

FASEAL® 快易封

雙摺邊屋面系統

Double Seam Lock Roof



建築金屬圍護 全方位服務

SOLUTION Provider of Metal Building Envelope

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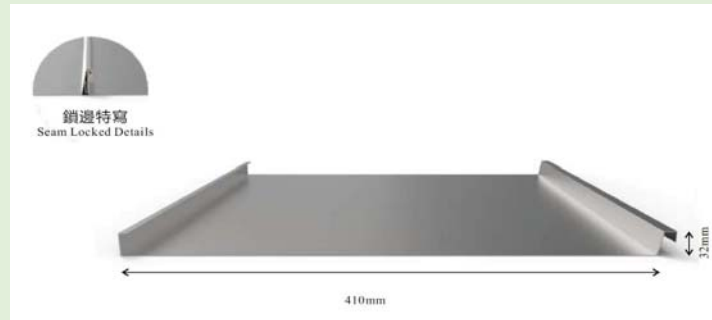
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產品簡介

1 . Products

1.1 FASEAL Panel Profile 快易封板型



FASEAL 快易封產品是一種經典設計的金屬屋面板，採用雙摺邊扣合方式與固定座的連接，在完成安裝後是沒有任何螺釘外露，屋面系統保持完整的密封性，形成一個連續的耐候圍護性，解決了建築物的雨水滲漏問題。

FASEAL roofing products is a classic design metal roof panel, which is connected to the fixing clips by a double folded buckle method. After the installation is completed, no screws are exposed. The roof system maintains a complete seal and forms a continuous weather resistance. The FASEAL envelope system can solve the problem of rainwater leakage in the building.

FASEAL 快易封屋面系統採用了滑動式的固定座組件，提供屋面板沿長度方有足夠的位移空間，防止金屬屋面板因溫度差異而出現的冷縮熱脹變形，導致連接組件疲勞及影響屋面系統結構失效。

FASEAL roofing system adopts sliding fixing clips components to provide enough displacement space along the length of the roof panel to prevent it from shrinking and thermal expansion due to temperature differences, causing fatigue of the connecting components and affecting the roof system structure failure.

FASEAL 快易封是一種全支撐屋面系統，無需其他填充材料輔助，屋面板肋以機械鎖扣折密，完成後完全防滲、防水；

FASEAL 快易封屋面板成弧性能良好，能做特別細的三維加工處理，適合圓頂、馬鞍形等雙曲屋面造型；板肋較低，線條柔和順滑，給建築師帶出精緻、東方古典韻味。

FASEAL roof system is a fully supported roofing system without the assistance of other waterproof filling materials. The roof panel ribs are folded and sealed with mechanical locks, and they are completely impermeable and waterproof after completion;

The arc-forming performance is good, and it can be processed into a particularly fine three-dimensional arc, which is suitable for hyperbolic roof shapes such as domes and saddles. The rib is low and the lines are soft and smooth, giving architects a delicate, oriental classical charm.



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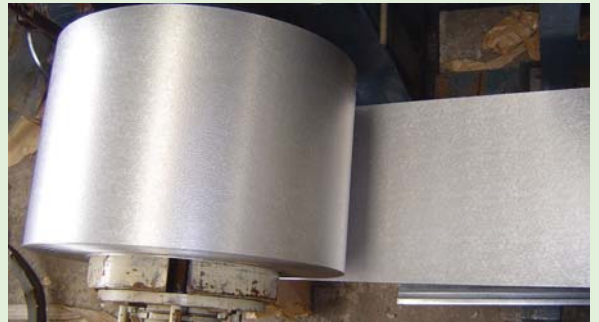
產品簡介

1 . Products

1.2 面板材料 Panel Materials

FASEAL 快易封金屬屋面可以提供不鏽鋼、鋁合金、彩鋼板等材質供設計師根據項目個性需要自由選擇。

FASEAL roof can provide Stainless steel, Aluminum alloy, Paint steel and other materials for designers to choose freely according to the individual needs of the project.



不鏽鋼 Stainless Steel	SUS 316L	SUS 445
鋁合金 Aluminum Alloy	AA 3004	AA5052
彩鋼板 Painted Steel	AM/AZ 150 G300	

材料類別 Materials	厚度 mm Thickness	耐腐蝕性 Corrosion Assistance	熱膨脹性 Expansion	耐海洋氣候 Ocean Climate Resistanle
不鏽鋼 316L Stainless steel	0.4~0.5	○○○○○	○○○	○○○○○
不鏽鋼445 Stainless steel	0.4~0.5	○○○○○	○○	○○○
不鏽鋼444 (烤漆) Stainless steel	0.4~0.5	○○○○○	○○	○○○
鋁合金3004 Aluminum alloy	0.7	○○○	○	○○
鋁合金5052 Aluminum Alloy	0.7	○○	○	○○
彩鋼板 Paint steel	0.45	○	○○	○

注：○ 是代表性能的優異程度。 Note: ○ is the performance level.

1.3 表面處理 Surface Treatment

* 壓紋 Embossing

不鏽鋼材質的快易封面板可以在表面，附加不同形式的壓紋，對光線造成漫射，產生柔和舒適的外觀效果。

The stainless steel FASEAL panel can be embossed in different forms on the surface to diffuse the light and produce a soft and comfortable appearance.

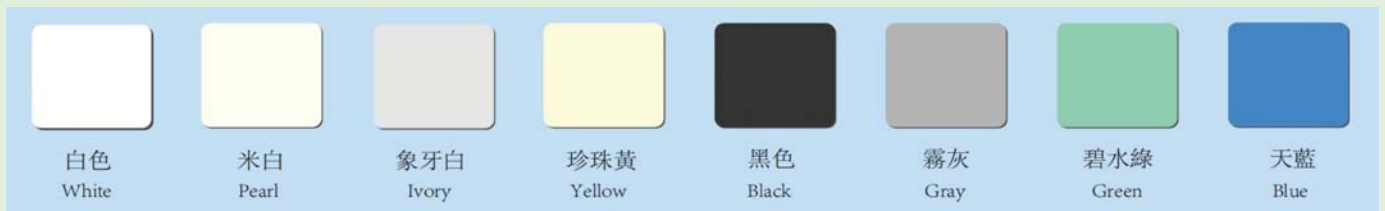


防反光
Anti-Reflective

* 烤漆 Painting

除了壓紋工藝外，金屬屋面板還可以選擇表面烤漆處理，可以滿足不同建築設計顏色的需求。(僅限鐵素體444不鏽鋼)

In addition to the embossing process, the Roof panel can also choose the surface paint treatment, which can meet the needs of different architectural design colors. (Ferritic 444 stainless steel only)



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產品簡介

1 . Products

1.4 板型特性 Features

FASEAL 快易封屋面系統產品具有多樣特點，可以滿足設計複雜，應用多變要求，融入現代建築理念。

FASEAL roof system products have various characteristics, which can meet the requirements of complex designs and changeable applications, and are easy integrated into modern architectural concepts.



在異型、彎弧屋面板的應用過程中，板肋變形是最常見的問題而且影響屋面結構性能，因此應通過檢測來確定產品截面特性並用於設計驗算，產品系統測試所用的異型板、彎弧板的形狀大小等特徵是需要和項目建設一致。

In the application process of special-shaped and curved roof panels, the deformation of plate ribs is the most common problem and affects the performance of the roof structure. Therefore, the cross-sectional characteristics of the product should be determined through testing and used for design verification. The shape and size of the special-shaped plate and the curved plate used in the product system test need to be consistent with the project construction.

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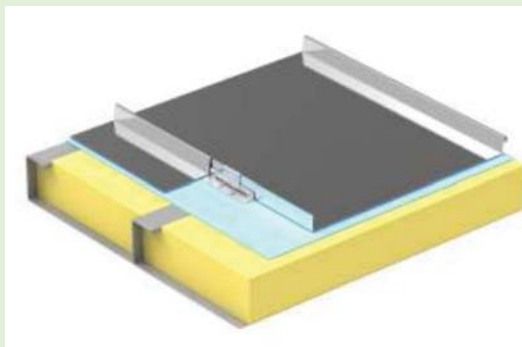
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產品簡介

1 . Products

1.5 標準系統組合 Standard System

FASEAL 快易封可以根據不同建築使用需求，自由搭配或不同的系統屋面產品。
According to the different requirements, FASEAL can be combined with different roof products freely.



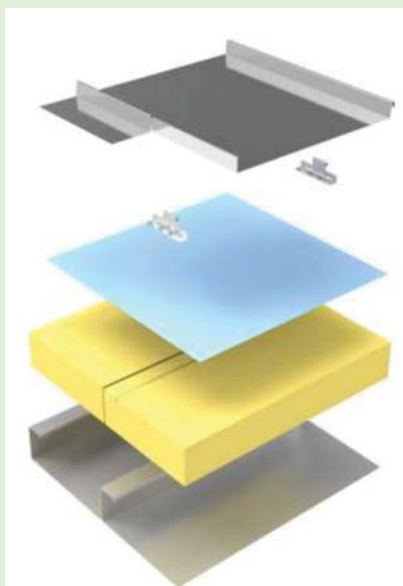
A 款 : 盆式結構系統
Type A : Structural Tray system

鋼結構底板, 無需檁條,
底面是美觀平整的天花板

Steel structure bottom tray, no purlin required, and the bottom surface is a beautiful and flat ceiling

性能指標 Performance Indicators

設計使用年限 Design life	50年 +
耐火系數 Fire resistance	>1.5 H
抗風荷載 wind load resistance	10.0 kPa
系統自重 System Weight	0.3kN/m ² ~0.4kN/m ²
系統厚度 Thickness	~150mm



系統構造 Components

由上至下 From top to bottom

- A : 快易封面板 FASEAL Roof panel
- B : 可滑移固定座 Slide clips
- C : 防水透氣膜 Breather membranes
- D : 優質岩棉 Rock wool insulation
- E : 隔氣膜 Vapour control layer
- F : 輕而承底板 FASTRAY Structural Tray

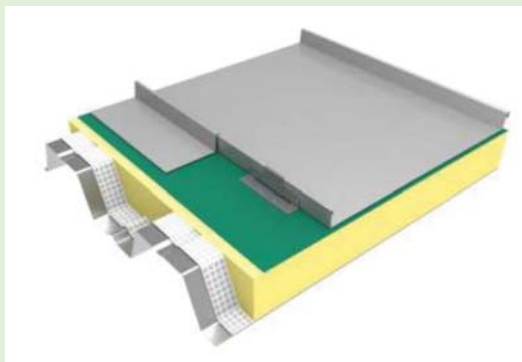
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產品簡介

1 . Products

1.5 標準系統組合 Standard System



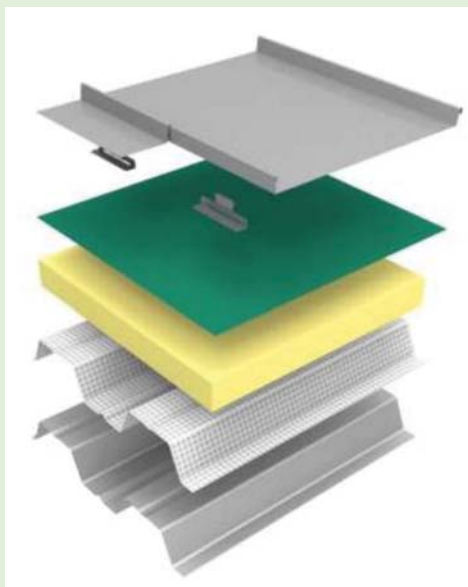
B款：結構鋼承板構系統
Type B : Roof Deck Structure

大跨度，施工方便、快捷

Large Span, Convenient and Quick Construction

性能指標 Performance Indicators

設計使用年限 Design life	50年 +
耐火系數 Fire resistance	>1.5 H
抗風荷載 wind load resistance	10.0 kPa
系統自重 System Weight	0.3kN/m ² ~0.4kN/m ²
系統厚度 Thickness	~140mm



系統構造 Components

由上至下 From top to bottom

- A : 快易封屋面板 FASEAL Roof panel
- B : 可滑移固定座 Slide clips
- C : 防水透氣膜 Breather membranes
- D : 優質岩棉 Rock wool insulation
- E : 隔氣膜 Vapour control layer
- F : 高鋼迪樓承板 KOFORMDEK Roof deck

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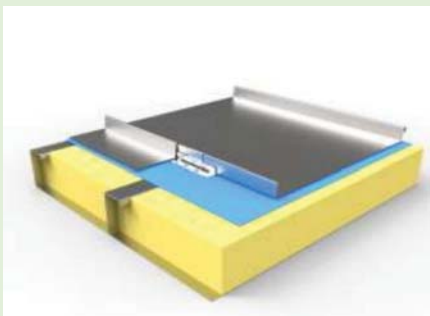
產品簡介

1 . Products

1.6 System Recommendation 系統推薦

P&L百安力將與設計師密切溝通，了解建築設計階段的要求細節，並根據專案特點提供科學合理的屋面系統。

P&L will communicate closely with the designer to understand the details of the requirements in the architectural design stage, and provide a scientific and reasonable roofing system according to the characteristics of the project.

項目概況 Project Introduction		設計 Design Services (No.1)			
建築類型/功能 : Building function	1. 展覽會館 Exhibition	2. 體育中心 Stadium	3. 飛機場 Airport	4. 火車站 Train station	5. 其他 Other
建築使用壽命 Service life	5年(臨時性) 5 years	25年(易於替換性) 25 years	50年(普通房屋) 50 years	100年(新概念建築) 100 years	
建築性能要求: Requirements	外觀性能 Appearance	造型較為複雜, 曲面較多。 Complex surface.			
	耐久性能 Durability	建築位於亞熱帶沿海地區, 海洋性腐蝕環境。 Subtropical coastal areas, marine corrosive environment.			
	保溫性能 Insulation	需要冬季保溫, 夏季隔熱。 Requires insulation in winter and summer.			
	聲學性能 Acoustic	無特殊要求。 No special requirements.			
	抗風性能 Wind resistance	符合MCIS標準要求。設計風壓5.0kpa以上。 Meets MCIS standard requirements. Design wind pressure above 5.0kpa.			
	防水性能 Waterproofing	優異的防水排水性能。 Excellent waterproof and drainage performance.			
	耐火性能 Fire Resistance	符合BS476. EN1187標準耐火要求。 Comply with BS476. EN1187 standard fire resistance requirements.			
	底板/天花性能 Tray/Ceiling	底面平整美觀, 無需加裝天花。 The base is flat and beautiful, no need to install a ceiling.			
廠家建議 Recommendation					
		<p>A : 快易封屋面板 FASEAL Roof panel</p> <p>B : 可滑移固定座 Slide clips</p> <p>C : 防水透氣膜 Breather membranes</p> <p>D : 優質岩棉 Rock wool insulation</p> <p>E : 輕而承底板 FASTRAY Structural Tray</p>			
性能指標 Performance Indicators					
外觀性能 Appearance	良好成弧性能 Good arc forming performance	抗風性能 Wind resistance	動態抗風性能達到 $\geq 10.0\text{kpa}$ Dynamic wind resistance (MCIS)		
耐久性能 Durability	系統設計使用年限50年以上 System design life more than 50 years	防水性能 Waterproofing	15分鐘噴淋, 無滲漏 (MCIS) 15 minutes spray, no leakage (MCIS)		
保溫性能 Insulation	熱傳導係數 Thermal conductivity 0.35W/(m ² ·K) 表面溫度係數 Surface temp. coefficient 0.9	耐火性能 Fire Resistance	90min 無穿透、融化、滴落 No penetration, melting, drip (BS. EN)		
聲學性能 Acoustic	計權隔聲量 37dB Weighted sound insulation 37dB	底板/天花性能 Tray/Ceiling	底面平整美觀, 可直接做為天花使用 The base is smooth as a ceiling		

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性能介紹 2 . Performance

2.1 Durability 耐久性能

金屬屋面腐蝕 Metal Roof Corrosion:

金屬材料受周圍介質的作用而損壞，稱為金屬腐蝕。金屬的鏽蝕是最常見的腐蝕形態。這會顯著降低金屬材料的強度、塑性、韌性等力學性能，破壞金屬構件的幾何形狀，增加零件間的磨損，破壞了材質的物理性能，縮短建築的使用壽命。

The metal material is damaged by the action of the surrounding medium, known as metal corrosion. Rust, the most common form of corrosion, will significantly reduce the mechanical properties such as strength, plasticity, toughness, etc., damage the geometry of the metal components, increase wear between parts, destroy physical properties, and shorten the service life of the building.



不同的環境會對金屬帶來不同的腐蝕效果，所以屋面選材要根據不同的環境考慮。因此環境因素對於系統的耐久性能非常重要，而環境因素又包括了外部環境和內部環境。

The different environments will cause different metal corrosion. Thus, for materials durability, the environment effect, which including exterior and interior should be considered when selecting materials.

A 外部環境 Exterior :

◎ 海洋環境 Ocean

◎ 工業環境 Industry

◎ 鄉村和郊區環境 Village

B 內部環境 Interior:

◎ 潮溼或有污染的環境 Wet/polluted

◎ 乾燥的環境 Dry

◎ 熱/乾燥的環境 Hot / Dry

外部環境下不同材料的耐久性：

Durability of different materials in exterior environment:

自然材質，表面無有機塗層 Natural material, without coating

材質 Material	外部環境 External Environment		
	◎ 海洋環境 Ocean	◎ 工業環境 Industry	◎ 鄉村和郊區 Village
不銹鋼 Stainless Steel	> 50 years	> 50 years	> 50 years
鋁合金 Aluminum Alloy	> 10 years	> 10 years	> 25 years
熱浸鍍鋁鋅 Hot-Dip Al-zn	10 years	> 10 years	20 years
熱浸鍍鋅 Hot-Dip Zn	2-5 years	2-5 years	15 years

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性能介紹 2 . Performance

2.1 Durability 耐久性能

爲了增強金屬屋面的耐久性能,通常會對金屬屋面板進行預軋塗耐候性塗料,以下是不同材質的金屬板在中性鹽霧 2000小時測試後表面的腐蝕狀態:

In order to enhance the durability of metal roofs, the metal roof panels are usually pre-rolled with weather-resistant coatings. The following is the corrosion state of the metal panels of different materials after 2000 hours of neutral salt spray test:



AA 5052 彩鋁 5052 color aluminum

316不銹鋼 316 stainless steel

鋅鈦合金板 Zinc-titanium panel

因此,金屬屋面系統的設計應用應充分考慮耐久性特點,根據不同的建築壽命要求進行科學有效的金屬屋面系統設計和選材。如BS 7543:1992對於不同的建築有著不同的壽命要求。

Therefore, the design and application of metal roofing systems should fully consider the durability characteristics, and carry out scientific and effective design and material selection of metal roofing systems according to different building life requirements. For example, BS 7543:1992 has different life requirements for different buildings.

類別 Category	描述 Description	建築壽命 Service Life	示例 Example
1	臨時性的 Temporary	10年 10 years	臨時性的展廳和臨時性的場所建築 Temporary exhibition building
2	短期 short term	最少10年 10 + years	臨時性的教室, 短期工業建築, 倉庫等 Temporary classroom, industrial building warehouse
3	中期 Medium term	最少30年 30 + years	大多數的工業廠房 Most of industrial workshop
4	正常期限 Normal term	最少60年 60 + years	新建的教學樓、住宅等 New teaching building, living building
5	長期 Long term	最少120年 120 + years	城市或其他高要求的建築 Buildings in city or with higher demands

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性能介紹 2 . Performance

2.2 Wind Resistance 抗風性能

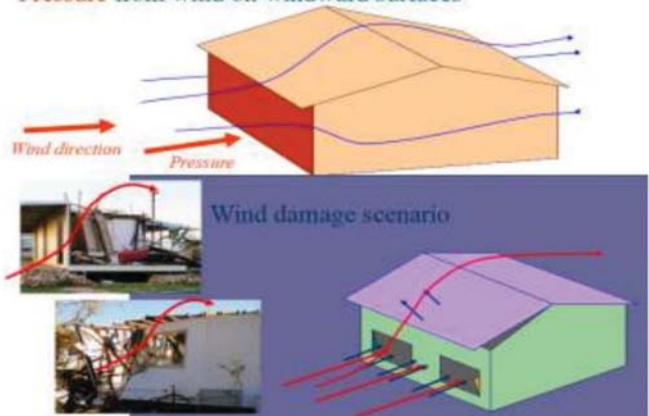
金屬屋面圍護系統建築物經常會遇到強颱風破壞。
The metal building envelop is usually damaged by typhoon.



大自然環境的風力荷載直接影響建築物結構，在迎風面會產生正風壓，屋面和側面會產生負風壓，因此必需要進行充分的設計考慮，防止嚴重的風揭破壞。

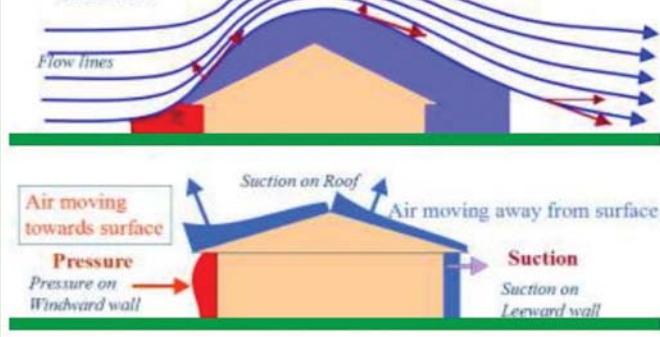
The wind load of the natural environment directly affects the structure of the building. Positive wind pressure will be generated on the windward side, and negative wind pressure will be generated on the roof and sides. Therefore, sufficient design considerations must be taken to prevent serious wind damage.

Pressure from wind on windward surfaces



Wind Actions

Forces caused by pressures induced by wind passing over structure



特別注意的是，當自然風從屋面吹過的時候，受負風壓狀態影響，會產生較大的向上拉扯力，由此使得屋面板脫扣，連接失效，進而造成風揭破壞。

It is especially important to note that when the natural wind blows through the roof, a large uplift force will be generated due to the influence of the negative wind pressure, which will cause the roof panel to trip and the connection to fail, thereby causing wind damage.

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性能介紹 2 . Performance

2.2 Wind Resistance 抗風性能

FASEAL 快易封金屬屋面為有效應對風荷問題通過系統全面的設計考慮。滿足不同地區，不同海拔，不同建築造型對於抗風性能的不同要求。如主支撐間距的合理設置,固定座密度的合理排布等,有效提高其抗風性能。

FASEAL considers comprehensively to meet different requirements of wind resistance for different buildings in different regions , such as reasonable main support span, fixing clips quantity. For example :Rational arrangement of purlins spacing or fixed bearing, effectively improve the performance of wind resistance.

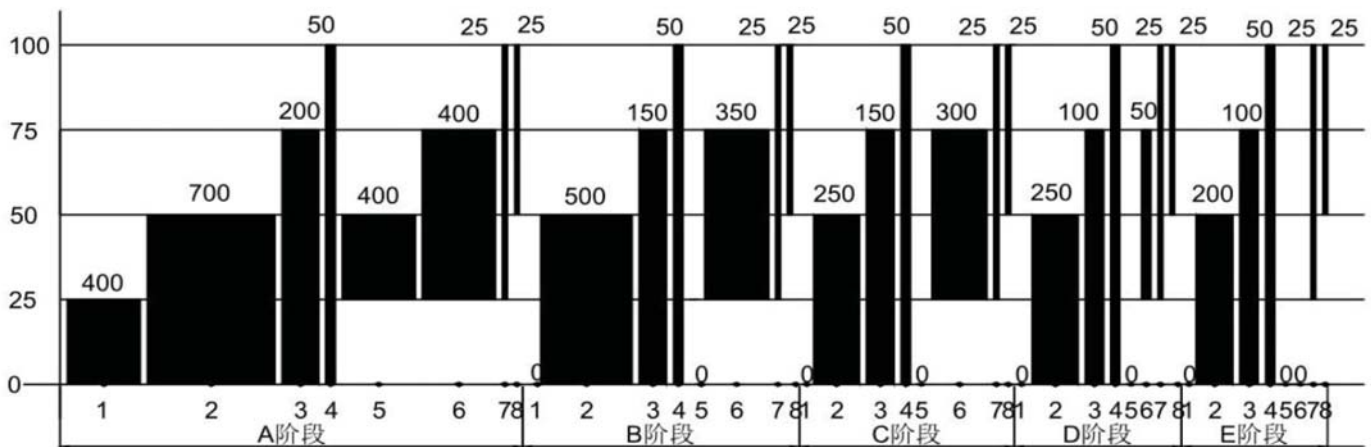
百安力會根據建築設計風壓,初步進行系統設計,然後按照MCIS進行抗風揭檢測,驗證所推薦的屋面系統設計方案,以確保產品抗風安全。

Based on the building design wind pressure, P&L will design the system initially and then take wind resistance test, which is according to MCIS, to verify the solution available.

抗風性能檢測標準 Wind resistance test standard

抗風性能檢測遵循MCIS-PPT-01抗風揭檢測方法進行,抗風檢測方法可分為靜態抗風揭與動態抗風揭檢測。值得注意的是,一個真正的颱風持續時間為13~14個小時,約50000秒,一次波動時間為10秒,為真實模擬台風狀態波動風荷載檢測的基礎數值5000次僅為一個颱風週期的模擬。測試風荷載的分級實際上是模擬真實的颱風變化,所以對於動態風荷載檢測可要求至少要高於5000次的檢測。

The wind resistance test is carried out according to the MCIS-PPT-01 wind resistance test method, which can be divided into static wind resistance test and dynamic wind resistance test. It is worth noting that the duration of a real typhoon is 13~14 hours, about 50,000 seconds, and the time of one fluctuation is 10 seconds, which is the basic value of 5,000 times for the real simulation of typhoon state fluctuation wind load detection, which is only a simulation of one typhoon cycle. . The classification of the test wind load is actually to simulate the real typhoon change, so for the dynamic wind load detection, at least 5000 times of detection may be required.



FASEAL 快易封金屬屋面系統達到 MCIS-PPT-01 風荷載要求。

FASEAL metal roof can meet the wind loading resistance requirement of MCIS-PPT-01.

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性能介紹 2 . Performance

2.3 Waterproof 防水性能

金屬屋面系統最常見的便是漏水漏雨問題，而漏水的原因可能是多方面的比如：
Leakage is the most common problem of metal roof system caused by the following reasons:

- 屋面坡度與排板方向
Roof slope and panel laying
- 屋面板的防水排水能力
Waterproofing and draining ability
- 天溝與落水管
Gutter and downpipe
- 搭接與節點處理
Lap detail
- 屋面板的強度與剛度性能
Strength and stiffness of roof panel
- 材料的耐用性
Material durability
- 屋面的施工質量
Installation quality



明報 Ming Pao Daily News

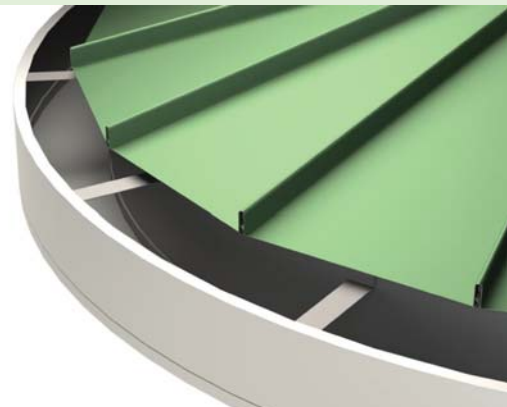
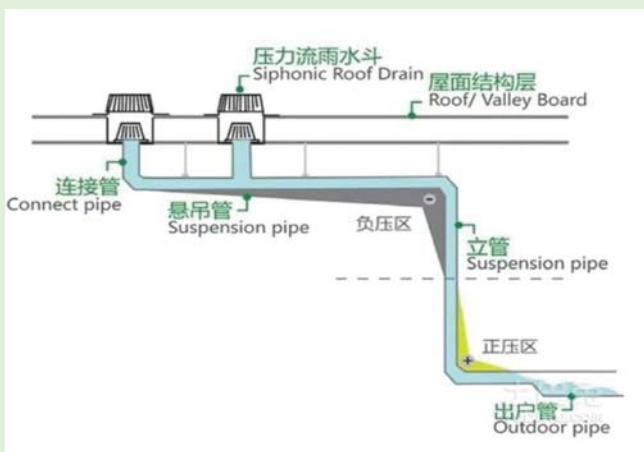
FASEAL 快易封金屬屋面充分考慮建築的防水要求，通過不同的防水材料搭配，科學的節點處理，適宜的坡度與板材設置，有效的排水路徑分配，以及專業的施工隊伍來達到有效防水要求。

FASEAL fully considers the construction waterproofing requirements, which including different waterproofing material, scientific node processing, suitable slope and plate laying, effective draining path and professional installing team to achieve effective waterproofing requirement.

Gutter and downpipe design 天溝與落水管設計:

虹吸排水系統：利用屋面與地面所形成的高差間產生的能量，控制排水高度，隔絕空氣進入排水管，以滿管狀態（虹吸狀態）排水時，以抽吸的作用將雨水快速的排走。

Siphon draining system: Prevent air getting into draining pipe by the height difference roof and ground, siphoning the rainwater speedily.



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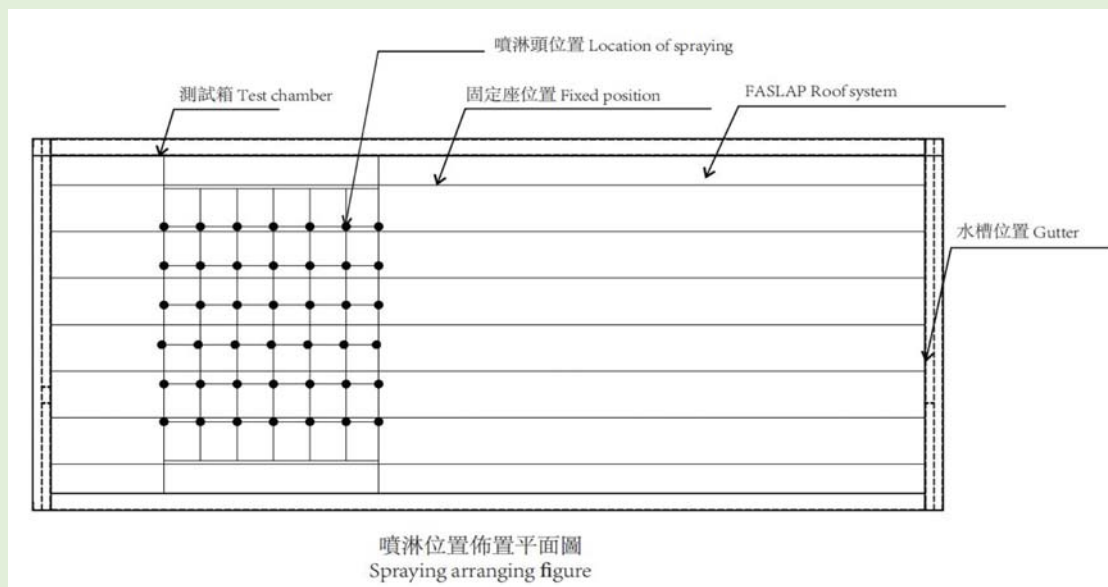
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性能介紹 2 . Performance

2.3 Waterproof 防水性能

為確保屋面產品的防水性能,P&L百安力同樣提供嚴謹的檢測驗證服務,按照MCIS標準執行屋面噴淋試驗驗證,所推薦的金屬屋面系統防水性能可靠。

In order to ensure the waterproof performance of roofing products, P&L Baianli also provides testing and verification services, and performs roof spray test verification in accordance with MCIS standards. The recommended metal roofing system has reliable waterproof performance.



模擬真實風雨狀態 Simulating real storm :

金屬屋面在強風雨的天氣狀態下,屋面金屬板接縫會受風壓的影響產生鬆動進而導致雨水滲漏,因此在FASEAL 快易封屋面系統進行模擬噴淋降雨實驗時加入了風壓作用,測試階段如下表:

In the weather of strong wind and rain, the metal roof joints will be loose due to the influence of wind pressure, which will lead to the leakage of rainwater. Therefore, the effect of wind pressure was added to the simulated spray rainfall experiment of the FASEAL roofing system. The test phase is as follows:

載入階段 Loading stage	目標壓力值(Pa) Target pressure	保壓(sec) Remaining time	卸載時間(min) Unloading time
1	-3225	10	2
2	-4300	10	2
3	-3225	10	2
4	-4300	10	2
5	-3225	10	2
6	-4300	10	2

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2.4 Fire Resistance 耐火性能



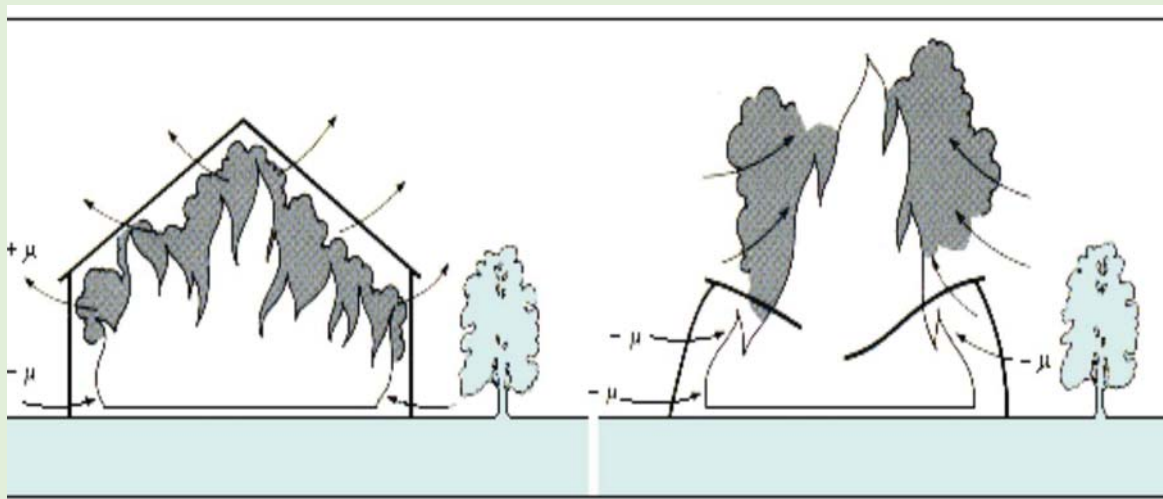
火災現場圖例
Fire site

金屬屋面防火設計應遵循的最高原則：

The highest principle of fire resistanting design :

有效的防止火災快速的蔓延，在建築結構失效前，確保人員有充足的時間逃離火災現場。各地耐火標準對此各有不同，一般為60min~90min。

Effectively prevent the rapid spread of fire, and ensure that personnel have sufficient time to escape the fire scene before the building structure fails. The fire resistance standards vary from place to place, generally 60min~90min.



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性能介紹 2 . Performance

2.4 Fire Resistance 耐火性能

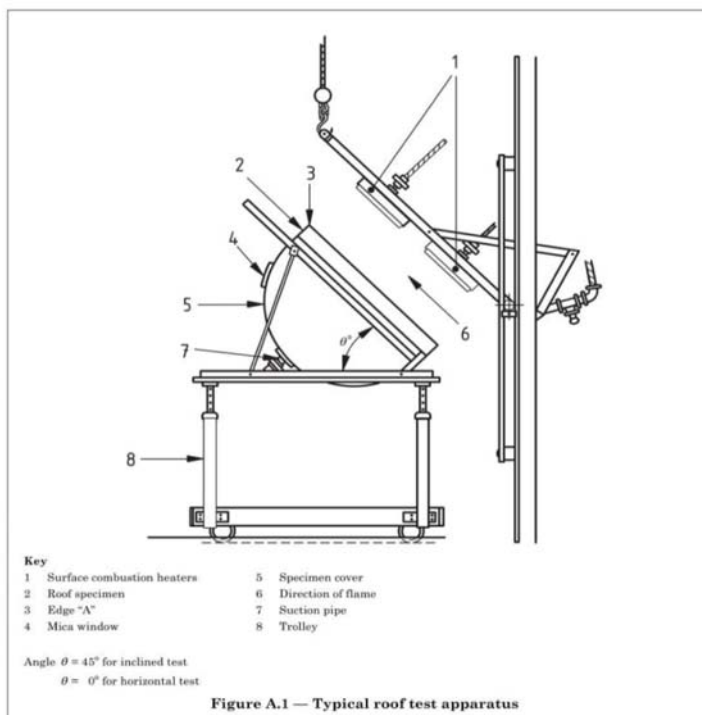
為保證屋面產品應用的耐火性能安全,參考英國標準的耐火檢測方法,對屋面系統試件進行試驗,確定產品在要求的測試時間內無燒穿,無融化。

In order to ensure the safety of the fire resistance performance of the roofing product application, refer to the British standard fire resistance test method to test the roof system specimens to ensure that the product does not burn through or melt within the required test time.

耐火檢測方法示意:

Fire resistanting test :

試件尺寸 Specimen size	輻射距離 Radiation distance
1M*1M	585mm ± 5mm
輻射量 Radiation quantity	輻射角度 Radiation angle
2 ± 1.5Kw/ m ²	0° / 45°



FASEAL 快易封金屬屋面系統材料本身屬於A1級不燃材料外,還可以根據建築設計的不同耐火要求進行靈活合理的系統組件調整,以滿足應用要求。

In addition to the materials themselves are A1 non-combustible materials, the FASEAL metal roofing system can also be adjusted flexibly and reasonably according to the different fire resistance requirements of the building design to meet the application requirements.

檢測結論 Conclusion

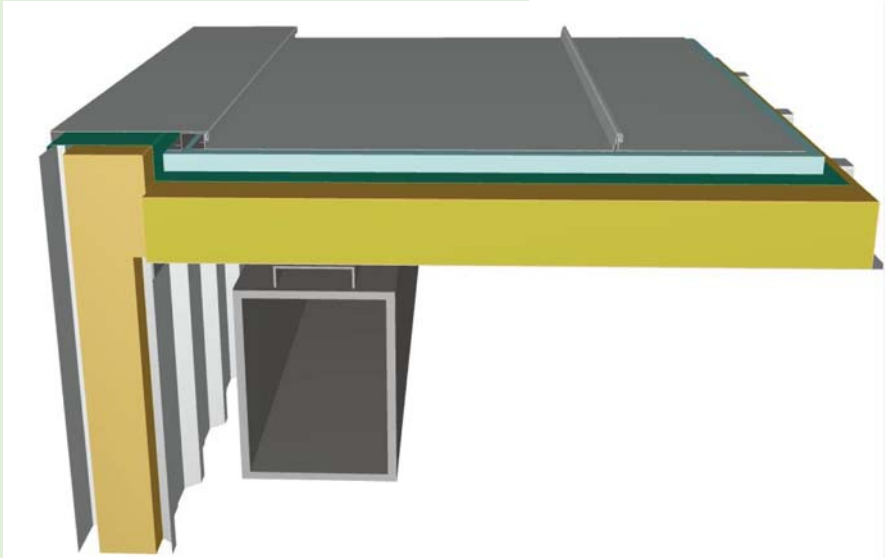
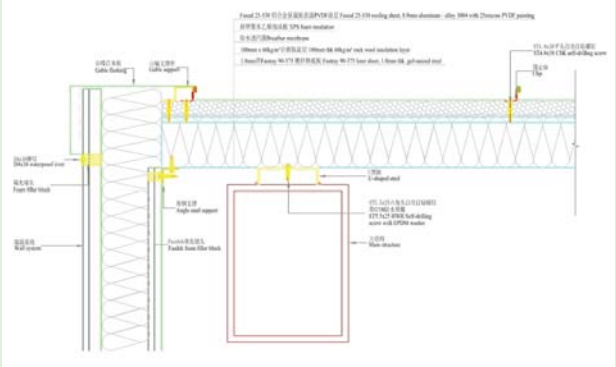
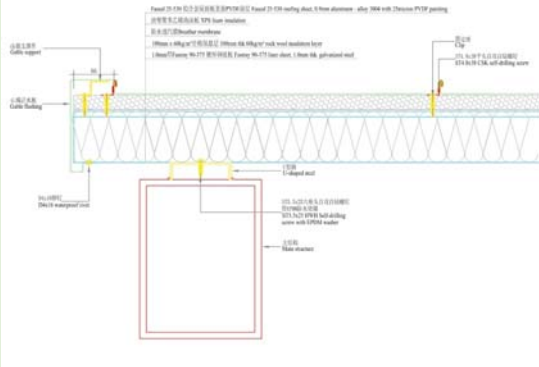
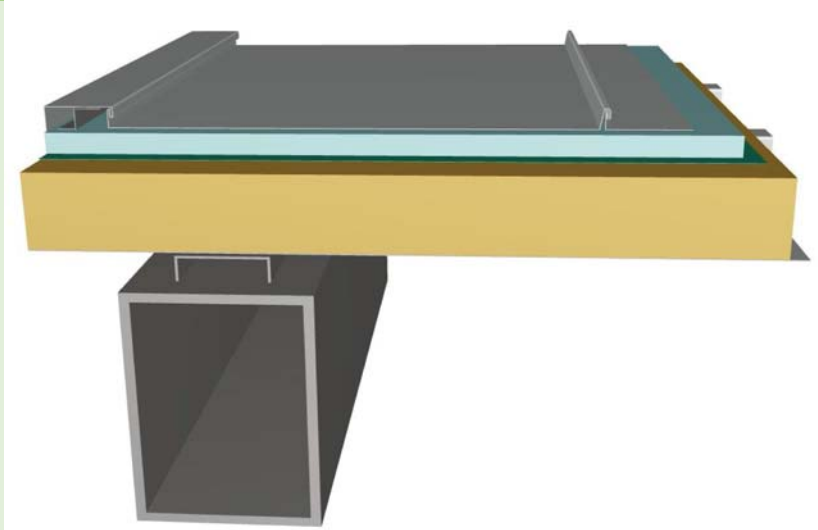
5 min	30 min	60 min	90 min
無明顯變化 No obvious change	輕微變黃 Slightly yellowing	局部發黑 Going black partly	輕微變形無燒穿無融化 Deformation slightly without burn through and melting

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系統節點 3 . Details

3.1 Gable details 山輪節點

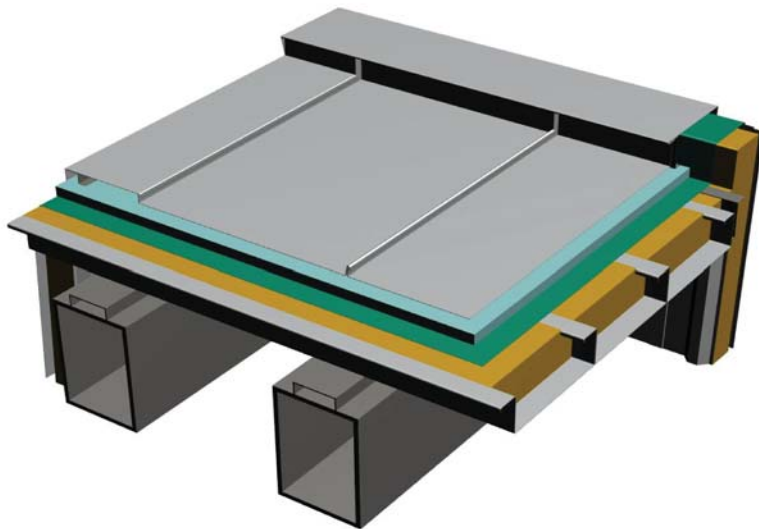
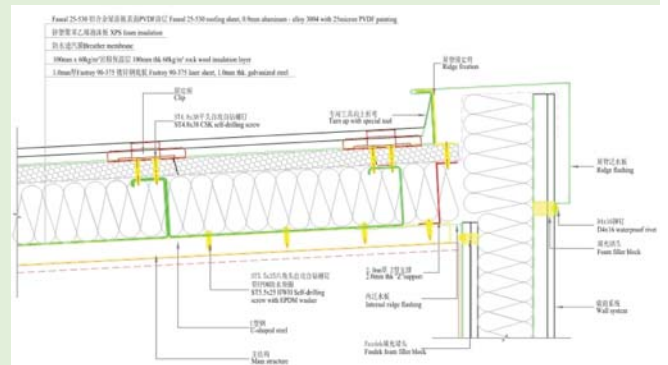
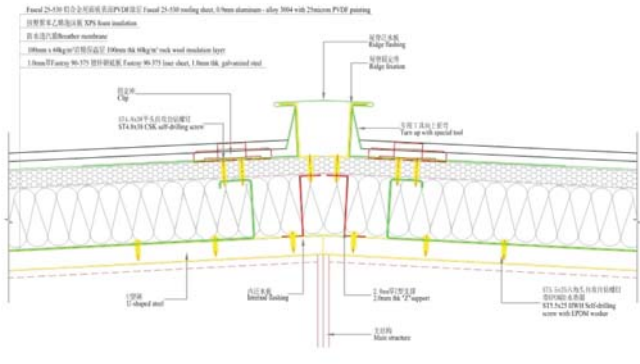
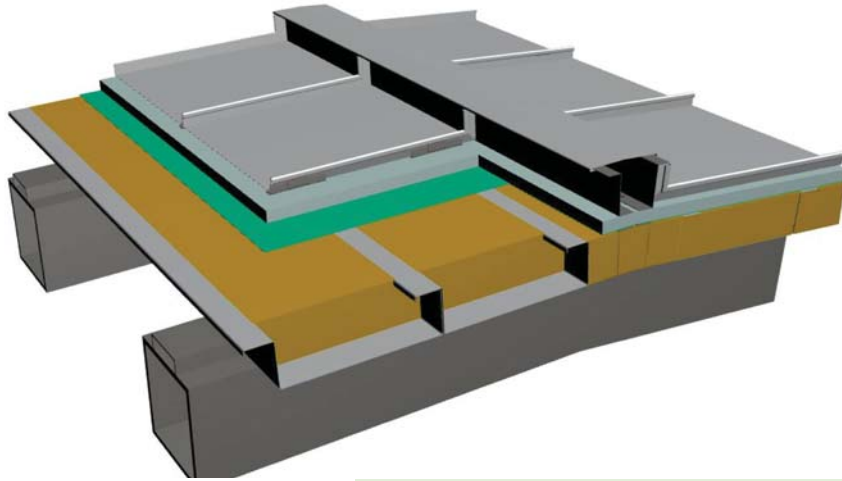


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系統節點 3 . Details

3.2 Ridge details 屋脊節點

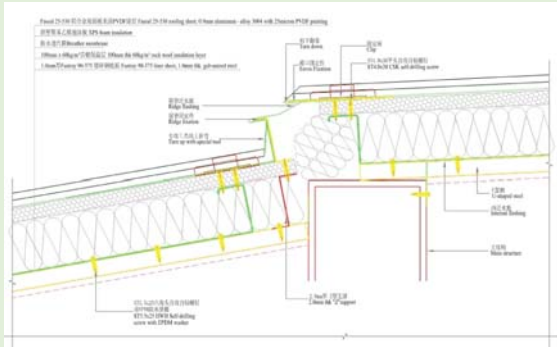
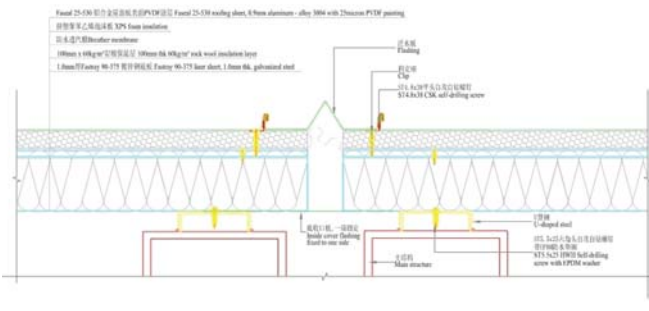
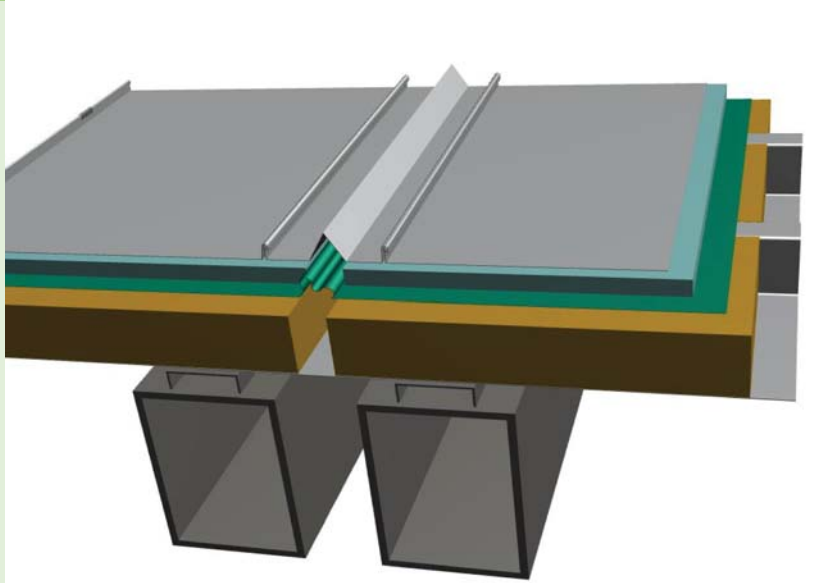


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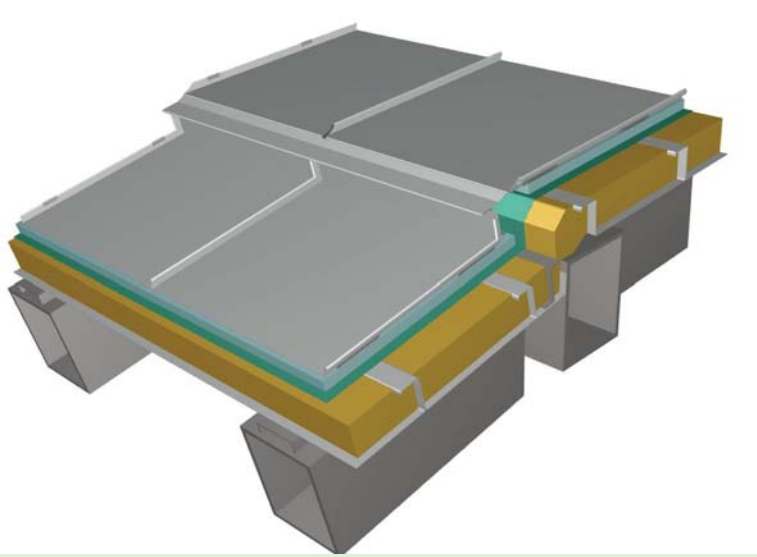
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系統節點 3 . Details

3.3 Expansion Joint 伸縮縫節點



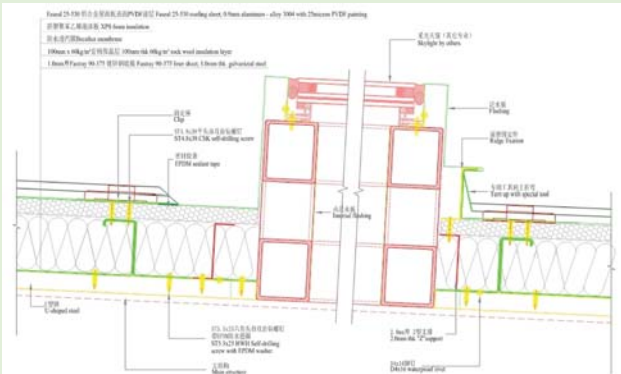
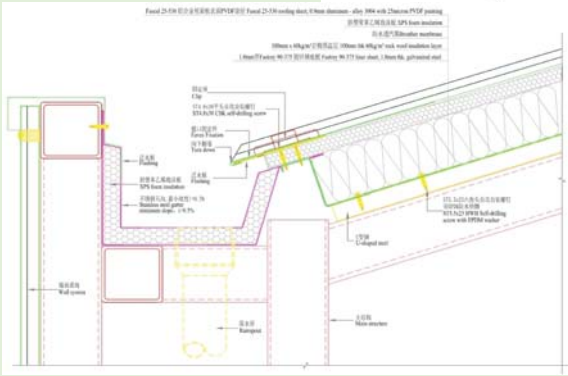
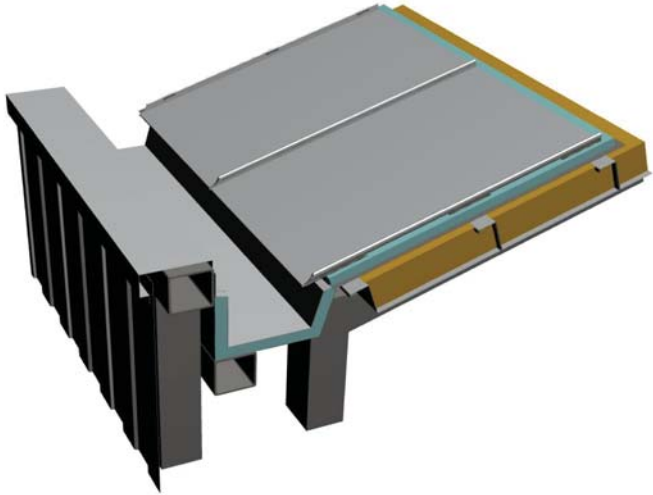
3.4 Step Slope 坡度節點



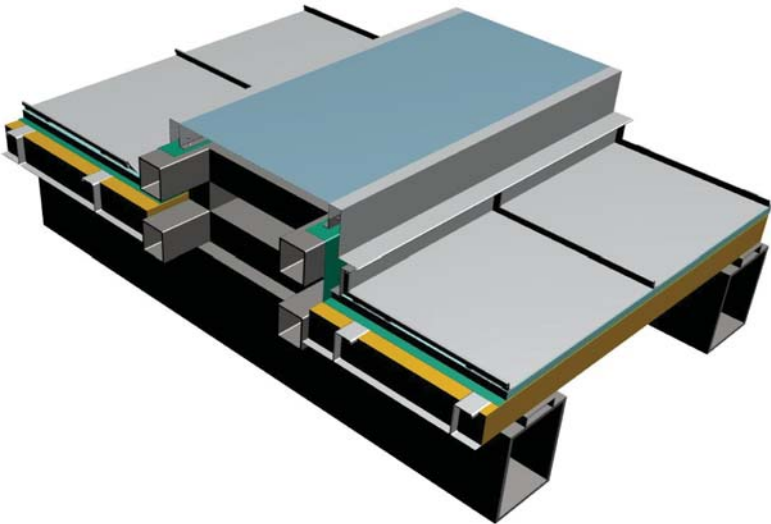
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系統節點 3 . Details

3.5 Gutter details 天溝節點



3.6 Skylight details 天窗節點



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工程案例 4 . Projects



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FASEAL® 快易封

雙摺邊屋面系統

Double Seam Lock Roof



百安力鋼結構應用科技有限公司
P&Ls Steel Structures Applied Technology Co., Limited

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