

Stainless steels in sports infrastructure

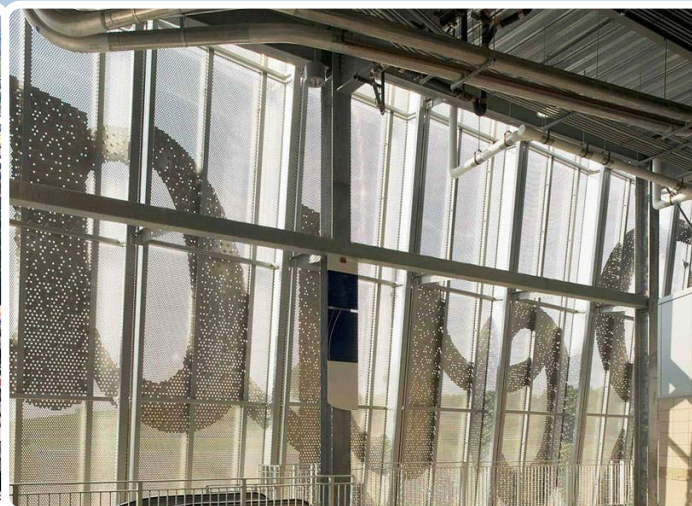




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What makes stainless steel a sustainable material?

Before we can determine whether stainless steel is a sustainable material, we should first define what we mean by sustainability in relation to what is known as the triple bottomline: social, environmental and economical sustainability.

Social sustainability

The material, in its use or in its production process, respects the human being, especially in terms of health and safety. A sustainable material does not harm the people working to produce it, or the people who handle it during its use, recycling and ultimate disposal. Stainless steel is not harmful to people during either its production or use. A protective passive layer forms naturally on all stainless steels because of the inclusion of more than 10.5% chromium. The self-repairing passive layer protects the steel from corrosion, thereby ensuring a long life. As long as the correct grade of stainless is selected for an application, the steel remains inert and harmless to the people who handle it and the environment. These characteristics have made stainless steel the primary material in medical, food processing, household and catering applications.

Environmental sustainability

The emission footprints of the material, especially those related to carbon, other GHGs, water and air, are minimised during production. Reuse and recyclability are at high levels. The material has low maintenance costs and a long life, both key indicators

that the impact of the material on the planet is at the lowest levels possible. The electric arc furnace (EAF), the main process used to make stainless steels, is extremely efficient. An EAF has a low impact on the environment in terms of both CO₂ and other emissions. The EAF is also extremely efficient at processing scrap stainless, ensuring that new stainless steel has an average recycled content of more than 60%. Stainless steels are easily recycled to produce more stainless steels and this process can be carried on indefinitely. It has been determined that at least 80% of stainless steels are currently recycled at the end of their life. As stainless steel has a high intrinsic value, it is collected and recycled without any economic incentives from the public purse.

Economical sustainability

The industries producing stainless steels show long-term sustainability and growth, provide excellent material reliability and quality for their customers, and ensure a solid and reliable supply-chain to the end consumer. Choosing stainless steel for an application ensures that it will have low maintenance costs, a long life and be 'recycling ready' at the end of that life. This makes stainless an economical choice in consumer durables (such as refrigerators and washing machines), in capital goods applications (such as transportation, chemical, power generation and process applications) and in infrastructure where exceptional longevity and freedom from regular maintenance are clear imperatives. Its fire

and corrosion resistance make stainless a good choice in transportation, building or public works such as railways, subways, tunnels and bridges. These properties, together with stainless steels' mechanical behaviour, are of prime importance in these applications to ensure human beings are protected and maintenance costs are kept low. d. Stainless steels also have aesthetically pleasing appearances, making them the material of choice in demanding architectural and design projects.

Conclusion

Taking into account its recyclability, reuse, long life, low maintenance and product safety, the emissions from the production and use of stainless steels are the best-in-class when compared to any other primary alternative material. A detailed and precise analysis of the sustainability of stainless steel makes the choice of stainless a logical one. This might explain why, as society and governments are becoming more conscious of environmental and economic factors, the growth in the use of stainless steel has been the highest of any material in the world.



Civic Arena Pittsburgh

Pittsburg, United States of America

Civic Arena (formerly the Civic Auditorium and later Mellon Arena) was an arena located in downtown Pittsburgh, Pennsylvania. The Civic Arena primarily served as the home to the Pittsburgh Penguins, the city's National Hockey League (NHL) franchise, from 1967 to 2010.

Constructed in 1961 for use by the Pittsburgh Civic Light Opera (CLO), it was the brainchild of department store owner Edgar J. Kaufmann. It was the first retractable roof major-sports venue in the world, covering 170,000 sq. feet, constructed with nearly 3,000 tons of stainless steel and supported solely by a massive 260-foot-long cantilevered arm on the exterior. Even though it was designed and engineered as a retractable-roof dome, the operating cost and repairs to the hydraulic jacks halted all full retractions after 1995, and the roof stayed permanently closed after 2001. The first roof opening was during a July 4, 1962 Carol Burnett show to which she exclaimed "Ladies and Gentlemen...I present the sky!"

The Mellon Arena's stainless steel dome had glimmered and gleamed for over 40 years. As if the shape of this unique arena were not eye-opening enough, the dome was designed to open or close

in just two minutes. The Mellon Arena was the first retractable dome, and it was the largest dome in the world at the time it was built. It kept that record until the Houston Astrodome was built three years later. The stainless steel dome weighed almost four thousand tons and had a diameter of a little over four hundred feet. To cover the entire outer surface of the dome, it took a whopping 166,000 square feet, 2,950 tons of stainless steel sheeting.

The Civic Arena closed on June 26, 2010. The former Mellon naming rights expired soon after, and the Penguins and all other events moved across the street to the new Consol Energy Center - now PPG Paints Arena. After various groups declined historic status for the venue, it was demolished between September 2011 and March 2012.

In November 2011, the Penguins started selling Christmas ornaments crafted from the Civic Arena's stainless steel roof. The team used the promotion to raise money for its charitable foundation. Grove City-based Wendell August Forge, the oldest and largest forge in the United States, created two types of ornaments: one with the arena and the Pittsburgh skyline and another with the arena with the Penguins' logo. The Penguins had originally planned to sell 6,000 ornaments, but due to demand, the team ended selling over 40,000 pieces.



Environment:	urban
Use:	roof panels
Architects:	Mitchell & Ritchey Architects
Photographs:	Daveyin and others
More information:	wikipedia.org

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.

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:	faulknerbrowns.co.uk



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.

Yamuna Stadium

New Delhi, India

The portfolio of famous sporting venues with metallic mesh reflects the virtually inexhaustible formal language and functionality of this industrial base material in stadium construction. The most recent example is the Yamuna Stadium in New Delhi, India, which was opened in the summer of 2010 for the largest sporting event in the city's history, the Commonwealth Games. With 272 competitions in 17 sporting disciplines, as well as over 7,000 athletes and officials from the Commonwealth states, this event enjoys reverence comparable with the Olympic Games among the countries that take part. The venue for the archery and table tennis events was the Yamuna Sports Complex in the 16-million metropolis of New Delhi. With seating for 5,000 spectators, 10 practice areas and a multifunctional hall, the planners at Peddle Thorp Architects, Melbourne, developed a stadium that can hold its



own against any other venue worldwide. The façades of the circular building employ 86 "Tigris" stainless steel mesh panels to create a visually seamless shell. With intelligent interplay of reflection and transparency, its woven skin transforms the sporting

venue into a modern interpretation of coexistence. At the same time, the mesh provides effective sun protection for the subtropical climate in New Delhi with temperatures well in excess of 40°C.

Environment:	urban
Material:	316 stainless steel
Manufacturer:	GKD-Tigris
Architects:	Peddle Thorp
Photographs:	GKD/Badri Narayan
More information:	gkd-group.com

Allianz Parque, Palmeiras Stadium

São Paulo, Brazil

The Allianz Park Palmeiras is a multi-functional arena that specifically serves the needs of a well-known São Paulo soccer team. Stainless steel tube and strip are combined into a proprietary facade system called "Stripweave". It provides an optimal

balance between transparency and reflectivity for the hot and sunny climate of the region. As a material, higher alloyed ferritic grade 444 was identified as the best choice for the project. As an iron, chromium, molybdenum alloy, it is particularly price stable. The added molybdenum provides the necessary corrosion resistance for an urban environment.



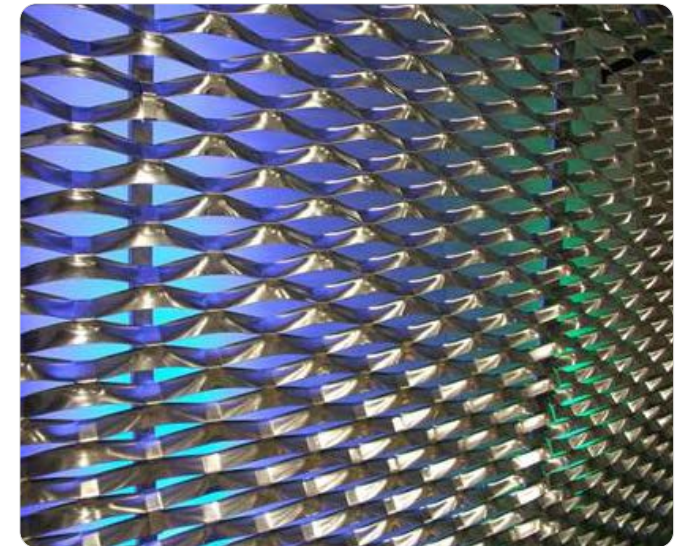
Environment:	urban outdoor
Fabrication process:	perforation
Grade and finish:	444, 2B
Total weight of the stainless steel used in the project:	210 tons
Date of completion:	2014
Architects:	Edo Rocha, São Paulo
Manufacturing companies:	WTorre (contractor), Permetal (perforated sheet) and Hunter Douglas (façade)
Material supplier:	Aperam South America
Photographs:	Aperam South America
More information:	aperam.com

Governador Plácido Castelo Stadium - Castelão Arena

Fortaleza, Ceará, Brazil

The stadium in Fortaleza city in the North East of the country, called Castelão, hosted six World Cup matches. Designed for 64,000 persons and initially opened in 1973, it recently went through two years of refurbishments. The façade was entirely rebuilt using stainless steel stretch metal. The principle: by slitting sheet metal and expanding it, the material naturally shapes into a structurally optimal geometry. The stretching process is carefully controlled to produce

the desired ratio of open and closed surfaces. Although the original 2B surface used is quite bright, the reflection of the stretch metal is diffuse. It reflects heat away from the building without causing glare. The molybdenum-bearing ferritic grade 444 was found to be technically and economically an optimal solution for the environment. In addition to the external frame, stainless steel was used on railings, handrails at VIP areas, lavatories and locks of the stadium.



Environment:	urban outdoor
Fabrication process:	stretch forming
Grade and finish:	444, 2B
Total weight of the stainless steel used in the project:	80 tons
Date of completion:	2012
Manufacturing company:	Martifer, Fortaleza, and Permetal, Ribeirânia, Ribeirão Preto
Architects:	Viglicca & Associados, São Paulo (refurbishment)
Material supplier:	Aperam South America
Photographs:	Aperam South America
More information:	aperam.com

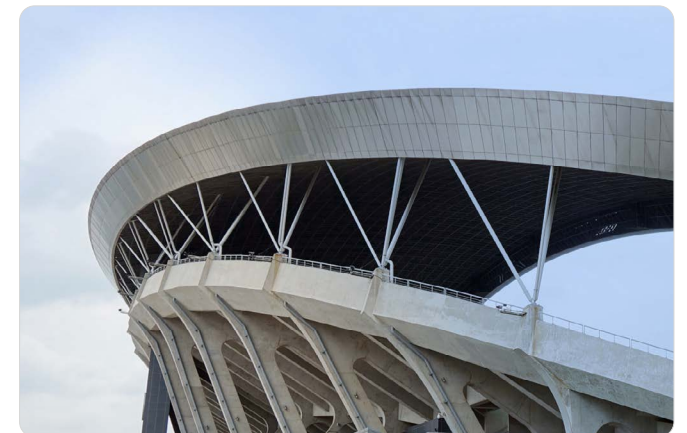


Gwangju World Cup Stadium

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:	316L stainless steel
Finish:	dull finish
Photographs:	POSCO
Material supplier:	POSCO
Photographs:	POSCO
More information:	posco.com



Nissan Stadium

Yokohama, Japan

On June 30, 2002 while the Brazilian team captain Cafu holds the golden cup high up in the air and some 2.7 million paper cranes flew down from the sky, the 2002 FIFA World Cup™ “the Stage of a Dream” closed its curtain. At Nissan Stadium, which was called International Stadium Yokohama at that time, four games including the finals were held, and it was crowded with 260,000 spectators from

Japan and abroad. We have received high praise for wonderfulness of a stadium with a seating capacity of 70,000.

Having been recognized by the global community, Nissan Stadium will continue providing “the Stage of a Dream”, by hosting international sports events, live concerts of various artists, and by offering the guided stadium tour and its running track open for public. With 72,327 seats, the stadium has the largest spectator capacity in Japan. All the seats are

individually sectioned with 90 cm of space between rows, so spectators can sit back and enjoy the games in comfort. To ensure that spectators do not miss any of the drama, large screens are installed on both Side Stands for instant replays of outstanding plays and scores. Additionally, the sound coming from the 528 loudspeakers adds emotion and excitement to the game. Three quarters of the seating area is covered by a large roof.

In this stadium, a roof by stainless steel vibration damping steel plate welding method was adopted. This roof is designed to emphasize the airiness of the roof using a gentle curved line that takes into consideration the surrounding environment, a landscape as a park facility, an image as a sports facility. Especially by adopting the welding method of stainless steel damped steel plate, in addition to preventing metal sounds caused by rain and wind, beautiful shape with more durability is further enhancing the sense of quality.



Environment:	urban
Material:	304 and 316 stainless steel
Weight:	146 tonnes
Manufacturer:	Nippon Metal Industry Co. Ltd.
Architect:	Takenaka Corporation a.o.
Pictures:	Yokohama Sports Association
More information:	nissan-stadium.jp

Pyeongchang Winter Olympic Ice-Hockey Stadium

Kwandong, Korea

For the 2018 Pyeongchang Winter Olympics, lean duplex stainless steel was applied to the exterior of the Kwandong Hockey Centre.

The stadium is located 7 km away from the coast and it was required that the steel have at least 316L-grade corrosion resistance. Because of budget overrun concerns, POSCO recommended its Lean Duplex 329LD Steel. Its corrosion resistance is above that of the required 316L steel and because of its high strength, thinner applications of the steel could be used in the final design. In addition, vibration surface treatment was applied in order to add texture to the surface of the exterior, giving the building a more modern touch.



Environment:	marine urban
Grade:	STS 329LD (duplex)
Surface Finish:	vibration
Date of completion:	2017
Manufacturer:	posco.com
More information:	posco.com

Kaufmann Stadium

Kansas City, USA

The Kauffman Stadium renovation for the Royals Ballpark in Kansas City was lead by the architects at Populous. Zahner, producer of highly crafted architectural metalwork, provided an exterior stainless steel façade as well as improvements to the interior experience. The Zahner scope also included the Royals Crown artwork which can be seen atop the ballpark's digital scoreboard.

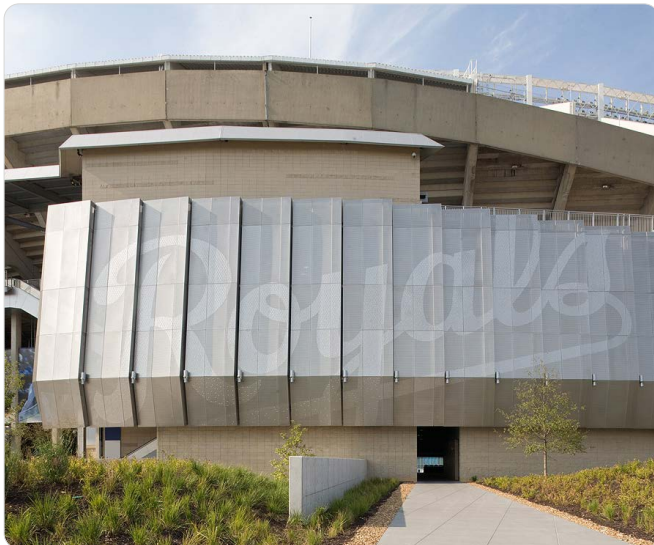
The new structure at the Royals stadium features two sections which use selective perforations in stainless steel to create the image of the Royals logo

on the surface of the metal. This perforated surface wraps the entire building, yielding a mesh façade which provides light, air control, and a visually intriguing artistic aesthetic. A pattern of perforations and dimples allows glimpses of the original structure and the emblazoned the Royals' graphic adds visual delight. Daylight and air transverse the façade, and the result is a breezy atmosphere which anticipates the excitement of the ballpark within.

The details show the exquisite stainless steel surface, a process Zahner developed for a soft semi-reflective surface known as Angel Hair® stainless steel. The detail photos also reveal how the logo

Environment:	urban
Material:	perforated stainless steel
Surface:	Angel Hair®
Date of completion:	2009
Architects:	populous.com
Photographs:	Mike Sinclair and A. Zahner Company
More information:	azahner.com

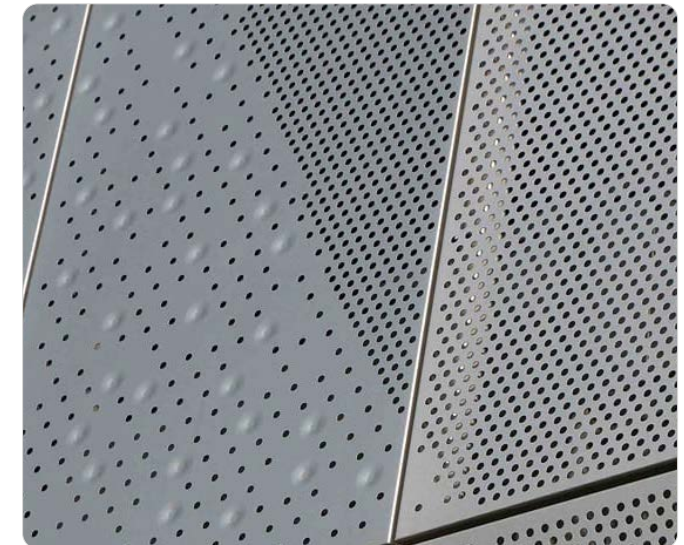
is composed of a dimpled and perforated façade. When standing a hundred feet from the facade, these dimples and perforations disappear to the naked eye, becoming the Royals graphic.



Picture courtesy of Mike Sinclair



Picture courtesy of A. Zahner Company



Picture courtesy of Mike Sinclair

Estadio Wanda Metropolitano

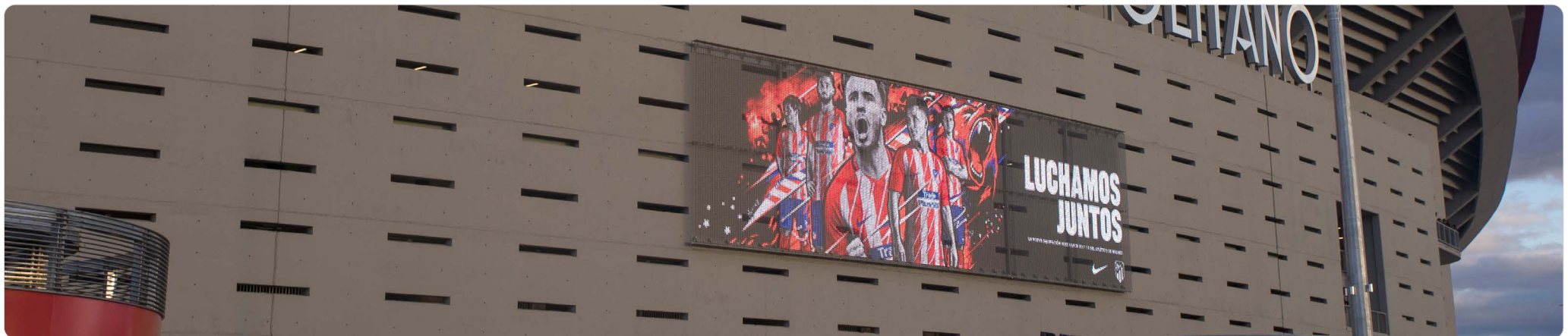
Madrid, Spain

Bigger, more convenient, more spectacular: the new stadium of the top Spanish club Atlético Madrid is among the very elite of European soccer arenas. After six years in construction, the tradition-steeped club opened the doors of the Estadio Wanda Metropolitano in the north-east of the Spanish capital. A large screen on the western façade above the main entrance gets arriving fans in the mood for the match ahead with video sequences from previous games and emotional images. Yet the transparent MEDIAMESH® system from GKD nevertheless blends in perfectly with the puristic façade design. As a result, the spectacularly sweeping roof with integrated LED bands, the bright, horizontally

perforated façade and the MEDIAMESH® display all blend in together perfectly.

The stadium did not have to wait long to score its first major success: just a few days after it was opened, the European soccer governing body UEFA awarded the Champions League final to the Estadio Wanda Metropolitano. Atlético Madrid will therefore host the final of the continent's top club competition on June 1, 2019 – an event that last took place in Spain at the Santiago Bernabéu stadium of local rivals Real Madrid in 2010. The spectators at the Champions League final will then enjoy a fitting welcome from the imposing MEDIAMESH® screen from GKD.

Environment:	urban
Material:	316 stainless steel
Manufacturer:	GKD Mediamesh
Photographs:	GKD
More information:	gkd-group.com



Stainless steel underneath the seats

The steel underneath the seats in a stadium can be hard to reach. Corrosion can be a problem in this case. It is therefore wise to make the scaffolding underneath in stainless steel. If you choose the correct grade, it will ensure ongoing visitor safety and be maintenance free.





Turnstiles

Full Height Type Turnstiles are durable products that can be used indoors and outdoors. They provide access and access control in areas requiring high levels of security.

Turnstiles made from stainless steels are corrosion resistant, strong and easy to keep clean and hygienic. When calculating the life cycle cost it will often be the least expensive choice.

Security Cameras

In this day and age Closed Circuit Television systems (CCTV) seem to have become part of daily life in many shops, parking garages, industrial sites and indeed cities around the world. In the longstanding debate over whether privacy should prevail over security, it seems that for the time being security has become a priority. The Axis Dome Network Camera system is encased in nitrogen-pressurized stainless steel casings and is ideally suited for surveillance and remote monitoring applications in a wide range of outdoor facilities. These cameras are capable of resisting the corrosive effect of sea water and cleaning chemicals, and can also withstand high-pressure steam cleaning.

Pressurized nitrogen prevents internal condensation. Axis has three outdoor-ready, marine-grade stainless steel cameras that enable 360° coverage of wide areas in resolutions up to HDTV 1080p and great zoomed-in detail with up to 36x optical zoom. These cameras provide excellent video surveillance and high durability for reliable performance in demanding indoor and outdoor environments.



Manufactured from austenitic grade 316L stainless steel, with a nylon clear dome cover, they can operate in a temperature range from -30°C to 50°C and they offer protection against dust, rain, high pressure steam-jet cleaning, snow, ice and salt fog. Stainless steel mounting accessories are also available. This is a good example of applications where the life of the relatively high cost internal equipment of a unit can be prolonged by using the more robust external protection provided by the strength and corrosion resistance of a stainless steel casing.

Picture courtesy of Axis Communications



Waste Bins

Stainless steel waste bins are elegant and sturdy, corrosion-resistant, fire-resistant, require minimal maintenance and easy to clean.





Urinals

Stainless steel urinals are sleek with both classic and modern touches. Luckily, the metal is not just beautiful, but highly functional too. Stainless steel urinals are durable, hard wearing and vandal resistant.

The robust structure, which should be mounted with stainless steel fixings, enables maximum usage with minimal maintenance, cleaning with water and soap is enough. Stainless steel is one of the most hygienic materials and does not support the growth of bacteria and other pathogens.

Stainless steel is very tough, and even lightweight stainless steel won't buckle under great weight, making it one of the most durable metals on the market. It can endure weight, hot and cold temperatures as well as weather extremes.





Stadium kitchen and foodservice equipment

Australia's leading stainless-steel fabrication specialists, Stoddart was heavily involved in the fit-out of the stainless-steel kitchen and equipment utilised in the Bankwest Stadium. This world-class stadium has five levels of premium, corporate, and general-purpose function spaces and are expected to house more than 30,000 spectators during every major event.

To ensure that this stainless-steel kitchen fit-out was designed and installed as per the desired construction requirements, Stoddart proudly worked hand-in-hand with the selected builders and contractors. Some of the equipment supplied and installed included;

- Halton ventilation exhaust hoods.
- Electrolux Professional combi ovens.
- Culinaire vertical and standard hot cupboards, bain maries, hot food slides, and cold food displays.
- Adande drawer systems.
- Anets fryers.
- Stoddart Plumbing washbasins.
- Custom fabricated workbenches, counters, and shelves.
- Custom fabricated wall sheeting and spine walls.

Text and pictures courtesy of [Stoddart](#).



Stadium Cups

Selling food and drinks is big business at events. When disposable cups are used, they bring about a massive amount of waste. Stainless steel stadium cups can solve this problem. They can be used for serving drinks, avoiding waste and at the same time are sturdy and unbreakable, whilst offering a unique event souvenir. These cups are easy to clean and dishwasher safe.





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About ISSF

The International Stainless Steel Forum (ISSF) is a not-for-profit research and development organisation which was founded in 1996 and serves as the focal point for the global stainless steel industry.

Vision

Sustain our future with stainless steels

Membership of the ISSF

ISSF has two categories of membership namely:

- a. [company members](#) who are producers of stainless steels (integrated mills and re-rollers)
- b. [affiliated members](#) who are national or regional stainless steels industry associations.

The ISSF now has 56 members in 26 countries. Collectively they represent approximately 90% of the total production of stainless steels.

More information

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

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