

## DESIGN GUIDE

### ASKIN® CONTROLLED ENVIRONMENT INSULATED PANEL SYSTEM

#### Performance Panel Solutions

This guide is intended to provide guidance for designing a basic ASKIN® Controlled Environment building. It is not intended to fully cover the special requirements for designing Controlled Environment construction, but rather to assist with the general design of the ASKIN® system. Designers are encouraged to contact ASKIN® for specific structural advice at the earliest possible design stage.

For more information Free Call 13 000 ASKIN.

## GENERAL

ASKIN® Panel is a sandwich panel with steel faces bonded each side of an insulating core.

This panel has a wide range of uses where a pre-finished fully insulated construction product is required. The standard of paint finish complies with food safety guidelines, enabling use in controlled environment and hygiene areas.

### Composition

- Steel Thickness varies from 0.4mm to 0.6mm depending upon structural and certification requirements.
- ASKIN® Z275 pre-painted steel has a zinc coated steel base coupled to a high performance paint system for damp environments with little or no airflow.
- ASKIN® AZ150 pre-painted steel has a zinc/aluminum coated steel base coupled to a high performance paint system for harsh environments.
- ASKIN® PVDF 0.6mm pre-painted steel has a zinc/aluminium coated steel base coupled to a high performance paint system for extreme environments.
- ASKINROOF™ external upper face of pre-painted zinc coated steel and pre-painted Z275, AZ150, AM100 or PVDF internal face.

### Insulating Cores

1. EPS. Flame retardant expanded polystyrene SL Grade, manufactured to AS1366.3:1992
2. XFLAM. XFLAM FM Approved fire resistant insulation.
3. MINERAL WOOL. Non-combustible high density mineral wool insulation for the fire and acoustic performance.
4. PIR. Polyisocyanurate FM Approved fire resistant insulation.

### Surface Textures

ASKIN® Panel can be supplied with the following surface finishes:

- Flat (plain surface)
- Ribbed (15mmx2mm ribs impressed into steel surface)
- Silkline (stylized micro corrugate impressed into steel surface)
- Mesa (equal spaced ribs impressed into steel surface)

### Panel Joint

The ASKIN® SLIPJOINT® provides male/female joints facilitating rapid and accurate panel installation.

The SLIPJOINT® accepts sealants applied internally for the purposes of weatherproofing and providing a vapor barrier.

Where specialist fire rating details are required refer to ASKIN® regarding the enhanced joints and sealants required.

## Dimensions

### ASKIN® PANEL

- Thickness 50, 75, 100, 125, 150, 175, 200, 250, 300mm
- Effective cover 1200mm for flat, unideck and econodeck panels and 1000mm for metric roofing panels
- Length Minimum 1200mm, maximum 25m

## Tolerances

- Thickness                    ±1mm
- Width                        ±1mm
- Length                      ±5mm

## Surface finish

The steel surface is smooth without irregularities such as roughness, buckling and other imperfections. Viewing or lighting at oblique incident angles may highlight minor surface ripples.

Panning can be minimised by using ribbed, silkline or mesa surface profiles.

## SERVICE CONDITIONS

ASKIN® EPS Panel should not be specified where the service temperatures exceed 75°C. If the temperatures exceed this, the structural integrity of the panel can rapidly deteriorate.

To reduce thermal bowing movement ASKIN® recommends the use of light to medium colours on walls and roofs exposed to direct sunlight. The use of dark colours in these situations is not recommended and will not be supported by warranties.

## PERFORMANCE

### Thermal Efficiency

The core of ASKIN® panels provides high resistance to thermal transmission. The thermal conductivity (k-value) varies with selected core and with temperature so that the insulation performance improves for EPS and XFLAM as the service temperature reduces.

Refer Table 1

Thermal resistance defines the insulation performance of a given thickness of panel. The service temperature is the average of the internal operating temperatures and the external skin temperature.

Table 1 - Thermal Efficiency  
R Values; (m<sup>2</sup> K/W) at 15° Celsius (Aged conductivity).

PANEL THICKNESS	XFLAM	EPS	PIR	MINERAL WOOL
50mm	1.7	1.5	2.4	1.3
75mm	2.5	2.1	3.6	1.9
100mm	3.3	2.8	4.8	2.6
150mm	4.8	4.0	7.1	3.8
200mm	6.4	5.4	9.1	N/A
250mm	8.0	6.7	N/A	N/A
300mm (Non-FM Approved)	9.5	8.0	N/A	N/A

## **Vapor Barriers**

A complete and continuous vapor barrier envelope is an essential feature in any coldroom. In a coldroom application vapor movement will cause ice build-up and frosting to occur within the panel core or on the internal panel face. To prevent this problem developing, an effective external vapor barrier must be incorporated into the design of the coldroom.

In applications, such as coolrooms and processing areas, a vapor barrier allows easier temperature/humidity control and less moisture in the air inside for the air conditioning equipment to remove.

The ASKIN® system provides a simple solution to vapor barrier requirements.

## **Continuity of Insulation**

In addition to the vapor barrier, it is essential that the design of a coldroom or coolroom includes a continuous insulation envelope.

Any discontinuity in the insulation envelope of a coldroom can result in ice buildup and frosting occurring on the vapor barrier or external side of the panel.

The ASKIN® system addresses situations such as ceiling-to-wall junctions and joints in under floor insulation.

ASKIN® can also advise designers on how to solve thermal bridging problems such as structural steelwork penetrations.

## **Building Envelope**

### **External Moisture Control**

The external surface of the ASKIN® panel system will achieve compliance with the NCC Section F, FF1.2 when designed in accordance with this Design Guide and installed in accordance with an appropriate combination of project specific and ASKIN® Standard Details.

## **Roof products**

Comprising an insulating core laminated between a ribbed exterior profile and flat or ribbed interior (ceiling) profile, ASKIN Roofing™ delivers a pre-painted, fully insulated roofing system that is simple and economical to install and inexpensive to maintain.

ASKIN® Panel Projects requiring a vapour barrier are ideally suited to the ASKIN® panel roof including Birds Beak joint flashing details.

ASKIN® recommend that roof panels be designed/installed such that the Slipjoint® runs only parallel to the direction of roof fall.

## **Roof Pitch**

**RECOMMENDED MINIMUM ROOF PITCH IS 3°**

With virtually any form of ASKIN® construction, the owner or his agent, must comply with local Territorial Authority Building Controls. ASKIN® recommends that the owner/agent employ a Chartered Engineer or a Registered Architect who will design the proposed building and also provide a Design Producer Statement in support of a Building Consent application.

## Spans

Where an estimate of ASKIN® panel spans is required, contact ASKIN® for load/span information.

From ASKIN's® extensive independent testing, the following span/load TABLES have been produced. Designers should carefully consider the parameters noted and use Tables 2 & 3 conservatively

- 1 The tables are to be used with uniformly distributed loads derived from AS/NZS 1170.0:2002 or equivalent ultimate limit state loads and serviceability limit state loads.
- 2 These tables apply to uniformly distributed short term loads on simply supported panels, generally used as walls and roofs.
- 3 Loads to be derived must include the dead weight of panel.
- 4 A concentrated load of 1 kN is not critical within the range of spans shown on the table.
- 5 Shear strength is not critical within the range of spans shown on the table.
- 6 These tables are for short-term loads only. For continuous loads with duration of 7 days (e.g. snow) the design resistance obtained from the chart should be multiplied by a factor of 0.8 to determine the 7 day derived design resistance.
- 7 If a different deflection limit is appropriate for the project (e.g. span/150) then use the Deflection table with load adjusted by 200/150.
- 8 Refer also to 'Thermal Bowing', for further information on deflection.

Table 02. Engineered Ultimate Limit State Panel Spans

Maximum allowable UDL for ULS Single Span Condition (kPa)

Guide to ASKIN ULS Panel Spanning Capacity (Meters)									
	XFLAM - 0.6/0.6mm			SL EPS - 0.6/0.6mm			MINERAL WOOL - 0.6/0.6mm		
0.6/0.6 skins	0.5 kPa	0.87 kPa	1.0 kPa	0.5 kPa	0.87 kPa	1.0 kPa	0.5 kPa	0.87 kPa	1.0 kPa
50mm	5.8	4.4	4.1	4.9	3.7	3.4	3.3	2.5	2.3
75mm	7.1	5.4	5.0	6.0	4.6	4.2	4.1	3.1	2.9
100mm	8.2	6.3	5.8	7.0	5.3	4.9	4.8	3.6	3.4
125mm	9.1	6.7	6.4	7.7	5.9	5.5	N/A	N/A	N/A
150mm	10.0	7.6	7.1	8.5	6.4	6.0	5.8	4.4	4.1
175mm	10.8	8.1	7.6	9.1	6.9	6.4	N/A	N/A	N/A
200mm	11.5	8.8	8.2	9.8	7.4	6.9	N/A	N/A	N/A
250mm	12.0	9.8	9.1	10.9	8.3	7.7	N/A	N/A	N/A
300mm	12.0	10.4	9.7	12.0	9.1	8.5	N/A	N/A	N/A

0.5 kPa, 0.87 kPa and 1.0 kPa are arbitrary loads which apply to common building applications. The table is designed to give the reader a brief understanding of the panels spanning capabilities. For panel span tables, refer to downloads.

Table 03. Serviceability Limit State Panel Spans

Maximum allowable UDL for SLS Span / 200 Single Span Condition (kPa)

Guide to ASKIN ULS Panel Spanning Capacity (Meters)									
	XFLAM - 0.6/0.6mm			SL EPS - 0.6/0.6mm			MINERAL WOOL - 0.6/0.6mm		
0.6/0.6 skins	0.5 kPa	0.87 kPa	1.0 kPa	0.5 kPa	0.87 kPa	1.0 kPa	0.5 kPa	0.87 kPa	1.0 kPa
50mm	5.2	3.8	3.6	4.2	3.2	3.0	3.8	3.0	2.8
75mm	7.0	5.2	4.9	5.7	4.3	4.1	5.0	3.8	3.6
100mm	8.6	6.4	6.0	6.8	5.4	5.1	6.0	4.8	4.6
125mm	9.4	6.9	6.5	8.1	6.3	6.0	N/A	N/A	N/A
150mm	10.5	7.8	7.4	9.3	7.1	6.8	8.0	6.4	6.1
175mm	11.6	8.8	8.3	10.4	8.0	7.7	N/A	N/A	N/A
200mm	12.7	9.7	9.1	11.4	8.8	8.4	N/A	N/A	N/A
250mm	13.8	11.0	10.4	12.3	9.5	9.2	N/A	N/A	N/A
300mm	14.9	12.0	11.3	13.1	10.3	10.0	N/A	N/A	N/A

0.5 kPa, 0.87 kPa and 1.0 kPa are arbitrary loads which apply to common building applications. The table is designed to give the reader a brief understanding of the panels spanning capabilities. For panel span tables, refer to downloads.

Table 04. Cyclone Performance

0.6/0.6mm XFLAM Panel Span Table derived from Test Results performed by the University of Adelaide.

	XFLAM FLAT				XFLAM METRIC			
Pressures / Fixing centres	6 kPa 1200	8 kPa 600	12 kPa 400	Impact m/s	6 kPa 250	8 kPa 250	12 kPa 250	Impact m/s
75mm (Theoretical)	1.6	1.4	0.8		1.8	1.5	0.9	
100mm (Certified)	1.8	1.5	1.2	39	2.4	2.0	1.2	40
150mm (Theoretical)	2.2	1.8	1.4		3.5	2.9	1.7	

\* 100mm EPS panel has been impact tested successfully to 38 m/s

### Narrow Panels

Particularly in large coldrooms, the designer should ensure the minimum ASKIN® panel width is 600mm.

### Bracing & Axial Loads

ASKIN® panel is able to both provide structural bracing and also withstand axial loadings. Upon request, ASKIN® can assist designers to take advantage of ASKIN® panel's full range of structural capabilities.

### Fixings

It is important to consider the specific design of connections and fixings used in the construction of a ASKIN® controlled environment building.

### Rivets

Rivets are used in virtually all situations to connect extrusions, flashings etc to the metal skins of ASKIN® panel.

Only ASKIN® approved, sealed, 4 mm nominal diameter rivets should be used.

ASKIN® approved rivets have an Ultimate Limit State (ULS) S=1.2kN in shear, T= 0.8kN in tension.

When the SLIPJOINT® is fixed with an approved rivet, the ULS load for the rivet is reduced to SJ. = 0.9kN in shear.

Rivets in tension are governed by the ASKIN® panel skin delaminating resistance:

Dc=1.6kN in the centre of the panel

De=0.5kN within 50mm of the panel edge

Note: these are for short term loads only! Refer to ASKIN® for long term de-rating factors.



### **Support Bolts**

Support bolts are widely used as parts of the ASKIN® system, predominantly as a means of connecting roof/wall panels to the supporting structure and also as a means of connecting equipment which is mounted onto panel work.

Designers should pay particular attention to the fact that in many situations, the long term load-carrying capacity of the ASKIN® core governs design.

For further advice contact ASKIN®.

### **Nylon Bolts**

ASKIN® does not specify or recommend the use of Nylon shafted support bolts. The Nylon bolts have no fire resistance and will fail at temperatures above 150°C. They also have limited durability and structural performance.

### **Thermal Bowing**

ASKIN® Sandwich panels will bow naturally convex on the warmer side of the panel when the two panel skins are exposed to different temperatures.

Checks must be made to ensure that detailing which may restrain this natural bowing does not overload the panels or structure and that the bowing is within appropriate limits.

### **Maximum Design Temperature**

Various factors determine the maximum temperature build-up on the external skin of the panel. The most important factors are sun, wind, ambient air temperature, whether the panels are shaded, the insulation material under the skin, colour of the skin, and orientation.

For advice, contact ASKIN® Free Call 13 000 ASKIN.

### **Minimum Design Temperature**

For processing or similar areas which operate at ambient temperatures, 15°C is recommended for use in determining the inside skin temperature during the period of maximum outside temperature.

For coolstore applications the actual minimum design room temperature should be used.

Note: There may be occasions when designers need to consider bowing in the reverse direction due to the effect of night radiation or winter conditions on the outside skin and higher internal process temperatures.

### **Stress Relief Cuts**

Stresses are induced if deflection is restrained by building elements. Induced stress from restrained thermal bowing must be considered in all situations where T difference exceeds 30°C and/or spans exceed 3 metres.

Wherever practical, ASKIN® recommends full stress relief cuts as indicated in their Standard Details to eliminate all induced stress. Any other methods proposed to relieve stress should be referred to ASKIN®.

## **Panel Skin Cuts**

A stress relief cut is normally a saw cut which fully penetrates one skin of the panel for the full width of the panel including the Slipjoint®, with minimal cutting of the core.

A panel would normally be fixed both sides of a stress relief cut. The exception to this rule is for an edge-restrained panel, or a panel between a panel with intermediate restraint and one with none. In this case, a partial cut across approx. 50% of the panel width may be required.

For coolstore applications, to preserve the integrity of the external vapor barrier these cuts are internal.

## **Partial Panel Skin Cuts**

Of necessity, bowing must be restrained in certain areas, typically in corners, possibly where a lean-to adjoins a wall, or with horizontal systems along the base or roof line. Experience has indicated that off-white coloured steel panels, when fully edge restrained over less than 3 metres, do not fail by creasing but the skin ripples slightly between the fixings along the restrained edge.

ASKIN® recommend that off-white coloured ASKIN® steel panels subjected to restraint along an edge have partial relief cuts. These cuts must be in addition to any which may be required because of the preceding sections.

## **Flashing Stress Relief Cuts**

Cuts may be pointed with sealant or flashed, provided the flashing is fixed to one side of the cut only or is a top-hat section.

Refer to ASKIN® for alternative flashing details if required.

## **Durability**

When maintained in accordance with the recommendations contained in the ASKIN® MAINTENANCE GUIDE, the ASKIN® system will deliver outstanding durability. Aesthetic appearance is not a durability requirement.

ASKIN® panel systems have been used in Australia and New Zealand for half a century in a wide range of building applications. With normal maintenance, an excellent service life has resulted in buildings which remain aesthetic and functional for their design lives.

## **Warranties**

Upon request, ASKIN® can provide a conditional warranty for a completed project with a term of ten years for materials and two years for workmanship.

Not all product applications will receive a standard warranty. Some applications are not warranted due to the harshness of the service.

Please contact ASKIN® for further details in respect of warranties applicable to your specific project and product application.



## **UV Protection**

Australia and New Zealand experience some of the most extreme UV conditions in the world. UV light can cause breakdown of the resin used in some paints. This leads to erosion and chalking of the paint film. UV light can also cause the breakdown of pigments (particularly organic-based pigments), resulting in fading.

ASKIN® coating systems utilise pigments and resins which have been selected for their colour stability, flexibility and durability in Australasia.

## **Accessories**

Only accessories approved by ASKIN® shall be used in the ASKIN® system. All attachments and fasteners must be compatible with the other elements of the panel system and must be selected to provide durability at least equivalent to the ASKIN® system, and be included in any maintenance schedule.

## **Sealants**

Sealants need to remain functional for a minimum durability period of 10 years and shall be inspected and replaced if necessary, according to the maintenance schedule described in ASKIN's® MAINTENANCE GUIDE.

Water penetrating the joints and seals of the ASKIN® system will result in premature failure of the system.

Only ASKIN® approved neutral-cure sealants may be used with the ASKIN® system.

## **Fasteners**

The selection of the appropriate form of fastener should not be solely influenced by cost. Fastener costs are minimal relative to the overall project and there is no benefit to be gained through the use of inferior fixings. The fastener durability should be equal to or better than the roofing or cladding system.

The overall performance of an ASKIN® system can be dependent on correct selection, layout and mechanical application of the fasteners. The durability of the system is often dependent on the durability of the fasteners.

Use ASKIN® approved aluminium rivets for joining all ASKIN® panels.

Stainless-steel rivets may be used with ASKIN® Panel in internal and Fire Rated applications in moderate environments but are not recommended for use with ASKIN® products in severe or very severe environments. (eg. Coastal or geothermal)

Washers with carbon black pigmentation may lead to galvanic corrosion, especially in severe environments.

## **Fire Safety**

The core of ASKIN's® EPS, XFLAM and PIR Panel, are classified as foamed plastics.

ASKIN® supplied panels satisfy various flame propagation (p), surface finish (sf), and flame barrier (fb) criteria.

## Flame Propagation (p)

ASKIN® manufactures the flame retardant and fire resistant cores of ASKIN® panel in accordance with AS 1366.

It is important to note that ASKIN® and its predecessors have always produced flame retardant cored panel.

## Surface Finish (sf)

For interior surfaces the requirements are also evaluated in terms of SFI (Spread of Flame Index) and SDI (Smoke Developed Index). AS/NZS 1530.3 : 1999.

The range of ASKIN® panels have been tested and the following indices have been obtained.

ASKIN®	AM100 Panel SFI=0, SDI=1
ASKIN®	Z275 Panel SFI=0, SDI=1
ASKIN®	PVDF Panel SFI=0, SDI=1

## Non Combustible Insulated Panel

ASKIN® Mineral Wool panel uses a mineral wool insulating core which is classed as a NON-COMBUSTIBLE product, not requiring flame barrier detailing.

## Inert Catchment

Care should be taken when combining metal products. If products are combined incorrectly, severe localised corrosion may occur as a result of 'bimetallic corrosion'.

When rainwater flows over or is collected from inert roofing materials, accelerated corrosion of unpainted galvanised steel components and gutters can occur. This situation is referred to as an inert catchment effect and care should be taken to avoid this.

## Flashing Materials

When two different metals are in contact and moisture is present, one metal is relatively protected while the other suffers accelerated corrosion. This is known as galvanic or bimetallic corrosion. A similar effect commonly occurs when water flows over dissimilar metals.

This form of corrosion is commonly found:

- Where water is discharged from copper or brass systems over an ASKIN® roof.
- Where lead flashings are applied directly to ASKIN® products.
- Where fasteners and accessories are incompatible with the ASKIN® material.

## Avoiding Corrosion

The use of large stainless steel accessories with ASKIN® panel should be avoided. Where they must be used their area should be as small as possible. Larger areas of stainless steel should be electrically isolated from the ASKIN® panel.

Dissimilar metals should be separated by using a barrier such as plastic sheeting, PVC tape, bituminous felt, neutral-cure silicone sealant or an appropriate paint system. Potential run-off from copper or brass pipes over ASKIN® surfaces must be prevented by diverting the discharge clear of the roofing.

## **Flashings**

Flashings and ridge capping should be manufactured from the same base product coating system as used for the ASKIN® panel to ensure equal durability.

Where penetration flashings are required, neoprene or silicone rubber, EPDM, aluminium or soft zinc, all give excellent performance.

Some flashing materials and sealants are incompatible.

## **Foot Traffic**

Repeated foot traffic and the dragging of maintenance or cleaning equipment may damage the panel, thus reducing its life expectancy.

Catwalks and platforms over ASKIN® panels should be designed and installed where necessary. Aluminium or galvanised steel catwalks are recommended.

Where copper-chrome/arsenate treated timber is specified, it must be well dried after treating and isolated from the ASKIN® panel.

## **Over painting ASKIN® Panel**

ASKIN® Panel may be readily over painted, after suitable preparation, for aesthetic reasons.

- If over painting is carried out while the top coat is still in sound condition there is no need to use a primer.
- High quality acrylic roof paints are recommended.

## **Product Warranty**

The ASKIN® Warranty extent of cover is the original paint finish and does not include any over painting finish applied by others. Deterioration of the original paint finish and metal substrates caused by failure of the over painting is likewise not covered by the ASKIN® Warranty.

## **Fire Resistance**

ASKIN® panel has a unique Slipjoint® in the steel facings which securely encloses the ASKIN® Panel insulation core.

ASKIN® fire-resistant system wall panel has been fire resistance tested by approved laboratories to AS 1530.4 and when detailed to ASKIN® fire-resistant specification, can achieve a significant fire resistance rating for non-load bearing applications. Refer to ASKIN® for details.

Boundary separation for ASKIN® panel is governed by specific radiation calculations. Refer to ASKIN® for assistance.

## **ASKIN XFLAM, ASKIN PIR and ASKIN Mineral Wool**

Three fire resistant cores for ASKIN® panel are available bringing a fire insulation rating when tested in accordance to AS1530.4 and Approved by Factory Mutual Refer to ASKIN® for updated product information on these product developments.

## Pressure Relief

It is necessary for the designer to include adequate relief ports to accommodate significant changes in air volumes caused by changing air temperature in coldrooms.

## Under floor Venting

The designer must also allow for either some form of venting or a heating system below the base slab of a cold room.

## Acoustics

ASKIN® panel is acoustically reflective.

The following table details acoustic airborne transmission through ASKIN® panels.

ASKIN® Panel achieves the following ratings for 75mm panel in accordance with ISO 717 / AS 1191.

PANEL TYPE	$R_w$	$R_w + C_{tr}$
ASKIN® EPS Panel	$R_w = 25$	20
ASKIN® XFLAM Panel	$R_w = 25$	23
ASKIN® Mineral Wool Panel	$R_w = 28$	25
ASKIN® PIR Panel	$R_w = 24$	20
ASKIN® XFLAM / EPS Dual Panel System	$R_w = 43$	37

## Disclaimer

There are many complex variables in a sandwich panel system. These range from raw material inputs through the panel manufacturing process, technical standards and jointing system to installation details. All have a significant impact on a sandwich panel system's structural performance.

Look-a-likes and/or equivalents are invariably not the same. ASKIN® employs world class technology, independent testing authorities and approved installers and engineers to ensure the consistency and validity of the information presented for the ASKIN® system.

ASKIN® panel system information can only be applied to ASKIN® panel system.

Designers and Territorial Authorities that use the information presented in this guide to support a producer statement for sandwich panel not produced by ASKIN®, not only contravene copyright but also the Building Code.