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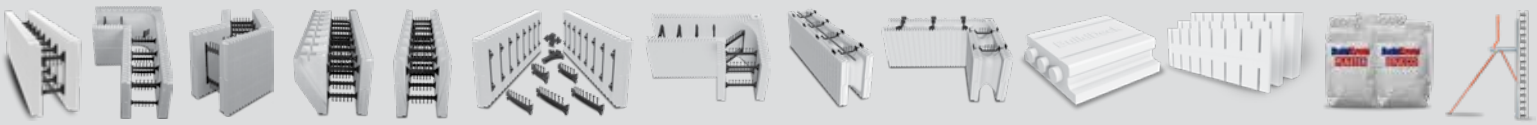
BUILDING SYSTEMS

BUILDBLOCK BUILDING SYSTEMS

A COMPREHENSIVE GUIDE TO ICF WATERPROOFING



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BUILDBLOCK ICF GUIDE TO WATERPROOFING

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A COMPREHENSIVE GUIDE TO ICF WATERPROOFING

PUBLICATION

This comprehensive guide to ICF waterproofing manual was published on September 2, 2016 and is a supplment and companion to the BuildBlock Installation & Technical Manual. Changes to this and other documents, however, may occur without notice and users should download the most current version at buildblock.com.

It is the purchaser's and/or contractor's responsibility to always use the most current and up-to-date version of the installation manual when installing BuildBlock forms and/or products.

This manual was designed to be used as a reference guide only. This manual is not intended to be used as a replacement or substitute for the actual training by an experienced and properly trained BuildBlock building professional. Before starting any project BuildBlock recommends that you receive proper training. BuildBlock also recommends that you consult with design professionals familiar with the type and scope of project to be built. Training is available by contacting BuildBlock Building Systems LLC at buildblock.com or 866-222-2575.

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TRADEMARKS

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Typical walkout ICF basement using a waterproofing barrier and an air gap membrane installed as well as perimeter foundation drainage.

INTRODUCTION

There are two levels defined by building codes to protect a structure from water. Damp-proofing refers to any system which will protect a basement or other enclosed space from moisture found in the soil around a home. Impermeable in most instances, it may not protect against a column of liquid water. Waterproofing systems which will protect a basement or other enclosed space from liquid water as well as the moisture commonly found in soils. Building codes require any walls below grade with an interior enclosed space that is habitable have appropriate moisture control.

Damp proofing and lower levels of moisture control are required for other types of below grade areas such as stem walls and crawlspaces. There are many waterproofing systems to choose from and several of these are widely used and perform exceptionally well.

Newer methods are designed to save labor and material costs. Spray-on membranes for ICF are beginning to grow as well, but currently depend on the regional skills and availability of applicators. Research options and choose the solution that will provide the best below grade protection for the life of the structure. BuildBlock recommends that all below grade crawlspaces or basements be waterproofed even if not used as a living space. Consult local codes, though if not habitable the choice may be yours.

In many installations, a combination of materials offers the best waterproofing performance. The primary methods of waterproofing are: peel and stick membranes, liquid systems that are sprayed, rolled, or applied with a trowel, and dimpled drainage mats which are mechanically fastened to ICF walls.

STANDARD WATERPROOFING EXAMPLES

- A self-adhesive 40 mil membrane such as the Home Stretch Peel and Stick Membrane by Poly Wall. This can also be used in conjunction with an air gap or dimpled membrane such as DMX-AG or Platon to protect the waterproofing from backfill and provide additional hydrostatic pressure relief.
- An ICF compatible spray-on membrane. (Caution: Do not use a petroleum based paint or primer. These products will dissolve the EPS foam.)
- A one-step mat type protection (ex. SuperSeal, Platon, or DMX-AG). This type of plastic mat provides an air gap between the ICF wall and the surrounding earth.
- A combination of waterproofing options may require both the membrane (self-adhesive, roll-on, or spray-on), plus the air gap mat.

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CAUTION: When installing a waterproofing membrane, ensure the membrane is mechanically attached using a thin furring strip of wood or metal at the very top of the wall above the final finish grade by 8" to 12".

It is also possible to use basket screws spaced a maximum of 12-inches apart. This will ensure the adhesive has adequate time to bond to the foam or primer. This is critical in cold and hot weather or when significant temperature changes occur such as daytime heating and cooling overnight.

Waterproofing membrane and air gap membranes installed and mechanically attached above final grade level.

ABOUT WATERPROOFING ICFS

Waterproofing an ICF structure is substantially different from standard concrete construction. While it is important to place a barrier between the elements and the interior of the home, the nature of that barrier is much more important when working with ICFs. Due to the nature of foam, and its susceptibility to solvents, water based materials alone should be used. A peel and stick membrane recommended for use with ICFs to maintain a consistent membrane thickness, bridge any gaps or seams, and easy installation and cleanup.

Waterproofing is a multi-step project, involving many areas of the ICF wall and other building components. Moisture control begins with flashing from the roof line, parging at grade level, below grade membranes, air gap barriers and site drainage to route water away from the structure. This includes water shed from the structure and runoff from other sources on the property.

A typical basement will have much of the wall square footage backfilled. This backfill will contain moisture and will apply hydrostatic pressure against the wall. Any moisture or liquid water will seek out cracks or voids, and use them to migrate into your basement. Careful attention to waterproofing will ensure that your structure is dry, comfortable, and energy-efficient.

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Waterproofing membrane and air gap membranes installed and mechanically attached above grade levels.

WHAT AFFECTS MOISTURE IN THE SOIL?

There are many factors that can affect the hydrostatic pressure of the soil in your area. The water table is influenced by:

1. The site's proximity to a body of water; lakes, rivers, oceans, artesian wells, and underground streams all affect the water table.
2. Precipitation, including the amount of rain or snow melt both locally and upstream of the site can increase the hydrostatic pressure against a basement.
3. Water shed runoff from other areas of the site or nearby areas can also contribute to the amount of water the system must be constructed to handle.
4. Different types of soil have different properties when relating to retention of groundwater. Locally heavy rains can overwhelm the ability of the soil to soak up the water (saturation) which increases the fluid pressure on the walls.

BuildBlock recommends a combination of waterproofing materials and systems to adequately manage the different factors affecting moisture and hydrostatic pressure in the soil. Each of these systems provides a different function and complements the other. A peel and stick sheet material such as Poly Wall Home Stretch and a dimple membrane like DMX-AG are the best options when waterproofing your structure. The combination of the two systems adds additional protection to your structure.

Adhesive waterproofing membrane installed. Note overlap on all seams and mechanical attachment at the top of the membrane.

PEEL AND STICK WATERPROOFING MEMBRANE OVERVIEW

A peel and stick waterproofing membrane such as Poly Wall Home Stretch provides a positive seal against the wall and acts as a barrier to prevent liquid water or water vapor from finding their way into the basement. Home Stretch is a flexible self-adhering rubberized asphalt sheet waterproofing membrane well suited for below-grade waterproofing of foundation walls, tunnels, earth shelters, ICF forms and similar structures. It is 40 mils thick (.040") and is typically supplied in 36" wide rolls.

Poly Wall Home Stretch is installed vertically, with three inches of overlap at each seam. It is very important to seal all overlapping seams 1-1/2" on each side of the seam with a plastic mastic or self adhesive sheet such as Poly Wall Home Stretch Detail Tape. The top of the Home Stretch Membrane should extend above grade by a small margin and BuildBlock recommends installing a termination bar at the top attached to the ICF web attachment points. This bar will be permanent and should be as thin as possible so it is not visible underneath a parge coat, stucco, or other finish. The termination bar may be plastic or aluminum, or steel such as plumbers tape or banding. A small amount of membrane should extend above the termination bar and be caulked with a polyurethane 1-part caulking such as NP-1 to further seal the top of the membrane.

The bottom of the membrane should extend out onto the footing 1 – 3 inches, and should be caulked at the end to provide a positive seal. A water based primer should be used to enhance the bond with the EPS foam.

Read all directions and manufacturer instructions on the packaging prior to installation.

DMX AG membrade attached below large opening.

AIR GAP MEMBRANE OVERVIEW

An air gap membrane, also called a dimpled membrane, such as Platon or DMX AG is a plastic membrane with a raised flat tab on one side. The membrane is installed vertically, and the raised tabs are placed against the wall creating a uniform space between the wall and the membrane. As hydrostatic pressure increases, air is displaced relieving hydrostatic pressure against a basement or foundation. This membrane also provides a clear drainage plane against the wall.

DMX-AG has a flat tab at the top which is used as a sealing strip. Cut material may be sealed with DMX Flex Trim, at the top, and around window and door openings. DMX-AG is screwed or nailed onto the foundation wall and sealed with caulk or mastic to prevent soil infill between sheets at joints or the top of the wall. When using a both a waterproof and an air gap membrane, do not screw through the air gap membrane into the waterproofing membrane below. This breaks the membrane and defeats the purpose of the membrane.

BuildBlock recommends utilizing both a peel and stick membrane and a dimple/air gap membrane for the best protection. This is inexpensive to do correctly and very expensive to correct.

OTHER WATERPROOFING OPTIONS

Other systems available include rolled, troweled, and sprayed coatings. It is important to note that solvent based coatings will dissolve EPS foam. Some coatings may do so slowly, and it may go unnoticed until after backfilling. Without the foam to support the coating, the waterproofing loses its effectiveness. Always use water or emulsion based coatings that allow for water cleanup. If in doubt, contact BuildBlock.

Monopour installation using the Fab Form Monopour System and FastFoot.

MONOLITHIC ICF CONSTRUCTION (MONOPOUR)

A monopour system directly integrates a plastic fabric footing form with the first course of an ICF wall. The footings are poured at the same time as the foundation walls, eliminating the need for multiple pours, as well as the setting and stripping of forms and screed boards.

Constructing a project through the use of a monopour system is not recommended for first time installers. The process requires great attention to detail.

Pouring an ICF wall monolithically with the footing using a product such as the Monopour system by Fab-Form, can help avoid a cold joint between the footing and the wall altogether.

Fab-Form offers multiple solutions for pouring footings and columns, in a waterproof fabric "casing" which prevents moisture wicking into the core of ICF walls in wet environments.

WATERPROOFING CONCRETE ADDITIVES

Concrete additives that provide integral crystalline waterproofing are available from a variety of companies. Penetron, Xypex, and BASF's Masterlife products are all based on the chemical reaction between the active ingredient, crystalline silica, and the hydrated compounds in the concrete. In the presence of water, an insoluble crystal grows into the void, toward the water source, effectively sealing cracks and fissures in the concrete.

These additives also assist should water enter the wall cavity. Concrete may form small capillaries that would allow water to travel through the wall. The source of this water infiltration is difficult to detect as the entry and exit of the moisture may be far apart. These materials also increase the compressive strength of the concrete and provide a water resistant buffer around all rebar, protecting it from moisture and corrosion.

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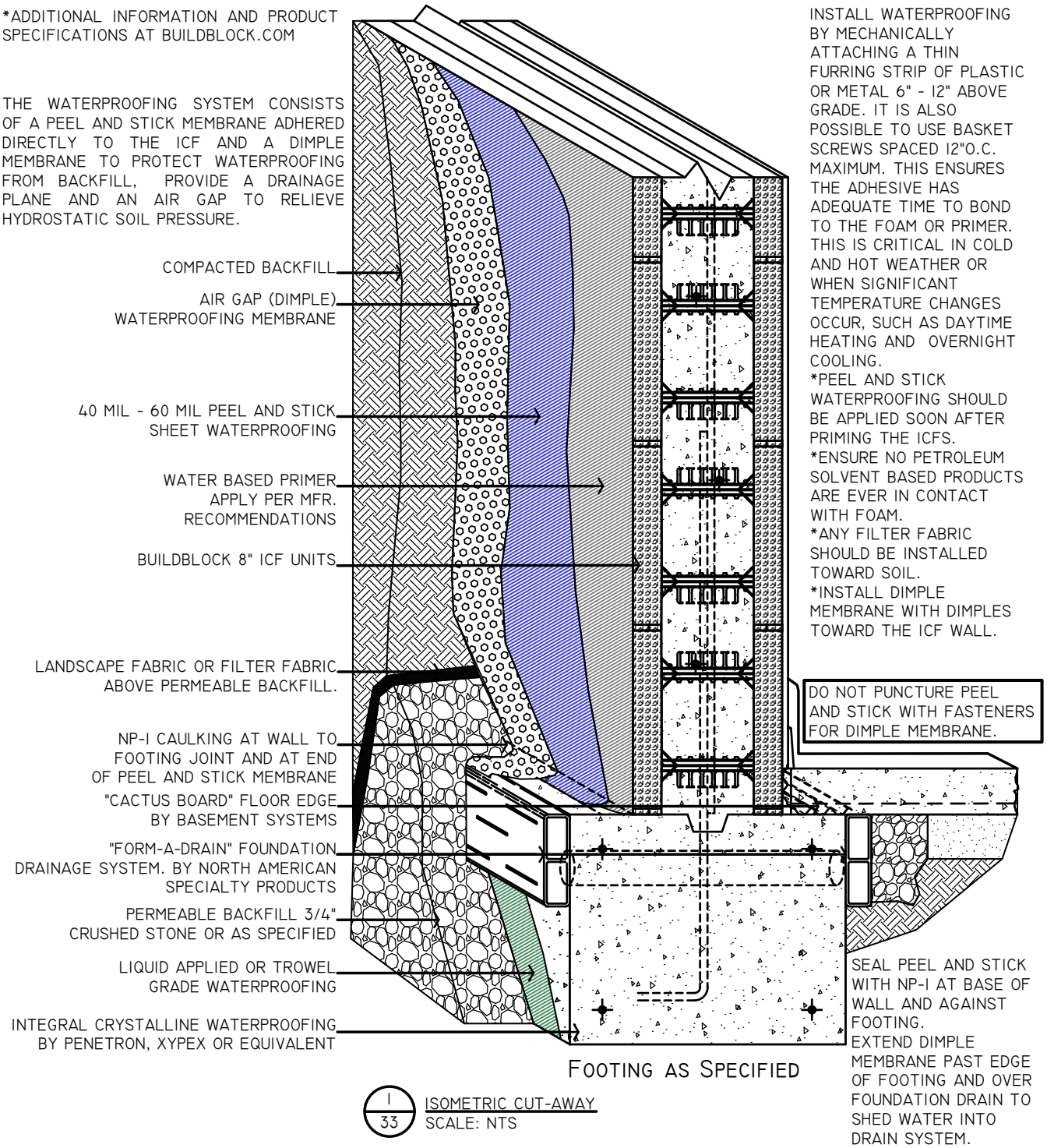
BUILDBLOCK SUB-GRADE WATERPROOFING CAD DETAIL

*ADDITIONAL INFORMATION AND PRODUCT SPECIFICATIONS AT BUILDBLOCK.COM

THE WATERPROOFING SYSTEM CONSISTS OF A PEEL AND STICK MEMBRANE ADHERED DIRECTLY TO THE ICF AND A DIMPLE MEMBRANE TO PROTECT WATERPROOFING FROM BACKFILL, PROVIDE A DRAINAGE PLANE AND AN AIR GAP TO RELIEVE HYDROSTATIC SOIL PRESSURE.



INSTALL WATERPROOFING BY MECHANICALLY ATTACHING A THIN FURRING STRIP OF PLASTIC OR METAL 6" - 12" ABOVE GRADE. IT IS ALSO POSSIBLE TO USE BASKET SCREWS SPACED 12"O.C. MAXIMUM. THIS ENSURES THE ADHESIVE HAS ADEQUATE TIME TO BOND TO THE FOAM OR PRIMER. THIS IS CRITICAL IN COLD AND HOT WEATHER OR WHEN SIGNIFICANT TEMPERATURE CHANGES OCCUR, SUCH AS DAYTIME HEATING AND OVERNIGHT COOLING.
*PEEL AND STICK WATERPROOFING SHOULD BE APPLIED SOON AFTER PRIMING THE ICFS.
*ENSURE NO PETROLEUM SOLVENT BASED PRODUCTS ARE EVER IN CONTACT WITH FOAM.
*ANY FILTER FABRIC SHOULD BE INSTALLED TOWARD SOIL.
*INSTALL DIMPLE MEMBRANE WITH DIMPLES TOWARD THE ICF WALL.

DO NOT PUNCTURE PEEL AND STICK WITH FASTENERS FOR DIMPLE MEMBRANE.

SEAL PEEL AND STICK WITH NP-I AT BASE OF WALL AND AGAINST FOOTING.
EXTEND DIMPLE MEMBRANE PAST EDGE OF FOOTING AND OVER FOUNDATION DRAIN TO SHED WATER INTO DRAIN SYSTEM.

1/33 ISOMETRIC CUT-AWAY
SCALE: NTS

GENERAL DETAIL NOTES:

1. ALTERNATE WATERPROOFING PRODUCTS WITH EQUAL OR GREATER SPECIFICATIONS MAY BE USED.
2. FOLLOW ALL MANUFACTURER'S INSTALLATION DETAILS AND SPECIFICATIONS.

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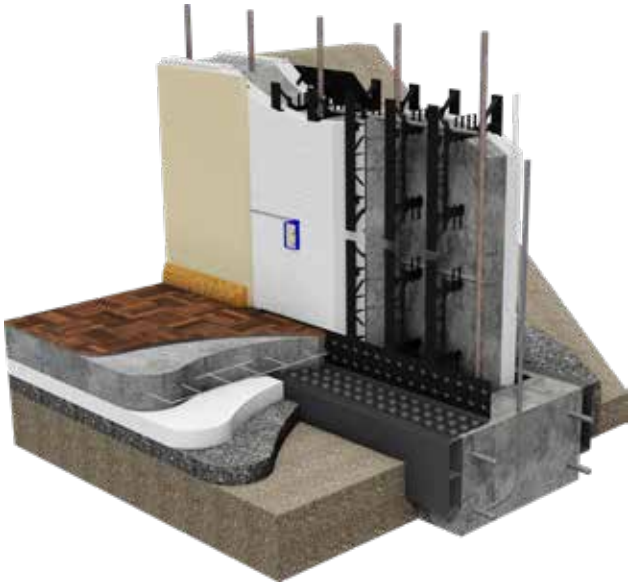

Additional interior waterproofing system using CactusBoard, Form-a-Drain, and appropriate backfill.

FOOTING DRAINAGE SYSTEMS

Adequate drainage around the footings is necessary to maintain a dry basement. Several methods are used for perimeter drains, including drain tiles, corrugated pipe and Form-A-Drain.

Form-A-Drain provides a stay in place forming system for footings which interconnect a drain on both the inside and outside of the footing. This drain connects to a sump or daylight drain. Form-A-Drain is also designed to evacuate radon gas from foundations through passive or active venting. Many codes are shifting toward active venting, but if used with passive venting and a sump, the sump must be sealed and tested to prevent radon gas from entering through the drainage system.

There are many systems available in the market to protect your basement walls from water infiltration. Taking the time to do it right from the start can prevent costly repairs later.

BELOW GRADE MOISTURE CONTROL

DAMP-PROOFING (NOT PREFERRED)

Damp-proofing is specified for normal basement walls, crawlspace walls, and other below grade walls enclosing an interior space. Damp-proofing refers to any system which will protect a basement or other enclosed space from moisture found in the soil around a home, and is impermeable in most instances, but may not protect against a column of liquid water.

WATERPROOFING (PREFERRED)

Waterproofing is specified for areas with high hydrostatic pressure, standing water, or other known soil-water conditions. Waterproofing refers to any system which will protect a basement or other enclosed space from liquid water as well as the moisture commonly found in soils. It is fully impermeable, and will prevent any moisture or water incursion.

Note: When installing waterproofing or damp-proofing, ensure that no untreated penetrations are present in the barrier. Failures of this barrier can occur due to fastener placement, rips or tears that are not properly sealed, or an incomplete seal at seams. Backfill with large stones, sticks, or other debris can also cause the membrane or coatings to become torn. Proper backfilling methods and materials will help prevent this. Paying strict attention during backfill is imperative.

BACKFILLING

Proper backfilling around a basement wall is more than replacing and compacting soil around the walls. Backfill materials should be free from large inclusions, such as stones, sticks, or other large debris. These can damage the waterproofing. If the waterproofing is damaged it may require the backfill to be removed and sections of waterproofing replaced at great cost.

Backfill should also be compacted properly. Fill should be placed about 2 feet or less in depth, beginning with gravel, transitioning to soil, using a small compacting machine to compress the soil evenly around the foundation. **DO NOT use a tractor to compact the soil all at once after filling.** This can cause damage to the waterproofing materials, and can even cause the basement or stem walls to be pushed in or crack.

Once the entire wall has been waterproofed, backfill should be built up in proper layers including the type of material in the correct location. At the base around

the drain pipe or Form-a-Drain fine gravel should be placed to the height of at least 12-inches. A layer of silt cloth should then be placed on top of the gravel before additional backfill is placed. Backfilling can only occur after the walls are poured and floor trusses are in place to help support the walls from pressure of the the backfill.

Never backfill unsupported basement walls until the floor system is in place to support the tops of all walls from moving in from backfill pressure.

Backfill and compact carefully to prevent pulling waterproofing loose from the walls. Backfill material should then be built up around the basement or stem/frost walls until it is higher than the surrounding grade. The soil should then be sloped smoothly away from the home or building to ensure that no standing water will make its way back to the foundation walls.

BASEMENT BACKFILL REQUIREMENTS

Foundation walls that retain earth and enclose interior spaces and floors below grade shall be damp-proofed from the top of the footing to the finished grade. In areas where a high water table or other severe soil-water conditions are known to exist, exterior foundation walls that retain earth and enclose interior spaces and floors below grade shall be waterproofed from the top of the footing to the finished grade.

Regarding waterproofing materials for ICF: Organic-solvent-based products such as hydrocarbons, chlorinated hydrocarbons, ketones and esters shall not be used for ICF walls with expanded polystyrene form material. Use of plastic roofing cements, acrylic coatings, latex coatings, mortars and pargings to seal ICF walls is permitted. (IRC-2012, 406.1 and 406.2).

CRAWLSPACE BACKFILL REQUIREMENTS

Crawlspace requirements vary by the type and use of the crawlspace, and also by variances in local codes.

UTILITY ACCESS ONLY

Typically this space only requires minimal damp-proofing and cross ventilation when well drained soils are present. Some jurisdictions will require a vapor barrier to be installed, creating an encapsulated crawlspace.

STORAGE AND UTILITY ACCESS

When a crawlspace will be used for more than utility access alone, it is a good idea to address moisture below the foundation more directly. A full damp-proofing system consisting of a vapor barrier taped or bonded to the inner walls and damp-proofing on the exterior walls to control or prevent moisture incursion should be installed.

ENCAPSULATED CRAWLSPACE

An encapsulated crawlspace is typically sealed completely. It is usually non-vented and may or may not recirculate air with the home. An encapsulated crawlspace may also have a mudcap, or a thin concrete slab used to further protect the crawlspace. It should be fully damp-proofed and adequate drainage should be in place at the base of the footings to fully drain any moisture that accumulates.

If exposing the interior air to a crawlspace, the crawlspace should be treated just like a basement, with full encapsulation and waterproofing. A full foundation drain system should be in place, and the entire system sealed within the home/building envelope.

STEM WALL BACKFILL REQUIREMENTS

Stem or Frost walls are defined as walls installed below grade to connect above grade walls with footings set at frost line. These walls typically have fill against both sides do not typically need to be waterproofed. As with any ICF wall, integral waterproofing, such as Masterlife 300D will help to prevent moisture wicking up the concrete core.

FOOTING TO WALL CONNECTIONS

Basement walls should be stacked on footings, with the slab poured above the footing. This provides a 4-inch buffer if water reached the cold joint at the base of the wall. If water did push through the cold joint it would still be below the floor level, allowing it to drain away.

Caution Stacking block directly on a basement slab requires additional waterproofing measures and is not recommended. Water stops or offset slab edges are required. Dropping the edge of the slab by several inches, a ledge is created that acts like flashing to direct water back to the outside of the foundation, and into the footing drain system. Failure to adequately shed water away from this joint will cause moisture intrusion into the structure and ICF wall.

CACTUS BOARD

CactusBoard is a perimeter basement footing drain and foundation wall drain system that is installed during the construction of the foundation. It is installed over the footings before the slab is poured and provides continuous drainage at the wall.

REPAIR AND MITIGATION SOLUTIONS

There are a number of solutions that can serve to reduce or eliminate waterproofing problems after backfill is in place. Some of these involve diverting water away from the waterproofing, adding additional barriers, and providing controlled spaces to mitigate damage from moisture that does enter.

In severe cases, depending on the cause of the problem, removal of the backfill and reapplication of the waterproofing is necessary. Taking time to plan, install, and inspect, waterproofing at all stages of the project will prevent problems and maintain dry basements and happy homeowners.

BuildBlock's recommended installation guidelines for waterproofing products should be used in conjunction with the manufacturer's specific installation guides. For more information contact BuildBlock or the manufacturer directly. The success of your waterproofing is dependent upon quality of materials and attention to detail during installation.

WATERPROOFING INSTALLATION

INSTALLING A PEEL AND STICK WATERPROOFING MEMBRANE

1. Mark a starting line level around the wall.
2. Measure the height of the wall from 8" to 12" above grade adding 3" to 4" for overlap onto the footing.
3. Cut membrane into strips with a consistent length.
4. Ensure the EPS foam is clean and free of voids or debris. Fill all holes with spray foam and rasp smooth. Clean the footing to ensure the membrane can tightly bond to the concrete.
5. It is recommended to apply primer over the EPS foam and concrete. Install Peel and Stick membrane within 2 hours. Do not spread more primer than can be covered by the membrane in the 2 hour open time. Allow primer to dry slightly to be tack or tack free per manufacturer's instructions.
6. Peel no more than 12" of release paper from the back of the membrane at any time. Install from the strting line slowly working the membrane down the wall. Take care to ensure there are no bulges or air pockets under the membrane. Make sure the membrane is pressed firmly against the wall ensuring the adhesive fully bonds in all areas.
7. As you reach the bottom of the wall apply a small bead of a one part polyurethane caulking (such as NP-1) against the seam between the EPS foam and the concrete footing. Press the membrane tightly into the corner.
8. Apply an additional bead of NP-1 to the concrete at the end of the membrane. Make sure the edge of the membrane is embedded into the bead of caulk and against the concrete.
9. Press the full membrane with a small roller to ensure a tight bond to both EPS foam and concrete.
10. Begin installing the next section the same way overlapping any seams by at least 3 inches. Ensure that the membrane is installed smooth and flat with no bulges or air bubbles on the wall, especially at any overlapping areas.
11. Continue working around the building in this manner ensuring the proper overlap of each section.
12. At the top of the membrane (8"-12" above final grade) install a thin 1" to 1-1/2" wide metal strip or banding (such as plumber's tape). Strip should be installed with screws every 6 inches into the BuildBlock webs. This strip will hold the waterproofing in place through the rest of the construction and finishing process. The strip should extend slightly higher than the membrane to mechanically lock waterproofing to the top to the wall. Place a bead of caulk in the small cavity above the membrane to further seal the top of the waterproofing membrane.
13. Mastic should be installed over every seam from the top of the membrane out onto the footing at the bottom. Caution, many mastic's are solvent based and will dissolve the EPS foam. This is the recommended application as long as it is only placed on top of the membrane and does not come in contact with any foam.

INSTALLING AN AIR GAP / DIMPLE MEMBRANES

Air gap or dimple membranes can be installed easily over peel and stick or liquid applied waterproofing membranes.

Dimple membranes are typically installed with mechanical fasteners to hold them in place. When installed alone, they are often nailed or screwed the full height of the wall. If a peel and stick or liquid applied membrane is beneath it, puncturing this membrane anywhere below grade ruins the waterproofing seal of the membrane, and render it ineffective.

1. The dimple membrane should be installed with fasteners above grade only. Mastic, caulking, or liquid nails may be used to attach the dimple membrane to the face of the wall, holding it in place until backfilled. All seams should also be sea
2. The dimple membrane should be long enough to extend past the edge of the footing, and over the top of the drain tile. This will shed water to the gravel adjacent to the drain tile and away from the footing and wall system.
3. All seams in the dimple membrane should be overlapped and caulked to keep them in place and prevent silting from backfill. Silting defeats the drainage behind the membrane.

4. Gravel (1/4" to 1/2" diameter) should be installed to the height of the footing, fully covering the foundation drain.
5. Once the dimple membrane is installed, it should be covered with gravel. The dimple membrane should not fully cover the gravel, allowing water that accumulates to flow into the drain system.

ABOVE GRADE & WALKOUT LEVEL MOISTURE CONTROL

There are several components to controlling moisture in above grade walls. This typically also requires a combination of materials in different areas of the wall. Placing the appropriate barrier to moisture is critical to ensuring the ICF walls perform to their highest level.

FLASHING TOP OF WALL

Flashing at the top of the wall and at any transitions between roofs and walls is used to control the flow of liquid water against the walls. Proper flashing directs water from rain, and snow runoff to the outside of the wall and away from the home. Improper or missing flashing can allow water to bypass other weather protections and migrate to an interior drainage plane, causing leaks.

VAPOR BARRIER / VAPOR RETARDER

EPS foam is considered a Class 2 Vapor Retarder. It reduces the transmission of moisture and water vapor through the material. The concrete core likewise offers protection against water vapor, when installed properly, with a well-drained footing, and appropriate waterproofing and damp-proofing.

AIR BARRIERS

Air Barriers may be any number of materials or coatings used to slow or eliminate air infiltration. ICFs typically do not need a whole wall air barrier, as the concrete core serves as a very effective air barrier. To meet some standards (LEED, Passiv-Haus, Net-Zero, and others) it may be necessary to add an air barrier at windows and doors, sealing the bucking to the wall and the window or door frame to the bucking.

Window and door flashing, such as Tamko Flash and Wrap, performs double duty of flashing against moisture and air infiltration.

WEATHER BARRIERS

Weather Barriers, such as DuPont Tyvek, as well as other house wraps are used to repel liquid water, while permitting water vapor to migrate through the material. This is typically used on wood frame housing to protect the sheathing, which is often an Oriented Strand Board (OSB) material.

This allows the material to dry if any moisture does get past flashings or other barriers. ICFs do not typically require a house wrap, but the wrap will not cause any adverse effects if used.

Independent testing (ASTEM E283) concluded an ICF wall assembly with a 6-inch concrete core has negligible air infiltration and therefore the wall assembly acts as an air barrier itself. No additional materials are required to be installed over ICF forms for the wall system to act as an air barrier.

EXTERIOR FINISHES

The exterior finish acts as the structure's primary weather barrier. It should direct the water outward from the wall structure and away from the foundation. Paint and other finishes serve to protect the exterior finishes and prolong their life.

PARGING / PARGE COATS

Parge is used to cover the foundation walls at and just below grade. Parge, as a material is often cementitious or acrylic, but stucco and EIFS may be used as a parge coat. Parging an ICF is important to protect the foam from both UV radiation and impacts such as from weed eaters and lawnmowers. Parge is typically intended to provide the look of a cast in place concrete foundation wall.

MOISTURE CONTROL AROUND WINDOWS & DOORS

BUCKS AND BUCKING

Bucking is the process of using a forming material to create openings in an ICF wall. Bucks may be wood, steel, vinyl, EPS, or other materials. Bucks also serve as anchor or attachment points for windows and doors. Bucking may also be used as bulkheads to end a wall.

Waterproofing openings typically consists of applying external flashings, such as peel and stick materials or HVAC tape. Additionally bucks should be installed or designed with a means to prevent water or air from migrating through the wall at the buck to concrete joints and provide a method to drain water to the face of the ICF.

FLASHING

Flashing is used in many areas of an ICF installation. Flashing is intended to direct the flow of liquid water away from moisture sensitive materials and the interior of the home. It should always extend past the layer below it, much like shingles in a roof continuously overlap as you move higher on the roof.

Flashing materials can be peel and stick materials, such as Poly Wall Home Stretch, or Poly Wall Blue Barrier. HVAC tape may also be used, and works quite well for

flashing smaller joints. Flashing may also be galvanized steel, aluminum or copper. Flashing should be installed at the top of a wall, around doors and windows, and at the base of walls where water may be present at the cold joint. Flashing may also be used below bricks or exterior finishes in order helping direct water outside of the walls structural layers.

MOISTURE CONTROL IN CONCRETE ROOF AND DECK SYSTEMS

BALCONIES

Balconies are a unique challenge as they are essentially floor systems which extend outside. Balconies should be sloped away from the openings, and should be flashed and thoroughly caulked against the threshold to prevent any water movement underneath the openings. Walls on either side of the opening should be flashed as well.

FLAT ROOF DECKS

Roof decks should be fully waterproofed with sheet membranes or liquid applied roofing materials. It is also recommended to add a crystalline waterproofing to the concrete when it is being poured, for an added layer of protection. Roof decks should also be sloped carefully to ensure that no standing or pooling water is present. Overhangs or drip edges are also recommended, as well as flashing, especially on parapet roofs.

FLAT & PITCHED ICF ROOFING

All ICF roofs must be fully waterproofed to prevent costly damage inside the home. Flat roofs are typically finished with a two-part system: a membrane, tar, or liquid applied material and gravel or a wear layer above. Proper flashing and sealants for all penetrations such as drains and venting and are critical. Contact a competent roofing contractor for assistance.

Pitched roofs usually require an aesthetic finish using standard roofing materials applied above additional waterproofing. Standing Seam metal roofs can be installed over furring strips and decking, as can composition, wood, and other roof finishes. Furring strips should be attached to the concrete with Hilti nails or Tap-Con screws. Contact your local roofing company or BuildBlock Technical services for assistance.

GUTTERING

Gutters is used to control the shed of water from the roof system. Downspouts should be placed to quickly move any water away from the foundation of the home. Extending the length of the downspouts from the home or building by a few feet will significantly reduce the amount of water the foundation drain system must manage.

RECOMMENDED WATERPROOFING PRODUCT MANUFACTURERS

MANUFACTURER	WEBSITE	PRODUCT
Polyguard	polyguardproducts.com	Home Stretch Waterproofing Membrane
Tamko	tamko.com	TW-60
Protecto-Wrap	protectowrap.com	Jiffy Seal 140/60
Soprema	soprema.us	Colphene
US-Tek Supreme Coatings	us-teksupremecoatings.com	Rubber Coat
Ames	amesresearch.com	Blue Max
Henry	us.henry.com	Blueskin
Acrylall	acrylall.com	Garrison
Styro Industries	styro.net	Styro Tuff II Acrylic Stucco
Benjamin Obdyke	benjaminobdyke.com	Slicker Max Rainscreen

DEFINITIONS & TERMS

There are a variety of terms used throughout this guide that readers may not be familiar with. We have provided many of them below. Please also review the BuildBlock Installation and Technical Manual for further information.

Above Grade	That portion of a structure that is above the ground (grade).
Asphaltic Emulsion	Asphalt dispersed through water and chemically stabilized. Generally permissible to use with ICFs.
Backfill	Fill material placed against a below grade wall.
Basement	An area wholly or partially below grade meeting the requirements for living space.
Below Grade	That portion of a structure that is wholly or partly below the ground (grade).
Crawlspace	An enclosed area below a living space that does not meet the requirements for a living space.
Crystalline Integral Waterproofing	Chemically modifying concrete to become impervious to water. Crystalline waterproofing is an active waterproofing method that reacts with the cementitious chemicals to grow insoluble crystals in the presence of moisture.

Damp Proofing	An application of water resistive coatings to reduce or prevent migration of moisture through a structure. May also be accomplished by additives blended with the concrete in an ICF wall. Damp-proofing is intended to be used where less severe soil-water conditions exist, and over walls enclosing spaces not intended as living spaces.
Daylight Drain	A gravity dependent drain system with an exit below the level being drained. Typically a daylight drain is installed to run down grade to a lower level of the property. A daylight drain does not use a pump, but can be used in conjunction with a sump system.
Dimple Membrane / Air Gap	A plastic sheet characterized by an embossed feature providing a space between the sheet and the wall, acting as both a drainage plane and a protection for the wall.

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Drain Tile	Refers to a pipe system placed at the bottom of a footing to eliminate standing water from the base of the footing. Referred initially to a terra cotta pipe, hence the "tile", but now refers to any number of systems used to clear water from the base of a footing or foundation.
Drainage Plane	The face of a wall where water can travel vertically. A wall may have multiple drainage planes. The exterior face of waterproofing or weather barriers is typically the intended drainage plane. Water following another plane interior to the intended layer would be defined as a leak.
Exterior Insulation Finish System (EIFS)	A non-load bearing finish bonded or attached over a foam substrate, which serves as insulation as well as structure for the finish.
Elastomeric	Referring to a waterproofing material that is typically applied wet and is capable of stretching and flexing throughout its serviceable life.
Flashing	Metal or other material, applied as a sheet, and either bonded or affixed with fasteners, to direct water away from joints and seams in construction. Flashing may be applied at the top of a wall, along corners, at openings including windows and doors as well as at the base of a wall.
Footing	A supportive structure, designed to carry the weight of the building above, and transfer that load to the soil. Footings are designed to support the load and to spread it over an area of soil such that the weight of the structure does not exceed the bearing capacity of the soil.
Form-A-Drain	A product manufactured by North American Pipe Corporation, used as formwork for footings, and remaining in place to serve as a drain system. Form-A-Drain is designed to be used on both the interior and exterior of the footing, providing maximum drying potential at the footing.
Foundation	A load bearing wall, typically below grade that transfers the load of the building to the footing. May also be used interchangeably with footing.
French Drain	A drain system consisting of a trench with drain tile or other suitable pipe, covered with gravel and or landscape cloth, used to move water away from a footing or foundation.
Frost Wall	A wall used to connect the footing, placed at frost line, with the above grade portions of the building. Also see Stem Wall.
Grade	The level of soil around a building. Also the slope of the surrounding ground in relation the level.
Hydrostatic Pressure	The pressure exerted by a fluid at equilibrium at a given point within the fluid, due to the force of gravity. Hydrostatic pressure increases in proportion to depth measured from the surface because of the increasing weight of fluid exerting downward force from above. www.dictionary.com/browse/hydrostatic-pressure
Living Space	Also called Habitable Space, refers to rooms or spaces meeting specific criteria relating to light, ventilation, minimum floor area, and minimum ceiling height.

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Mastic	A very thick waterproofing material typically used to seal edges or bond other waterproofing materials. Note that many mastics are solvent based and are not recommended for direct application to ICF. They may be used against footings and between layers of peel and stick and dimple membrane.
Parge, Parget, Parging	Parge refers to a coating applied to a foundation wall, typically at or near grade, which is used to decorate, protect, and provide weather
Peel And Stick Waterproofing	Waterproofing available as a sheet, with an adhesive layer used to attach it to a substrate. Peel and stick is typically 20 to 80 mils in thickness, with the majority measuring 40 to 60 mils. Often these are an Elastomeric or Asphaltic Emulsion based product.
Radon	Radon is a naturally occurring, inert, radioactive gas, derived from naturally occurring uranium deposits in the earth. Radon is cancer-causing. You cannot see, smell or taste radon, but it may be a problem in your home. Passive or active venting may be required.
Roll On / Brush Grade Waterproofing	Waterproofing material that has been designed to be applied with a brush or roller. It is typically thinned to meet this requirement, and may require multiple coats.
Silt/Silting	This is the process where small particles of soil or other material are deposited by water or gravity. In construciton this will clog or block drain systems defeating waterproofing systems.
Slope Grading	Refers to the slope of the grade around a home in order to ensure that rainwater is directed away from the home.
Spray On Waterproofing	Waterproofing that has been designed to be applied with a sprayer. It is typically thinned, and may have additives and setting agents added as it is sprayed to permit faster recoat or higher build applications.
Stem Wall	Also called a Frost Wall. A wall designed to carry the load of the building and transfer it to the footing or other supporting structure.
Sump	A basin placed below the lowest level of the home with a pump and a float switch. Used to collect water that would normally be retained around a footing or foundation. The pump will turn on when the float switch is activated, and the water will be pumped out of the basin to an approved drain line or sewer line.
Termination Strip	A metal or plastic strip that creates a mechanical (screw or nail) attachment at the top of the waterproofing or between waterproofing and exterior finishes.
Trowel On / Trowel Grade Waterproofing	Waterproofing material that has been designed to be applied with a trowel or putty knife. Trowel grade waterproofing is typically much thicker than Brush Grade. This material may also have fiber reinforcement.
Waterproofing	An application of water resistive coatings to prevent migration of moisture and liquid water through a structure. Consists of one or more layers typically installed to the outside of the foundation wall. Waterproofing is more robust than Damp-proofing. Waterproofing is specified where more sever soil-water conditions exist, especially covering below grade walls enclosing interior living spaces.

BELOW GRADE ICF WATERPROOFING QUICK REFERENCE

1. Ensure that the soil on the lot is well drained. Adequate drainage may be natural grade, or installed systems to maintain minimal moisture around the basement.

   A. Cut trenches upslope to divert water away from the structure.

   B. Cut trenches downslope to gravity drain the foundation. Use drain tiles or Form-A-Drain.

   C. Locate a sump at a strategic point, usually inside the foundation. If draining to daylight, a sump may not be necessary.

   D. Proper compaction may not be possible in poorly drained soils. Structurally, the standing water may also reduce the bearing capacity of the soil below the footings.

   E. High water tables may require additional engineered solutions to remove water from foundations. Relocate the structure to be above the water table if possible. A method to remove any standing water at the base of the foundation wall must be installed. Form-A-Drain provides the additional advantage of draining both the inside and outside of the footings. Drain systems should rest below the top of the footing, and not on the top. This will ensure that no water can sit on the footing.

   F. Most waterproofing systems are not designed to permanently retain standing water. Many of the systems on the market serve as damp-proofing only.

   G. In severe cases, the water displaced by a basement can cause the basement to float, much the same way a swimming pool can float out of the ground if left empty.

   H. A simple sump can be constructed by using polypropylene culvert pipe (12″ to 30″ diameter), cut to 3ft depth. The hole is dug and filled with 6 inches of gravel. The poly pipe is then placed into the hole on the gravel. Slots may be cut into the base to permit additional flow of groundwater. The pipe is then backfilled with additional gravel or pea stone. The floor is poured as usual, leaving access to the sump. A wet or dry sump pump can then be installed, with appropriate piping to remove the water in the sump to either daylight or an alternate drain system.

2. Provide solution for breaking hydrostatic pressure.

   A. Hydrostatic pressure is present at all points of the wall below grade. It will increase with depth, and can also affect the bottom of footings and slabs.

   B. Hydrostatic pressure can be broken by air gaps and removal of liquid water from foundation walls.

   C. In very moist environments, waterproofing below the slab may also be necessary. This should fully integrate with the remainder of the waterproofing system.

3. It is recommended to install an ICF wall over a footing, and pour the slab on top of the footing and inside the ICF walls. This provides a path for water to exit below the slab. Problems are more likely to arise when the ICF is stacked on a slab below grade.

4. Provide drainage below the slab and around the outside of the foundation using gravel (4″ – 6″ deep below the slab, and 12″ – 24″ outside the foundation) and above the footing, covering the drain system to permit any water that may be present at the cold joint between the wall and the footing, to flow to the drainage system below the floor.

   A. CactusBoard is a perimeter basement footing drain and foundation wall drain system that is installed during the building of the foundation by new home builders. It is installed over the footings before the slab is poured and provides continuous drainage at the wall to floor connection and is highly recommended in all installations.

   B. Before backfilling, cover and place gravel next to the drain tile. Cover to a depth of at least 12" in height against the first course of block. Cover with with landscape fabric to prevent silting of the drain tiles from backfill.

   C. Smaller gravel will prevent silting in of the drain system better than larger gravel, and is less likely to damage waterproofing when backfilling.

   D. It is recommended to backfill the first couple of feet with gravel, then a layer of landscape fabric followed by additional gravel to retain the fabric. Soil is then placed and compacted above the gravel, and gently sloped away from the foundation wall at the final grade.

5. Provide positive water barrier against wall from footing to above grade.

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A. A positive barrier may be a peel and stick membrane or liquid applied barrier.

B. Walls should be properly prepared prior to installing waterproofing. Walls should be smooth and flat, and all voids should be filled with spray foam adhesive. Walls should be clean and dry.

C. It is recommended to prime the walls when installing peel and stick membranes. Consult manufacturer documentation for application instructions.

D. Barriers should be installed per the manufacturer's documentation. Peel and stick membranes are typically installed vertically, whereas dimple membranes are often installed horizontally unless they are used in combination with a peel and stick membrane. Liquid applied waterproofing is usually installed in layered coats to build thickness.

E. These barriers should be protected from backfill materials during compaction. Using a dimple membrane is an ideal solution but other materials can be used to isolate the waterproofing from the backfill material.

F. When layering multiple types of waterproofing, do not defeat a peel and stick or liquid applied membranes by driving fasteners through the membrane to retain a dimple membrane. Hold dimple board in place with mastic or caulking. This will prevent it moving until the backfill is placed.

G. Ensure positive seal of peel and stick membranes at footing by using NP1 or equivalent caulking.

H. Caulking the top of the waterproofing membrane and providing for a mechanically attached termination strip will alleviate any issues permitting water to travel behind the membrane.

I. Sealing all seams in the material with an approved mastic or caulking helps to ensure the tightest seal against the wall. Use caution when working with mastic around ICFs, as many waterproofing mastics are solvent based and will dissolve the EPS. They may only be used on the outside of the waterproofing membrane and is recommended to seal all connectons and overlapping joints.

J. Extending waterproofing above expected water level in high precipitation events is also recommended.

K. Protect the top of the waterproofing above grade from impact damage from lawnmowers and weed-eaters with proper parging as required. This also protects this area from UV damage from exposure to the sun.

6. Ensure all waterproofing is attached firmly to the EPS. It is recommended to not remove EPS to waterproof the base of the wall. Waterproofing should maintain a single plane at the face of the EPS.

7. Waterproofing should extend above grade and the exterior finish of the wall above should overlap onto it. Parging can serve as a bridge when finishes above will not reach to the waterproofing. Parge must likewise lap over the waterproofing end extend behind the wall finish above.