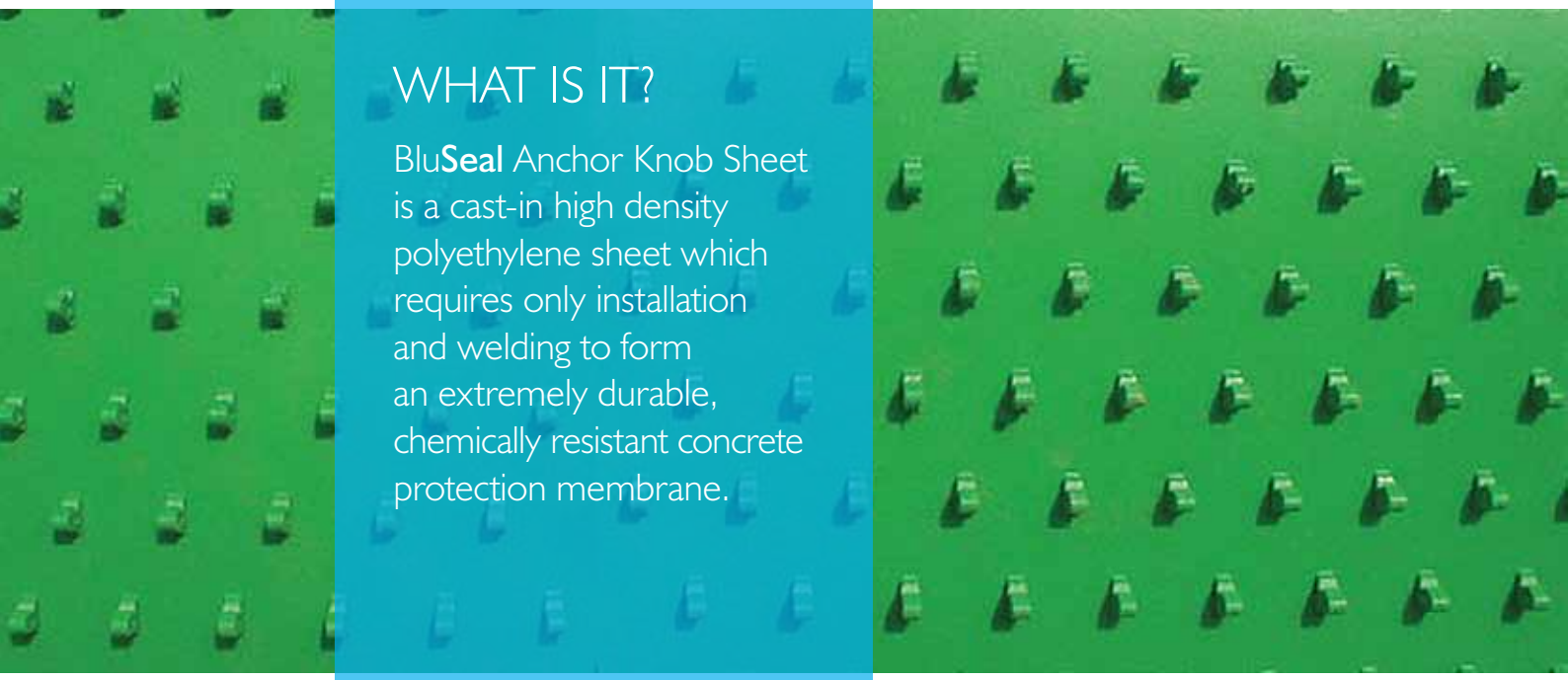
Blu**Seal** Anchor Knob Sheet

HDPE CONCRETE PROTECTION MEMBRANE

Blu**Seal** Anchor Knob Sheet

HDPE CONCRETE PROTECTION MEMBRANE



WHAT IS IT?

Blu**Seal** Anchor Knob Sheet is a cast-in high density polyethylene sheet which requires only installation and welding to form an extremely durable, chemically resistant concrete protection membrane.

Blu**Seal** Anchor Knob Sheet
PRODUCT INFORMATION

Blu**Seal** Anchor Knob Sheet is used for lining concrete structures subject to aggressive chemical environments.

WHERE DO WE USE BLUSEAL ANCHOR KNOB SHEET?

Blu**Seal** Anchor Knob Sheet comes in a range of thicknesses for various performance applications. The membrane may be applied to both new and existing structures for protection, enhancement or repair requirements.

Sewer pipelines systems (precast)

Wastewater treatment tanks and structures

Marine works - piles and pilecaps

Tunnel waterproofing

Rehabilitation and post installations

WHY BLUSEAL ANCHOR KNOB SHEET?

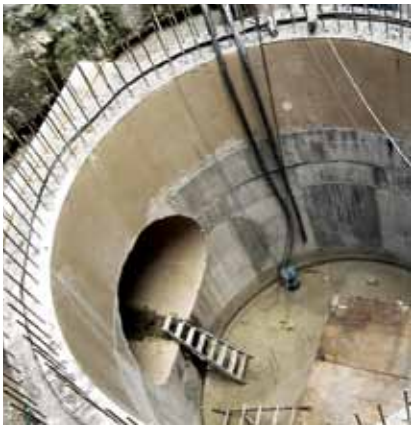
Resistant to chemical and mechanical impact

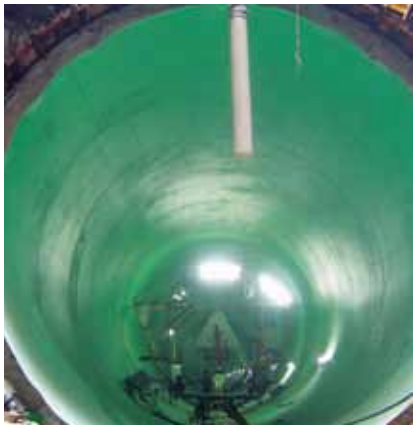
Fully welded homogeneous lining

Low maintenance

Time saving and reliable installation

High anchor pull-out strength





Blu**Seal** Anchor Knob Sheet
PRODUCT SUPPORT

RESEARCH, EXPERIENCE, PRODUCT, SUPPORT

AKS Lining Systems commenced production of AKS in 1993. AKS has set up a production plant which only manufactures AKS and ancillary items to support installation activities. This specialisation ensures that all resources are focused upon improving support services for AKS to markets around the world.

Prior to the commencement of manufacture of AKS the key personnel in AKS had been extensively involved in the installation of HDPE smooth liners in South Africa, starting as early as 1977. This knowledge of working with HDPE ensured good practices were employed with the installation of AKS from the first installations.

Applications for AKS initially focused almost exclusively on sewer projects but the market gradually opened up other applications where concrete structures were threatened by aggressive chemical environments. Although aggressive sewage applications remain the biggest single market for AKS today, the track record involves a wide variety of applications including:

- Sewage treatment structures
- Desalination Plants
- Waste water treatment structures
- Mining industry structures such as sumps, pump chambers and channels
- Sub-marine service tunnels
- Piles in aggressive soils

Realising that good solutions start with the production of a high performance product and end with quality installation, AKS has developed a very strong support network for its distributors and installers around the world. Special skills, techniques, tools and ancillary products are needed to ensure a high standard of installation. An Installation Guide has been developed by AKS for distribution within its installer network and regular training of customers' workmen has raised standards of installations and effected a high level of skills sharing.

Specialised equipment such as mechanised orbital welding machines, wedge welders and various small tools are developed and supplied by AKS to its network.

AKS activities are now spread throughout Southern Africa, Europe, South and North America, Far East, South East Asia, Australia and the Middle East.

BluSeal Anchor Knob Sheet
PRODUCT APPLICATIONS

BluSeal Anchor Knob Sheet provides many advantages over traditional insitu lining systems. Suitable for new structures (precast/insitu) and retro-fitting to existing structures.

THE EVOLUTION OF CONCRETE PROTECTION SYSTEMS:

Concrete has a long history as a structural building material.

In the past 150 years environments have become more aggressive.

Coatings have failed to provide a long term solution.

Tiling and brick have demonstrated limited success.

Mechanically fixed and glued liners have demonstrated limited success.

A SYSTEM FOR CONCRETE PROTECTION WAS NEEDED WHICH COULD DEAL WITH:

Chemical attack.

Thermal fluctuations.

Cracks in the concrete.

Abrasion.

Difficult installation environments.

THE IDEAL CONCRETE PROTECTION SYSTEM NEEDS TO:

Use the proven strength and simplicity of concrete.

Provide a robust and durable lining.

Be a chemically inert, permanent protective skin.

Allow for easy installation.

Reduce occurrence of installation defects.

BLUSEAL AKS AS A CONCRETE PROTECTION LINER:

Uses concrete for structural support.

Provides a chemically inert skin on the surface, which is highly abrasive resistant

Uses anchor knobs for attachment.

Bridges cracks in concrete.

Has low friction therefore increased flow capacity and reduces deposits.

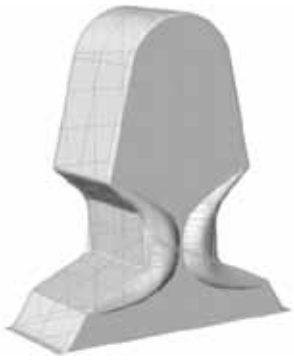
Blu**Seal** Anchor Knob Sheet
PRODUCT FEATURES & BENEFITS

KEY FEATURES	KEY BENEFITS
Factory produced membrane under ISO9001 QA system and welds 100% tested onsite	Guarantees consistent quality, membrane thickness and absence of pinholes
HDPE membrane has 13% elastic stretch between anchored knob	Bridges across live cracks
Moisture and hydrostatic pressure dissipates through water path between membrane and concrete	Eliminates localised failure of membrane from hydrostatic pressure build up through concrete
Eliminates need for minimum 28 day concrete cure associated with spray applied coatings	Reduces construction program

BluSeal Anchor Knob Sheet
PRODUCT DEVELOPMENT

Bluey recognised that there was a need in the industry for a new method of concrete protection which was durable and more considerate of site application constraints.

- Knobs integrally formed with sheet
- Extruded in wide sheets or coils - up to 3m
- Various colours
- Thickness from 2.0 to 5.0mm
- Knob size 12mm long when pinched
- 1,230 knobs per m^2 (28.5mm c/c)
- High pull-out resistance per knob

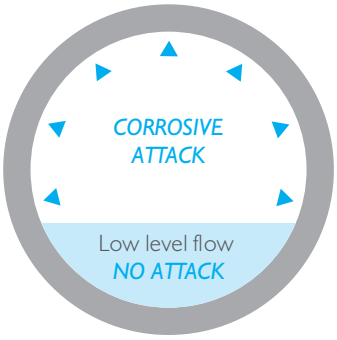


BluSeal Anchor Knob Sheet
PRODUCT DEVELOPMENT

Spray liners - what can go wrong

- Surface preparation or dampness issues
- Incorrect mixing of products
- Pinholes in coating
- Inconsistent thickness
- Live cracks in structure fail coating
- Ground water causes delamination
- Dark and humid working environment impede bond
- Curing difficulties
- Concrete vapour transmission delamination

THE SEWER PROBLEM



Thiobacillus Concretivorus effect

DESIGN OF SEWER LINERS

Sulphuric acid attacks concrete

AKS cast-in liner advantages

- Cast in structural concrete
- No on-site mixing of materials required
- Pinhole and defect free
- Set thickness of lining from factory
- Crack bridging (700% elongation at break)
- Welding of seams is 100% quality tested
- Endures ground water inflow
- No curing required
- Allows concrete vapour transmission

Blu**Seal** Anchor Knob Sheet
PRODUCT DEVELOPMENT

CONCRETE PIPE
MANUFACTURE AND PRECAST

CONCRETE PIPE INSTALLATION

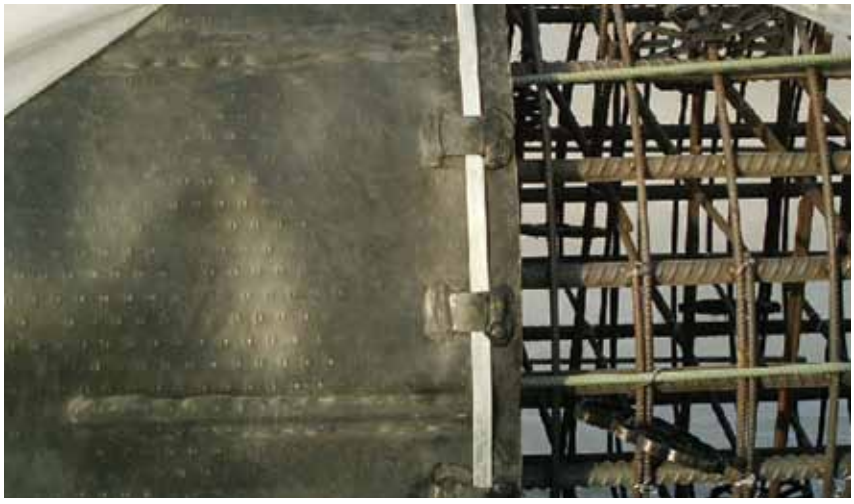
Blu**Seal** Anchor Knob Sheet
PRODUCT DEVELOPMENT

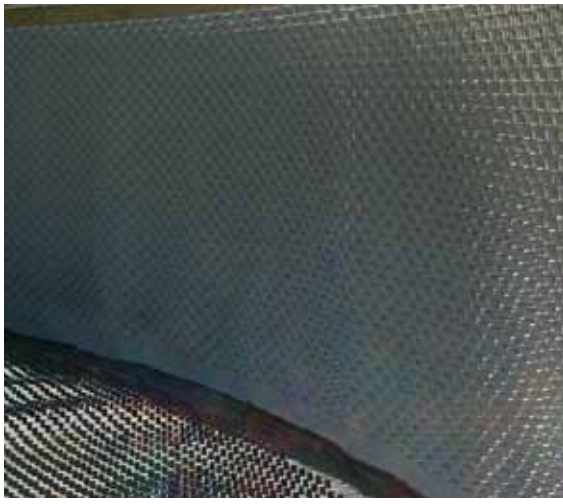
WASTEWATER TREATMENT
TANKS AND STRUCTURES

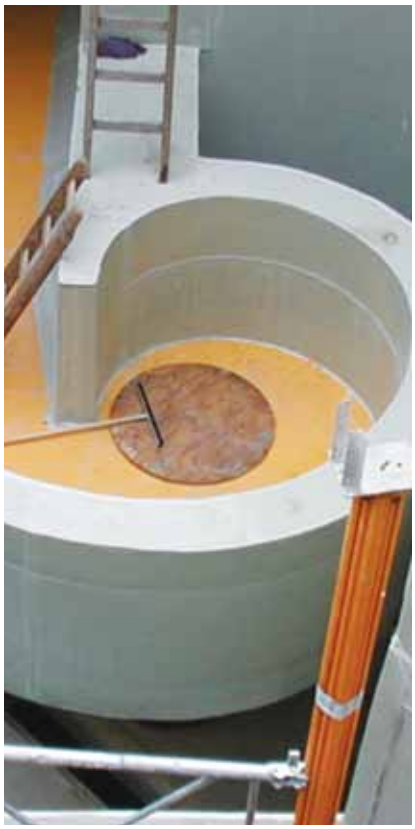
TUNNEL WATERPROOFING

BluSeal Anchor Knob Sheet
PRODUCT DEVELOPMENT

MARINE WORKS - PILES AND PILECAPS







REHABILITATION AND POST INSTALLATIONS

Blu**Seal** Anchor Knob Sheet
TEST DATA

IN-PLANT QUALITY CONTROL

VISUAL CHECKS FOR:

Waviness

Surface finish

Knob shape and alignment

MEASURE:

Sheet thickness

Average mass

Sheet/roll dimensions

Crimp height and depth

LABORATORY TESTS:

Density

Melt flow index

Tensile values

Dimensional stability

Potable Water Testing	AS/NZS 4020
Density	ASTM D505
ESCR (NCTL)	ASTM5397
OIT	D3895
Coefficient of Expansion	ASTM E831
Tensile Properties	ASTM D6693-04
Tear Resistance	ASTM D1004
Puncture Resistance	ASTM D4833
Dimensional Stability	ASTM D1204
Water Absorption	ASTM D570

BluSeal Anchor Knob Sheet
TEST DATA

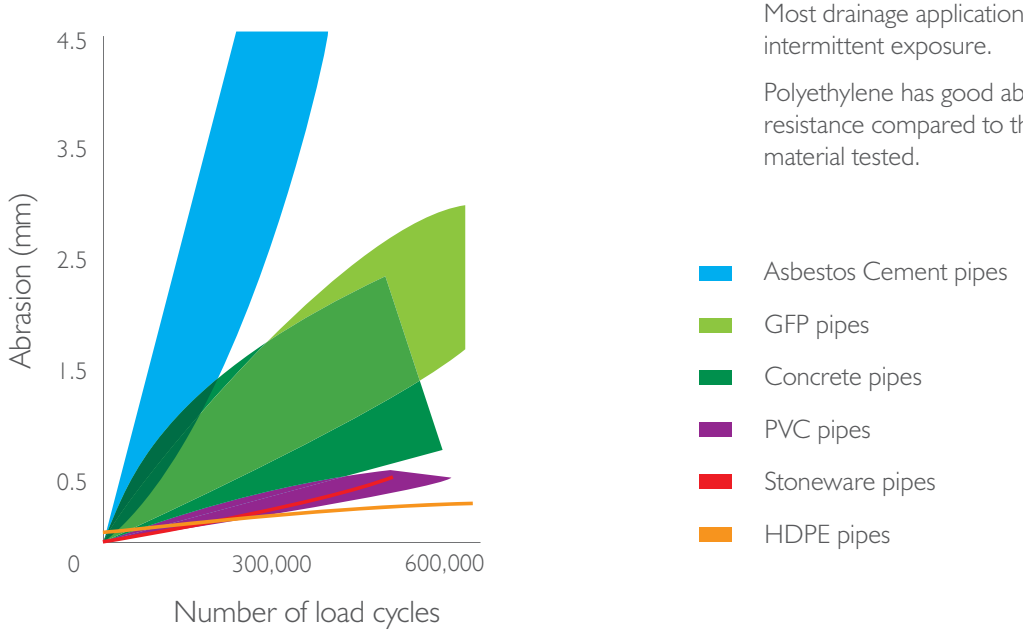
ABRASION RESISTANCE TESTS

Using an abrasion testing method developed by Dr. Kirschmer of Technische Hochschule Darmstadt, a test specimen one (1) metre long is tilted back and forth with a frequency of 21.6 cycles/minute while containing an abrasive mixture of 46% by volume quartz sand (with a particle size of 0-30 mm) in water. The resultant flow rate is 0.36 m/s (1.18 fps).

As shown in the figure below, abrasion can then be plotted for different materials as a function of the number of cycles. Using this method, HDPE pipe had an average abrasion of 0.3 mm (0.012 in) after 400,000 cycles. (Kirschmer, O., "Problems of Abrasion in Pipes", Steinzeugin Formationen, 1966, No. 1, pp 3-13).

The wear rates are very small, under continuous flow of abrasive slurry. Most drainage applications would have intermittent exposure.

Polyethylene has good abrasion resistance compared to the other material tested.



Blu**Seal** Anchor Knob Sheet
TEST DATA

HYDRAULIC LOAD TESTS
CONDUCTED BY UNIVERSITY OF CAPE TOWN:

5 Samples 60cm x 60cm panels cast into 46MPa concrete.

Tested to destruction load.

Failure load and mode monitored.

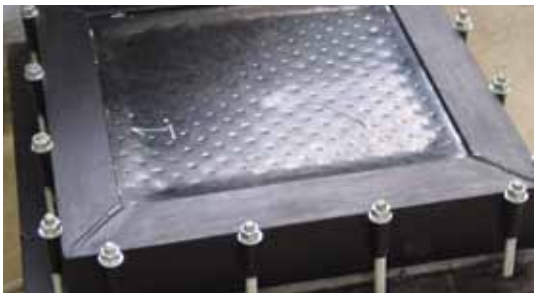
Gasket seals perimeter of sheet to concrete.

Water pressure created between concrete protection liner and concrete.

Cylinder is filled with water.

Compressed air maintains cylinder pressure.

TEST RIG FOR HYDRAULIC PULL-OFF TEST



HYDRAULIC LOAD TEST RESULTS

Blu**Seal** AKS – 5.0 bar negative pressure at failure.

Highest performance by Blu**Seal** AKS does not mean that other products will fail. It however means that Blu**Seal** AKS offers the best value for money and the highest safety factor.

WATER INTRODUCED THROUGH CAST-IN NOZZLE

Blu**Seal** Anchor Knob Sheet
TEST DATA

PULL-OUT TESTS

PULL-OUT RESISTANCE WAS ALSO TESTED ON SAMPLES WHERE THEY WERE:

Tested to destruction load.

Failure load and mode monitored.

Blu**Seal** AKS – 1,230 knobs per m^2.

Close spacing of knobs.

Knobs have domed heads.

Stress concentrates in waist of knobs.

PULL-OUT TEST RESULTS

BLU**SEAL** AKS AFTER INDIVIDUAL KNOB PULL-OFF TEST:

Elongation at waist of knob.

No damage to concrete.

Due to creep knob often snaps.

High elongation before break.

Domed knob holds much longer.

Blu**Seal** AKS – 77,800kg/m^2 at failure.

Blu**Seal** Anchor Knob Sheet
TEST DATA

FRICTION ASSESSMENT

There is a significant difference in friction between concrete and HDPE.

The Manning coefficient of roughness attributed to trowelled concrete is 0.013. This is compared to 0.0095 or better for HDPE.

For example – a pipe with:

Diameter of 5.0m,

Slope of 1 in 500,

Using coefficient of 0.013 for concrete, using coefficient of 0.0095 for HDPE lining,

The velocity in the unlined concrete pipe will be 3.99m/s.

The velocity in the HDPE lined pipe will be 5.46m/s.

Manning's formula: $V = \frac{1}{n} . R^{\frac{2}{3}} . S^{\frac{1}{2}}$

where:

V = velocity

n = Manning's coefficient of roughness

R = hydraulic radius

$$\frac{\text{water area}}{\text{wetted perimeter}}$$

S = slope

SERVICE DESIGN LIFE – ANTI-OXIDANT DEPLETION ASSESSMENT

The Blu**Seal** AKS HDPE resin is pre-formulated by a world leading resin supplier with the anti-oxidant incorporated in their manufacturing process.

The Geosynthetic Research Institute (GRI), in accordance with their test method GM13 "Test Properties, Testing frequency and Recommended Warrant for High Density Polyethylene (HDPE) Geomembranes", studied the depletion of antioxidant from the HDPE resin in time and extrapolated this to a time scale which indicated when the liner would lose sufficient physical properties to impede performance. GRI used the minimum Oxidation Induction Time (OIT) level for their GRI-GM13 standards as the reference, which is 100 minutes, and concluded that a typical HDPE liner (1.5mm thick) at 20°C has an Antioxidant Depletion Lifetime of 200-215 years.

Blu**Seal** AKS has been tested and achieved around 330 minutes OIT time and therefore it can be assumed that it will achieve 3 times the life predicted by the GRI study - i.e. over 600 years.

Blu**Seal** Anchor Knob Sheet
TEST DATA

UV STABILISATION

The UV resistance of the Blu**Seal** AKS (black) comes from the addition of Carbon Black (CB). The GRI-GM13 includes clear requirements on the CB masterbatch. Blu**Seal** AKS uses the highest quality (P Type) CB with a particle size < 25nm. This ensures an extremely well spread dispersion of CB and this leads to the highest level of UV protection in such a product. The required percentage of CB per GRI-GM13 is 2 to 3%.

Blu**Seal** AKS is formulated to be at 2.4% - which is ideal. The dosing of the CB in the Blu**Seal** AKS plant is by a gravimetric unit. This is extremely accurate and well controlled by computerisation and very sensitive load cells controlling every gram of material used. So BluSeal AKS does truly conform to the best standards the industry has to offer. The harshness of the UV conditions must be measured at the site of application and this will vary according to the climate.

Typically this is measured in Langleys, a unit of UV radiation. Modern HDPE liners (even thin liners) will be good for at least 30 years life under extremely harsh conditions, such as high altitude, high temperatures, high percentage of cloudless days per annum, etc.

UV resistance is also a function of the liner thickness. Blu**Seal** AKS is thicker than a typical pond liner meaning that it will resist UV degradation for longer. This increase in thickness is considered to be important and life expectancy is noted as being exponential to thickness.

Pale (beige) coloured Blu**Seal** AKS is formulated with shorter term UV protection which can be made to order, either 1, 2, 5 or 20 year UV stability packages, dependent upon the client's requirements and its intended design application and exposure.

Blu**Seal** Anchor Knob Sheet
ONSITE INSTALLATION

EQUIPMENT


SMALL HAND TOOLS FOR WELD PREPARATION:

BluSeal AKS sheet cutting tool.

Stanley knives and blades.

Extension leads.

Hand grinders and 80mm grit grinding disks.

Knob cutting pliers.

Silicone roller.


PREPARATION BEFORE WELDING:

Scraping away the oxidation layer.

Chamfering of edges 30 – 45 degrees.

Removing the knobs with pliers and specialised tools.


SITE WELDING EQUIPMENT:

4mm/5mm Extrusion welder.

Teflon welding shoes – flat and corners.

Hot air blower with tacking nozzle and speed weld attachments.

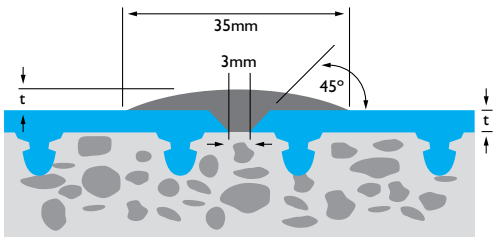
Double wedge welder (usually for prefabrication).



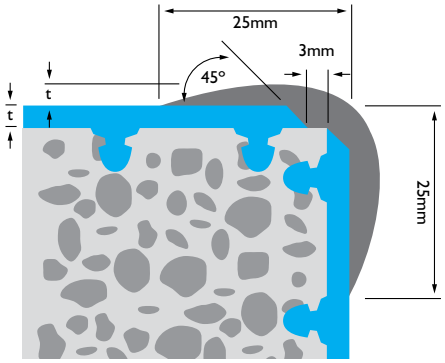
BluSeal Anchor Knob Sheet
ONSITE INSTALLATION

WELD AND EXTRUDED WELD OPTIONS

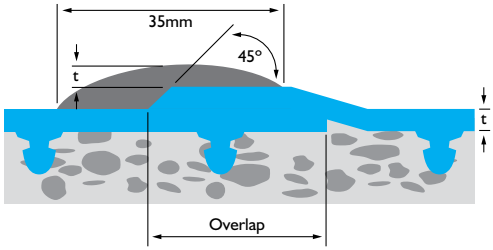
FLAT EXTRUSION BUTT WELD



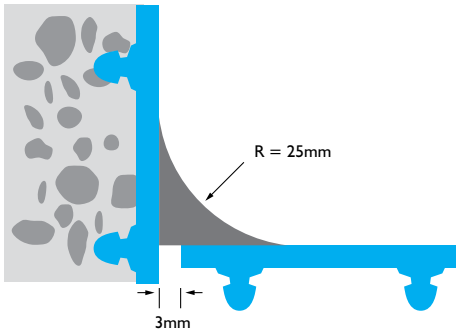
OUTSIDE CORNER WELD



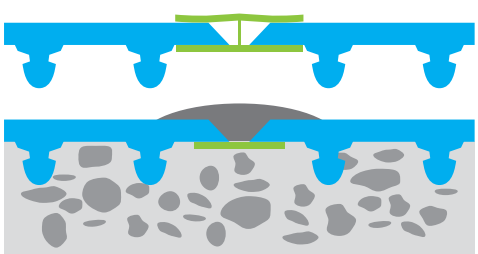
FLAT EXTRUSION OVERLAP WELD



INSIDE CORNER WELD



BUTT JOINT WITH ALS H-PROFILE



Blu**Seal** Anchor Knob Sheet
ONSITE INSTALLATION

SEAM WELD OPTIONS

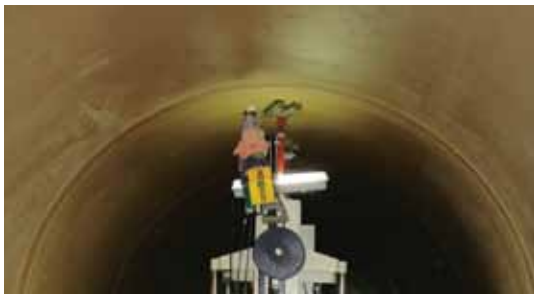
EXTRUSION SEAM HAND WELDING ON FLOOR

EXTRUSION SEAM HAND WELDING OVERHEAD

SMALL DIAMETER PIPE WELDING

LARGE DIAMETER PIPE WELDING

AUTOMATED PIPE WELDING ROBOT



EXTRUSION SEAM SHOE CLOSE UP

DOUBLE SEAM WELDING MACHINE

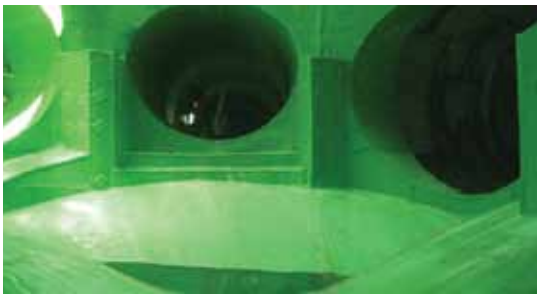
DOUBLE SEAM WELD

BluSeal Anchor Knob Sheet
ONSITE INSTALLATION

PREFABRICATION OPTIONS



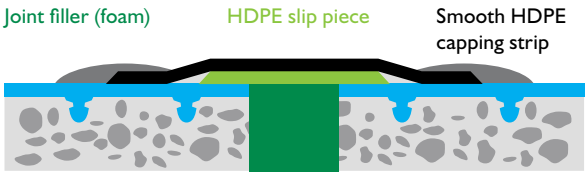




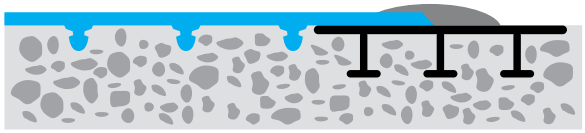
BluSeal Anchor Knob Sheet
ONSITE INSTALLATION

DETAILING SCENARIOS

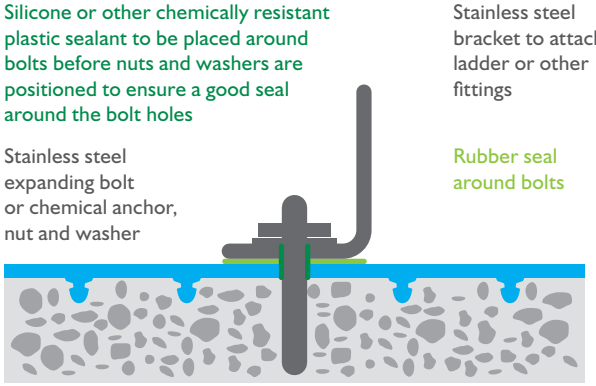
EXPANSION JOINT



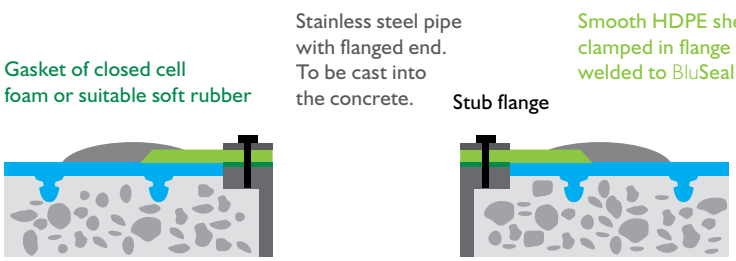
SEALING OF PERIMETER OF BLUSEAL AKS TO WATERBAR



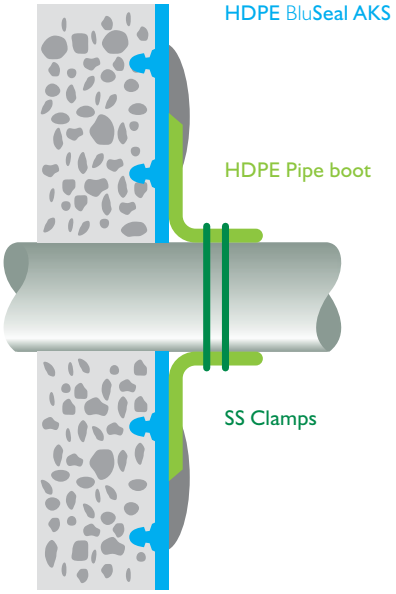
SEALING OF BRACKETS AND FITTINGS ATTACHED TO BLUSEAL AKS LINED STRUCTURES



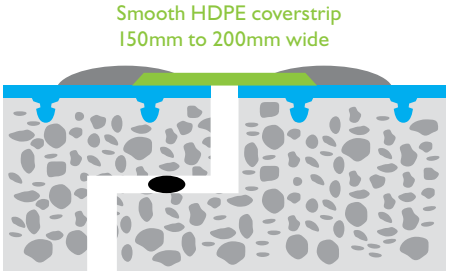
INTERIOR OF SUMP



PIPE PENETRATION DETAIL



PRECAST CONCRETE PIPE JOINT USING COVER STRIP AND EXTRUSION WELDING



BluSeal Anchor Knob Sheet
POST INSTALLATION & REHABILITATION

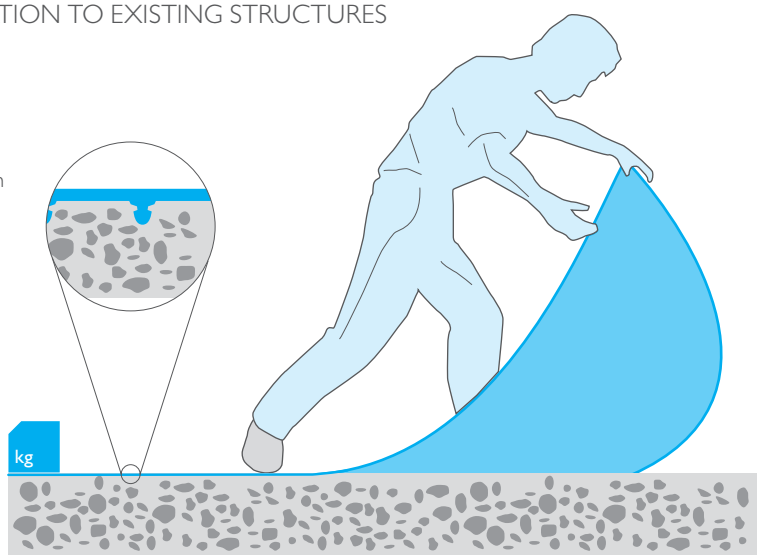
FORMWORK

CONCRETE PREPARATION

POST INSTALLATION TO EXISTING STRUCTURES

Close-up illustrating AKS sheet laid in such a manner to prevent any air being trapped between the sheet and screed

AKS sheet weighted down to prevent any movement



Blu**Seal** Anchor Knob Sheet
POST INSTALLATION & REHABILITATION

INSITU INSTALLATION TO STRUCTURES

INSTALLATION IN NEW STRUCTURES

PRELIMINARY PREPARATION:

Cleaning of formwork - formwork is cleaned before securing Blu**Seal** AKS to avoid scratches and uneveness on the lining surface.

Fixing to forms – FormTak (peel and stick adhesive strip).

Removal of forms - take care not to damage the lining removing the forms.

POST INSTALLATION TO EXISTING STRUCTURES

HORIZONTAL APPLICATIONS

Prepare surface – water jet, etc.

Prepare panel of Blu**Seal** AKS.

Set out timber strip boundaries.

Prime surface.

Mix and pour grout.

Embed Blu**Seal** AKS in grout and place ballast.

VERTICAL APPLICATIONS

Knobs act as spacers to keep distance between liner and concrete.

Grout is poured into this space.

For best results a primer coat of acrylic modified cement slurry is applied to obtain best adhesion.

BLU**SEAL AKS GROUTED INTO EXISTING PIPES AND TUNNELS**

Alternative form systems including inflatable and collapsible.

Surface preparation completed – clean roughened surface (de-greased and scabbled).

Alternative grout placement methods dependent on project specific requirements (gravity feed, pressure injection, etc.) – to ensure no voids between Blu**Seal** AKS liner and other concrete surface.

Blu**Seal** Anchor Knob Sheet
POST INSTALLATION & REHABILITATION

BLU**CEM** HS100A

OVERVIEW

The Blu**Cem** HS100A is a high yielding one-part blended powder additive that, when added to cement and water, forms a high strength pumpable grout for all types of construction projects.

It has been specifically designed for use with Blu**Seal** AKS lining for contact grouting between concrete and concrete protection lining.

CHARACTERISTICS

Unique properties eliminate plastic shrinkage and bleeding, and improve bond integrity.

Forms either a 'thixotropic' paste that can be placed on horizontal or sloping surfaces, or a 'flowable' grout that entirely fills the void space when used with a formwork system.

Early high strength for increased productivity.

Long work life with excellent pumpability.

Sand free formulation allows easy pumping and eliminates segregation during casting.

Low viscosity gives maximum penetration.

THE ADVANTAGES OF USING BLUCEM HS100A

Shrinkage compensation minimises cracking and improves bond integrity - gaseous expansion during the plastic stage provides internal resistance to shrinkage during drying.

It can be mixed with different volumes of water to form either a:

'Thixotropic' paste that can be placed on horizontal or sloping surfaces, where the Blu**Seal** AKS liner will be pushed into the grout; or

A 'flowable' grout that entirely fills the void space when used with a formwork system.

Grout can be applied with minimum priming, or possibly none in some circumstances, and still achieve adequate bond strength.

High early strength enables short cycle times for casting and stripping of formwork - in some circumstances within 6 hours.

As a high-yielding powder additive it is easily transportable to remote locations and difficult access sites where it can be mixed onsite with locally supplied cement and water.

Eliminates voids and air pockets - grout flows easily through the 12mm Blu**Seal** AKS annulus and is fluid enough to encapsulate anchors without forming voids or air pockets.

Even with pourable consistency it has a low bleed rate.

Blu**Seal** Anchor Knob Sheet
POST INSTALLATION & REHABILITATION

STRENGTH DEVELOPMENT

Blu**Cem** HS100A is a sand free formulation which allows easy pumping and eliminates segregation during casting.

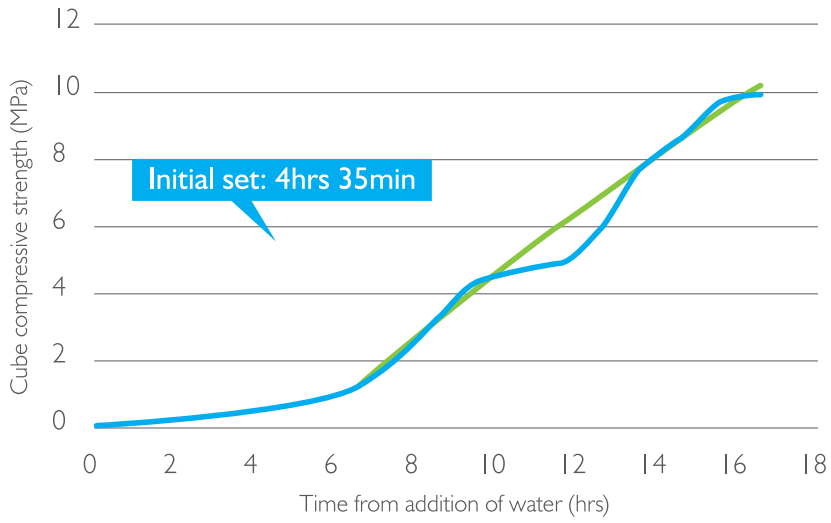
It can also be blended with HE or GP grade cements to vary the work life and initial set times for different work cycle requirements.

Depending upon surface preparation and the use of a primer the Blu**Cem** HS100A provides significant bonding strength in accordance with the Testing Summary Table (next page above right).

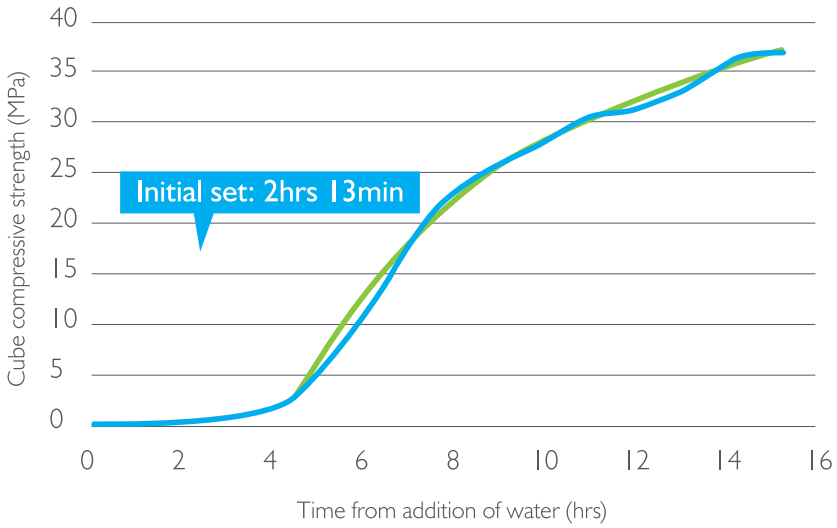
The tensile strength of the Blu**Cem** HS100A is 1.5MPa at 7 days.

All tests were completed in a controlled 25°C 100%RH environment to stimulate an underground environment. Host concrete strength was 50MPa.

STRENGTH DEVELOPMENT OF MIXED GROUT AT 0.5 WATER/CEMENT RATIO



STRENGTH DEVELOPMENT OF MIXED GROUT AT 0.3 WATER/CEMENT RATIO



BluSeal Anchor Knob Sheet
POST INSTALLATION & REHABILITATION

BLUCEM HS100A TESTING SUMMARY TABLE

SURFACE PREPARATION	PRIMING	MINIMUM BOND (MPA)	MAXIMUM BOND (MPA)	PERCENTAGE OF TENSILE STRENGTH
Form Finish	None	0.2	0.8	13-53%
HP Water Blast	None	0.5	1.0	33-66%
Scabble	None	0.6	0.9	40-60%
HP Water Blast	Acrylic	0.8	1.2	53-80%
HP Water Blast	Epoxy	1.2	1.5	80-100%

Blu**Seal** Anchor Knob Sheet
ONSITE TESTING & QUALITY CONTROL

ONSITE TESTING

Bluey's Engineers specialise in onsite techniques to ensure that the Client, its designers and applicators receive full support during the entire material selection, installation and testing process. Bluey is able to offer training and quality inspections on site either directly or through third party trained specialists accredited by Bluey. For all of our products we are also able to recommend competent applicators who have experience in applying our products.

It is important that all detailed drawings are completed and evaluated by a competent professional prior to commencement. The applicator is also required to develop specific work methods and inspection procedures prior to commencement.

BluSeal Anchor Knob Sheet
ONSITE TESTING & QUALITY CONTROL

PRESSURE TEST (DOUBLE WEDGE WELD)

THE TEST PROCEDURE IS AS FOLLOWS:

Seal both ends of the weld.

Insert the needle into the channel.

Pump channel pressure to between 215 and 265 kPa.

Allow the pressure to stabilise for about 2 minutes.

Note the pressure loss after a further 5 minutes.

Repair if loss of pressure exceeds 14 kPa (2 psi).

Once located, and repaired retest weld.

Min pressure 215kPa/32psi.

Max pressure 275kPa/40psi.

SPARK TESTING (EXTRUDED WELD)

Apply potential difference of between 35kV and 55kV between the electrodes. The actual voltage to be used is determined in a calibration test.

OFF-SITE PRE-WELD DESTRUCTIVE TESTING

PEEL AND SHEAR TEST

The procedure for peel and shear testing of samples is as follows:

Cut sample with sample cutter.

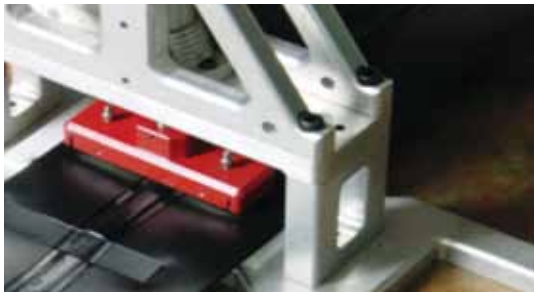
Allow sample to cool to ambient temperature before testing.

Confirm sample width and place in the jaws of the tensiometer in either peel or sheer orientation depending on test.

Set test rate to 50mm/minute.

Start machine and monitor failure load.

Remove sample and confirm failure mode.



Blu**Seal** Anchor Knob Sheet
ONSITE TESTING & QUALITY CONTROL

ON-SITE PRE-WELD TESTING

Pyrometer - Testing the extrudate and hot air temperature.

Tensiometer/Peel Test - Test a number of proto-type/test weld samples.

VACUUM BOX TEST (EXTRUDED WELD)

THE TEST PROCEDURE IS AS FOLLOWS:

Apply soapy solution, to weld, place vacuum box over the weld, press down firmly and start pump.

The bleed valve is closed and a partial vacuum is drawn to approx. minus 35 kPa (below atmospheric) gauge pressure and ensuring a leak-tight seal.

For a min 5 seconds, weld examined for bubbles (large bubbles or fine froth). If no bubbles then vacuum released.

The vacuum box moved with min 50mm overlap.

ON-SITE POST-WELD TESTING

Blunt Screw Driver/Needle Test (Visual).

Vacuum Box Test.

Pressure Test.

Spark Test (with copper wire and multi meter/voltage tester).

Blu**Seal** Anchor Knob Sheet
ONSITE TESTING & QUALITY CONTROL

TESTED COUPON WITH FAILURE IN PARENT MATERIAL NOT ON THE WELD

TESTED COUPON WITH PEEL FAILURE OF THE WELD

DESTRUCTIVE TESTS

Destructive tests are to be carried out on trial samples prepared under the same conditions as the in-situ welding work. These should be performed on site to confirm that the welding equipment settings are correct by using a field tensiometer/peel tester.

PEEL AND SHEAR TEST EVALUATION

HDPE is "notch sensitive" – which means stress concentrations occur at localised thinning or change of thickness.

"Notch sensitivity" has a significant influence on test results of samples with Blu**Seal** AKS tested in peel and shear and when compared to samples of smooth sheet composed of the same resins.

This notch sensitivity does not affect the function of cast-in Blu**Seal** AKS as frequently anchored to the concrete and cannot be stressed to near its yield point without catastrophic failure of the concrete behind the lining.

DESTRUCTIVE TESTS PEEL AND SHEAR EVALUATION

Weld strengths are defined in various guides used by the Geosynthetic Industry, but all of these are aimed at testing the welds carried out on smooth sheet.

The GRI Standards for shear and tensile tests of welds, carried out on smooth sheet, are as follows:

Shear - 90% minimum of liner strength

Peel - 60% minimum of liner strength.

The Blu**Seal** AKS anchors will interfere with the values. To allow for the effect of the anchors, the following values are applicable to extrusion welds, carried out on Blu**Seal** AKS liner:

Shear - 70% minimum of liner strength.

Peel - 50% minimum of liner strength.

Blu**Seal** Anchor Knob Sheet
PRODUCT SUMMARY

BLU**SEAL** AKS
PRODUCT OFFERS

- Low maintenance
- High performance
- Long term durability
- Enhanced carrying capacity for pipelines
- Cost efficient

COMPLIMENTARY AND RELATED PRODUCTS

FormTak for fixing to forms.

Weld rod available in colours to match Blu**Seal** AKS.

H-Profile strips to set cast-insitu joints for later welding

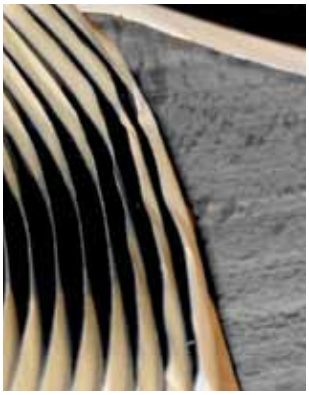
Blu**Seal** AKS anti-slip surface texture for specialized floor applications.

Blu**Seal** AKS provided in various colours useful in identification of zones, etc and sheet sizes (to suit panel layouts or installation specific requirements).

Blu**Seal** AKS also available with additional UV stabilization (for application and design specific requirements).

Blu**Seal** AKS varied packaging for project specific handling requirements (ie. rolls sheet wrapped or sheets on pallet, etc.).






Bluey Technologies
PRODUCT RANGE

bluCem

- BluCem AP10
- BluCem RF20
- BluCem FC
- BluCem HB range
- BluCem HE10
- BluCem HE80
- BluCem HE80AG
- BluCem HE80HT
- BluCem HS100 range
- BluCem HS200 range
- BluCem EA02
- BluCem GP60
- BluCem UF40
- BluCem UW range

bluGeo

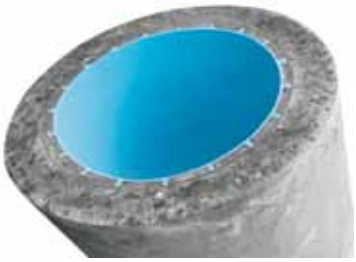
- BluGeo Powerthread range
- BluGeo SD Anchors range
- BluGeo ST Rock Bolts range
- BluGeo Swellex range
- BluGeo Tekflex

bluRez

- BluRez Crackseal 111
- BluRez Crack Seal 150
- BluRez Crackseal NV
- BluRez Carbostop
- BluRez Carbostop 42D
- BluRez Epoxy 225
- BluRez Epoxy 480
- BluRez Epoxy 480UT
- BluRez Epoxy 575 CG
- BluRez Epoxy 655

bluSeal

- BluSeal Anchor Knob Sheet
- BluSeal Britdex Membrane
- BluSeal Moulding Putty
- BluSeal Dust Control 10
- BluSeal Road Sealer 10
- BluSeal Containment Liner
- BluSeal PVC Tunnel Liner
- BluSeal Injection Kit



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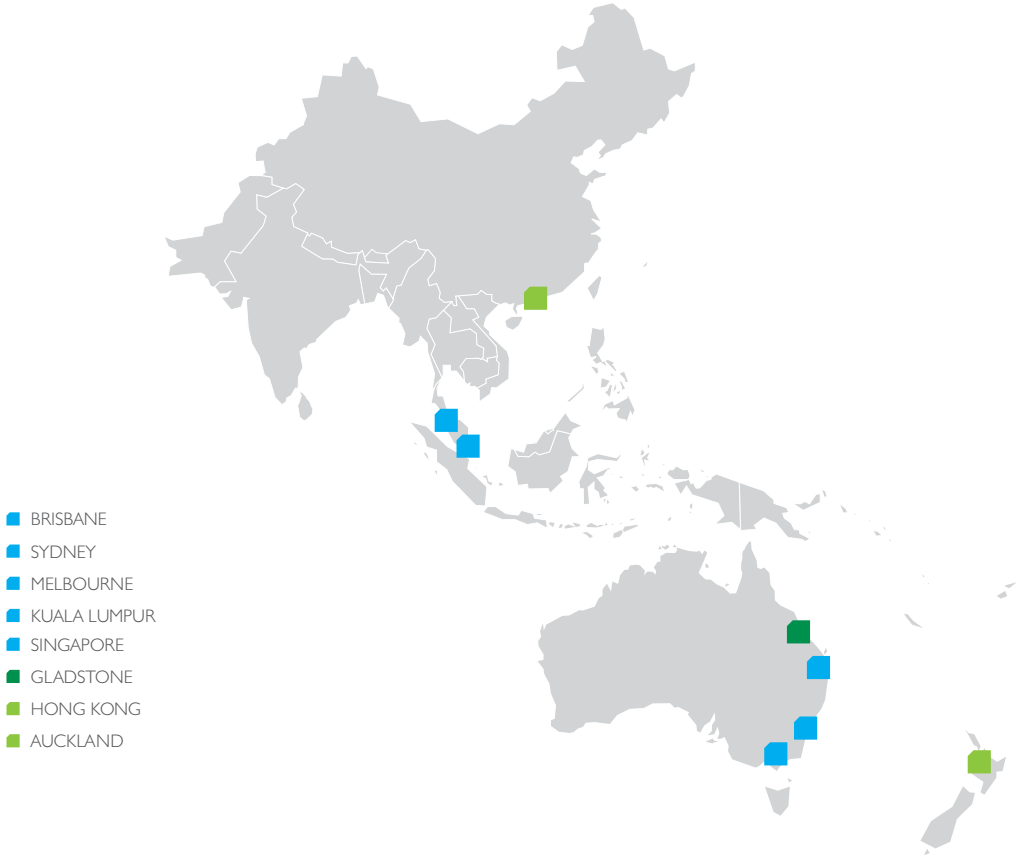

STATEMENT OF RESPONSIBILITY

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