

Specialty Film & Sheet



# Lexan\* Thermopanel\* sheet

Technical Manual



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Lexan\* polycarbonate is a unique engineering thermoplastic which combines a high level of mechanical, optical and thermal properties. When extruded in multi-wall sheet form, its optical and impact properties in particular render this material a strong candidate for a wide range of glazing applications.

Lexan\* Thermopanel\* sheet, is an impact resistant, energy-saving multi-wall sheet with side wings which can be optimal matched to various existing metal sandwich panels. Lexan Thermopanel sheet is due to its light weight and excellent fit with various existing metal sandwich panels an simple fast and easy glazing product.

Lexan Thermopanel is available in two different sheet configuration, widths varying from 945-1150mm and a high range of different side wings to come to an optimal match with existing metal sandwich panels.

## Various Properties

### Lexan Thermopanel Sheet offers:

- Excellent thermal insulation
- UV protected surface
- Long-term weather resistance
- High impact strength
- Good light transmission and light diffusion characteristics
- High impact strength
- Extremely high stiffness
- Simple, easy and fast installation

### LTP30(A,B,C,D,E)4RS36

Property Profile	Value	Test Method
Panel body part	945 mm (-2 mm; + 5 mm)	
Standard length	<6 meter -0 + 20 mm, >6 meter -0 + 30 mm	
Panel thickness	30 mm ± 0.8 mm	
Weight	3.6 kg/m <sup>2</sup> ± 5%	
Hail impact	diam 20 mm V ≥ 21 m/s	TNO
Temperature resistance	-40 °C up to + 100°C	UL 746 B
U-Value	1.9 W/m <sup>2</sup> K	NEN2444
Sound insulation	≤ 22dB	DIN 52210-75
Coeff.of linear	7 x 10 <sup>-5</sup> 1/°C	DIN 53752
Fire Rating	B, S2, d0	EN13501
thermal expansion		
Light transmission		ASTM D1003
Opal white WH7A092X	62% ± 5%	
Transparent 112	68% ± 5%	
Solar transmission		DIN 67507
Opal white WH7A092X	68% ± 5%	
Transparent 112	68% ± 5%	

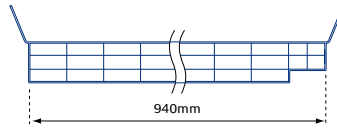
### LTP30(F,G,L)3X36

Property Profile	Value	Test Method
Panel width ctc	1000 ± 5.0mm 1050 ± 5.0mm 1100 ± 5.0mm 1150 ± 5.0mm	
Standard length	≤6 meter -0+20 mm >6 meter -0+30 mm	
Panel thickness	30mm ±0.8 mm	
Weight	3.6 kg/m <sup>2</sup> ±5%	
Hail impact	diam 20 mm V≥ 21m/sec	TNO Test
Temperature resistance	-40 up to +100°C	
U-Value	1.55 W/m <sup>2</sup> K	ISO10077 (EN673)
Sound insulation	≤ 22dB	DIN 52210-75
Coefficient of linear	7 x 10 <sup>-5</sup> 1/°C	DIN 53752
Fire Rating	B, S1, d0	EN13501
Light transmission		ASTM D1003
Opal white WH7A092X	63% ± 5%	
Transparent 112	67% ± 5%	
Solar transmission		DIN 67507
Opal white WH7A092X	67% ± 5%	
Transparent 112	70% ± 5%	

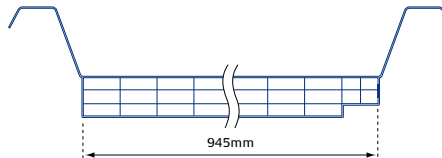
**Lexan Thermopanel sheet**

Lexan Thermopanel sheet is an impact resistant, energy saving multi-wall transparent sheet with calibrated multi form side wings matching any insulating corrugated metal panel. Its optical and impact properties in particular render this panel a strong candidate as roofglazing for insulated corrugated metal industrial buildings.

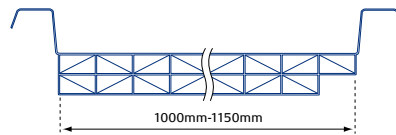
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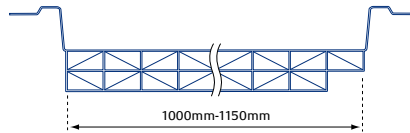
LTP30E4RS3600



LTP30F3X3600



LTP30G3X3600



LTP30L3X3600

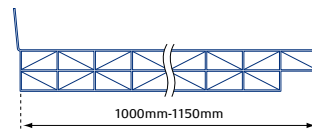


Table 2: Typical properties for Lexan Polycarbonate Sheet

Property Physical	Test method	Unit	Value
<b>Density</b>	<b>ISO 1183</b>	<b>g/cm<sup>3</sup></b>	<b>1,20</b>
Water absorption, 50% RH / 23°C	ISO62	%	0,15
Water absorption, saturation / 23°C	ISO 62	%	0,35
<b>Mechanical</b>			
Tensile stress at yield 50mm/min	ISO 527	MPa	60
Tensile stress at break 50mm/min	ISO 527	MPa	70
Tensile strain at yield 50mm/min	ISO 527	%	6
Tensile strain at break 50mm/min	ISO 527	%	120
Tensile modulus 2mm/min	ISO 527	MPa	2300
Flexural stress at yield 2mm/min	ISO 178	MPa	90
Flexural stress at break 2mm/min	ISO 178	MPa	2300
Hardness H358/30 95	ISO 2039/1	MPa	95
<b>Thermal</b>			
Vicat Softening Temperature, rate B/120	ISO 306	°C	145
HTD/Ae, 1.8 MPa edgew. 120*1*04/sp=100	ISO 75	°C	127
Thermal conductivity	ISO 8302	W/m.°C	0,2
Coeff. of lin. Therm. Exp.extr. 23-80°C	ISO 11359-2	1/°C	7.00 E-05
<b>Electrical</b>			
Volume resistivity	IEC 60093	Ohm.cm	10 E15

These property values have been derived from Lexan resin data for the material used to produce this sheet product. Variation within normal tolerances are possible for various colors. These typical values are not intended for specification purposes. If minimum certifiable properties are required please contact your local SABIC Innovative Plastics, Specialty Film & sheet representative. All values are measured at least after 48 hours storage at 23°C/50% relative humidity. All properties are measured on injection molded samples. All samples are prepared according ISO 294.





## Impact Strength

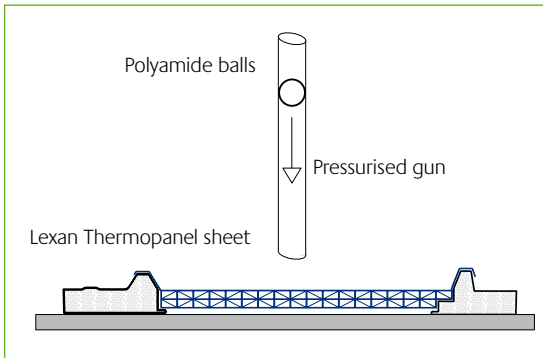
Lexan Thermoclear sheet has outstanding impact performance over a wide temperature range, -40°C to +120°C, and also after prolonged outdoor exposure.

## Hail Resistance

As a roof glazing material Lexan Thermoclear sheet is subject to extremes of weather; storms, hail-stones, wind, snowfalls and ice formation. Under these conditions, the product is virtually unbreakable and is able to withstand the subsequent temperature change to sunny conditions without breaking or buckling.

In a test developed by the Dutch Testing Institute TNO, samples of Lexan Thermoclear sheet have been subjected to simulated hail-stones of varying diameters without significant damage.

A test sample is clamped into a metal frame and polymide balls of varying diameters are fired at the surface of the sample using a pressurized airgun.



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In practice, hail-stones with a diameter of 20 mm can reach a terminal velocity of around 21 m/s. Under these conditions materials such as glass and acrylic fail.

It should be noted that when the glass and the acrylic are tested their failure characteristics are typically brittle, whilst the Lexan Thermoclear showed ductile behaviour: upon impact the ball will leave indentations but the sheet will not break (See fig. 2). SABIC Innovative Plastics offers a Ten Years Written Limited Warranty on Lexan Thermoclear sheet covering loss of strength or impact due to weathering.

Table 3: Hail Simulation Test Results

Material	Ball diameter
	<b>20 mm</b>
Acrylic multi-wall sheet t=16 mm	7-14 m/s
Float glass t=4 mm	10 m/s
Lexan Thermoclear sheet t=10 mm	>21 m/s
Lexan Thermoclear sheet t=16 mm	>21 m/s
Equilibrium velocity of hail stones in practice	21 m/s

2. Represents material failure at this speed

## Light Transmission

The sunlight which reaches the surface of the earth has a wavelength that ranges between 295 – 2140 nanometres (10E-9 metres). This optical window is divided into the following sections:

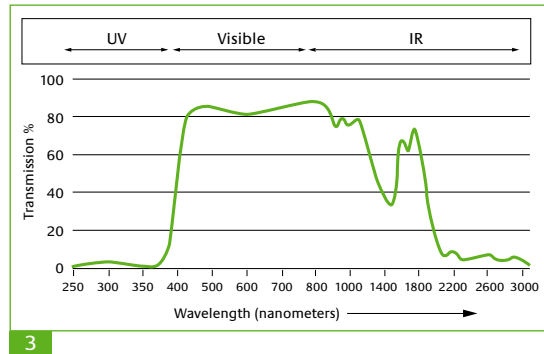
UV-B Middle ultraviolet region	280 – 315 nm
UV-A Near ultraviolet region	315 – 380 nm
Visible light region	380 – 780 nm
Near infra-red region	780 – 1400 nm
Middle infra-red region	1400 – 3000 nm

As shown in fig. 3, Lexan Thermoclear sheet has the highest transmission in the visible light.

Despite transmitting visible light very well, Lexan Thermoclear sheet is almost opaque to radiation in the UV and far infra-red region. This useful shielding property can prevent discolouration of sensitive materials such as fabrics or other organic materials placed under or behind Lexan Thermoclear sheet glazing in, for example, a factory warehouse, museum or shopping centre.

## Thermal Insulation

The multi-wall structure of Lexan Thermoclear sheet offers significant advantages where thermal insulation is a major consideration. The hollow form provides excellent insulation characteristics with heat losses significantly lower than mono-wall glazing materials. Heat loss is normally referred to as the U-value, which is the amount of energy transmitted through a material per square metre of glazing area and per degree temperature difference. It is expressed in terms of W/ m<sup>2</sup>K. Lexan Thermopanel has a U-value range from 1.9W/m<sup>2</sup>K to 1.55W/m<sup>2</sup>K.



3. Light Transmission Spectrum of Lexan Thermoclear sheet

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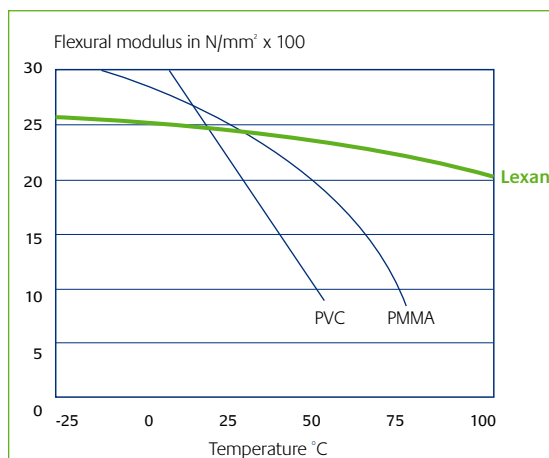
## Temperature Resistance

The heat build-up of glazing materials can be seen as a function of the solar energy absorption of the glazing material and the solar intensity.

In areas with intense sun radiation, and when high energy absorbing tinted glazing is installed, heat build-up of the glazing can be considerable. Calculations and actual measurements on installed Lexan Thermoclear sheet in several projects throughout Europe have shown that sheet surface temperatures of 100°C can exist.

## Dimensional Stability

Lexan Thermoclear sheet is characterised by its excellent retention of impact strength and stiffness at elevated temperatures, even over an extended period. Lexan Thermoclear sheet retains 85% of its room temperature flexural modulus at 80°C.



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## Continuous use Temperature

### UL Ratings

The U.S.A. Underwriters Laboratories continuous-use temperature rating can be considered as a reliable indicator of a thermoplastic's long-term high temperature performance. The most important properties of the thermoplastic are tested at various temperatures. Test results are extrapolated over a period of 10 years and no property may lose more than

### Underwriters Laboratories

	Continuous-use Temperature Rating	Softening Temperature
Lexan polycarbonate	100°C	145°C
Acrylic	50°C	100°C
PVC	50°C	70°C

50% of its original value. Table 7 outlines the UL-continuous use temperatures of typical thermoplastic glazing materials.

Lexan Thermoclear sheet has a continuous-use temperature of 100°C. At the other end of the scale the minimum continuous-use temperature has been set at -40°C. However, using Lexan Thermoclear sheet at lower temperatures is possible since the embrittlement temperature is as low as -110°C.

### Fire Performance

Lexan Thermoclear sheet has good fire behaviour characteristics, and receives high ratings in several major European fire performance tests including EN13501. More detailed information is available from your local SABIC Innovative Plastics Service Centre or authorised dealer.

### Sound Insulation

The sound insulation characteristics of a material are largely pre-determined by its stiffness, mass and physical construction. In accordance with DIN 52210-75, the maximum obtainable sound transmission class for a particular thickness of Lexan Thermoclear sheet is 22db.

4. Dimensional stability. Flexural modulus in N/mm<sup>2</sup> x 100

These cleaning recommendations apply to all Lexan polycarbonate sheet products, including, but not limited to, Lexan solid sheet and signs, Lexan coated Margard\* sheet and Lexan multiwall sheet.

Periodic cleaning using correct procedures can help to prolong service life. For cleaning, it is recommended that the following instructions be adhered to:

### Cleaning Procedure for Small Areas – Manual

1. Gently wash sheet with a solution of mild soap and lukewarm water, using a soft, grid-free cloth or sponge to loosen any dirt or grime.
2. Fresh paint splashes, grease and smeared glazing compounds can be removed easily before drying by rubbing lightly with a soft cloth using petroleum ether (BP65), hexane or heptane. Afterwards, wash the sheet using mild soap and lukewarm water.
3. Scratches and minor abrasions can be minimized by using a mild automobile polish. We suggest that a test be made on a small area of Lexan sheet with the polish selected and that the polish manufacturer's instructions be followed, prior to using the polish on the entire sheet.
4. Finally, thoroughly rinse with clean water to remove any cleaner residue and dry the surface with a soft cloth to prevent water spotting.

### Cleaning Procedure for Large Areas - Automated

1. Clean the surface using a high-pressure water cleaner (max. 100bar or 1,450psi) and/or a steam cleaner. We suggest that a test be made on a small area, prior to cleaning the entire sheet.
2. Use of additives to the water and/or steam should be avoided.

### Other Important Instructions for All Lexan sheets:

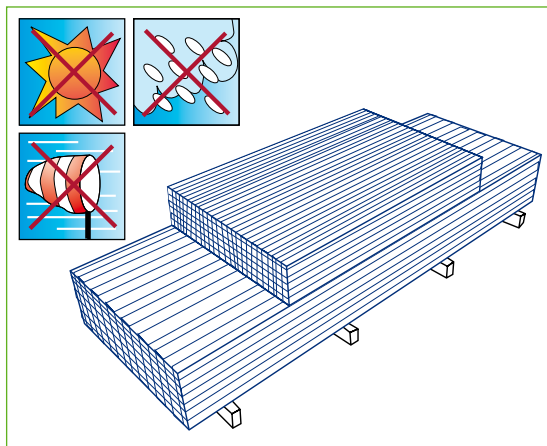
- Never use abrasive or highly alkaline cleaner on Lexan polycarbonate materials.
- Never use aromatic or halogenated solvents like toluene, benzene, gasoline, acetone or carbon tetrachloride on Lexan polycarbonate materials.
- Use of incompatible cleaning materials with Lexan sheet can cause structural and/or surface damage.
- Contact with harsh solvents such as methyl ethyl ketone (MEK) or hydrochloric acid can result in surface degradation and possible crazing of Lexan sheet.
- Never scrub with brushes, steel wool or other abrasive materials.
- Never use squeegees, razorblades or other sharp instruments to remove deposits or spots.
- Do not clean Lexan polycarbonate in direct sunlight or at high temperatures as this can lead to staining.
- For all mentioned chemicals consult the manufacturer's material safety datasheet (MSDS) for proper safety precautions.

### Additional Important Considerations for Multiwall, Corrugated and Sign sheet:

- Cleaners and solvents generally recommended for use on polycarbonate are not necessarily compatible with the UV-protected surfaces of Lexan multiwall, corrugated and sign polycarbonate materials.
- Do not use alcohols on the UV-protected surfaces of Lexan sheet.
- Never clean the Dripgard surface of Lexan multiwall and corrugated sheets.

### Storage

Lexan Thermoclear sheet should be stored and protected against atmospheric influences like sun, rain, etc. Lexan Thermoclear sheets of the same length should be stacked together horizontally or, if different lengths, graded with the longest sheet at the bottom of the stack in order to avoid unsupported overhangs. The stacks should be supported on timber bearers and should not be placed where they can be walked on or driven into.



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### Handling

As with all glazing materials, care should be exercised when handling and transporting Lexan Thermopanel sheet in order to prevent scratches and damage to sheet edges. Each sheet is packaged as follows to minimize the risk of these problems:

- The top- and bottom face is covered with masking.
- The edges of the sheets have colored tape on them.
- The sheet should be kept in their packaging until immediately prior to installation, sheets on the roof, during installation should be sheltered from direct sunlight
- Remove masking directly after installation

### Sawing

Lexan Thermoclear sheet can be cut easily and accurately with standard workshop equipment. This includes common circular, hand and hacksaws. Saw dust should be blown out of the channels using dry compressed air. Circular saws should have fine-toothed panel blades. When hand or power hacksaws are used, the sheet should be clamped to the worktable to avoid undesirable vibration. To avoid scratching the surface do not remove the protective masking. When finished the edges of the Lexan Thermoclear sheet should be free of notches and swarf build-up. With the smaller wall section Lexan Thermoclear sheet, (up to 10 mm), it is possible to cut the sheet with a knife. However, it is important that the knife is sharp.

### Drilling

Holes can be drilled by a power drill using standard high speed steel twist drills or drills with an angular wedged bit. When drilling, support should be given immediately beneath the drill to avoid vibration. Very clean holes are easily obtained. The use of liquid cooling media is not recommended.

## Installation type E

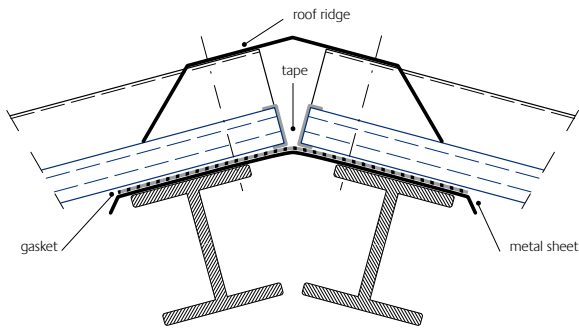
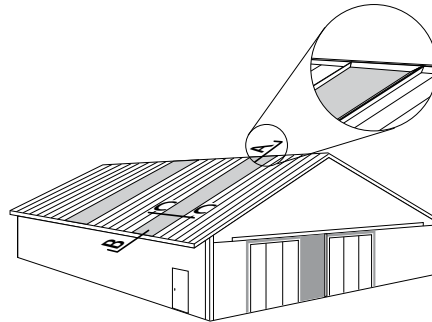
### Roof glazing

Lexan Thermopanel sheet will be mainly used as roof lights covering the roof from ridge to eaves. To obtain a water tight connection on the roof ridge well known metal flashing accessories can be used. See section A.

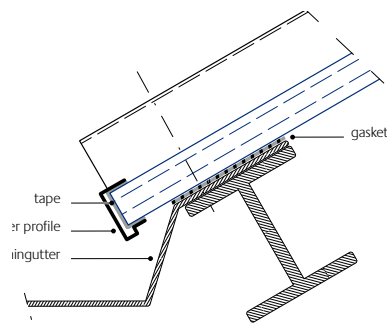
Fixing holes at the both side wings must be pre-drilled approx. 5 mm larger than the diameter of the shank of the fixing to allow for thermal expansion. The center to center distance between the fixings may not exceed 500 mm.

To cover the tape and to facilitate condensation drainage out the channels a 'U' profile as indicated on section B is suggested. To avoid sheet damaging and to restrict the rattle noise effect during extreme wind pressure/suction it is recommended to apply a neoprene or foam gasket on the metal purlins.

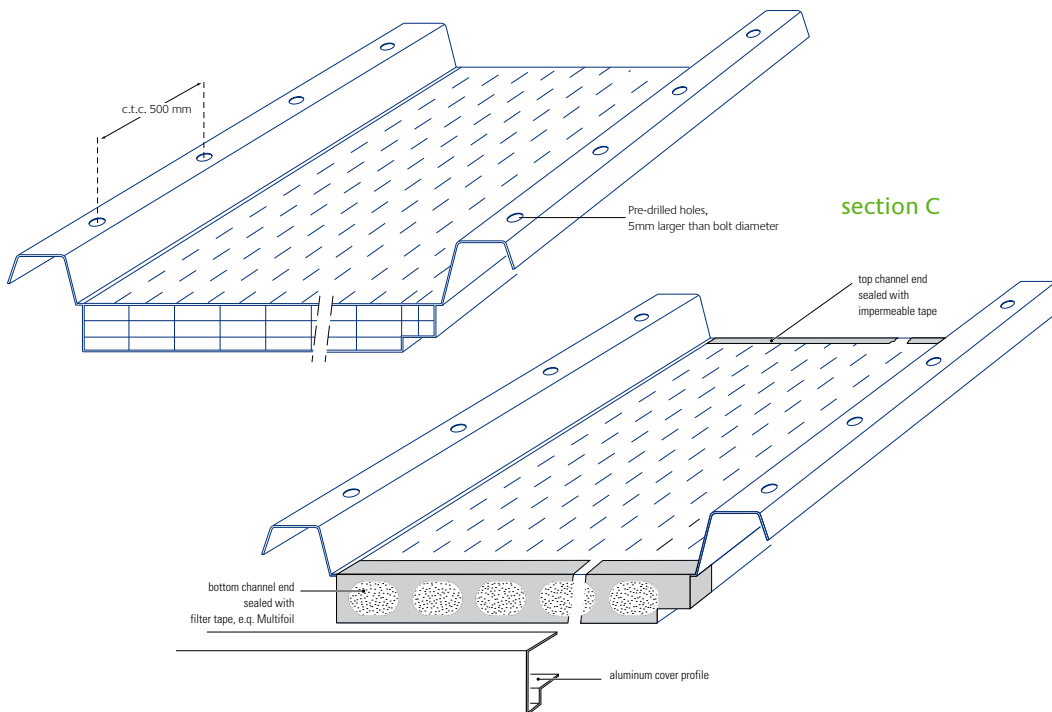
Wind pressure/suction in N/mm <sup>2</sup>	Maximum recommended span "H" in mm	
	width	945
1000		2000
1200		1900
1400		1800



section A



section B

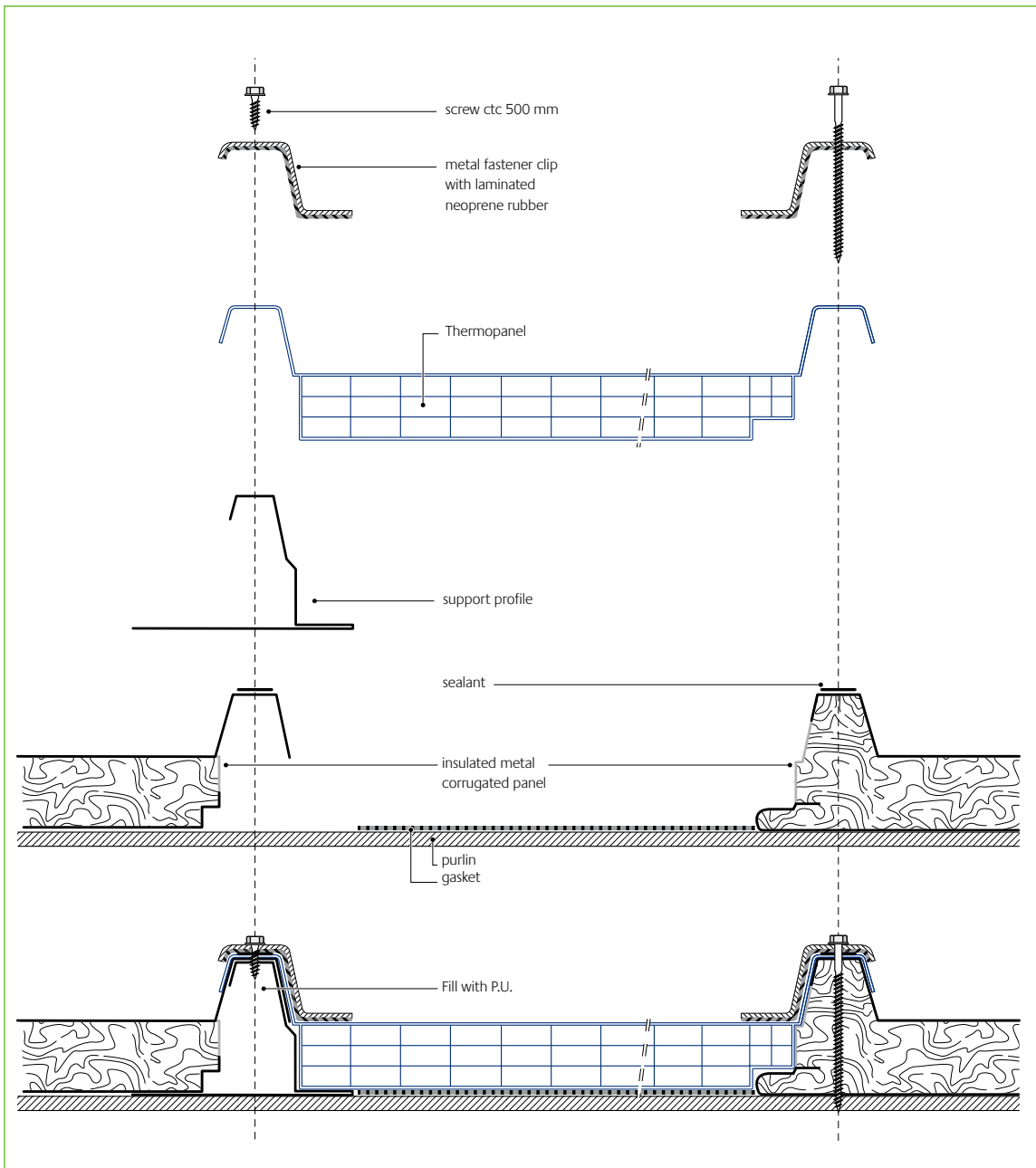


section C

## Installation type E

Metal fastener clips with laminated neoprene rubber, as indicated above, can be used to fix the side wings of the Lexan Thermopanel sheet with bolts to the sides of the metal corrugated insulated panel. The metal fasteners forced the Lexan Thermopanel sheet downwards and hold it in place during loading.

The arised empty place on one side between the metal corrugated insulated panel and the multi-wall part of the Lexan Thermopanel sheet must be filled with an insulated infill piece. This infill piece may be cut out the metal corrugated insulated panel.



# Installation type F

## Roof glazing

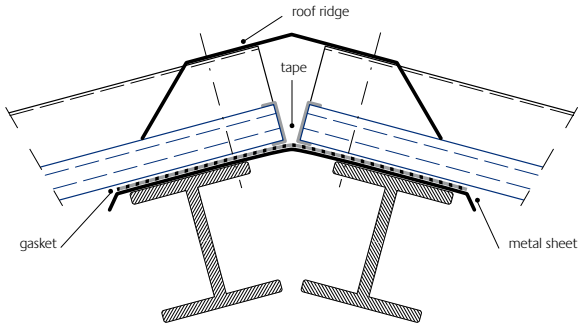
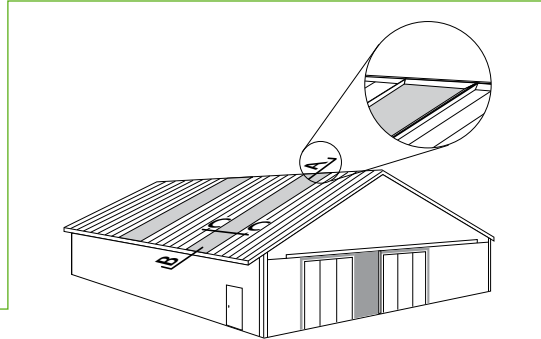
Lexan Thermopanel sheet will be mainly used as roof lights covering the roof from ridge to eaves. To obtain a water tight connection on the roof ridge well known metal flashing accessories can be used. See section A.

Fixing holes at the both side wings must be pre-drilled approx. 5 mm larger than the diameter of the shank of the fixing to allow for thermal expansion. The center to center distance between the fixings may not exceed 500 mm.

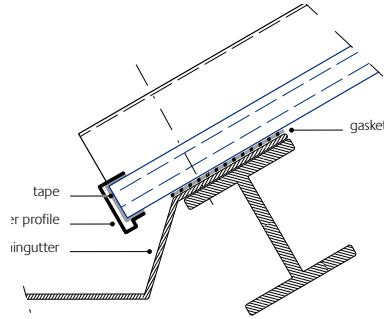
To cover the tape and to facilitate condensation drainage out the channels a 'U' profile as indicated on section B is suggested. To avoid sheet damaging and to restrict the rattle noise effect during extreme wind pressure/suction it is recommended to apply a neoprene or foam gasket on the metal purlins.

Wind pressure/suction in N/mm <sup>2</sup>	Maximum recommended span "H" in mm
	width
	1150
1000	2000
1200	1850
1400	1700

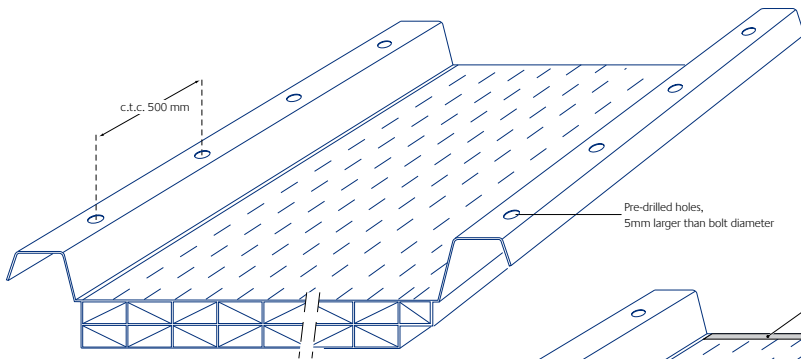
Max. allowable wind suction = 1500N/mm<sup>2</sup>



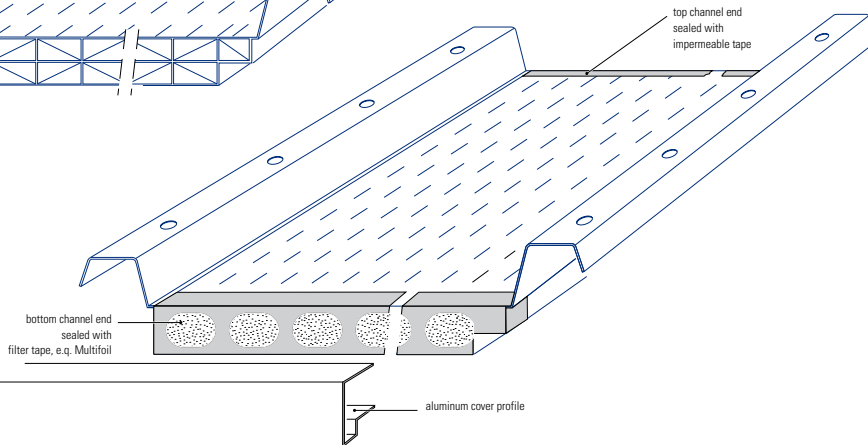
section A



section B



section C

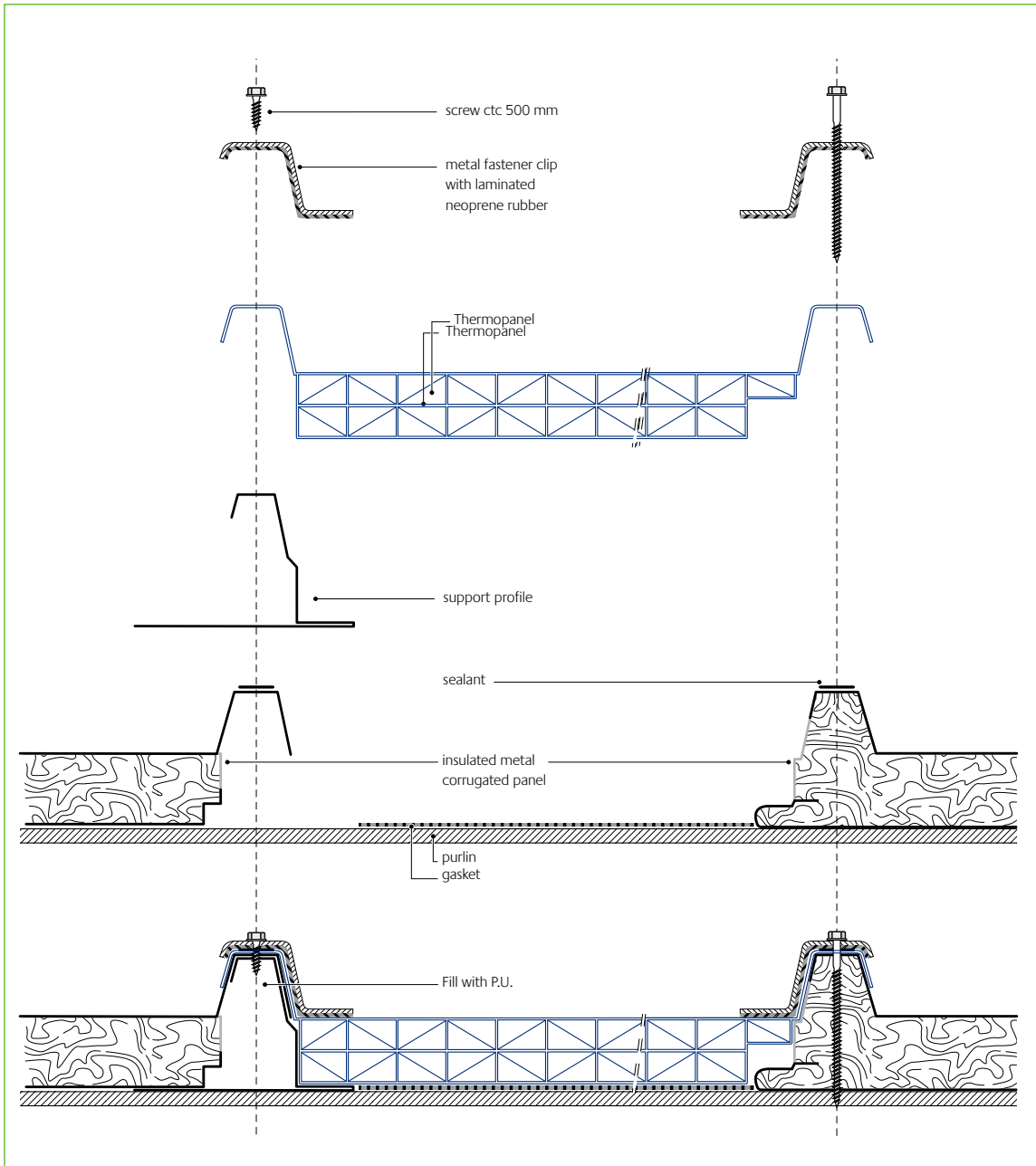




# Installation type F

Metal fastener clips with laminated neoprene rubber, as indicated above, can be used to fixed the side wings of the Lexan Thermopanel sheet with bolts to the sides of the metal corrugated insulated panel. The metal fasteners forced the Lexan Thermopanel sheet downwards and hold it in place during loading.

The arised empty place on one side between the metal corrugated insulated panel and the multi-wall part of the Lexan Thermopanel sheet must be filled with an insulated infill piece. This infill piece may be cut out the metal corrugated insulated panel.



## Installation type G

### Roof glazing

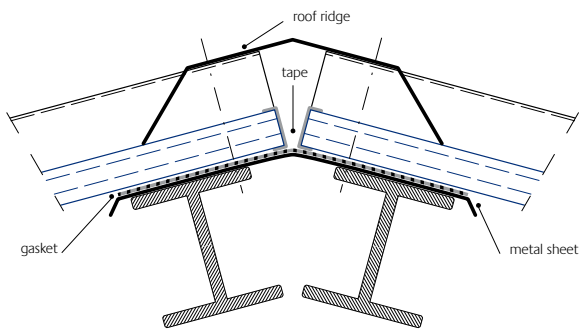
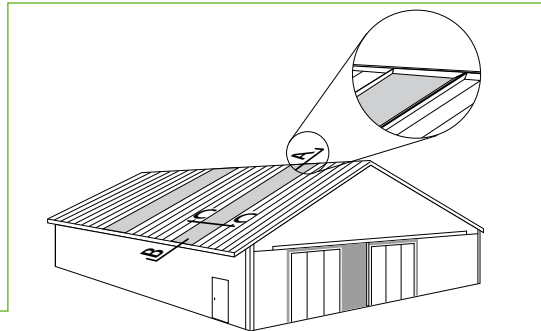
Lexan Thermopanel sheet will be mainly used as roof lights covering the roof from ridge to eaves. To obtain a water tight connection on the roof ridge well known metal flashing accessories can be used. See section A.

Fixing holes at the both side wings must be pre-drilled approx. 5 mm larger than the diameter of the shank of the fixing to allow for thermal expansion. The center to center distance between the fixings may not exceed 500 mm.

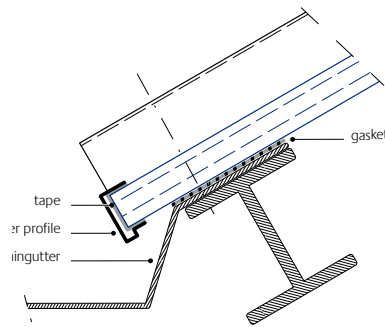
To cover the tape and to facilitate condensation drainage out the channels a 'U' profile as indicated on section B is suggested. To avoid sheet damaging and to restrict the rattle noise effect during extreme wind pressure/suction it is recommended to apply a neoprene or foam gasket on the metal purlins.

Wind pressure/suction in N/mm <sup>2</sup>	Maximum recommended span "H" in mm	
	width	1150
1000		2000
1200		1850
1400		1700

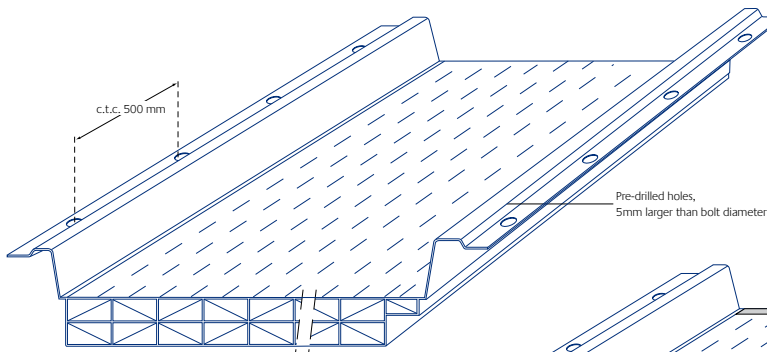
Max. allowable wind suction = 1500N/mm<sup>2</sup>



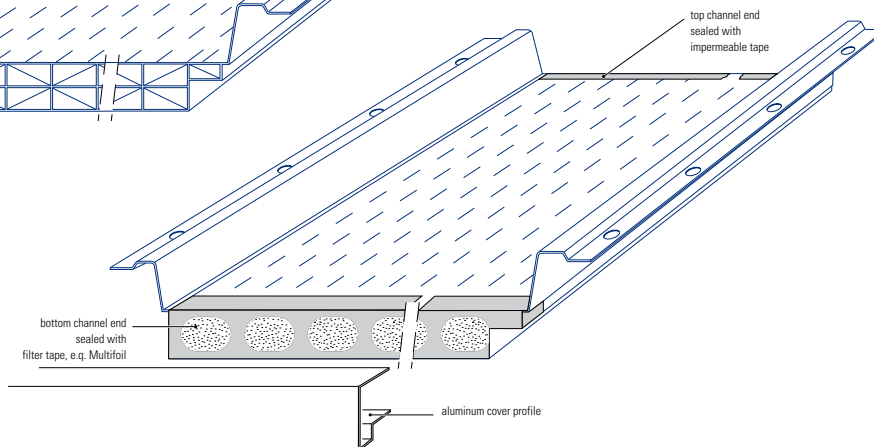
section A



section B



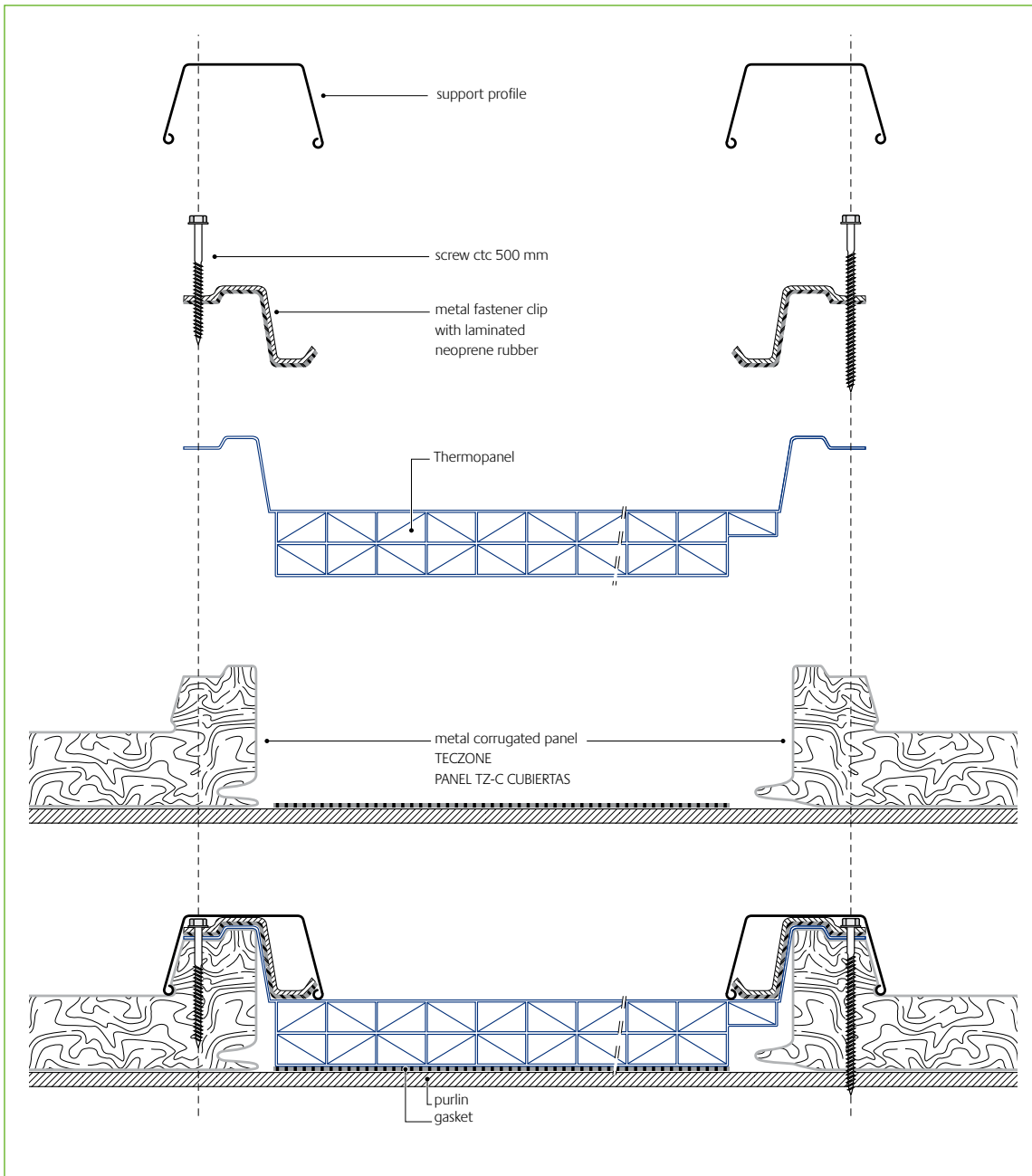
section C



## Installation type G

Metal fastener clips with laminated neoprene rubber, as indicated above, can be used to fix the side wings of the Lexan Thermopanel sheet with bolts to the sides of the metal corrugated insulated panel. The metal fasteners forced the Lexan Thermopanel sheet downwards and hold it in place during loading.

The arised empty place on one side between the metal corrugated insulated panel and the multi-wall part of the Lexan Thermopanel sheet must be filled with an insulated infill piece. This infill piece may be cut out the metal corrugated insulated panel.



## Installation type L

### Roof glazing

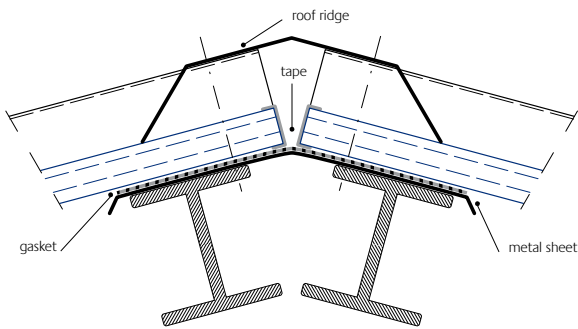
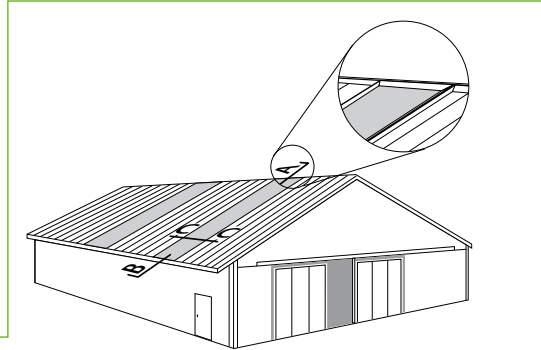
Lexan Thermopanel sheet will be mainly used as roof lights covering the roof from ridge to eaves. To obtain a water tight connection on the roof ridge well known metal flashing accessories can be used. See section A.

Fixing holes at the both side wings must be pre-drilled approx. 5 mm larger than the diameter of the shank of the fixing to allow for thermal expansion. The center to center distance between the fixings may not exceed 500 mm.

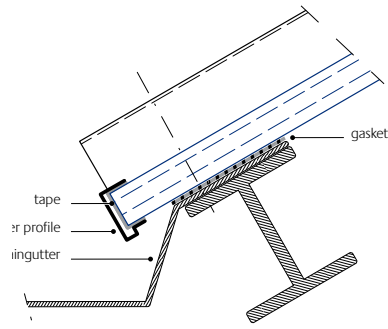
To cover the tape and to facilitate condensation drainage out the channels a 'U' profile as indicated on section B is suggested. To avoid sheet damaging and to restrict the rattle noise effect during extreme wind pressure/suction it is recommended to apply a neoprene or foam gasket on the metal purlins.

Wind pressure/suction in N/mm <sup>2</sup>	Maximum recommended span "H" in mm			
	width	1000	1100	1150
1000		2700	2200	2000
1200		2500	2100	1850
1400		2250	2000	1700

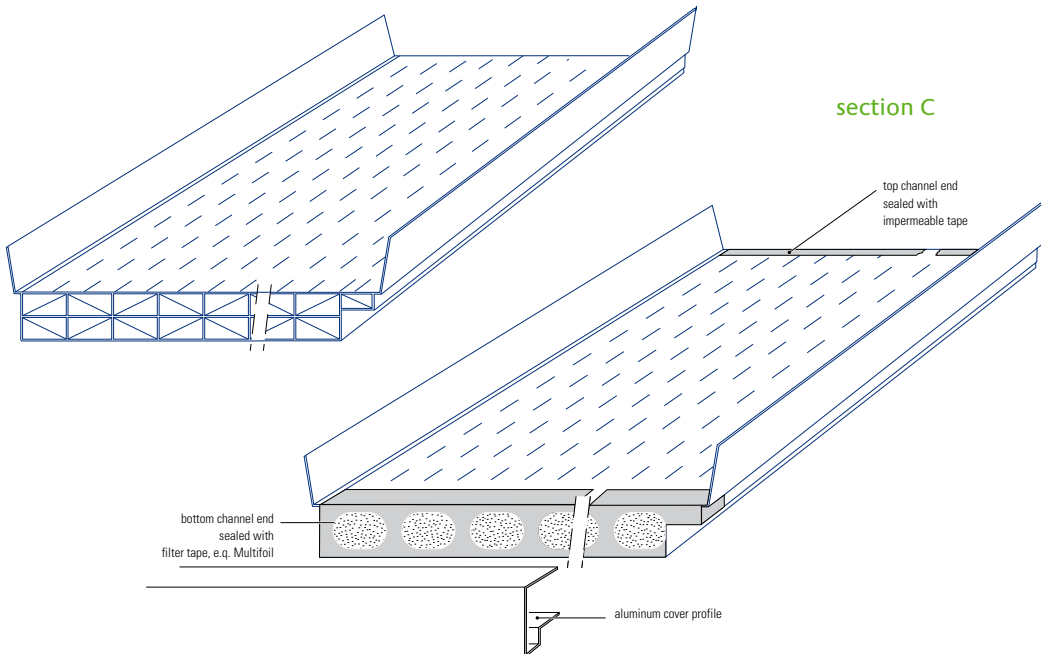
Max. allowable wind suction = 1500N/mm<sup>2</sup>



section A



section B

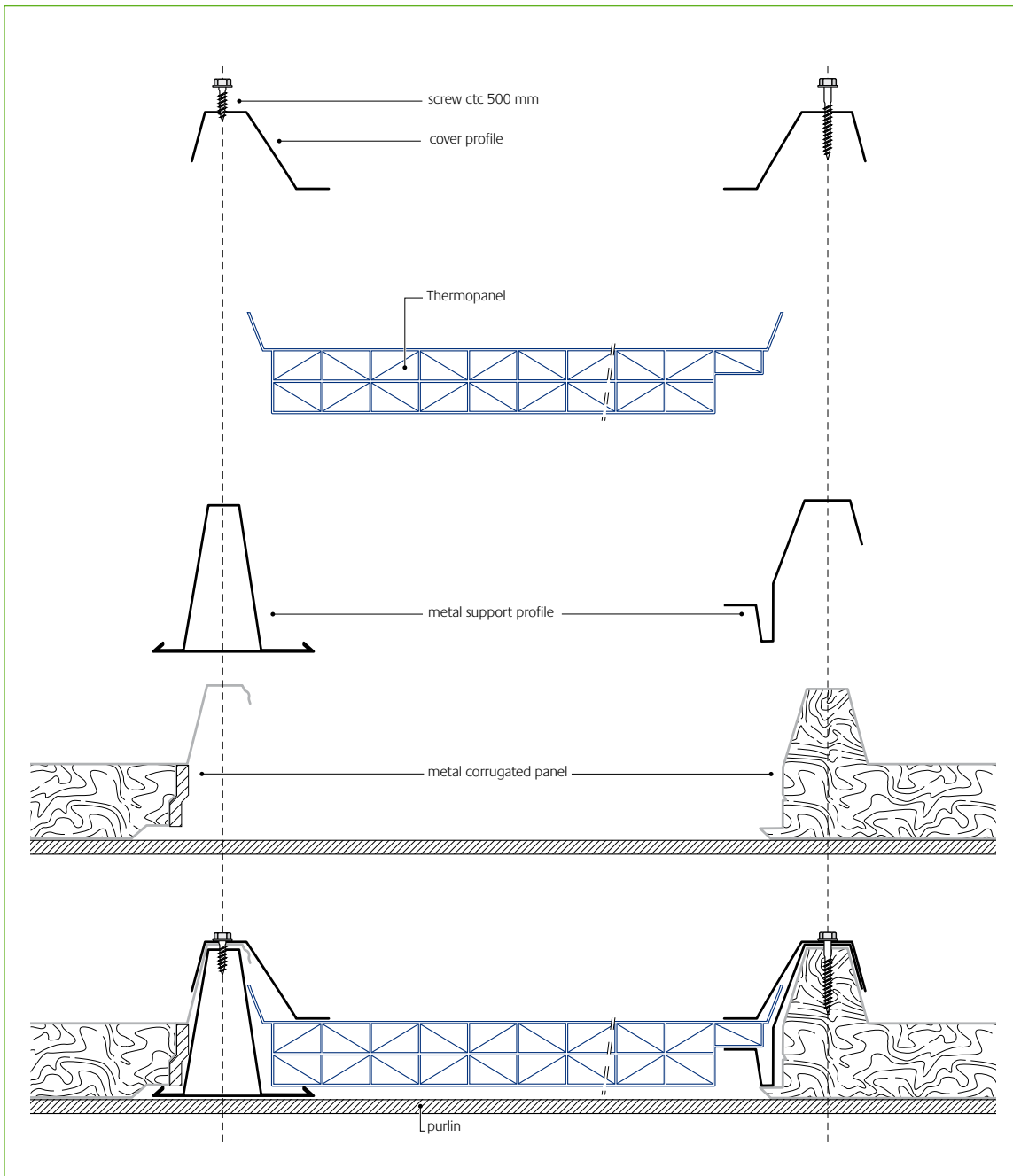


section C

## Installation type L

Metal fastener clips with laminated neoprene rubber, as indicated above, can be used to fix the side wings of the Lexan Thermopanel sheet with bolts to the sides of the metal corrugated insulated panel. The metal fasteners forced the Lexan Thermopanel sheet downwards and hold it in place during loading.

The arised empty place on one side between the metal corrugated insulated panel and the multi-wall part of the Lexan Thermopanel sheet must be filled with an insulated infill piece. This infill piece may be cut out the metal corrugated insulated panel.



## Contact us

### Americas

SABIC Innovative Plastics  
Specialty Film & Sheet  
One Plastics Avenue  
Pittsfield, MA 01201  
USA  
T 800 451 3147  
T 413 448 5400  
F 413 448 7506

### Europe

SABIC Innovative Plastics  
Specialty Film & Sheet  
Plasticslaan 1  
PO Box 117  
4600 AC  
Bergen op Zoom  
The Netherlands  
T +31 164 292911  
F +31 164 292940

### Pacific

SABIC Innovative Plastics  
Specialty Film & Sheet  
1266 Nanjing Road (W)  
Unit 902-907, Plaza 66  
200040 Shanghai  
China  
T +86 21 3222 4500  
F +86 21 6289 8998

### Email

sfs.info@sabic-ip.com

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