HULABOND

Our aluminium composite panels offer developers, specifiers and fabricators so much more.

HBS
ALUMINIUM SYSTEMS

HBS offers fabricators so much more than any other distributor of aluminium profiles. We have more backup, more products, more innovative inventory practices and more technical support.

Only HBS sell a unique range of branded products. HulaBond is the biggest selling aluminium composite panel in South Africa, NuKlip is the only branded shopfront system in South Africa, Coastal is a range of sliding doors and windows that use punching tools to dramatically improve productivity. HulaSign is available off the shelf in white.

HulaBond is the largest selling aluminium composite panel in South Africa.

More convenience

It has never been easier to order standard HulaBond panels. HBS stocks HulaBond 1250 x 3200 in silver, white and champaigne and is available in Johannesburg, Cape Town, PE and Durban. For smaller jobs, where colour matching is not critical, orders will take just 48 hours.

More colours

HulaBond is available in 24 colours which will satisfy anyone’s aesthetic needs. The minimum order quantity for any colour is 1000 m2 - only 250 panels. More colour less hassle!

More versatile

Most project specific requirements such as colour, width or length can be delivered 9 weeks from order. We can manufacture up to 1500 x 5800 in 4mm or 6mm thickness. Double sided panels and a Fire Retardant core are also available. Minimum order quantity is only 1000m2.

More cost effective

HulaBond can be up to 40% cheaper than other imported composite panels. Also there is no up front payment, no letter of credit or any other financial commitment required. HulaBond is treated like any other HBS product so you only pay after receipt of the product.

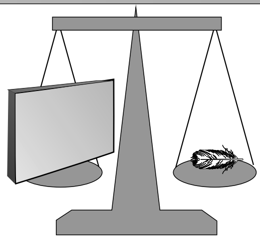
More sense

It makes more sense than ever to use HBS composite panel because it is more convenient, and with more colours, is more versatile and cost effective.

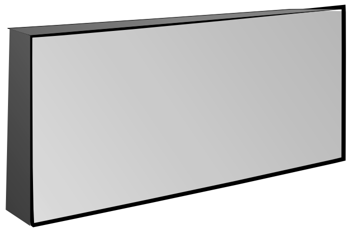
1. FULL PRODUCT DESCRIPTION

HBS aluminium composite panels consist of two sheets of aluminium, bonded to a polyethylene core. The panel is available in a range of metallic and non-metallic based PVDF paint finishes in both standard and custom sizes

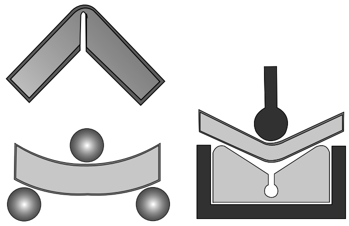
1.1 Product attributes



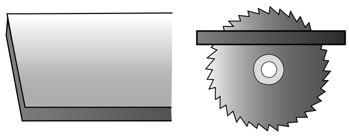
Lightweight and rigid
The composite structure of HulaBond panels provides high rigidity at a fraction of the weight compared with the panels of single sheet construction.



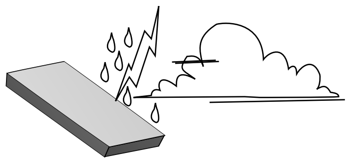
Flat surface
The painted sheet used in the construction of the HulaBond panel undergoes a special tension levelling operation; ensuring panels are superior in surface smoothness and sheet flatness.



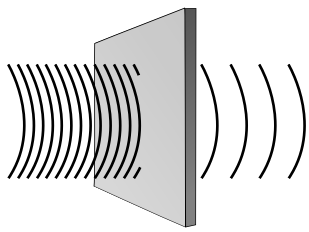
Formability
Shaping of the HulaBond panel is a straightforward process. The panel can be easily curved to tight radii using pyramid rollers or a brake press. Folding of the panel can be accomplished by routing through one of the aluminium cover sheets and most of the plastic core whereafter the panel can be folded by hand or using a simple folding tool.



Machinability
The HulaBond aluminium composite panel is easily cut, punched, drilled and machined using standard woodworking and metalworking equipment.

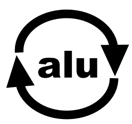


PVDF paint finish
The enduring paint finish imparts a weather resistant low maintenance finish to the panel. Only UV stable, inorganic "ceramic" pigments are used in order to ensure long-term colour retention.



Vibration damping
The polyethylene core of the HulaBond panel exhibits excellent sound attenuation properties. The vibration loss factor on the panel is approximately six times better than an equivalent solid aluminium sheet.

Technical assistance
The HulaBond product is fully supported. Further information and technical assistance are provided to address requirements on specific products.



Recyclable
HulaBond is manufactured from fully recyclable materials. On separation both the aluminium and polyethylene can be economically reprocessed.

1.2 Panel gauge

The standard panel thicknesses are 4 and 6mm. Other thicknesses can be manufactured on request to cater for specific application.

1.3 Skin gauge 0.5mm

The skin gauge is 0.5mm.

1.4 Alloy

The standard alloy used is 1100 H18.

1.5 Panel Size

Special sizes and colours
The standard size for HulaBond is 1250X3200X4mm.

HulaBond can be manufactured up to 1500 wide and up to 5800 long X 4mm or 6mm thick. HulaBond is available in 24 colours. Please note that minimum order quantities on special sizes and colours are 1000m^2.

Stocking
We endeavor to keep stock of silver HulaBond which is equivalent to 6 months sales and stock of white and champagne HulaBond which is equivalent to 3 months sales on our shelves in Johannesburg, Cape Town and Durban.

Stock is replenished monthly based on demand and it is unlikely that smaller non project orders cannot be fulfilled.

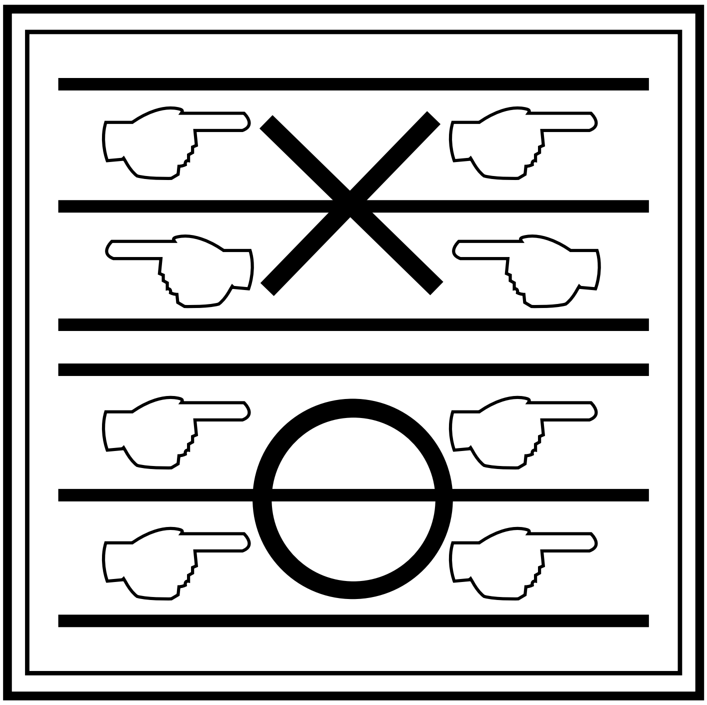
The purpose of keeping stock on the shelf is to supply smaller projects or where colour matching is not critical as colours differ from batch to batch. Please remember that for colour consistency you are advised to place complete orders for any specific project to ensure a high standard of colour matching.

Lead times on project orders
The estimated lead time on project orders is 8 weeks which is comprised of the following:

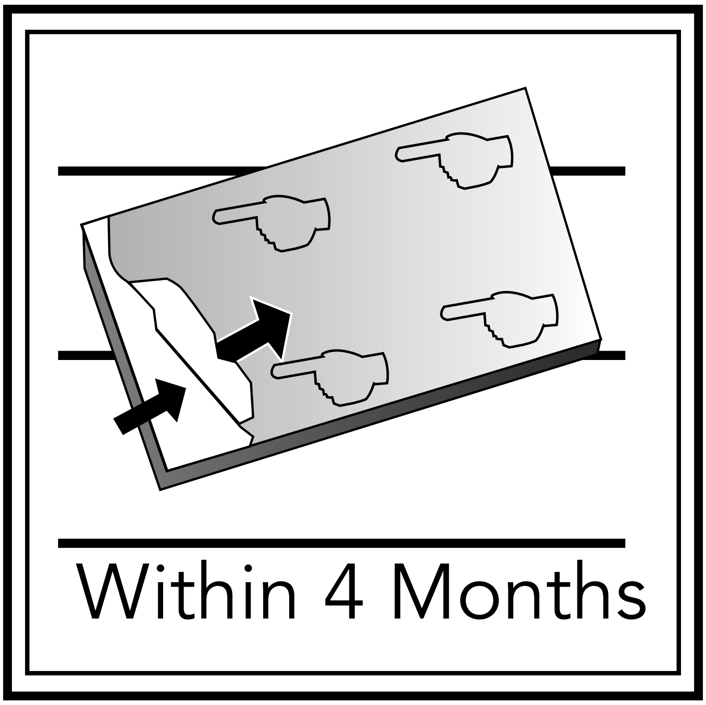
- Manufacturing 2 weeks
- Transport to harbor and loading on ship 1 week
- Sea freight 4 weeks
- Customs clearance and delivery 1 week

We manufacture 3 million m^2 per year so it is highly unlikely that manufacturing lead times will be longer than estimated above. Lead times will be quoted per order.

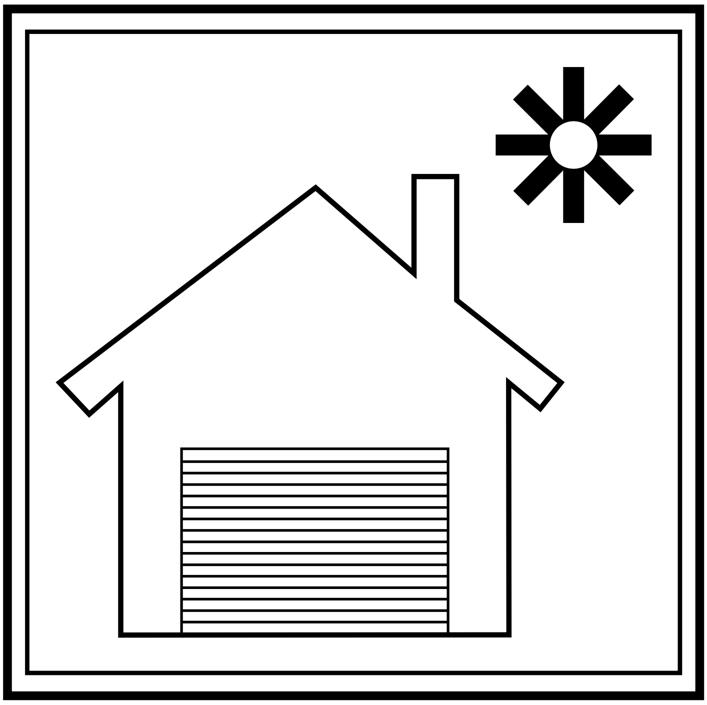
IMPORTANT INSTRUCTIONS



Please install panels in the same facade according to the indicated direction.



Please store panels in a cool and flat place before fabrication and installation.



Please remove the protective film within 4 months after installation.

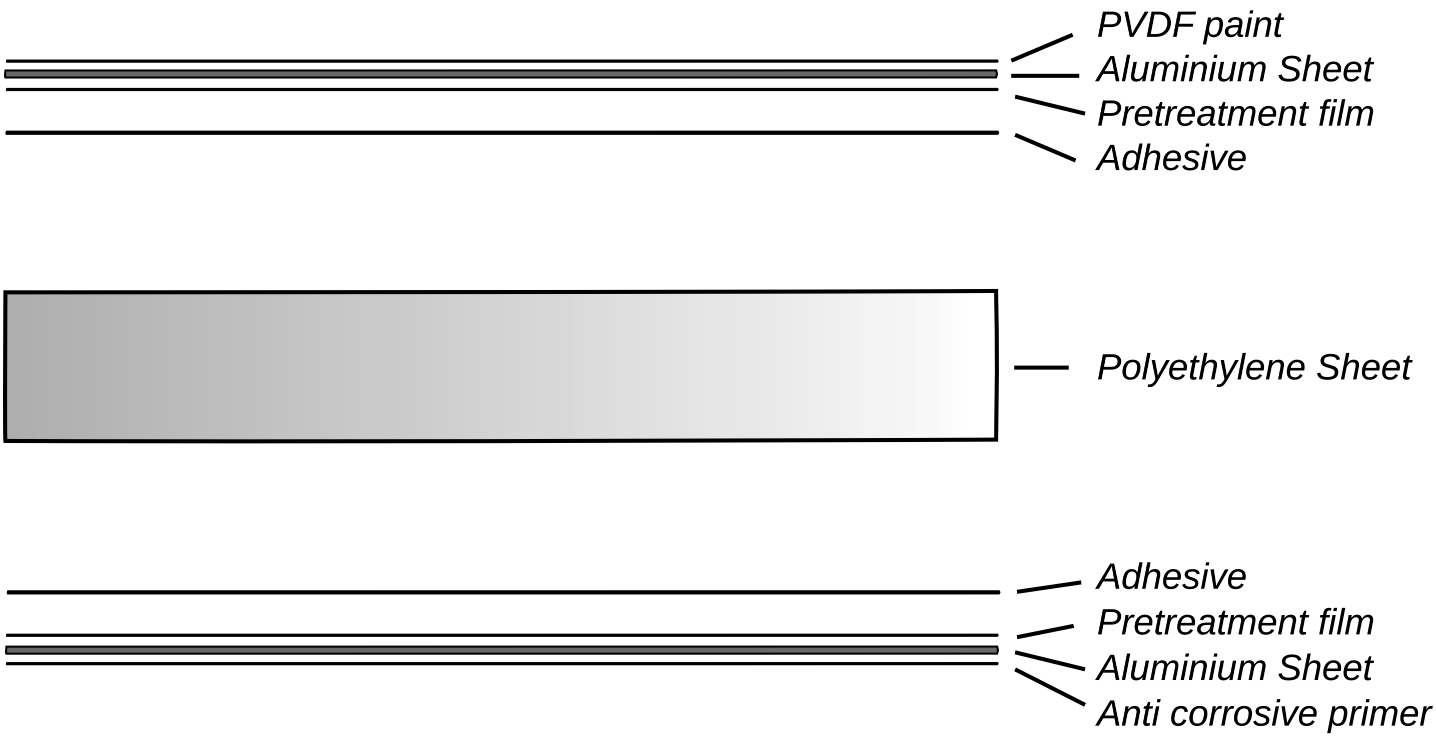
Colour variation may happen to the panel of same color code but different batch of production, please contact us to check before fabrication and installation.

2. PRODUCT SPECIFICATIONS

2.1 General properties

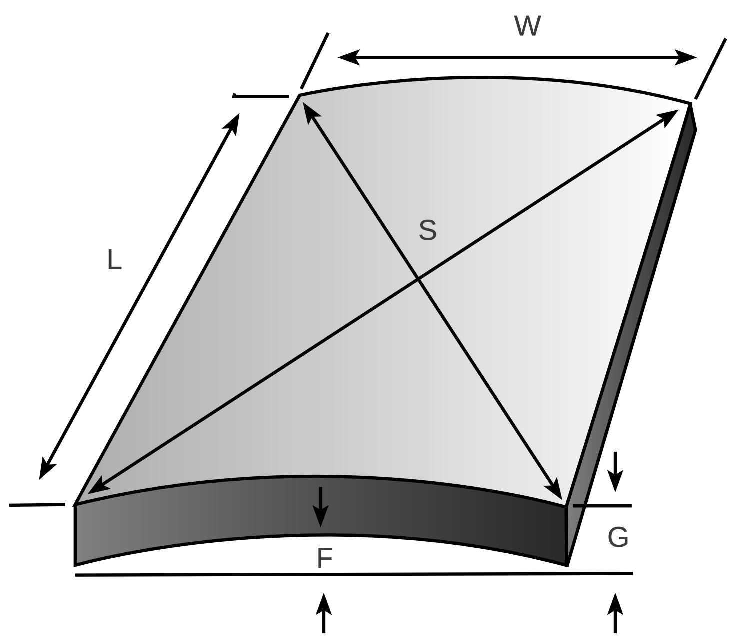
Panel construction

(a) The HulaBond aluminium composite panel consists of skins of aluminium, which are coated with PVDF paint, bonded to a polyethylene core.



Dimensional tolerances

Length (L)	±2mm
Width (W)	±2mm
Flatness (F)	≤0.5% of span
Gauge (G)	±0.2MM
Squareness (S)	S1 – S2 ≤ 5mm



Thermal Expansion

It is the two aluminium cover sheets which determine the thermal expansion properties of HulaBond in the length and width dimensions. This thermal expansion necessitates a close examination of:

- Possible consequences of thermal movements
- Location of expansion joint
- Restrained parts in which elastic buckling may occur at relatively low stress levels.

For a uniform increase in temperature ΔT an unrestrained HulaBond panel will increase in width and length by an amount;

$$e = \alpha L \Delta T$$

Where e = increase in span length L
L = span length
α = coefficient of linear thermal expansion which for HulaBond = 2.4mm per 100°C temperature change. A value of 0.000024/°C should be used in the equation.
ΔT = temperature change in °C

Under normal circumstances, an allowance should be made during the installation of HulaBond to accommodate temperature fluctuations over the range – 20°C to +80°C. This is equivalent to an unrestrained change in length of ± 1.2mm per 1m span of panel.

2.2 Load deflection properties

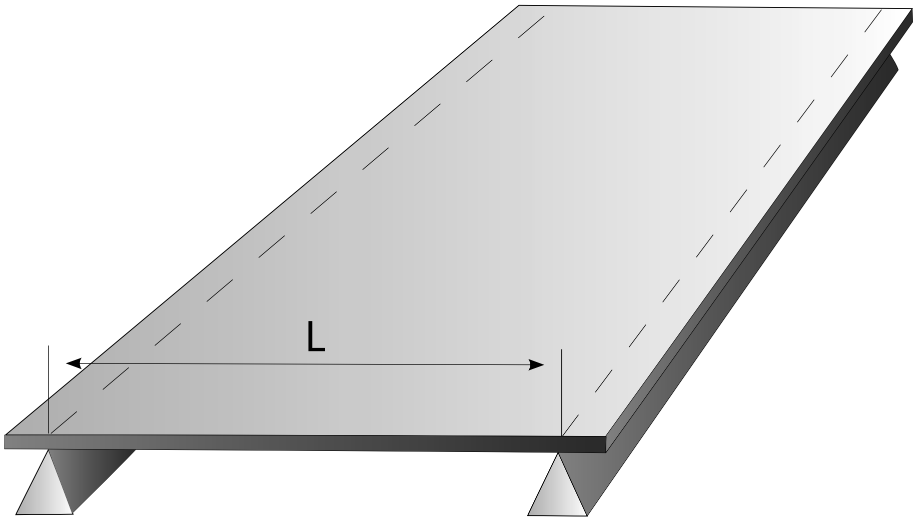
The nature of wind flow around a building is complex and a theoretical prediction must be done with care. Small variations in shape, surface roughness or in wind direction can cause significant changes in the flow and hence in the magnitude and distribution of the resulting pressures on the building.

Factors such as the scale and intensity of wind turbulence, the size of the building, the nature of the surrounding buildings and topographical features have a profound influence. However, for the great majority of buildings with conventional shapes, it is sufficient and more convenient to use the detailed procedures given in SABS 0160-1989. "The General Procedures and Loadings to be adopted in the Design of Buildings"

Wind is a dynamic phenomenon. The fluctuations in the wind forces results in a dynamic responses of the building where the magnitude of this response will depend upon factors such as the turbulence of the wind and the size, shape, weight, stiffness and dampening characteristics of the building and building elements.

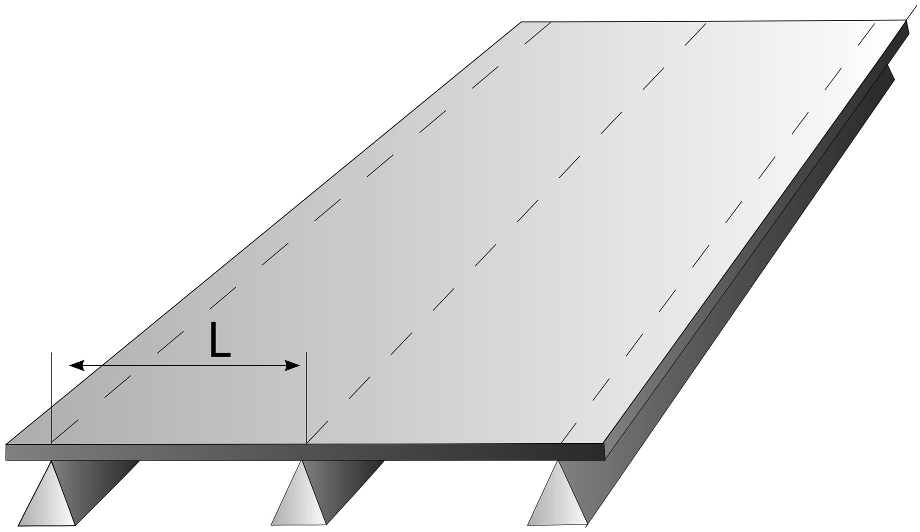
However, for the majority of buildings the dynamic response effects are small and a static wind loading in which the wind forces are based on a peak gust speed will suffice. It should also be noted that wind-induced vibration of light, flexible roof structures or claddings could lead to loosening of fasteners and on occasions to fatigue failure, eventualities which can be easily prevented through good design.

The performance of the panel in a wind load environment is highly dependant upon the fixing geometry selected, the length of the spans involved, the degree of support and the type of support used. The majority of installations closely approximate one of three fixing geometries. They are: single-span, double span and plate



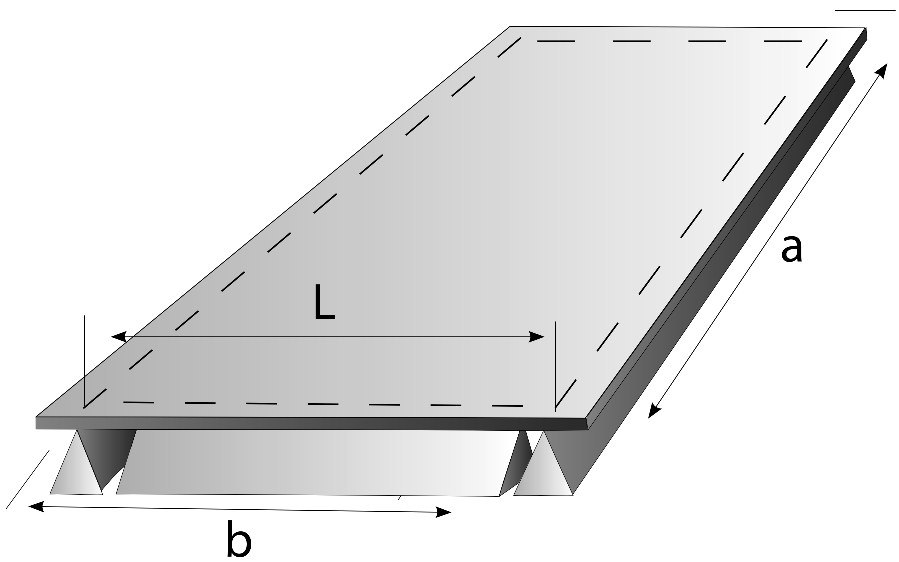
Single-span

Single-span loading considers the case of a panel of short span length (L) simply supported along each long edge. The support spacing in this model is equal to the panel short span length (L). The load configuration is represented schematically above.



Double-span

Double-span loading considers the scenario in which a rigidly fastened stiffener has been attached at the mid length/width position of the panel, effectively reducing the panel by a line of symmetry into two smaller panel modules. The loading configuration for each module in then that of a panel, which is simply supported along the one long edge and rigidly fastened along the long edge corresponding to the mid-panel position of the stiffener. This load configuration is represented schematically above.



Plate

Plate load considers the scenario in which the panel is simply supported along all four edges. Te cover sheet stress and panel deflection, for a panel simply supported along all four edges can be determined from the single-span properties by applying a correction factor, which allows for the additional support. This correction factor is a function of the panel aspect ratio (a/b). The influence of the additional support along the short panel length is greatest for panel aspect ratio close to one and decreases with increasing aspect ratio.

Limit states design criteria

The installer should ensure that, for every panel module, the design wind load on the module does not give rise to a deflection in the panel, which exceeds any one of the following limit states:

Limit state 1
A panel deflection, which exceeds a user, defined limit based purely on visual considerations. Exceeding this limit state, although not posing any substantial risks of failure, may under adverse windload conditions, give rise to visually unacceptable deflections of the panel.

Limit state 2
A panel deflection which gives rise to a stress in the aluminium cover sheets which exceeds a limiting value. Exceeding this limiting value may lead to the permanent deformation of the panel surface.

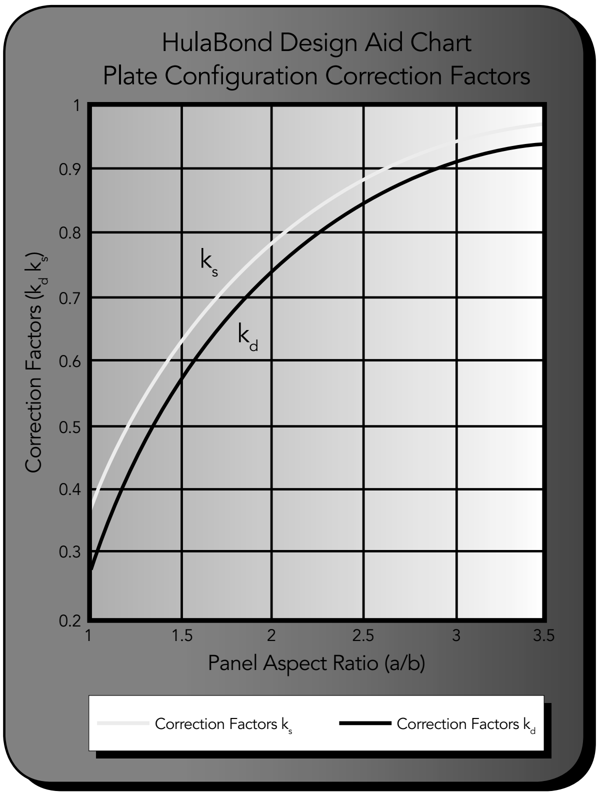
Limit state 3
A panel deflection, which gives rise to a displacement in the panel edge, which exceeds a limiting value. Exceeding this limiting state may result in the panel popping out or becoming detached from its fixing.

Limit State 1, Calculation of maximum panel deflection

Single and double span configurations
For a uni-directional span (single and double span configurations), deflection in the panel under uniform wind loading conditions can be determined from:

$$d = \frac{K^1 P L^4}{EI}$$

Where
- d = midspan deflection (mm)
- P = wind pressure (kN/m2)
- L = panel support spacing (mm)
- EI = modus of rigidity*
  - EI 120 x 103 Nmm2/mm (3mm panel)
  - EI 230 x 103 Nmm2/mm (4mm panel)
  - EI 570x 103 Nmm2/mm (6mm panel)
- K^1 = coefficient of restraint
  - Single-span K1 = 13×10^{-6}
  - Double-span K1 = $5{,}4 \times 10^{-6}$



*The modulus of rigidity (EI) for specified panel configuration has been determined using software package "CLASS" Composite Laminate Analysis System available form ASM International. Values of modules of rigidity calculated using this package closely agree with those published for panels of similar construction and also with results obtained from tests conducted by independent consultants.

Plate configuration
For a panel simply supported on all its edges (plate configuration) the maximum panel deflection can be determined by applying a correction factor to the maximum deflection determined for the single span scenario

$$d_p = k_d d_s$$

Where
- d_p = maximum panel deflection (plate configuration) (mm)
- d_s =Maximum panel deflection (single-span configuration) (mm)
- k_d = correct factor which is a function of the panel aspect ratio a/b. Values of K can be read from the graph once a/b is known.

Maximum allowable outer cover sheet banding stress

It is the spaced aluminium cover sheets, which determine the bending strength of the panel. The core, which acts as a "shearweb" in much the same way as the webs of an I-beam, can be disregarded when calculating the bending tension.

For design purposes, a maximum bending stress failure criterion is used, where failure is deemed to have occurred of the stress in the cover sheet resulting from an applied ending moment is raised beyond the 0.2% proof strength of the aluminium alloy. A 1.75 safety factor is then applied to give a maximum permissible design bending stress for the panel. The 0.2% yield limit (Sy) and the maximum permissible design stress in the aluminium outer cover sheet (Sd) for the panel are:

S_y = 170 N/mm^2
S_d = 97 N/mm^2

Tests conducted by independent consultants* indicate that the panel performance under short term load cycling, simulating "3 second gust" wind buffeting conditions, exceed that determined from static loading conditions. It is therefore the maximum permissible design stress (Sd) determine under static load conditions, which determines the upper performance limit of the HBS aluminium composite panel.

Single and double span configurations

The actual stress developed in the cover sheet as a result of an applied bending moment to the panel is given by

$$S_a = \frac{M_b}{Z}$$

Where S_a = actual stress in cover sheet (N/mm2)
M_b = bending moment* (N)
Z = selection modulus# (mm2)

Z = 1.06 x 10 -3 mm2 (3mm panel)
Z = 1.54 x 10 -3 mm2 (4mm panel)
Z = 2.53 x 10 -3 mm2 (6mm panel)

*The maximum bending moment "M_b" for both single-span and double-span configurations, is for an evenly applied load, given by:

$$M_b = 125 \times 10^{-9} PL^2$$

Where P = wind pressure (kN/m2)
L = supporting spacing (mm)

The section modulus of the panel "Z" can be calculated using:

$$Z = \frac{(t_t^3 - t_c^3)L}{6t_t}$$

Where t_t = total panel thickness (mm)
t_c = thickness of polyethylene core (mm)

Plate configuration

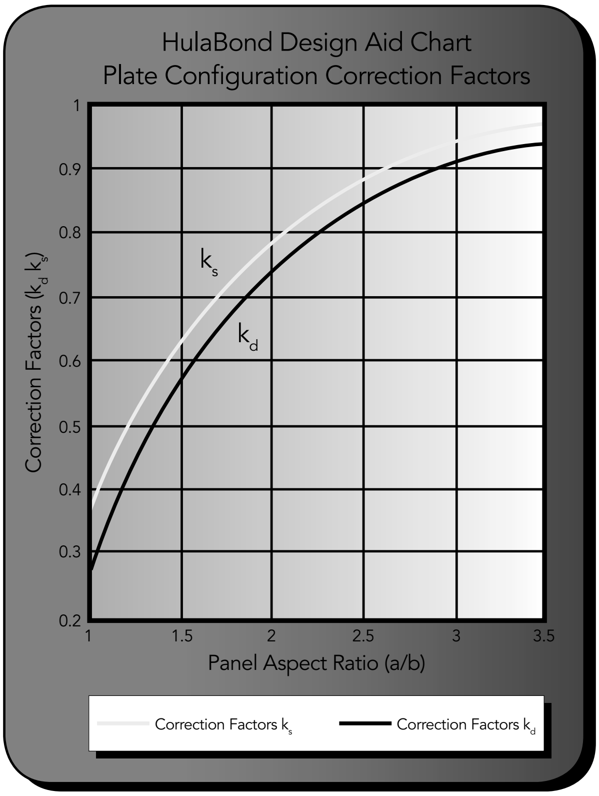
For a panel simply supported along the edges (plate configuration), the maximum outer cover sheet stress can be determined b7 applying a correction factor to the maximum outer cover sheet stress determined for the single span scenario.

$S_P = K_S S_S$

Where S_P = maximum outer cover sheet stress (N/mm2) (Plate configuration)

S_S = maximum outer cover sheet stress (N/mm2) (Single-span configuration)

K_S = correct factor which is a function of the panel aspect ratio a/b. Values of K ca be read from the graph once a/b is known



Limit State 3. Calculation of maximum panel edge displacement

It is possible to calculate the panel edge displacement resulting from an applied wind load as a function of panel support spacing and panel mid-point deflection using the following occasion, which assumes the panel displacement profile closely approximates that of a parabola.

$$D = \frac{x}{a}\sqrt{x^2 + a^2} + \ln\left(\frac{x+\sqrt{x^2 + a^2}}{a}\right) - L$$

Where: D = maximum edge displacement (one end fixed) (mm)

x = 0.5L

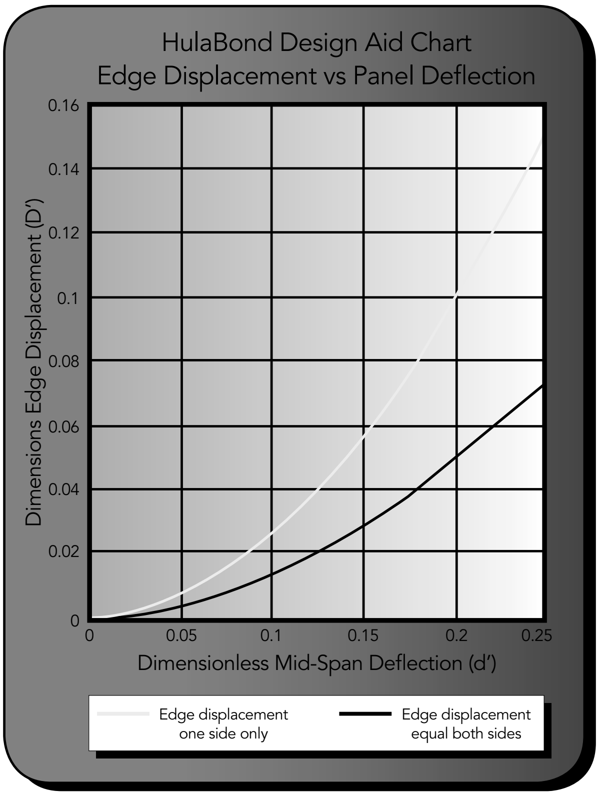
a = $L^2/8d$

L = Supporting spacing (mm)

d = maximum panel deflection (m)

ln = natural Logarithm

Alternatively, it is possible to ascertain the maximum edge displacement (D') by reading off the dimensionless edge displacement (D') corresponding to the dimensionless mid-span panel deflection (D') from the following graph:



Equations:

L' = L/Unit support spacing

d' = d/L

D' = D/L

Where: L' = dimensionless support spacing

d' = dimensionless mid-span panel deflection

D' = dimensionless edge displacement

L = actual support spacing

d = actual mid-span panel deflection

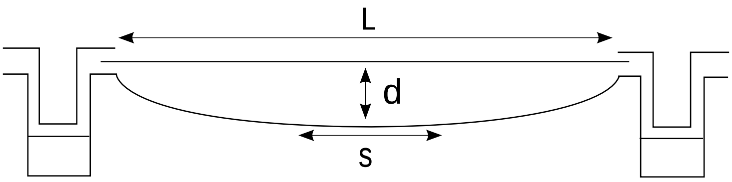
D = actual edge displacement

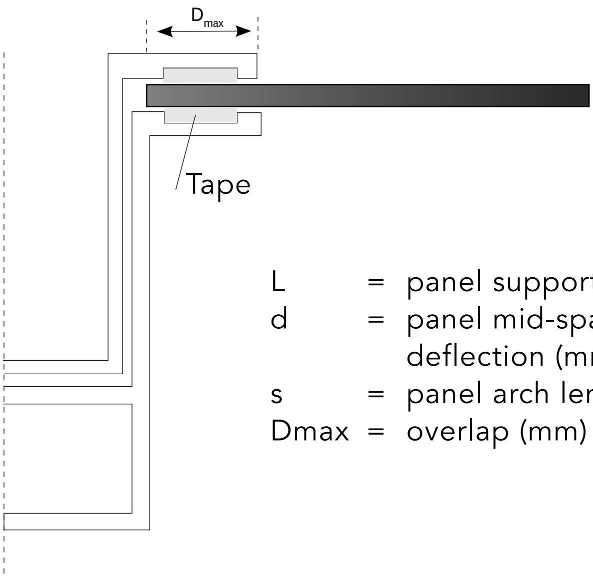
Edge displacement

It is the installer's responsibility to ensure that the maximum likely edge displacement in the panel for a given fixing configuration will not lead to failure. However, to assist, the limitations of the two popular fixing methods, the double top hat and the adhesively bonded joint using an approved flexible silicone glazing sealant, are examined in more details.

Double top-hat

Where a double top-hat section has been used, the amount of displacement, which can be accommodated before there is risk of the panel popping out of the fixing, is determined by the amount of overlap between panel and the land fastening.





L = panel support spacing (mm)
d = panel mid-span panel deflection (mm)
s = panel arch length (mm)
Dmax = overlap (mm)

Step 1. Calculate the maximum dimensionless edge displacement (D'_{max}) which can be accommodated by the fixing. This is the ratio of the overlap (D_{max}) to the support spacing (L).

$$D'_{max} = \frac{D_{max}}{L}$$

Step 2. Determine from the graph (displacement one side only curve) the value of dimensions mid-span panel deflection (d') corresponding to the value of dimensionless edge displacement (D'Max) calculated in step 1.

Step 3. Convert to the value of dimensionless mid-span panel deflection (d') into an actual mid-span panel deflection (d) by multiplying the dimensionless mid-span panel deflection by the support spacing (L).

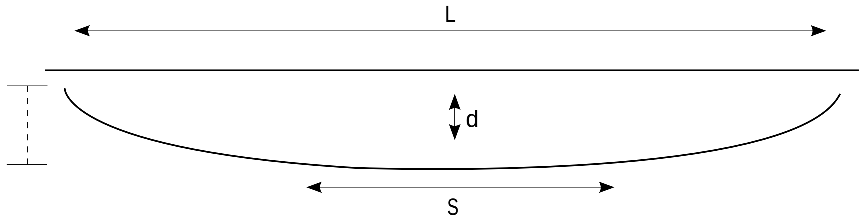
$$d = d'L$$

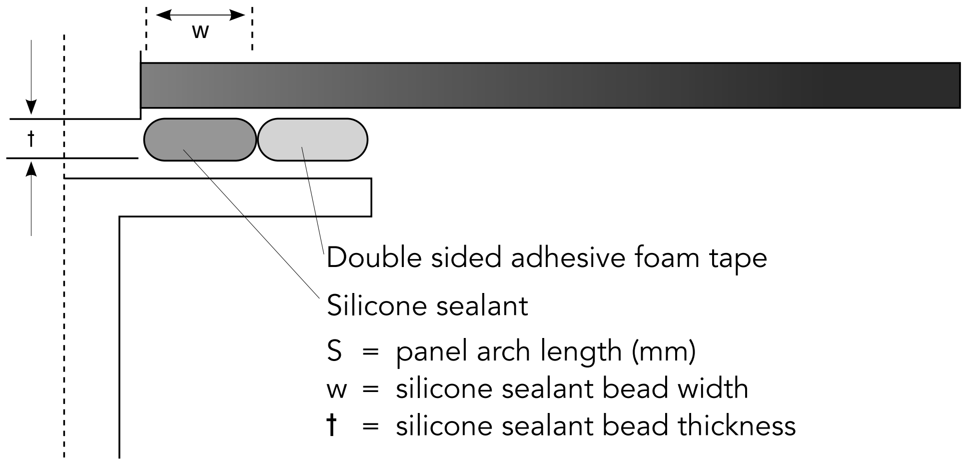
Step 4. Confirm using the wind load deflection design Aid Charts provided that the limit panel deflection calculated in step 3 is not exceeded.

Note: *To determine the maximum edge displacement for a given panel geometry and wind load reverse the above procedure.*

Silicone Lap Joint

Where panels have been fastened using a silicone sealant, the amount of displacement which can be accommodated is that which results either cohesive failure (failure in the bond between adhesive and adherent) or in adhesive failure (failure within the adhesive). In this instance, the criterion, which will determine whether failure will take place, is not only a function of the geometry of fixing (sealant thickness and bead width) but also the adhesive strength, shear modulus and shear strength of the sealant used.





For single span and plate configuration fixing geometries the edge displacement generated is distributed equally between adjacent fixings, however, where panels have been fixed using a double span geometry, no displacement takes place at the mid- span fixing but is accommodated entirely at the panel edge.

The fabricator should ensure that the stress generated within the silicone joint fall within the acceptable limits. This is usually accomplished by ensuring that the combined edge displacement, which may result from both thermal expansion and wind load deflection of the panel, falls within rule of thumb limits of joint movement capability, which have been provided by the supplier of silicone sealant.

Step 1. Calculate the maximum dimensionless edge displacement (D'_{max}) which can be accommodated by the joint without exceeding the endurance limits of the sealant. This is a function of both the thickness of the bead of silicone (t) and the grade of silicone used. A typical high performance structural glazing silicone sealant is able to accommodate up to +-50% joint movement. For a 6mm silicone bead, this is sufficient to accommodate a displacement in the panel of up to +- 3mm. However, before proceeding, exact limits of D should be determined from the supplier of the silicone sealant. The maximum dimensionless edge displacement (D'_{max}) which can be accommodated by the joint is the actual edge displacement, which can be accommodated by (D), divided by the panel support spacing (L).

Step 2. Determine from the graph the value of dimensionless mid-span panel deflection (d’) corresponding to the value of dimensionless edge displacement (D’) calculated in Step 1. Where the panel is fixed using a single span or plate configuration mode information should be read from the “edge displacement equal both sides” data curve, whereas information should be read from the “edge displacement one side only” if panel has been fixed in the double span mode.

Step 3. Convert the value of dimensionless mid-span panel deflection (d’) into an actual mid-span panel deflection (d) by multiplying the dimensionless mid span panel deflection by the support spacing (L).

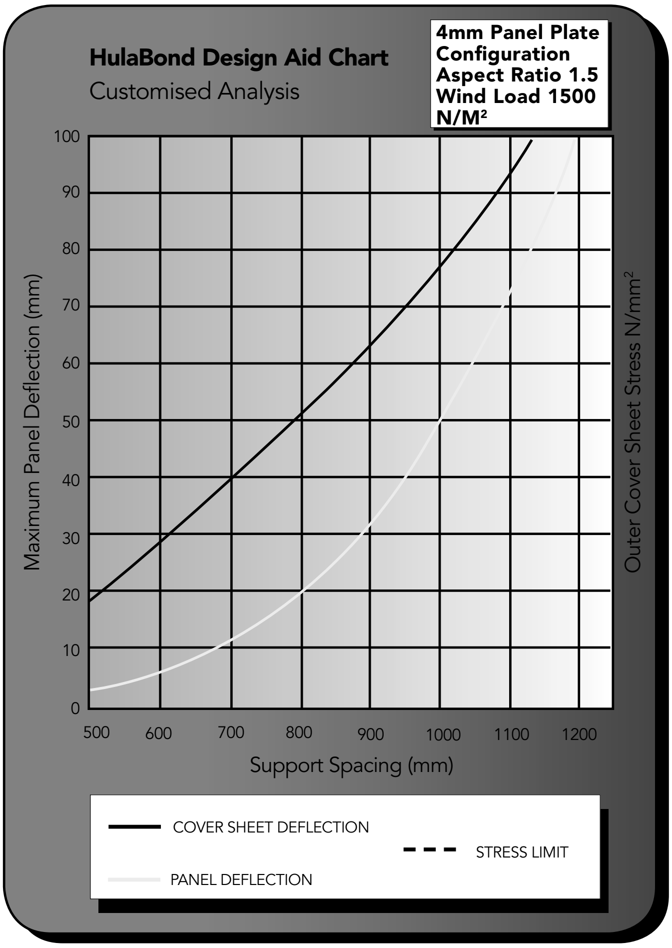
$$d = d'L$$

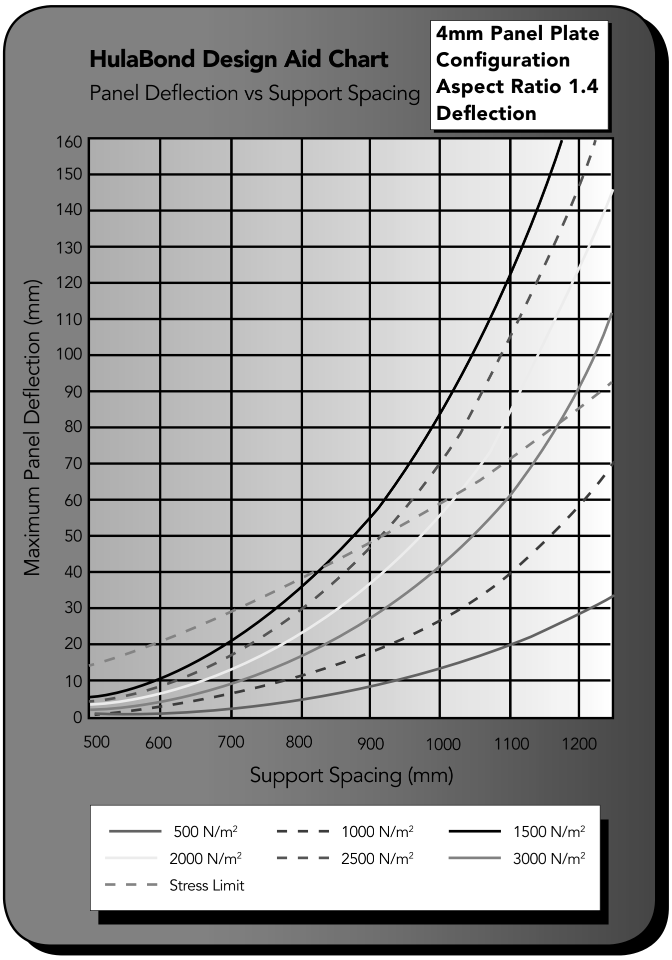
Step 4. Confirm using the load deflection design aid charts that the limiting panel deflection calculated in Step 3 is not exceeded. (See attached aid design charts)

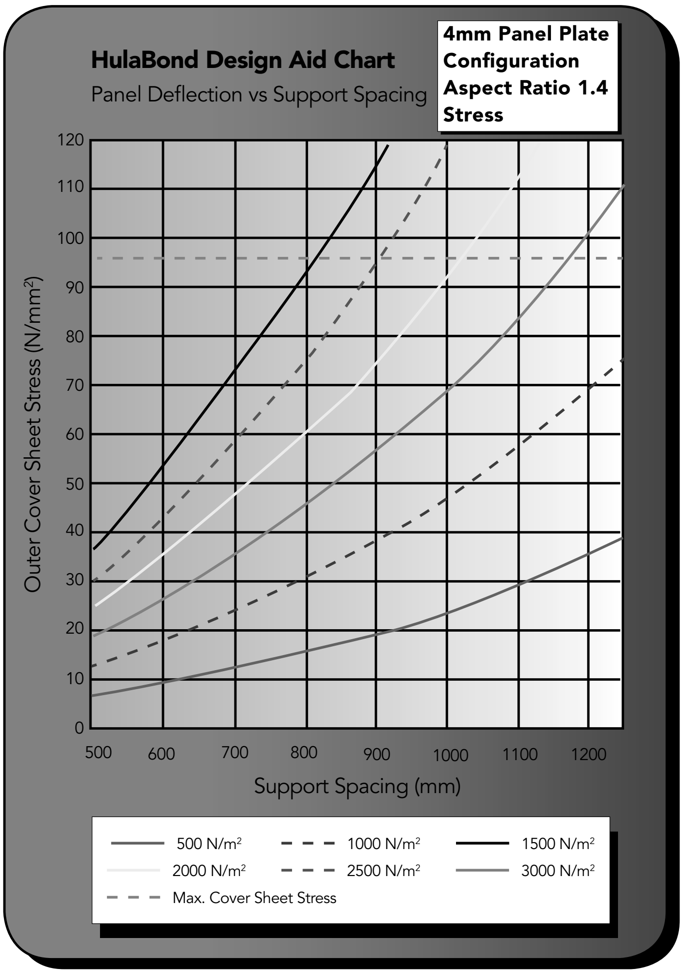
Note: *To determine the maximum edge displacement for a given panel geometry and wind load, reverse the above procedure.*

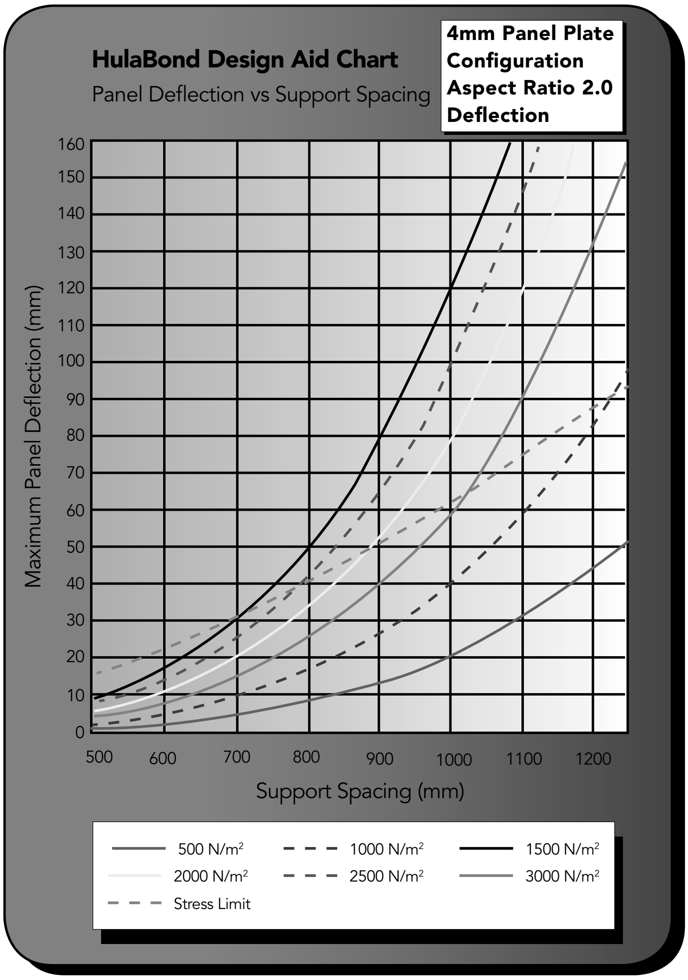
The following design aid charts are available to assist your engineers to select and optimise the use of HulaBond for the installation at hand.

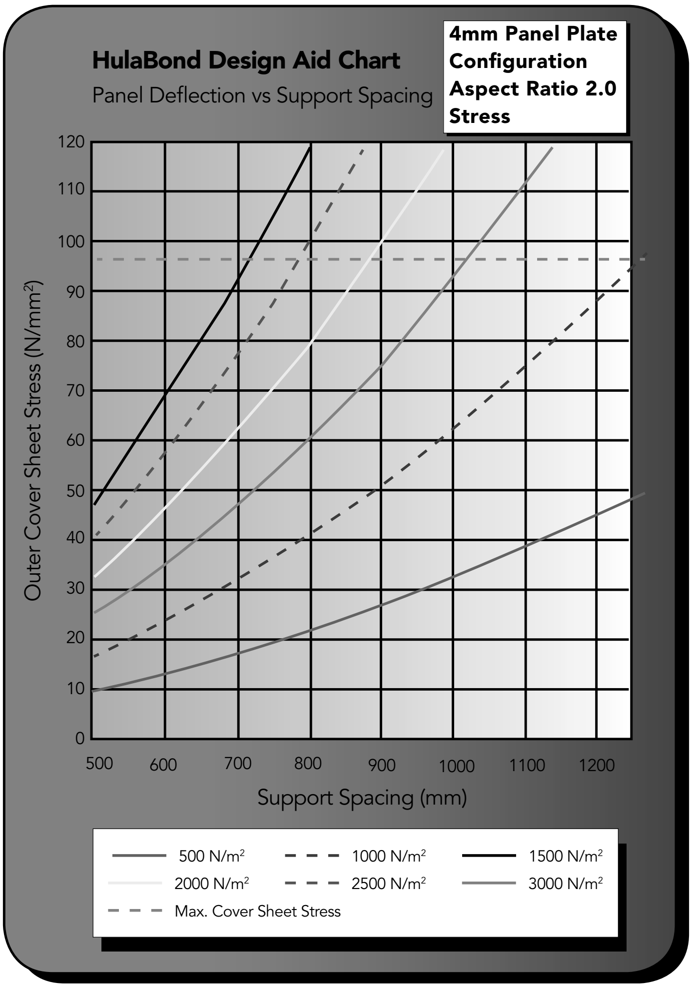
- Single Span Design Aid Charts
  - determination of maximum panel deflection
  - determination of panel outer cover sheet stress
  - determination of panel edge displacement
- Double Span Design Aid Charts
  - determination of maximum panel deflection
  - determination of panel outer cover sheet stress
  - determination of panel edge displacement
- Plate Configuration Design Aid Charts
  - determination of maximum deflection
  - determination of outer cover sheet stress
  - determination of edge displacement

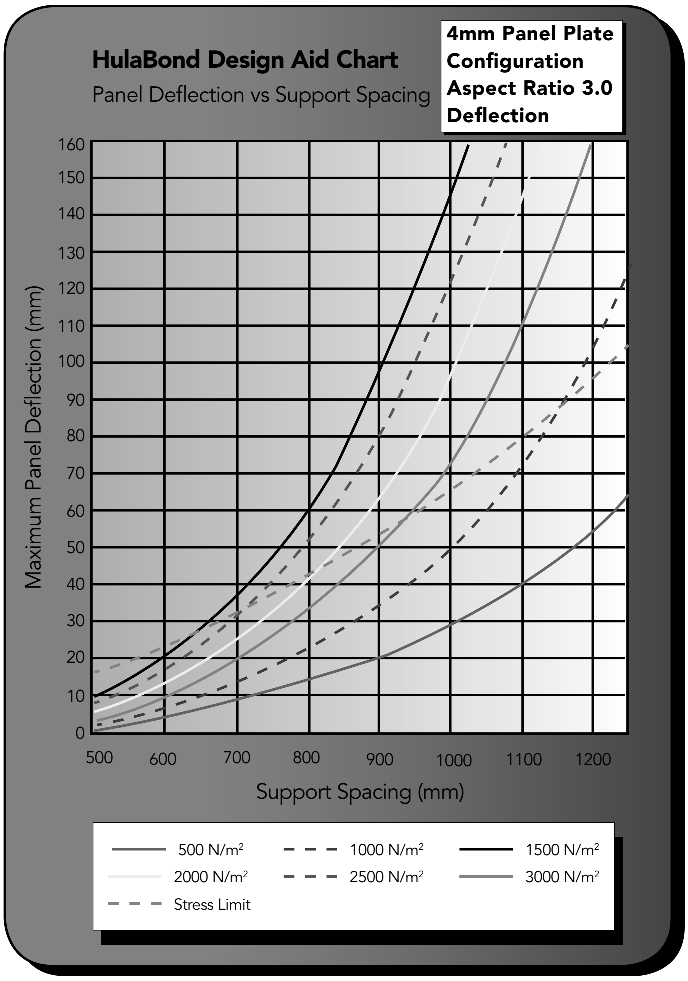


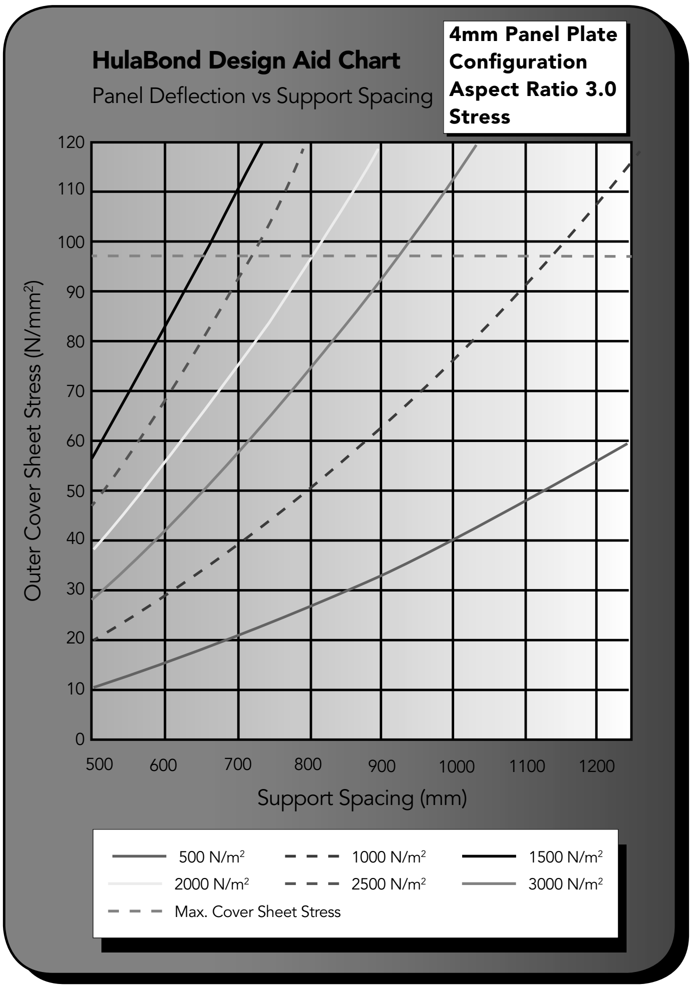


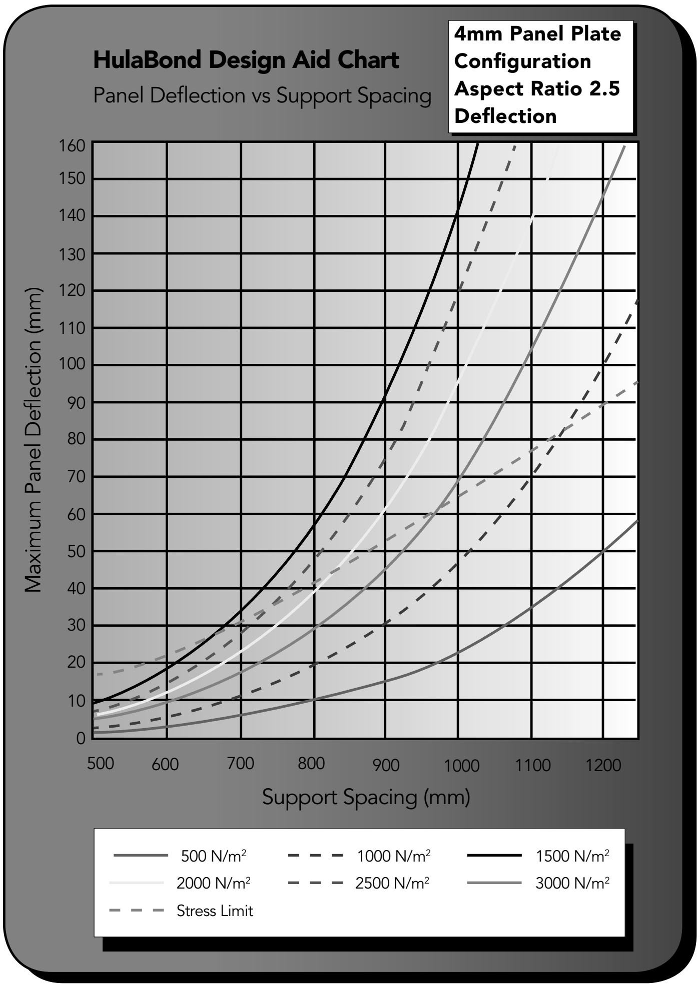



HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate Configuration Aspect Ratio 2.0 Deflection
Maximum Panel Deflection (mm)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit

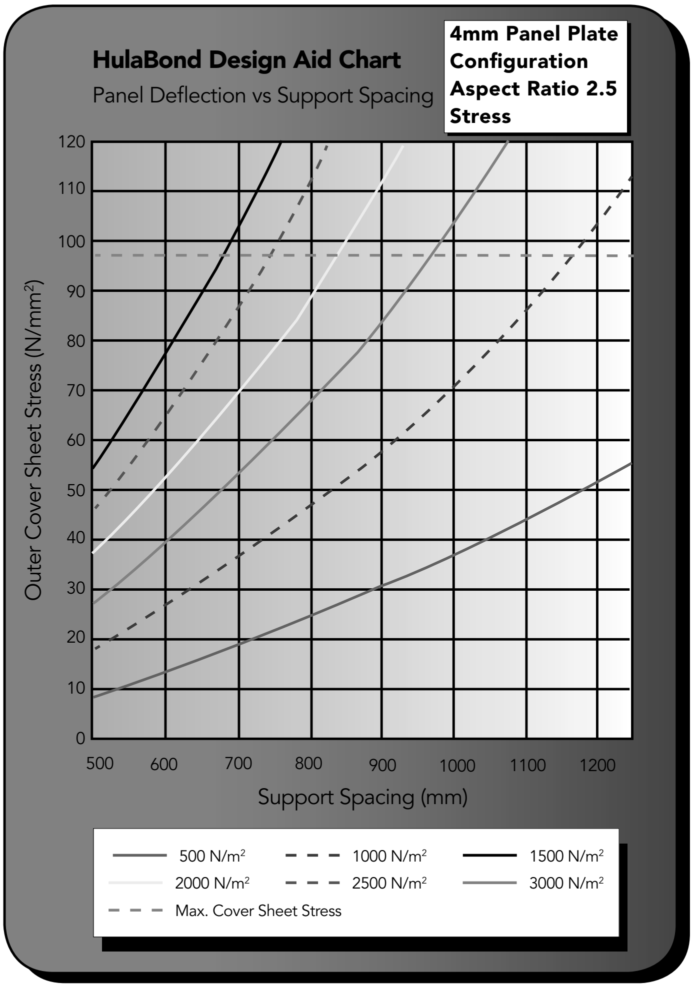

HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate Configuration Aspect Ratio 2.0 Stress
Outer Cover Sheet Stress (N/mm²)
0 10 20 30 40 50 60 70 80 90 100 110 120
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate Configuration Aspect Ratio 3.0 Deflection
Maximum Panel Deflection (mm)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit

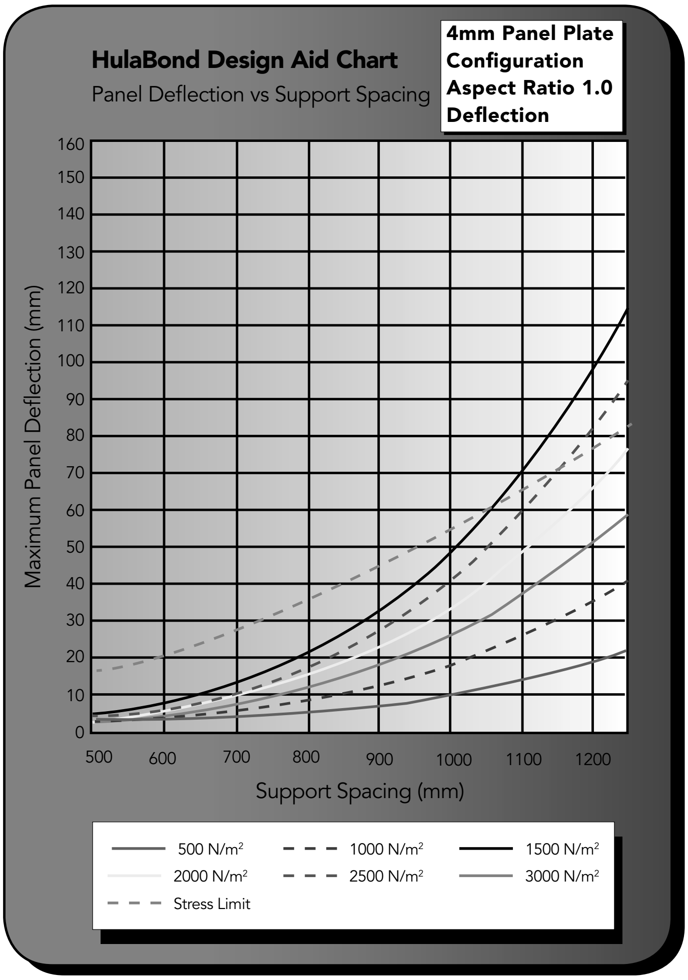

HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate Configuration Aspect Ratio 3.0 Stress
Outer Cover Sheet Stress (N/mm²)
0 10 20 30 40 50 60 70 80 90 100 110 120
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress



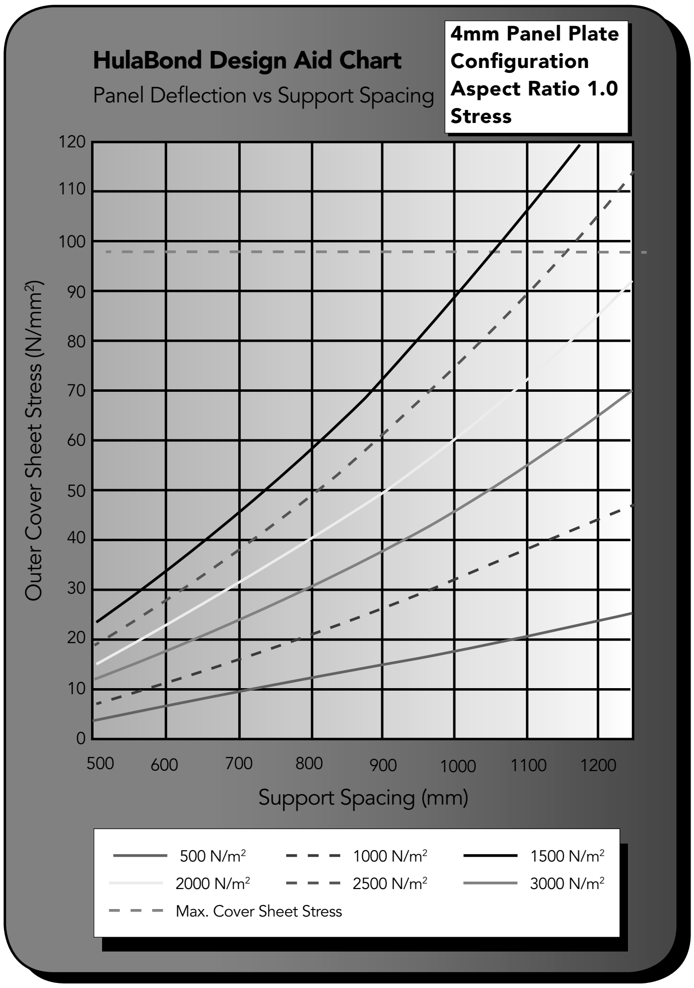
HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate Configuration Aspect Ratio 2.5 Deflection
Maximum Panel Deflection (mm)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit



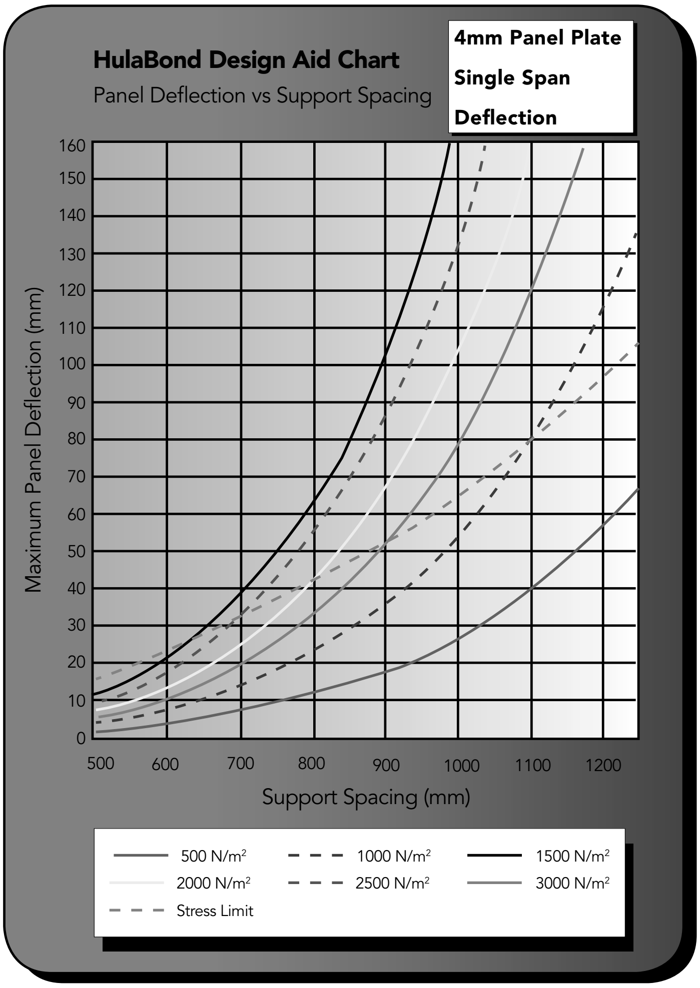
HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate Configuration Aspect Ratio 2.5 Stress
Outer Cover Sheet Stress (N/mm²)
0 10 20 30 40 50 60 70 80 90 100 110 120
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress

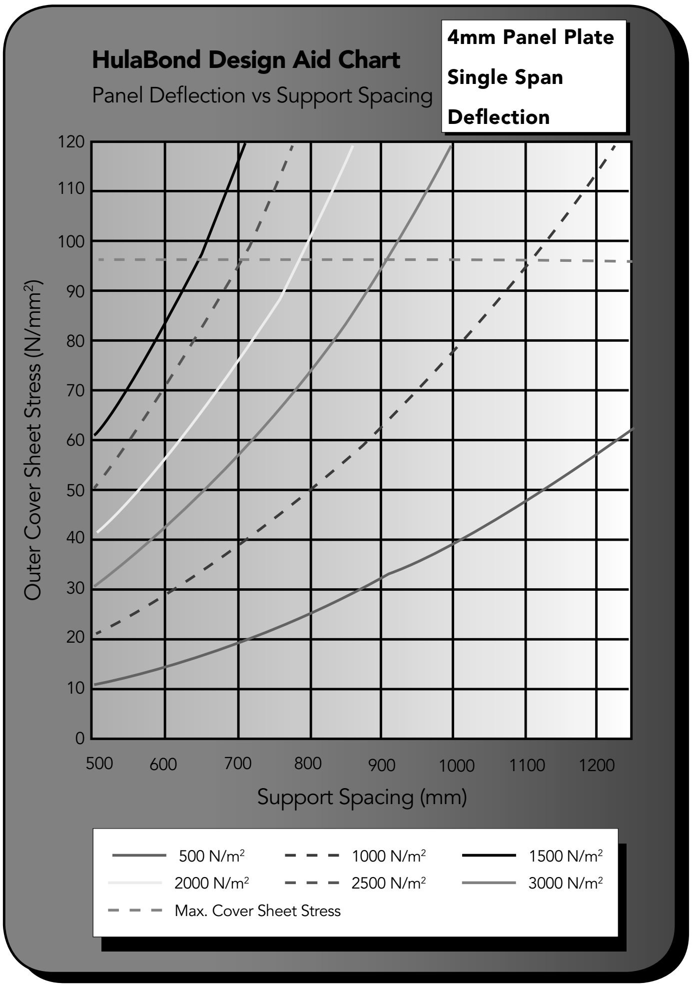


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate Configuration Aspect Ratio 1.0 Deflection
Maximum Panel Deflection (mm)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit



HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate Configuration Aspect Ratio 1.0 Stress
Outer Cover Sheet Stress (N/mm²)
0 10 20 30 40 50 60 70 80 90 100 110 120
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate
Single Span
Deflection
Maximum Panel Deflection (mm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
500
600
700
800
900
1000
1100
1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate
Single Span
Deflection
Outer Cover Sheet Stress (N/mm²)
0
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100
110
120
500
600
700
800
900
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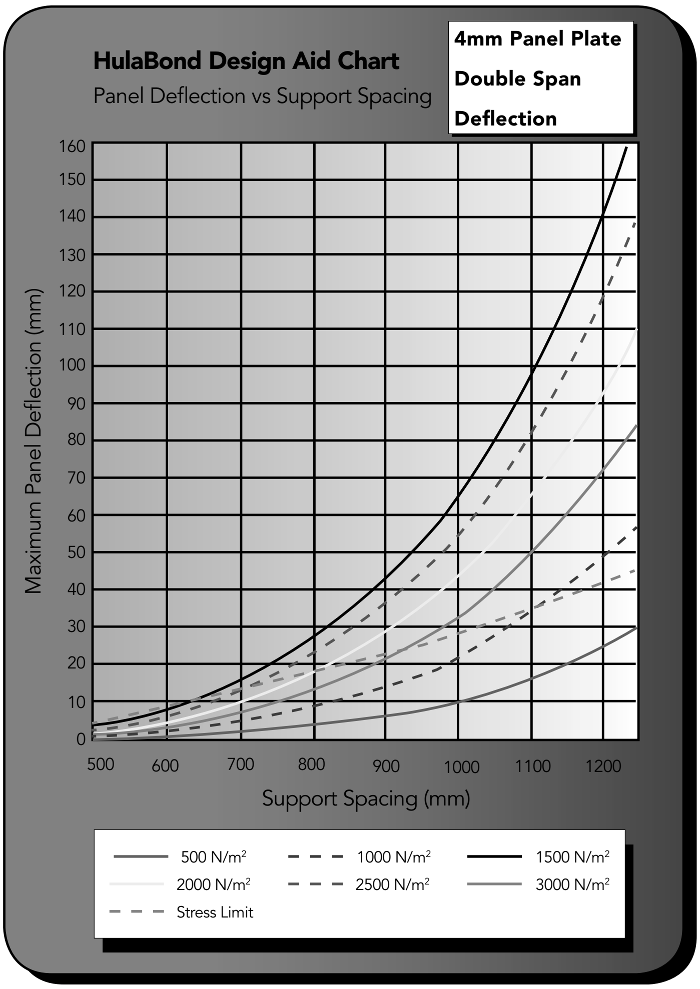
1100
1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate
Double Span
Deflection
Maximum Panel Deflection (mm)
0
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60
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110
120
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160
500
600
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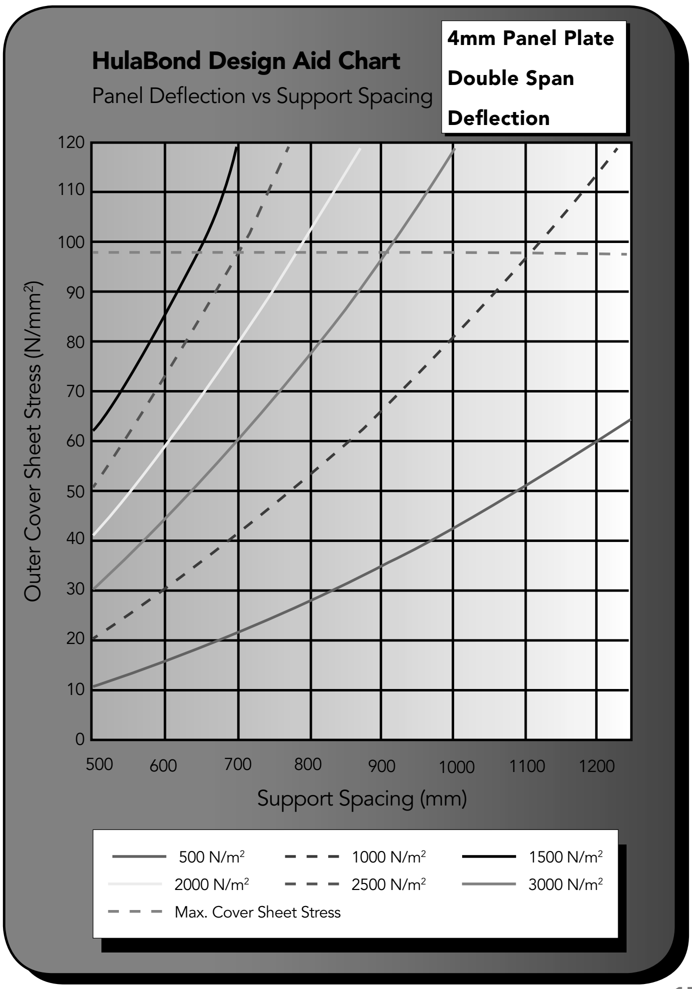
1100
1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate
Double Span
Deflection
Outer Cover Sheet Stress (N/mm²)
0
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40
50
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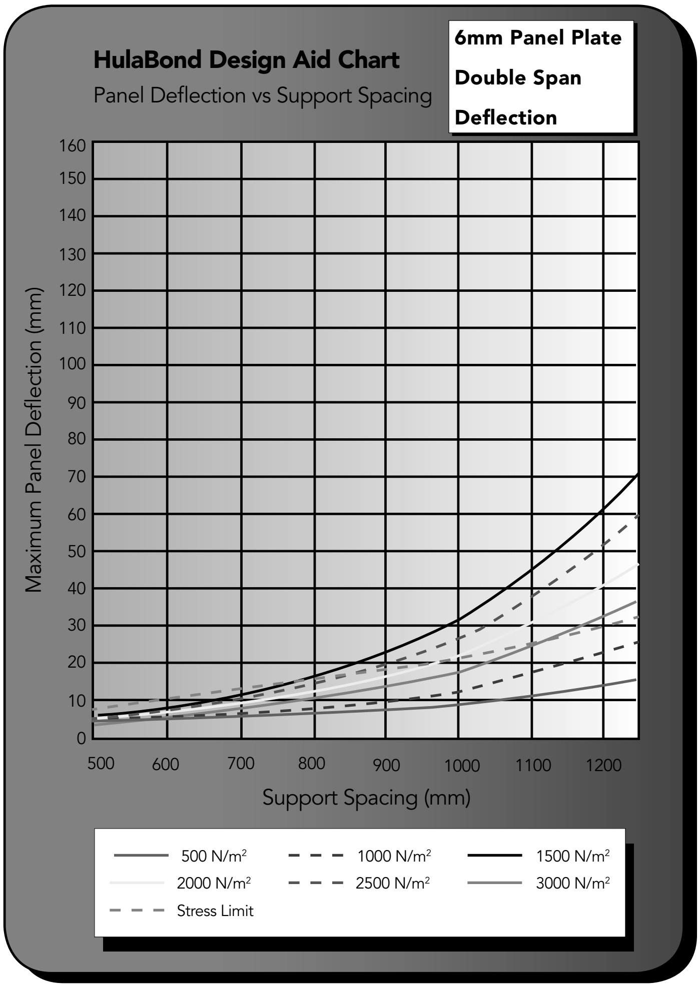
70
80
90
100
110
120
500
600
700
800
900
1000
1100
1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
6mm Panel Plate
Double Span
Deflection
Maximum Panel Deflection (mm)
Support Spacing (mm)
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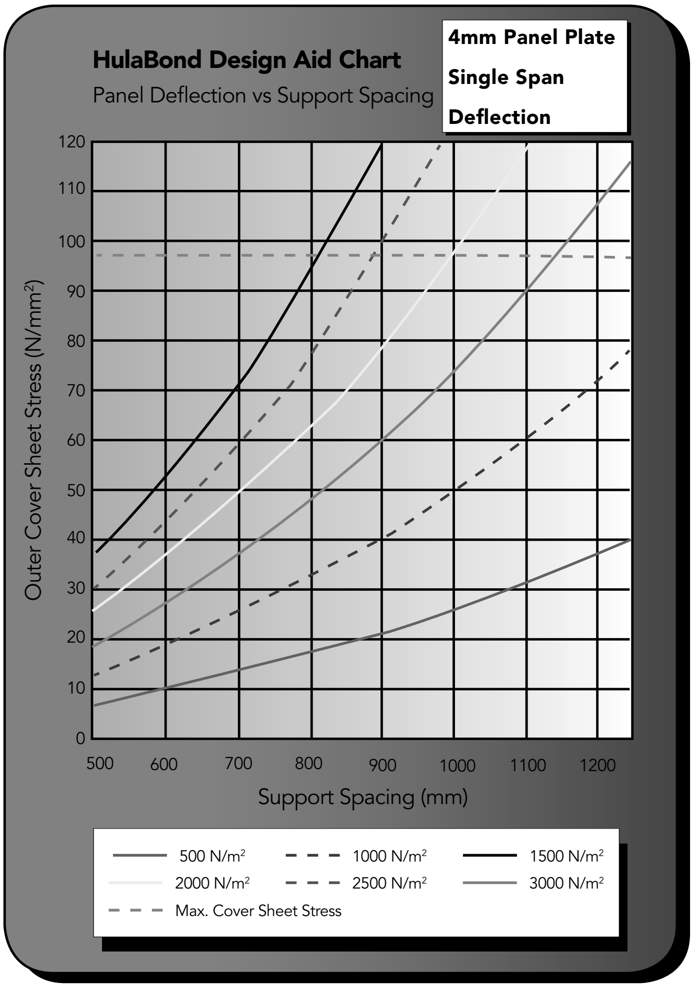
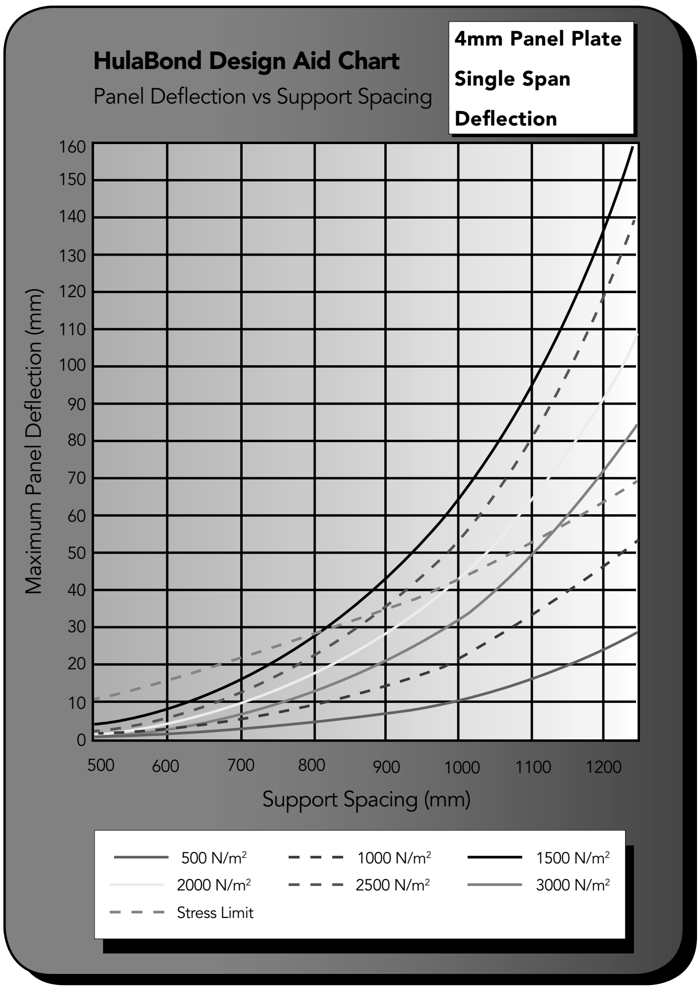
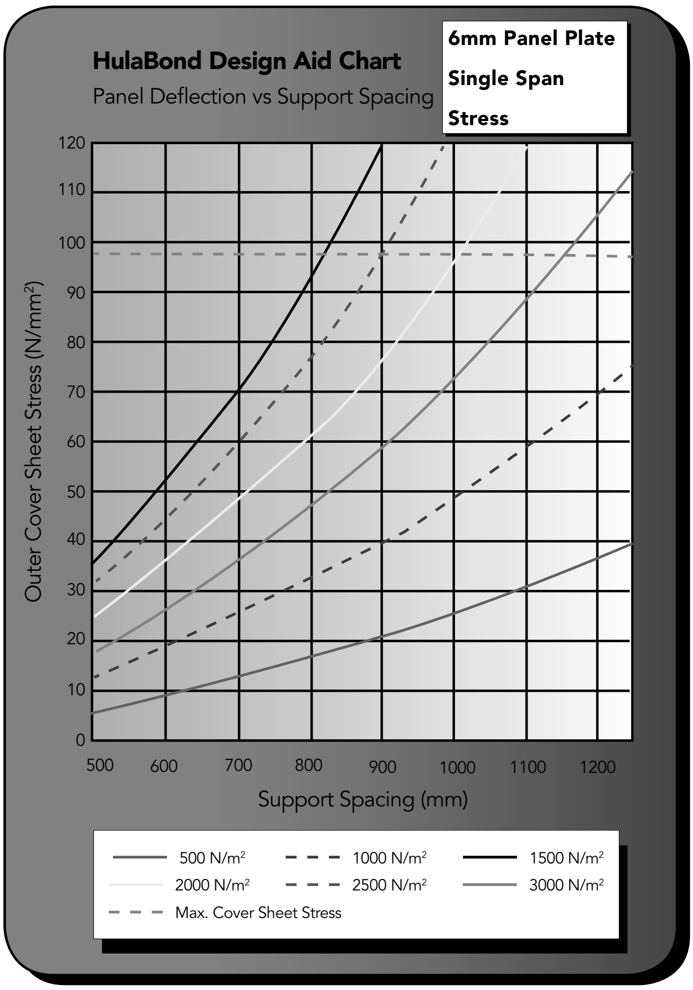
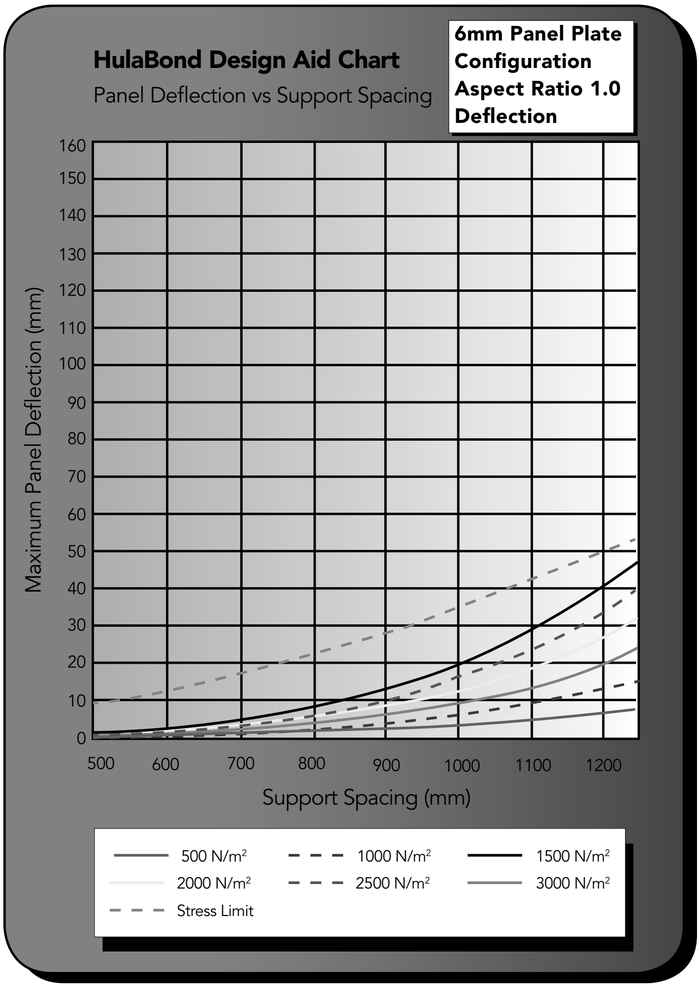
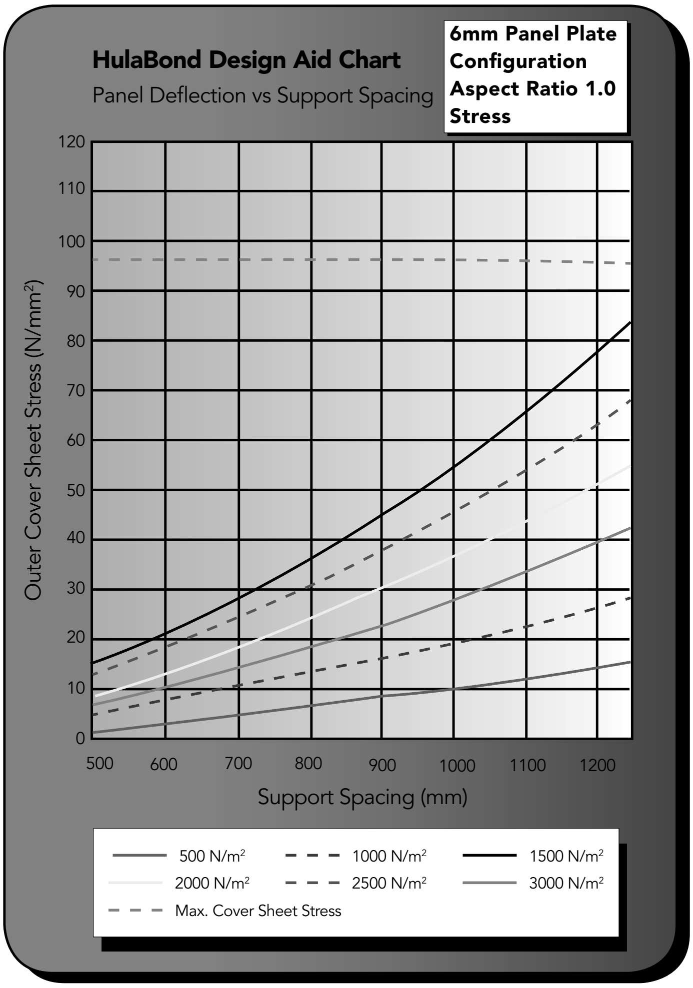
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit

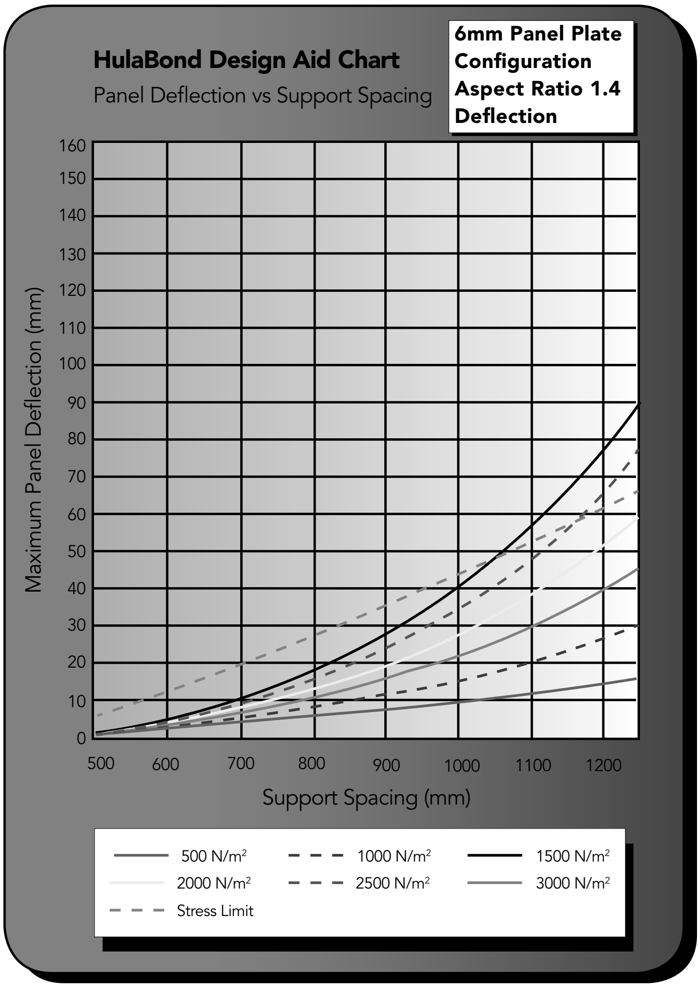

HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate
Single Span
Deflection
Outer Cover Sheet Stress (N/mm²)
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress

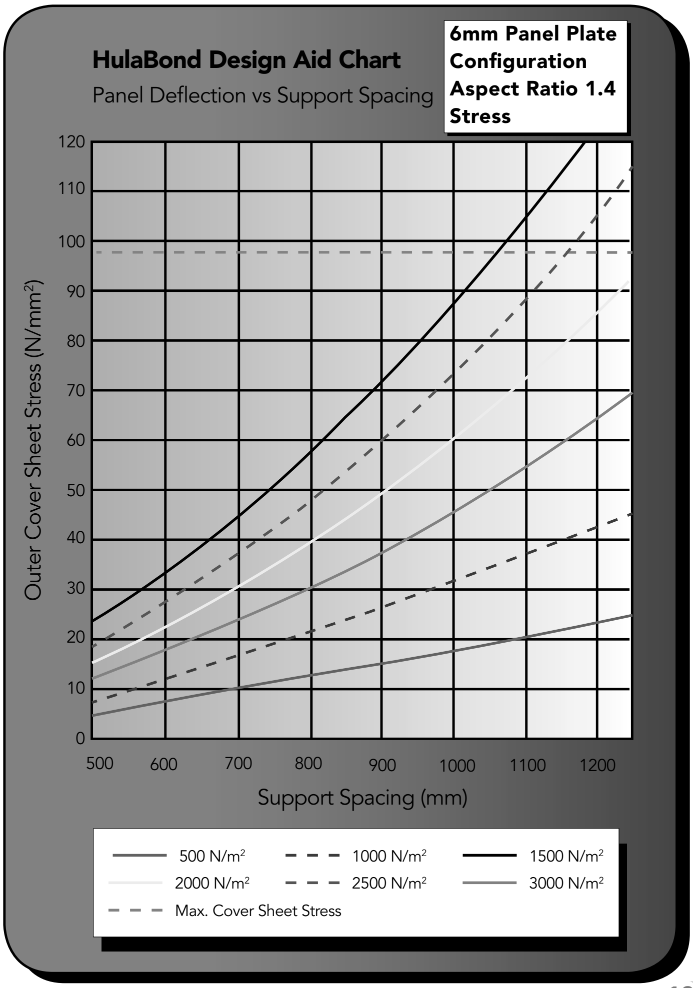

HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
4mm Panel Plate
Single Span
Deflection
Maximum Panel Deflection (mm)
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit

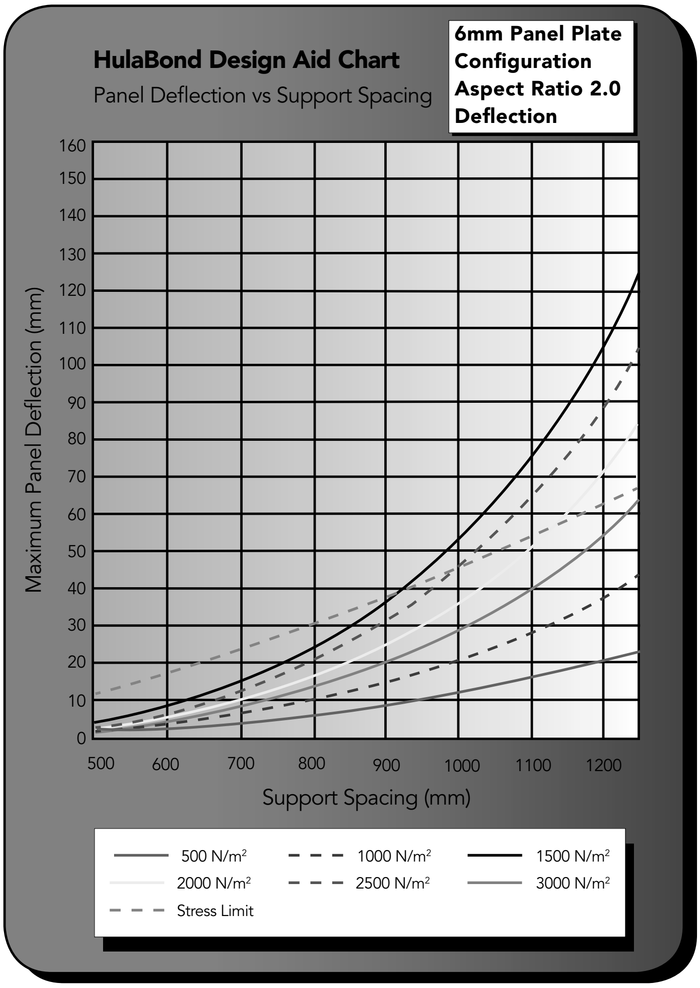

HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
6mm Panel Plate
Single Span
Stress
Outer Cover Sheet Stress (N/mm²)
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress

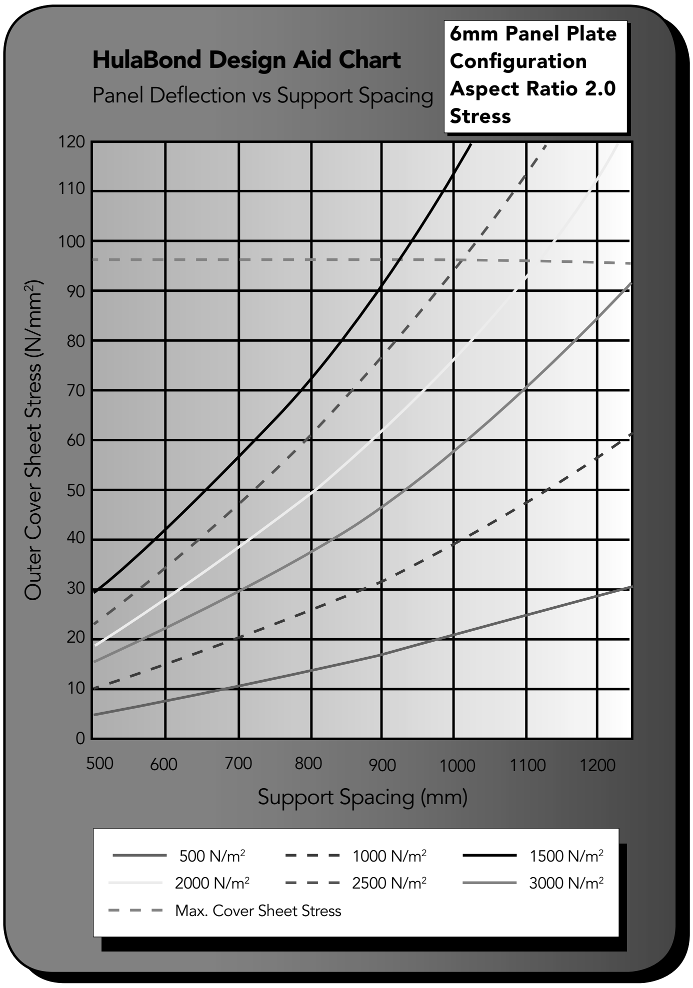

HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
6mm Panel Plate Configuration Aspect Ratio 1.0 Deflection
Maximum Panel Deflection (mm)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit

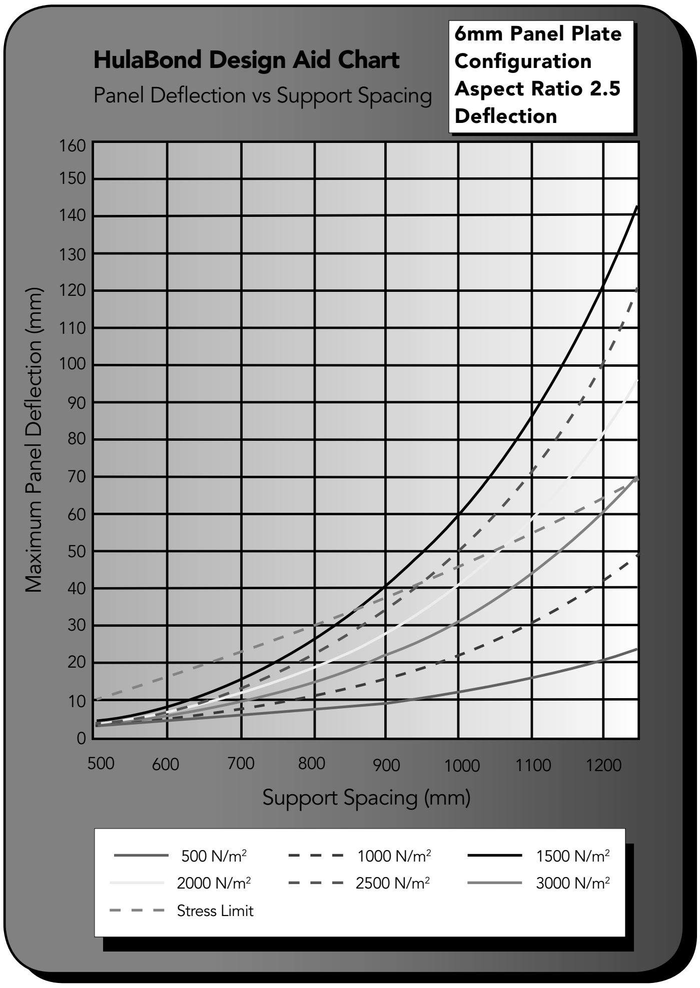

HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
6mm Panel Plate Configuration Aspect Ratio 1.0 Stress
Outer Cover Sheet Stress (N/mm²)
0 10 20 30 40 50 60 70 80 90 100 110 120
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress

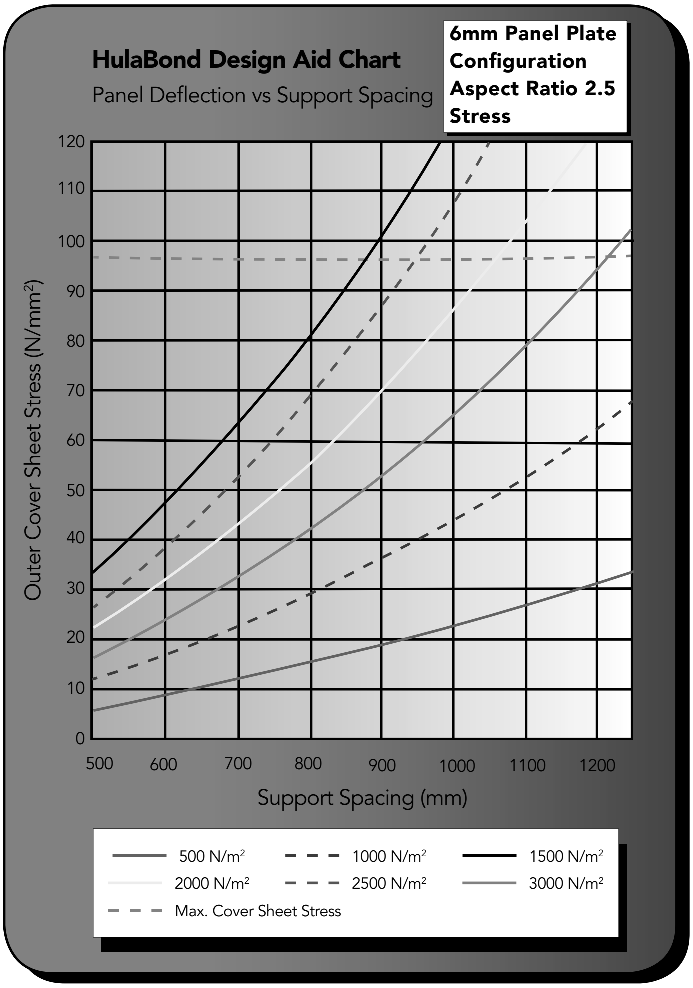

HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
6mm Panel Plate Configuration Aspect Ratio 1.4 Deflection
Maximum Panel Deflection (mm)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
6mm Panel Plate Configuration Aspect Ratio 1.4 Stress
Outer Cover Sheet Stress (N/mm²)
0 10 20 30 40 50 60 70 80 90 100 110 120
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
6mm Panel Plate Configuration Aspect Ratio 2.0 Deflection
Maximum Panel Deflection (mm)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
6mm Panel Plate Configuration Aspect Ratio 2.0 Stress
Outer Cover Sheet Stress (N/mm²)
0 10 20 30 40 50 60 70 80 90 100 110 120
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
6mm Panel Plate Configuration Aspect Ratio 2.5 Deflection
Maximum Panel Deflection (mm)
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
500 600 700 800 900 1000 1100 1200
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Stress Limit


HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
6mm Panel Plate Configuration Aspect Ratio 2.5 Stress
Outer Cover Sheet Stress (N/mm²)
0 10 20 30 40 50 60 70 80 90 100 110 120
500 600 700 800 900 1000 1100 1200
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500 N/m²
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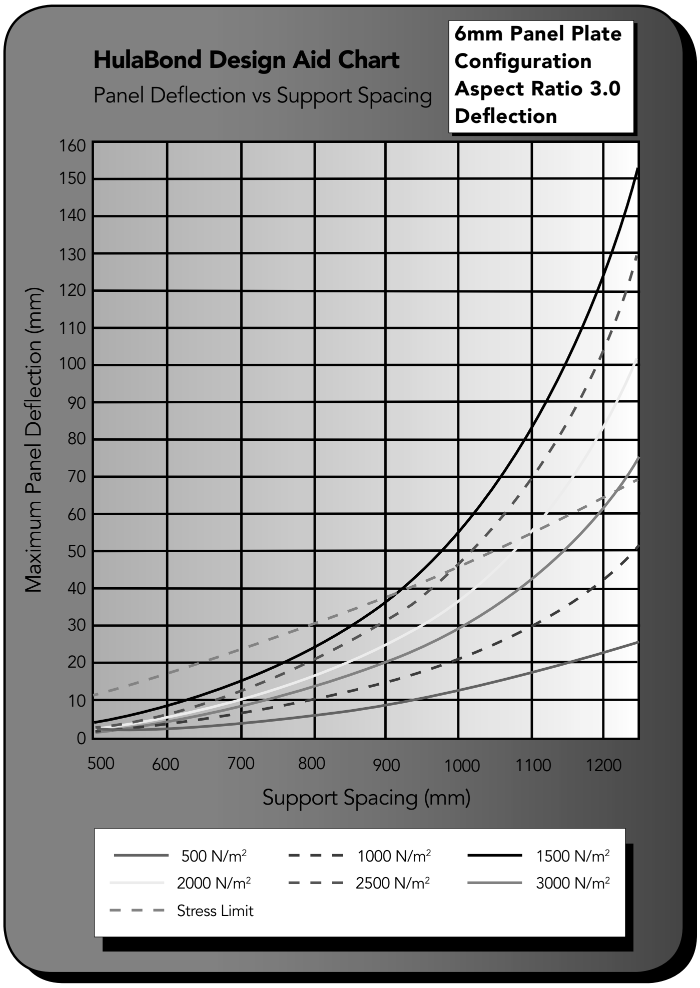
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress


6mm Panel Plate
Configuration
Aspect Ratio 3.0
Deflection
HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
Maximum Panel Deflection (mm)
Support Spacing (mm)
500 N/m²
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1500 N/m²
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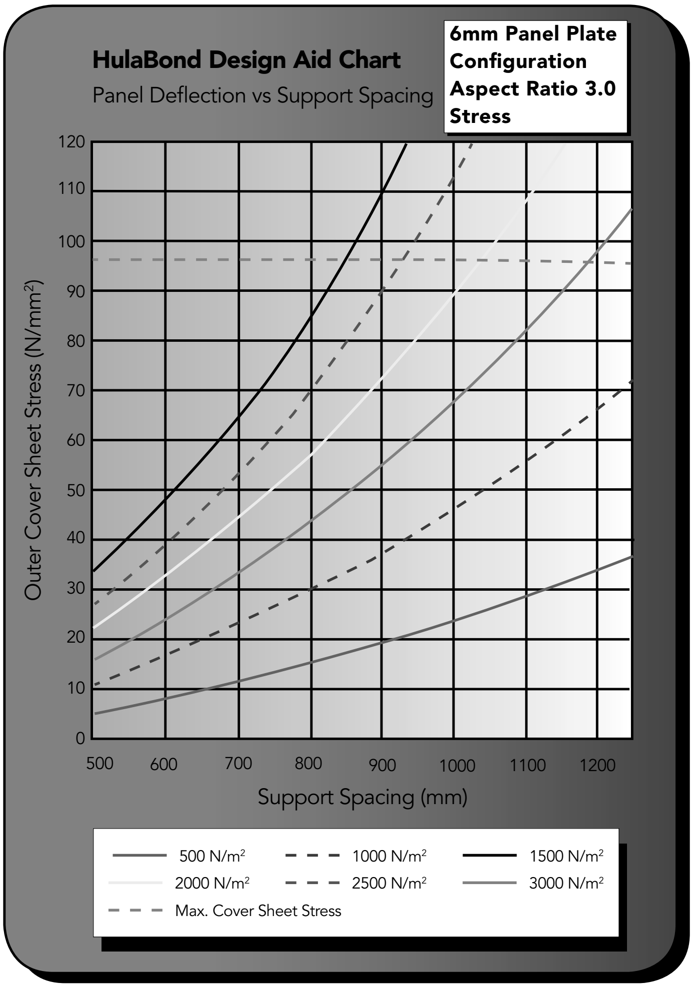
3000 N/m²
Stress Limit


6mm Panel Plate
Configuration
Aspect Ratio 3.0
Stress
HulaBond Design Aid Chart
Panel Deflection vs Support Spacing
Outer Cover Sheet Stress (N/mm²)
Support Spacing (mm)
500 N/m²
1000 N/m²
1500 N/m²
2000 N/m²
2500 N/m²
3000 N/m²
Max. Cover Sheet Stress

3. SURFACE FINISHES

3.1 Painted

PVDF paint finish

HulaBond is available in 24 colours. Customised colours are available subject to enquiry. Paints are prepared using resins, which are blended with modifying resins and inorganic, ceramic pigments to provide a coating of considerable durability. The coatings applied to the HulaBond panel are:

- Resistant to degradation by ultraviolet light
- Resistant to colour change
- Resistant to chalking
- Resistant to erosion
- Resistant to dirt pick-up
- Resistant to fungal growth
- Flexible, allowing post-coating forming
- Low in maintenance costs for the life of the building

PVDF paint tests

Samples of the coil coated product used in the manufacture of HBS aluminium composite panels are subject to the following tests:

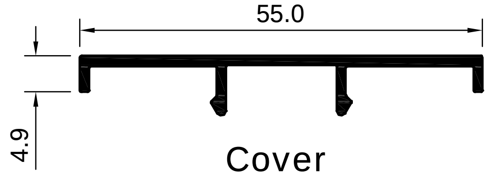
• Hot acetic acid salt spray	(ASTM B287)
• Pencil hardness	(ASTM D3363)
• Film thickness	(ASTM D1400)
• Reverse thickness	(ASTM D2794)
• Adhesion (T-bend and tape)	(ASTM D1737)
• Cross hatch	(ASTM D3359)
• Humidity	(ASTM D2247)

3.2 Maintenance – general

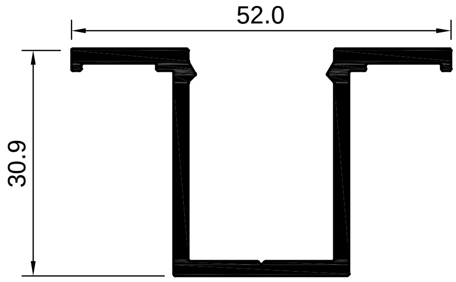
Rain washing is usually sufficient. Panels not exposed to rain should be cleaned every 6 months using a mild neutral household detergent with a cloth or soft brush. More regular cleaning would be advised for panels in heavily polluted industrial areas or panels on the coast.

4. MANUFACTURING AND INSTALLATION INFORMATION

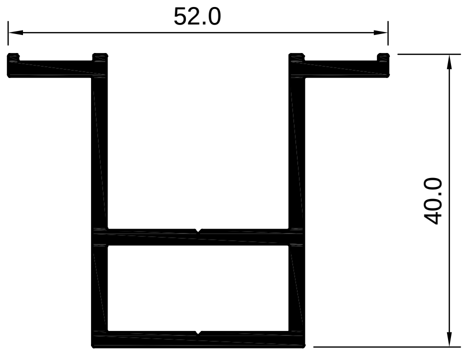
4.1 HulaBond profile identification full size details



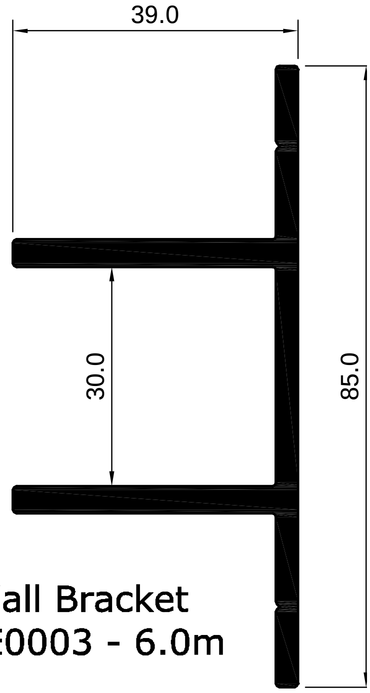
Cover
AXE0017 - 6.0m



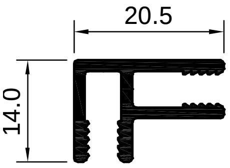
Top Hat
AXE0002 - 6.0m



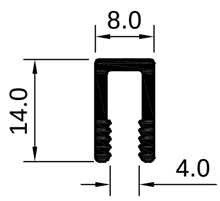
Top Hat
AXE0001 - 6.0m



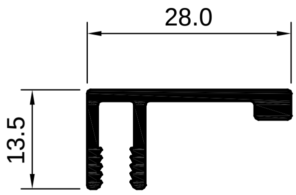
Wall Bracket
AXE0003 - 6.0m



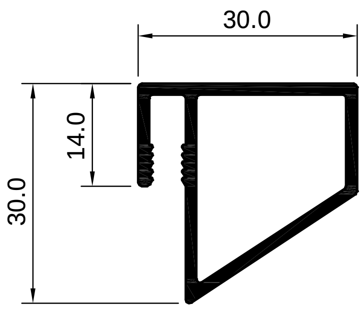
Corner
AXE0007 - 6.0m



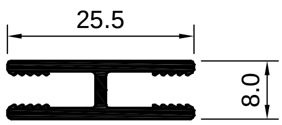
End
AXE0005 - 6.0m



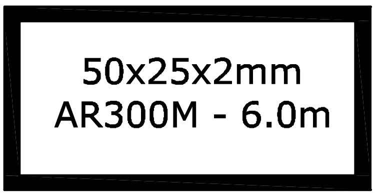
End Link
AXE0006 - 6.0m



Balustrade
AXE0004 - 6.0m



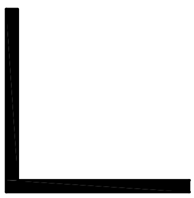
Connector
AXE0008 - 6.0m



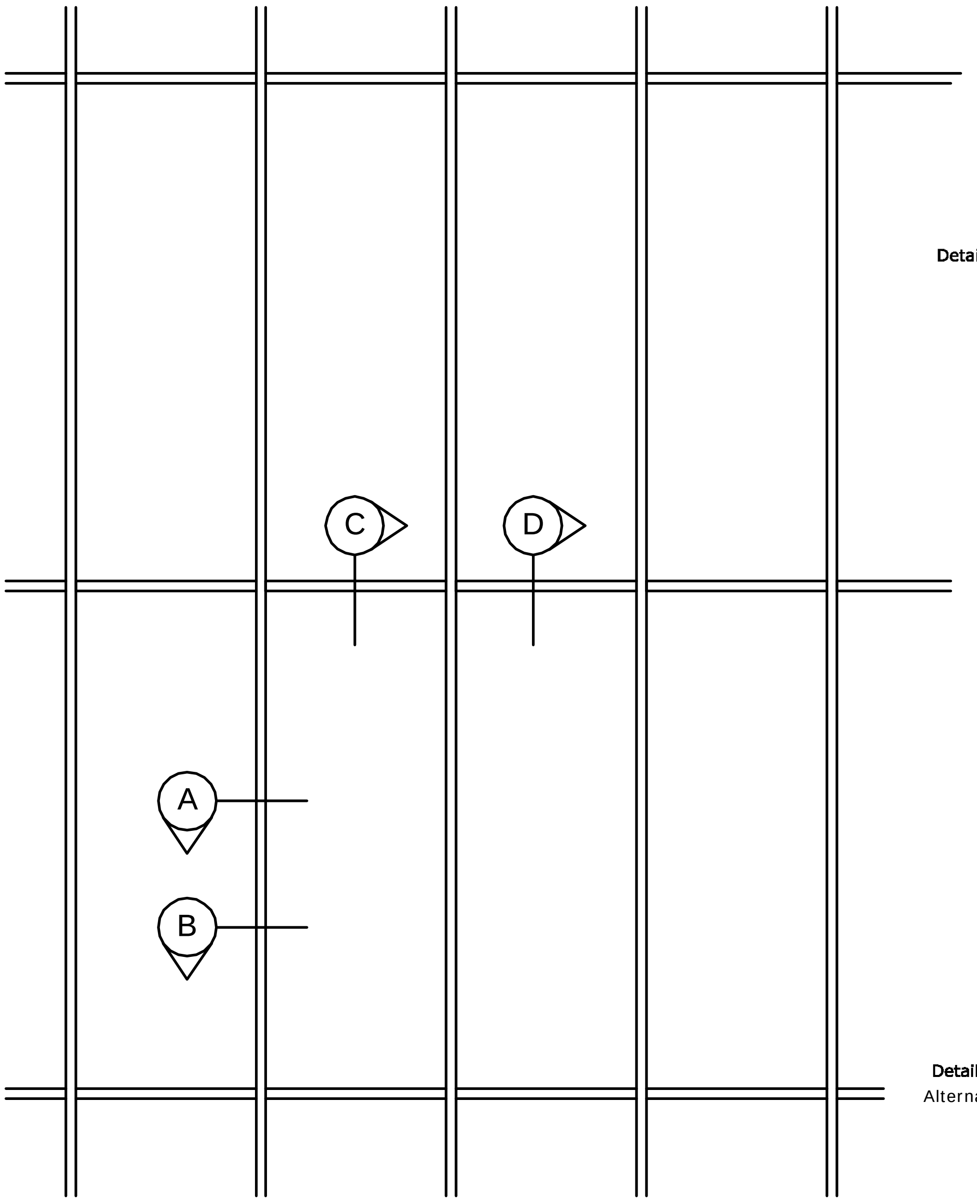
50x25x2mm
AR300M - 6.0m

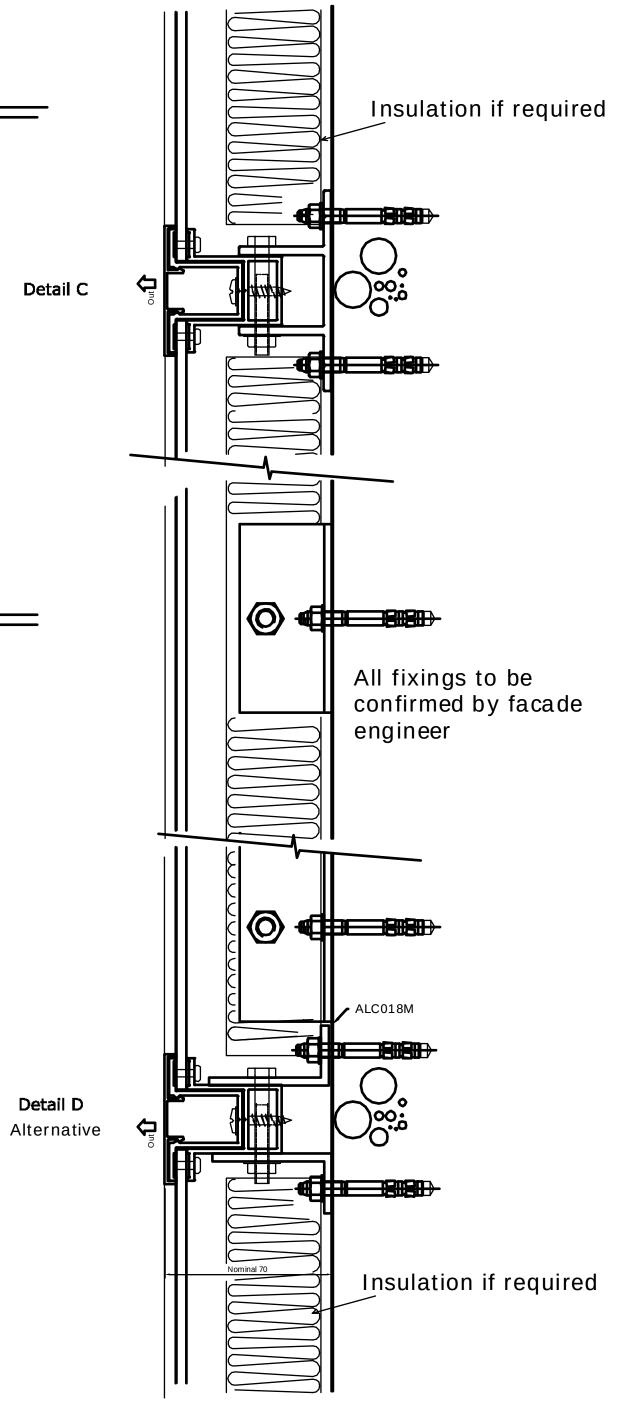
50.8x25.4x3.18mm
ALC018M - 6.0m

31.75x31.75x3.18mm
AL023M - 6.0m

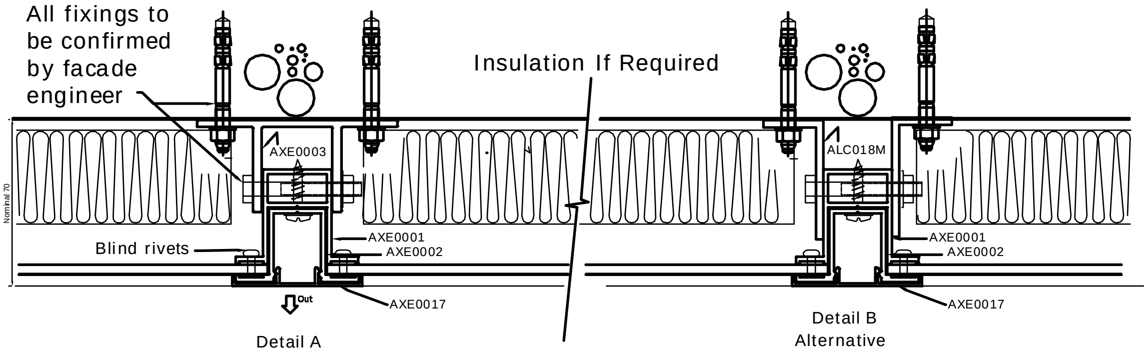


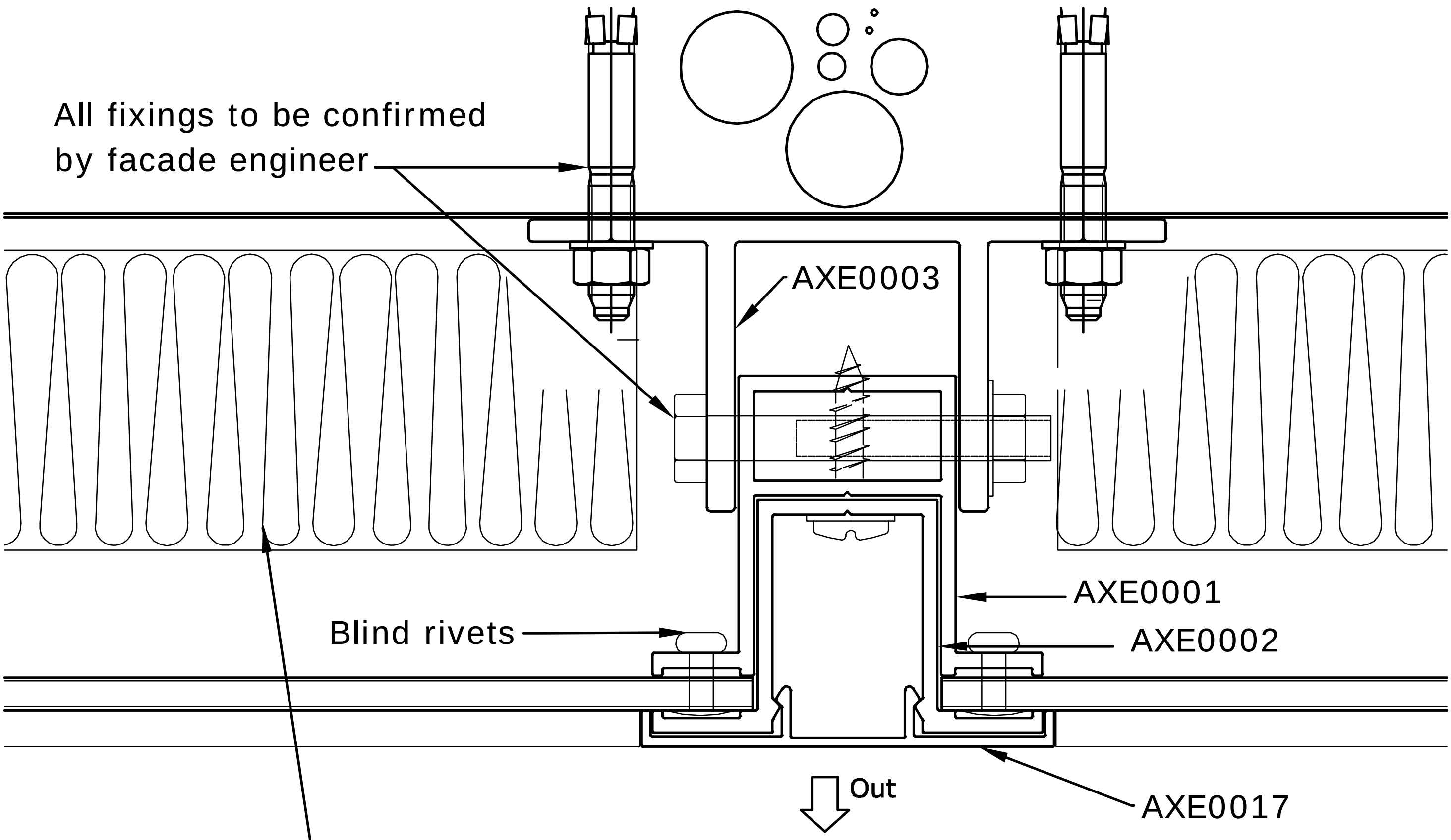
25.4x25.4x1.52mm
ALD007M - 6.0m



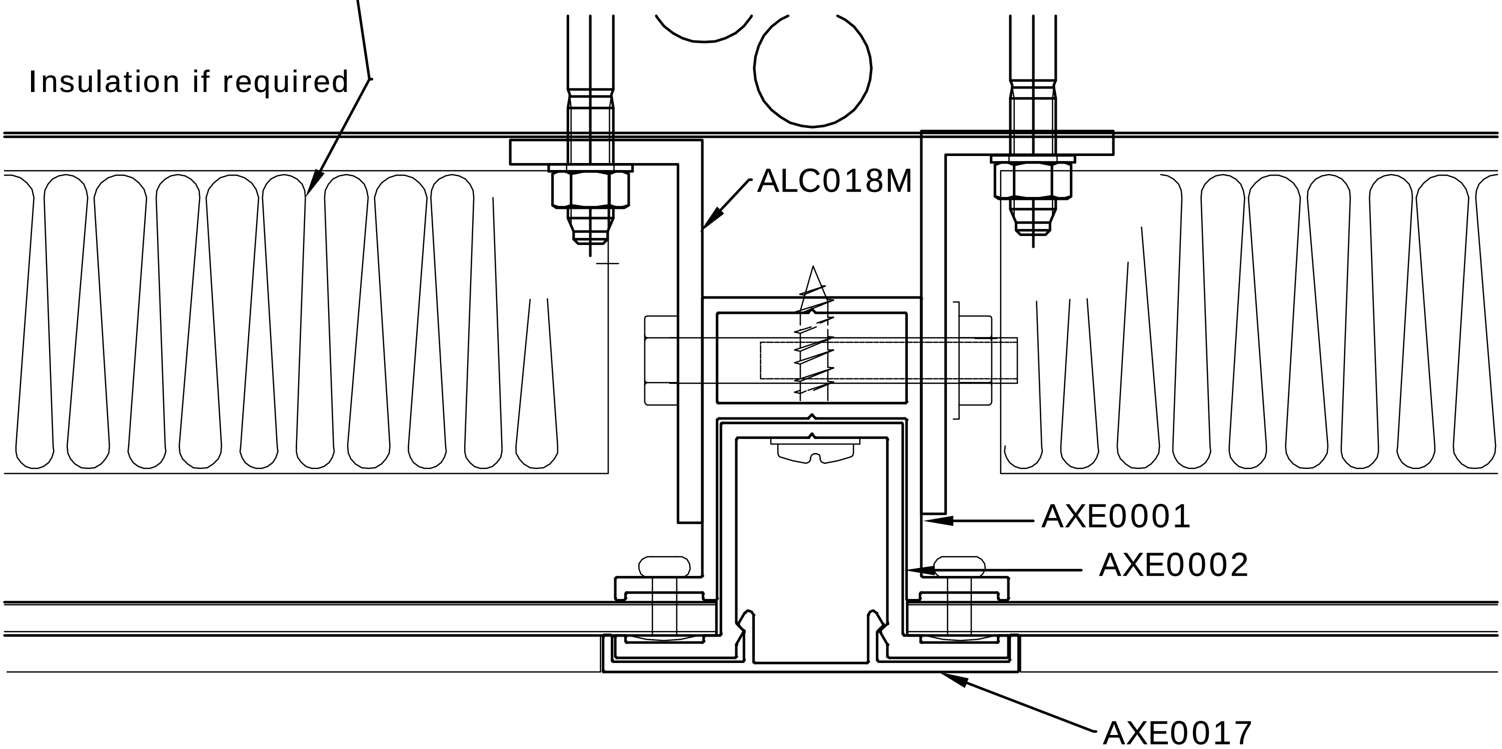


Number of fixings and brackets per panel dependent on windload and panel sizes
Consult your facade engineer



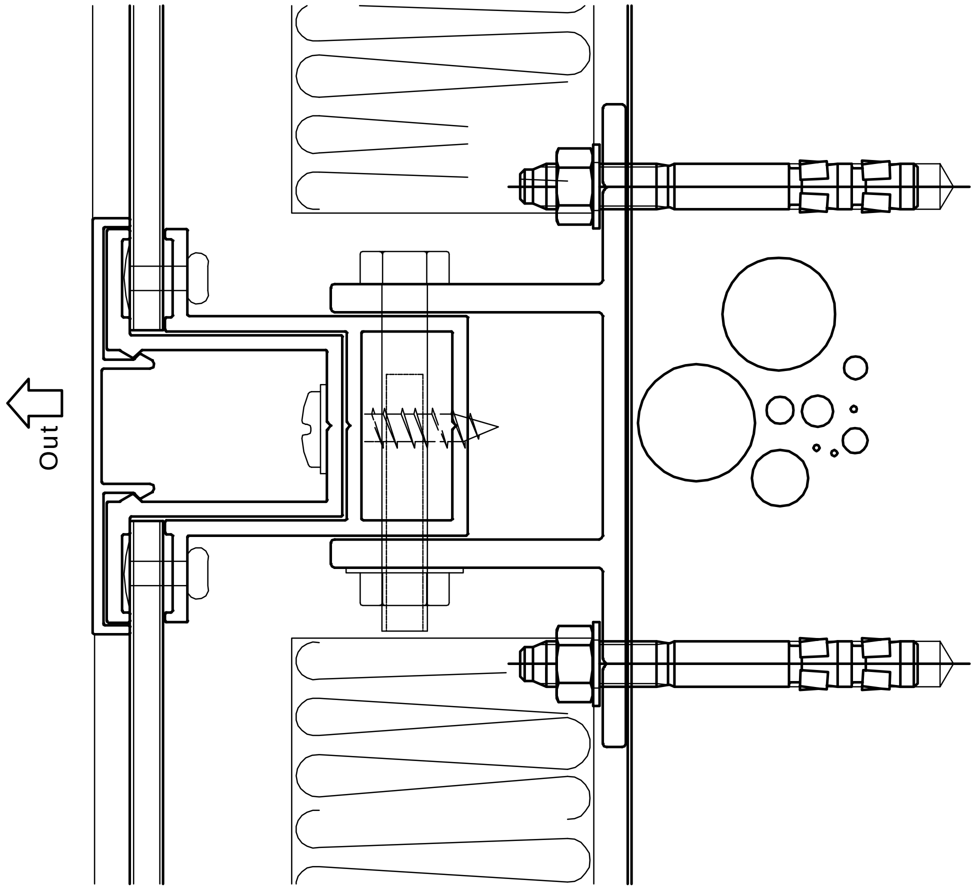


Detail A

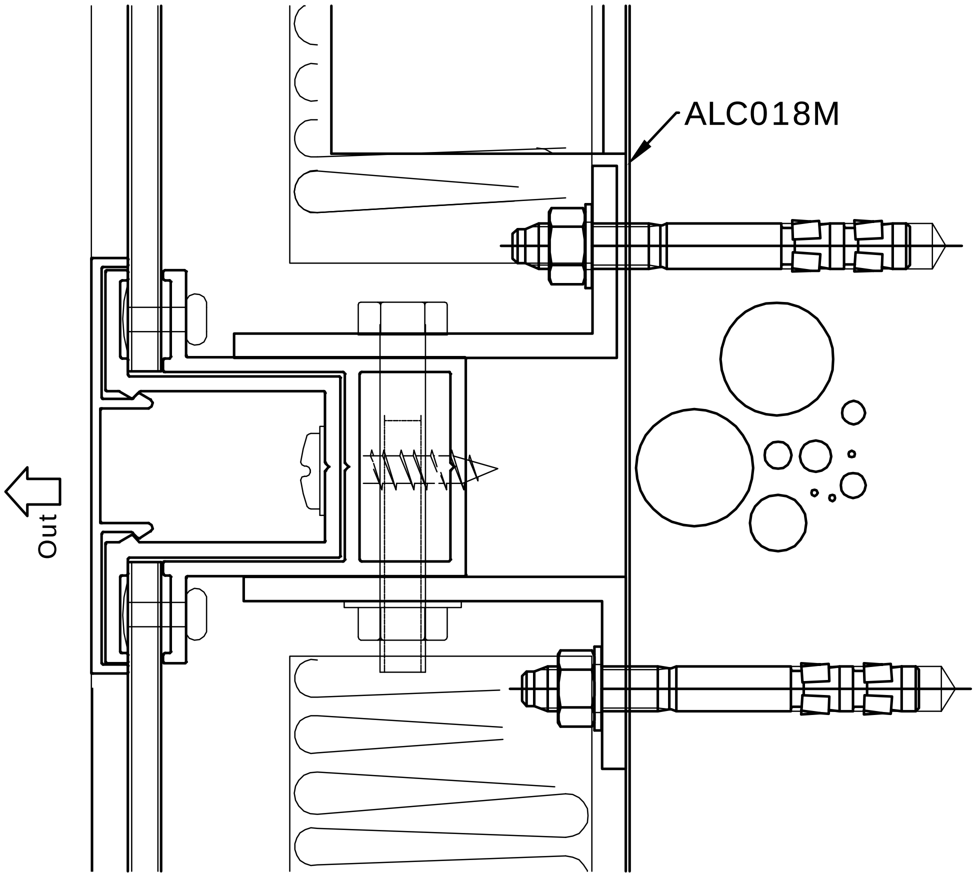


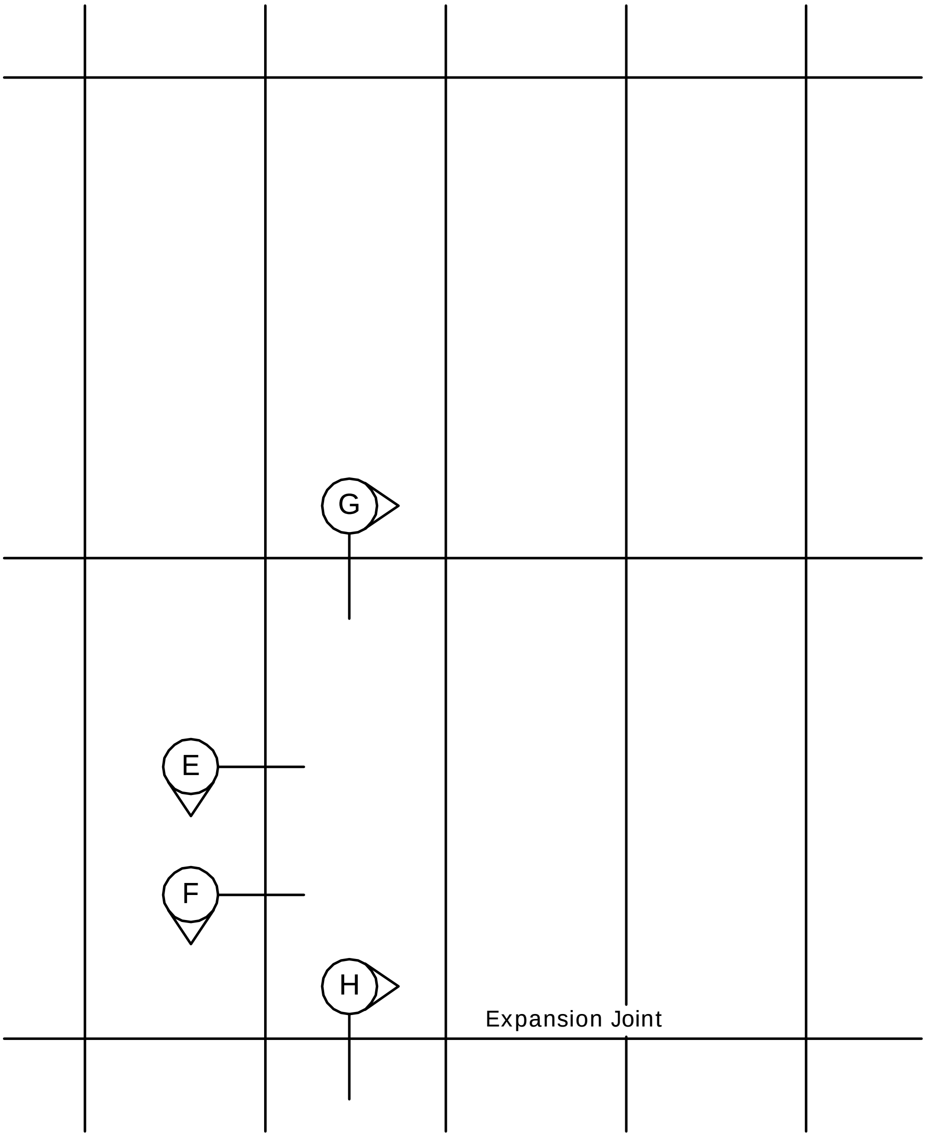
Detail B
Alternative

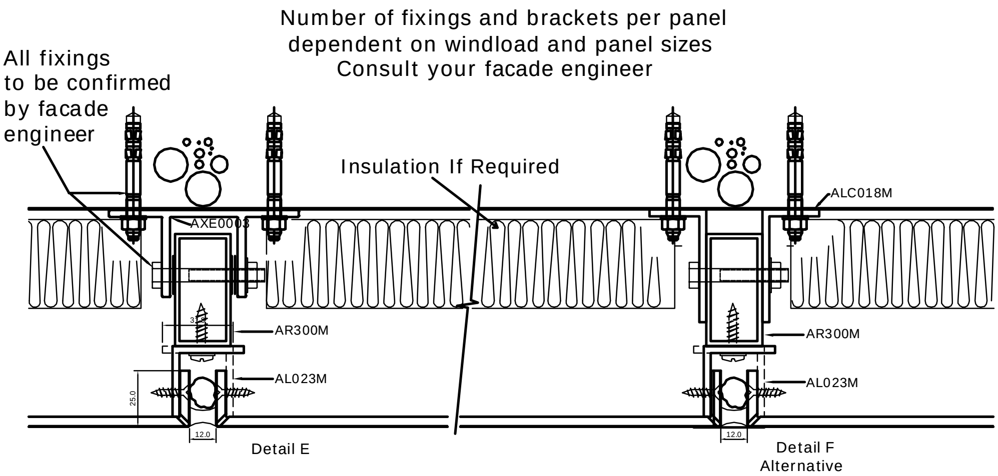
Detail C

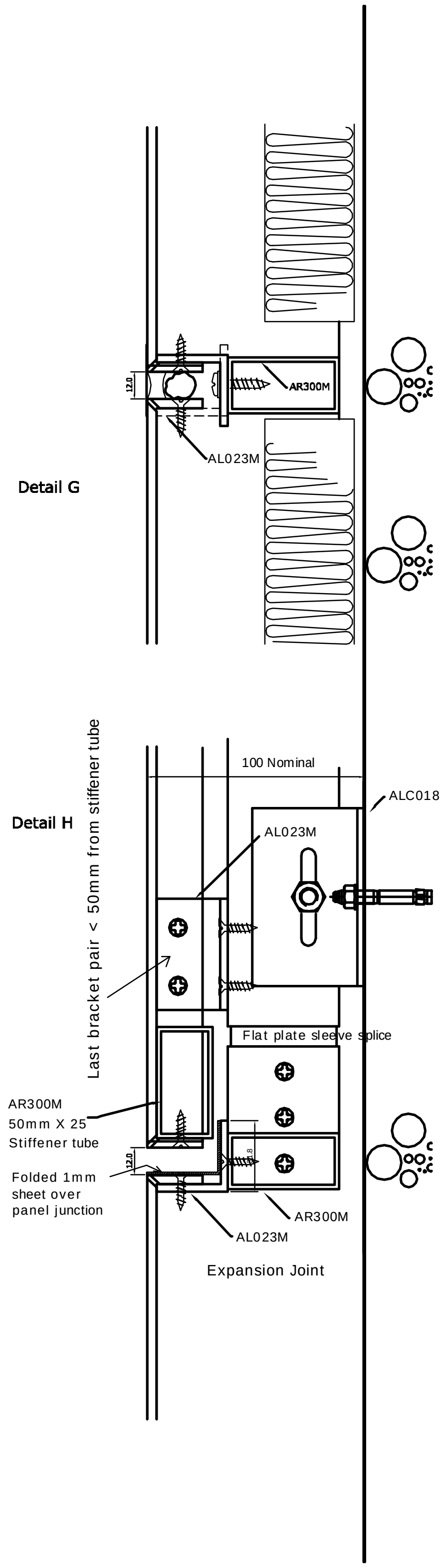


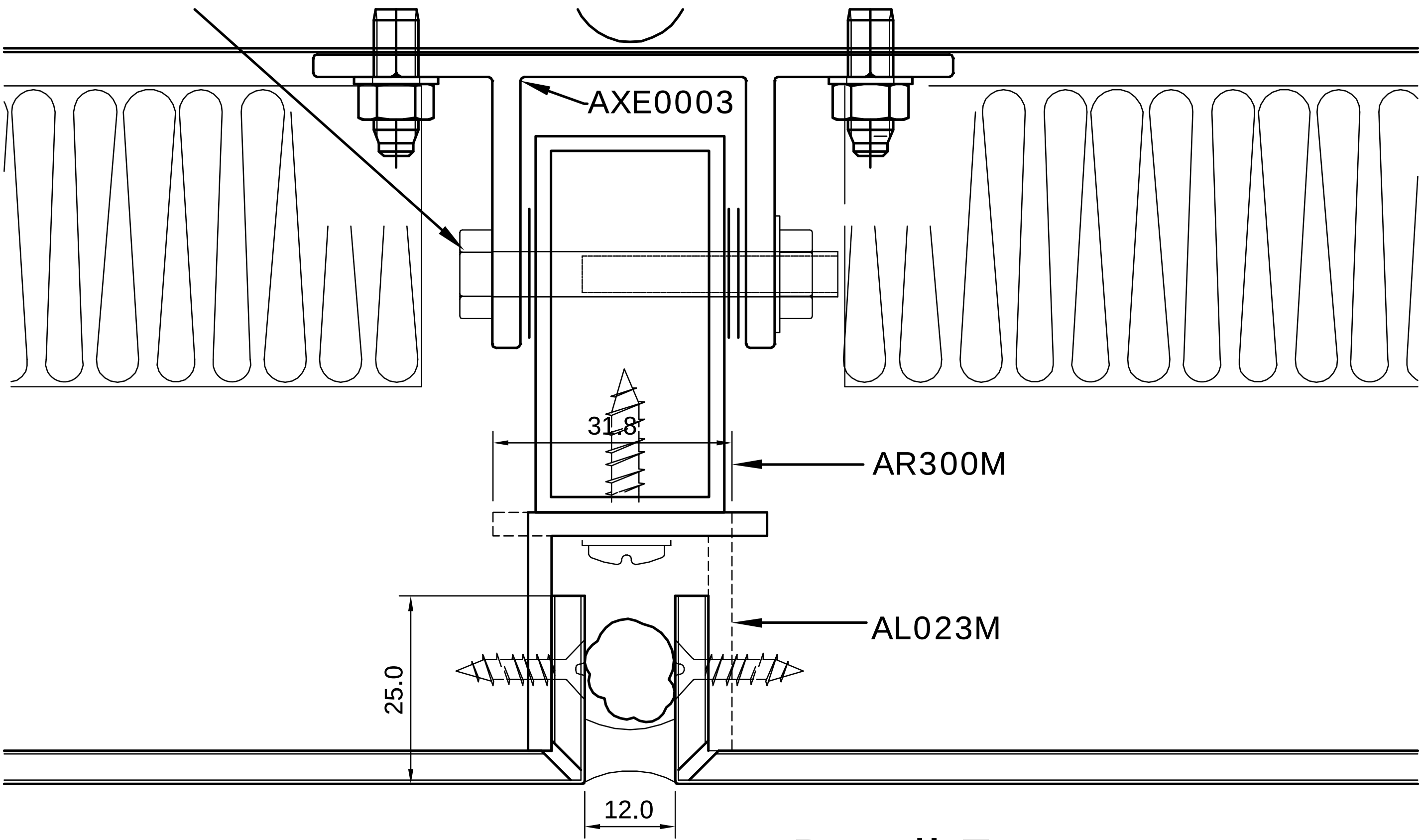
Detail D
Alternative



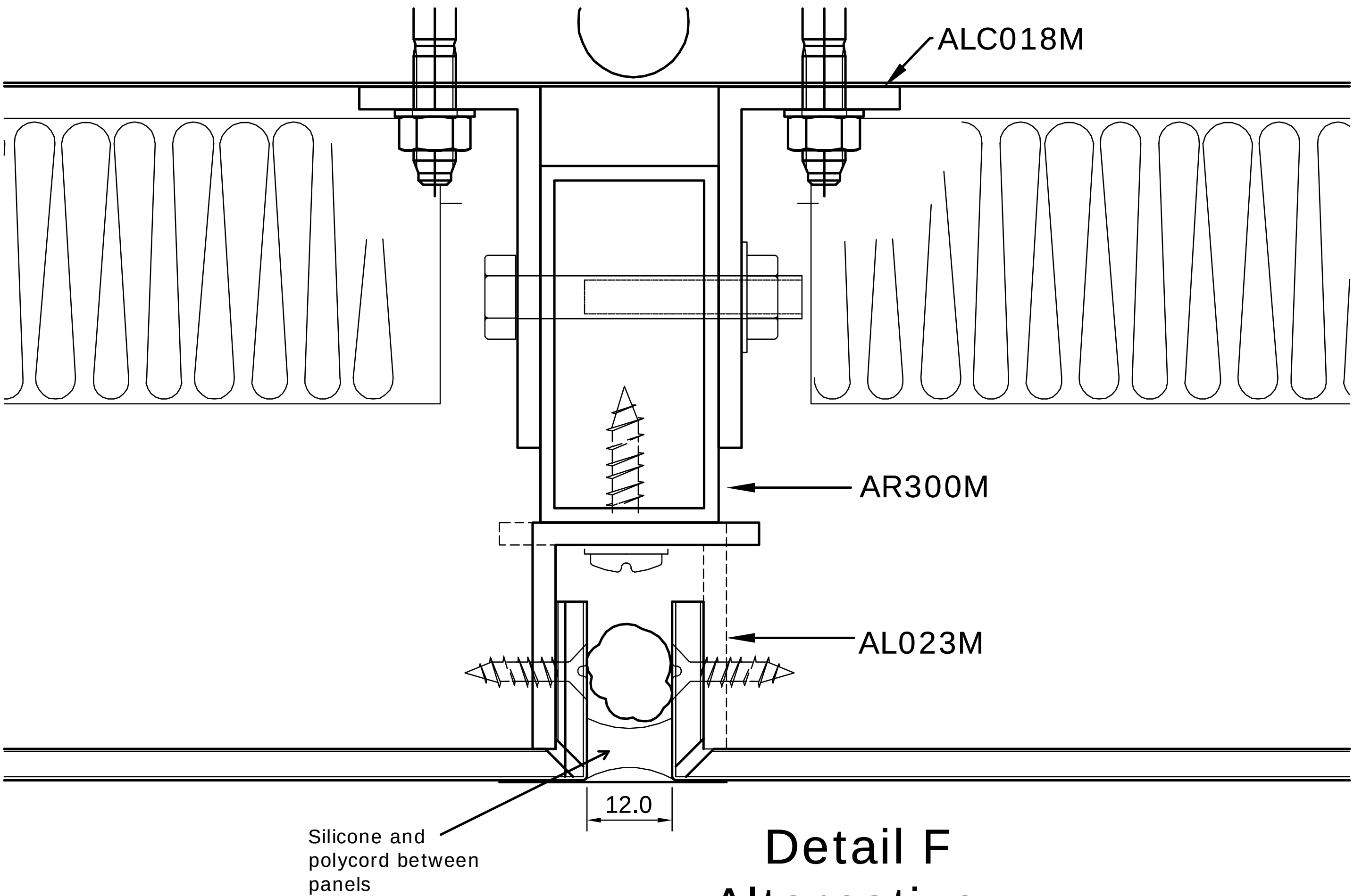

G
E
F
H
Expansion Joint


Number of fixings and brackets per panel
dependent on windload and panel sizes
Consult your facade engineer
All fixings
to be confirmed
by facade
engineer
Insulation If Required
AXE0003
ALC018M
AR300M
AL023M
AR300M
AL023M
25.0
12.0
12.0
Detail E
Detail F
Alternative

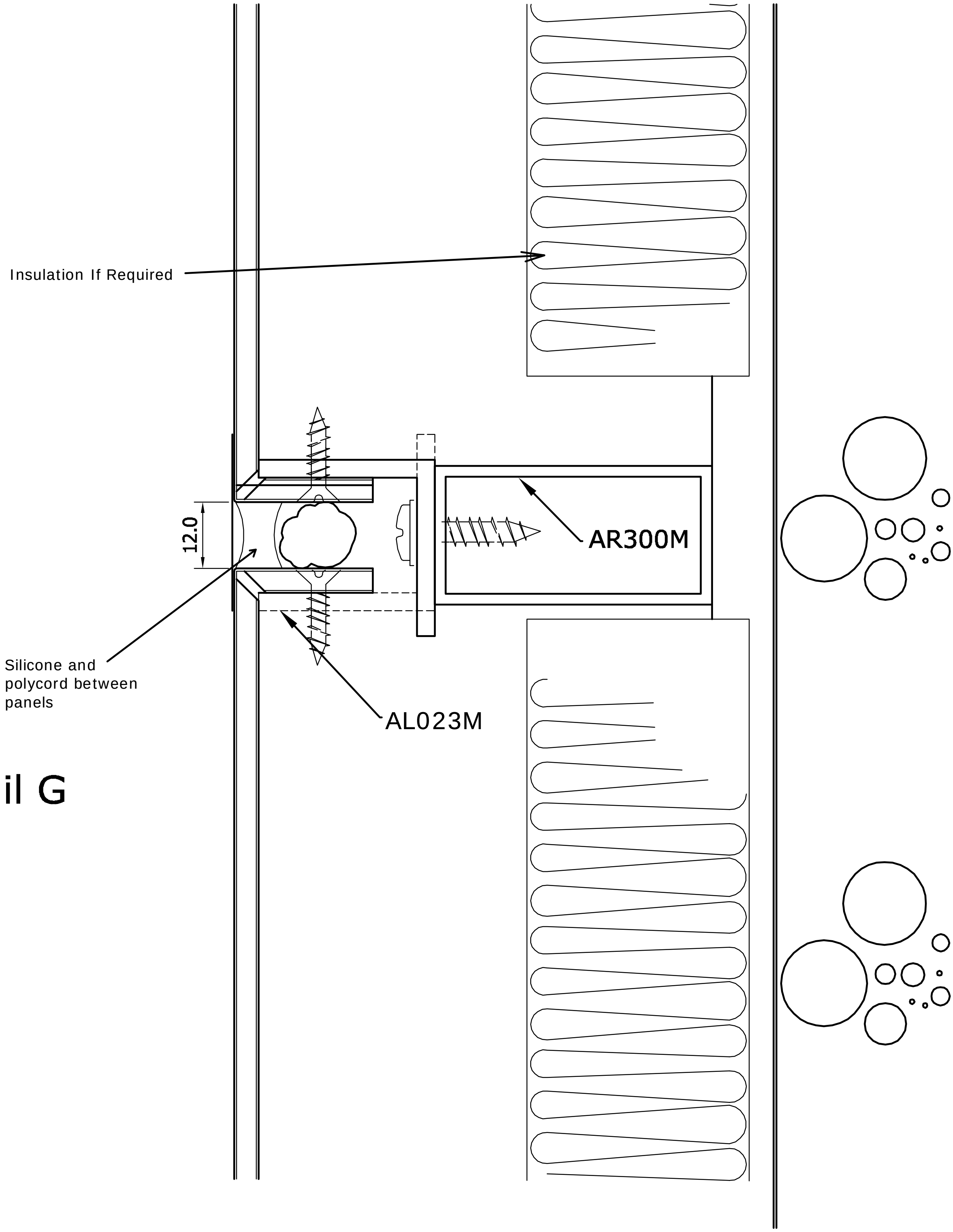

12.0
AR300M
AL023M
Detail G
Last bracket pair < 50mm from stiffener tube
100 Nominal
ALC018
Detail H
AL023M
Flat plate sleeve splice
AR300M
50mm X 25
Stiffener tube
12.0
Folded 1mm
sheet over
panel junction
AR300M
AL023M
Expansion Joint



Detail E

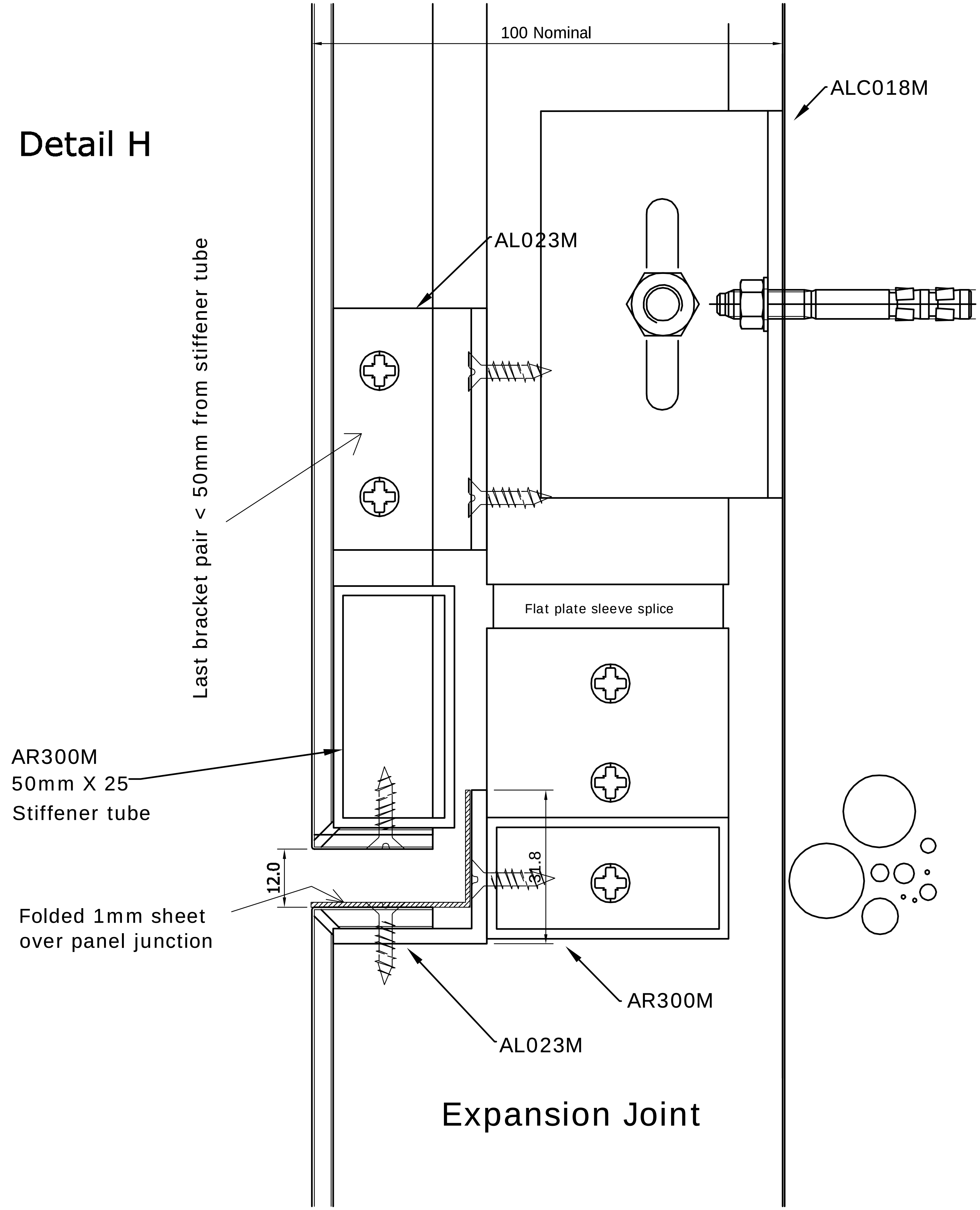


Detail F Alternative

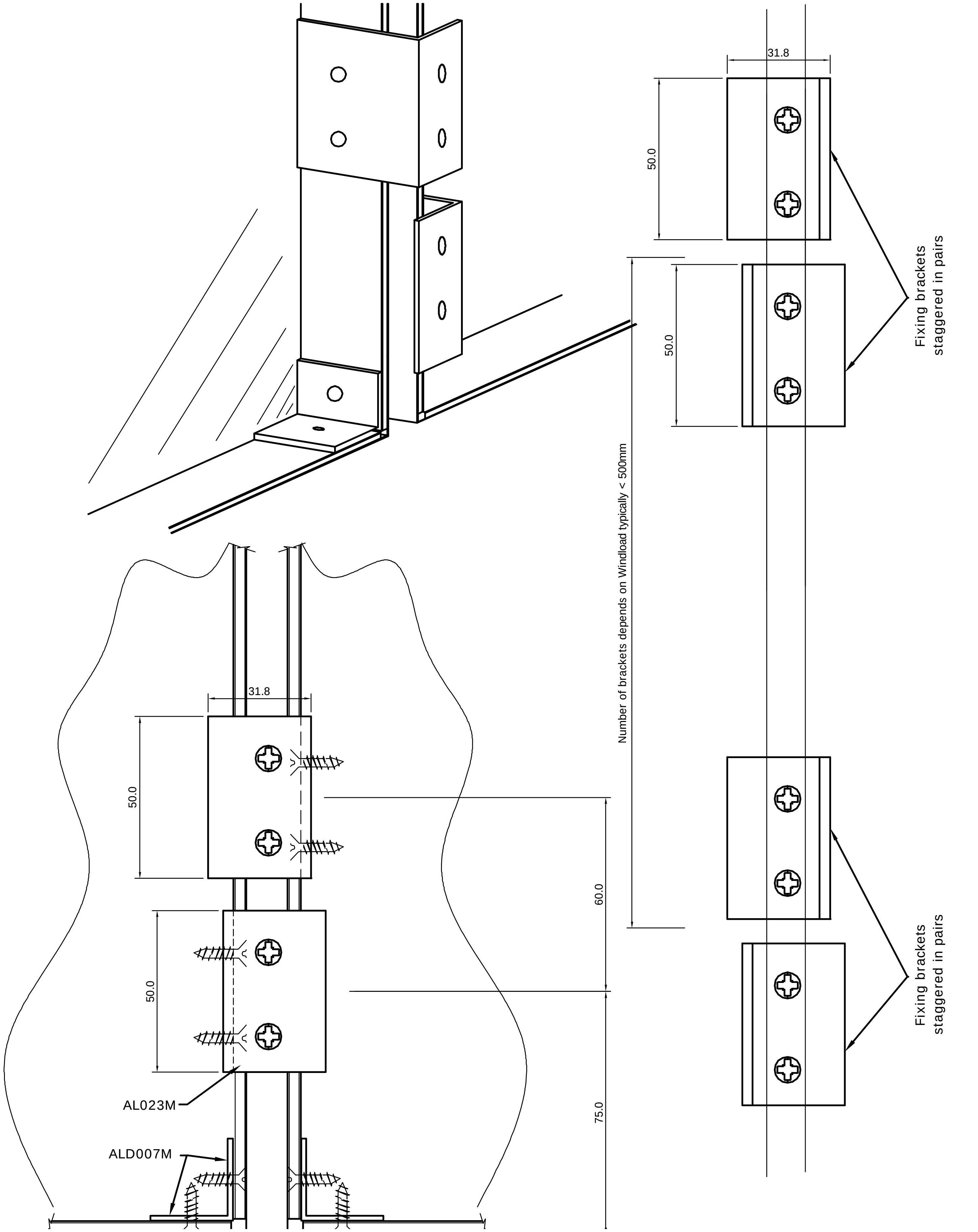

Insulation If Required
12.0
AR300M
Silicone and polycord between panels
AL023M

Detail G

Detail H



Expansion Joint


31.8
50.0
50.0
60.0
75.0
AL023M
ALD007M
Number of brackets depends on Windload typically < 500mm
31.8
50.0
50.0
Fixing brackets
staggered in pairs
Fixing brackets
staggered in pairs

Riveting of HulaBond panels

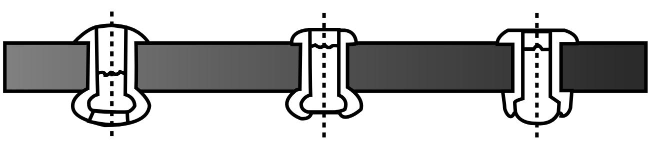
The information provided in this section is for guidance only. Where rivets are used for the structural fastening of the HulaBond panel, we strongly recommend that future information is obtained from the manufacturers of the rivet system used and that this be followed up with pre-production testing of the intended joint configuration. Ultimately, it is the installer's responsibility to ensure that the rivet system and joint geometry used, fully meet the requirements of the task to be accomplished.

As a rule, riveted joints are used where welding is uneconomic or impossible or where the materials to be joined are too thin. Riveting of HulaBond is also frequently used in combination with other fixing systems, for example, to provide clinching during hot air welding and to provide a temporary fastening during cure of an adhesive bond.

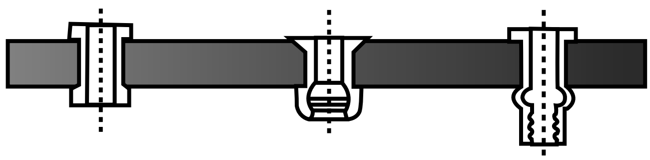
A distinction can be made between solid riveting and blind or "pop" riveting. Solid riveting assumes there is access to both sides of the assembly to be joined, so that rivets can be closed through use of a dolly or snap tool. In instances where it is not possible to use solid rivets, the blind riveting system provides a practical solution. Because access to both sides of the join is invariably limited, our focus is primarily on the use of blind riveting systems.

Rivet systems

According to the type of closing head, the customary blind riveting process can be grouped under "rivets with break-off-shanks" and those with "pull/push-through-shanks". Rivets are available in a wide variety of head shapes. Countersunk rivets should not be used in contact with the HulaBond panel. Some of the most commonly used riveting systems are shown below:



Pop blind rivet | **Gesipa** blind rivet | **Fero** blind rivet

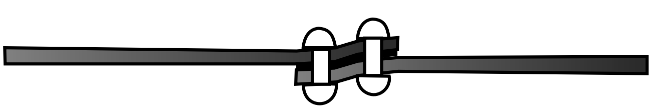


Chobert blind rivet | **Avdel** blind rivet | **Tubtara** blind rivet (nut)

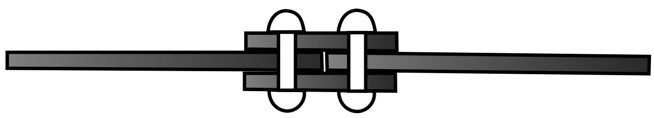
Large flange rivet | **Sealed rivet**

Arrangements of rivets

Rivets can be positioned individually or rows or set over an area. Joints can be made by lap or butt. Lap and single riveted butt joints have a tendency to bulge when subjected to a load, a disadvantage that can be overcome through use of a double butt riveting technique.



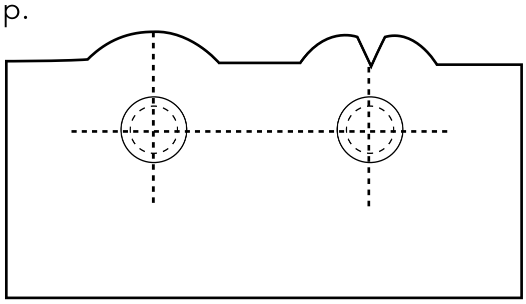
Lap riveting

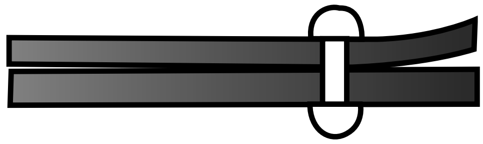


Butt riveting

Edge spacing

With too small edge spacing the edge may bulge or breakout. With too large edge spacing, the edge may curl up.





Rivet diameter

It is hardly possible to give a general ruling on the choice of rivet diameter and rivet spacing. However, an attempt has been made to provide guidelines, which optimise the rivet diameter "d" to sheet thickness "s" so as to take full advantage of the maximum permissible shear strength of the rivet and the maximum permissible pressure on the wall of the holes in the parts to be joined. Where possible, a large head rivet should be used so as to avoid compression of the comparatively soft HBS aluminium composite panel.

Rivet shank length

For clinching a rivet successfully, the shank length must exceed the length of the rivet hole. Too short a shank length may result in too small a head, insufficient clamping and possible loosening, whereas too long a shank length may result in extended closure time, and lateral buckling of the rivet. Further information on selection of an appropriate shank length should be obtained from your rivet supplier.

Riveted joint strength calculations

Where aluminium rivet are used, the transmission of load is largely through resistance to shear, and with aluminium structural components, through the walls of the hole. The installer should check rivet strength requirements with his rivet supplier.

Bearing pressure

Caution is recommended with thin and soft materials, since the edge of the hole can become upset or buckled when subjected to a high load. Head shapes, which hold down the edge of the hole firmly, must be used, or washers and cover strips must be provided. The permissible pressure at the hole wall is defined by the permissible tensile stress of the joint components.

Workshop data

Marking off
Only lead or wax pencils should be used. Scribers acting on the surface panel may give rise to shallow fissures which in subsequent use, especially with structural parts subjected to dynamic loading, can cause fractures. Use of centre punches is acceptable only when the mark is drilled out.

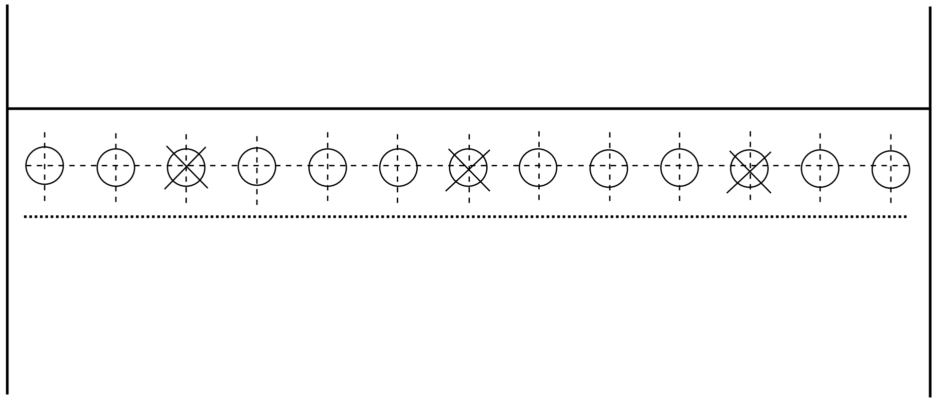
Hole Clearance
The maximum permissible clearance, which depends upon rivet diameter, must not be exceeded. Greater play causes unnecessary work of clinching and can make the strong, tightly-closed fitting of the hole unreliable, or with greater clamping lengths may even lead to bending of the shank. The maximum play between rivet shank and rivet hole diameter is 0.1mm.
Rivet Hole
Rivet Holes are either punched and drilled or predrilled and reamed. Both ends must be cleanly deburred.

Surface treatment
Before assembly, the components must be thoroughly cleaned and cut edges smoothly deburred. Where required, a zinc chromate primer should be applied to improve corrosion resistance and provide protection from friction and notch effects.

Tacking
In order to prevent slipping or distortion of the parts to be riveted they should be held together at intervals by tacking bolts or clamps. To keep tacking time to a minimum, it is advantageous to use quick gripping devices.

Riveting sequence
With long riveted seams stretching of the sheet due to upsetting occurs. In order that this stretching is evenly distributed, rivets should be set using a sequence similar to that shown below. See diagram 1

Removal of faulty rivets
Under no circumstances must the rivet head be chiselled off and the shank punched out. The primary rivet head is to be drilled as accurately as possible down to sheet level where after the residue of the head should be carefully knocked away and the shank removed with a punch or pulled through from the reverse side.



Prevention of Contact Corrosion

Galvanic action can take place when aluminium is joined to an appreciably more noble metal, and the joint exposed to moisture. The moisture acts as an electrolyte to form an electrical couple in which the aluminium, as the less noble metal is prone to attack. The degree of attack depends upon the electrolyte and the type and size of materials, which are in combination.

A couple can also form in an aluminium assembly where moisture has penetrated a crevice. In this way, more oxygen can diffuse into moistened edge zone than into the interior zone thus giving rise to a potential difference, the less aerated inner zone being always less noble than the more aerated outer zone, the former becoming susceptible to attack.

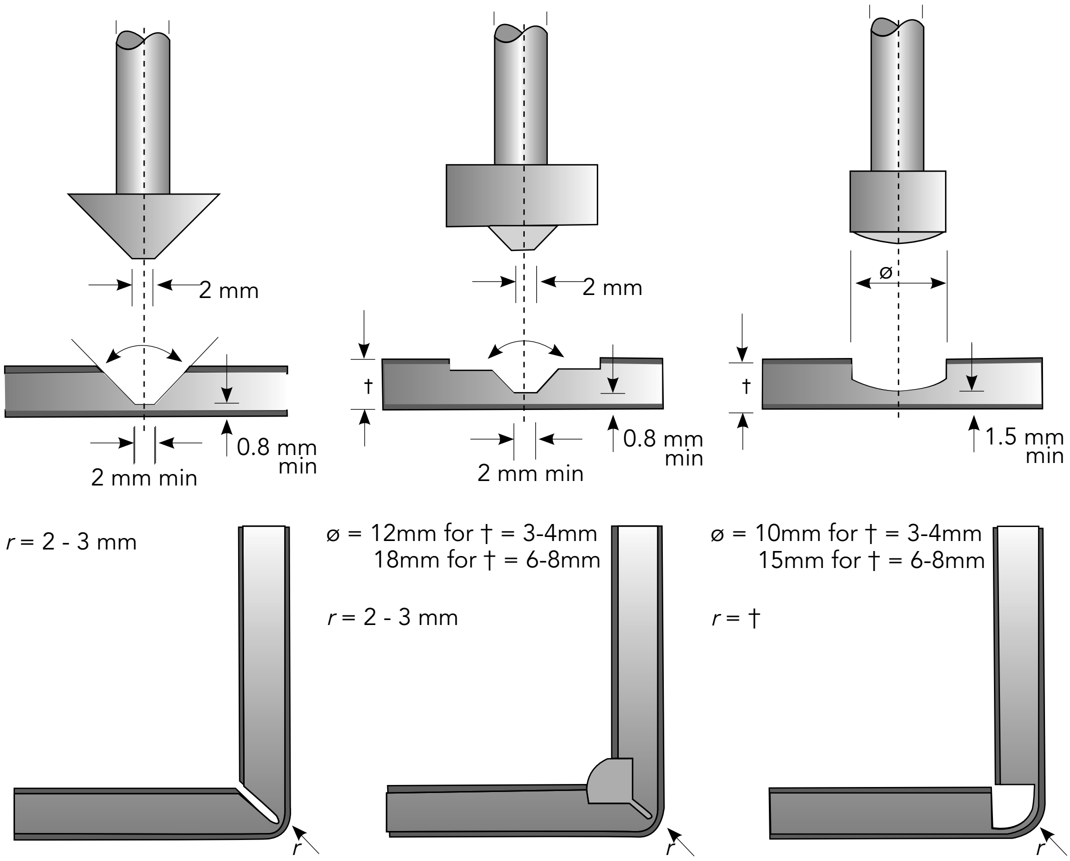
In order to prevent contact corrosion suitable measures should be taken. Avoid pairing aluminium with more noble metals. Minimise the relative area of the more noble material. Increase the electrical resistance and electrical path length between contacting surfaces by treating with a zinc-chromate primer and application of an insulation layer.

The insulating or sealing material used, must not absorb moisture, must be sufficiently pressure proof. Painting is adequate for simple cases. Zinc-chromate primers, bitumen paints, wash primers and rubber-chloride lacquers are particularly suitable.

The use of copper, lead or mercury bearing paints and lacquers and application of graphite bearing lubricants/greases are to be avoided.

5. FABRICATION

5.1 Routing and folding



Conventional, off-the-shelf equipment can be used including: universal, vertical and horizontal routing machines.

To avoid pressure marks on the HulaBond surface when chucking the work pieces, wooded or plastic shims should be used.

The most suitable cutters for both aluminium and HulaBond panels are high-speed steel or carbide tipped cutters which have a wide tooth spacing, radiused and small grooves and small lip angles. These produce perfect cuts under the following conditions:

High-speed steel (HHS) cutters:

Cutting speed max.	3000 m/min.
Feed max.	25m/min.

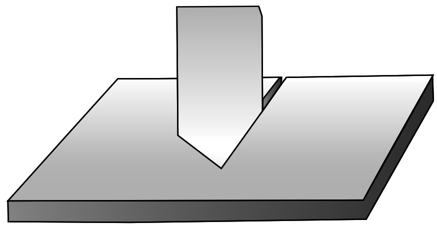
Carbide tipper (CT) cutters:

Cutting speed max.	5000 m/min.
Feed max.	30m/min.

The very simple method of routing makes the shaping ability of the HulaBond one of its major features. The system allows shapes of various kinds and sizes to be formed out of the panel. A v-shaped groove is formed in the panel allowing it to be bent without the use of a brake press.

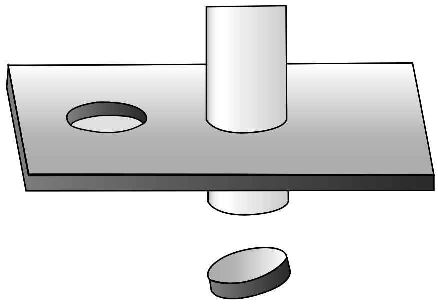
5.2 Shearing

The shearing of HulaBond can easily be done using rotary shears or a guillotine. It is however difficult to avoid light markings caused by the rollers, or a slight drawing of the aluminium cover sheets on the impact side caused by rolling over of the core material. To prevent damage to the HulaBond panel, the hold down on the shear should be fitted with a shock-absorbing rubber pad.



5.3 Punching

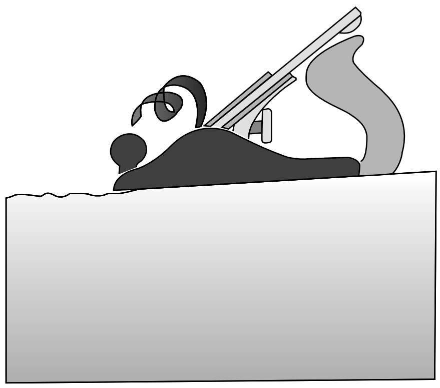
Punching flat-formed parts from an HulaBond is performed in the same way as solid aluminium sheet, using the narrowest possible cutting gap and evenly ground tools.



5.4 Planing and filing of edges

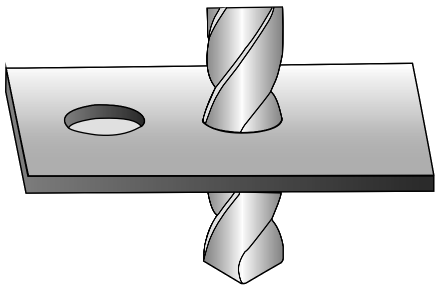
When using a jig saw on HulaBond, swarf is often left behind on the edges of the sheet. For removing this swarf and finishing off the edges, plane cutting files work best. Files with screenlike perforated roots, or tools with very coarse or rasp-like cut are recommended for filing. Through these perforations the swarf will be removed from the tool surface.

The file profile should be from slightly to fully rounded. The proper filing direction is lengthways along the edge. When clamping a sheet of HulaBond between jaws, a shim of wood or plastic will protect the surface against damage.



5.5 Drilling

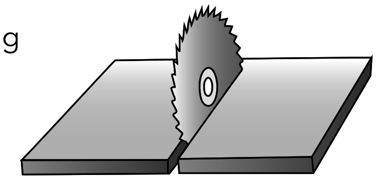
The drilling of HulaBond can be achieved with twist drills normally used for aluminium and plastic on machines common for metals.
Drill material: High-speed steel (HSS)
Tool geometry: Lip angle: 100 degrees – 140 degrees
or spot facing cutter with centre-point.
Angle of twist 30 – 45 degrees
Working conditions: Cutting speed: 50 – 300 m/min.
Feed: 0.02 – 0.5 mm/rev.



By using high-speed, low feed, occasional raising of the drill and blowing with compressed air, the swarf will be rapidly removed.

5.6 Cutting/sawing

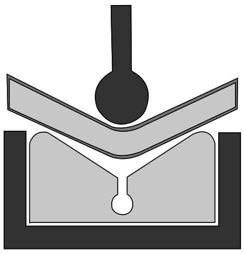
A fine tooth tungsten-carbide tipped (CT) saw blade is the most suitable for cutting HulaBond aluminium composite panel. E.g. A 60 tooth on 250mm diameter.



5.7 Curving/folding

Using the standard 1100-H18, HulaBond can be curved to the following minimum radii:

Panel thickness	4mm	6mm
Radius	175mm	275mm



6. INSTALLATION TIPS

1. Care must be taken to avoid damage of the panels during installation.
2. The plastic protective film must be left on during installation with only enough removed to allow for fixing the panel in position. The protective film must only be removed once all wet trades are off site.
3. Care must be taken to install all panels facing the same direction as per the direction indicators on the panels
4. Allowance must be made for thermal expansion and contraction. See details under product specification.
5. Check spanning capabilities with HBS technical staff prior to installation.
6. When using silicone, care must be taken to ensure that the surfaces being bonded are suitably cleaned, (see manufacturer's instructions) to ensure maximum adhesion.

7. SILICONE BUILDING SEALANTS

7.1 Silicone building

Silicones are man made materials in which organic and inorganic substances are chemically combined The elements silicon is present in sufficient amounts to affect the properties of the materials measurably.

There is a whole family of finished silicone products amongst the sealant family. A characteristic of silicone is its resistance to heat, cold, chemicals and weathering, which makes it extremely widely used as a sealant, within not only the building and glazing field but also in general industry.

Silicone sealants are available in one-component and two-component form. In the one component form, they are supplied in squeeze tubes, or in 310ml caulking cartridges which are used in a hand operated caulking gun. The two-component sealants are less widely used because of their expensive application equipment and reduced versatility.

The commercially available one-part silicone sealant is toothpaste-like in consistency and on being extruded from the container, combines with moisture vapour to form a resilient rubber seal, which is virtually unaffected by weathering and the elements. Naturally the drier the conditions (Highveld winter) the longer the sealant will take to cure. (During curing temperature plays almost no part, however excessive heat may cause bubbles to occur in the silicone, negating the manufacturers warranty. Please adhere to silicone manufacturers guidelines).

To cater for the various surfaces found within the building and construction industry, silicone sealants are available in a wide range of colours. There are two basic types of curing systems available, the older acid curing system, (acetoxy) and the neutral system, which tends to be a little softer and offers better movement capacity.

Acetoxy type

The consistency of this product allows it to be applied over a wide temperature range, allowing application in any kind of weather.

Acetic acid is given off on exposure to the air which can cause irritation if working too close or in confined spaces. Most acetoxy type sealants will develop a skin within 10 – 15 minutes.

The sealant will not sag or slump. NB: If used in conjunction with copper, e.g.: a fascia, there will be very limited adhesion, possibly incomplete curing, due to the acetic acid.

Some typical properties

These are not intended for preparation of specifications, but are used merely as a guide.

Weathering exposure after 10 hrs (In Atlas weatherometer, change in hardness and colour)	None
Tack Free Time (at 25 degrees Celsius)	1 Hour
Movement capability in service	± 25%
Working time, minutes (Dependant on R.H, factor)	10-15
Ozone Resistance	Excellent
U.V. Resistance	Excellent
Elastic Recovery	100 degrees
Service Temperature range	-60°C to approx 230°C

Typical uses

This type of sealant is particularly effective for glazing butt and lap joints, all glass vision systems, curtain walls and other glass, plastic and metal assemblies. It may be factory applied as the primer or as a secondary seal in the components which are erected in situ before receiving the primary seal.

Limitations

- Acetoxy type silicone sealants should not be applied to: concrete, marble, limestone, lead and lead surfaces, galvanised iron and copper.
- To surfaces which may bleed oils or solvents: - they include impregnated wood, curtain rubbers, or tapers (e.g. Neoprene)
- In totally confined spaces, as the sealant requires atmospheric moisture to cure.
- To surfaces which will be painted, as a paint film does not stretch with the extension of sealant. The paint will not adhere strongly to the sealant.
- If used with mill finish aluminium, extensive cleaning and priming must be done.

Joint design

A thin bead silicone sealant will accommodate more movement than a thick bead. The thin bead is therefore more desirable. The ideal ratio of a joint width to depth is 2:1. Closed cell polyethylene is the recommended bond breaker. The use of this bond breaker prevents undesirable three-sided adhesion.

Small curtain wall panels should allow a minimum width of 4 times the expected movement. If plastic is involved, the coefficient of thermal expansion is greater and therefore necessitates larger joint dimensions. In that case the neutral curing sealant or lower modulus product should be used.

8. PRODUCT TESTS

8.1 Tests

The following tests have been performed on the HulaBond Composite Panel.

1.	Surface Fire Index	SABS 0177
2.	Toxicity Index of Materials	Nes 713
3.	Thermal Resistance (Winter conditions)	SABS
4.	Thermal Resistance (Summer conditions)	SABS
5.	Resistance to impact by hail	ASTM E822
6.	Flexural properties	ASTM C393
7.	Flatwise tensile properties	ASTM C297
8.	Climbing drum peel test	ASTM D1781
9.	Flatwise plane shear tests	ASTM C273

9. PHYSICAL PROPERTIES (4mm and 6mm HulaBond panels)

	Standard 4mm panel	Non standard 6mm panel
Weight		
Mass per unit area (kg/m²)	5.51	7.38
Density (kg/m²)	1380	1230
Mechanical Properties of panel		
Section Modulus - (cm²/m)	1.54	2.53
Modulus of rigidity (EI) (kNm²/m)	0.23	0.57
Minimum curving radius (mm)	175	275
Properties of aluminium outer cover sheet		
Alloy	1100-H18	1100-H18
UTS (N/mm² Max.)	220	220
0.2% Proof strength (N/mm² Min.)	170	170
Elongation (in 50mm)	2% Min.	2% Min.
Max. permissable outer cover sheet stress	97	97
Modulus of elasticity (N/mm²)	70000	70000
Properties of polyethylene core		
Shear Modulus (N/mm²) (ASTM C273)	308	308
Core shear stress at failure (N/mm²) (ASTM C393)	1.90	1.90
Bond integrity		
Flatwise plane shear (N/mm²) (ASTM C273)	15.9	15.9
Flatwise tensile strength (N/mm²) (ASTM 297)	13.0	13.0
Climbing drum peel strength (Nmm/mm) (ASTM D1781)	172	172
Thermal properties		
Thermal resistance (Calc.) (m²K/W)	0.0097	0.0172
Coefficient of linear-thermal expansion mm/mk	0.024	0.024
Surface fire properties		
Surface fire index test on finishing materials (SABS 0177-111)		
Spread of flame index	Nil	Nil
Heat contribution index	Nil	Nil
Smoke emission index	0.16	0.16
Surface fire index	0.05	0.05
Class	1	1
Toxicity index on materials for air-conditioning ductwork (NES 713)		
Smoke toxicity index (core only)	2 (low toxicity)	2 (low toxicity)
Note smoke toxicity between: 0 and 3 indicates a low smoke toxicity 3 and 5 indicates an intermediate smoke toxicity. Above 5 indicates a high smoke toxicity		
Impact properties		
Resistance to impact by hail (ASTM E822)		

	Depth of Indentation	
Stone diameter (mm)	Velocity (m/s)	4mm panel (mm)
25	30.12	0.5
50	36.23	2.5
75	50.51	11.5

10. TYPICAL HULABOND REACTION TO CHEMICAL SPILLAGE

Chemicals	Concentration	HulaBond
Petrol, Gasoline	Concentrated	No change
Water	Concentrated	No change
Germicide	Concentrated	No change
Acid of vinegar	10%	No change
Ethanol	25%	No change
Ethanol	95%	No change
Paraffin/Diesel oil	Concentrated	No change
Caustic potash sol.	10%	No change
Sea water (NaCl)	3.5%	No change
Soda lye (NaOH)	10%	No change
Sodium carbonate	10%	No change
Hydrochloric acid	10%	No change
Nitric acid	10%	Colour change
Sulphuric acid	10%	No change
Typical washing agent	5%	No change

11. HULABOND SURFACE COATING PROPERTIES

Property	ASTM	Criteria	Result
Coating thickness	CNS8406	µm	>25.0
Gloss	D523-89	At 60°	20 - 75
Pencil Hardness	D33633-74		2H
Flexibility (T-bend)	D4145-83	No Cracking	2T no rift
Adhesion	D3359-87	100°C 2 hours	No adhesion loss
Abrasion resistance	D968-81	Falling sand 20 liters/mil	50-80 KTR no crack
Mortar resistance	D605.2-90	Test 7.7.2 / 24 hours	24 hours. Pat test
Humidity resistance	D714-87	At 35°C	3000 hours. No blister
Boiling water resistance	D3359-B		Passed
Salt spray resistance	D117-94	Blister-10 Scribe-8	3000 hours. No blister
Acid resistance	D1308-87		Passed
Alkali resistance	D1308-87		Passed
Chalk resistance	D4214-89		Max. chalk = rating of 8

SOLID COLOUR SERIES

04 Pure White

08 Ivory White

09 Deep Blue

10 Green

11 Red

13 Yellow

14 Black

15 Light Blue

1003 Milk White

1006 Grey

1014 Dark Green

1017 Finland Green

1020 Orange

1046 Grass Green

1052 Pink

As a result of printing processes, this colour chart is not an exact replica of actual product colours.

HulaBond Aluminium Composite Panel

METALLIC COLOUR SERIES

01 Glossy Silver

02 Silver Grey

03 Champagne Gold

05 Gold

06 Jade Green

07 Metallic Grey

18G Gold Brushed

18S Silver Brushed

1034 Copper

As a result of printing processes, this colour chart is not an exact replica of actual product colours.

NUKLIP

HULASIGN

HULABOND

COASTAL

HBS
Jhb (011) 626 3332 / 3337
Durban (031) 564 7350
Cape Town (021) 552 5884
PE (041) 403 1400

ARM 30176