



GROUNDWORK

ENGINEERED SYSTEMS

ANTI-CON

CONTAMINATION PROOFED FORMWORK SYSTEM



ANTI-CON



WATER

THE CORRIFORM CONTAMINATION PROOFING SYSTEM

Contamination of sub-ground can come in various ways, including by naturally occurring sulphates or man-made contamination such as methane gas from compacted buried waste. Venting and proofing for sub soil gas and a variety of constructive methods are easily designed to combat these different contaminants.

The 'Anti-Con' system offers the contractor the core formwork which can be adapted to combat these differing contaminant types.

The system allows for the steel reinforced concrete foundation to be formed and in the same operation, acts as a barrier shielding the foundation from sub soil attack.

The following typical procedures can be used where protection from aggressive ground is required:

- Corriform U-shaped ground beam shutters during installation, showing ground beam connections. These to be proofed after sealing of pile heads
- Note - reinforcement to be installed on completion of form work.



Methane Proofing – On site photo example

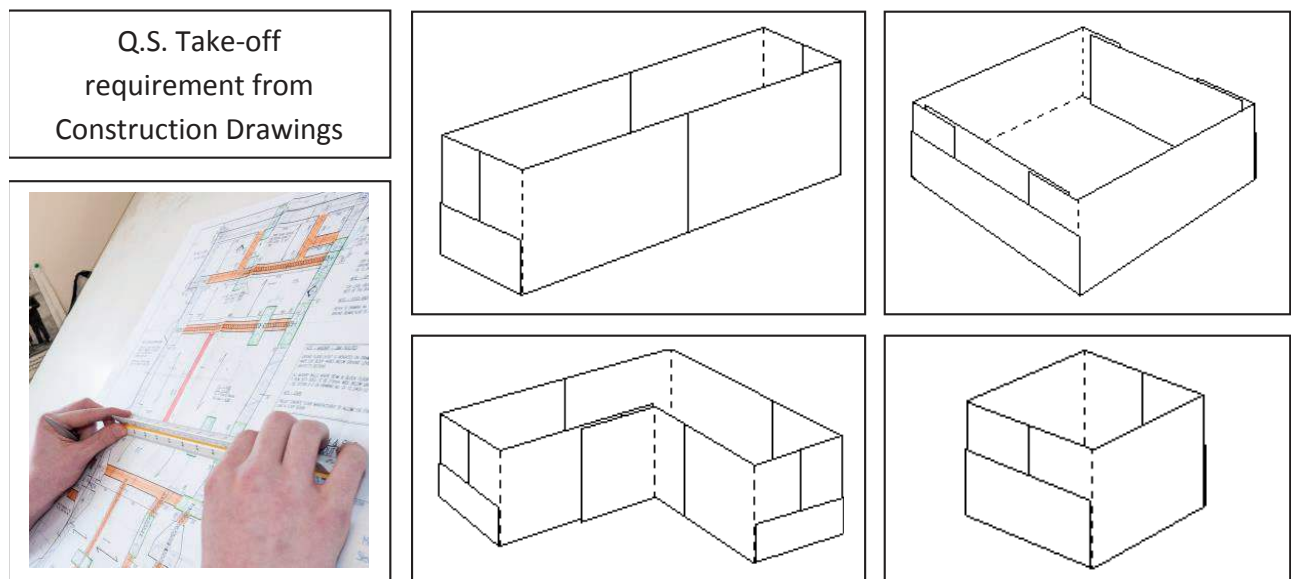


GROUNDWORK ENGINEERED SYSTEMS

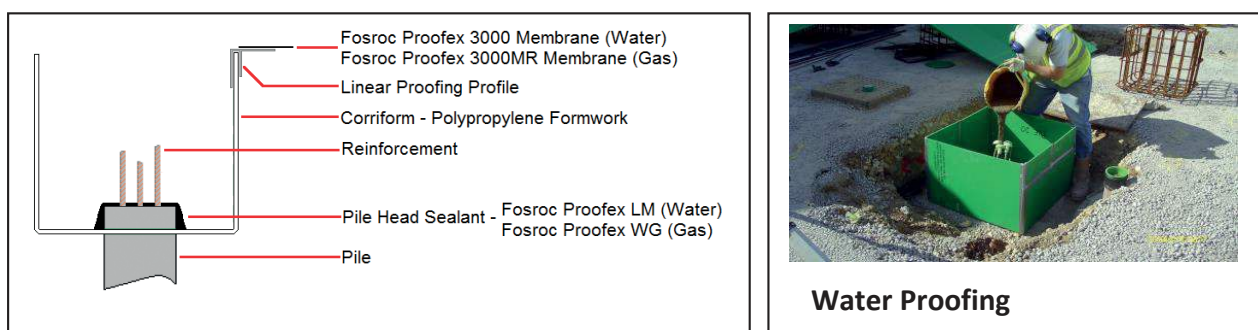
TAKE-OFF & DESIGN

Groundwork will take-off to quantify and design each foundation formwork element, indicating the specific contamination type and the appropriate sealants, tapes, chemicals and membranes etc. from the FOSROC Proofex range of construction products.

Types to be specified at the time of design.



Example: Pile head protruding through ground beam base showing sealant and actual site shots adjacent.



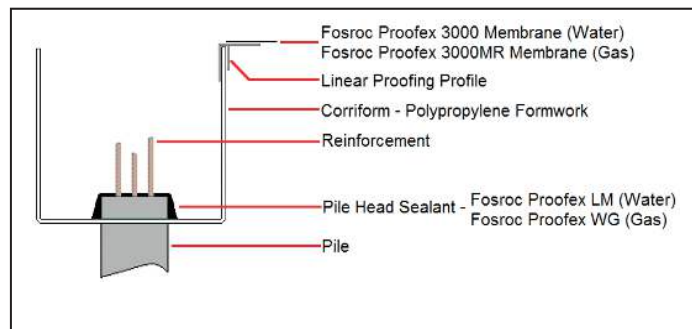
Corriform Permanent Formwork

The Corriform permanent formwork system, originally devised to be dedicated to forming concrete foundations. The system can be adapted to create a valuable time saving proofed formwork system. This is unique to Groundwork Engineered Systems.

This Anti-Con contamination Proofing system is designed specifically to counter a variety of contamination types, be they gas, mineral or waterborne.

Benefits of the Anti Con system & Typical Pile Cap section referencing details.

- Fully compatible with the FOSROC Proofex range of products
- Project specific
- Effective in gas, water & mineral contamination situations
- Non permeable
- Sulphate res/concrete not required

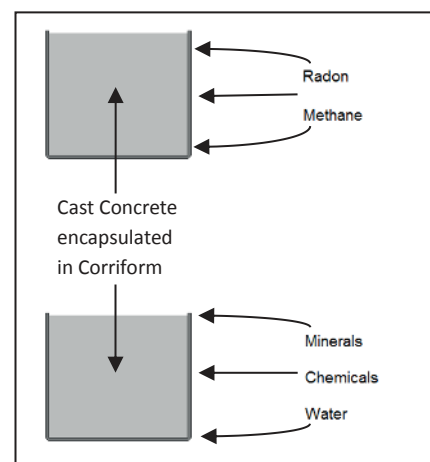


The Anti-Con system utilises polypropylene board to act as a permanent shutter, obviating the requirement for expensive sulphate resistant concrete.

Chemical resistance: Polypropylene has outstanding chemical Resistance, one of the best of all the thermoplastics to organic chemicals. Polypropylene is also extremely resistant to inorganic environments.

It is not affected by aqueous solutions of inorganic salts, nor by most mineral acids and bases, even when concentrated. The chemical resistance of polypropylene to various substances is summarised in Montell Polyfins technical bulletin: Chemical resistance data for shell polypropylene.

Request technical bulletin if required



Water Absorption: Polypropylene is impervious to gas and water, but the fabrication and sealing of joints must be carried out with care and the use of the recommended sealants is essential to ensure secure proofing. When building in normal soil conditions, the sealing of connecting formwork boards can be by the use of specific PVC Formwork tape. Where gas, water and mineral contamination proofing is required, these must be as specified to type.



Polypropylene Board Profiles & Types

There are various types of hollow, fluted polypropylene extruded board profiles. These include 'H' 'M' & 'X' profiles (shown opposite).

Polypropylene board is referenced by thickness & weight per metre squared i.e. 10/1800 = 10mm thick x 1800 GMS.

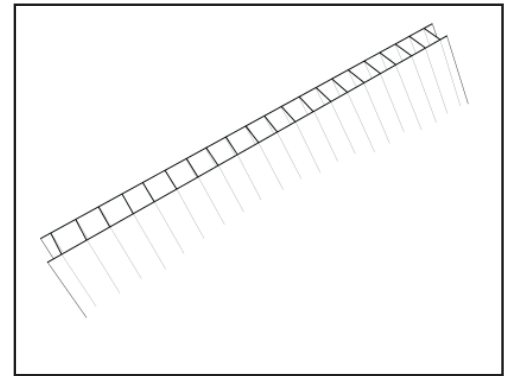
The profile reference indicates the different Extrusion design profile. This profile provides a scale Of flexural strengths, which can be advantageous when Fabricating formwork element types.

This mechanically stronger profile would suggest the 'X' profile should outperform the other two.

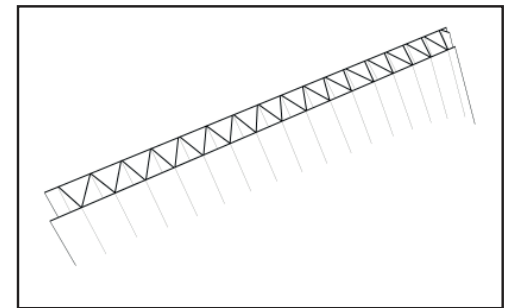
Weight in square metres is distributed throughout the wall/webs etc. i.e. thicker walls and webs have a part to play.

Note:

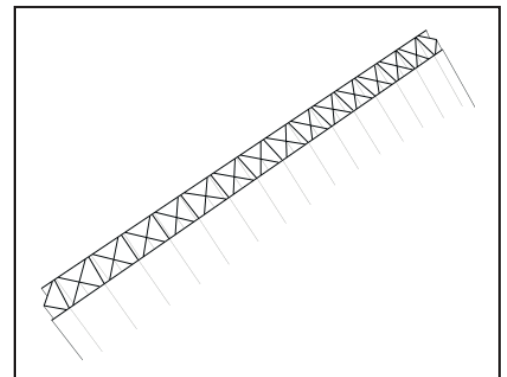
Although the medium to heavy 'H' profile (1500-1800 GSM) has proven to be quite efficient in previous UK Formwork projects.



H Profile



M Profile



X Profile

Method: All reinforced concrete element shapes have a base and vertical sides, making it relatively easy to create rectangular type shapes.

The Groundwork QS will take-off and quantify the material square meterage required. The design of each foundation element will follow. The design exercise will show the specific square metre requirement to create the foundation shape.

Due to the logistics of the board length (3mtr long) being limited the boards are creased or 'V' routed across the longitudinal flutes.

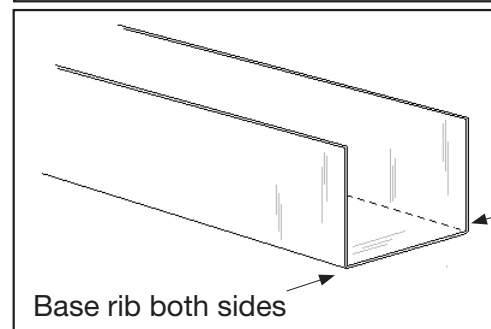
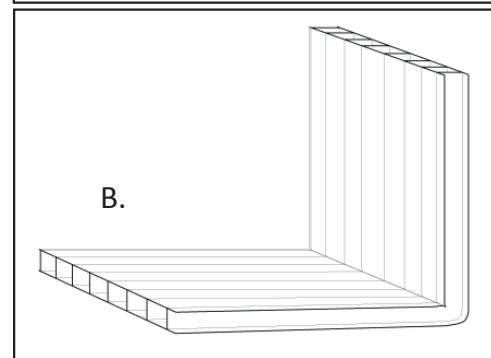
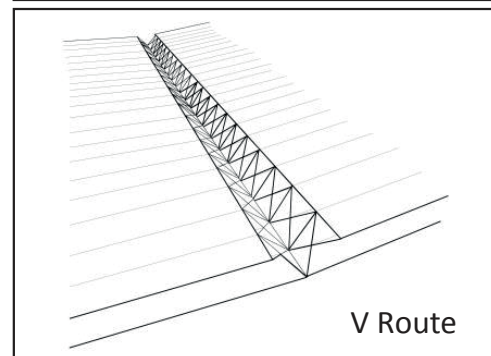
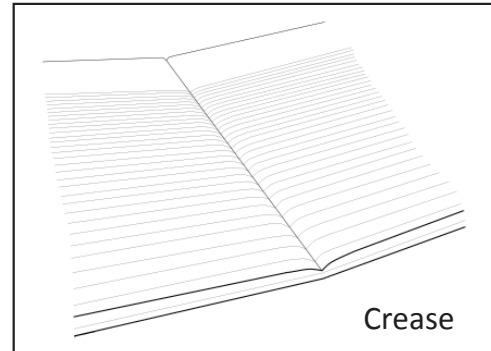
This crease/route allows the board a mechanically strong rib at 90 degrees. The rib being utilised at the base of most Formwork Elements.

When fabricating high vertical sides it is common To start with a crease/route along the a base line. The forming of this at the base creates a strong rib, which can be used as a connection point to secure a base membrane. See (B).

The base rib also allows for the creation of an Accurate 90 degree bend to fabricate Ground beams, pile caps, etc.

Note:

The cutter creaser machine throat is approx 3.2 metres wide.





Anti-Con Vertical Connection: Method & Sealing

The Anti-Con (Corriform) system can be designed to encompass practically all shapes and sizes of foundation elements. These include standard sized ground beams and pile caps.

Connecting these formwork component parts to form the whole is a relatively easy operation. Examples of connection methods are as follows:

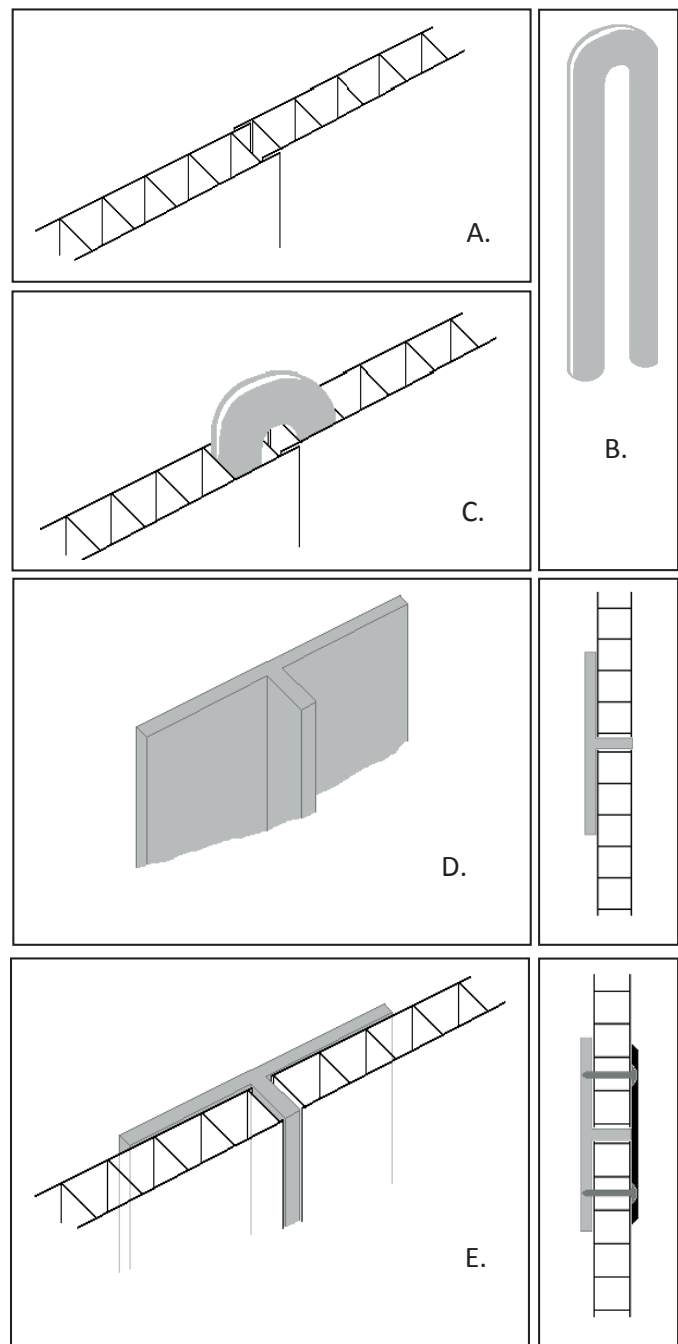
Polypropylene board is an extruded plastic & therefore is limited to standard widths of 2000/2400mm across the flutes due to the extrusion machine widths and handleable lengths. Large formwork shapes can be joined together as most component parts are within this scope.

Most board connections are vertical. Due mainly to the vertical polypropylene flutes. The boards can be butted together as diagram (A) and secured by inserting a pre sprung 'U' pin (Corripin B) down the hollow polypropylene flutes as diagram (C).

A stronger mechanical connection is achieved by butting vertical joints up to a rigid plastic 'T' profile as per diagram (D).

Self tapping screws are screwed through the polypropylene securing the polypropylene to the rigid 'T' profile.

A specified sealing tape is to be Applied to cover the screw heads vertically. (Fosroc Proofex Detail Strip – Water or Fosroc Proofex 3000MR – Gas)



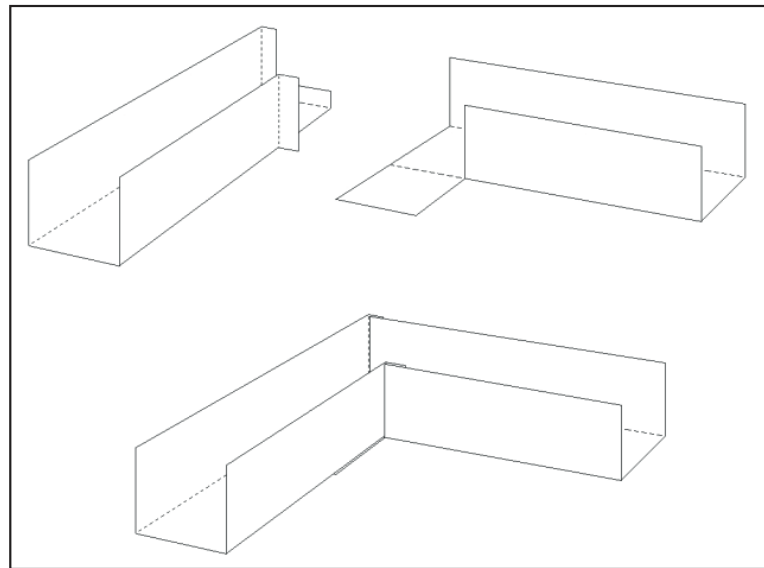
GROUND BEAMS & PILE CAPS

DESIGN-CONNECTION-PROOFING

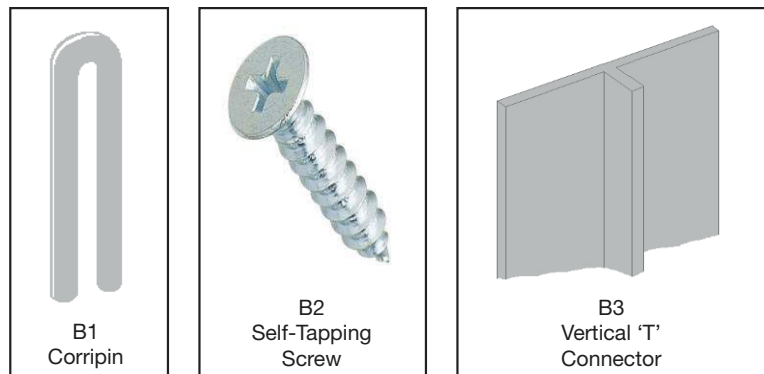
Groundworks QS team design the specified foundation elements to create the specified formwork element.

On delivery to site they arrive palletised & flat packed, to be folded into shape on site to form each specified element.

The connection/sealant points are indicated, for on site connection.

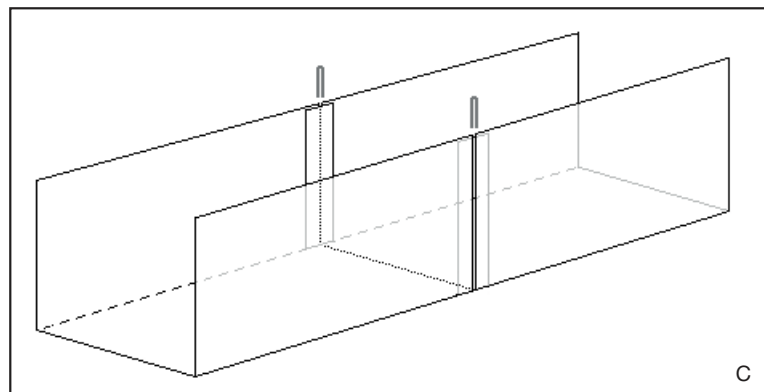


The main accessories to connect ground beams and pile caps are as shown by (B).



Full connection details will arrive with each delivery.

See (C) showing 'T' connector (T piece) and Corripin.





GROUND BEAMS & PILE CAPS

CONNECTION & PROOFING

Each formwork elements, design shape is important, to enable stability and resistance to soil backfill pressures when installed.

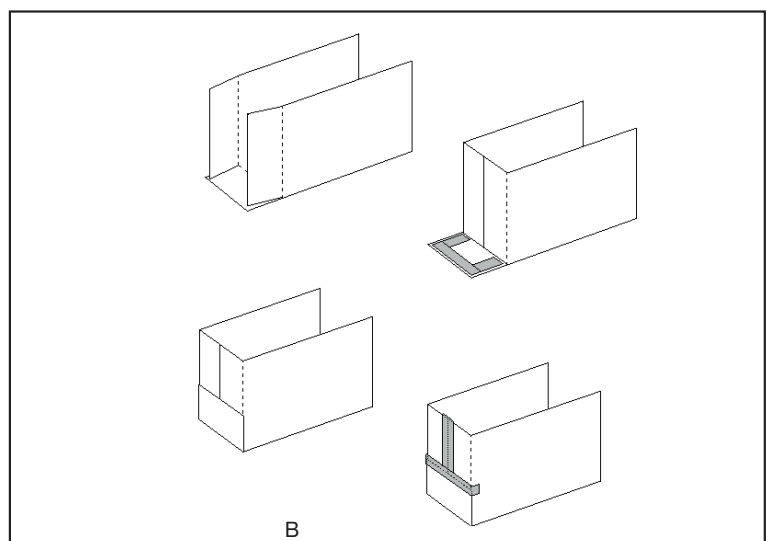
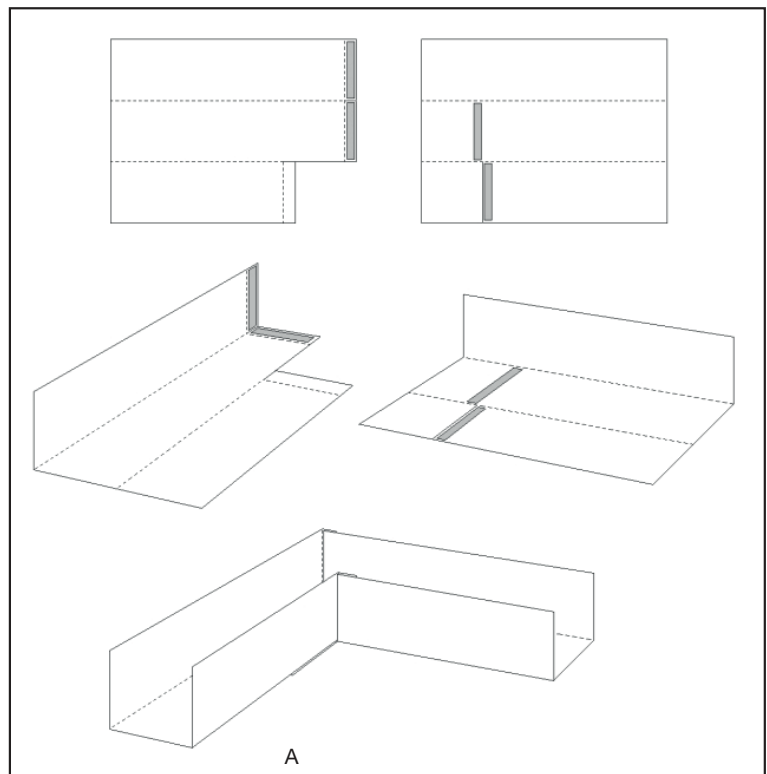
Furthermore correct Proofing connections are equally as important to remain contamination proof.

Connection points will be shown on outgoing installation guides, on delivery to site.

Group (A) The diagram examples to the right show clearly marked proofing connection points.

Also showing sequenced ground beam corner connection details.

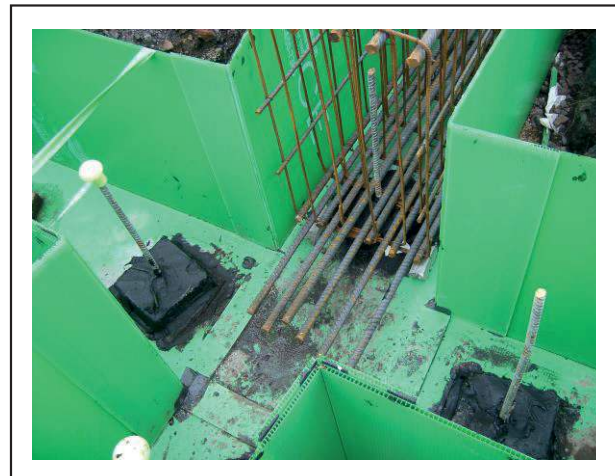
Group (B) shows typical ground beam stop end fabrication and connection detail.



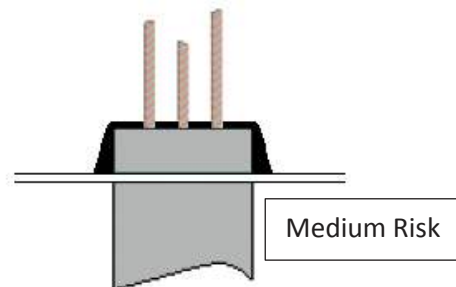
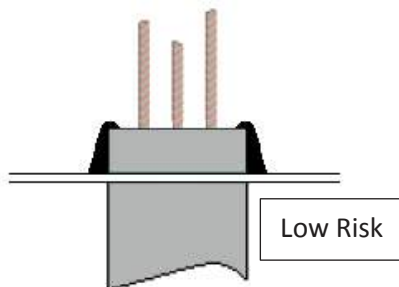
Proofing Pile Heads

Methods vary slightly depending on contamination type, although in all cases the head of the pile will protrude through the base of the Corriform shutters. Groundwork advocate cutting a neat and precise hole through which the pile can locate. The methods are shown in these diagrams and photograph examples.

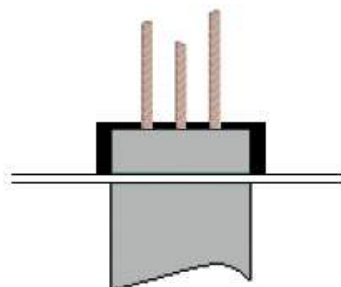
Pile Head sealant types will depend on contamination types, be they gas, mineral or waterborne.



WATER ONLY – Fosroc Proofex LM



GAS & WATER – Fosroc Proofex WG (Epoxy Grout)



This can be poured in liquid form as above into a former, which retains it in its liquid form until set.

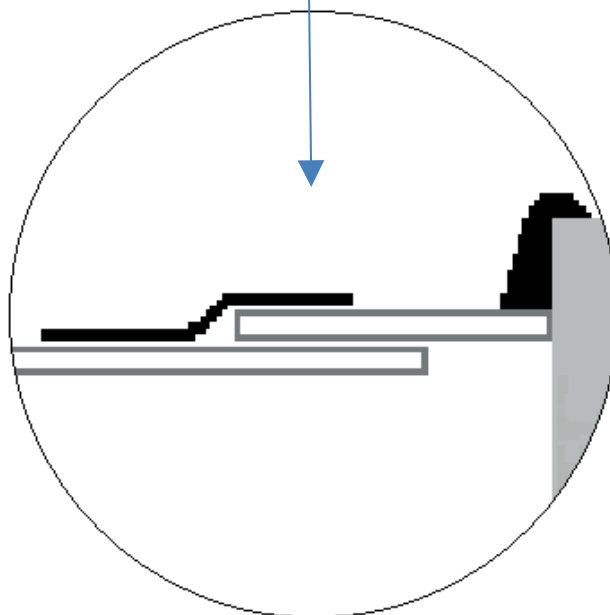
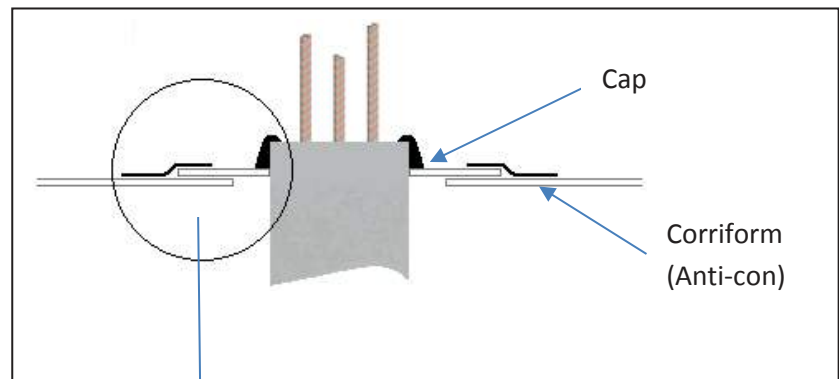
Pile Head Proofing

This method provides an accurate and neat seal, although there is a double seal ie. cap to shutter and cap to pile. Care must be taken to allow for the precise double seal.

Diagram 1 shows detail cap cut to fit over pile head neatly.

If the contamination is waterborne, use Proofex Detail Strip.

If it is gas contamination, use Proofex 3000MR.



Concrete Cover To Steel Dimension & Placings

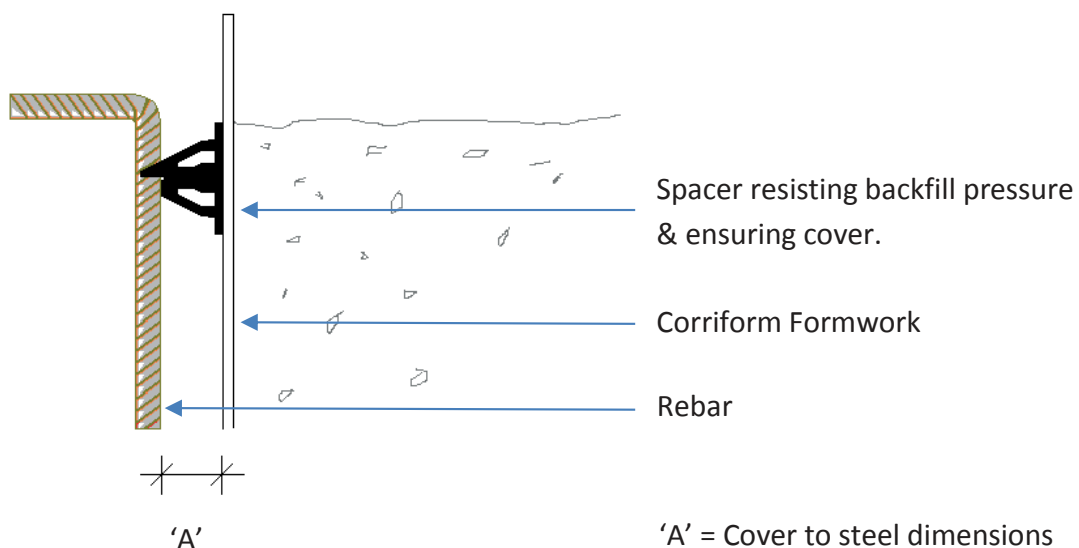


Typical spacer placement pattern.

Backfill pressure would normally be supported at Spacer centres of 200-250mm on standard foundations up to approximately 1000mm deep.

Although adverse ground conditions, depth of foundations and weather could all affect spacer centre distances.

Judge the above suggestion on-site conditions, taking care that enough spacers are fixed to help resist external soil backfill pressure.



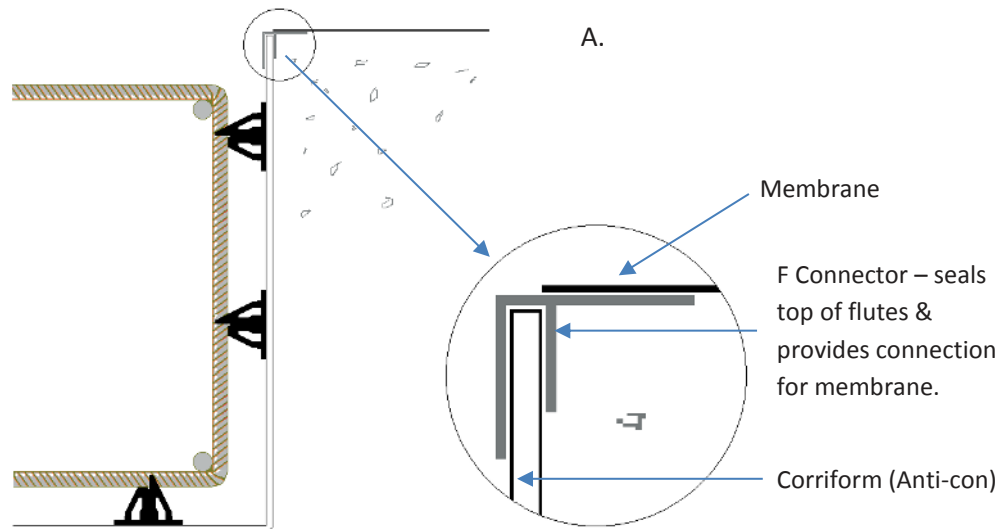
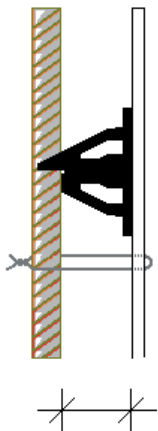


Diagram A above shows detail in section of the connection point for a contamination membrane (Proofex 3000 or 3000MR) to the corriform vertical sides. The contamination type will indicate the proofing membrane be it gas, mineral or water.



B. Diagram B shows in section the position of the steel tie to the concrete cover to steel spacer.

This aids & maintains the correct specified dimension.

Note: If using Ties, cover with appropriate Tape.

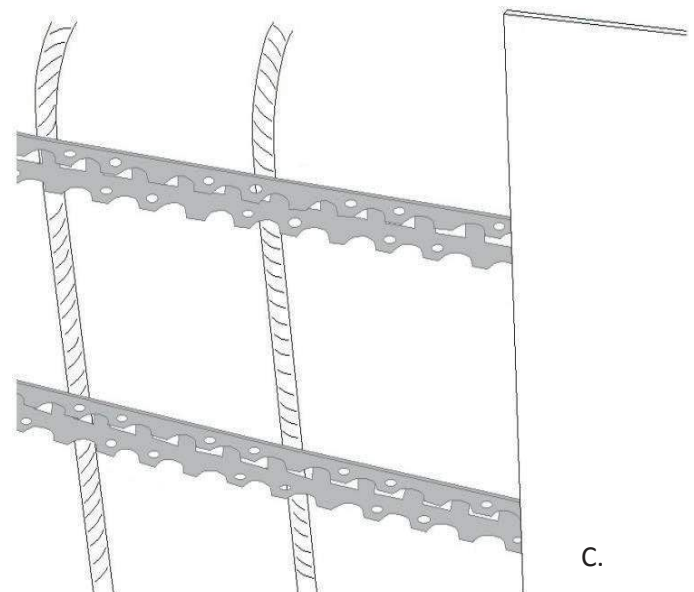
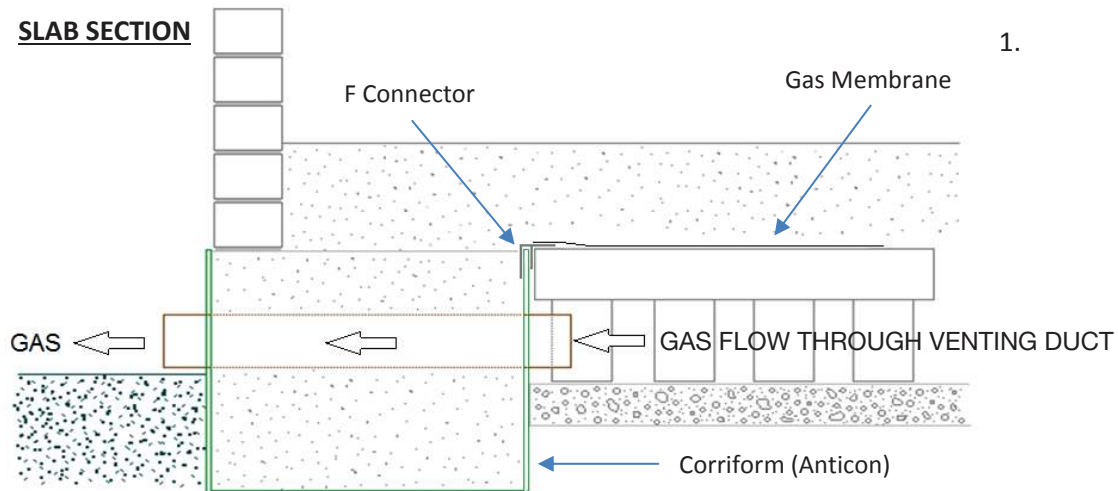


Diagram C shows linear spacers which may provide more accurate cover dimension, horizontally along the top lines of deeper vertical formwork.

Corriform (Anti-Con System) Adapted To Allow Gas Venting



Due to the nature of the polypropylene material, it is fairly easy to assist in the simple fabrication of various anti-contamination systemised products, such as the gas venting system shown by images 1 & 2.

The system uses EPS pods to support the slab. These pods have moulded support feet through which the ground gas can flow.

Vent pipes cut through external ground beams allow the release of the gas to the open air.

The gap around the pipe should be sealed with Proofex 3000MR

This gas venting system utilising under slab membranes etc. is fairly typical.



Corriform (Anti-Con System) adapted to proof concrete foundations from a high water table



Formwork to slab edge beam



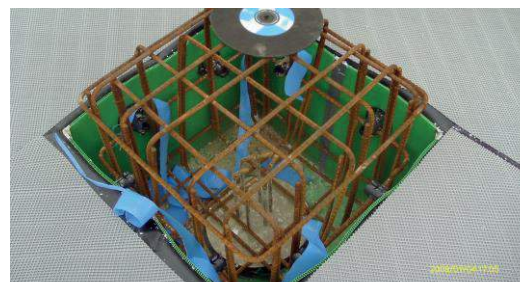
Fosroc Proofex Engage under slab & reinforcement



Large Pile Cap combining Corriform and Fosroc Proofex Hydromat System



Sealed under slab Pile Head



Pile Head with Fosroc Proofex Engage



Sulphate contamination proofing



Water proofing



Gas venting



Water proofing

The different project photograph examples above, show the simplistic variety of the Anti-Con system. Adapted to protect the concrete foundations against attack from varied contamination types.

The versatility of the core material, polypropylene, acting as a strong shuttering element and ably adapting to the use of differing chemicals, sealants and membranes.

These products assist in creating proofing connections, thus allowing each project complete protection from attack.

Anti-Con is prefabricated to the project's construction drawings, is lightweight, easy to handle and install. It provides a fully proofed solution, to contamination attack and is delivered to site to the consulting engineers specifications.



Corriform Formwork Data Sheet

High performance, waterproof, gasproof permanent formwork system.



Permanent formwork system designed for concrete foundations, both forming the concrete and protecting it against water, gas and other solid contaminants.

- Foundation ground beams
- Pile caps

As polypropylene permanent formwork, Corriform remains in-situ when concrete is cast, encapsulating the ground beam within a permanent gas impervious layer. Corriform can be bonded to other FOSROC Proofex gasproof membranes at ground level, creating a complete gasproof layer beneath your structure.

Advantages

- Provides radon and methane protection
- Compatible with FOSROC Proofex gas resistant membranes
- Compatible with FOSROC Proofex waterproofing membranes
- Water, mineral, chemical and gas resistant
- Can be installed in-situ or pre-fabricated prior to placing
- No binding needed
- Quick and easy to install
- Permanent system requires no cleaning

Description

Corriform is a range of extruded plastic boards based on polypropylene/ethylene copolymer. It comprises of flat polypropylene fluted boards which are pre-creased to specific project requirements. Supplied as bespoke panels, it comes in two weights and two colour types (green and natural). White is used in extreme hot climates. Each board is chemically inert regardless of colour. For applications in hot climates, a white coloured board can be supplied upon request.

Standard Compliances

Manufacturers certified performance.

Typical Properties

Board Thickness	10mm	10mm
Board Length	3050mm	3050mm
Board Width	2000mm	2000mm
Weight per M2	2000GSM	2500GSM
Tensile Strength (ASTMD638)	25	25
Nominal Wall Thickness	0.5mm	0.5mm
Melting Point	200/250°	200/250°
Vicat Softening Point A (10N)	+150°	+150°

Standard Tolerances

Length	3050mm	-0/+15mm
Width	2000mm	-0/+3mm
Flute Pitch	10mm	10mm

Application Instructions

Preparation

The trench is excavated to accommodate the desired size of formwork. The bottom of the excavation should be level, even and properly compacted.

Installation

The 'U' sections should be butted up to the corner / end pieces and mechanically secured with two Corripins pushed down the flute of the boards.

Continue the installation inwardly until the final length is to be put in place. The required length should be measured and a 'U' section cut to the correct length to fill the gap.

Joints should be sealed with FOSROC Proofex TOTAL Tape to prevent grout loss. The reinforcement cage is placed in the formwork with spacers attached to the cage. (When fabricating out of the trench, the sides should be tied temporarily to the reinforcement). Holes for pile caps should be cut out of the base.

The pre-creased boards may be made up in-situ or outside the excavation and lifted into place together with the reinforcement. The trench is then backfilled up to the level of the top spacers or within 100mm of the top of the formwork, whichever is the highest.

Checks should be made to ensure that the correct cover to the reinforcement is maintained. The concrete is poured and vibrated according to normal practice.

Additional procedures for gasproof applications

Joins between adjacent boards should be made by butting together and securing with two Corripins. An internal saddle 100mm wide is then positioned centrally over the join and sealed with FOSROC Proofex TOTAL Tape.

Where pile caps penetrate the base an additional piece of Corriform should be stuck with FOSROC Proofex TOTAL Tape, giving a minimum overlap of 150mm all around. All corners, ends and exposed flutes should be sealed with FOSROC Proofex TOTAL Tape. Pile caps should be sealed with either FOSROC Proofex LM or FOSROC Proofex WG as required.

Estimating

Corriform

Board Length	3050mm
Board Width	2000mm

Proofex TOTAL Tape

Board Length	30M
Board Width	50mm

Storage

Store in original unopened packaging, in cool dry conditions, away from direct sunlight.

Precautions

Health and Safety

There are no known health hazards associated with Proofex Corriform in normal use. For further information on ancillary products refer to appropriate Product Safety Data Sheet.

Additional Information

Ancillary products

FOSROC Proofex Detail Strip Tape

A double sided sticky tape to seal joins in Corriform boards for waterproofing.

FOSROC Proofex LM

A two-component bituminous liquid membrane for waterproofing pile caps.

FOSROC Proofex WG

An epoxy grout for gas proofing pile caps.

FOSROC Corripin

U-shaped metal pin inserted into the flutes to mechanically connect the Corriform boards.

Spacers

Grippa type spacers are attached to the reinforcement to provide the correct dimensional concrete cover to the reinforcement.

Important note

Groundwork Engineered Systems are guaranteed against defective materials and manufacture and are sold subject to its standard conditions for the supply of goods and services, copies of which may be obtained on request. Whilst Groundwork Engineered Systems endeavours to ensure that any advice, recommendation, specification or information it may give is accurate and correct, it cannot, because it has no direct or continuous control over where or how its products are applied, accept any liability either directly or indirectly arising from the use of its products, whether or not in accordance with any advice, specification, recommendation of information given by it.



Technical Data Sheet

Groundworks panels made of Polypropylene

Properties

- Good chemical resistance
- Easy to processing by cutting and welding, and easy to clean
- Impact resistant and tear-proof
- Sound absorbing and thermally insulating
- Environmentally friendly because the base polypropylene is recyclable

Technical data

▪ Temperature range	-20° to +80° C
▪ HDT B (0,45 MPA)	+95° C
▪ Vicat softening point A (10N)	+150° C
▪ Density	0,9 g/cm ³
▪ Flexural modulus	1400 MPa
▪ Elongation at break	70 %
▪ Impact strength (notched)	+23° C 45 KJ/m ²
	0° C 10 KJ/m ²
	-20° C 6 KJ/m ²

Chemical resistance

Polypropylene is generally resistant against most chemicals at temperatures $\leq 50^{\circ}\text{C}$ proof. Some solvents can cause swelling. Also some substances can cause discoloration irreversible. In case of doubt, tests must be done by user.

Tolerances

Length (from current production)	$\pm 0,3 \%$
Width (from current production)	$\pm 1 \text{ mm/m}$
Sheet thickness tolerance	$\pm 5 \%$
Thickness over the surface	$\pm 0.1 \text{ mm}$
Thermal expansion	$1\text{-}2 \text{ mm/m} / 10^{\circ}\text{C}$
Weight tolerance	$> -3 \%$
Angle	$\pm 0.3 \%$

Notes

- Polypropylene (P.P.) is an extremely durable thermoplastic and will resist attack from many sub ground contaminants including waterborne mineral and gas including methane and radon.

Although care must be taken where acids and organic solvents are present in high concentrations. See chemical compatibility of F.P.P.M's etc.

- When installed the anti-con system formwork is to be supported by backfill material prior to concrete pour, which must be adequate to provide support.
- All excavations must be carried out in accordance with BS6031:1981 paying attention to all safety procedures
- Resistance to underground gases - BRE Reports 211 Radon: Guidance on protective measures for new dwellings, (BRE 376 Radon: Guidance on protective measures for new dwellings in Scotland) and 212 Construction of new buildings on gas contaminated land recommend 300 microns thick polythene as the minimum specification for a gas-resistant membrane. The boards of the system are made from fluted polypropylene boards with a nominal wall thickness of 0.7mm. This will contribute to preventing/reducing transmission of harmful gases from the ground through the shuttering. Care must be taken to ensure joints are carefully detailed to eliminated any potential paths for gas leakage.
- Groundwork Engineered Systems Ltd will not accept responsibility to any person or body for any loss or damage including personal injury, arising as a direct or indirect result of the manufacture, supply, installation, use and maintenance of this product or system.



Notes

Notes



Notes



Contamination Proof Systems



CORRIFORM PERMANENT FORMWORK SYSTEMS

Contact our technical department on
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Email: admin@groundworkeng.co.uk