read the procedures below completely before you begin. If you need further clarification, contact your Solmax representative for assistance. Remember safety first and use safe practices always on every project.

SODIUM BENTONITE

Sodium bentonite is a non-toxic, naturally forming volcanic mineral (Montmorillonite) that absorbs large quantities of water, swelling to many times its original dry volume. Because of its excellent swelling properties, sodium bentonite is often used as a self-sealing, highly impermeable barrier to water ingress on below ground basement structures.

Under confinement pressure, the bentonite expands to an impervious liner. It is important that a back pressure is created on both sides of the membrane, partly via the overlying concrete structure and partly the underlying ground / blinding, or the backfill at the walls. This should be taken into account when installing onto ground that is likely to settle. e.g. in soil conditions requiring piling.

PRODUCT DESCRIPTION

BentoLiner® SW is a high-performance self-healing structural waterproofing system ideal for underground reinforced concrete structures. It comprises a uniform layer of granular sodium bentonite, encapsulated between a woven and a nonwoven geotextile that is needle-punched together confining the bentonite to create a composite geosynthetic clay liner (GCL) that mechanically bonds to poured concrete.

BentoLiner® LSW with an additional Polyethylene membrane bonded to the outside of the nonwoven geotextile provides extreme low permeability for water vapor transmission. With the high swelling capacity and low permeability of bentonite, this results in a product with a high sealing effect and outstanding mechanical properties that prevents water ingress between the waterproofing and the concrete structure.

NEEDLE-PUNCHING MAKES A DIFFERENCE

By needle-punching thousands of high tenacity fibers through the sodium bentonite clay layer, a completely uniform, reinforced GCL is produced. A heat bonding process is then used to modify and permanently lock the needle-punched fibers into place. This process results in a strong mechanical bond between the fabrics.

EASY TO INSTALL

Simple, cost-effective installation techniques make **BentoLiner® SW** a practical alternative to traditional waterproofing methods. All that is required before installation is a properly prepared substrate. The product is available in wide widths and custom lengths, making **BentoLiner® SW** the most versatile GCL available.

SATISFYING ALL YOUR WATERPROOFING NEEDS

Underground waterproofing is a fundamental aspect of a building envelope, which is a controlled environment. Solmax has engineered with **BentoLiner® SW**, a reliable, high-performance clay-geosynthetic barrier to satisfy your demanding waterproofing needs.

If the groundwater at the building site is suspected to be contaminated or saline, water samples should be sent to the manufacturer for compatibility testing.

SYSTEM PRODUCTS

- **BentoLiner® SW**
- **BentoLiner® LSW** for contaminated areas
- **BentoLiner® SW Paste** - used to detail around penetrations and transitions
- **BentoLiner® Mastic** - used to detail around terminations
- **Solmax Waterstop** - hydrophilic waterstop
- **Bonding tape** to seal overlapped edges of **BentoLiner® LSW**
- **Termination bar**
- **BentoLiner® SW granules**

SECTION 1

UNDERSLAB INSTALLATION

BentoLiner® SW is engineered for use under reinforced concrete slabs 150 mm thick or greater on a compacted earth/gravel or concrete blinding substrate.

Prior to installing **BentoLiner® SW**, the substrate must be properly prepared. Complete all required elevator pit, sump pit, ground beam, and piling work prior to installing **BentoLiner® SW** under the main slab area. These areas must be correctly tied into the underslab waterproofing to form a monolithic seal. **BentoLiner® SW** should be installed under footings and ground beams as shown in Figures 1.4, 1.5 and 1.6 for hydrostatic conditions. For non-hydrostatic conditions, **BentoLiner® SW** should be installed around footings and ground beams as shown in Figures 1.7, 1.8 and 1.9.

1.1 SUBSTRATE PREPARATION

The surface upon which **BentoLiner® SW** is installed should be smooth and level. Substrate may be concrete, earth, sand, or crushed stone. Earth and sand substrates should be compacted to a minimum 85% Modified Proctor density. Crushed stone should be no larger than 19 mm in size. Substrate should be smooth and without sharp deflections or pockets. Blinding concrete should have a wood float finish.

1.2 INSTALLATION

Install **BentoLiner® SW** over the properly prepared substrate with the woven geotextile side up. Overlap all adjoining edges a minimum of 100 mm and stagger sheet ends a minimum of 300 mm (Figure 1.1). Always nail or staple edges together or use reinforcement spacers on top of the overlaps to prevent any displacement before and during concrete placement.

When the slab is poured in sections, **BentoLiner® SW** should extend a minimum 300 mm beyond the slab edge (Figure 1.2). This enables **BentoLiner® SW** to be properly overlapped for subsequent slab section pours. Solmax Waterbar, a flexible, hydrophilic waterstop should be installed in all applicable slab construction joints (Figure 1.2).

The HDPE membrane on **BentoLiner® LSW** should face downwards. The woven geotextile is facing upwards towards the concrete of both types. The 1,15 x 5,1 m and 2,55 x 15 m rolls are delivered in a so-called kick-out version, they automatically get the woven side up when rolled out. Do not install in free standing water or on ice/snow. Traces of moisture or water on the surface do not affect the product's performance as long as strong spot pressure is avoided. If **BentoLiner® SW** is exposed to rainfall during assembly time, the bentonite will begin to swell. The swelling process is held back via the sewing technique, but the bentonite will form a soft jelly-like texture. It is then sensitive to damage from eg. pedestrian traffic where the bentonite can be locally displaced. It is strongly recommended to lay out walkways for staff to walk.

OVERLAP RECOMMENDATION

Roll size: 1,15 x 5,1 m, Overlap \geq 10 cm

Roll size: 2,55 x 15 m, Overlap \geq 15 cm

Roll size: 5,0 x 40 m, Overlap \geq 25 cm

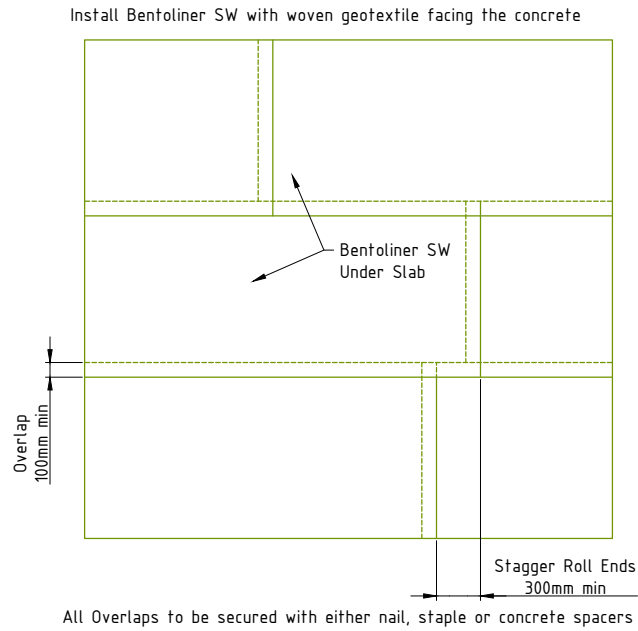


Figure 1.1 - Overlap edges 100 mm with seams staggered 300 mm

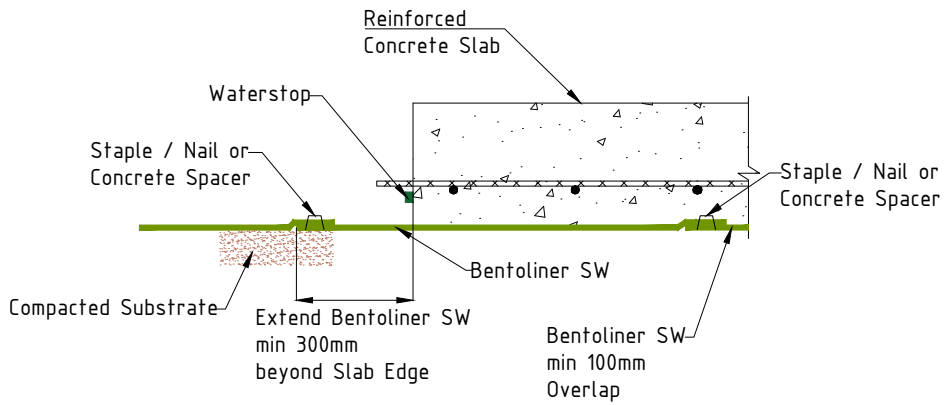


Figure 1.2 - Extend BentoLiner® SW a minimum 300 mm beyond slab edge. Install Waterbar in joint, secure overlaps

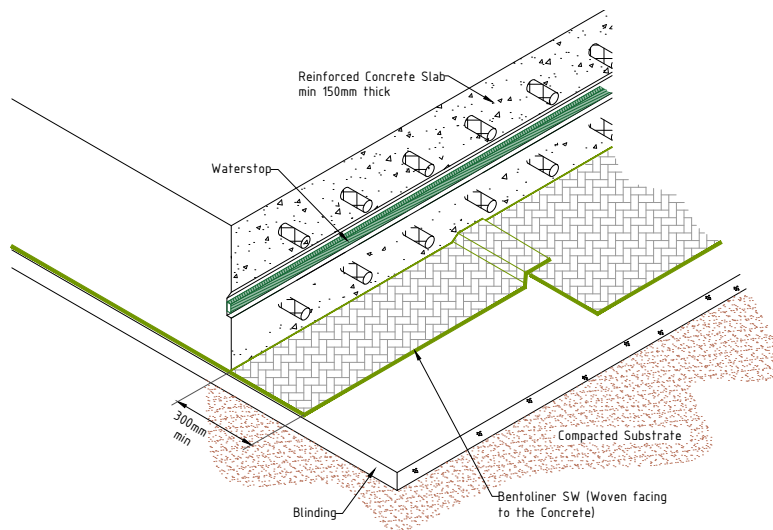


Figure 1.3 - BentoLiner® SW installed over concrete blinding or earth/gravel substrate requires a minimum 150 mm thick reinforced slab

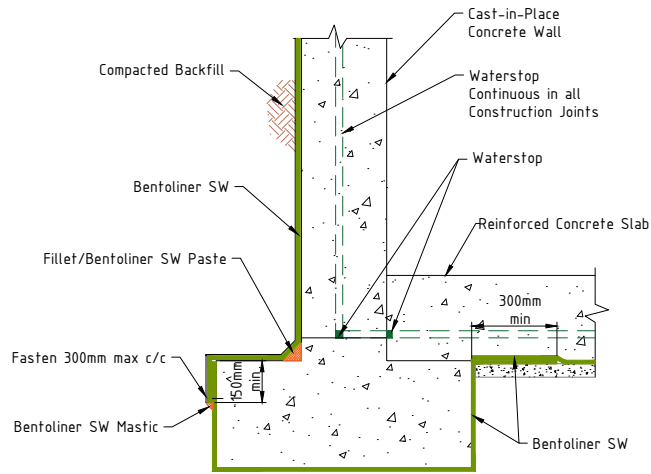


Figure 1.4 – Slab on footing detail at hydrostatic condition

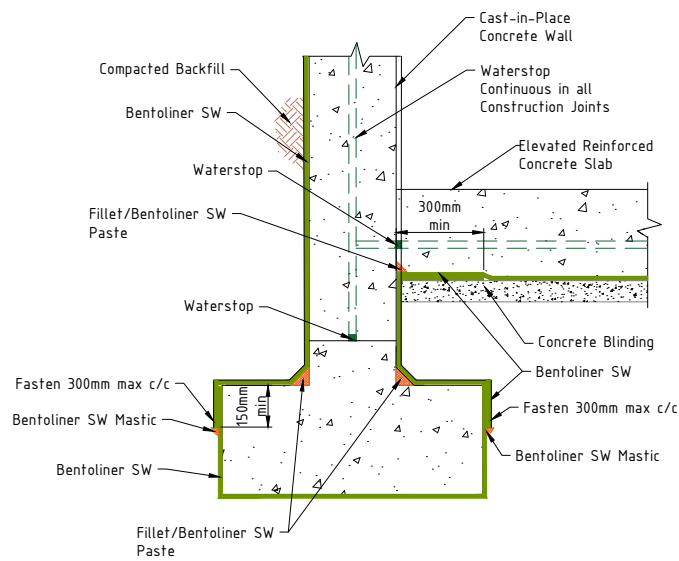


Figure 1.5 – Raised slab detail with concrete blinding at hydrostatic condition

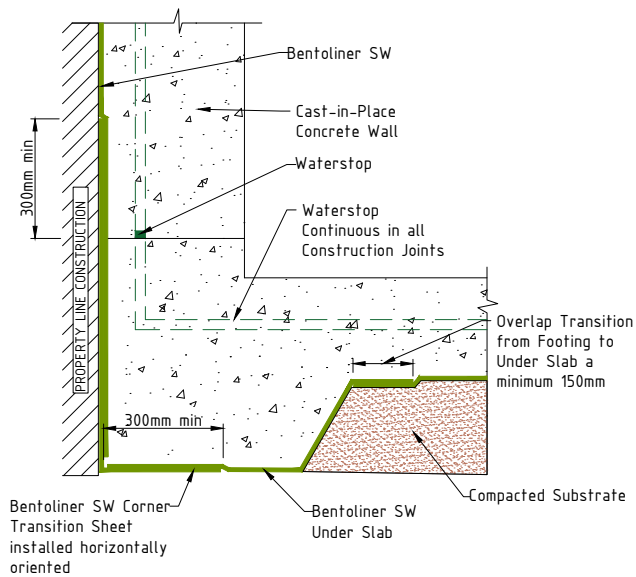


Figure 1.6 – Flush slab detail property line wall at hydrostatic condition

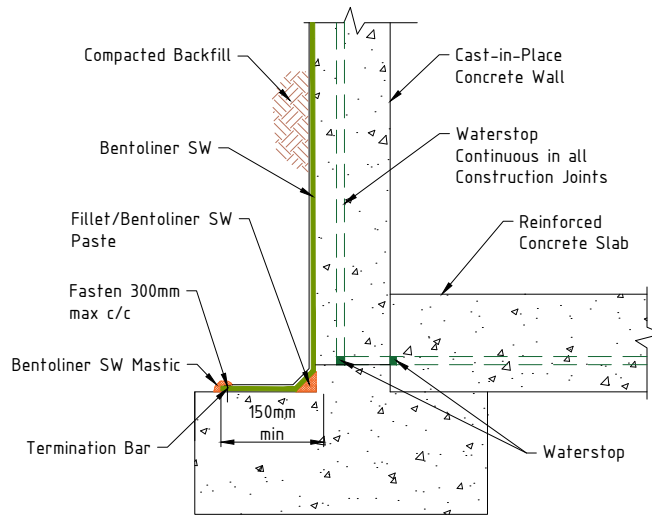


Figure 1.7 – Slab on footing detail at non-hydrostatic condition

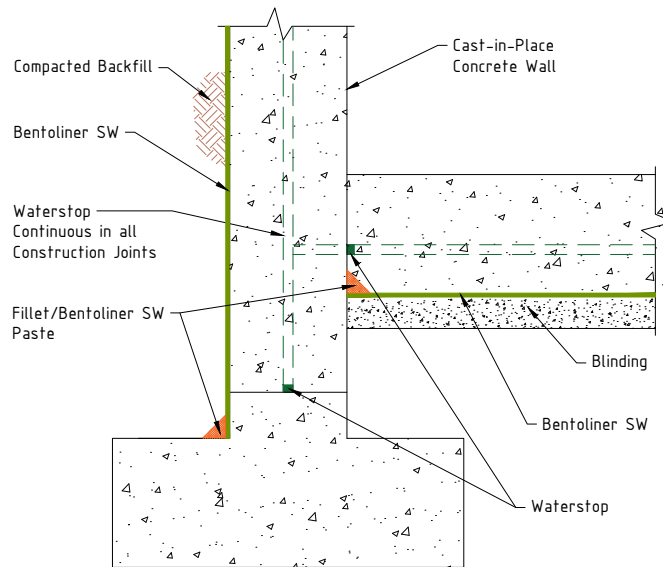
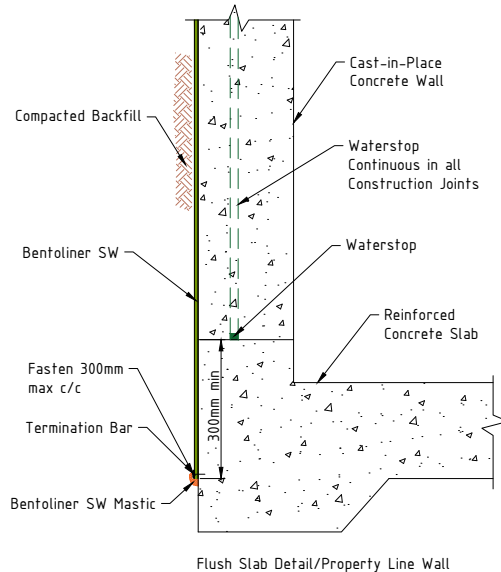


Figure 1.8 – Raised slab detail with concrete blinding at non-hydrostatic condition



Flush Slab Detail/Property Line Wall

Figure 1.9 – Flush slab detail backfilled wall at non-hydrostatic condition

1.3 PILE CAPS AND GROUND BEAMS

Bentoliner® SW is typically not installed over pile caps but cut to fit tightly around pile caps. Then apply a minimum 19 mm thick fillet of **Bentoliner® SW Paste** at the intersection of **Bentoliner® SW** and the piling (Figure 1.10) with **Bentoliner® SW Granules** under **Bentoliner® SW** at the piling edge.

Bentoliner® SW Paste should extend onto **Bentoliner® SW** and piling a minimum of 50 mm at 19 mm thickness. Solmax Waterbar should be installed on the top surface of the pile cap, around reinforcing steel (Figure 1.10).

Detail ground beams the same as pile caps (Figure 1.12) with a non-hydrostatic condition. For hydrostatic conditions, **Bentoliner® SW** should be installed under the entire ground beam (Figure 1.13). Line the ground beam formwork with **Bentoliner® SW** prior to placement of reinforcing steel. Leave a minimum 300 mm of **Bentoliner® SW** at the top of the form to tie into below slab waterproofing.

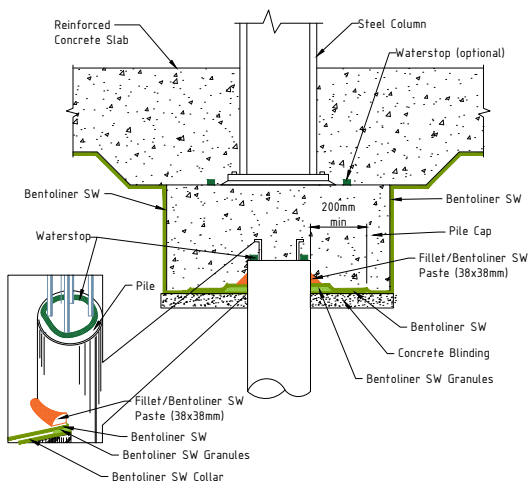


Figure 1.10 - Pile Cap Detail at hydrostatic condition

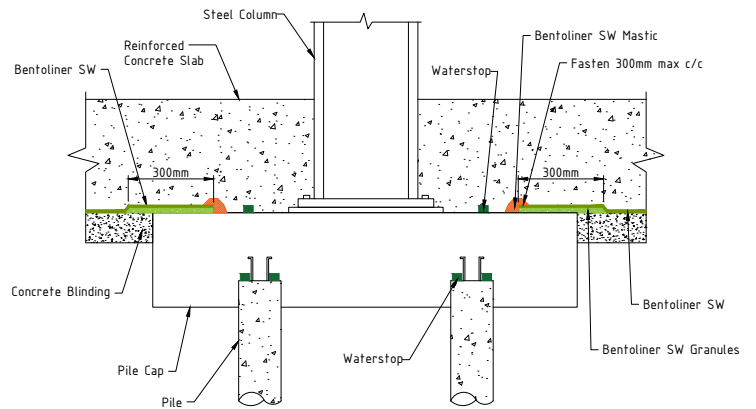


Figure 1.11 - Pile Cap Detail at non-hydrostatic condition

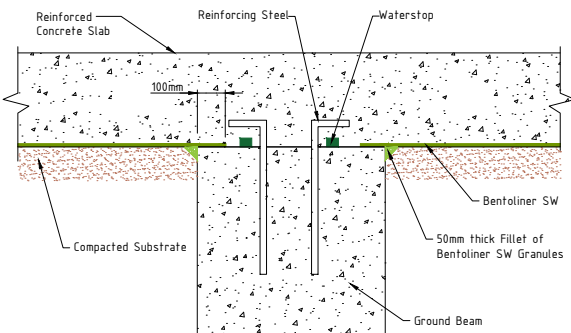


Figure 1.12 - Ground Beam at non-hydrostatic condition

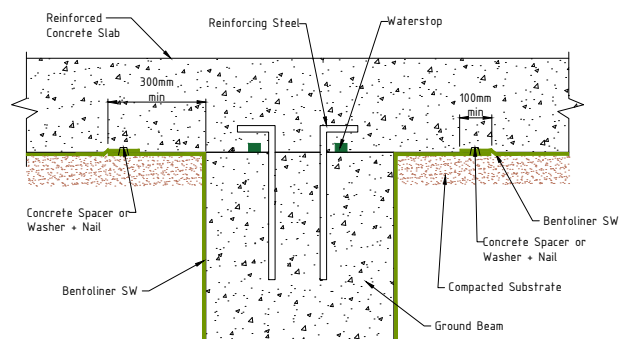


Figure 1.13 - Ground Beam at hydrostatic condition

1.4 SLAB PENETRATIONS

Cut **BentoLiner® SW** to closely fit around penetrations (Figure 1.14). Trowel a minimum 19 mm thick fillet of **BentoLiner® SW Mastic** around the penetration to completely fill any void area between **BentoLiner® SW** and the penetration (Figure 1.14). The Sealant should extend up the penetration about 38 mm and extend onto **BentoLiner® SW**.

In areas where multiple penetrations are close together, it may be impractical to cut **BentoLiner® SW** to fit around each penetration. Pour **BentoLiner® SW Granules** a minimum 6 mm thick around the penetrations covering the entire substrate area. With gravel substrate, install a minimum 200 mm collar of **BentoLiner® SW** around penetration prior to placing **BentoLiner® SW Granules**. Then apply a thick layer of **BentoLiner® SW Mastic** around each penetration as detailed (Figure 1.16).

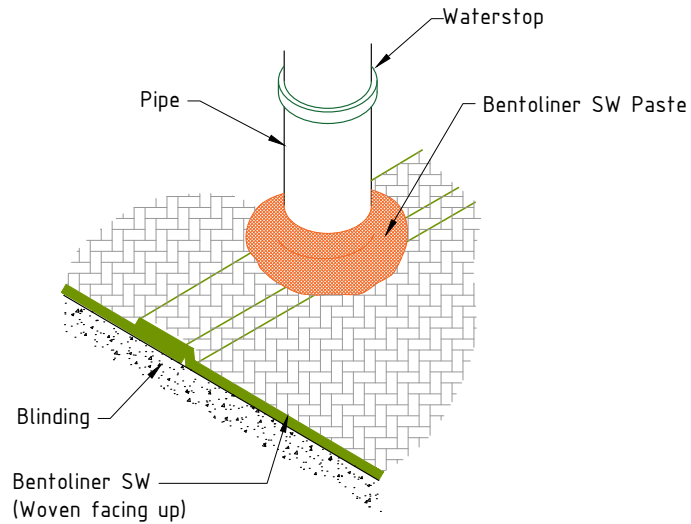


Figure 1.14 – Sealant troweled around penetrations

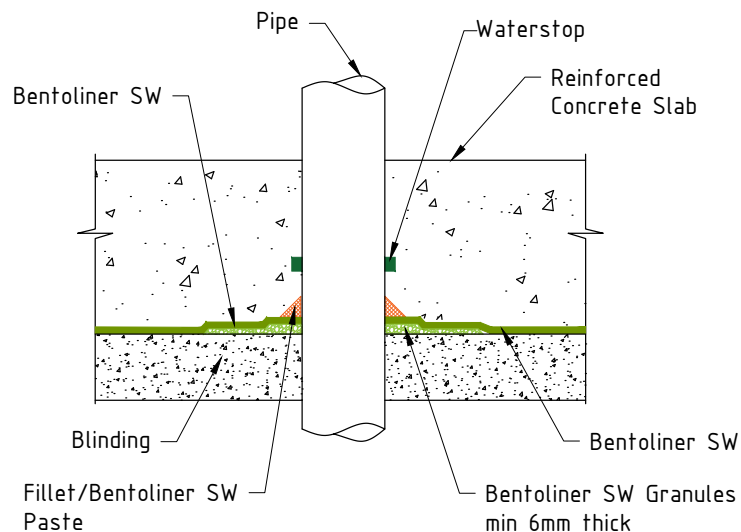


Figure 1.15 – Slab penetration cross section detail

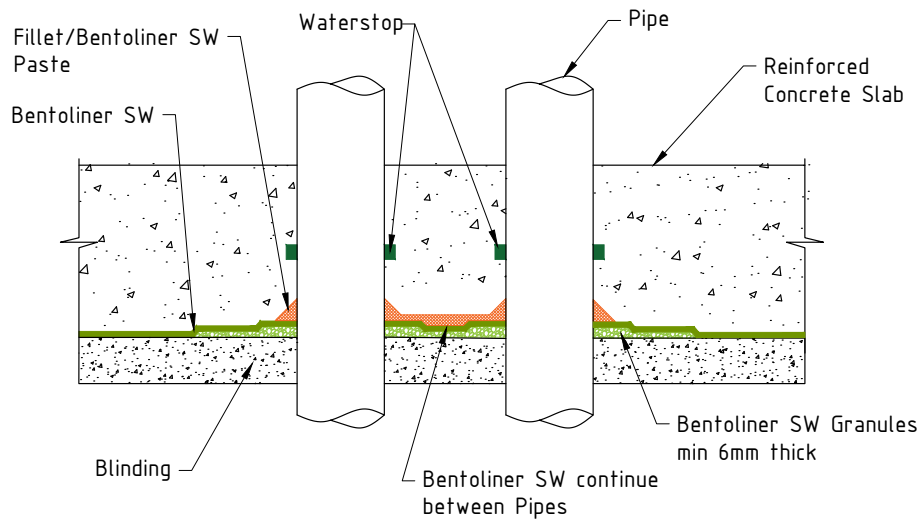


Figure 1.16 - Multiple pipe penetrations. Trowel Sealant around pipes and covering area between the pipes

1.5 ELEVATOR PITS

BentoLiner® SW should be placed on vertical surfaces and on the substrate below the slab to form a continuous envelope around the elevator pit (Figure 1.17). If the vertical soil cut is smooth and stable, **BentoLiner® SW** may be installed directly against the soil.

Contain unstable soils with concrete backblinding. Install **BentoLiner® SW** directly against the concrete backblinding. Due to various elevator piston plunger designs, consult your Solmax representative for specific installation and detailing for piston plungers that penetrate the pit slab.

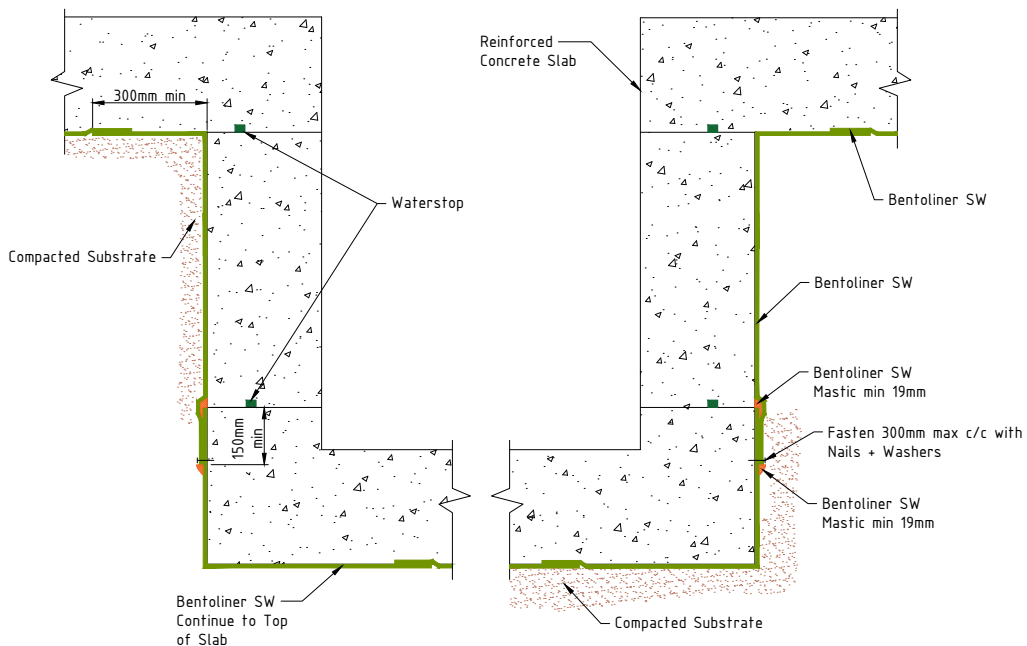


Figure 1.17 - BentoLiner® SW under elevator pit slab and on excavation cut walls

1.6 EDGE OF SLAB, BACKFILLED WALLS

When the installation reaches the outer edge of the slab, continue **Bentoliner® SW** up to the top edge of the forms inside surface (Figure 1.18) or extend the **Bentoliner® SW** sheet out the top of the form a minimum of 300 mm (Figure 1.19). At the slab corner, **Bentoliner® SW** should remain in contact with the substrate and the inside surface of the concrete form.

When the slab edge form is removed, any undamaged portion of **Bentoliner® SW** extended outside the form should be positioned and secured to the top of the concrete footing. Damaged material outside the form should be cut off and disposed of. Overlap the secured **Bentoliner® SW** edge on top of the footing a minimum 150 mm with the succeeding wall waterproofing. Install **Bentoliner® SW Mastic** fillet (min 38 mm x 38 mm) at wall-to-footing corner prior to installing overlapping wall waterproofing.

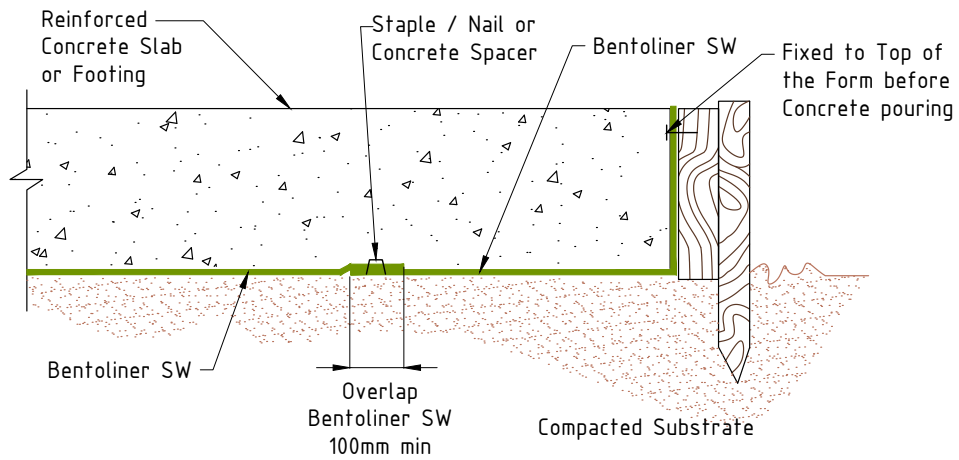


Figure 1.18 - Bentoliner® SW turned up and secured at top of concrete form

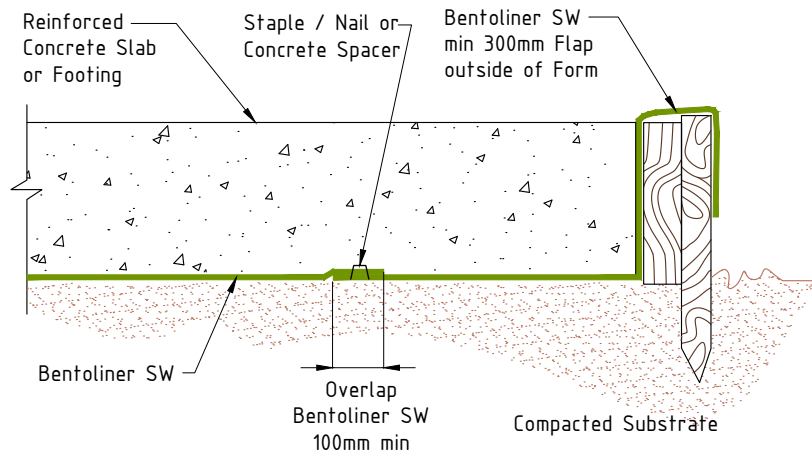


Figure 1.19 - Extra tail of Bentoliner® SW extended out of form and later cut off after concrete pour

SECTION 2

2.1 STEEL SHEET PILING RETAINING WALL

Bentoliner® SW is installed to the shoring wall prior to concrete placement. Install **Bentoliner® SW** with the woven side facing the installer when substrate preparation work has been completed. Trowel a 12 mm thick layer of **Bentoliner® SW Mastic** along all sheet piling knuckles. Fill voids or cavities at tieback plates with cementitious grout or compacted soils. If excessive water is penetrating the sheet piling knuckles, this water ingress must be stopped prior to application.

Alternate Plywood Method

Alternatively, 12 mm plywood may be fastened to the sheet piling to create a flat surface upon which **Bentoliner® SW** is fastened. All void spaces between the plywood and sheet piling must be filled with compacted earth or lean mix concrete or pea gravel. Apply **Bentoliner® SW** to the plywood.

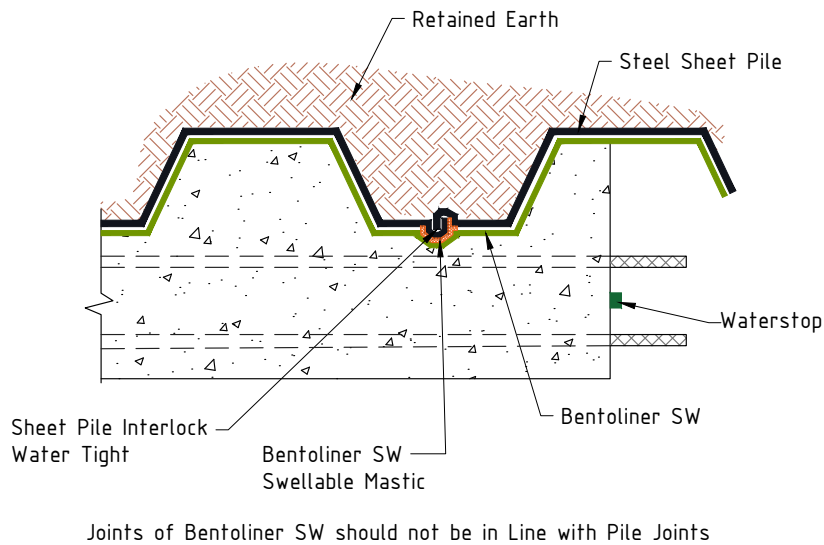


Figure 2.1 – Sheet pile interlock detail

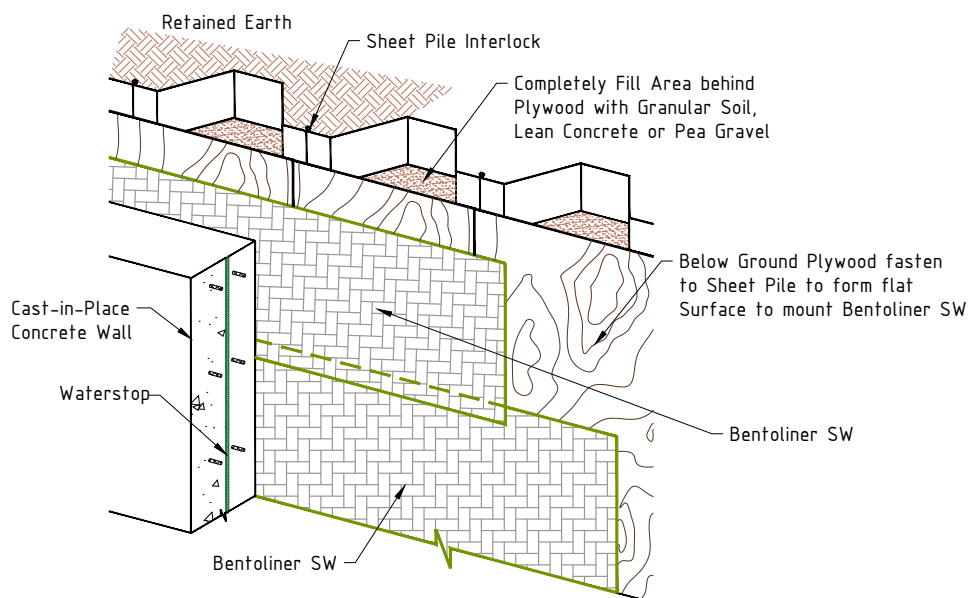


Figure 2.2 – Install Bentoliner® SW onto steel sheet piling retaining wall with washer-head fasteners

2.2 SECANT / CONTIGUOUS PILED WALLS

The surface of secant / contiguous piled and cut rock excavation walls must be sufficiently regulated to provide an adequately smooth surface to apply **Bentoliner® SW**. It can be applied over large, relatively shallow indentations where it can conform tightly against the surface.

The surface should not contain voids or sharp protrusions in excess of 25 mm. Cut rock excavations typically require shotcrete or grout work to provide an acceptable surface to install **Bentoliner® SW** (Figure 2.3). Fill all large recesses between piles with cementitious grout prior to installing **Bentoliner® SW** (Figure 2.4).

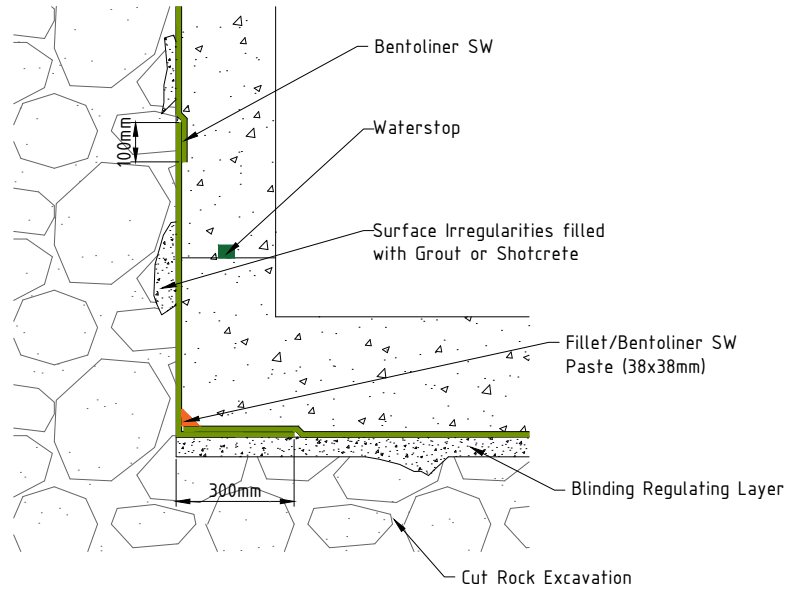


Figure 2.3 - Cut rock excavation with shotcrete applied to provide a smooth surface for waterproofing installation

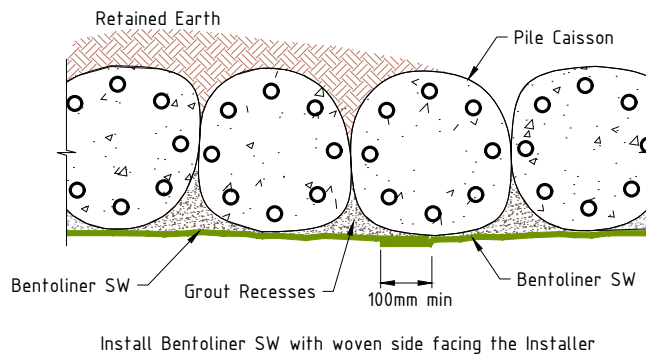


Figure 2.4 - Fill in recesses between cast piles with grout to provide smooth surface (Plan View)

SECTION 3

BACKFILLED WALLS

Install **BentoLiner® SW** with the woven geotextile side against the concrete wall on cast-in-place concrete foundation walls prior to backfilling. **BentoLiner® SW** may be applied as soon as the forms are removed. It is not necessary to wait for the concrete to completely cure. Use **BentoLiner® SW** with a concrete cast with conventional forms that produce a smooth surface.

3.1 SURFACE PREPARATION

Footings should be swept clean of silt, rocks, and debris to provide **BentoLiner® SW** with direct contact to the concrete in the application area. The wall surface must be properly prepared before **BentoLiner® SW** is installed.

Areas of surface honeycombing or voids should be filled with cementitious grout or **BentoLiner® SW Paste**. Protrusions of over 6 mm should be knocked off smooth with the concrete surface.

Apply **BentoLiner® SW Mastic** over the exterior grouted surface of all form tie holes (Figure 3.1).

3.2 INSTALLATION

Before installing the first course of **BentoLiner® SW**, install **BentoLiner® SW Paste** fillet (min 38 mm x 38 mm) at the wall/footing inside corner (Figure 3.2).

Beginning at the bottom corner of the wall, install **BentoLiner® SW** horizontally oriented with 1.5m on one wall and the remainder around the corner on the other wall surface (Figure 3.2). Cut the bottom edge of **BentoLiner® SW** at the corner a minimum of 150 mm so that **BentoLiner® SW** can be extended onto the footing.

Fasten **BentoLiner® SW** into position with washer head fasteners maximum 600 mm on center. Then cut and install a **BentoLiner® SW** section over the uncovered footing corner area. Apply **BentoLiner® SW Paste** at the **BentoLiner® SW** section to overlaps. (Figure 3.2).

Install adjacent **BentoLiner® SW** rolls of the bottom course horizontally oriented. Each roll should overlap the preceding roll a minimum 100 mm and should extend onto the footing a minimum 150 mm. At vertical inside corners apply a continuous 19 mm fillet of **BentoLiner® SW Paste** directly in the corner prior to installing **BentoLiner® SW** (Figure 3.3).

Stagger all vertical overlap joints a minimum of 300 mm (Figure 3.4). When hydrostatic conditions exist, the vertical wall **BentoLiner® SW** should cover the entire footing and overlap the underslab waterproofing a minimum 150 mm (Figure 3.6). Tape all **BentoLiner® LSW** membrane overlap seams with Bonding Tape.

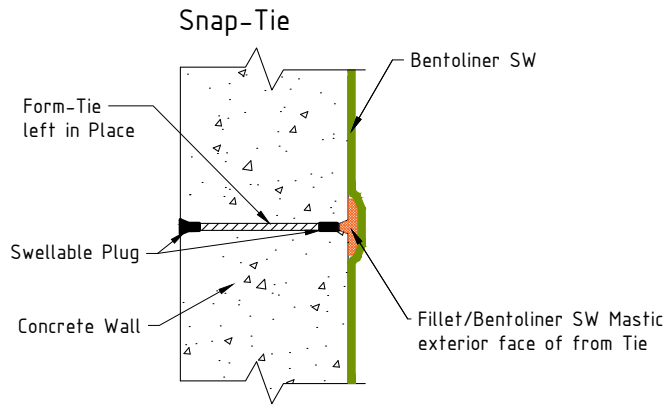


Figure 3.1 – Concrete form tie details

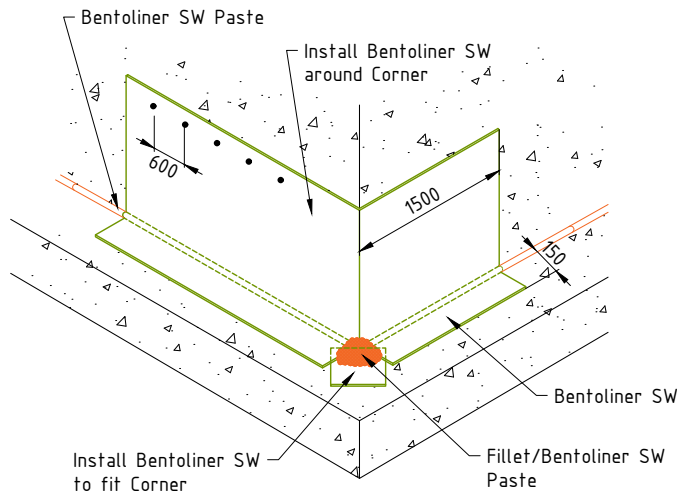


Figure 3.2 – Start BentoLiner® SW at the corner horizontally. Place cut section at corner and apply Sealant at overlaps

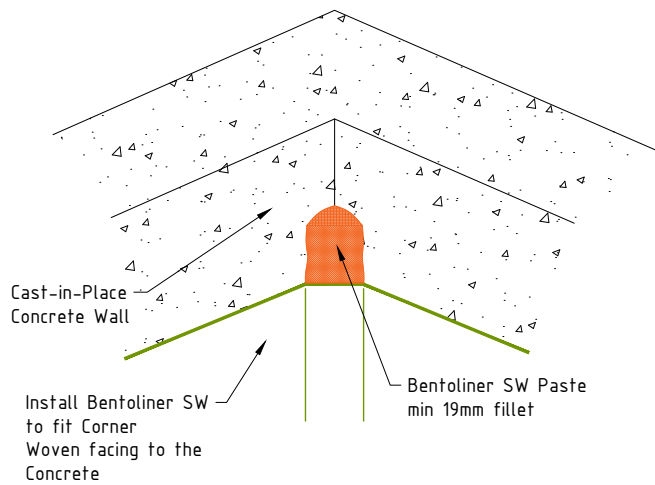


Figure 3.3 – Apply fillet of Sealant to the inside corner

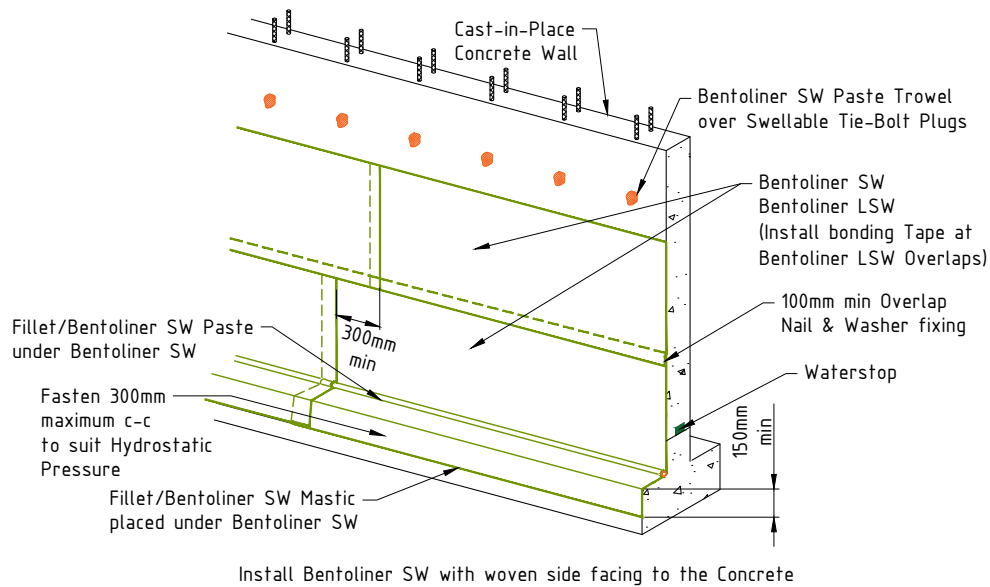


Figure 3.4 - BentoLiner® SW installed on cast-in-place backfilled wall, overlap edges 100 mm and stagger vertical end laps

Backfill: The excavated area should be backfilled and compacted promptly after **BentoLiner® SW** is installed. Use placed backfill as a platform in applying succeeding **BentoLiner® SW** courses. The backfill must be compacted to a minimum 85% Modified Proctor density.

Backfill should consist of compatible soils or angular aggregate (19 mm or less) free of debris, sharp objects, and stone larger than 19 mm. When backfill cannot be placed immediately, protect the membrane from precipitation and debris by sealing edges to the concrete substrate with a tooled bead of **BentoLiner® SW Mastic**. This temporary termination can be left in place covered by subsequent membrane overlap.

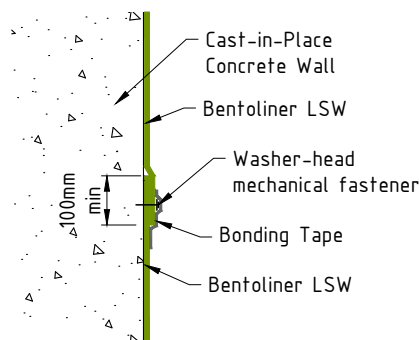


Figure 3.5 - Minimum BentoLiner® LSW overlap detail; tape BentoLiner® LSW seams

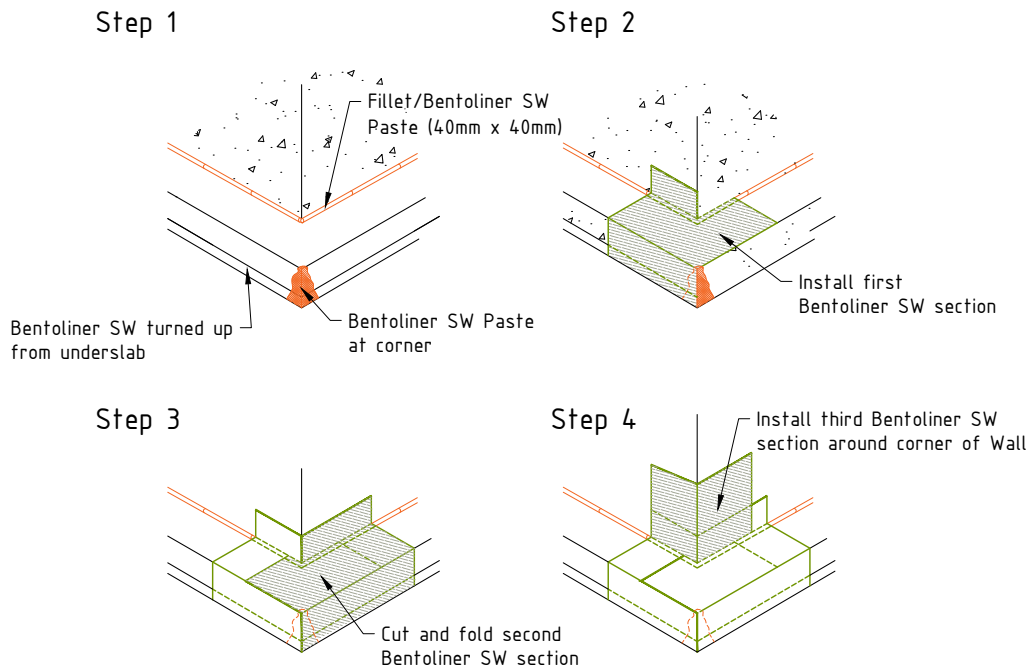


Figure 3.6 – Step by step detail of outside wall base corner installation (hydrostatic condition)

3.3 BACKFILLED WALL PENETRATIONS

Cut **BentoLiner® SW** to closely fit around penetrations. After installing **BentoLiner® SW**, trowel a minimum 19 mm thick fillet of **BentoLiner® SW Paste** around the penetration to completely fill any space between the penetration and the **BentoLiner® SW** edge. The Sealant should extend onto the penetration 38 mm and cover **BentoLiner® SW's** edge (Figure 3.7).

In areas where multiple penetrations are close together, it may be impractical to cut **BentoLiner® SW** to fit around the base of each penetration. Therefore, apply a 19 mm thick fillet of **BentoLiner® SW Paste** around each penetration and cover the entire surface between the penetrations (Figure 3.8). Extend **BentoLiner® SW Paste** 38 mm onto the penetrations.

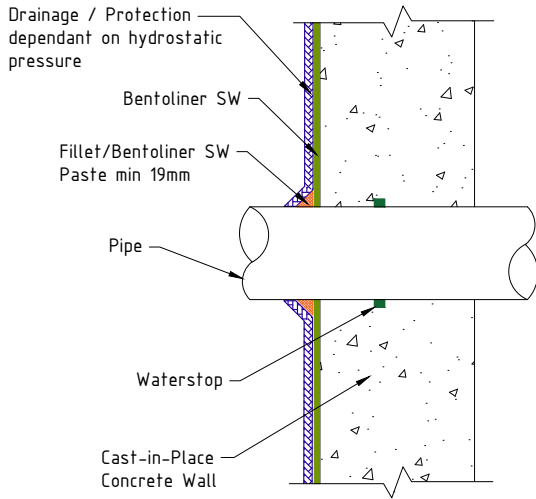


Figure 3.7 – Single penetration cast-in-place wall detail

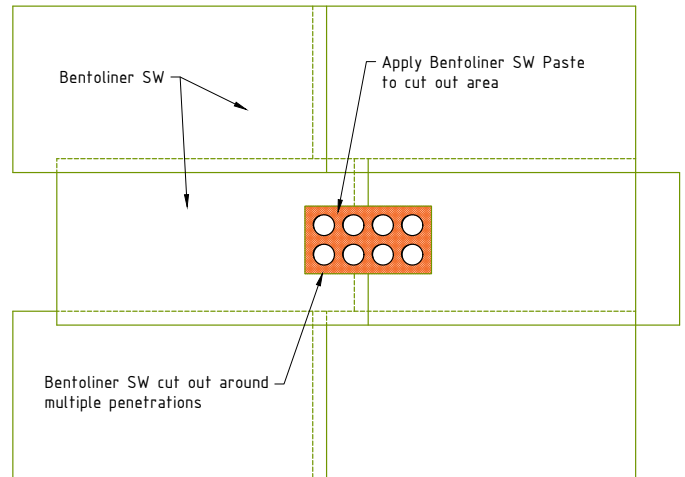


Figure 3.8 – Cut Bentoliner® SW to fit around penetrations

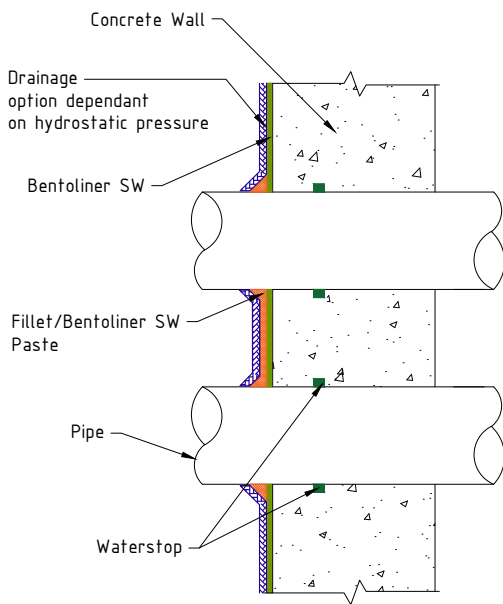


Figure 3.9 – Close multiple penetrations. Trowel Sealant around and between penetrations

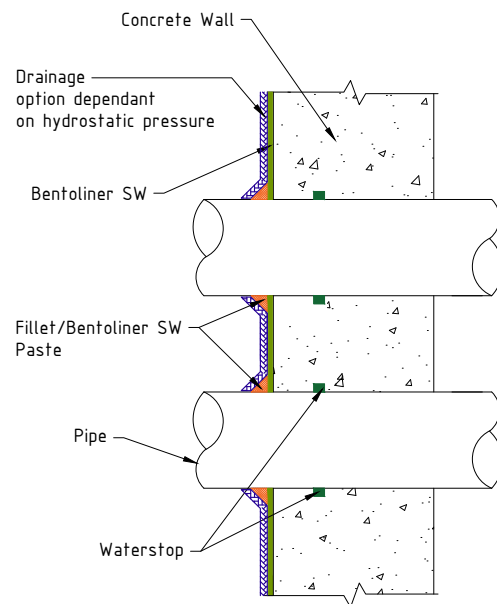


Figure 3.10 – Install Bentoliner® SW between penetrations with accessibility. Trowel Sealant around penetrations

3.4 GROUND LEVEL TERMINATIONS

Terminate **Bentoliner® SW** membrane 300 mm below finished ground elevation with washer-head fasteners maximum 300 mm on center. Install self-adhering waterproofing membrane flashing to the primed concrete substrate with the bottom edge overlapping the top edge of **Bentoliner® SW** membrane by a minimum of 100 mm.

Overlap all roll ends a minimum 150 mm to form a continuous flashing. The height of flashing shall be per project details and specifications. Install a rigid termination bar along the top edge of the self-adhering waterproofing membrane; fastened maximum 300 mm on center. Complete ground level termination detail with a tooled bead of **Bentoliner® SW Mastic** along the top edge, at all penetrations through the flashing, and all exposed overlap seams. Ground level termination is illustrated in Figure 3.11.

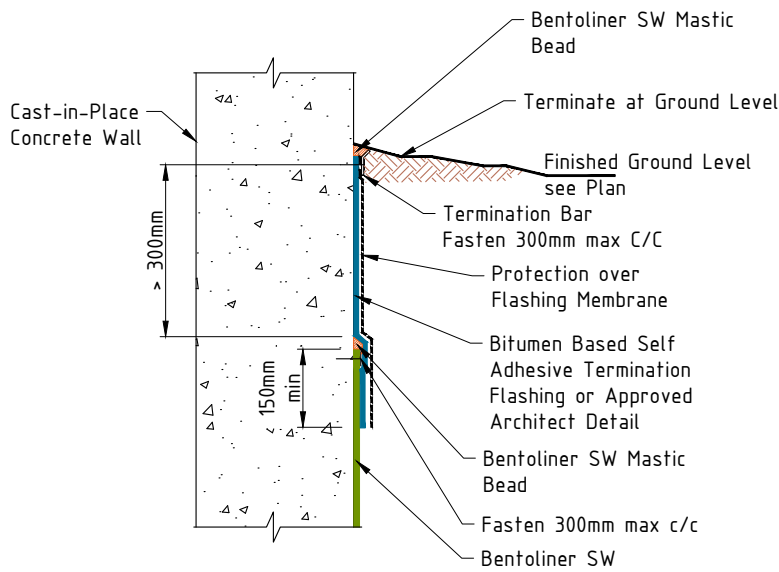


Figure 3.11 – Termination at finished ground level

OUR LOCATIONS



 **HEADQUARTER**
VARENNES, QC | CANADA



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