

Stainless Steel in Architectural Applications





Contents

Introduction

Art

Arches of Oman
Emerging Chinese Dragon Sculpture
Force of Nature II

Business

ASEM Convention Center
Visual Arts Building, University of Iowa

Culture and history

Lillehammer Art Museum
Sportcampus Zuiderpark

Green façade

New Bendigo Hospital
Platinum Apartment
Cambridge Terrace
Stonnington Office

Mobility and infrastructure

Incheon International Airport Passenger Terminal
Rapid-transit Railway Gwangmyeong Station
Wynyard Walk

Sports and leisure

Gwangju World Cup Stadium

Other

Steel Grove



Introduction



JOHN ROWE
Secretary-General

As I approach my fiftieth year in the stainless steel industry I find increasingly that the one constant that runs continuously through all those years is that I remain in awe of what can be achieved by this amazingly versatile material. From delicately precise surgical instruments, for which there is no viable alternative material, to kitchen knives and appliances; from hotel and catering equipment to hospital fittings; from industrial tubes and plants to containers for hazardous gases and liquids, as well as for the transport of daily staples such as milk and beer; from household appliances to architectural surfaces – the list today is practically endless and yet new developments emerge practically every day.

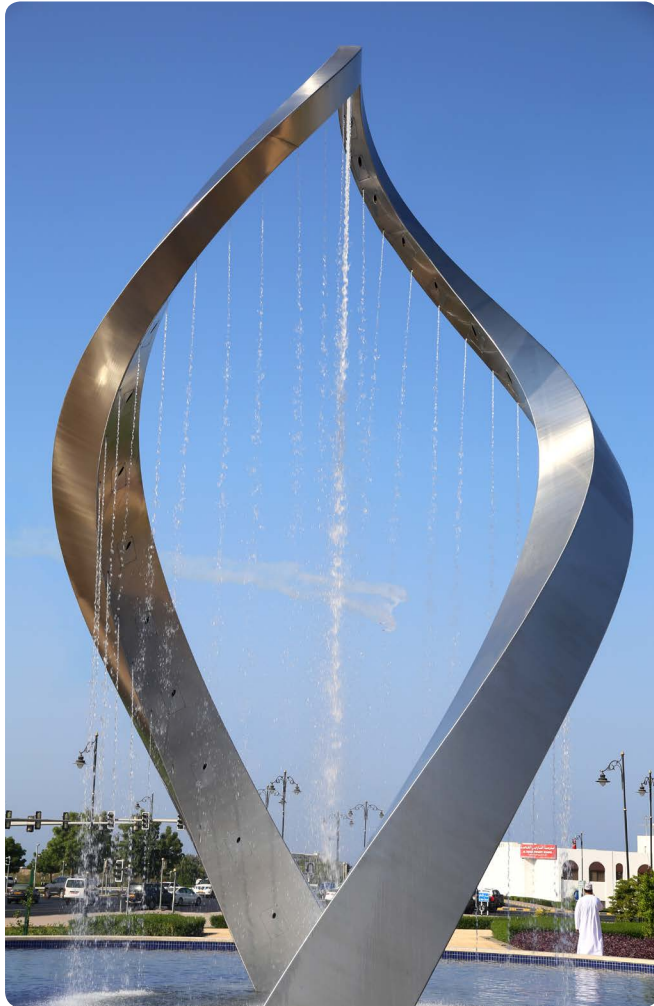
For me, the milestone achievement over the years since the Millennium has been the amazing growth of the development of stainless steel as an “art meets function” tool in the architectural sector. A glance through the pages of this (4th Edition) of our Architectural Brochures series will reveal immediately how the architect, as artist, has used stainless steel creatively to design something which is more than a building, more than a sculpture or more than a structure.

And the best thing is that whilst creating a thing of beauty, the designer is adding to the sustainability of our world, because the stainless steel he uses is capable of being 100% recycled when it comes to the end of its useful life. And that, dear reader, adds immeasurably to the value of life on earth.

As you page through this Brochure and look forward to further editions in this popular series, spare a thought to the men and women who work as one with science and art, and whose creativity and inspiration make modern life good. Long may it be so.

A warm word of thanks is due to our Fellow from Nisshin, Naoki Yasuda, who worked so hard to collect the contributions in this issue and to track the sources of the information so we could seek their approval to reprint the material; to Jo Claes, our Administration and Communications Manager, who manages to keep us within timetables and arranges the superb designs; to those of you who worked so hard to find unusual and informative examples that have not been used before and to submit the details to us; and, finally, to the architects, designers and photographers, who so willingly gave their permission for us to reproduce their work in these pages.

John Rowe
Secretary-General
International Stainless Steel Forum
Brussels



Arches of Oman

Muscat, Oman

The Arches of Oman, a ground-breaking, 12 metres high, water and stainless steel sculpture by the inspirational artist Giles Rayner, developed by the UK's leading engineers, has been unveiled at the Royal Opera House in Muscat, Oman.

It is anticipated that this extraordinary work of art will become an iconic symbol not only in Muscat, but also in the wider Middle East. At its location, next to The Royal Opera House, the country's premier venue for musical arts and culture, the new sculpture offers unique views from all surrounding approaches. Its stunning design includes purpose built gardens, a purpose built pool, 70 water jets, a subterranean plant room and 2 kilometres of hydraulic hoses.

The sculpture's jets provide four distinct patterns of water that project out of the piece and into the pool below. The sculpture is formed from Duplex Stainless Steel that is specified for extreme environments. Julian Glyn-Owen, the Commission Director for the artist, said that duplex provides enormous structural surface strength for the sculpture as well as the surface finish the architect and owner wanted and the anti-corrosive properties needed in this coastal environment.

Environment:	Urban
Material:	Grade: Duplex 2205
	Finish: Grit finish 320
	Size: Thickness 10 mm
	Weight: 12 ton
Artist:	Giles Rayer
More information:	www.archesoman.com



Emerging Chinese Dragon Sculpture

Australia

The designer, Michael Van Dam commented "The Dragon plays a major part in Chinese culture dating back several thousand years. It is a symbol of prosperity, strength courage and resolve." The designer was himself born in the year of the Dragon (1964).

Other Awards:

- People's Choice Currumbin Beach Vikings Surf Club Award
- Stainless Chain Reaction at Australia's 2015 Swell Sculpture Festival
- Children's Choice award, Swell Sculpture Festival, Australia 2015



Environment:	Urban
Material:	Grade: 316 Size: 4,000 mm of 4 mm thickness stainless steel chain Weight: 700 kg
Artist:	Michael Van Dam
Photographs:	Images supplied by Michael Van Dam
More information:	http://stainlesschainreaction.com/emerging-dragon-sculpture.html



Force of Nature II

London, UK (New York, USA and Doha, Qatar)

We humans think of ourselves as supreme beings, above all others and in absolute control of our destiny and our surroundings.

We live with a false sense of security only to be awakened by Mother Nature's fury, almost as if she needs to remind us of her presence and our responsibility towards her child (The Earth).

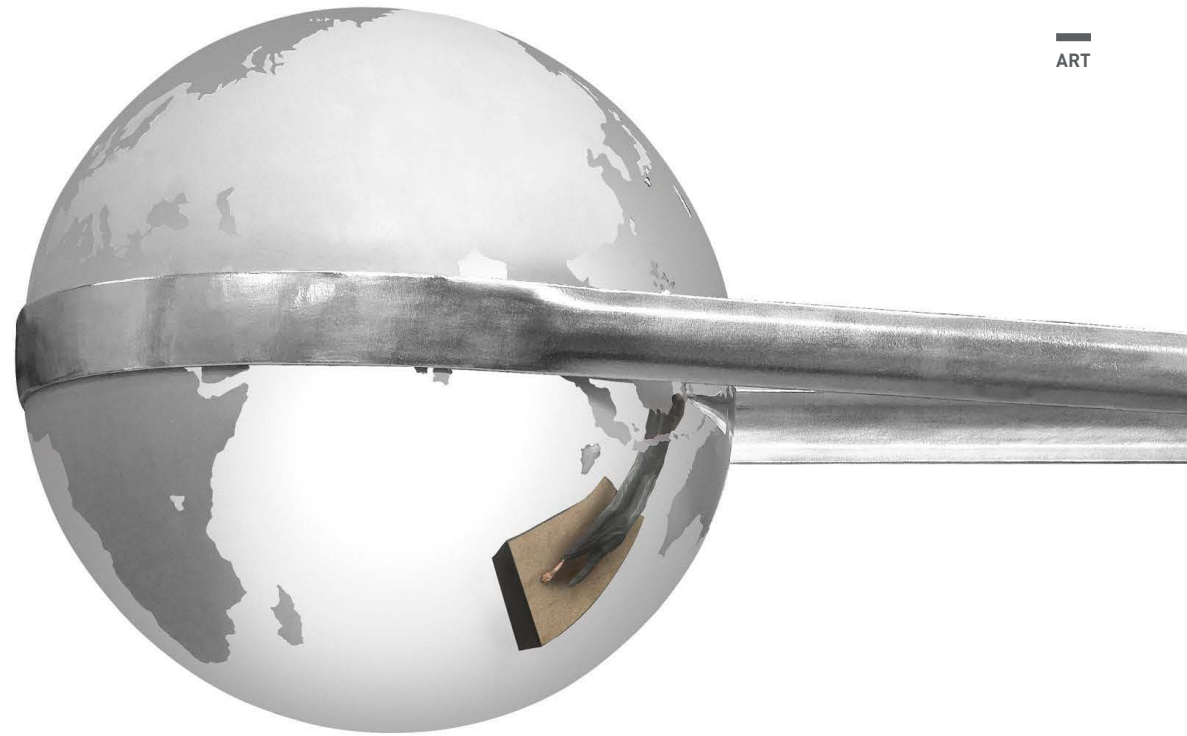
After having seen the ravaged coast of Thailand and the Hurricane that affected the Southern States

I decided to create a sculpture dedicated to Mother Nature.

This would be reminiscent of the early statues made as peace offerings to the Gods in the hope of quenching their anger.

In essence, people are not very different today from the people who lived thousands of years ago. We still devote ourselves to symbols in order to escape our destiny.

—Lorenzo Quinn



Environment:	Urban
Material:	Grade: 316L
Artist:	Lorenzo Quinn
Photograph:	Images supplied by Lorenzo Quinn
More information:	https://www.lorenzoquinn.com/portfolio-items/installations-the-force-of-nature-2/





ASEM Convention Center

Seoul, South Korea

The ASEM Convention Center, which opened in May 2000, is the representative convention center of South Korea and has attracted a variety of international events such as the Asia-Europe Summit in October of the same year. It has four large exhibition halls, a convention hall

that can accommodate 6,000 people, and 85 meeting rooms.

The walls in the lobby amounting to 450 metres are made entirely of transparent glass and the convention hall on the third floor has no pillars, despite being 85 metres long and 85 metres wide. The large roof, finished in stainless steel, creates an atmosphere of a plaza downtown located among buildings such as ASEM Tower and the Trade Center.

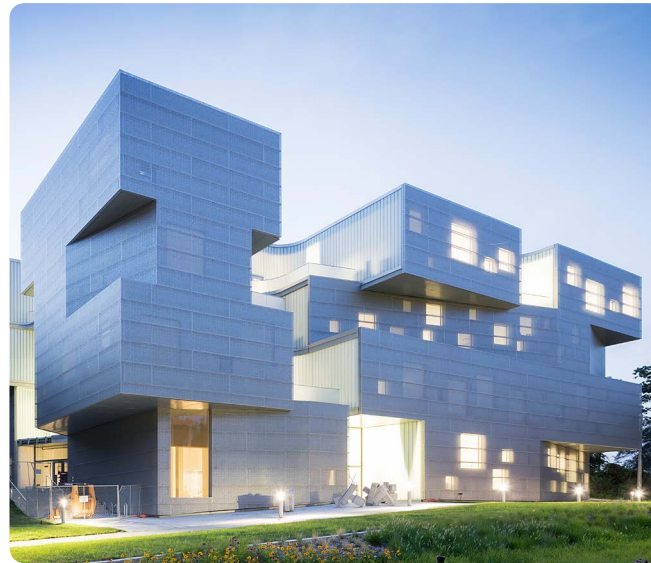
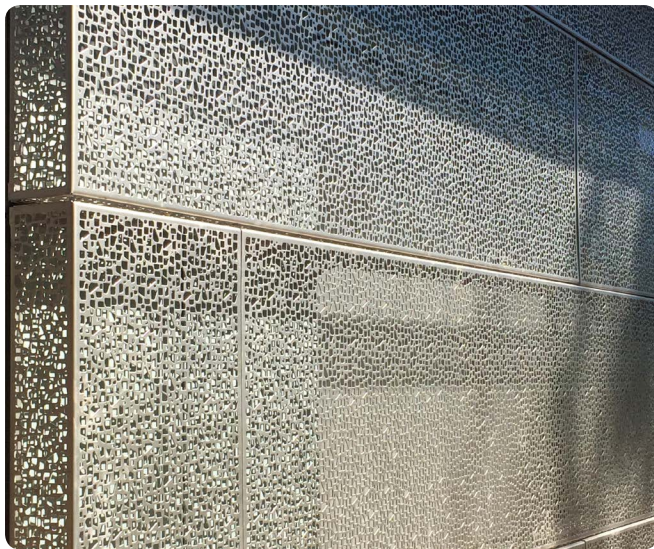
Environment:	Urban
Material:	Grade: 446M (26Cr-LCN), 316L Finish: Dull finish
Photograph:	POSCO
More information:	www.posco.com



Visual Arts Building, University of Iowa

Iowa, USA

The Visual Arts Building at the University of Iowa, designed by Steven Holl Architects in partnership with BNIM Architects, will open on October 7, 2016. The new state of the art facility provides 126,000 square feet of loft-like space for all visual arts media, as well as galleries, faculty offices, an outdoor rooftop studio, and teaching spaces for Art History. The building is designed to encourage collaboration between all arts disciplines.



Natural light and ventilation reach into the core of the building via “centers of light.” The seven vertical cutouts are characterized by a language of shifted layers, where one floor plate slides past another. This geometry creates multiple balconies, providing outdoor meeting spaces and informal exterior working space, further developing zones for interaction between the building’s four levels. Stairs are shaped to enable informal meeting, interaction and discussion, opening onto lounge spaces for collaborative work.

The new building forms an Arts Quad with the adjacent Art Building West, which was also designed by Steven Holl Architects and has drawn students from all over the campus to its social

Environment:	Urban
Architects:	Steven Holl Architects
Photographs:	Courtesy of Steven Holl Architects
More information:	www.stevenholl.com

spaces and library since opening in 2006. The Quad sets the two buildings in complementary contrast; Art Building West’s planar, red-steel brachiating form extends out over the landscape blurring boundaries; for the Visual Arts Building, the landscape carves into the building’s zinc-clad concrete volume forming seven terraced light courts infusing the interior with light. A campus route threads through the largest court, the central Forum, engaging the larger university community with art programs.

The porous, layered skin on the south and west façades of the Visual Arts Building modulates direct sunlight into the studio interiors. A fine-grain perforated, etched stainless steel screen floats eight inches over a zinc and glass inner skin, creating shifting shadows and depth in relation to the adjacent ravine’s trees. From the studios inside, the screen’s perforated shadows are blurred in the capillary insulation of the translucent windows. From the exterior during the day the screen’s scaleless nature renders the sculptural carving of the building volume. At night the windows behind the screen become visible as a rhythm of glowing squares in Fibonacci proportions.





Lillehammer Art Museum

Lillehammer, Norway

The Lillehammer Art Museum and Lillehammer Cinema were first established in an Erling Viksjø-designed building in 1964, which is considered today a definite representation of the architectural style of its time. The expansion of the Lillehammer Art Museum and Lillehammer Cinema was completed throughout spring 2016, with the Museum being completed in January, the Cinema in March, and the return of the art garden being completed in May.

The expansion of the Museum is created on idea of art hovering above a transparent base. The new space houses a children's workshop at ground level with floor-to-ceiling windows and sits beneath a cantilevered hall wrapped in a dynamic metal façade.

The second story gallery is dedicated to housing the works of Lillehammer-based artist Jakob Weidemann (1923-2001). The gallery's striking

metallic wrapping reflects the surrounding context and changes its appearance with the light. The façade was created by late Norwegian artist Bård Breivik (1948-2016), and it is conceptually rooted in the sculptural idea of a shooting star, a dramatic symbol of the importance of Weidemann's contribution to Norwegian painting. The façade is made from driven, highly polished stainless steel, with reliefs at approximately 25 cm deep.

The Lillehammer Cinema added two new auditoriums and renovated its existing circulation space. One auditorium is integrated in the existing building structure, and the second is located below the art garden, between the two existing buildings.

The entrance façade is renewed to compliment the style of the original building and brings to front a wall integrated with art by Odd Tandberg. The key concept is to bring back the foyer as an extension of the plaza in front of the Cinema, creating a stronger connection between the city and the foyer, as Viksjø originally had imagined it. With this, Tandbergs wall art in the foyer is again part of the city.

Environment:	Urban
Material:	Finish: Polished
Architects:	Snøhetta
Photograph:	Mark Syke
More information:	www.snohetta.com



Sportcampus Zuiderpark

The Hague, Netherlands

Located at the heart of the historic Zuiderpark, the €50 million sports campus is an innovative collaboration of alliances between education, sport, sport science and the community, for both the municipality of The Hague and its private partners: the Haagse Hogeschool and ROC Mondriaan.

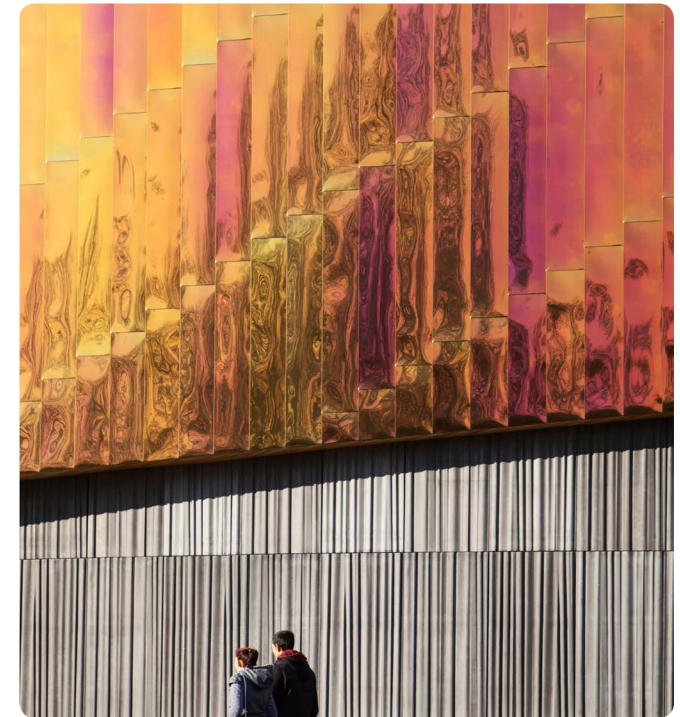
The overriding aim is to emphasize the importance of sport and exercise through learning and engagement, for the amateur as well as the elite athlete, using sport as the inspiration to deliver a healthier society. The 33,000 m² sports campus includes a gymnastics hall, beach sports hall, spectator arena and a multi-purpose sports hall, as well as a variety of sports science and education spaces.

Our design solution is an interpretation of the brief to embody within the campus the principles of 'motion and activity'. This is expressed externally in the fluid movement of the elevational treatment. At ground level, the curved form of the plan is expressed by a simple plinth constructed from textured precast concrete panels. The upper part of the elevation is expressed as a metallic

'ribbon' that narrows and twists to reveal glazing on the elevation. Constructed from brightly polished stainless steel, the dynamic ribbon changes colour with different lighting conditions and cloud patterns, as well as reflecting the animation of its natural setting.

The municipality of The Hague has the ambition to be climate neutral by 2040. This informed the client's desire for a sustainable campus.

The building is designed to be as compact as possible, whilst providing the necessary space for the range of sport and education facilities. When combined with a well-insulated shell, energy loss is therefore minimised. The 20,000 m² roof is covered with over 15,000 m² of heat-regulating green sedum, as well as photovoltaic solar panels to generate energy for the building and solar collectors to produce hot water for the showers. The energy generated by the roof is supplemented by a ground water heating and cooling system which utilises two wells excavated to different depths. In the summer when there is a demand for cooling, groundwater is pumped from the shallower 'cold' water well and fed through a heat exchanger to provide cooling for the building. Due to this energy transfer the water returns warmed and is fed back into the deeper 'warm' water well. In the winter the system is reversed to provide heating to the building.



Environment:	Urban
Material:	Grade: 316 Size: Thickness 0.8 mm Finish: Polished with Inox spectral finish (gold-red)
Architects:	Faulkner Browns Architects
Photographs:	Scagliola Brakkee, Hufton+Crow, Arjen Schmitz
More information:	www.faulknerbrowns.co.uk



New Bendigo Hospital

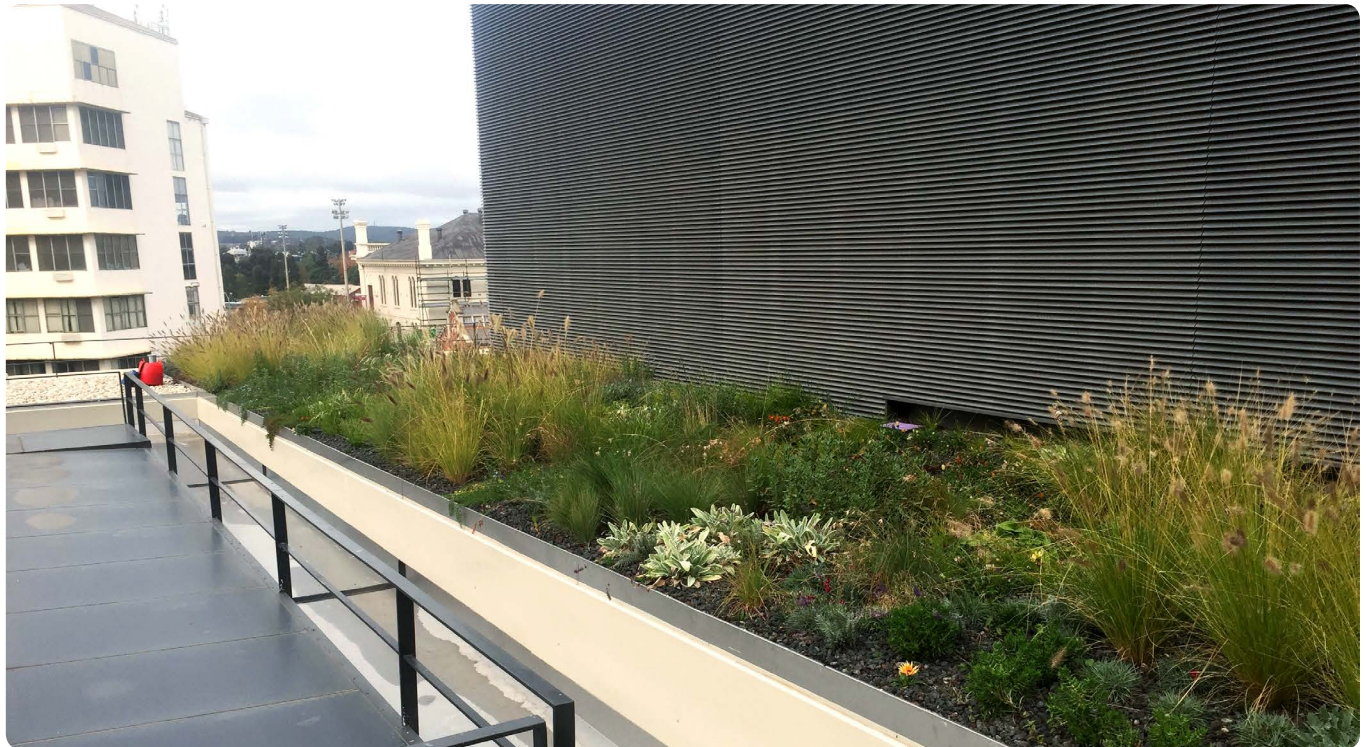
Bendigo, Australia

Fytogreen was commissioned to install 10 individual extensive roof gardens, totalling 965 m², spread over 4 levels at the New Bendigo Hospital site.

The planting design was completed in conjunction with Oculus to reflect the row cropping history of the region using 8,672 plants and 33 different species.

Fytogreen also installed 4,388 m² of stone ballast, spread over 5 roof levels using a combination of a white stone and tumbled grey bluestone.

Fytogreen stainless steel L- profile was used to contain the ballast and green roof from the exposed box gutter and the majority of the installation was constructed on "kingspan" panels.



Environment:	Urban
Architects:	Bates Smart
Photographs:	Fytogreen Australia
More information:	www.fytogreen.com.au



Platinum Apartment

Melbourne, Australia

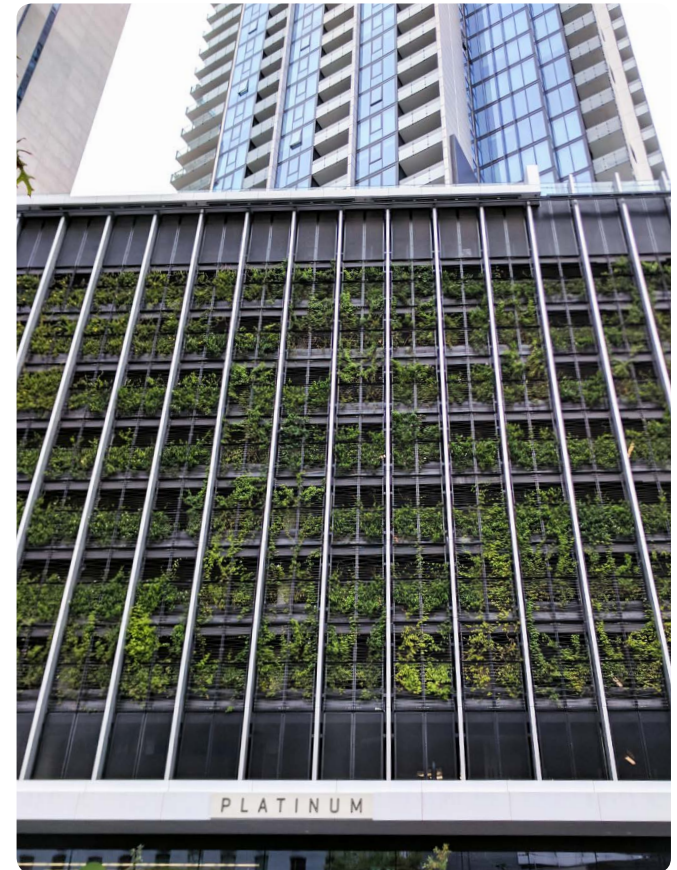
203 planter boxes were pre-grown at Fytogreen's nursery facility in Somerville for 9 months. The planting pallet comprised of 5 species with the aspect facing west and north.

A specially designed planter utilizing LLDPE "Rotomould" technology for long term sustainability to act as both a crash and fall protection barrier was designed with forklift slipper slots.

Pre-growth, V24 mesh from Tensile fitted to a powder coated frame, enable good plant establishment. A pre-growth period of 12 months or more would of been ideal to deliver the planters with their starter mesh panel at full coverage for all species.

This will be an iconic green facade for Melbourne and be spectacular in early summer when in full flower.

Environment:	Urban
Architects:	Squillace
Photographs:	Fytogreen Australia
More information:	www.fytogreen.com.au



TMENTS

K

SALVO

AWARD
DRESS
ALE
TT
SALVO

Metro

PLATINUM

Metro

45 CLARKE
45 CLARKE
45 STREET



Cambridge Terrace

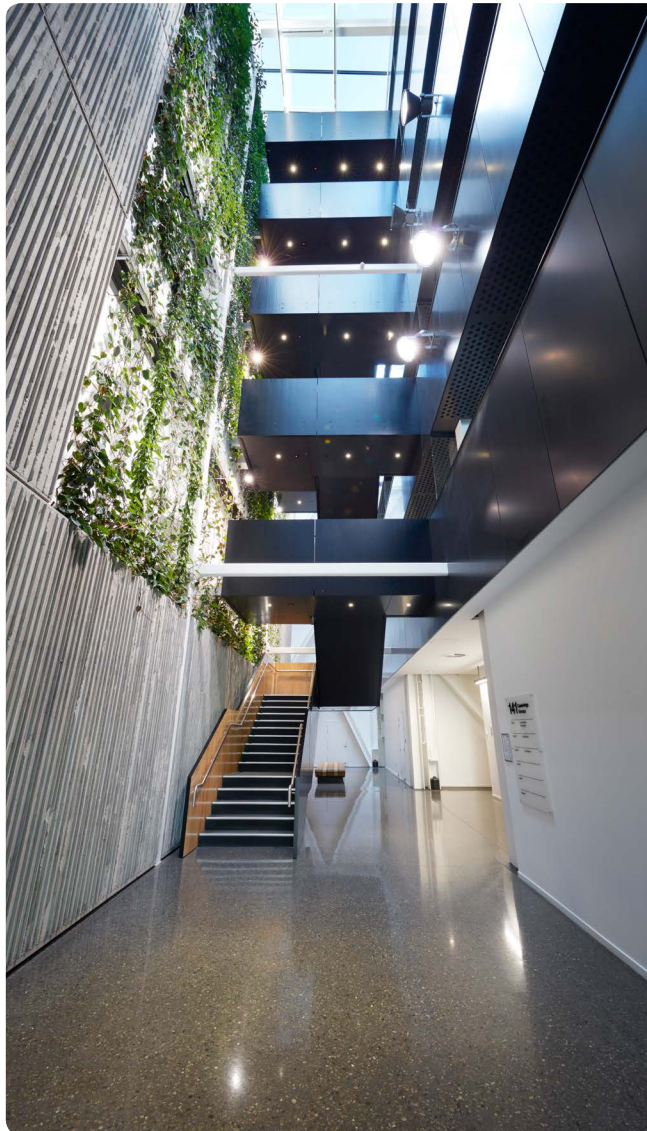
Christchurch, New Zealand

Fytogreen, together with GreenAir, provided a new commercial building in Christchurch with New Zealand's largest indoor green facade. Towering up 4 levels in the atrium area of the new six-story office building.

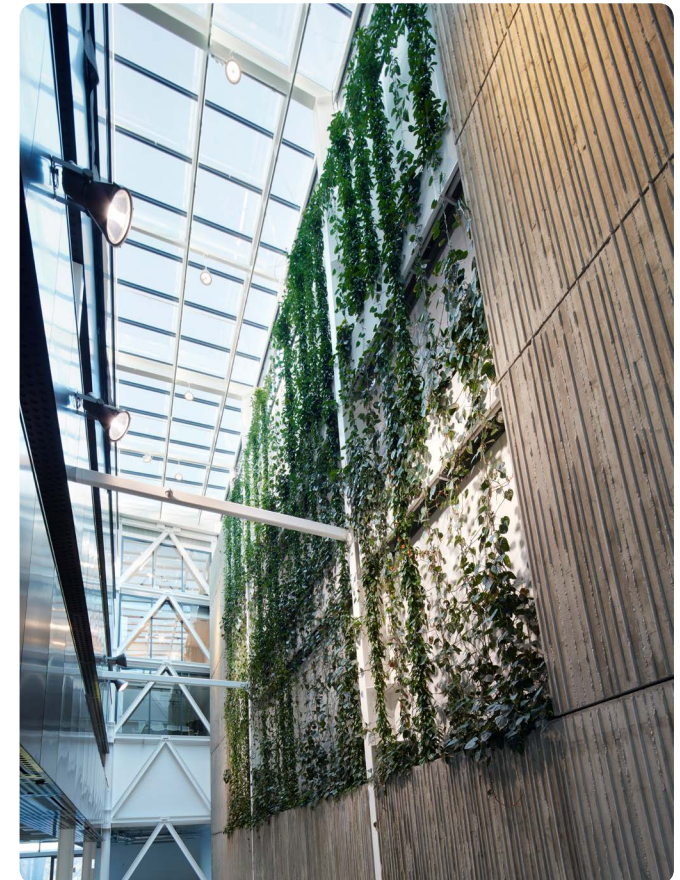
The atrium area provides an infiltration of natural light and ventilation. The plants are supported by a combination of growing lights and natural light to ensure plant sustainability. The living facade softens the raw surfaces, provides a fresh outlook for the office floors and reinforces the idea of a 'Garden City'.

Designed by Fytogreen's inhouse Botanist Erik Van Zuilekom, a selection of very low light tolerant climbers were used; Philodendron Scandans, Epipremnum and Hoya positioned within 107 lineal metres of Fytogreen's Low Density Polyethylene planter boxes. The Hoya and Scandans have proved to be the star performers on this particular facade.

The green facade is an impressive 450 m² and was construed on 52 vertical stainless steel wires, supplied by Tensile, with a varied height range of 13 to 17 metres.



Environment: Urban
Architects: Jasmax
Photographs: Fytogreen Australia & GreenAir NZ
More information: www.fytogreen.com.au





5



Stonnington Office

Melbourne, Australia

During the refurbishment of Stonnington Council Offices, Fytogreen installed a combination of 3 Fytowall vertical gardens and a green façade in the internal atrium.

These stunning greenwalls/facades, cover both sides of the 3 level atrium wall, providing a fresh al fresco feel to the building whilst providing additional benefit for the health and wellbeing of all employees.

A living, breathing green wall in an Atrium space, reduces CO₂ and VOC levels while enriching the O₂ levels; the living wall act as an indoor air purifier, providing improved air quality for all the buildings occupants.



Environment: Urban
Architects: Williams Ross
Photographs: Fytogreen Australia
More information: www.fytogreen.com.au





Environment: Urban
Material: Grade: 446M (26Cr-LCN)
Finish: Dull finish
Photographs: POSCO
More information: www.posco.com

Incheon International Airport Passenger Terminal

Incheon, South Korea

Incheon International Airport is known for its construction on reclaimed land on a tidal flat between Yeongjongdo (Island) and Yongyudo (Island). As a result, the airport is greatly affected by salinity and it is necessary to use an exterior that can endure the corrosiveness of salt. Stainless steel is used for the exterior of the passenger terminal and transportation center. The atmosphere of the entire airport, like that of a splendid future city, is also mainly evoked by the stainless steel exterior.





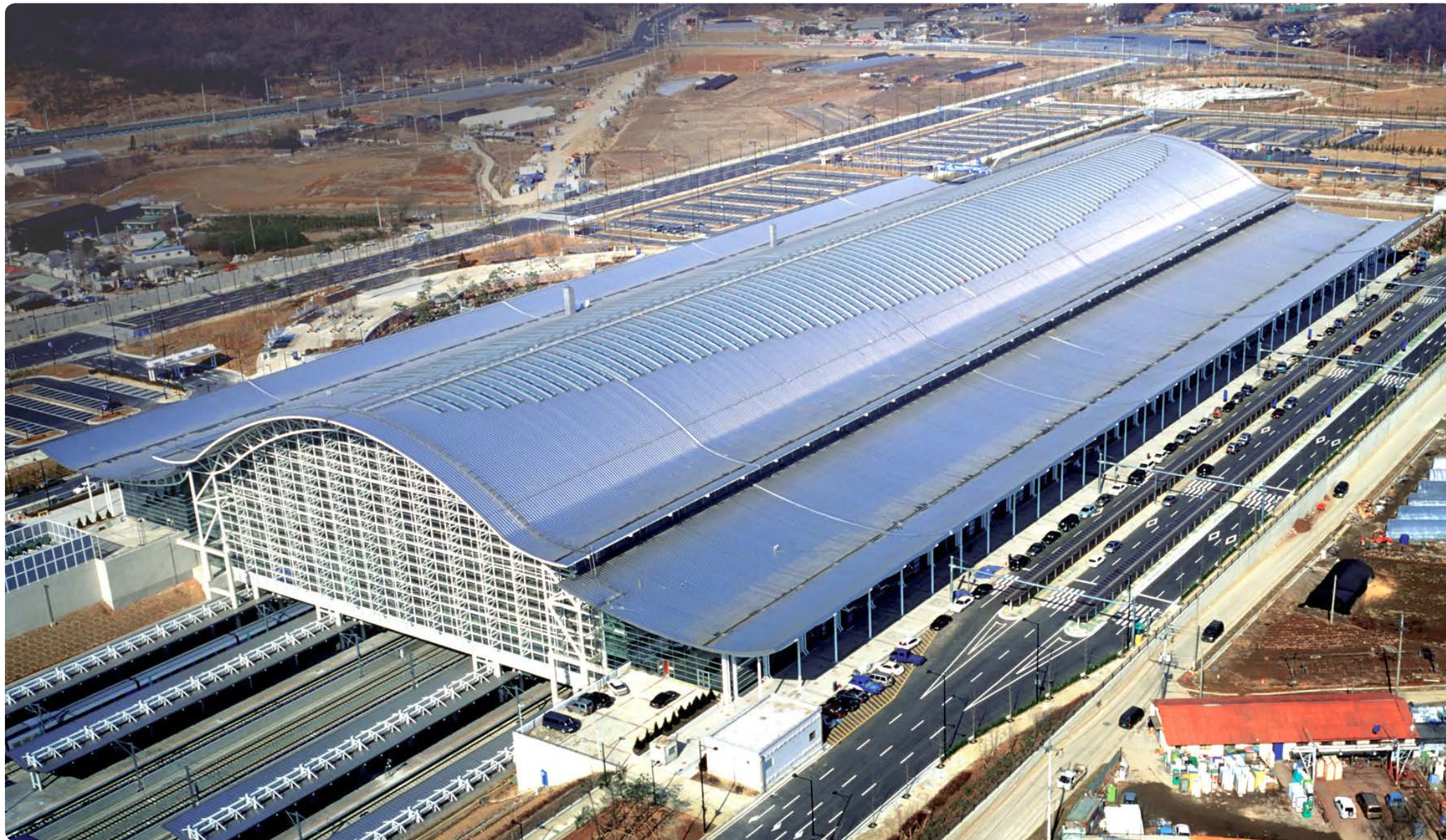
Rapid-transit Railway Gwangmyeong Station

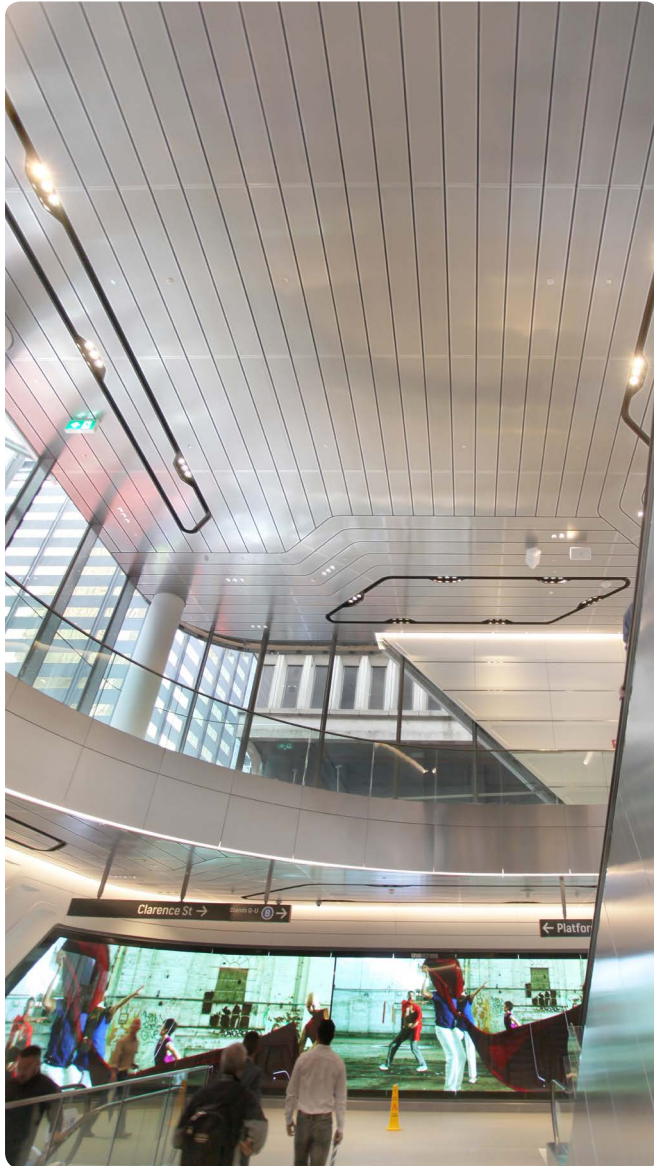
Gwangmyeong, South Korea

Gwangmyeong Station has a total floor area of 78,000 m² with two above-ground floors and two basement floors and is responsible for rapid-transit railway demand in the southwest region of the metropolitan area. There are station facilities on the east and west sides of the platform on the second underground floor and a square that symbolizes that the station is composed of a 'central square' facing the central axis of the station and a 'waiting assembly plaza' where group visitors can gather.

Environment:	Urban
Material:	Grade: 304 Finish: 2D
Photographs:	POSCO
More information:	www.posco.com

Glass, steel frame and stainless steel roof finishes complement the sophisticated appearance of Gwangmyeong Station. The eaves of the tile roof, with the theme of harmony between traditional Korean imagery and the surrounding environment, are especially impressive. This is a typical case where the beauty of stainless steel and the traditional beauty of Korea are well-matched.





Wynyard Walk

Sydney, Australia

Wynyard Walk is a major pedestrian walkway connecting Wynyard Train Station to the bustling Barangaroo waterfront precinct and Sydney CBD. Completed in 2017, the new infrastructure forms one of several solutions to break pedestrian congestion, with an estimated 75,000 commuters using the hub every day. It features over 1,600 m² of perforated and solid stainless steel sheeting into ceiling and fascia panelling installed at the Clarence Street entry façade and the tunnel lining. The panels twist and curve with the bends of the tunnel, creating a sense of flow and motion.

Unique to this stunning architectural application is the use of ferritic stainless steel, 445M2, rather than the conventional specification of 304 or 316. The key factors of formability, cost and corrosion resistance, as well as stainless steel's aesthetic appeal were the driving factors around the specification of this grade for this project. This application showcases strong innovation in stainless steel and opens the market to more

Environment:	Urban
Material:	Grade: 445M2
	Finish: 2B
More information:	www.assda.asn.au

opportunities. It is a good and different example to promote the material use (cost savings and life-cycle) in architectural and infrastructure applications, and stainless steel as a whole.

Another point of difference (in relation to drafting) was that the project was modelled from point clouds. These point clouds were generated using 3D surveying equipment and modelled to create a real world model in which the stainless steel panels were then generated to suit. This included the sub structure. This meant there were next to no discrepancies in panel sizes on site and allowed installation to go smoothly.





← Kent St

↑ Clarence St
Stands Q-U (B) ↑

↑ ↓
GO
GO

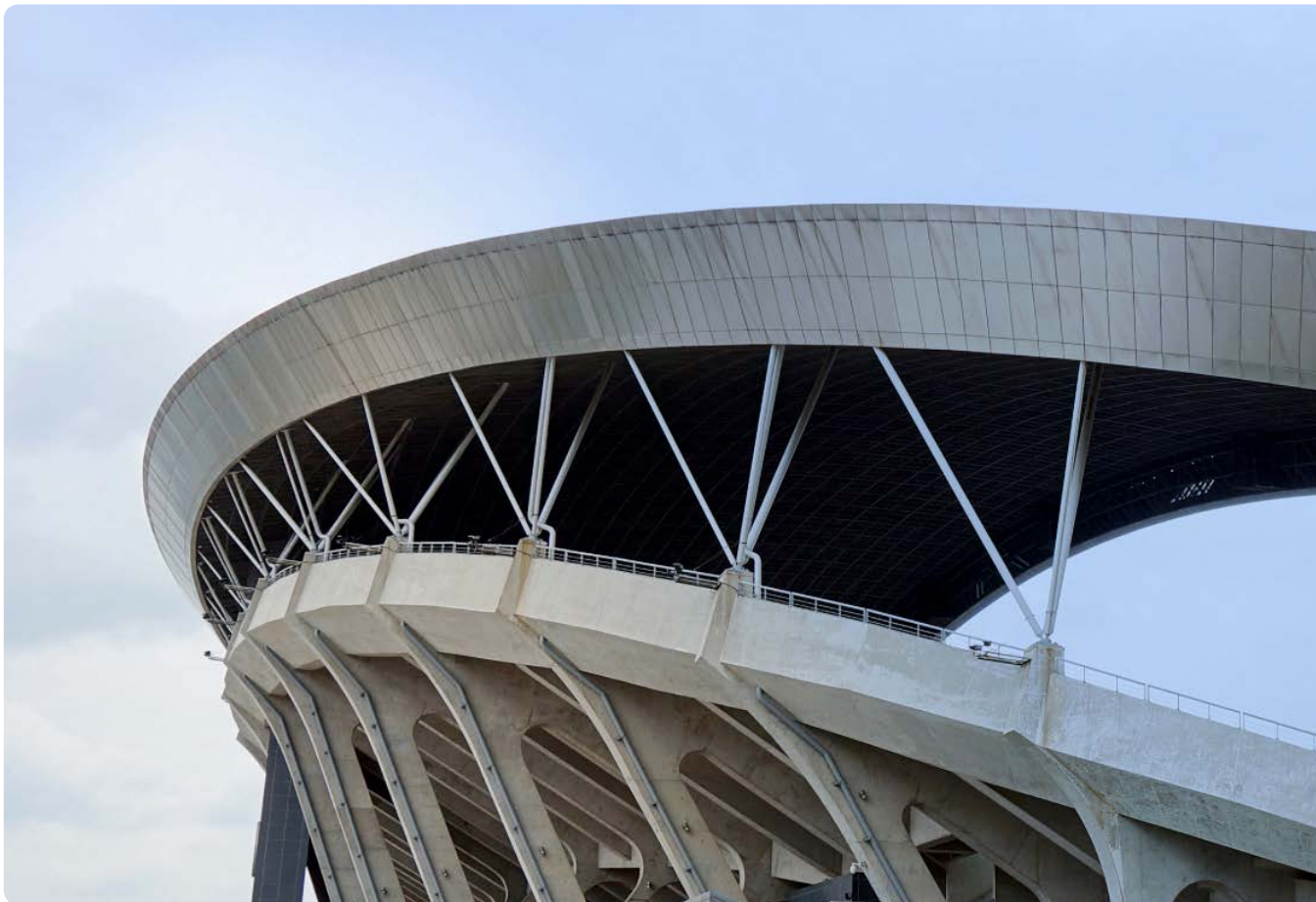
Lift to Home

Gwangju World Cup Stadium

Gwangju, South Korea

The Gwangju World Cup Stadium is a building that symbolizes the image of Gwangju, the village of light. The shape of the pillars that support the roof and stands of the stadium were made in the form of the letter Y to indicate the head of Go used in Go-fighting games, and the low slope and finishing curves of the roof are said to express the skyline of Mudeungsan Mountain, the true mountain of Gwangju. The roof is made of stainless steel. The Gwangju World Cup Stadium, where the roof was finished with steel materials like the stadiums in Ulsan, Daejeon, Suwon, and Jeonju, is the only instance where stainless steel plates were used, among 10 stadiums.

Environment:	Urban
Material:	Grade: 316L Finish: Dull finish
Photographs:	POSCO
More information:	www.posco.com





Steel Grove

Gimhae, South Korea

“Steel Grove” is a house for a couple and two university students. The site is located in a town house neighborhood where houses surround each other. We wanted to create a house that provides enough privacy and yet has some kind of relationship with the neighborhood.

“Steel Grove” is a modern translation of a traditional Korean house in terms of how exterior spaces are composed. The mainstream housing for Koreans are apartments. More than 90% of Korean population live in apartments or houses that resemble apartments. These functional living machines don't have exterior spaces. Traditional Korean houses have various exterior spaces; front yard, backyard, taenmaru (narrow wooden porch running along the outside of a room), daecheongmaru (main porch). Each exterior space has a different function in different rooms. Furthermore, some exterior spaces even have relations with the streets outside the fence.

Environment:	Urban
Material:	Grade: 304
	Finish: Hand polish
Architects:	Lee Joo Hyoung, Kang Shin Il
Photographs:	Sergio Pirrone
More information:	https://ar-a.kr/168-2/



“Steel Grove” has various exterior spaces that resembles the characteristics of a traditional Korean house. Each exterior space relates with each other and has different function to individual rooms. When you open the main door, you enter an open roofed space, and that space is connected by an atrium to the dining room. That atrium also relates to the front garden which is connected by the living room. The front garden is also related to the 2nd floor's deck. While most of exterior spaces in “Steel Grove” are located in-side the house and

function with-in the house, the south façade and the south garden, however, tries to relate, or to communicate, with the streets of the neighborhood.

We tried to give a sense of privacy while creating a relationship with the neighborhood when designing the south façade, which faces a four lane road. In order to create privacy, one needs to close a façade. In order to create a relationship, one needs to open a façade. These two character contradict each other. We came up with the idea of “Steel Grove” to solve the two contradicting qualities. After many studies, the “Steel Grove” was designed in the form of a stainless steel pipe, which not only creates a sense of privacy, but also relates to the nature and the neighborhood. The “Steel Grove” is made of 4 different types of stainless steel pipe. It was produced after many sample productions in order to find the most stable balance.

The “Steel Grove” not only solves the functional aspect of the house but also tries to create a new type of relation with the streets of the neighborhood. When the sun is up, the “Steel Grove” stands out and acts as the façade. The direct sun light is delicately scattered by the “Steel Grove” when entering the room. When the sun is down, the lights from the rooms permeates through the “Steel Grove” generating a different façade from the daytime. The façade changes create a different environment for the street trough times of the day. By doing so we tried to give a relation-ship between the house and the neighborhood.





Help

Help page

Contents page.

Previous page.

Next page.

Previous view.

About ISSF

The International Stainless Steel Forum (ISSF) is a non-profit research and development organisation which was founded in 1996 and which serves as the focal point for the international stainless steel industry.

Who are the members?

ISSF has two categories of membership: company members and affiliated members. Company members are producers of stainless steel (integrated mills and rerollers). The association has 56 members from all over the world and currently represents approximately 90% of the total production of stainless steel.

More information

For more information about ISSF, please consult our website worldstainless.org.

For more information about stainless steel and sustainability, please consult the sustainablestainless.org website.

Contact us

issf@issf.org
+32 2 702 89 00

Disclaimer

The International Stainless Steel Forum believes that the information presented is technically correct. However, ISSF, its members, staff and consultants specifically disclaim any and all liability or responsibility of any kind for loss, damage, or injury resulting from the use of the information contained in this brochure.

Design in collaboration with double-id.com

worldstainless.org