Ash&Lacy
building systems

a Hill & Smith Holdings Plc Company

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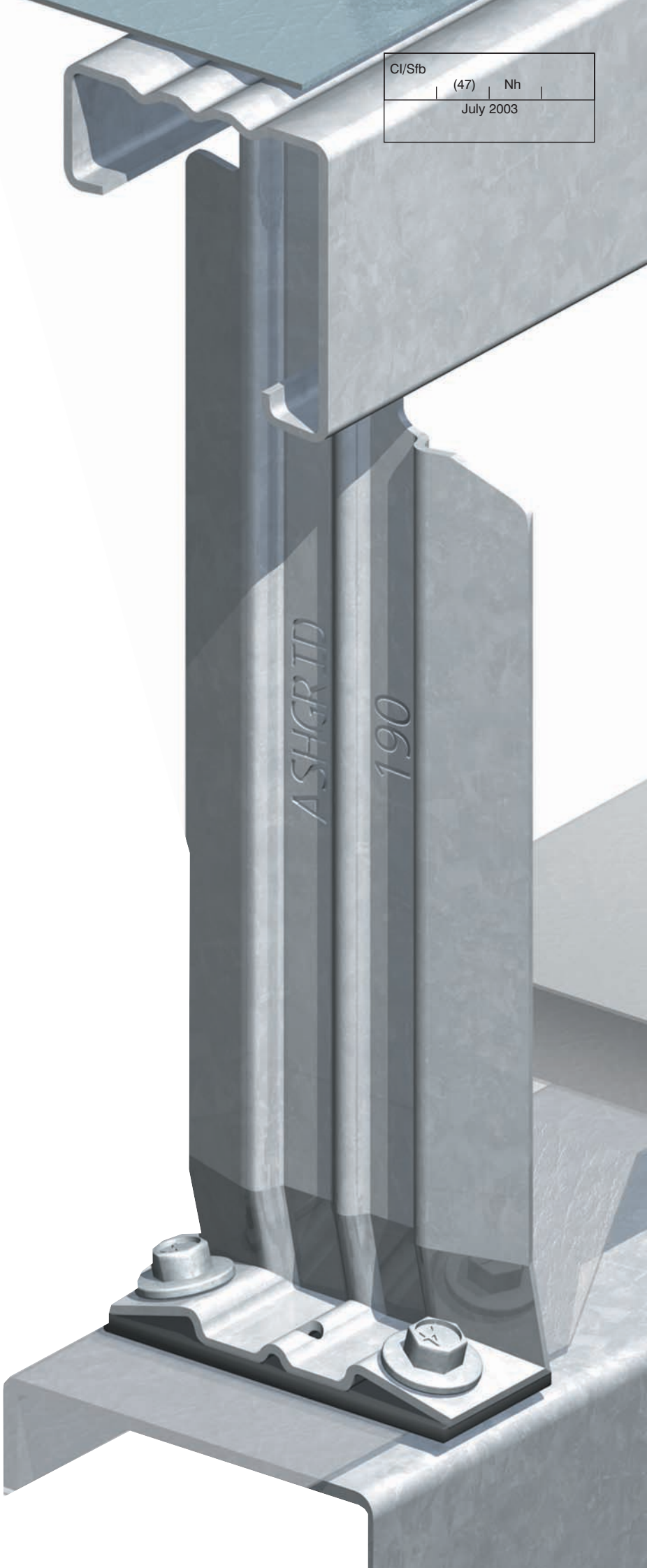
Ashgrid™

spacer support system



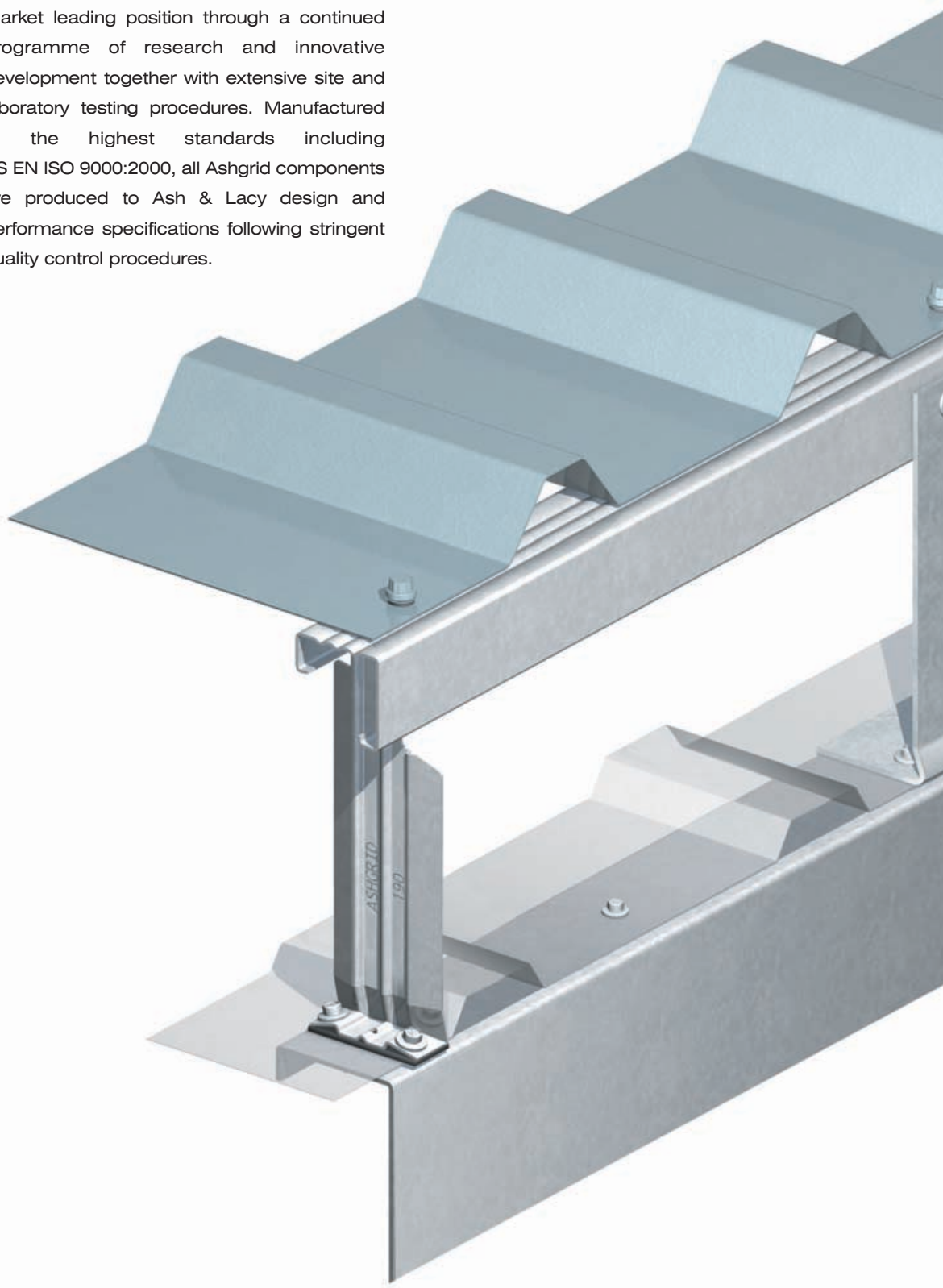
Introduction

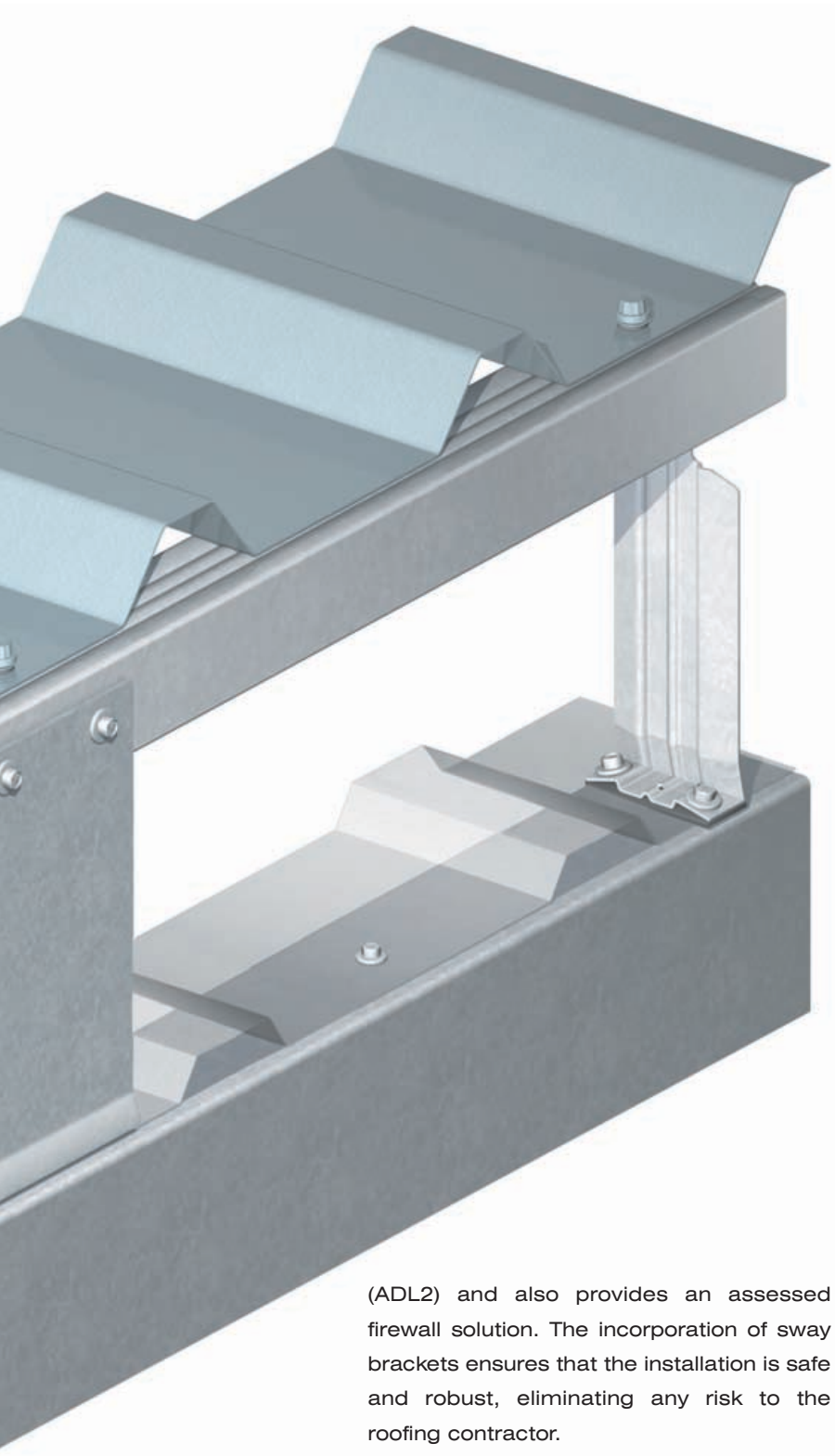
features and benefits

As market leading manufacturers and distributors of metal cladding building systems and ancillary products to all sectors of the construction industry Ash & Lacy is committed to providing engineered solutions of the highest quality.

Developed and launched by Ash & Lacy in 1988, Ashgrid was the first spacer support system for built-up metal roofing and cladding. Since its launch, Ashgrid has maintained its market leading position through a continued programme of research and innovative development together with extensive site and laboratory testing procedures. Manufactured to the highest standards including BS EN ISO 9000:2000, all Ashgrid components are produced to Ash & Lacy design and performance specifications following stringent quality control procedures.

The Ashgrid spacer support system is a strong, simple and efficient method of installing metal roof and wall cladding systems. The fully engineered bar and bracket make the Ashgrid system unique as it is fully adjustable yet maintains its structural integrity. Offering a wide range of bracket heights, the system is versatile enough to meet the stringent performance requirements of Approved Document L2





(ADL2) and also provides an assessed firewall solution. The incorporation of sway brackets ensures that the installation is safe and robust, eliminating any risk to the roofing contractor.

Ashgrid is supported by a highly skilled technical team which is available to give design and application advice on a wide variety of issues. Three strategically placed distribution centres in London, the Midlands and Scotland hold extensive stocks of Ashgrid to guarantee fast delivery to site to meet the tightest of deadlines.

- **The UK industry standard – over 50 million metres installed to date**
- **Full range of roof, horizontal / vertical wall and firewall solutions**
- **Firewall applications assessed by the Warrington Fire Research Consultancy**
- **Incorporates Ashgrid sway brackets that ensure stability at greater system depths**
- **Engineered to Ash & Lacy design drawings and performance specifications in accordance with BS EN ISO 9000 : 2000**
- **Stringent testing procedures guarantee quality and ensure product is fit for purpose**
- **Ribbed bar ensures maximum pullout capacity for screw fixings**
- **Twin fixing holes, angled for increased stability and resistance to pullout**
- **Thermal pad prevents cold bridging and cushions against fastener stress**
- **Bar end spigot for easy alignment and continuity**
- **Fast, safe and cost effective fixing method**
- **Meets performance requirements of ADL2**
- **Full design and technical support package available**

Ashgrid™ research & development

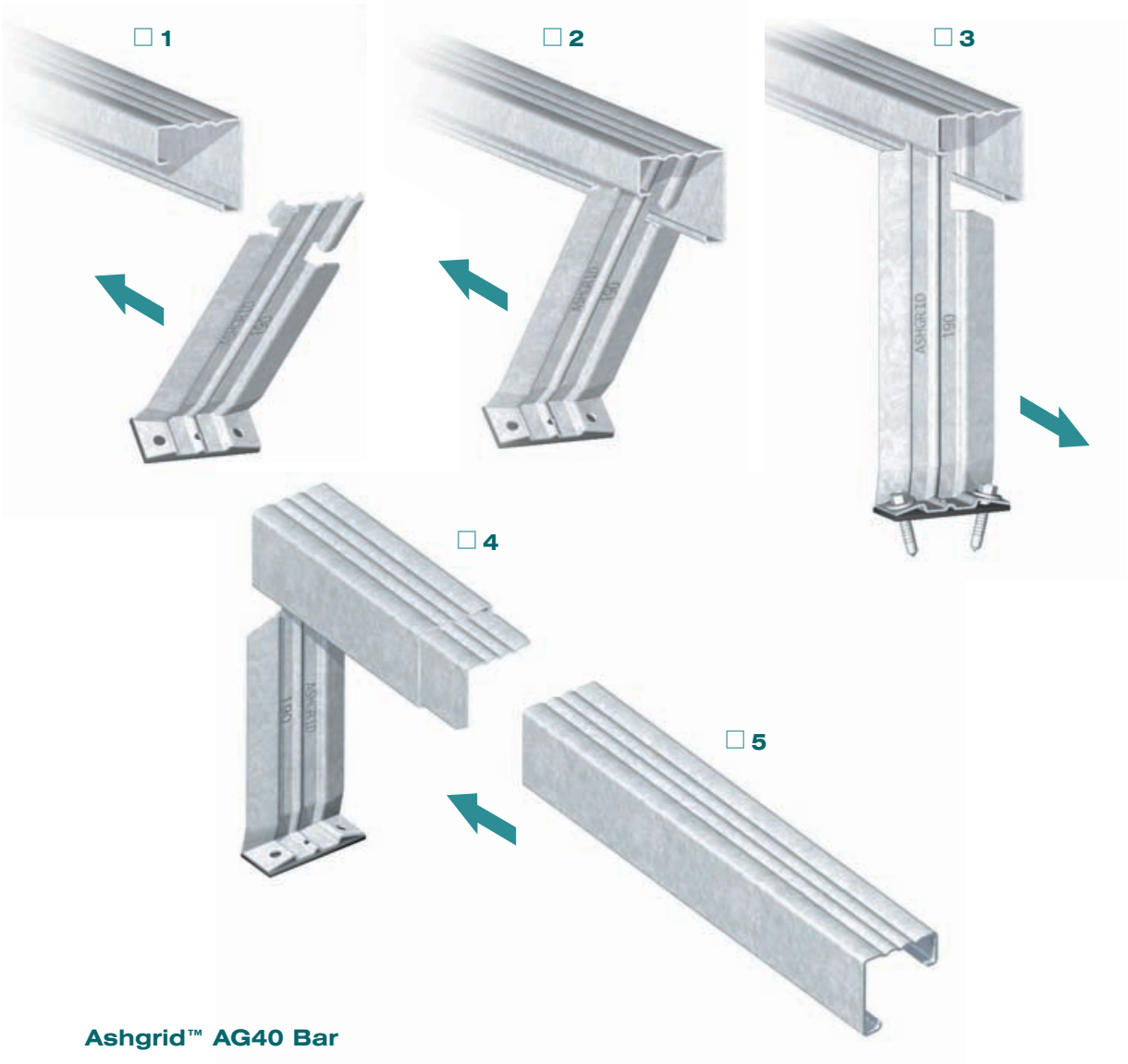
A continuous programme of research and development ensures that Ash & Lacy maintains its market leading position by developing innovative and technologically advanced solutions to meet the ever-changing needs and regulatory requirements of the UK construction industry.

As part of this commitment to research and development Ash & Lacy has made a considerable investment in a state-of-the-art testing facility at the company's West Bromwich headquarters. As reliability and performance are two of the most important criteria all Ashgrid components undergo rigorous testing procedures to ensure they meet the design-life requirements of a building. This not only ensures consistency of product performance but it can also be used as a valuable resource to provide assistance in application solutions.

Components are tested for various loading conditions:-

- **Download**
- **Uplift**
- **Side sway**
- **Pull out**

With Ashgrid, nothing is assumed, everything is proven.



Ashgrid™ AG40 Bar

Manufactured from 1.25mm thick high yield galvanised steel to S390GD + Z275 NA-C. Coil to EN 10147: 2000. Minimum yield: 390N/mm², Minimum tensile: 460N/mm². Supplied in lengths of 1m, 2m & 3m incorporating spigot end for easy on-site connection.

Ashgrid™ Brackets

Manufactured from 1.6mm thick galvanised steel to FEPO2G + Z275 BS EN 10142. Supplied with a 3mm thick EPDM base thermal insulator pad the standard bracket heights (mm) are: 60, 80, 85, 90, 100, 110, 120, 130, 135, 140, 150, 160, 170, 180, 190, 195, 200, 210, 220, 230, 240 & 250.

Ashfix™ Fixings LS25 (1.25mm - 3mm thickness steel)

For fixing brackets into thin gauge steel use LS25 fixings. To ensure maximum sheet to bar fastener performance use LS25 with G16 washers for walls, G19 for roofs and G29 for rooflights.

1. Offer the bracket to the bar at an angle from the non-spigot end.
2. Slide brackets along the bar to the desired fixing positions.
3. Snap each bracket upright to lock into position at 90° to the bar. (Brackets may be repositioned by pushing the bracket back to an angle and sliding along the bar as in step 1). Install two inclined fasteners ensuring the bracket does not twist in the bar.
4. Making certain there is a bracket within 100mm of a spigot end, install other brackets to match the liner module up to 1m centres maximum. (Bracket centres may need to be reduced in areas of high wind suction or heavy snow loading).
5. Engage the open end of the bar onto the spigot and push firmly for continuity and easy alignment.

Traditionally, a twin skin metal roof assembly incorporated an 83mm bracket height which provided a stable and robust construction. However, with the new ADL2 of the Building Regulations, and C.E. compliant insulation, more stringent thermal requirements for building envelopes are leading to a bracket height of 190mm and more. Such a deep construction could render the system unstable with the brackets tending to sway like a pack of dominoes under the influence of excessive loads.

A roofing system is at its greatest risk during the installation stage when it is not restrained by the sheeting and is subjected to loading from access traffic, temporary loading and heavy sheet packs. This combined with drag forces from high winds could compound the problem further.

Recognising this risk, Ash & Lacy has developed a sway bracket constructed from 3mm thick galvanised steel. This not only offers stability during installation, but provides a permanent feature of the complete roof.

Installation

1. Install a sway bracket at the beginning and end of the bar line to ensure the Ashgrid system is stable and not subject to any sway. This prevents the brackets from moving out of plumb and ensures they remain vertically upright.

2. Fix screws into the outer top two holes of the bracket into the sidewall of the AG40 bar. Proceed with fixing two screws into the base of the bracket through the liner and into the purlin flange using the two outer holes local to the bracket web.

3. For the internal bays position the sway brackets on the rafters where the heavy sheet packs are intended to be loaded and fix as above. Alternatively the sway brackets may be positioned on alternate rafters. In both cases this will prevent any localised crushing of the Ashgrid system.

4. Do not load out the Ashgrid system until all brackets are installed and fixed.

SWAY BRACKET USAGE GUIDE

Bar type	Bracket Depth (mm)	Sway Bracket Depth (mm)
Ashgrid AG40	160, 170, 180	160
	190, 200, 210	190
	220, 230, 240	220
Ashgrid AG60	120 - 240	To match bracket depth

Bracket Stability

To demonstrate the change in behaviour of spacer support systems that incorporate deeper bracket heights, an Ashgrid system was set up with a 40kg horizontal load applied to the bar. When the load was applied to an 83mm deep bracket (pre-ADL2 compliant), a sideways movement of only 1.5mm was experienced. However, when the same load was applied to a 190mm deep bracket (ADL2 compliant) a sideways movement of 17mm was recorded (figure 1). **This is not unique to Ashgrid and other bar and bracket systems will behave in a similar way**.

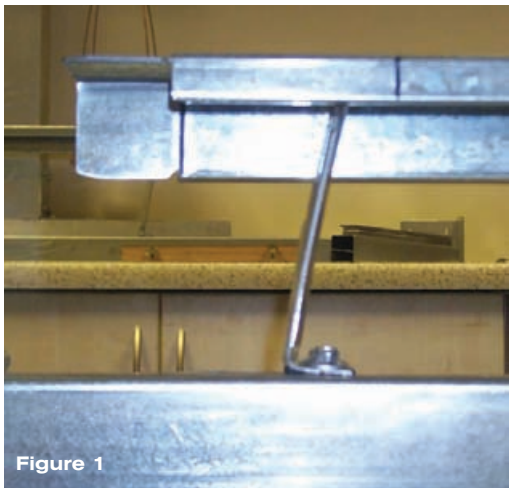


Figure 1

An Ashgrid sway bracket was then installed to anchor the 190mm deep system. The resulting sideways movement was only 0.7mm, and applying a further total lateral load of 100kg resulted in only a 3.5mm sideways movement.

This demonstrates that shallow brackets (pre-ADL2) were extremely stable and not prone to any sway. With deeper constructions the sway bracket not only anchors the system against any type of side movement but also ensures that all brackets remain plumb and vertical preventing any premature failures as a result of inclined brackets.

Load Capacity

To determine the load capacity of a vertical 190mm deep Ashgrid bracket, a load was applied as shown in (figure 2). The Ashgrid bracket failed at 5kN (1/2 tonne) by the bending of the head and a slight inclination


Figure 2

of the body of the bracket. Applying a safety factor of 1.6, the working capacity for the bracket can be confirmed as 3kN and is used as criteria for the Ashgrid loadspan tables. By inspection, the Ashgrid bracket is clearly unsuitable to receive heavy sheet packs weighing 2 tonnes.

To prevent this local crushing under heavy loading, we would recommend the use of sway brackets at appropriate locations. Tests demonstrate that the Ashgrid sway bracket will withstand a force of 10kN (1 tonne) under a local point load (figure 3). (A 2 tonne pack would generally spread the load over 3 or 4 sway brackets fixed to purlins at rafter positions, the pack also spreads the load over a 1m wide area as opposed to a point load as tested.)

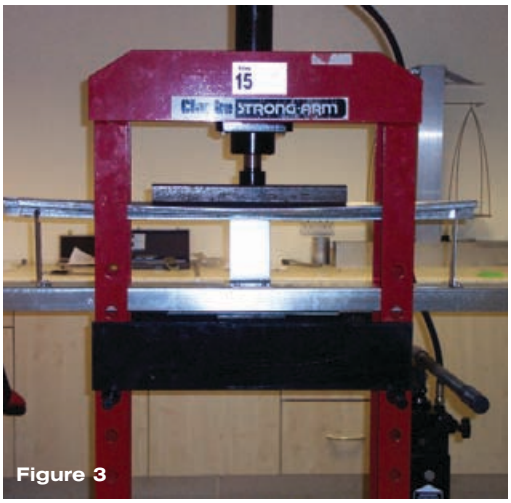
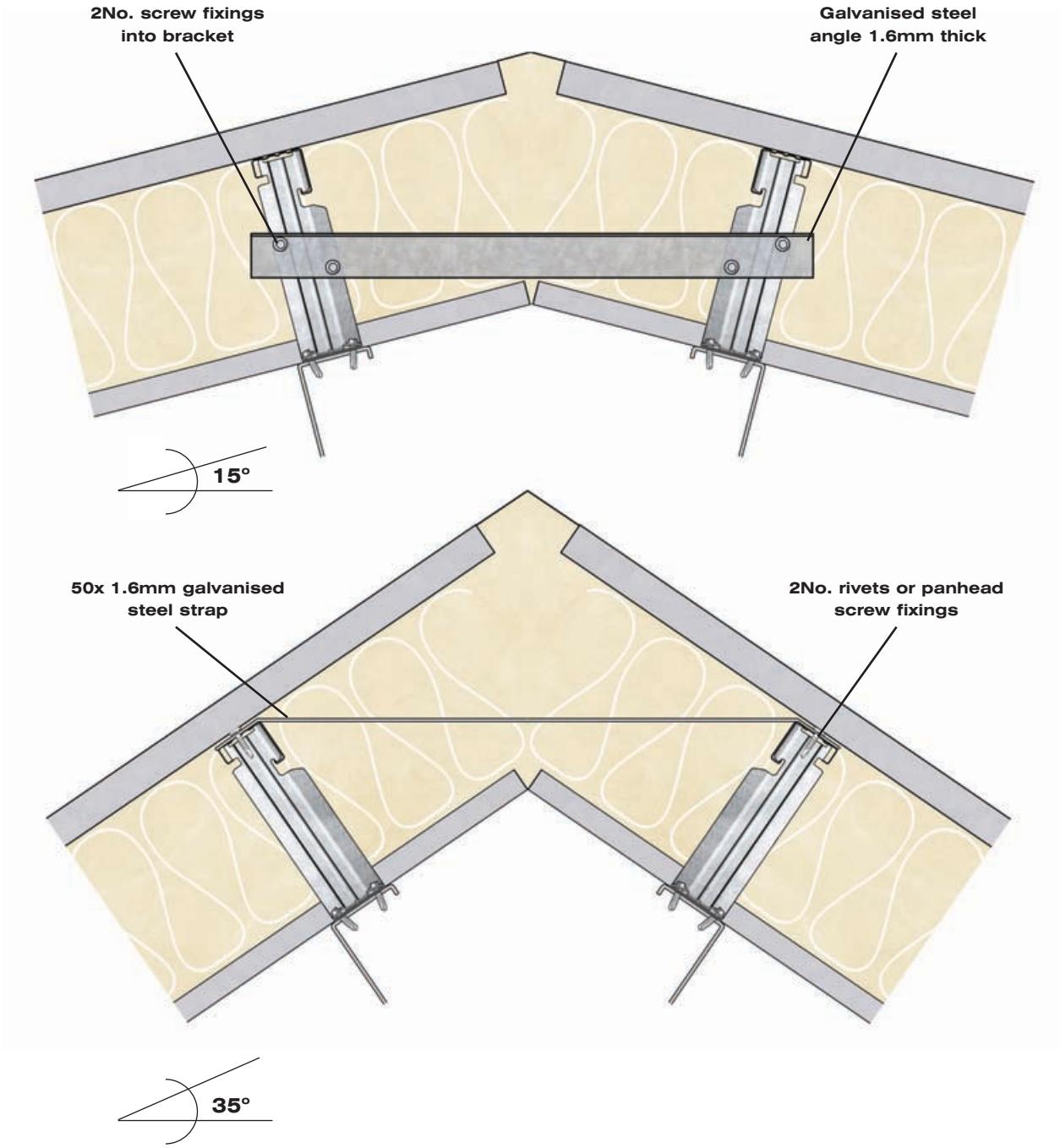


Figure 3



Roof construction

steep pitched roof

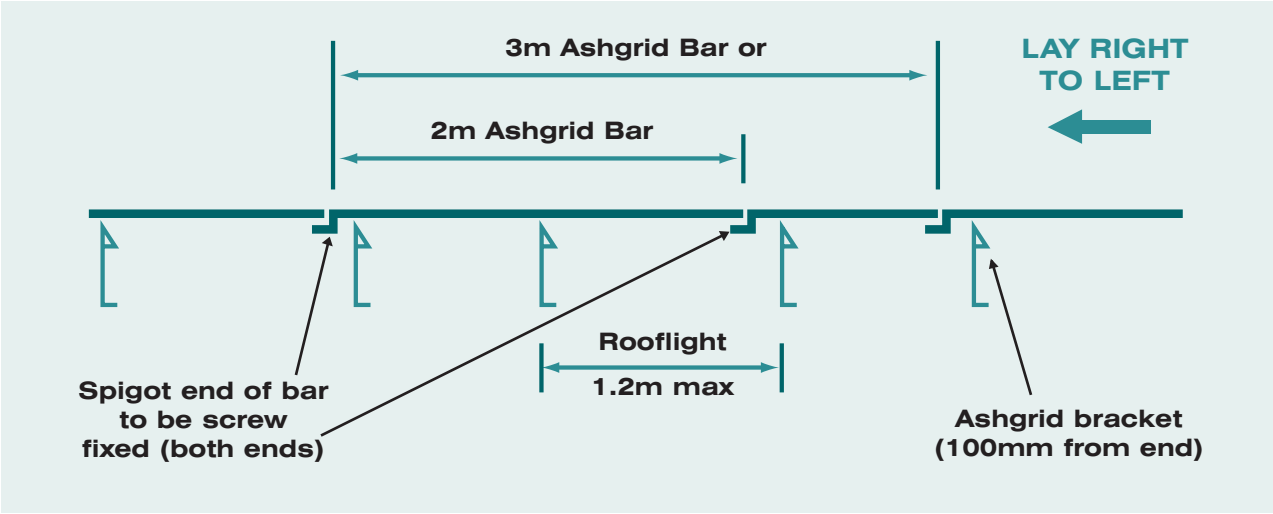
With roof constructions ever increasing in depth there is a tendency for the support system to rotate down the slope by the action of the roof loading. To prevent this, the ridge brackets must be fully tied together as illustrated. Screw fixing the end and side laps of the roof sheet ensures continuity. This enables each roof slope to act as a stress plate hanging from the fixed ridge detail and reduces any downslope movement.

Steel sections need to be fixed across every apex bracket as shown. Where the pitch is too steep to introduce such a member then a steel strap is fixed over the bar at the bracket positions with rivets or flathead screws to allow the sheet pans to sit on to the bar.

During installation it is clear that the apex brackets need to be in line to allow the fixing of the cross members. To eliminate any out of balance forces it may be prudent to sheet both slopes in unison, gradually working up to the ridge detail.

Note

Ashgrid brackets either side of ridge need to be installed in line.



A rooflight build-up conforming with the requirements of ADL2 requires the Ashgrid brackets to be installed either side of the module, resulting in the Ashgrid bar spanning 1200mm as shown above. To maintain the structural adequacy of the bar, we would recommend either a 2m or 3m length of bar positively fixed at each spigot end to provide the continuity required over the central rooflight zone.

In areas of high wind suction loads or heavy drifting snow the bar is further reinforced with a top hat 40 section. This sits tightly over the Ashgrid AG40 for a distance of 1500mm over this bay and is screwed to the bar at 500mm centres along its length. Supplying the top hat in standard 6m lengths will allow modules of 1500mm long to be cut from this.

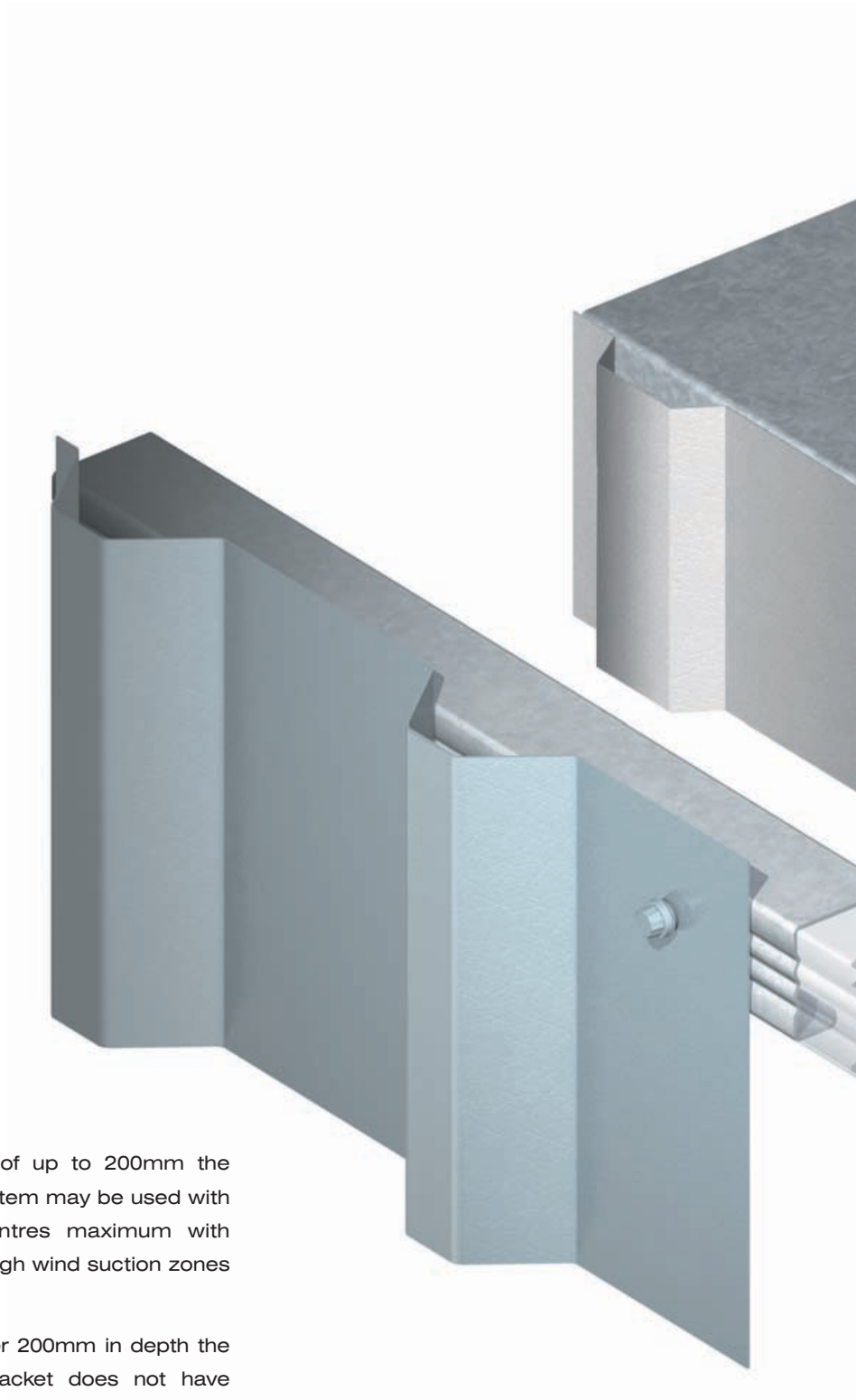
LOAD SPAN TABLE FOR AG40 ROOFLIGHT DETAIL

	Bracket centres along bar (m)	Direction of loading	Purlin Centres (m)					
			1.0	1.2	1.4	1.6	1.8	2.0
			Loading in kN/m2					
AG40 BAR	1.0	Download	2.23	1.86	1.59	1.39	1.24	1.12
		Uplift	**2.55**	**2.13**	**1.82**	**1.59**	**1.42**	**1.28**
	1.1	Download	1.84	1.54	1.32	1.15	1.02	0.92
		Uplift	**2.11**	**1.76**	**1.51**	**1.32**	**1.17**	**1.05**
	1.2	Download	1.55	1.29	1.11	0.97	0.86	0.77
		Uplift	**1.77**	**1.48**	**1.26**	**1.11**	**0.98**	**0.89**
AG40 BAR WITH TH40	1.0	Download	3.00	2.50	2.14	1.88	1.67	1.50
		Uplift	**3.00**	**2.50**	**2.14**	**1.88**	**1.67**	**1.50**
	1.1	Download	2.73	2.27	1.95	1.70	1.52	1.36
		Uplift	**2.73**	**2.27**	**1.95**	**1.70**	**1.52**	**1.36**
	1.2	Download	2.50	2.08	1.79	1.56	1.39	1.25
		Uplift	**2.50**	**2.08**	**1.79**	**1.56**	**1.39**	**1.25**

Notes

- All loads are working loads
- Steel based on Z35 material
- Download deflection = span/200
- Figures limited to a bar/bracket connection load of3kN.
- Pull-out of screws into purlin assumed to be 3kN.
- Ultimate bending stress is based on a load factor of 1.6 for download and 1.4 for uplift.

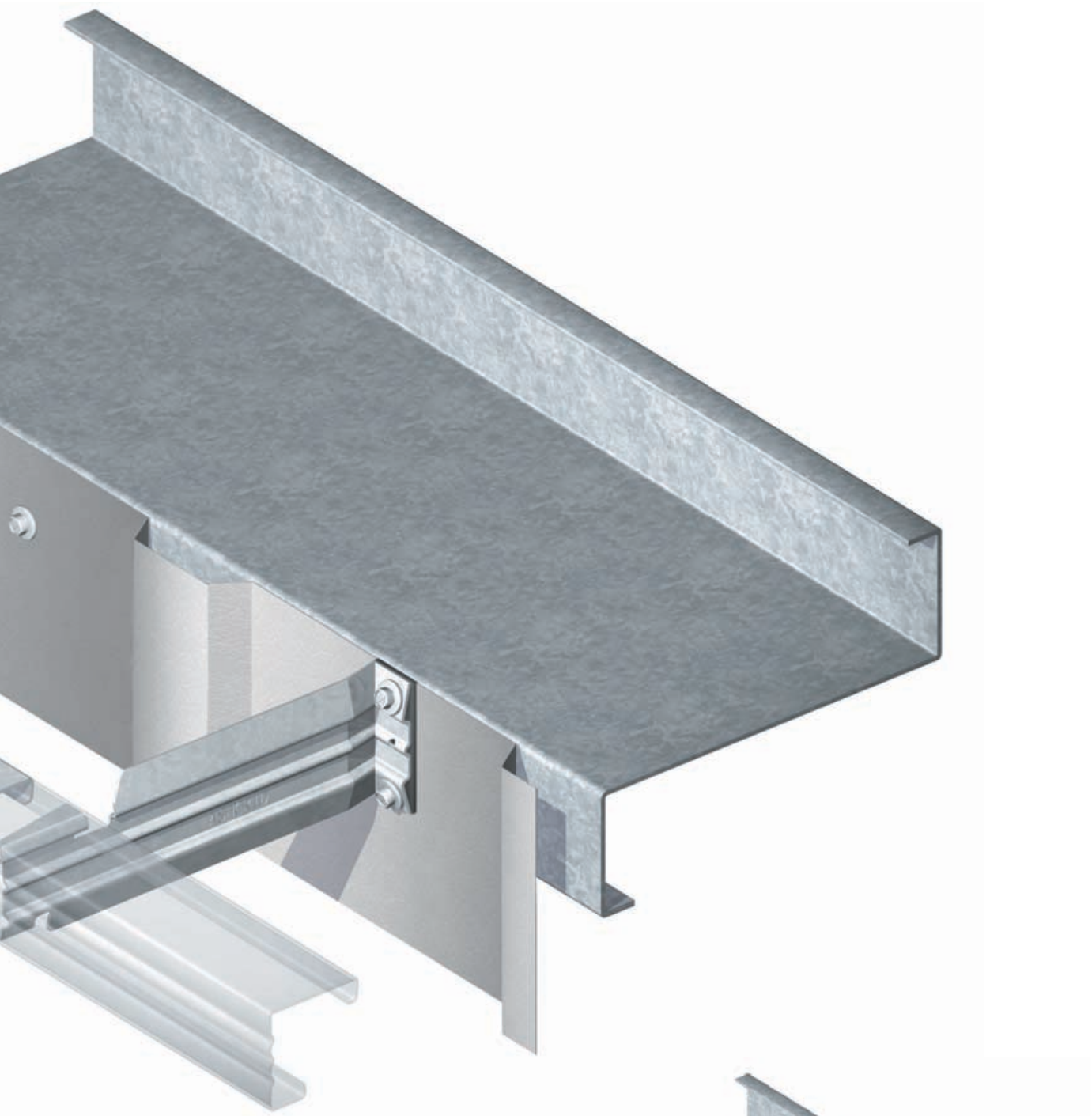
Wall construction
vertical sheeting

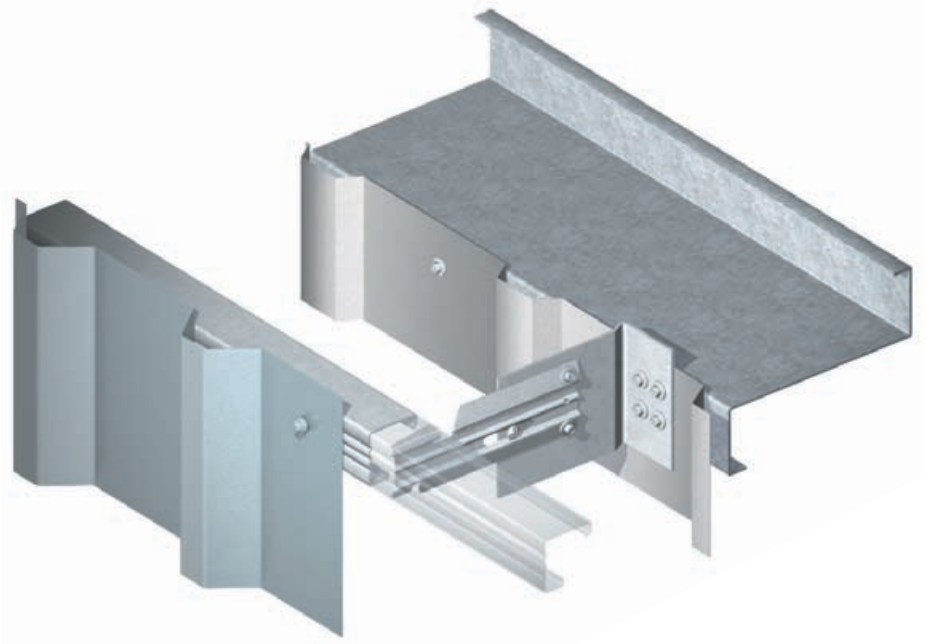


For bracket depths of up to 200mm the standard Ashgrid system may be used with brackets at 1m centres maximum with reduced centres in high wind suction zones if necessary.

For constructions over 200mm in depth the standard Ashgrid bracket does not have sufficient strength to support the sheeting. Instead the AF-adjustable system is required which incorporates a substantial 3mm thick AJC galvanised cleat bolted to a slotted ABF bracket offering sideways adjustment. When the depth is set the ABF bracket is fixed with 2 No. screws to create a rigid connection. The full assembly is fixed back to the rail flange with 4 No. fixings. Using different components a range may be achieved from 100mm up to 360mm deep inclusive.

Note: For both cladding systems the liner and rail construction must be rigid enough to take the various bracket systems.





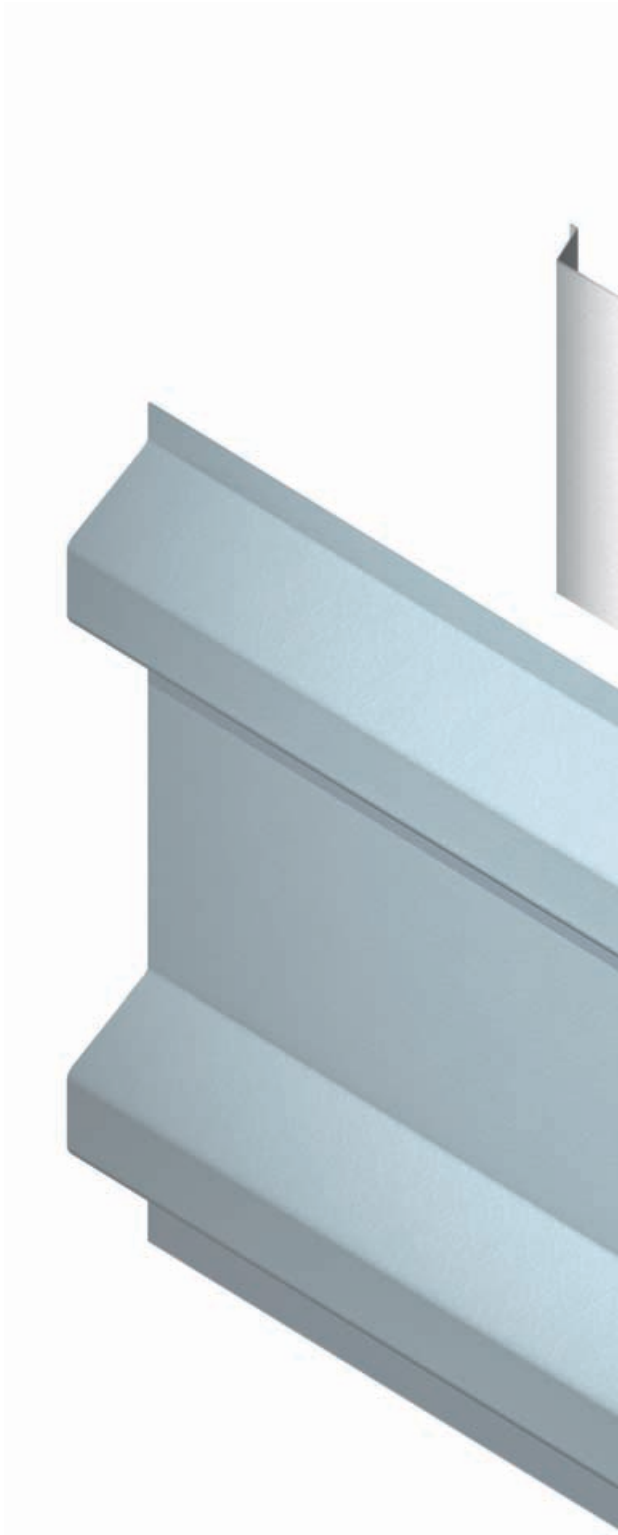
Following the introduction of Approved Document L2 the use of vertical Ashgrid for horizontal wall cladding is unsuitable, as constructions have increased in depth to 140mm with rail centres in the region of 2m apart.

When load is applied to the Ashgrid system following the fixing of the sheets, the vertical bar tends to slide downwards causing the brackets to bend. To prevent this movement, and to anchor the system, a rigid cleat is required at the base of the bar. However, the cleat then transfers the entire vertical loading onto one particular rail, which can cause actual twisting of the rail itself and have a detrimental effect on the structural stability of the secondary support steelwork.

A more robust construction incorporates top hat sections spanning vertically across the rails to support the horizontal sheeting. These sections are available in 4m and 6m lengths and can be made continuous by using splice joints. To form the required cavity, top hats are fixed onto special Ashwall brackets with 2 No. screw fixings (one in each face). The Ashwall bracket is then secured back to the rail flange with 2 No. or more screw fixings. This connection detail not only distributes the vertical load evenly over all the rails, but also offers lateral adjustment to compensate for out of plumb steelwork.

When comparing the structural performance of the two systems with a general wind loading of 1 kN/m^2 and typical rail centres of 1.8m, the Ashwall system would require vertical top hats at 1.7m centres. The Ashgrid system however would require bars at 700mm centres based on strength and deflection criteria.

Clearly the Ashgrid bar and bracket system requires a greater number of components and would therefore take longer to install. With members at such close centres many more fixings and penetrations would be required, leading to a greater air leakage potential for the building. In contrast, the Ashwall system is quick and easy to install using the minimum amount of fixings, resulting in a simple and structurally sound solution.



Note:
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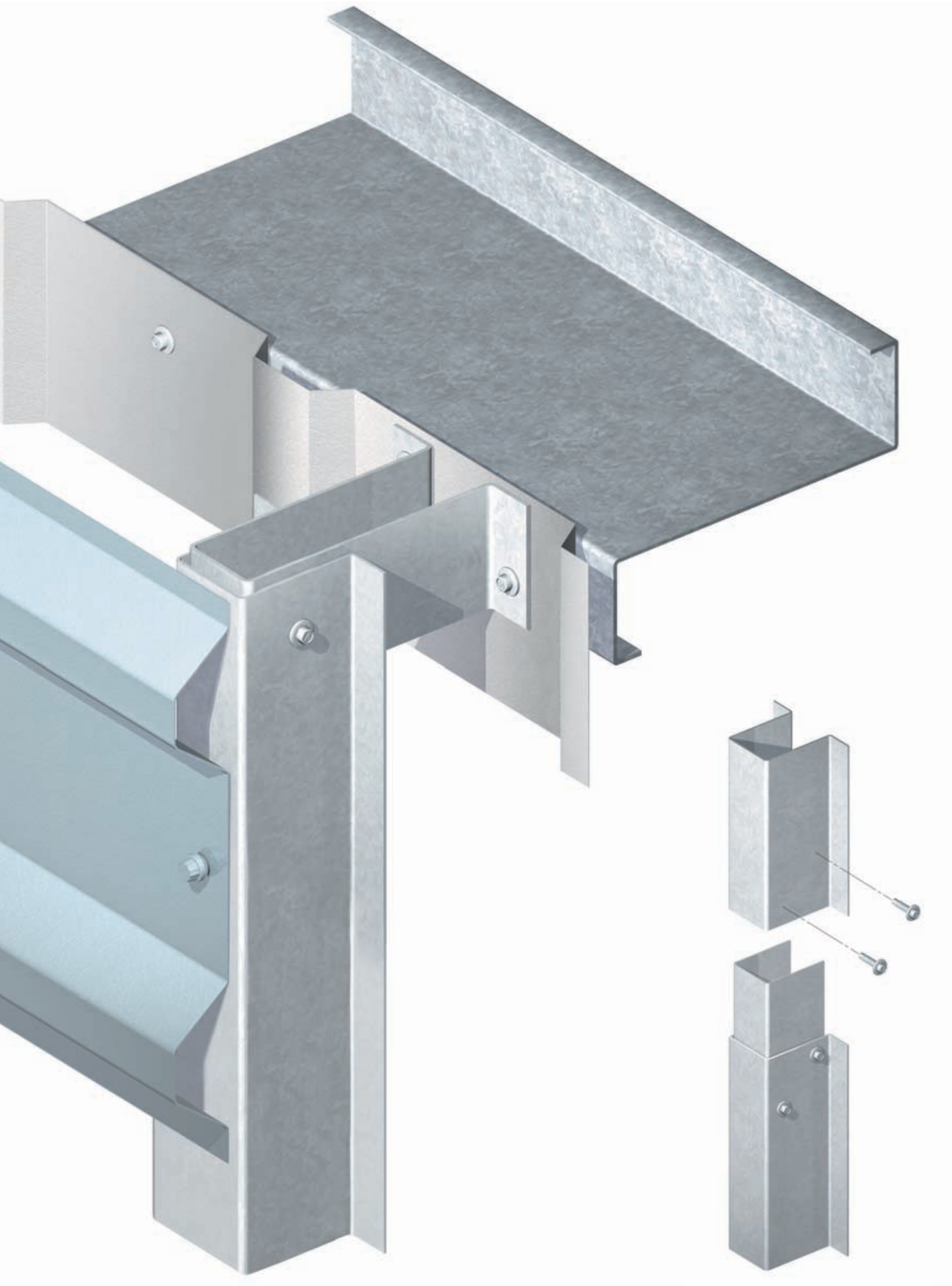


Wall construction

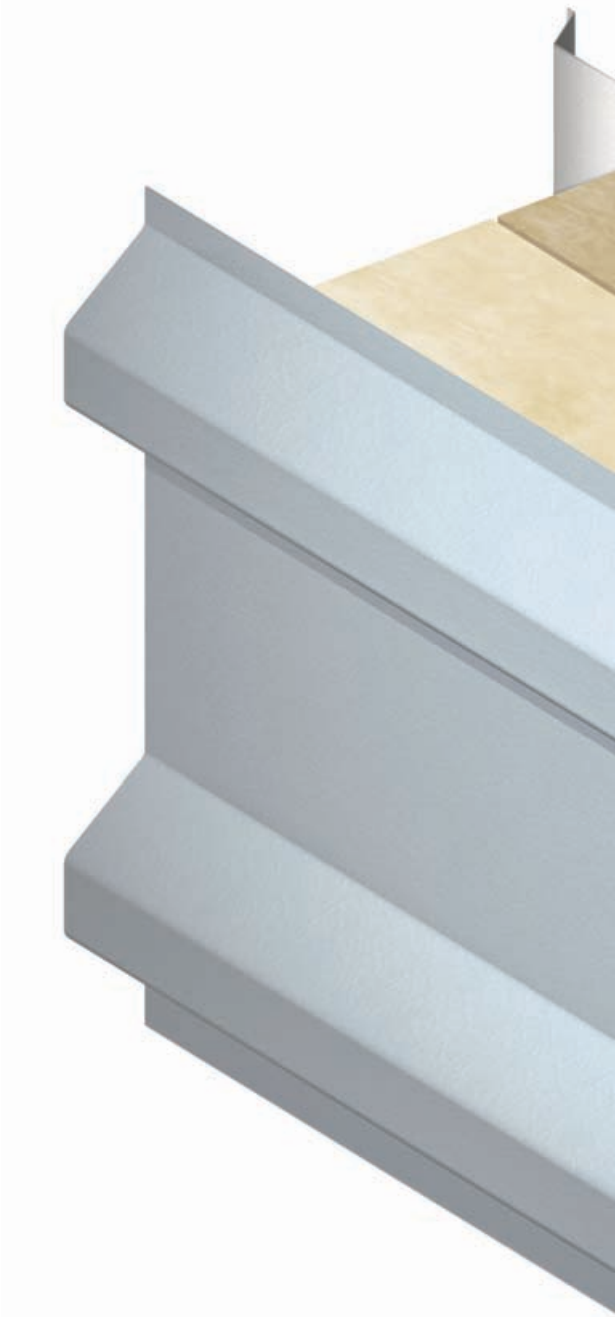
firewalls to comply with ADL2 horizontal sheeting

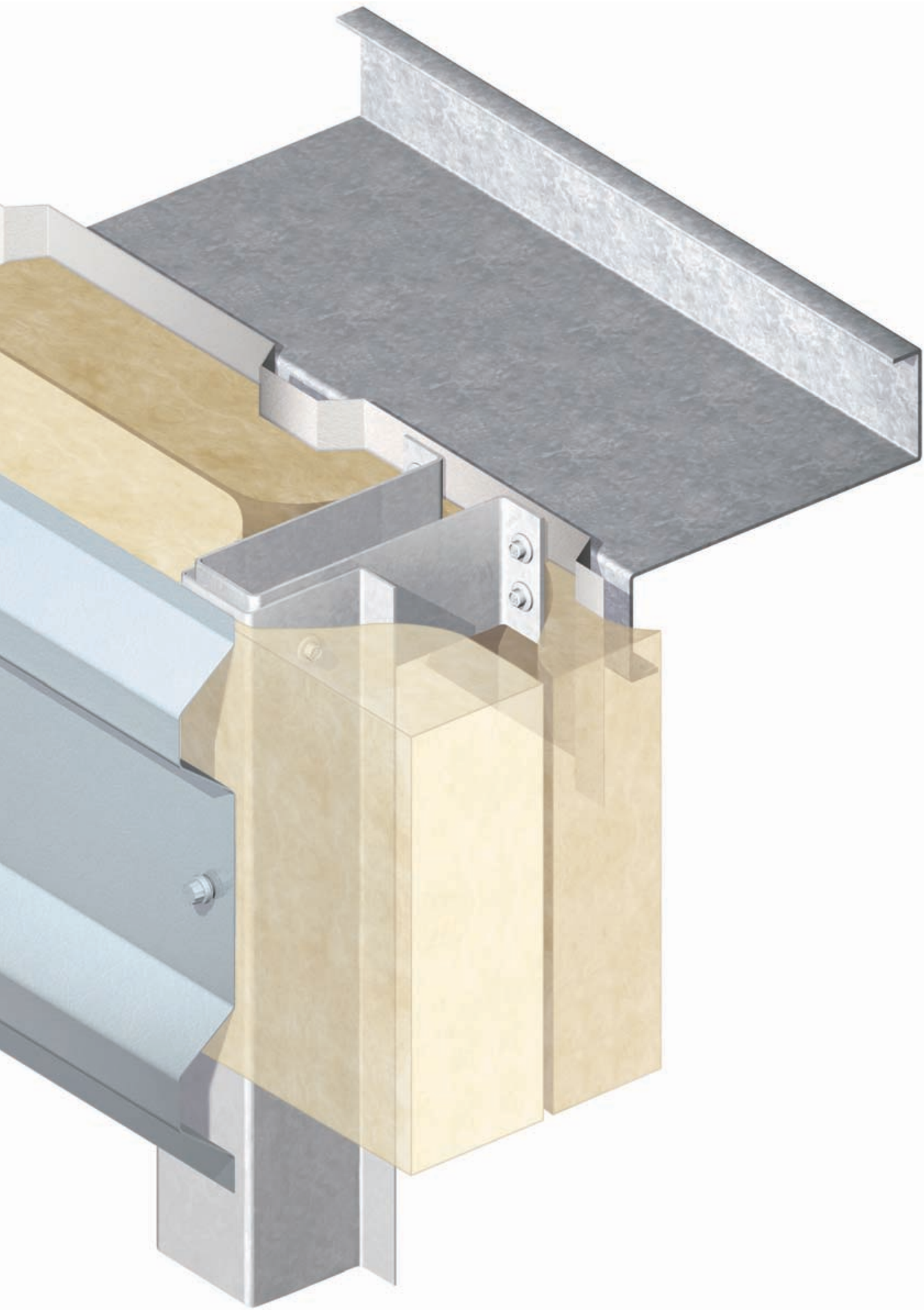
Installation

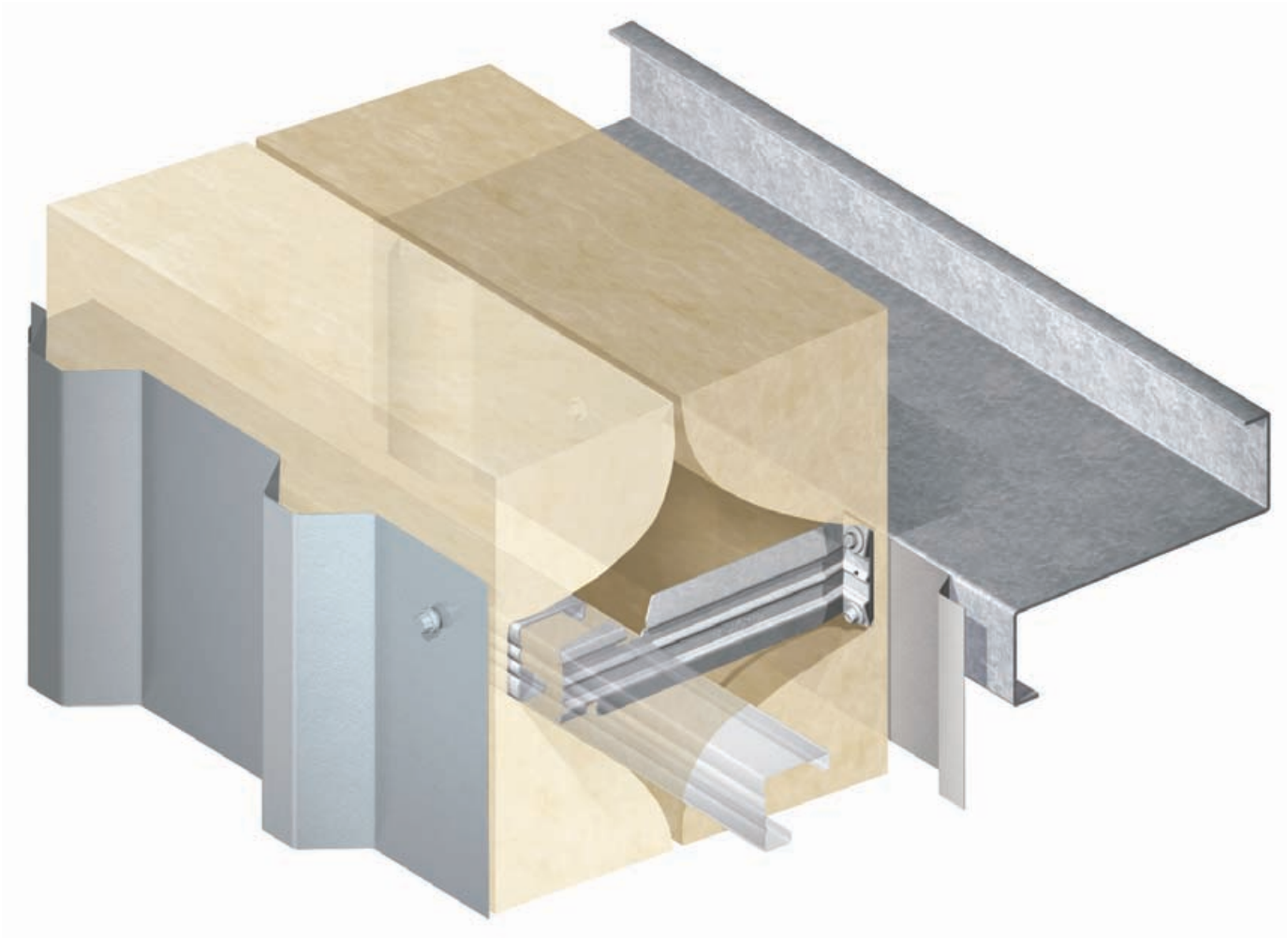
1. The Rockwool insulation is retained against the liner by fixing the Ashwall brackets through the insulation, using 4 No. screw fixings. This prevents the heat from a fire reaching the outer sheet through the bracket. Where additional support is required short steel straps/washer plates should be fixed through the Rockwool insulation and into the liner and rail flange with screws. Ensure all joints of the Rockwool insulation are tightly butted.
2. The outer glasswool insulation is pulled horizontally across the vertical top hat sections and temporarily retained in position by fixing short steel straps through the insulation into the lower bottom flange of the top hat. This ensures screw heads do not foul the outer sheet.
3. The outer glasswool insulation is then secured to each top hat by fixing the outer sheets with screws into the top hat crown. Roll end laps should be overlapped and positively secured between the outer sheet and the top hat crown.

This basic wall construction may be used specifically for use on firewalls sited 1m or more from a boundary with the following provisions:

1. The laps of the steel sheets must be stitched with screws at 300mm centres for the liner sheet and at 400mm centres for the outer sheet.
2. To comply with a U-value of 0.35 W/m^2K the 140mm cavity must be filled to the liner side with at least 60mm thick Rockwool cladding roll having a density of $23kg/m^3$. (This may be tissue faced to help installation).
3. To the outer sheet there must be a layer of at least 83mm thick glass wool insulation having a density of $10kg/m^3$.







Wall construction

firewalls to comply with ADL2 - vertical sheeting

Installation

1. The Rockwool insulation is retained against the liner by fixing the Ashgrid brackets through the insulation, preventing the heat from a fire reaching the outer sheet through the bracket. Where additional support is required short steel straps/washer plates should be fixed through the Rockwool insulation and into the liner and rail flange with screws. Ensure all joints of the Rockwool insulation are tightly butted.
2. The outer glasswool insulation layer is draped vertically over the Ashgrid support bars and secured by fixing the outer sheets with screws into each bar. Roll end laps should be overlapped and positively secured between the outer sheet and the Ashgrid bar.

This basic wall construction may be used specifically for use on firewalls sited 1m or more from a boundary with the following provisions:

1. The laps of the steel sheets must be stitched with screws at 300mm centres for the liner sheet and at 400mm centres for the outer sheet.
2. To comply with a U-value of 0.35 W/m^2K the 140mm cavity must be filled to the liner side with at least 60mm thick Rockwool cladding roll having a density of $23kg/m^3$. (This may be tissue faced to help installation).
3. To the outer sheet there must be a layer of at least 83mm thick glass wool insulation having a density of $10kg/m^3$.

Revisions to Approved Document L2 (Conservation of Fuel & Power) of the Building Regulations (England & Wales) came into effect in April 2002. The main changes affecting the design and construction of buildings using metal cladding systems are a significant increase in insulating performance standards (λ-values) and a change in the U-value calculation method to introduce a more rigorous method of dealing with repeated thermal bridges.

Implementation Date	April 2002
Roof U-value W/m²K	0.25
Wall U-value W/m²K	0.35*

*0.30 W/m²K Technical Standard J (Scotland)

Lambda 90/90

From 1st March 2003, a directive aimed at bringing conformity of product testing and performance assessment throughout Europe has been introduced. Lambda 90/90 states that all factory-made thermal insulation products for buildings must meet the requirements of the European Construction Products Directive (CPD) 89/106/EEC, which allows products to feature a CE mark to demonstrate their compliance.

The declared manufacturer's lambda value (λ-value) must be achieved for at least 90% of their production, which has led to higher λ-values and hence an increase in the thickness of insulation required.

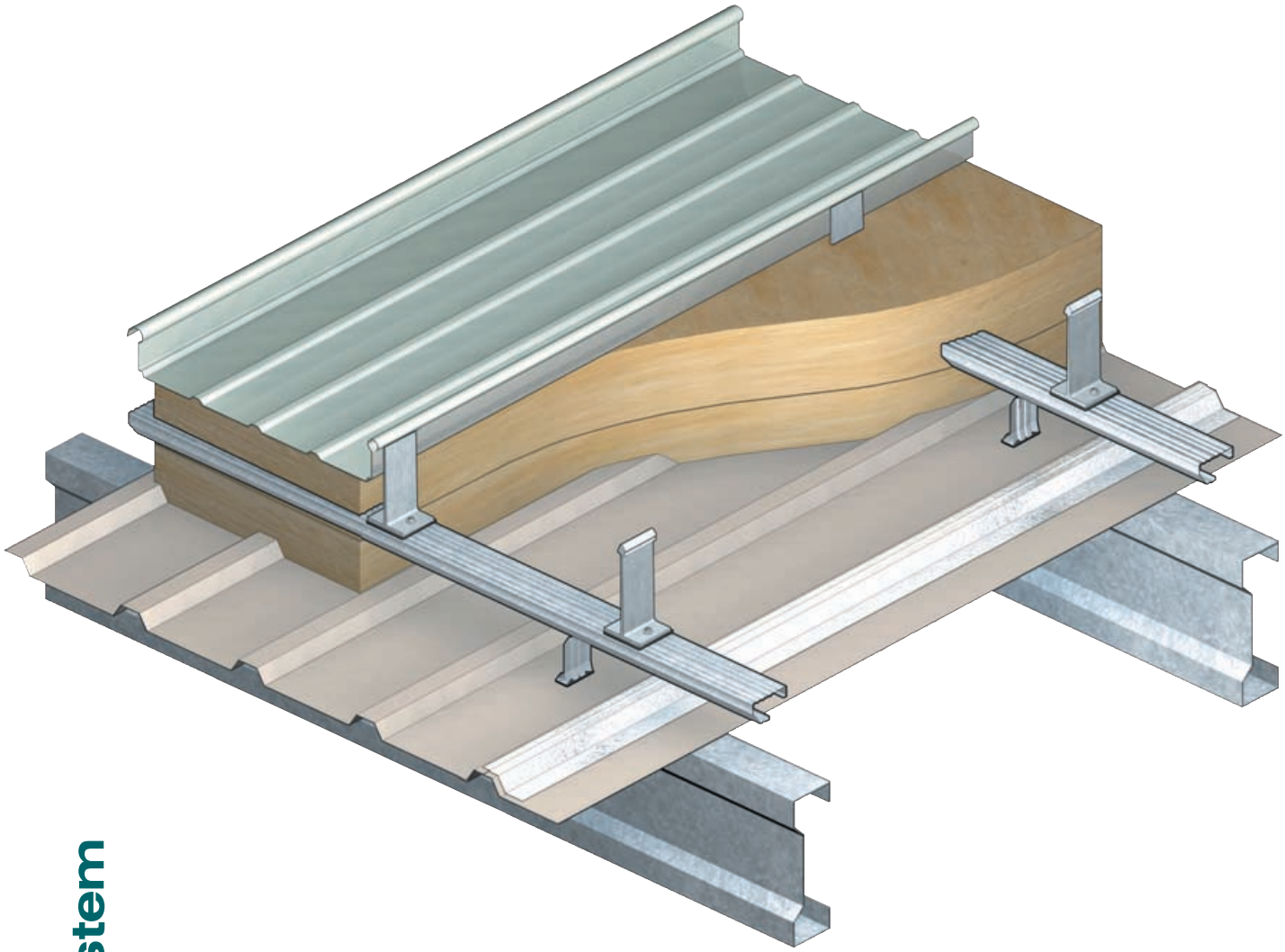
The thermal performance of roof and wall constructions utilising Ashgrid has been calculated to take into account the effects of two and three dimensional heat flow by using computer software to model the Ashgrid system. The table below details the depth of brackets required to achieve the desired U-value.

U-Value Table

	U–value W/m²K	ROOF (mm)	WALLS (mm)	
			Vertical Cladding (Bar & bracket)	Horizontal Cladding (Vertical top hats)
Rock Mineral Wool λ = 0.040 W/mK	0.20	220	-	-
	0.25	180	180	180
	0.35	-	140	140
Glass Mineral Wool λ = 0.044 W/mK	0.20	240	-	-
	0.25	190	190	200
	0.35	-	140	140

Notes

- Glass mineral wool λ = 0.044 W/mK from previously 0.040 W/mK
- Rock mineral wool λ = 0.040 W/mK from previously 0.037 W/mK
- All values include for insulation thickness and bracket depth
- Ashgrid brackets assumed to be at 1m centres
- Purlin centres assumed to average out to 1.2m
- Rail centres assumed to average out to 1.0m



Standing seam roofing system

The Ashgrid spacer support system can be used in conjunction with a traditional standing seam halter system as a method of achieving a U-valve of 0.25 W/m^{2}K in compliance with the requirements of ADL2.

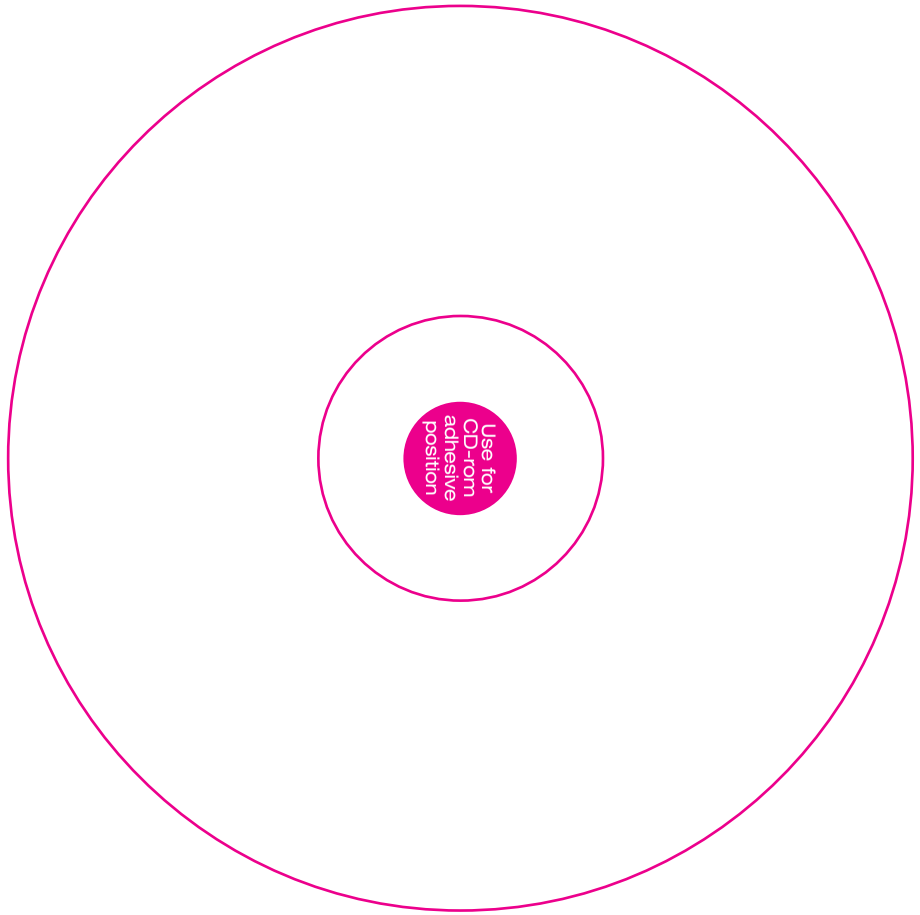
In a typical standing seam build-up aluminium halters are generally fixed at 400mm centres which repeatedly bridge the roof construction. The increased thickness of insulation required to compensate for this additional heat loss greatly increases the overall construction depth.

By incorporating an Ashgrid spacer support system into the roof build-up, the effects of repeated thermal bridging are reduced as the support brackets are fixed at 1m centres. This enables a reduced thickness of insulation to be used, creating a roof construction that is structurally sound and easily meets the required thermal performance criteria.

The use of the Ashgrid spacer support system also allows greater flexibility in the choice of liner profile as unlike a traditional standing seam halter, the Ashgrid brackets can be spaced accordingly.

CD-rom

u-value calculator, load tables and cad details



ASHGRID™

SPACER SUPPORT SYSTEMS

ASHJACK™

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ASHFAB™

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