



Technical Product Guide



**SOLID INSULATION AND
LIGHTWEIGHT CONSTRUCTION SOLUTIONS**

SOLID INSULATION AND LIGHTWEIGHT CONSTRUCTION SOLUTIONS

EXPOL supplies a range of products that provide solutions for insulation and lightweight construction, so you can focus on the things you do best.

EXPOL has a wide range of solutions made possible by the dynamic nature of Expanded Polystyrene (EPS) and Extruded Polystyrene (XPS) foams. All EXPOL products are tested by a variety of institutions, including BRANZ, to ensure quality and reliability.

The manufacturing of EXPOL products uses no CFC's or HCFC's. These products are so efficient they can save up to 200 times their own resource in thermal

energy savings. EXPOL also runs one of the country's biggest EPS recycling plants, ensuring the sustainability of EPS building products.

EXPOL operates six manufacturing facilities in New Zealand to ensure our customers get fast and reliable service at the lowest possible price. EXPOL also has manufacturing partners throughout Australia.



NEW ZEALAND
Auckland
Tauranga
Wellington
Blenheim
Christchurch
Cromwell



AUSTRALIA
Sydney
Melbourne
Adelaide
Tasmania

WHY SPECIFY EXPOL?



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Insulation

EXPOL produces and supplies some of the country's most efficient insulation materials. Products include EPS which has a long established reputation for its exceptionally high insulation qualities. EXPOL Platinum Board (a variation of EPS) can achieve an insulation efficiency of 0.032 W/mK while EXPOL-X (XPS) boasts as much as 0.028 W/mK. All EXPOL products have been tested for thermal performance by a variety of institutions, including BRANZ, to ensure all products are manufactured to specification.

Recycling & Sustainability Credentials

EXPOL have invested in and operate dedicated recycling plants in their manufacturing facilities. At every stage of its life cycle, from production to recovery or recycling, EPS offers exceptional eco-credentials and is therefore ideally suited to the new generation of eco-friendly building projects. All manufacturing processes comply with current environmental regulations. It is chemically and environmentally non-aggressive and it can be – and is – easily recycled into long-life products through an expanding nationwide network of collection points.

Rigid

EXPOL provides insulation solutions that cannot be achieved by other insulation products. Expanded Polystyrene (EPS) and Extruded Polystyrene (XPS) are both rigid foams that hold their shape, which means their insulation performance does not diminish over time. EXPOL UnderFloor Insulation is one of the only insulation products on the market that is suitable for use in exposed timber floor situations without the need for lining. This is backed by a BRANZ appraisal and shows the advantages of rigid foam products.

Lightweight

EPS offers an exceptionally lightweight solution to many applications in construction. This is not surprising when you consider that, as a result of advanced manufacturing technologies, EPS is effectively 98% air captured within a 2% cellular matrix. The advantages in on-site handling and transportation bring significant economic benefits whilst considerably reducing health and safety risks associated with the lifting of heavier materials. It is therefore an excellent substitute for infill materials and ballast where it also brings load and fill times down in time-critical build projects.

High Strength & Structural Stability

In spite of its lightweight, the unique matrix structure of EPS brings the benefits of exceptional compressive strength and block rigidity. This means it is ideal for use in many construction and civil engineering applications, particularly as a structural base infill, for example in road, railway and bridge infrastructures. Strength tests performed on EPS which was first placed in the ground almost 30 years ago show that it is just as strong today – the tested strength routinely exceeding the original minimum design strength of 100kPa. EPS bridge foundations, which have been subject to many years of sustained loading, show 'creep' deformation of less than 1.3% - only half as much as had been theoretically predicted. Most importantly, EPS stability does not deteriorate with age.

Resistance to Water Ingress

After almost 30 years in the ground, samples of EPS retrieved from locations as little as 200mm above the groundwater level all have less than 1% water content by volume, whilst blocks which are periodically entirely submerged show less than 4% water content – performance notably superior to other foamed plastic materials.



RECYCLABLE



FIRE RETARDANT



HIGH STRENGTH



MOISTURE RESISTANT



NEW ZEALAND OWNED
/ MANUFACTURED

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LIGHTWEIGHT CONSTRUCTION SOLUTIONS



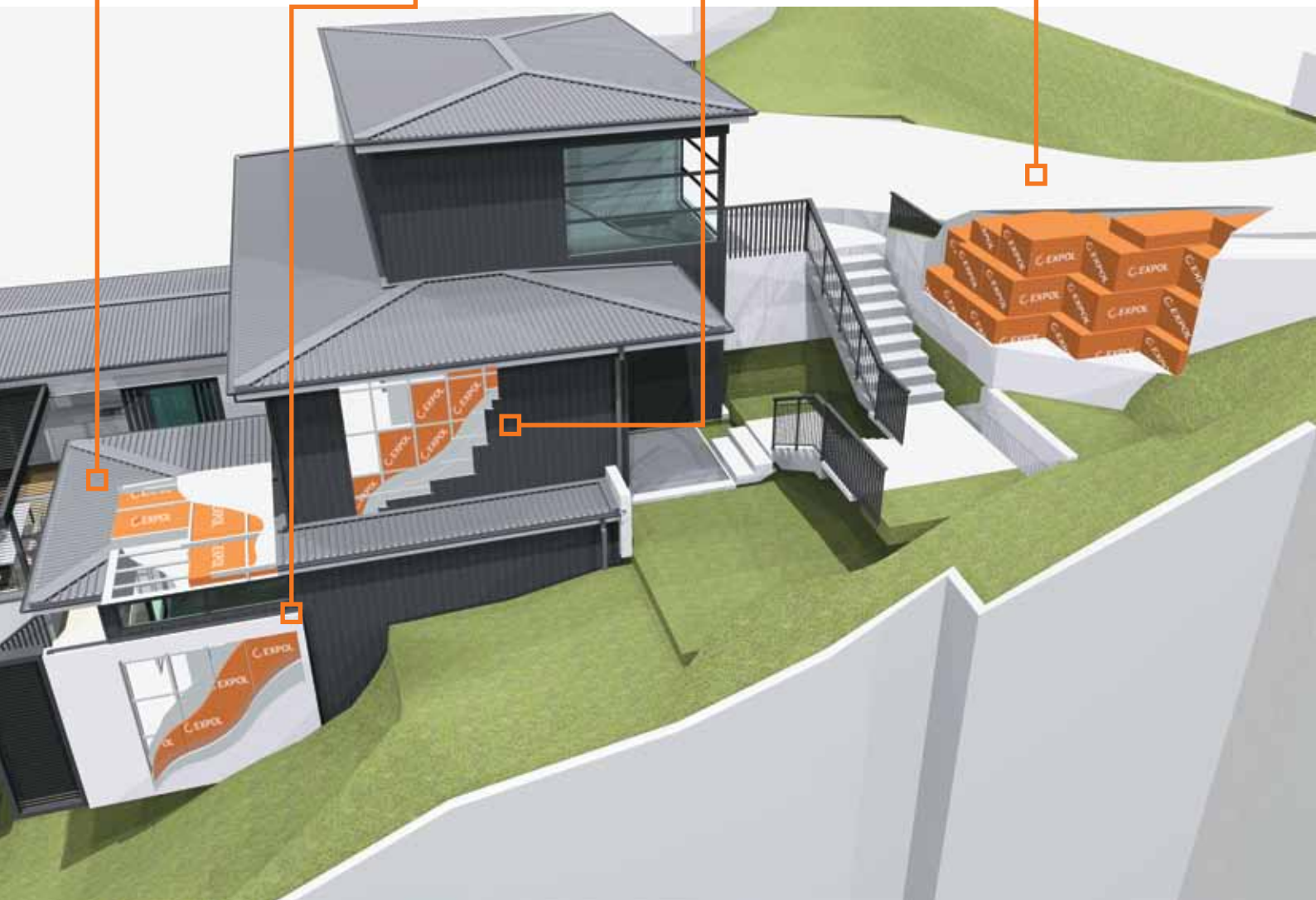
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RETAINING WALLS

Membrane protection, drainage, insulation.

EXPOL StyroDrain offers a lightweight alternative solution to traditional drainage materials for most retaining walls and is specifically designed for situations with limited access.

For protection of the waterproof membrane when using gravel / scoria for drainage, EXPOL supplies **ThermaSlab** sheets in a range of thicknesses, but recommends 20mm or 40mm depending on the situation.

EXPOL-X is the ideal solution for insulating a retaining wall. Its waterproof qualities provide an excellent exterior insulation solution.

THE PRODUCTS

EXPOL ThermaSlab (Protection) is standard EPS and is available in a range of thicknesses to suit the specific requirements. 20mm is common practice for most retaining walls, whereas 40mm is recommended when the retaining wall is higher than 1.2 metres or where the gravel / scoria will be more likely to damage the waterproof membrane.

EXPOL StyroDrain (Protection & Drainage) is a permeable light- weight drainage material manufactured from 100% recycled EPS material, offering drainage, and protection to the water-proofing membrane used on retaining walls. A double layer of EXPOL StyroDrain may be required if the retaining wall is higher than 1.2 metres or in special circumstances. StyroDrain comes in easy to handle sheets 90mm thick and can be cut with a sharp knife or hand saw.

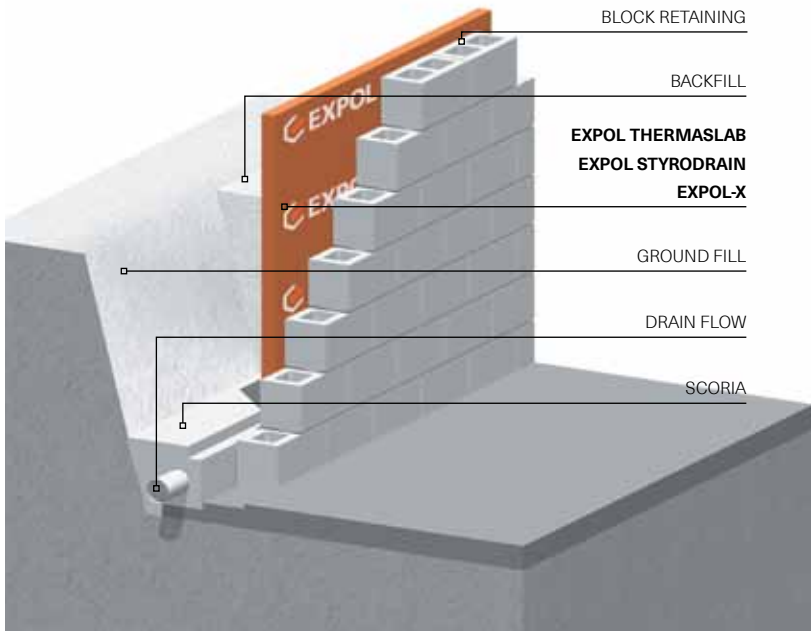
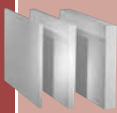
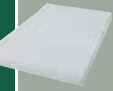
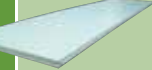


Table 1.1

PRODUCT OPTIONS & SIZES

		Length (mm)	Width (mm)
EXPOL ThermaSlab S		2400	1200
		2450	1200
		2700	1200
		3600	1200
		4800	1200
		Special sizes on request	
EXPOL StyroDrain		2400	1200
EXPOL-X		2500	600

EXPOL-X (Protection & Insulation) is extruded polystyrene (XPS) and is available in full sheets only (see Table 1.1). EXPOL-X is highly water resistant and has an extremely high compressive strength.

SYSTEM COMPONENTS

EXPOL SILICONE ADHESIVE

EXPOL supplies a water based glue designed to adhere polystyrene to most surfaces. EXPOL retaining wall solutions can be glued in place using this adhesive as an alternative or in combination with other fixing methods.



Table 1.2

PRODUCT PROPERTIES

Property	Unit	EXPOL StyroDrain	EXPOL ThermaSlab S	EXPOL-X	Test Reference
Material		EPS	EPS	XPS	
Density	kg/m ³	11	16	30	
Thickness / R Value	m ² K/W				ASTM C518-04
	20mm	-	R 0.53	-	
	25mm	-	R 0.66	-	
	30mm	-	R 0.79	R 1.10	
	40mm	-	R 1.05	R 1.45	
	50mm	-	R 1.32	R 1.80	
	60mm	-	R 1.58	-	
	70mm	-	R 1.84	-	
	80mm	-	R 2.11	-	
	90mm	n/a	R 2.37	-	
	100mm	-	R 2.63	-	
	110mm	-	R 2.89	-	
	120mm	-	R 3.16	-	
Compressive Resistance	KPA at 1%		34		
Compressive Resistance	KPA at 2%		59		
Compressive Resistance	KPA at 5%		74		
Compressive Resistance	KPA at 10%		84	250	AS 2498.3
Youngs Modulus	(MPA)	-	3.8		
Cross breaking strength	KPA	-	165	-	AS 2498.4
Determination of flame propagation surface ignition					
Medium flame duration (max)	sec	2	2	-	AS2122.1-1993
Eighth value	sec	3	3	-	
Fire behaviour - Spread of Flame Index (0-10)		0	0	0	AS/NZS
- Smoke Developed Index (0-10)		5	5	3	1530.3:1999
Dimensional stability of length, width & thickness (max) at 70 deg C for 7 days	%	1	1	-	AS2498.6
Recycled content	%	100	0	0	
Rate of water vapour transmission (max) measured parallel to rise at 23°C	mg/m ² s	-	520	-	AS 2498.5
Permeability	m/s	4.18 x 10 ⁻³	-	-	
Long term water absorption by immersion	% v/v	-	-	0.028	ASTM C272

FURTHER INFORMATION

For further, detailed information on all of these products, refer to the products on page 26 which provides links to product data sheets and technical brochures.



EXPOL StyroDrain has been tested by Opus International Consultants Ltd. OPUS INTERNATIONAL CONSULTANTS Job No. 169402.00. Refer to www.expol.co.nz/styrodrein

Reference No. 02/402/001 Permeability Tests: EXPOL StyroDrain Test References: Permeability as per "Constant Head Permeability of Aggregate, Based on Soil Laboratory Testing" by E.H.Head, Density by Mass/Volume calculation.

MANUFACTURING STANDARD

All products and grades of EPS EXPOL supplies for retaining wall solutions comply with manufacturing standard AS 1366 Part 3 1992.

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MASONRY WALL INSULATION

EXPOL provides high performance, solid insulation solutions for insulating both interior and exterior masonry walls.

EXPOL Platinum Board is best suited for interior applications, while **EXPOL-X**, with its water tight qualities, is designed more for exterior applications. *Also see Cladding and Retaining wall solutions for more exterior options.*

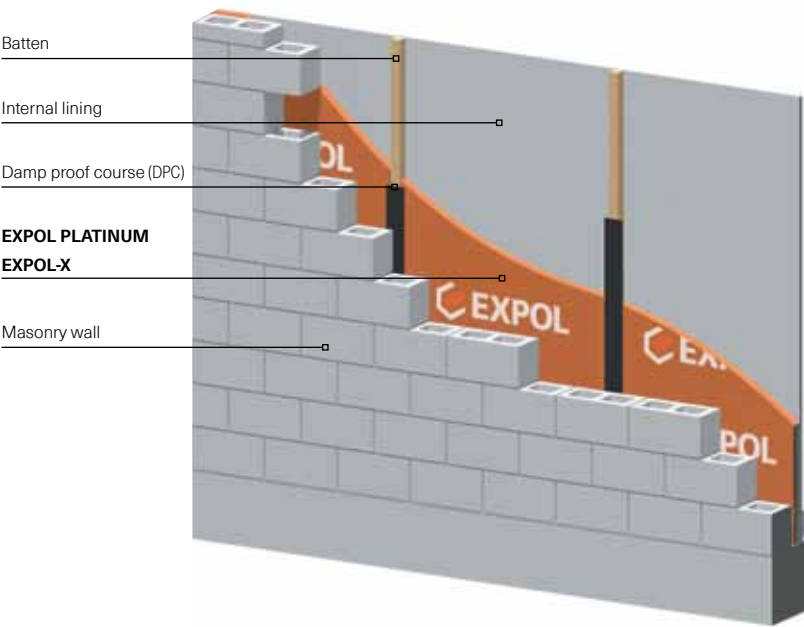
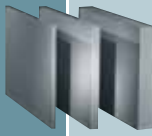
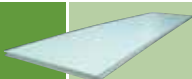


Table 2.1
PRODUCT OPTIONS & SIZES

	Length (mm)	Width (mm)
EXPOL Platinum Board 	2400	1200
	2450	1200
	2700	1200
	3600	1200
	4800	1200
	Special sizes on request	
EXPOL-X 	2500	600

THE PRODUCTS

EXPOL masonry wall insulation solutions utilise cutting edge innovations in solid insulation boards. Both products achieve substantially higher R values (for the relative thickness) than other insulating materials.

EXPOL Platinum Board is graphite infused EPS, supplied in full sheets or cut to suit. EXPOL Platinum Board is a premium product which achieves superior R values relative to thickness.

EXPOL-X is extruded polystyrene (XPS) available in full sheets only (see Table 2.1). EXPOL-X is highly water resistant and has an extremely high compressive strength.

SYSTEM COMPONENTS

WIRE GUARD

EXPOL Wireguard is a waxed paper strip used to separate exposed electrical cables from EXPOL insulation. EPS in some cases reacts with the plasticiser and degrades the elastic properties of some electrical cables over a prolonged period.



CONSTRUCTION ADHESIVE

Sabre Fix is an advanced single component polyurethane based construction adhesive. This powerful adhesive is developed especially for the construction industry and will bond most types of construction materials including timber (damp and dry), concrete, plasterboard, polystyrene and many other porous and non-porous substrates.



Table 2.2

PRODUCT PROPERTIES

Property	Unit	EXPOL Platinum Board - interior		EXPOL-X - exterior	Test Reference
Material		EPS (with graphite)		XPS	
Density	kg/m ³	18		30	
Thickness / R Value	m ² K/W				ASTM C518-04
	20mm	R 0.63		-	
	25mm	R 0.78		-	
	30mm	R 0.94		R 1.1	
	35mm	R 1.09		-	
	40mm	R 1.25		R 1.45	
	45mm	R 1.41		-	
	50mm	R 1.56		R 1.80	
	55mm	R 1.72		-	
	60mm	R 1.88		-	
	65mm	R 2.03		-	
	70mm	R 2.19		-	
	75mm	R 2.34		-	
	80mm	R 2.50		-	
	85mm	R 2.66		-	
	90mm	R 2.81		-	
	95mm	R 2.97		-	
	100mm	R 3.13		-	
	110mm	R 3.44		-	
	120mm	R 3.75		-	
Compressive strength at 10% deformation (min)	KPA	105		250	AS 2498.3
Cross breaking strength	KPA	200		-	AS 2498.4
Determination of flame propagation surface ignition					
Medium flame duration (max)	sec	2		-	AS2122.1-1993
Eighth value	sec	3		-	
Fire behaviour - Spread of Flame Index (0-10)		0		0	AS/NZS
- Smoke Developed Index (0-10)		5		3	1530.3:1999
Dimensional stability of length, width & thickness (max) at 70 deg C for 7 days	%	1		-	AS2498.6
Recycled content	%	0		0	
Rate of water vapour transmission (max) measured parallel to rise at 23°C	mg/m ² s	520		-	AS 2498.5
Long term water absorption by immersion % v/v		-		0.028	ASTM C272

FURTHER INFORMATION

For further, detailed information on both of these products, refer to product information on page 26 which provides links to product data sheets and technical brochures.

MANUFACTURING STANDARD

All products and grades of EPS supplied by EXPOL for masonry wall insulation comply with manufacturing standard AS 1366 Part 3 1992.

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Expanded Polystyrene Densities and Colour Coding - see page 27



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CONCRETE FLOOR INSULATION

EXPOL supplies both **EPS** and **XPS** for under concrete slab insulation. Depending on the application, one product will be more suitable than the other.

THE PRODUCTS

EXPOL ThermaSlab S and H are the most cost effective products for insulating under a concrete slab. These densities will suit most residential floors and will achieve R values above building regulations.

EXPOL ThermaSlab VH would normally be required in commercial applications where very high loads are probable. Also see EXPOL-X for these situations.

EXPOL Platinum Board is graphite infused EPS supplied in sheets suitable for insulating under a concrete slab. EXPOL Platinum Board is a premium product which achieves superior R values relative to thickness, commonly used when thickness is an issue or high R values are required.

EXPOL-X is extruded polystyrene (XPS) available in full sheets only (see Table 3.1). EXPOL-X is highly water resistant and has an extremely high compressive strength. See Table 3.2 for specifications.

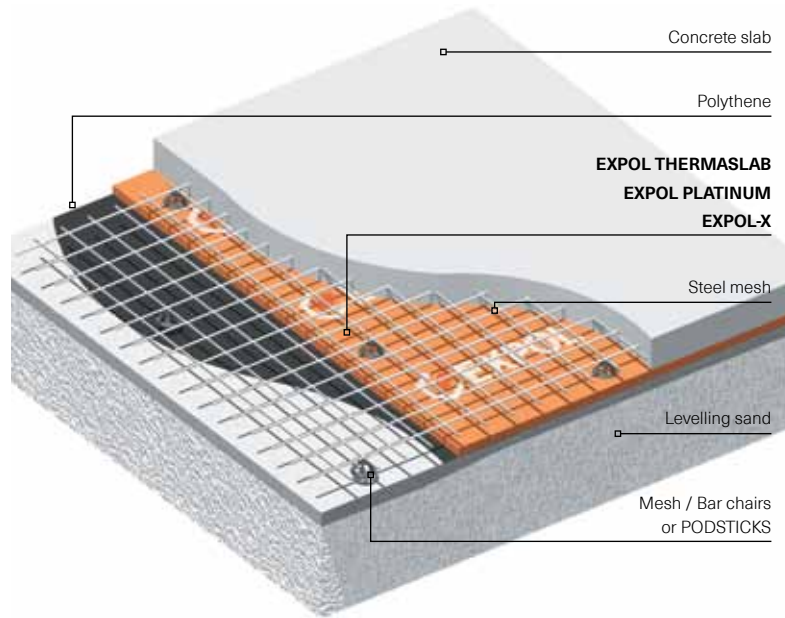
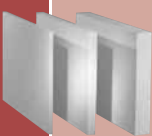
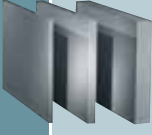
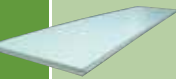


Table 3.1

PRODUCT OPTIONS & SIZES

	Length (mm)	Width (mm)
EXPOL ThermaSlab (S, H, VH) 	2400	1200
	2450	1200
	2700	1200
	3600	1200
	4800	1200
	Special sizes on request	
EXPOL Platinum Board 	2400	1200
	2450	1200
	2700	1200
	3600	1200
	4800	1200
	Special sizes on request	
EXPOL-X 	2500	600

SYSTEM COMPONENTS

MESH / BAR CHAIRS 25/40

EXPOL supplies bar chairs for steel mesh support



EXPOL PODSTICK

Used as an alternative to Mesh / Bar Chairs. Provides more support for steel mesh over polystyrene

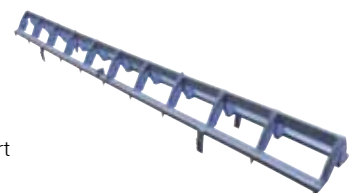


Table 3.2

PRODUCT PROPERTIES

Property	Unit	EXPOL ThermaSlab S	EXPOL ThermaSlab H	EXPOL ThermaSlab VH	EXPOL Platinum Board	EXPOL-X	Test Reference
Material		EPS	EPS	EPS	EPS (with graphite)	XPS	
Density	kg/m ³	16	24	28	18	30	
Thickness / R Value	m ² K/W						ASTM C518-04
	20mm	R 0.53	R 0.56	R 0.57	R 0.63	-	
	25mm	R 0.66	R 0.69	R 0.71	R 0.78	-	
	30mm	R 0.79	R 0.83	R 0.86	R 0.94	R 1.10	
	40mm	R 1.05	R 1.11	R 1.14	R 1.25	R 1.45	
	50mm	R 1.32	R 1.39	R 1.43	R 1.56	R 1.80	
	60mm	R 1.58	R 1.67	R 1.71	R 1.88	-	
	70mm	R 1.84	R 1.94	R 2.00	R 2.19	-	
	80mm	R 2.11	R 2.22	R 2.29	R 2.50	-	
	90mm	R 2.37	R 2.50	R 2.57	R 2.81	-	
	100mm	R 2.63	R 2.78	R 2.86	R 3.13	-	
	110mm	R 2.89	R 3.06	R 3.14	R 3.44	-	
	120mm	R 3.16	R 3.33	R 3.43	R 3.75	-	
Compressive Resistance	KPA at 1%	34	64	86	-	-	
Compressive Resistance	KPA at 2%	59	108	138	-	-	
Compressive Resistance	KPA at 5%	74	133	166	-	-	
Compressive Resistance	KPA at 10%	84	146	182	105	250	AS 2498.3
Youngs Modulus	(MPA)	3.8	6.2	8	-	-	
Cross breaking strength	KPA	165	260	320	200	-	AS 2498.4
Determination of flame propagation surface ignition							
Medium flame duration (max)	sec	2	2	2	2	-	AS2122.1-1993
Eighth value	sec	3	3	3	3	-	
Fire behaviour - Spread of Flame Index (0-10)		0	0	0	0	0	AS/NZS
- Smoke Developed Index (0-10)		5	5	5	5	3	1530.3:1999
Dimensional stability of length, width & thickness (max) at 70 deg C for 7 days %		1	1	1	1	-	AS2498.6
Recycled content	%	0	0	0	0	0	
Rate of water vapour transmission (max) measured parallel to rise at 23°C	mg/m ² s	520	460	400	520	-	AS 2498.5
Long term water absorption by immersion	% v/v	-	-	-	-	0.028	ASTM C272

FURTHER INFORMATION

For further, detailed information on all of these products, refer to product information on page 26 which provides links to product data sheets and technical brochures.

MANUFACTURING STANDARD

All products and grades of EPS supplied by EXPOL for concrete floors comply with manufacturing standard AS 1366 Part 3 1992.

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Expanded Polystyrene Densities and Colour Coding - see page 27



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CONCRETE FLOOR EDGE INSULATION

EXPOL concrete floor edge insulation is a proven method to significantly increase your building's overall thermal performance.

EXPOL-X sheets are installed vertically against the outside face of a concrete floor slab or foundation wall, to create a thermal barrier in an area where there is significant heat loss.

Once fixed, a top layer of plaster will finish to a modern clean look.

EXPOL concrete floor edge insulation can be retrofitted or incorporated into the planning detail of the wall cladding and concrete slab foundation.

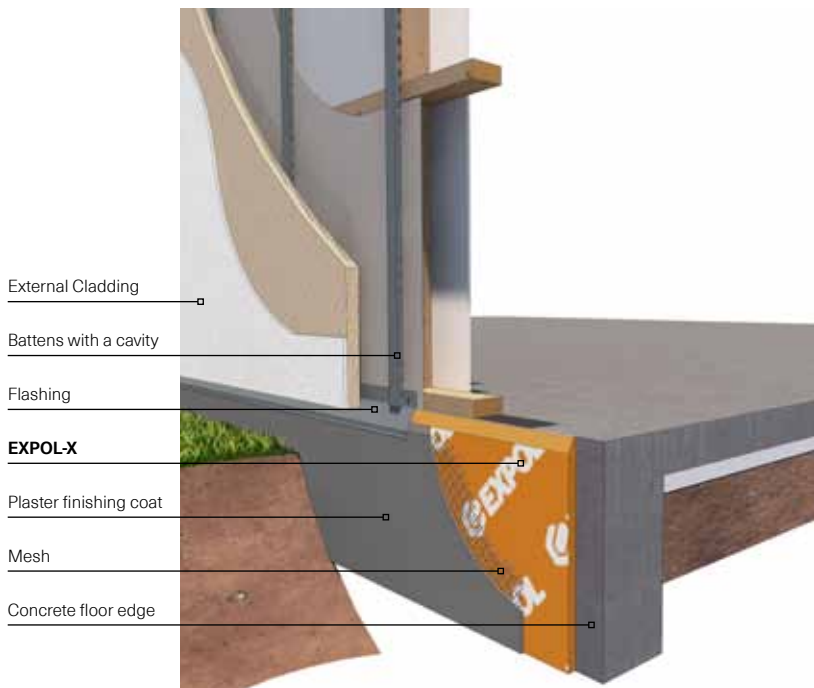
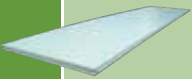


Table 4.1
PRODUCT OPTIONS & SIZES

		Length (mm)	Width (mm)
EXPOL-X		2500	300

THE PRODUCT

Product thickness is 30mm (+ plaster) and can achieve a respectable R-value of 1.0 to greatly improve your overall construction rating (see Table 4.2).

EXPOL concrete floor edge insulation system has been designed to include the 'Z' flashing to guarantee water tightness.

EXPOL-X is extruded polystyrene (XPS) and is only available in one size (see Table 4.1). EXPOL-X is highly water resistant and has an extremely high insulation value.

SYSTEM COMPONENTS

PERIMETER EDGE FLASHINGS

The 'Z' flashing has been specifically designed to ensure water tightness. Flashings should be used in circumstances that would normally require the cladding material to overhang the foundation edge.

CONSTRUCTION ADHESIVE

Sabre Fix is an advanced single component polyurethane based construction adhesive. This powerful adhesive is developed especially for the construction industry and will bond most types of construction materials including timber (damp and dry), concrete, plasterboard, polystyrene and many other porous and non-porous substrates.



Table 4.2

R-VALUES FOR A VARIETY OF FLOORING SYSTEMS

		Area-to-perimeter ratio						
		1.3	1.9	2.2	2.5	2.8	3.1	4.0
Total construction R-Value								
Without edge insulation								
Slab on Ground	90mm deep wall frame	0.8	1.0	1.1	1.2	1.4	1.5	1.8
	140mm wall frame or 150mm masonry	0.8	1.1	1.2	1.3	1.5	1.6	1.9
	200mm masonry	0.9	1.2	1.3	1.4	1.5	1.7	2.1
	250mm masonry	1.0	1.2	1.4	1.5	1.5	1.8	2.2
POD Floor	90mm deep wall frame	1.0	1.2	1.3	1.5	1.6	1.7	2.1
	140mm wall frame or 150mm masonry	1.0	1.3	1.4	1.5	1.7	1.8	2.2
	200mm masonry	1.1	1.4	1.6	1.7	1.9	2.0	2.4
	250mm masonry	1.3	1.6	1.8	1.9	2.1	2.2	2.6
R1.0 EXPOL Concrete floor edge insulation								
Slab on Ground	90mm deep wall frame	1.2	1.5	1.7	1.9	2.0	2.2	2.7
	140mm wall frame or 150mm masonry	1.3	1.6	1.8	1.9	2.1	2.3	2.8
	200mm masonry	1.3	1.6	1.8	2.0	2.1	2.3	2.8
	250mm masonry	1.3	1.7	1.9	2.0	2.2	2.4	2.9
POD Floor	90mm deep wall frame	1.4	1.8	1.9	2.1	2.3	2.4	2.9
	140mm wall frame or 150mm masonry	1.5	1.8	2.0	2.1	2.3	2.5	3.0
	200mm masonry	1.6	1.9	2.1	2.3	2.5	2.6	3.1
	250mm masonry	1.7	2.1	2.2	2.4	2.6	2.8	3.3
R1.0 EXPOL Concrete floor edge and R1.2 under concrete slab insulation (see page 10)								
Slab on Ground	90mm deep wall frame	1.7	2.1	2.3	2.5	2.7	2.9	3.5
	140mm wall frame or 150mm masonry	1.8	2.2	2.4	2.7	2.9	3.1	3.7
	200mm masonry	1.9	2.4	2.6	2.8	3.0	3.2	3.8
	250mm masonry	2.0	2.5	2.7	2.9	3.2	3.4	4.0

The table of R-values is taken from the BRANZ House Insulation Guide

FURTHER INFORMATION

For further, detailed information on all of these products, refer to product information on page 26 which provides links to product data sheets and technical brochures.



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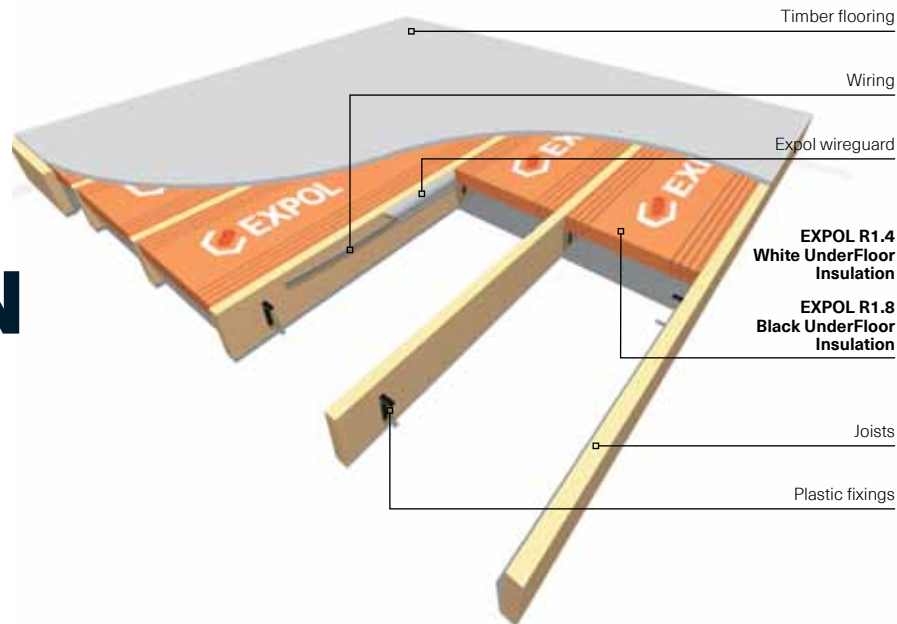
Website
www.expol.co.nz



Contact EXPOL
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TIMBER FLOOR INSULATION

EXPOL provides comprehensive solutions for insulating underfloor between the joists of a timber floor construction, specifically designed for both **new** and **existing** floors.



THE PRODUCTS


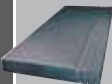
EXPOL Premium UnderFloor Insulation solutions are made from a fire retardant Expanded Polystyrene (EPS). In most situations floor insulation is exposed to the elements (as opposed to wall and ceiling insulation in a cavity) therefore, it is vital that the materials used will stand the test of time. EXPOL's solid insulation products are not affected by moisture and will not degrade over time. Both products are 60mm in thickness with concertina cuts on either side for easy installation. All fixing components are supplied by EXPOL and when used according to EXPOL's installation instructions, will ensure the system lasts the life time of the construction. EXPOL UnderFloor Insulation is appraised by BRANZ and has a 50 year warranty.

EXPOL UNDERFLOOR INSULATION

EXPOL R1.4 White UnderFloor Insulation is a rigid white panel manufactured from EPS material, 1200mm in length manufactured in four standard widths (see Table 5.1). This product is a proven solution for timber floor insulation and has been on the market for over 20 years.

EXPOL R1.8 Black UnderFloor Insulation is graphite infused EPS supplied in the same sizes as the standard white Underfloor insulation. EXPOL BLACK is a premium product which achieves superior R values.

Table 5.1
PRODUCT OPTIONS & SIZES

		Length (mm)	Width (mm)
EXPOL R1.4 White UnderFloor Insulation		1200	360
		1200	410
		1200	470
		1200	560
EXPOL R1.8 Black UnderFloor Insulation		1200	360
		1200	410
		1200	470
		1200	560

SYSTEM COMPONENTS

WIRE GUARD

EXPOL Wireguard is a waxed paper strip used to separate exposed electrical cables from EXPOL insulation. EPS in some cases reacts with the plasticiser and degrades the elastic properties of some electrical cables over a prolonged period.



FIXINGS

There are 2 types of fixings specific to Existing Floors and New Floors. They are made from non-corrosive nylon and are used to fix the EXPOL panels in place.

- Existing Floors: EXPOL L Brackets are designed to fit under the panel (supplied with stainless steel nails).
- New Floors: EXPOL Joist Saddles are designed to slip over the joist to support and secure the panel.



EXPOL SILICONE ADHESIVE

EXPOL supplies water based glue designed to adhere polystyrene to most surfaces. Underfloor panels can be glued in place using this adhesive as an alternative or in combination with the nylon fixings.



Table 5.2

PRODUCT PROPERTIES

Property	Unit	EXPOL R1.4 White UnderFloor Insulation	EXPOL R1.8 Black UnderFloor Insulation	Test Reference
Material		EPS	EPS	
Density	kg/m ³	12	18	
Thickness / R Value	m ² K/W			ASTM C518-04
	60mm	R 1.40	R 1.80	
	120mm (Double Layer)	R 2.80	R 3.60	
Compressive strength at 10% deformation (min)	KPA	70	105	AS 2498.3
Cross breaking strength	KPA	135	200	AS 2498.4
Determination of flame propagation surface ignition				
Medium flame duration (max)	sec	2	2	AS2122.1-1993
Eighth value	sec	3	3	
Fire behaviour - Spread of Flame Index (0-10)		0	0	AS/NZS
- Smoke Developed Index (0-10)		5	5	1530.3:1999
Dimensional stability of length, width & thickness (max) at 70 deg C for 7 days	%	1	1	AS2498.6
Recycled content	%	30	0	
Rate of water vapour transmission (max) measured parallel to rise at 23°C	mg/m ² s	630	520	AS 2498.5
Long term water absorption by immersion	% v/v	-	-	ASTM C272

INSTALLATION

For detailed installation instructions, please refer to EXPOL's technical literature or BRANZ appraisal, both available on our website www.expol.co.nz.

**FURTHER INFORMATION**

For further, detailed information on both of these products, refer to product information on page 26 which provides links to product data sheets and technical brochures.

SPECIFIERS, ARCHITECTS AND PLANNERS

For all specifying information, relevant product testing and other detailed information please refer to MasterSpec documents on www.masterspec.co.nz or contact EXPOL for an electronic copy.

BRANZ APPRAISAL

EXPOL UnderFloor has a BRANZ appraisal.
See BRANZ certificate number 256.

INSULATION STANDARD

All EXPOL timber floor insulation solutions comply with the Australian and New Zealand Standard AS/NZS 4859.1:2002.

MANUFACTURING STANDARD

All panels have a yellow stripe down one edge to confirm compliance with manufacturing standard AS 1366 Part 3 1992 for SL grade.



For
mipproducts
Details www.mipproducts.co.nz

For
masterspec
Details www.masterspec.co.nz

Expanded Polystyrene Densities and Colour Coding - see page 27

 Quotes / Technical
E: tech@expol.co.nz

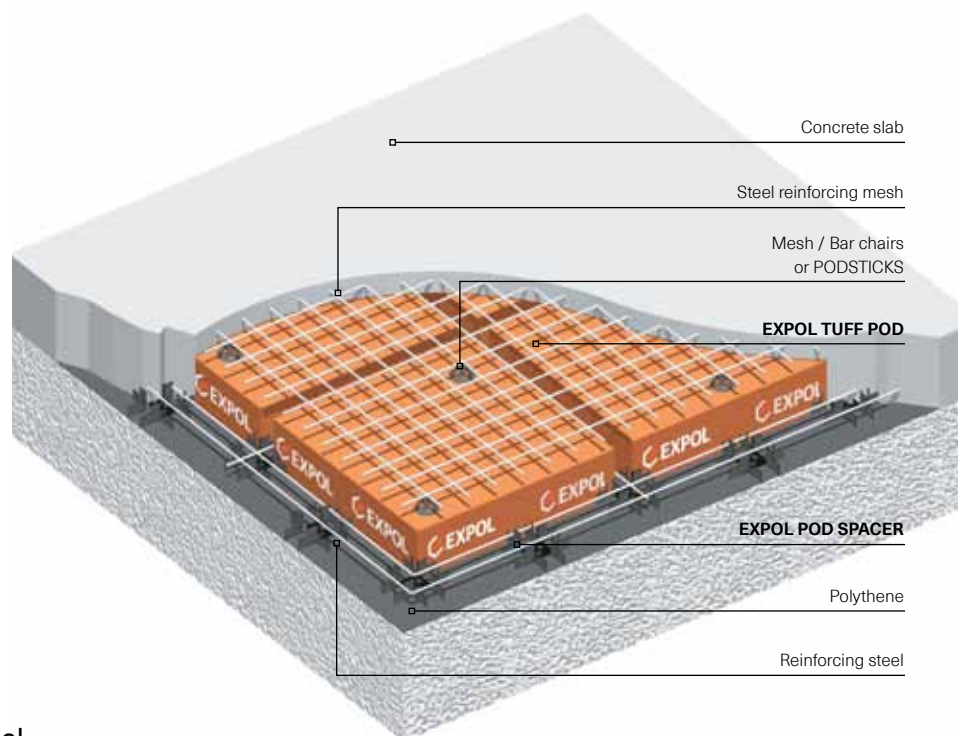
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www.expol.co.nz

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POD FLOOR SYSTEMS

EXPOL manufactures a variety of polystyrene **Tuff Pods** suitable for all raft / floating floor slab systems throughout New Zealand.

EXPOL Tuff Pods are a component used to create 100mm concrete ribs throughout the floor, providing additional strength and superior insulating qualities.



THE PRODUCTS

EXPOL Tuff Pods are manufactured from standard EPS material. Tuff pods are shape moulded and incorporate a waffle design.

To suit the many different pod floor systems, EXPOL supplies a variety of sizes to suit the specific design.

SYSTEM COMPONENTS

EXPOL supplies spacers to align the Tuff Pods, and PODSTICKS for mesh support.

EXPOL's range of components available is listed below:

EXPOL 100mm Spacer

Only suitable for 220mm PODS for internal ribs.



EXPOL 300mm Spacer

Only suitable for 220mm PODS for slab edge beam and thickenings.



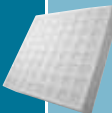
Mesh / Bar Chairs 25/40

Use EXPOL Bar Chairs to hold the mesh either 25mm or 40mm above the Tuff Pods. EXPOL Bar Chairs have a large base so they will not squash the polystyrene pod.



Table 6.1

PRODUCT OPTIONS & SIZES

	Length (mm)	Width (mm)	Thickness (mm)
Expol Tuff Pods 	1100	1100	220
	1100	1100	300
	1200	1200	200
	1200	1200	300*
	1800	1200	200*

* Solid Pods only - not shape moulded

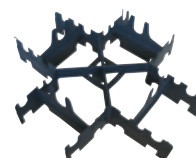
UNIMAX Spacer

The spacer sits on the ground between the pods and is suitable for use with any size Tuff Pod. The spacer cleverly clips together to form any size spacing required. EXPOL Unimax spacers can be used in conjunction with any other spacer type.



Centre Spacer

100mm internal four way spacer.

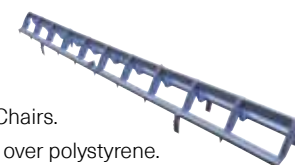


Wilton Joubert

Spacer available on request

EXPOL PODSTICK

Used as an alternative to Mesh / Bar Chairs. Provides more support for steel mesh over polystyrene.



STANDARD POD CONSTRUCTION DETAILS

Fig 6.1 **Masonry Wall**

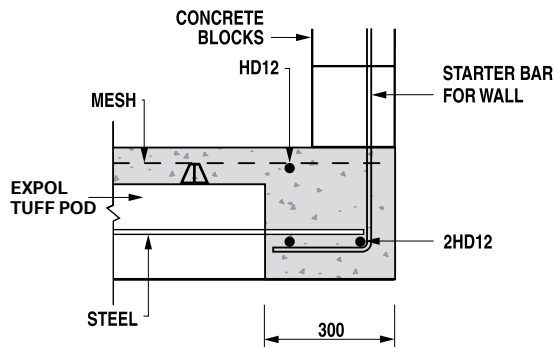


Fig 6.2 **Timber Frame**

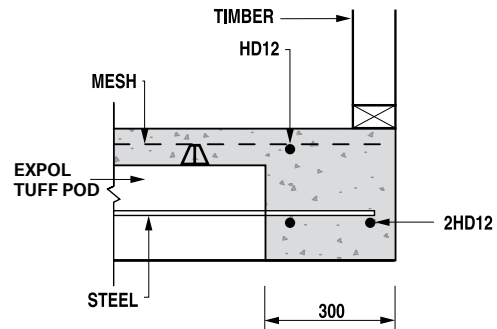


Fig 6.3 **Brick Veneer**

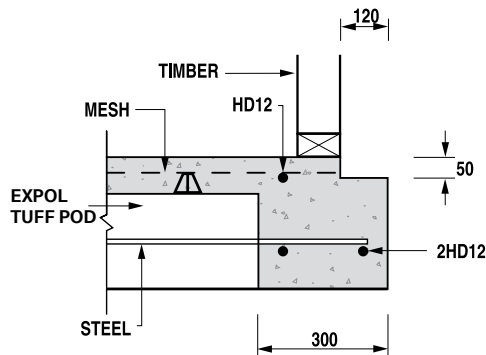


Fig 6.4 **300mm Rib**

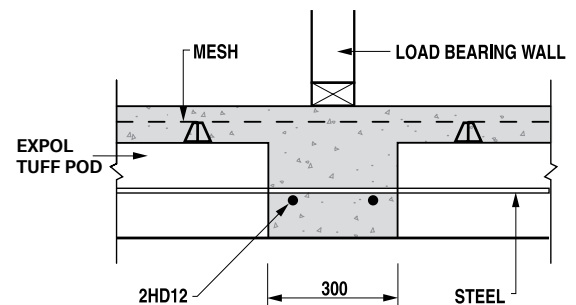
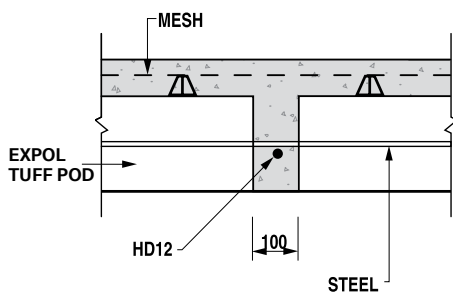


Fig 6.5 **100mm Rib**



FURTHER INFORMATION

For further, detailed information on all of these products, refer to product information on page 26 which provides links to product data sheets and technical brochures.

MANUFACTURING STANDARD

All products and grades of EPS supplied by Expol for Pod floors comply with manufacturing standard AS 1366 Part 3 1992.



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SKILLION ROOF INSULATION

EXPOL provides solid insulation solutions to solve the difficulties in achieving high R values in narrow roof spaces. EXPOL skillion roof solutions are panels cut to suit a variety of purlin / rafter spacings.

EXPOL Platinum Board is a premium product with superior insulating qualities, whereas **EXPOL ThermaSlab** is a cost effective alternative for areas that are not restricted by space.

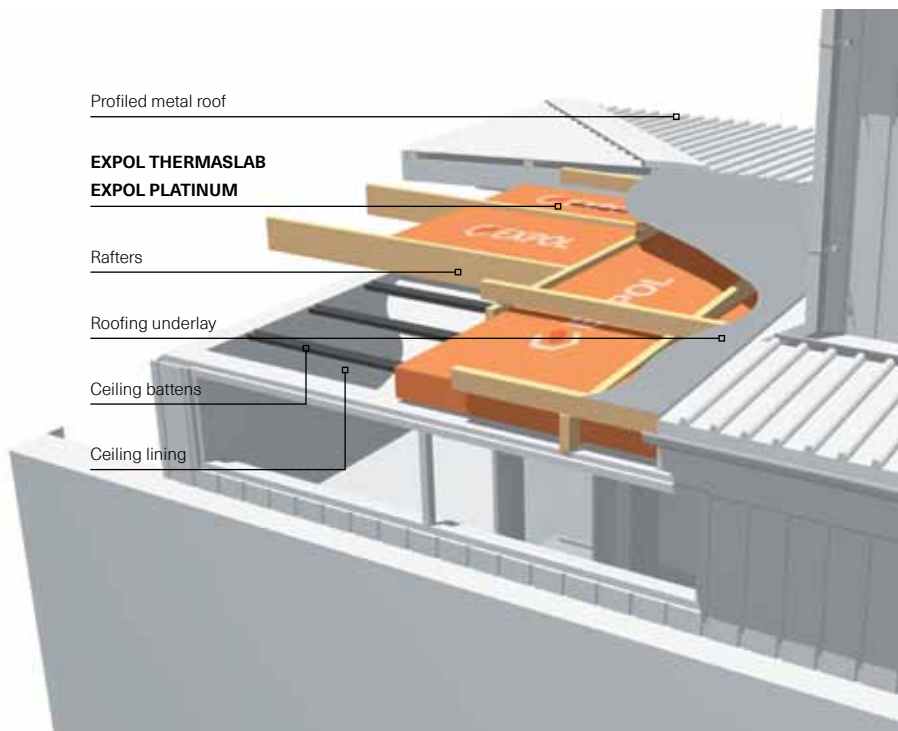

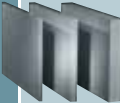


Table 7.1
PRODUCT OPTIONS & SIZES

		Length (mm)	Width (mm)
<div>EXPOL ThermaSlab (S,M,H)</div> 		1200	555
		1200	855
		1200	1155
<div>EXPOL Platinum Board</div> 		1200	555
		1200	855
		1200	1155

All sizes above are examples of some standard situations
NOTE: Other widths available

THE PRODUCTS

EXPOL ThermaSlab is standard EPS available in a variety of grades to suit the application, supplied in full sheets or cut to suit purlin / rafter spacings (see Table 7.1).

EXPOL Platinum Board is graphite infused EPS, supplied in full sheets or cut to suit purlin / rafter spacings (see Table 7.1). EXPOL Platinum Board is a premium product which achieves superior R values relative to thickness.

SYSTEM COMPONENTS

WIRE GUARD
EXPOL Wireguard is a waxed paper strip used to separate exposed electrical cables from EXPOL insulation. EPS in some cases reacts with the plasticiser and degrades the elastic properties of some electrical cables over a prolonged period.

EXPOL SILICONE ADHESIVE
EXPOL supplies water based glue designed to adhere polystyrene to most surfaces. EXPOL skillion roof insulation panels can be glued in place using this adhesive.



Table 7.2

PRODUCT PROPERTIES

Property	Unit	EXPOL ThermaSlab S	EXPOL ThermaSlab M	EXPOL ThermaSlab H	EXPOL Platinum Board	Test Reference
Material		EPS	EPS	EPS	EPS (with graphite)	
Density	kg/m ³	16	20	24	18	
Thickness / R Value	m ² K/W					ASTM C518-04
	20mm	R 0.53	R 0.54	R 0.56	R 0.63	
	25mm	R 0.66	R 0.68	R 0.69	R 0.78	
	30mm	R 0.79	R 0.81	R 0.83	R 0.94	
	35mm	R 0.92	R 0.95	R 0.97	R 1.09	
	40mm	R 1.05	R 1.08	R 1.11	R 1.25	
	45mm	R 1.18	R 1.22	R 1.25	R 1.41	
	50mm	R 1.32	R 1.35	R 1.39	R 1.56	
	55mm	R 1.45	R 1.49	R 1.53	R 1.72	
	60mm	R 1.58	R 1.62	R 1.67	R 1.88	
	65mm	R 1.71	R 1.76	R 1.81	R 2.03	
	70mm	R 1.84	R 1.89	R 1.94	R 2.19	
	75mm	R 1.97	R 2.03	R 2.08	R 2.34	
	80mm	R 2.11	R 2.16	R 2.22	R 2.50	
	85mm	R 2.24	R 2.30	R 2.36	R 2.66	
	90mm	R 2.37	R 2.43	R 2.50	R 2.81	
	95mm	R 2.50	R 2.57	R 2.64	R 2.97	
	100mm	R 2.63	R 2.70	R 2.78	R 3.13	
	110mm	R 2.89	R 2.97	R 3.06	R 3.44	
	120mm	R 3.16	R 3.24	R 3.33	R 3.75	
Compressive Resistance	KPA at 1%	34	49	64		
Compressive Resistance	KPA at 2%	59	96	108		
Compressive Resistance	KPA at 5%	74	111	133		
Compressive Resistance	KPA at 10%	84	126	146	105	AS 2498.3
Youngs Modulus	(MPA)	3.8	4.1	6.2		
Cross breaking strength	KPA	165	200	260	200	AS 2498.4
Determination of flame propagation surface ignition						
Medium flame duration (max)	sec	2	2	2	2	AS2122.1-1993
Eighth value	sec	3	3	3	3	
Fire behaviour - Spread of Flame Index (0-10)		0	0	0	0	AS/NZS
- Smoke Developed Index (0-10)		5	5	5	5	1530.3:1999
Dimensional stability of length, width & thickness (max) at 70 deg C for 7 days	%	1	1	1	1	AS2498.6
Recycled content	%	0	0	0	0	
Rate of water vapour transmission (max) measured parallel to rise at 23°C	mg/m ² s	520	520	460	520	AS 2498.5
Long term water absorption by immersion % v/v		-	-	-	-	ASTM C272

FURTHER INFORMATION

For further, detailed information on all of these products, refer to product information on page 26 which provides links to product data sheets and technical brochures.

MANUFACTURING STANDARD

All products and grades of EPS supplied by EXPOL for skillion roof insulation comply with manufacturing standard AS 1366 Part 3 1992.



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CLADDING INSULATION

EXPOL supplies both **EPS** and **XPS** sheets for EIFS cladding systems. EXPOL's EPS sheets have been tested and satisfy all the requirements necessary to be listed as a preferred provider for all EIFS systems.

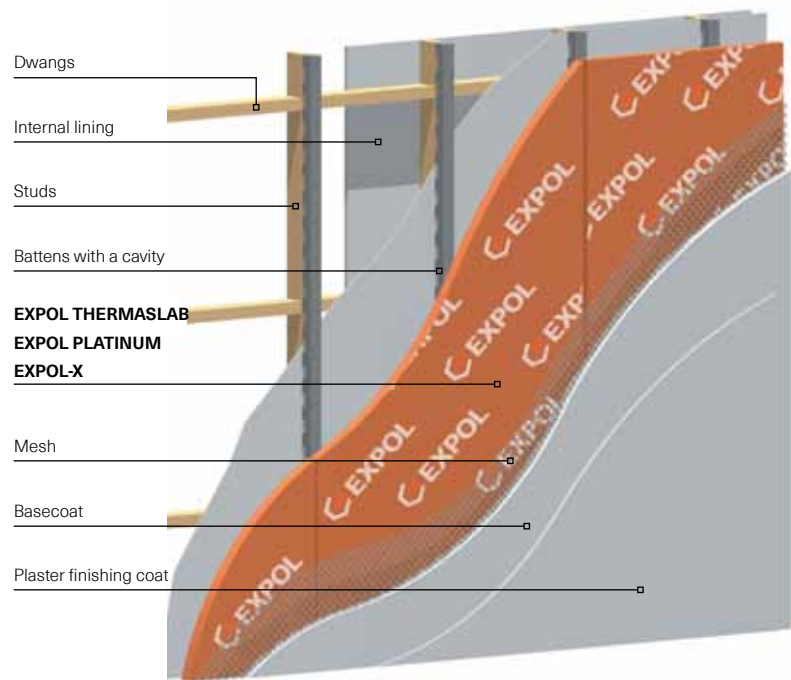
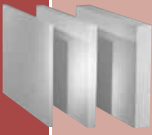
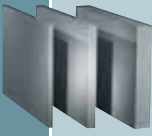



Table 8.1
PRODUCT OPTIONS & SIZES

	Length (mm)	Width (mm)
EXPOL ThermaSlab (S, H) 	2400	1200
	2450	1200
	2700	1200
	3600	1200
	4800	1200
	Special sizes on request	
EXPOL Platinum Board 	2400	1200
	2450	1200
	2700	1200
	3600	1200
	4800	1200
	Special sizes on request	
EXPOL-X 	2500	600

THE PRODUCTS

EXPOL offers a wide range of products to compliment exterior cladding solutions.

EXPOL ThermaSlab sheets have been tested and approved for the use in EIFS systems. EXPOL ThermaSlab for cladding solutions has been kiln dried and stabilised to ensure minimal shrinkage.

EXPOL Platinum Board is graphite infused EPS, supplied in full sheets (see Table 8.1). EXPOL Platinum Board is a premium product which achieves superior R values relative to thickness.

EXPOL-X is extruded polystyrene (XPS) available in full sheets only (see Table 8.1). EXPOL-X is highly water resistant and has an extremely high compressive strength.

SYSTEM COMPONENTS

BATTENS

EXPOL supplies a range of polystyrene batten sizes to suit all cladding systems.

WASHERS

EXPOL supplies 40mm plastic washers designed to increase the surface area of nail fixings.

CONSTRUCTION ADHESIVE

Sabre Fix is an advanced single component polyurethane based construction adhesive. This powerful adhesive is developed especially for the construction industry and will bond most types of construction materials including timber (damp and dry), concrete, plasterboard, polystyrene and many other porous and non-porous substrates.



Table 8.2

PRODUCT PROPERTIES

Property	Unit	EXPOL ThermaSlab S	EXPOL ThermaSlab H	EXPOL Platinum Board	EXPOL Platinum Board H	EXPOL-X	Test Reference
Material		EPS	EPS	EPS (with graphite)	EPS (with graphite)	XPS	
Density	kg/m ³	16	24	18	24	30	
Thickness / R Value	m ² K/W						ASTM C518-04
	20mm	R 0.53	R 0.56	R 0.63	R 0.65	-	
	25mm	R 0.66	R 0.69	R 0.78	R 0.81	-	
	30mm	R 0.79	R 0.83	R 0.94	R 0.97	R 1.10	
	40mm	R 1.05	R 1.11	R 1.25	R 1.29	R 1.45	
	50mm	R 1.32	R 1.39	R 1.56	R 1.61	R 1.80	
	60mm	R 1.58	R 1.67	R 1.88	R 1.94	-	
	70mm	R 1.84	R 1.94	R 2.19	R 2.23	-	
	80mm	R 2.11	R 2.22	R 2.50	R 2.58	-	
	90mm	R 2.37	R 2.50	R 2.81	R 2.90	-	
	100mm	R 2.63	R 2.78	R 3.13	R 3.23	-	
	110mm	R 2.89	R 3.06	R 3.44	R 3.55	-	
	120mm	R 3.16	R 3.33	R 3.75	R 3.87	-	
Compressive Resistance	KPA at 1%	34	64				
Compressive Resistance	KPA at 2%	59	108				
Compressive Resistance	KPA at 5%	74	133				
Compressive Resistance	KPA at 10%	84	146	105	135	250	AS 2498.3
Youngs Modulus	(MPa)	3.8	6.2				
Cross breaking strength	KPA	165	260	200	260	-	AS 2498.4
Determination of flame propagation surface ignition							
Medium flame duration (max)	sec	2	2	2	2	-	AS2122.1-1993
Eighth value	sec	3	3	3	3	-	
Fire behaviour - Spread of Flame Index (0-10)		0	0	0	0	0	AS/NZS
- Smoke Developed Index (0-10)		5	5	5	5	3	1530.3:1999
Dimensional stability of length, width & thickness (max) at 70 deg C for 7 days	%	1	1	1	1	-	AS2498.6
Recycled content	%	0	0	0	0	0	
Rate of water vapour transmission (max) measured parallel to rise at 23°C	mg/m ² s	520	460	520	460	-	AS 2498.5
Long term water absorption by immersion % v/v		-	-	-	-	0.028	ASTM C272

FURTHER INFORMATION

For further, detailed information on all of these products, refer to product information on page 26 which provides links to product data sheets and technical brochures.

PRODUCER STATEMENTS

EXPOL can provide a producer statement for all cladding insulation material on request.

MANUFACTURING STANDARD

All products and grades of EPS supplied by EXPOL for cladding insulation comply with manufacturing standard AS 1366 Part 3 1992.



Quotes / Technical
E: tech@expol.co.nz



Website
www.expol.co.nz



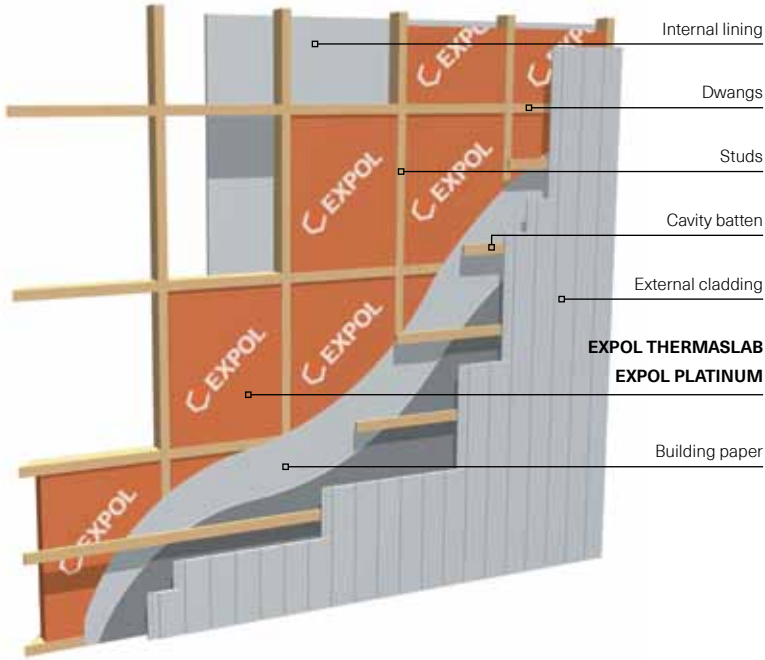
Contact EXPOL
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WALL INSULATION

EXPOL provides high performance solid insulation solutions for insulating timber and steel framed buildings.

EXPOL ThermaSlab is the economical choice to achieve Building Code requirements while **EXPOL Platinum Board** is a premium product offering high insulation values.

Both products can be cut to a standard width as specified by the customer.



THE PRODUCTS

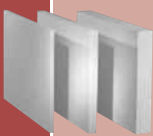
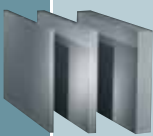
EXPOL offers a range of products to suit your requirements when installing wall insulation. Products are cut to standard widths and EXPOL can cut special sizes on request (see Table 9.1).

All EXPOL wall insulation products are resistant to moisture often found in wall cavities. The products are rigid polystyrene so will not slump or sag over time.

EXPOL ThermaSlab SL panels are manufactured from EPS material and are available in various thicknesses - (see Table 9.2)

EXPOL Platinum Board is graphite infused EPS and is a premium product which achieves superior R values relative to thickness.

Table 9.1
PRODUCT OPTIONS & SIZES

		Length (mm)	Width (mm)
EXPOL ThermaSlab SL		1200	355
		1200	555
		Special sizes on request	
EXPOL Platinum Board		1200	355
		1200	555
		Special sizes on request	

SYSTEM COMPONENTS

WIRE GUARD

EXPOL Wireguard is a waxed paper strip used to separate exposed electrical cables from EXPOL insulation. EPS in some cases reacts with the plasticiser and degrades the elastic properties of some electrical cables over a prolonged period.



Table 9.2

PRODUCT PROPERTIES

Property	Unit	EXPOL ThermaSlab SL	EXPOL Platinum Board	Test Reference
Material		EPS	EPS (with graphite)	
Density	kg/m ³	12	18	
Thickness / R Value	m ² K/W			ASTM C518-04
	60mm	R 1.46	R 1.88	
	65mm	R 1.59	R 2.03	
	70mm	R 1.71	R 2.19	
	75mm	R 1.83	R 2.34	
	80mm	R 1.95	R 2.50	
	85mm	R 2.07	R 2.65	
	90mm	R 2.20	R 2.81	
	95mm	R 2.32	R 2.97	
	100mm	R 2.44	R 3.13	
	110mm	R 2.68	R 3.44	
	120mm	R 2.93	R 3.75	
Compressive strength at 10% deformation (min)	KPA	70	105	AS 2498.3
Cross breaking strength	KPA	135	200	AS 2498.4
Determination of flame propagation surface ignition				
Medium flame duration (max)	sec	2	2	AS2122.1-1993
Eighth value	sec	3	3	
Fire behaviour - Spread of Flame Index (0-10)		0	0	AS/NZS
- Smoke Developed Index (0-10)		5	5	1530.3:1999
Dimensional stability of length, width & thickness (max) at 70 deg C for 7 days	%	1	1	AS2498.6
Recycled content	%	30	0	
Rate of water vapour transmission (max) measured parallel to rise at 23°C	mg/m ² s	630	520	AS 2498.5
Long term water absorption by immersion % v/v		-	-	ASTM C272

FURTHER INFORMATION

For further, detailed information on all of these products, refer to product information on page 26 which provides links to product data sheets and technical brochures.

MANUFACTURING STANDARD

All products and grades of EPS supplied by EXPOL for wall insulation comply with manufacturing standard AS 1366 Part 3 1992.



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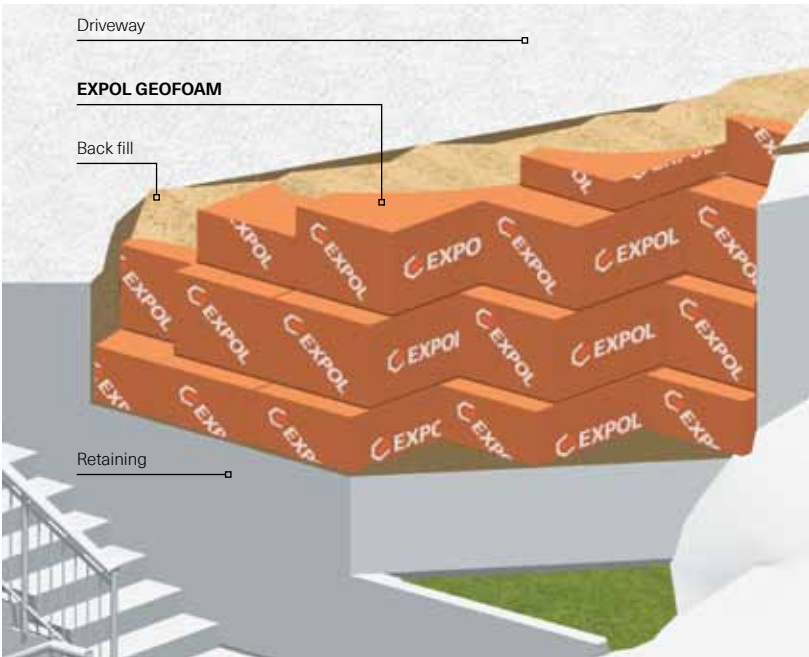
Contact EXPOL
T: 0800 86 33 73
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LIGHTWEIGHT FILL

Expanded Polystyrene (EPS) foam is used extensively for lightweight fill in problematic situations such as expansive soils and soft substrates.

EXPOL GeoFoam is supplied in a range of densities and sizes to suit the engineering design.

Choosing the correct density of **EXPOL GeoFoam** will depend on the compressive loads applied during its service life. All blocks can be cut to suit different project specifications, including angles and 2 dimensional profiles.



THE PRODUCT

EXPOL GeoFoam is manufactured from standard EPS foam and is available in a variety of grades to suit different construction conditions (see Table 10.2). Typical densities range from 12kg/m³ to 38kg/m³. EXPOL GeoFoam will absorb small volumes of water, however this will not have a significant effect on its mechanical properties or performance.

Table 10.1
PRODUCT OPTIONS & SIZES

	Length (mm)	Width (mm)	Thickness (mm)
EXPOL GeoFoam	2450	1220	620
(SL, S, M, H, VH)	4900	1220	620

Any size can be cut from these blocks

EXPOL GEOFOAM ADVANTAGES

- Lightweight
- High compressive strength
- Cost effective
- Durable
- Weighs 1% of conventional fill
- Eliminates lateral pressure and vertical movement
- All clean waste can be recovered for recycling

APPLICATIONS

- Construction
- Road embankments
- Bridge abutments
- Causeways
- Retaining wall fill
- Replacement of poor soils
- Landscaping
- Geotechnical fill
- Frost heave protection
- Sites with limited access

CHEMICAL RESISTANCE

EPS block is resistant to soaps and inorganic substances such as dilute acids, alkalis and salt solutions. It is attacked by organic solvent, including hydrocarbon fuels and lubricants.

For further information see our
EXPOL GeoFoam
Technical Manual



Table 10.2

PRODUCT PROPERTIES

Property	Unit	RECYCLED	EXPOL GeoFoam S	EXPOL GeoFoam M	EXPOL GeoFoam H	EXPOL GeoFoam VH	EXPOL GeoFoam UH	Test Reference
Material		EPS	EPS	EPS	EPS	EPS	EPS	
Density	kg/m ³	14	16	20	24	28	38	
Compressive Resistance	KPA at 1%	17	34	49	64	86	92	AS 2498.3.1993
Compressive Resistance	KPA at 2%	34	59	96	108	138	210	
Compressive Resistance	KPA at 5%	48	74	111	133	166	258	
Compressive Resistance	KPA at 10%	57	84	126	146	182	274	
Youngs Modulus	(MPa)	2.2	3.8	4.1	6.2	8	14	
Cross breaking strength	KPA	90	165	200	260	320	380	AS 2498.4
Determination of flame propagation surface ignition								AS2122.1-1993
Medium flame duration (max)	sec	2	2	2	2	2	2	
Eighth value	sec	3	3	3	3	3	3	
Fire behaviour - Spread of Flame Index	(0-10)	0	0	0	0	0	0	AS/NZS 1530.3:1999
- Smoke Developed Index	(0-10)	5	5	5	5	5	5	
Dimensional stability of length, width & thickness (max) at 70 deg C for 7 days	%	1	1	1	1	1	1	AS2498.6
Rate of water vapour transmission (max) measured parallel to rise at 23°C	mg/m ² s	750	520	520	460	400	350	AS 2498.5



EXPOL GeoFoam as lightweight fill under a concrete floor

FURTHER INFORMATION

For further, detailed information on EXPOL GeoFoam's properties and applications, refer to product information on page 26 which provides links to product data sheets and technical brochures.

PRODUCER STATEMENTS

EXPOL can provide a producers statement for all GeoFoam material on request.

MANUFACTURING STANDARD

All products and grades of EPS supplied by EXPOL for lightweight fill comply with manufacturing standard AS 1366 Part 3 1992.

FURTHER TECHNICAL RESEARCH

For further information please see our **EXPOL GeoFoam Technical Manual** or visit www.expol.co.nz.



Quotes / Technical
E: tech@expol.co.nz



Website
www.expol.co.nz



Contact EXPOL
T: 0800 86 33 73
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EXPOL R1.4 White UnderFloor Insulation

A flame retardant, rigid, Expanded Polystyrene (EPS) panel, designed to fit between the joists under a timber floor. The product offers excellent insulation values, can be installed easily, is resistant to moisture, and has no nutritional value for vermin, birds, or animals.

The panels are 1.2 metres in length and 60mm in thickness, and are produced in four standard widths to fit between most standard joists.

All panels are concertina cut on both sides to allow for a compression of up to 20mm for ease of installation, and are ideal for both retro-fit applications and new floors.

EXPOL UnderFloor is BRANZ Appraised and comes with a 50 year product warranty.

www.expol.co.nz

www.branz.co.nz/appraisals

www.miproducts.co.nz

EXPOL R1.8 Black UnderFloor Insulation

EXPOL BLACK has the same physical characteristic as EXPOL UnderFloor, and offers a greater insulation value with the addition of graphite infused into the raw material, hence the charcoal colour of the product.

EXPOL BLACK offers a superior R value for home owners who require the highest grade of insulation and warmth.

www.expol.co.nz

www.miproducts.co.nz

www.plasticsportalasia.net (see product info for NEOPOR)

EXPOL ThermaSlab

EPS ThermaSlab sheet is available in a range of sizes and thicknesses, for insulating concrete slab floors, waterproof protection for block walls and roof insulation. ThermaSlab has excellent thermal properties, is water resistant, easy to cut and lightweight, making it the first choice when choosing insulation materials.

www.expol.co.nz

www.miproducts.co.nz

EXPOL Platinum Board

Platinum Board has the same physical characteristics as ThermaSlab, with the addition of graphite to the raw material. It is a superior material, offering supreme R values for maximum insulation for floors, walls, and roofs. Platinum Board comes in a range of sizes and thicknesses suitable for all applications.

www.expol.co.nz

www.miproducts.co.nz

www.plasticsportalasia.net (see product info for NEOPOR)

EXPOL Tuff Pods

Tuff Pods are EPS blocks 1100mm or 1200mm square and between 200mm and 300mm in thickness. They are laid equally spaced separated by a plastic spacer, to create 100mm ribs of concrete. Steel reinforcing is laid between the Tuff Pods and around the perimeter before the concrete pad is poured over the entire area.

Tuff Pods provide a quick method for creating a concrete slab floor without the need to dig footings or build concrete block perimeters.

www.expol.co.nz

EXPOL StyroDrain

EXPOL StyroDrain is processed from 100% recycled EPS, fused lightly to allow water to migrate easily through it. The material is cut into sheets which can be placed behind a block wall providing protection for water proofing, and to act as a drainage material for water to flow to the drain coil and away from the wall.

www.expol.co.nz

www.miproducts.co.nz

EXPOL-X

EXPOL-X is extruded rigid polystyrene foam (XPS). It provides optimum insulation for high and low temperatures and reduces energy consumption. EXPOL-X features a high compressive strength, low water absorption and outstanding thermal insulation.

www.expol.co.nz

www.miproducts.co.nz

EXPOL GeoFoam Lightweight Fill

GeoFoam is a lightweight material, manufactured from EPS beads and moulded into blocks. Used on construction sites, roads, bridges, and other areas where soft substrates occur over a building site requiring lightweight fill. For further information see our EXPOL GeoFoam Technical Manual or visit:

www.expol.co.nz

www.miproducts.co.nz

masterspec

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RECYCLABLE



FIRE RETARDANT



HIGH STRENGTH



MOISTURE RESISTANT



NEW ZEALAND OWNED
/ MANUFACTURED

A cartoon penguin with a white body and black wings and back, holding a grey rectangular sign with both wings. The sign has the text "Proudly NZ Owned" in bold black font. The background is a solid orange color.

Grade	Density	Colour
SL	12kg/m3	Yellow
S	16kg/m3	Brown
M	20kg/m3	Black
H	24kg/m3	Green
VH	28kg/m3	Red

Contact EXPOL
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SOLID INSULATION AND LIGHTWEIGHT CONSTRUCTION SOLUTIONS



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