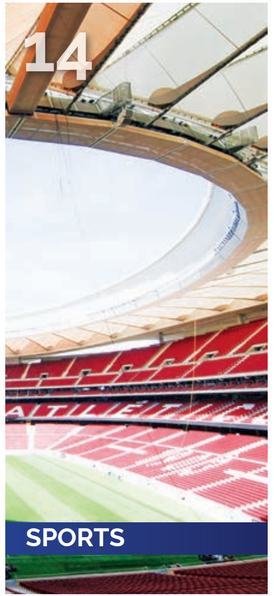
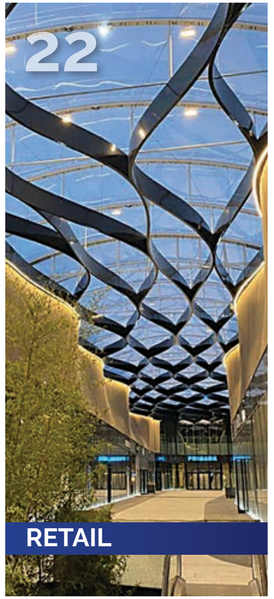
UNDER ONE ROOF

Taiyo Europe
MakMax

Setting the **Global Standard** for Tensile Architecture





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<< COVER PHOTO (page 1): WANDA METROPOLITANO | Taiyo Europe was responsible for the detailed engineering, fabrication and installation of the tensile roof structure, including the cable net system, big lift procedure, and PTFE-glass membrane roof, consisting of a mix of solid and mesh materials. This project received the 2019 International Achievement Award. Year of Construction: 2017; Architects: Cruz y Ortiz Architectos, Spain; Engineering: Schlaich Bergermann und Partner, Germany; Maffeis Engineering S.p.A, Italy; Size/Material: 85,000 m²; PTFE glass; Location: Madrid, Spain

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THE TAIYO GROUP

WORLD'S LEADING TENSILE MEMBRANE CONTRACTOR

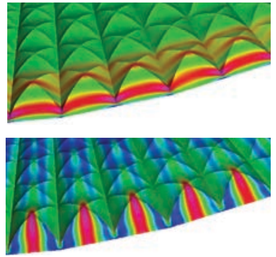
Founded in 1922 in Japan, Taiyo Kogyo Corporation is the leader of the Taiyo Group of Companies, which includes Birdair Inc. (USA), Taiyo Europe GmbH (Germany), Shanghai Taiyo Kogyo Corporation (China), MakMax Australia (Australia), Taiyo Middle East (UAE) and 24 other companies worldwide. Supported by our global network of offices and production facilities, as well as a cutting-edge R&D testing centre in Japan, and with projects completed in more than 50 countries on all seven continents, we dynamically merge global solutions to local individual regional needs.

Our reputation is built upon high-quality award-winning projects across the globe: from temporary to permanent applications, with structures in all shapes and sizes, our Group has the experience and knowhow to make our client's vision reality.

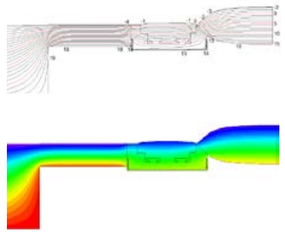
Some historic benchmarks include the Sports Science and Athletics Pavilion at the University of La Verne (California, USA, 1973), the world's first PTFE-coated-fiberglass tensioned structure, and the ThyssenKrupp Testtower (Rottweil, Germany, 2017), with a height of 807 ft, the tallest membrane-clad building in the world.

As partners to our clients at every stage of the project, we offer a complete set of in-house solutions: from concept support and development, to material selection, engineering design, fabrication, construction, and maintenance. We love collaborating with clients, combining the vision of an outstanding and elegant architecture with our expertise and experience in executing them. If you have a vision for a membrane structure, Taiyo is your partner to bring it to life.

STRUCTURAL ANALYSIS



THERMAL ANALYSIS



RESEARCH & DEVELOPMENT

SHAPING THE FUTURE OF MEMBRANE ARCHITECTURE

At Taiyo we believe that self-improvement shall always be our innate driving force to be industry leaders in membrane architecture.

Our Research & Development Department constantly works to improve our own systems, striving to increase membrane possibilities and technological development in our field. We focus on the growth and usage of recyclable materials, which can not only provide the expected life-span and performances, but can also actively reduce the environmental impact and carbon footprint.

We perform our strict testing procedures on an innumerable amount of materials and mock-up structures: only this way can we ensure that our tensile structures adhere to the highest standards of quality.

Our Technical Research Center in Osaka (Japan) masters the most recent testing procedures. There, any kind of textile material can be tested with our advanced machines. Our Laboratory has been accredited according to ISO/IEC 17025:2005 for membrane structures and as a centre of excellence for the whole industry.

- DEVELOPING CUTTING-EDGE SOLUTIONS
- WIDE RANGE OF MATERIALS TESTED
- ENVIRONMENTAL CONTRIBUTION
- TEXTILE MEMBRANES INNOVATION
- ACCREDITED PROPRIETARY LABORATORY
- VAST RANGE OF PHYSICAL TESTS
- ISO/IEC 17025:2005 ACCREDITED

TAIYO KOGYO CORPORATION

WORLD´S LEADING TENSILE MEMBRANE CONTRACTOR

1922 Kaneshige Nohmura establishes Nohmura Tent Company in Osaka, Japan.

1929 Development of tents supported by inflated tubes instead of tent poles.

1947 Company name changed to Taiyo Kogyo Corporation.

1970 Expo '70: World Expo in Osaka, Japan – first large-scale application of a cable-restrained, air-supported membrane structure: the US Pavilion.

1988 Tokyo Dome: Japan's first, permanent air-supported structure

1992 Taiyo Kogyo acquires Birdair, Inc.

1994 Expansion of the Asian market.

2003 Establishment of Taiyo Australia

2016 MakMax Flex Experience Center is opened at Osaka Headquarters

2022 100th anniversary of Taiyo Kogyo Corporation

HISTORY

TAIYO IS YOUR IDEAL PARTNER FOR DESIGN & REALIZATION OF TENSILE MEMBRANE STRUCTURES

TAIYO EUROPE GMBH

DEFINING THE STATE OF THE ART IN MEMBRANE STRUCTURES

1997 Taiyo Kogyo acquires Stromeyer & Wagner in order to support the needs of European customers, becoming Taiyo Europe Stromeyer GmbH.

2004 Birdair Europe Stromeyer GmbH is renamed Taiyo Europe GmbH and relocated to Munich.

2009 Completion of Centre Pompidou in Metz, France.

2014 Completion of Stade Velodrome in Marseilles, France.

2017 Completion of ThyssenKrupp Testtower in Rottweil, near Stuttgart, Germany, the tallest vertical membrane structure in the world

2018 Completion of Swatch Omega Headquarters in Biel, Switzerland

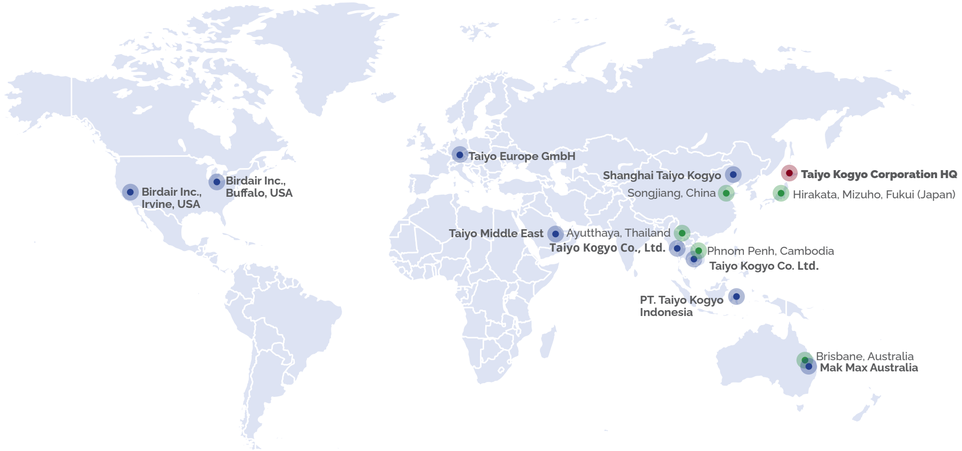
2019 Completion of Rennes Train Station in Rennes, France

2020 Completion of Lakhta Center in St. Petersburg, Russia

2023 Retractable roof for Suzanne Lenglen court for Roland Garros in Paris, France.

WORLDWIDE PRESENCE

WE WORK TOGETHER AS ONE TO SERVE OUR CLIENTS WHEREVER THEY NEED US.



HEADQUARTERS

Japan
HQ – Taiyo Kogyo Corporation, Osaka
HQ – Taiyo Kogyo Corporation, Tokio

COMPANIES OF THE TAIYO GROUP

Germany
Taiyo Europe GmbH

USA
Birdair, Inc., Buffalo
Birdair, Inc., Irvine

UAE
Taiyo Middle East, UAE

Thailand
Taiyo Kogyo Co., Ltd. Ayutthaya
Thai Taiyo Tent Co., Ltd. Bangkok

Indonesia
PT.Taiyo Kogyo Indonesia, Jakarta

Cambodia
Taiyo Kogyo Co., Ltd. Phnom Penh

China
Shanghai Taiyo Kogyo Co., Ltd.

Australia
MakMax Australia, Brisbane

FACTORIES

Thailand
Ayutthaya

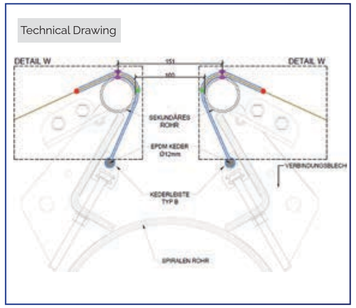
Cambodia
Phnom Penh

Australia
Brisbane

Japan
Hirakata
Mizuho
Fukui

China
Songjiang


Architectural Drawing




Membrane Manufacturing

DESIGN-BUILD CAPABILITIES

WE FOCUS ON OUR CLIENTS & ON QUALITY

For years architects, engineers, contractors, owners and developers have relied on Taiyo Europe for services that range from preconstruction support to field installation and maintenance of tensile architecture. Whether the topic is design, material and technology selection, construction physics, execution, commitment to costs and deadlines, or maintenance and repair: Taiyo offers a complete range of technical services, ensuring that you receive unparalleled experienced and reliable commitment right from the start.

DESIGN ASSISTANCE

Taiyo´s in-house team of engineers and designers works with clients during the design development phase, presenting material options and samples, design solutions and renderings in order to turn a client´s idea into a signature design. This early design support allows the project´s architects and structural engineers to determine the most effective details for an elegant tensile fabric structure. Taiyo can also provide conceptual budgeting at the earliest stage of the project.

ENGINEERING

We combine architectural designs with engineering solutions, anticipating any and all onsite challenges to ensure your project quality is second to none. Our experience and expertise in value management allows us to create complex structures economically. Through engineering analysis and peer review, Taiyo delivers reaction loads, connection details, member sizing, interface details, and construction methodologies.


Steel installation


Membrane Installation


Finished Project

© Rainer Viertlböck

AND DURING CONSTRUCTION & BEYOND

FOR OUTSTANDING STRUCTURES BUILT TO LAST

FABRICATION AND QUALITY CONTROL

Taiyo Europe is ISO 9001 (Quality Management) and ISO 14001 (Environmental Management) certified. During the manufacturing phase of a project and with four fabrication facilities worldwide, we have the essential capability to fabricate over 100,000 m2 of fabric structures per annum. Our commitment to excellence meets our client expectations with quality and quantity, putting us in an advanced position to secure relevant commercial aspects.

INSTALLATION

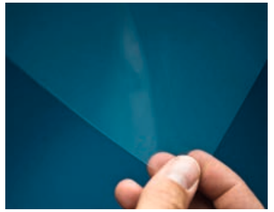
Offering a complete end-to-end solution, our expert installation team executes an on-time delivery with minimal impact on your venue's activities. Installation takes place according to the project quality standards and specifications, considering all HSE measures in different regions and temperatures. After intensive coordination with the site team, all parts are delivered prefabricated, enabling all installation activities to be carried out smoothly and efficiently.

MAINTENANCE SERVICE & WARRANTY

Our commitment to customer service doesn't end when the project is completed. Taiyo offers clients a wealth of post-project resources and assistance, ensuring that building owners have their structures looking as breathtaking years from now as they did the day the last element was installed. These services range from cleanings to comprehensive structural reviews and modifications. Our maintenance team is on call 24/7, allowing Taiyo to promptly respond to any service requests.

MATERIALS

TAIYO GROUP DESIGNS, FABRICATES, INSTALLS, AND MAINTAINS UNIQUE ROOFS, FACADES, ATRIUMS




TENSOSKY® ETFE

TRANSPARENT, FLEXIBLE & LIGHTWEIGHT

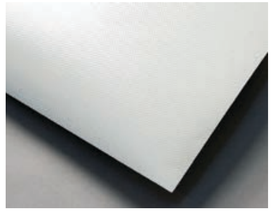
ETFE (Ethylene Tetrafluoroethylene) is a durable, highly transparent and very lightweight new generation membrane material which goes beyond glass. This membrane is considered the material of choice from traditional skylight applications to long-span structures and building facades. Thanks to its flexibility, it can be formed into irregular and curved surfaces, offering elegance and modern design possibilities. Taiyo´s TensoSky ETFE system is the best solution for environmentally oriented projects, supporting the aquisition of LEED® credits, and has its own environmental product declaration (EPD).

Key Benefits

Extremely lightweight, durable, thermal insulation, exceptional light transmission, solar control and shading, printable, illuminable, dirt resistant, recyclable.

Applications

Building envelopes where light transmission, flexibility and lightweight meet. Applied in a single layer, or in multiple layers incorporating a pneumatic system.




PVC-POLYESTER FABRIC

COST-EFFECTIVE, ADAPTABLE, MULTI-COLOUR

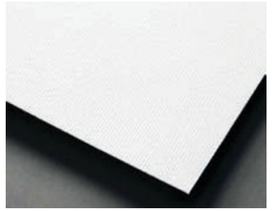
PVC (Polyvinyl Chloride) coated polyester fabric is immensely popular in membrane architecture and allows affordable solutions. This membrane is a cost-effective alternative to traditional roofing systems and can be produced in a multitude of colours to coordinate with individual building project needs. It is available as a solid watertight fabric, or as an open mesh. For unique projects with a sustainable and low-maintenance approach, PVC coated photocatalytic (TiO_2) fabrics and Air Purify mesh are the materials of choice. For improved fire rating, alternative PVC coated fiberglass yarns are also available.

Key Benefits

Translucent, cost-efficient, fire-resistant, colourful, minimum maintenance required, in solid and mesh, TiO_2 (titanium dioxide) self-cleaning and air purify options available.

Applications

Permanent and temporary applications, in roofs and facades, in different shapes and environments, different colours and combinations.




PTFE-GLASS FABRIC

DURABLE, NON-FLAMMABLE, SELF-CLEANING

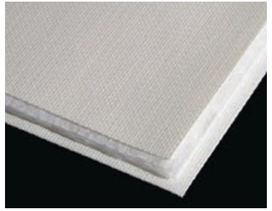
PTFE (polytetrafluoroethylene) coated fiberglass fabric is an extremely durable and weather-resistant material that lends itself to many bespoke designs and applications. This membrane can be installed in climates ranging from the frigid arctic to the scorching desert heat with an expected project life exceeding 30 years. PTFE fiberglass membrane is chemically inert and completely immune to UV degradation, also having the ability to evenly disperse light, creating comfortable shade during the day.

Key Benefits

Extremely resistant to UV radiation, and to chemical and biological attack, translucent, high reflectance, non-flammable, long lasting, TiO_2 self-cleaning and air purify options available.

Applications

Permanent applications, in roofs and facades, in different shapes and environments, from small canopies to large stadium structures.




TENSOTHERM™

INSULATED TRANSLUCENT TENSILE MEMBRANE

Tensotherm, and innovative membrane developed by the Taiyo Group, can be as thin as 9 mm and is the only translucent and insulated tensile fabric roofing material that delivers diffused glare-free natural daylight, enhanced temperature control (even in extreme instances) and innovative sustainability. To create Tensotherm, a thin translucent blanket, embedded with aerogel, is placed between a PTFE or PVC-coated fabric membrane exterior skin and an acoustic interior liner.

Key Benefits

Translucent and glare-free, thermal insulation, enhanced acoustical performance, lightweight and engineered for long spans.

Applications

Permanent, where thermal insulation and natural daylight are required in association with the structural lightness of tensile membrane structures.

PHOTOCATALYSTS (TiO2)

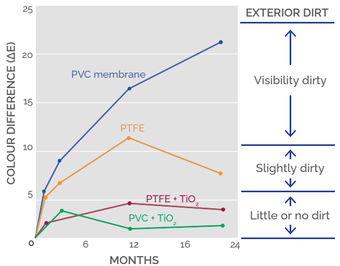
MEMBRANES NATURALLY KEEP THEIR WHITENESS

Taiyo Kogyo's architectural membrane materials have been experimentally proven to be resistant against dirt and grime. This is because they are covered in a titanium oxide photocatalytic coating. After absorbing sunlight (ultra-violet rays), TiO2 are capable of oxidizing and decomposing organic matter. As such, when sunlight hits the membrane material, the attached organic matter is decomposed.

As titanium dioxide photocatalysts also possess hydrophilic properties, when a water droplet hits the surface it spreads outward, forming a film of water. This creates a barrier between dirt and the membrane's surface that allows grime to be washed away with rain.

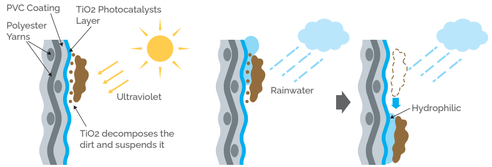
These oxidative decomposition and hydrophilic functions of TiO2 are what give membrane materials their incredible resistance to dirt and grime. In the past, white and other light colours were avoided due to the conspicuousness of stains. Now, however, thanks to this dirt-resistant technology, white has become the dominant colour of choice.

This graph shows the protective effects of membrane materials with TiO2 coatings against dirt. This self-cleaning mechanism uses the natural powers of sunlight and rain to fight against grime.



SELF-CLEANING

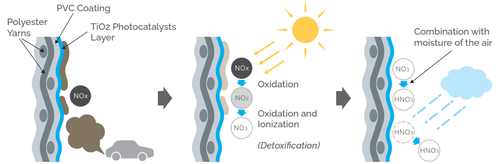
TiO2 photocatalysis has the function of absorbing natural sunlight (UV) and decomposing organic matter. For this reason, a phenomenom occurs: when natural sunlight irradiates the membrane, stains from organic matters decompose.



1. TiO2 decomposes the dirt
2. Rain suspends and washes away the dirt

NO_X REDUCTION

One of the contributors to air pollution in cities is the emissions from automobiles that include nitrogen oxide NO_x. TiO2 coated membrane decompose NO_x through an oxidation reaction, and purify the surrounding air.



1. NO_x adheres to membrane surface
2. TiO2 oxidizes NO_x to NO_2 which is then ionized to harmless NO_3
3. NO_x reacts with moisture in the air & changes to HNO_3 which is then washed away by rainwater

PHOTOCATALYSTS (TiO2)

THE SECRET LIES IN THE SELF-CLEANING MECHANISM OF TITANIUM DIOXIDE PHOTOCATALYSTS

6 MONTH EXPOSURE TEST

PROTOTYPE WITH PVC-COATED POLYESTER FABRIC

TiO2

NON-TiO2

NOx Reduction (FGT800-TFB actual measurement result in JAPAN)

Material		NOx removable volume per time			Decomposition Capability per 1000m		
Nominal Name	Product Name	Quantity	Weight		Popular trees	Car gas	Truck gas
		μmol/50cm²/5h	g/1000m²/h	g/1000m²/day	(unit: tree)	(unit: car)	(unit: truck)
Everline Coat	FGT800 TFB	0.55	0.66	15.8	292	22	16
Air Purify 450	AP450	1.58	1.87	44.9	83	6.3	4.6
Purify Shine Sky	PSS200 I	2.46	2.95	70.8	131	10	7.2
	PSS325 I	2.24	2.69	64.5	119	9.1	6.6
		NOx discharge (g/h)			0.0225	0.295	0.409

NOTE: Based on low-emission vehicles with seven (7) lower than the only standard under the approval system of Ministry of Land, Infrastructure, Transport and Tourism, Japan. Removal performance is based on the capability to remove NOx being emitted during an hour drive at an average speed of 10 + 5 km/h (km/h).

As the process of oxidative decomposition does not work on inorganic matter such as sand, rust, metallic particles and salt stuck to the material's surface, the coating's water repellent and hydrophilic properties may not be sufficient in preventing against staining from these substances. Also, in cases where the organic matter creating the dirt is a mold, moss, seaweed or other living organism, the coating's efficacy in eliminating dirt depends on the speed of the organism's reproduction and the environmental conditions surrounding the membrane (mainly the amount of UV rays). Likewise, dirt may accumulate on the membrane when its photocatalytic capacity is surpassed by an excessive amount of exhaust fumes, soot, sap or bird droppings.

SPORTS

IT DOESN'T MATTER WHO YOU CHEER FOR: WE COVER EVERYONE

© FCC

© Cruz y Ortiz Architectos

WANDA METROPOLITANO

Taiyo Europe was responsible for the detailed engineering, fabrication and installation of the tensile roof structure, including its cable net system, big lift procedure and PTFE-glass membrane roof, in a mix of solid and mesh materials. This project received the 2019 International Achievement Award (IFAI).

Year of Construction: 2017

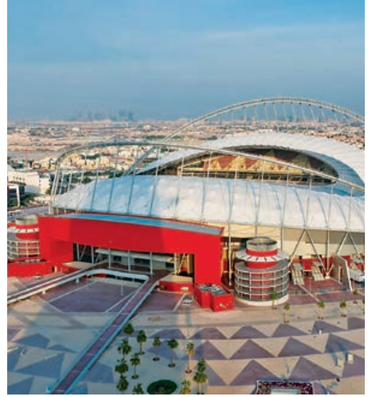
Architect:	Cruz y Ortiz Architectos, Spain
Engineering:	Schlaich Bergermann und Partner, Germany; Maffeis Engineering S.p.A, Italy Taiyo Europe GmbH, Germany
Size/Material:	405 tons of cables and 85,000 m² PTFE-glass fabric
Location:	Madrid, Spain

SCHIERKER FEUERSTEIN ARENA

The spatially curved saddle roof structure over the regional ice rink is a unique element which provides weather protection without obstructing the spectacular view onto the Harz mountain range. The single sourced execution of the steel, cable net and membrane structures ensure an outstanding result.

Year of Construction: 2017

Architect:	GRAFT, Germany
Engineering:	Schlaich Bergermann & Partner, Germany
Size/Material:	2.220 m² PTFE-glass fabric; steel structure and cable net
Location:	Wernigerode, Germany



STADE DE LA LICORNE AMIENS

The concept of the architect was to have a waterproof cover, while giving the illusion of being completely transparent. The innovative single skin ETFE solution was the perfect choice.

Year of Construction: 2018

Architect:	Gasnier Gossart, France
Engineering:	Taiyo Europe, Germany
Size/Material:	10.000 m² TensoSky ETFE single layer
Location:	Amiens, France

© GRAFT Architects

KHALIFA STADIUM

The New Khalifa Stadium is the first football stadium worldwide to use Tensotherm, and the first one in the Arabian Gulf to use single-layer ETFE. With this unique membrane roof, the stadium is rated four stars by the Global Sustainability Assessment System (GSAS).

Year of Construction: 2017

Architect:	DAR Al-Handasah, Lebanon
Engineering:	Maffeis Engineering SpA, Italy
Size/Material:	55.700 m² TensoSky single layer ETFE, PTFE -glass fabric and Tensotherm system
Location:	Doha, UAE

STADE VELODROME

This is the first stadium in France executed with PTFE-glass membrane cover. It consists of a 40.000 m² PTFE-glass roof and a 20.000 m² facade, creating an iconic landmark in the heart of Marseilles.

Year of Construction: 2014

Architect:	SCAU Architecture, France
Engineering:	Elliott Architects Ltd., UK, Maffeis Engineering SpA, Italy
Size/Material:	60.000 m² PTFE-glass fabric secondary steel
Location:	Marseilles, France

ESTADIO CIUDAD DE VALENCIA

New membrane roof covers all the stands with 28 membrane panels supported by two arches and fixed in the cable net structure. The total covered surface is around 9.000 sqm. Taiyo Europe was responsible for the detailed engineering, fabrication and installation of the tensile membrane roof.

Year of Construction: 2020

Architect:	IDOM, Spain
Engineering:	Taiyo Europe GmbH. Germany Maffeis Engineering SpA, Italy
Size/Material:	9.000 m² PVC-polyester
Location:	Valencia, Spain

COWBOYS STADIUM

World´s longest rectractable roof designed to open or close depending on the weather in just 12 minutes. It is also the first athletic facility in the US to use the self cleaning TiO2-coated architectural fabric membrane roofing system.

Year of Construction: 2009

Architect:	HKS, Inc., USA
Engineering:	Walter P. Moore, USA
Size/Material:	13.750 m² TiO2 coated PTFE-glass fabric
Location:	Arlington, USA

TRANSPORTATION

WHEREVER YOU GO:
WE WILL PROTECT YOUR WAY

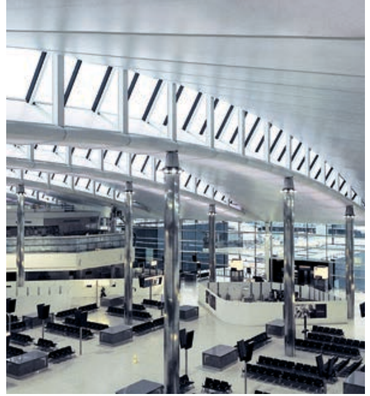
© SNCF Gares & Connexions
(all photos)

RENNES TRAIN STATION

The new multimodal exchange hub in Rennes is the transportation core of the capital of Brittany. The old building was transformed in order to simulate the typical regional landscape. This was possible due to the 3,500 m² of ETFE cushions that mimic the cloudy and foggy sky. On the southern end of the building the ETFE roof is equipped with a movable layer system that gives the possibility of managing the solar gain value.

Year of Construction: 2019

Architect:	AREP, France
Engineering:	MAP3, France, LEICHT France SAS, France
Size/Material:	5,200 m² of a mix of TensoSky ETFE single layer and cushions, including movable middle layer system
Location:	Rennes, France



TRAM STATION LODZ

The lightweight steel structure elevates the colourful tranlucent roof, creating this landmark tram station. This is the first large scale colour printed TensoSky ETFE. The structure consists of a mix of 3,000 m² uniquely printed ETFE roof and 600 m² of transparent facade, supported by stainless steel cables.

Year of Construction:	2014
Architect:	FOROOM, Poland
Engineering:	Buro Happold, Poland; konstruct AG, Germany
Size/Material:	3,600 m² TensoSky ETFE single layer, digitally printed
Location:	Lodz, Poland

HEATHROW TERMINAL 2A

Terminal 2A, The Queen's Terminal, became a landmark building in terms of energy efficiency. Its unique ondulated membrane ceiling distributes the natural light, while ensuring the required accoustic and aesthetic performances.

Year of Construction:	2014
Architect:	Luis Vidal + Architects, Spain
Engineering:	Maffeis Engineering SpA, Italy
Size/Material:	56,000 m² of combined silicone-glass fabric and TensoSky ETFE, secondary steel structure
Location:	London, UK

SPLIT AIRPORT

In the 1990's Taiyo has already built the PTFE front canopy of the main terminal. The satisfied client then asked Taiyo to also execute all four-layer skylights during the terminal's renovation, as well as the extension of the original canopy and the Bus Terminal, both consisting of PTFE-glass material.

Year of Construction:	2020
Architect:	VV -PROJEKT d.o.o, Croatia
Engineering:	RADNIC d.o.o, Croatia Taiyo Europe GmbH, Germany
Size/Material:	1,400 m² TensoSky ETFE 4 layers and 4,000 m² of PTFE-glass fabric
Location:	Split, Croatia

TAKANAWA GATEWAY STATION

Inspired by the Japanese traditional "origami" (paper folding) art, Takanawa Gateway Station's roof is a perfect fit to the membrane technologies, mixing a PTFE-glass roof coated with TiO2 roof and a mix of ETFE windows.

Year of Construction:	2020
Architect:	Kengo Kuma and Associates and JR East Design, Japan
Engineering:	Taiyo Kogyo Corporation, Japan
Size/Material:	5,000 m² TiO2 PTFE-glass fabric and 200 m² TensoSky ETFE
Location:	Tokyo, Japan

© gmp Architekten

PLACE ROGIER

This iconic canopy in the heart of Brussels has an expressive 25 m cantilever structure. This was possible due to the seamless integration of the single-layer ETFE roof and PVC membrane ceiling, which provides both a transparent waterproof cover, as well as a chess board pattern of shading on the ground.

Year of Construction:	2018
Architect:	XDGA, Xaveer De Geyter Architects, Belgium
Engineering:	Taiyo Europe GmbH, Germany; Konstruct AG, Germany
Size/Material:	3,000 m² TensoSky ETFE single layer; 1,200 m² PVC-polyester fabric
Location:	Brussels, Belgium

AIRPORT BERLIN BRANDENBURG

Not only will the metropolis at the center of Europe be receiving the most advanced airport of the continent, but yet another regional landmark with the completion of the new Airport Berlin Brandenburg. The entire ceiling is cladded with a tensioned PTFE-glass mesh modular system.

Year of Construction:	2012
Architect:	gmp, Germany
Engineering:	Schlaich Bergermann und Partner, Konstruct AG, Germany
Size/Material:	41,300 m² PTFE-glass fabric
Location:	Berlin, Germany

RETAIL

OUR MEMBRANE STRUCTURES BRING YOU
THE SOFISTICATED EXPERIENCE
YOU ARE LOOKING FOR

THE AVENUES - BAHRAIN

The Avenues-Bahrain is a shopping mall along the Manama sea front. Taiyo designed the steel and ETFE roof, as well as engineering, fabricating and installing 13,000 m² of TensoSky four-layer ETFE cushion system. The structure comprises 130 cushions, creating the avenue shopping experience, and converging onto two fantastic ETFE flower-shaped domes.

Year of Construction: 2017

Architect:	MSCEB, Bahrain
Engineering:	Maffeis Engineering SpA, Italy
Size/Material:	13,000 m² TensoSky ETFE 4 layers
Location:	Manama, Bahrain

MON GRAND PLAISIR SHOPPING MALL

53 ETFE cushions along the shopping alley, coupled with the twisting aluminium Fettuccine, give casual shopping enthusiasts a vibrant feeling of openness and a real feeling of warmth from the sunlight.

Year of Construction: 2020

Architect:	GR Design, France
Engineering:	MAP3, France; Taiyo Europe Gmbh, Germany
Size/Material:	4.000 m² TensoSky 2-layer ETFE cushions
Location:	Plaisir, France

SCALO MILANO

Scalo Milano is the new city district in the south area of Milano, which highlights the great value of Italian food, fashion, design, and art. Covering all this experience is this integrated PTFE-glass central canopy.The full structure (steel structure, membrane and cables) was entirely designed and built by Taiyo.

Year of Construction: 2016

Architect:	Metrogramma Srl, Italy
Engineering:	Maffeis Engineering SpA, Italy
Size/Material:	2,300 m² PTFE-glass fabric, steel and cables
Location:	Locate di Triulzi (MI), Italy

ATHENS METRO MALL

As one of the most modern shopping centres in Athens, Athens Metro Mall is also unique because of its two retractable roofs. The main roof was fabricated using PVC and the extension using ePTFE. It was the winner of the 2011 IFAI Award of Excellence for tensile structures larger than 2300 m².

Year of Construction: 2007

Architect:	Archicon Ltd., Greece
Engineering:	Maffeis Engineering SpA, Italy
Size/Material:	2,800 m² retractable roof PTFE-PTFE fabric Silicon; Extension roof ePTFE
Location:	Talima, Greece

SONY CENTER

Innovative architecture, living and work spaces. A unique connection between historical and modern Berlin. With the Sony Center, its planners and architects have created an internationally respected masterpiece of contemporary architecture.

Year of Construction: 2011

Architect:	Murphy/Jahn, Inc. Architects, USA
Engineering:	ARUP, Germany
Size/Material:	2,800 m² PTFE-glass fabric
Location:	Berlin, Germany

© Peter Bennetts

RUHR PARK BOCHUM

Engineering, fabrication and installation of the steel structure, printed ETFE single layer and supporting steel cables, shading panels behind the ETFE foils made from PVC-mesh materials.

Year of Construction: 2012

Architect:	Hütténes GmbH, Germany
Engineering:	Maas und Partner, Germany; Konstruct AG, Germany
Size/Material:	690 m² TensoSky ETFE single layer and PVC-polyester fabric
Location:	Bochum, Germany

CHADSTONE LINK WALKWAY

The combined use of tensile membrane roofing and laminated lumber in a steepled form creates a distinctively unique and elegant space over the walkway between the Chadstone shopping center and hotel. The project won an Excellence Award in 2020 from the Specialised Textiles Association.

Year of Construction: 2019

Architect:	Make Ltd. / Cera Stribley
Engineering:	MakMax Australia
Size/Material:	1,745 m² PTFE-PTFE fabric
Location:	Melbourne, Australia

CULTURE

LARGE OR SMALL: WE MAKE SURE THAT ALL EYES LIGHT UP

MILLENNIUM DOME

The O2, also referred to The Millenium Dome, is one of the largest dome-shaped buildings in the world. For this project Taiyo has executed more than 100,000 m² of double-layer PTFE-glass fabric (external solid and internal accoustic fabric). The roof assembly is supported by a web of 2,600 cables suspended from a circle of 12 steel masts, inclined slightly from vertical, that rise nearly 100 metres, representing the role played by Greenwich Mean Time.

Year of Construction: 1998

Architect:	Richard Rogers Partnership, UK
Engineering:	Buro Happold, UK
Size/Material:	85,530 m² of double-layer PTFE-glass fabric (inner accoustical liner)
Location:	London, UK

TARXIEN TEMPLES MALTA

PTFE fabric was selected as protective shelter for the megalithic temples against natural erosion. Using cable net structure, single PTFE panels were pretensioned and connected to the cables. All parts were chosen to harmonize seamlessly with this environment under UNESCO World Heritage protection.

Year of Construction: 2017

Architect:	Perit Mark Camillere
Engineers:	Maffeis Engineering SpA, Solagna, Italy
Size/Material:	3,000 m² PTFE-glass fabric
Location:	Tarxien, Malta

RIVER CULTURE PAVILION THE ARC

This architectonic masterpiece is constructed on the site where four rivers come together. The facade consists of a steel gridshell laterally supported by the primary structure. The gridshell is covered by specially-patterned ETFE cushions.

Year of Construction: 2012

Architect:	Asymptote Architecture, Hani Rashid, USA
Engineering:	Withworks, South Korea; Konstruct AG, Germany
Size/Material:	2,000 m² TensoSky ETFE 4 layers
Location:	Daegu, South Korea

MTV MUSIC AWARDS STAGE

Standing 12 m high and 40 m wide, the colossal unsupported tubular structure was created with 250 sq m of Eclipse Bright Nylon Lycra in white, with only minimal pocket sewing around the perimeter. Additional fabric sections were provided to create an entrance tunnel for the music acts and award winners.

Year of Construction: 2009

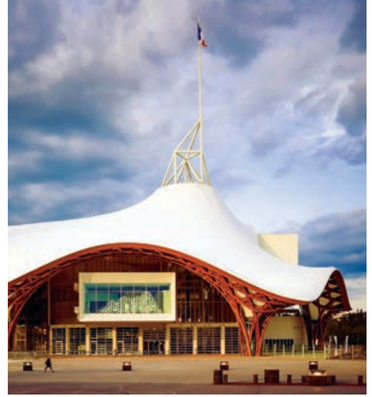
Architect:	LAVA, Australia
Engineers:	MakMax Australia
Size/Material:	400 m² Lycra
Location:	Sydney, Australia

CENTER PARCS VIENNE

Center Parcs is a waterpark which is open to the public all year long thanks to its ETFE roof of 3-layer cushions. Not only can multi-layer ETFE cushions be transformed into a myriad of shapes, they're also permeable to both natural light and UV rays.

Year of Construction: 2015

Architect:	ART'UR, France
Engineering:	LEICHT GmbH, Germany
Size/Material:	6,200 m² TensoSky ETFE
Location:	Vienne, France



FRAC NORD

Facing the North Sea, this building was inaugurated in 2013. It has six different levels for meetings, art exhibitions and work offices, offering a variety of cultural activities with a wonderful view, thanks to the 2-layer ETFE structure.

Year of Construction: 2013

Architect:	Lacaton & Vassal, France
Engineering:	Leicht, Germany
Size/Material:	3,362 m² TensoSky ETFE
Location:	Dunkerque, France

CENTRE POMPIDOU

With its hat shape, the glued laminated wood frame is covered by the PTFE TiO2 membrane (membrane with self-washing effect) with an area of 8,000 m². The roof is presented as a vast structure of hexagonal panels, crossed by three galleries and supported by a hexagonal tower in the center and 4 tulips.

Year of Construction: 2009

Architect:	Shigeru Ban Architects Europe, Jean de Gastines Architectes, France; Gumuchdjian Architects, England
Engineering:	Ove Arup & Partners, UK; Terrell Group, France
Size/Material:	8,000 m² TiO2 PTFE-glass fabric
Location:	Metz, France

© Philippe Ruault

EXPOSITIONS

CONNECTING PEOPLE AND TECHNOLOGIES. ALWAYS.

EXPO-2015 CARDO E DECUMANO

In ancient Rome, the main street that crossed the villages from East to West was called "Decumano" and the perpendicular one from North to South was called "Cardo". These are also the names of the two main streets of the Expo exhibition area. These walkways, which are 1,700 m long, with a covered surface close to 70,000 sqm, represent the main walkway of the EXPO and one of the biggest PVC roof structures in Europe.

Year of Construction: 2015

Architect:	Studio Tecnico Majowiecki, Italy
Engineering:	Maffeis Engineering S.p.A. Italy
Size/Material:	68,000 m^2 PVC-polyester fabric
Location:	Milan, Italy

SHANGHAI EXPO MAIN AXIS

With a length of 1 km, the Expo Axis served as the central boulevard to Shanghai Expo. The membrane roof is supported by the funnel-shaped glass shells and cables. The Expo Axis is one of the few structures to be left intact after the closing of the Exposition.

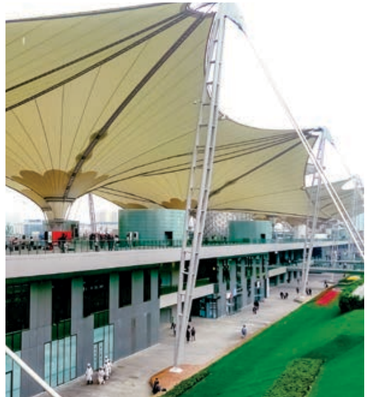
Year of Construction:	2009
Architects:	SBA International, South Korea, Xian Dai Architectural Design (Group) Co., Ltd
Engineering:	Knippers Helbig Advanced Engineering
Size/Material:	81.870 m² PTFE-glass fabric
Location:	Shanghai, China

© Maffeis Engineering S.p.A.

FUJI PAVILION

One of the most popular and iconic pavilions, built for the Osaka Expo in 1970, Fuji Pavilion is a fair and trade center and air-inflated membrane structure. This type of structure converted the common style into a new, remarkable, air-inflated type, composed of small inflated structures inside and outside of the main structure. This architecture is still the largest of its type in the world.

Year of Construction:	1970
Architect:	Yutaka Murata
Engineering:	Mamoru Kawaguchi
Size/Material:	3.400 m² Vinylon
Location:	Osaka, Japan



GERMAN PAVILION

The German Pavilion replicates the landscape of the typical rural areas of the country, as stylized trees emerge from the ground alongside the external exhibition area. By integrating cutting-edge organic photovoltaic (OPV) technology, the seedlings become Solar Trees. PVC mesh membrane and the ETFE internal "skirt" round up this innovative project.

Year of Construction:	2015
Architect:	Schmidhuber + Partner, Germany
Engineers:	Maffeis Engineering S.p.A., Italy
Size/Material:	3.300 m² TensoSky ETFE single layer, PVC-polyester and organic photovoltaics (OPV)
Location:	Milan, Italy

AL WASL DOME

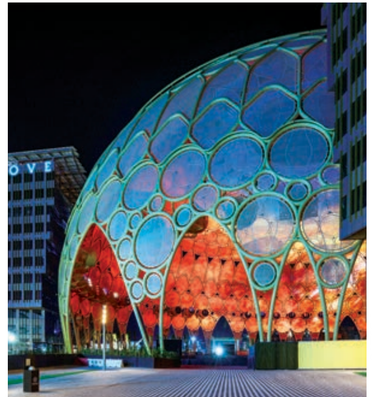
Al Wasl Dome Plaza is the largest 360-degree projection screen surface in the world. Enclosing a space of 724.000 m³ and standing 67,5 metres tall, the structure is the heart of the Expo 2020 site and Dubai's latest state-of-the-art architectural landmark. The project is a true collaboration between the companies in the Taiyo Group.

Year of Construction:	2019
Architect:	ASGG Chicago, USA
Engineering:	Taiyo Group
Size/Material:	16.500 m² of PTFE-glass fabric mesh
Location:	Dubai, UAE

BRILLIA RUNNING STADIUM

This facility is the first in Japan to adopt ETFE film on a large roof surface. The tunnel, 108 meters long and 8.5 high is formed by a laminated larch frame connected in arch form. Designed both for Olympics and Para-olympics, this running stadium embodies a simple but powerful belief: everyone with a body is an athlete.

Year of Construction:	2016
Architect:	Yukiharu Takematsu
Engineering:	E.P.A Environmental Protection Architectural Institute
Size/Material:	850 m² TensoSky ETFE 2 layers
Location:	Tokyo, Japan



© AETOSWire

COCA-COLA BEATBOX

A pavilion designed for the Olympic Games that could be played like a musical instrument. The "work of art ", consisting of 230 mutually stabilizing cushions, combines architectural design with the latest sound technology and invites visitors on a tour of discovery.

Year of Construction:	2012
Architect:	Pernilla Ohrstedt & Asif Khan, UK
Engineers:	AKT II, UK, Leicht, Germany
Size/Material:	1.560 m² TensoSky ETFE 2 layers, with incorporated sound system
Location:	London, UK

COMMERCIAL

ECONOMY, FUNCTION AND FLEXIBILITY FOR YOUR DAILY ROUTINE

SWATCH HEADQUARTERS

The roof of Swatch HQ (Swatch and Omega Campus) consists of timber frames in 3D grids. Almost 1,000 ETFE film cushions which form parts of the grid structure were engineered, fabricated, and delivered for this project. The total area of the ETFE cushions is 3,500 square meters. The three kinds of ETFE cushions were fabricated to accurately fit the 3D curvature timber frames, which required high precision from both engineering and fabrication.

Year of Construction: 2018

Architect:	Shigeru Ban Architects, Japan
Engineering:	LEICHT GmbH, Germany
Size/Material:	3,700 m² TensoSky ETFE multi-layer composed system incorporating movable shading and polycarbonate panels
Location:	Biel, Switzerland

© Rainer Viertlböck

US EMBASSY

The US Embassy in London is a project which stretches the boundaries of single-layer ETFE. The facade is composed of 399 pre-tensioned panels, installed on an articulated structure. The ETFE facade limits excessive solar gain and glare while allowing uniform distribution of natural light.

Year of Construction: 2017

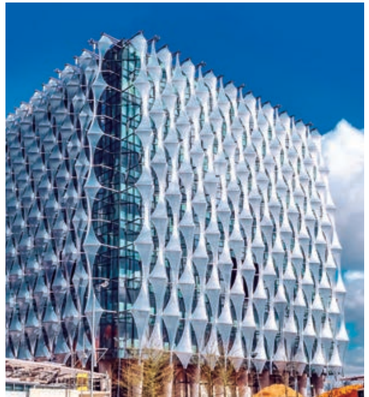
Architects:	Kieran Timberlake, USA
Engineering:	Birdair, USA; ARUP, USA; Taiyo Europe GmbH, Germany
Size/Material:	8,125 m² TensoSky ETFE single layer, cable and aluminium skeleton
Location:	London, UK

THYSSENKRUPP TEST TOWER

One of the tallest buildings in Germany (246 m) and the world's tallest building with a textile facade. The spiral arrangement of the facade consists of an extremely long-lasting PTFE coated, glass-fibre fabric. Also used to test and certify next-gen elevators.

Year of Construction: 2017

Architect:	JAHN Architects, Germany
Engineering:	Werner Sobek, Maffeis Engineering SpA, Italy; Taiyo Europe GmbH, Germany
Size/Material:	17,000 m² PTFE-glass fabric, supporting steel and cable
Location:	Rottweil, Germany



LAKHTA CENTER

This Multifunctional Building consists of two parallel buildings, fluidly united by a continuous 4-Layer TensoSky Skylight. The flexibility of TensoSky along with its tranparency and resistency ensures the harmony of geometry and sunlight, while resisting to the demanding snow loads.

Year of Construction: 2019

Architect:	RMJM Architects, UK, Gorproject, Russia
Engineers:	Maffeis Engineering SpA, Italy; Taiyo Europe GmbH, Germany
Size/Material:	4,000 m² TensoSky ETFE 4 layers, main steel structure
Location:	St. Petersburg, Russia

BIOREACTOR

The Würzburg sewage towers are covered with differently shaped membrane layers, so that two similar but not identical sculptures are created. The uniqueness of the objects and their smooth, light-coloured aesthetics symbolize the attributes with which the Würzburg sewage plant wants to identify in the future: precision, efficiency and technology.

Year of Construction: 2017

Architects:	Auer & Weber Architekten, Germany
Engineering:	LEICHT GmbH, Germany
Size/Material:	3,300 m² PVC-polyester fabric
Location:	Würzburg, Germany

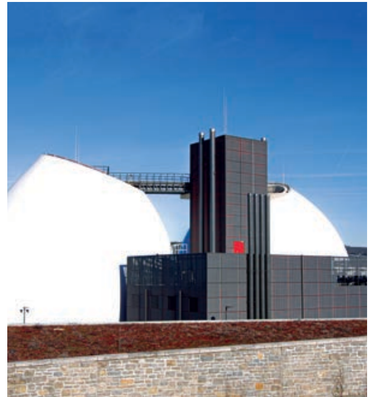
© Nacasa & Partners

AWM

Aesthetics and sustainability: the roof of Munich's municipal waste management building with its integrated photovoltaic cells fulfils all requirements of a functionally and ecologically advanced structure.

Year of Construction: 2011

Architect:	Ackermann und Partner Architekten BDA, Germany
Engineering:	Ackermann Ingenieure, Germany; Konstruct AG, Germany
Size/Material:	8,000 m² TensoSky ETFE 3 layer with incorporated photovoltaic system
Location:	Munich, Germany



NISSAN PAVILION

Enclosed by an ETFE film cushion facade, Nissan Pavilion is an interactive experience facility for future vehicles, technology, and the vision for the future of mobility. The soft form of the facade creates a distinctive atmosphere with the combined use of LED lighting.

Year of Construction: 2020

Architect:	Nissan Global Design HQ, TBWA/HAKUHODO, Archicept city, CBRE, Japan
Engineers:	Taiyo Kogyo Corporation, Japan
Size/Material:	1,000 m² TensoSky ETFE 3,500 m² PVC-polyester fabric
Location:	Yokohama, Japan

MEMBRANE CEILING SOLUTIONS

A SAFE SOLUTION FOR AESTHETIC, THERMAL AND ACOUSTIC IMPROVEMENTS

Function and aesthetics go hand in hand for ceiling membrane solutions. The lightweight nature of tensile membranes gives unique expression to various spaces.

Very flexible and light, membrane liners can take a wide variety of shapes without creating high additional loads on the main supporting structure. For this reason, textile ceilings are frequently attached to existing roofs, in order to improve overall indoor comfort.

Textile liners also enhance acoustic performance, improving sound absorption and reducing reverberations and echo effect. This makes a membrane ceiling the perfect solution for auditoriums, sport halls, swimming pools, open-air theaters and many other applications.

Taiyo lightweight systems are also safe solutions in seismic areas, drastically reducing the risk of injuries to the building users compared to heavier modular elements for ceiling applications. Moreover, thanks to their high fire resistance rate, they also keep users safe in the event of fire.

A flexible membrane ceiling design gives a perfect form and function combination for various spaces.

- LIGHTWEIGHT & FLEXIBLE IN FORM
- SOPHISTICATED ARCHITECTURAL FINISHING
- ACOUSTIC EFFICIENCY
- IMPROVED INDOOR COMFORT
- LOW MAINTENANCE
- FIRE RESISTANCE
- SEISMIC PROTECTION

© CFJ Photography

TENSILE MEMBRANE FACADE SOLUTIONS

THE ECONOMICAL ALTERNATIVE TO STANDARD FACADE SYSTEMS

Tensile Membrane facade solutions offer the remarkable benefits of low-weight structures, exceptional durability, reduced maintenance and energy-efficient systems that can be applied to any building shape.

Whether you aim to modernize an aging office building or create an innovative design, tensile membrane facades give a flexible and economical solution that can also help solve solar heat gain issues.

All buildings can benefit from membrane facades. Taiyo membrane solutions are ideal for realizing intricate designs, creating stylish separations, and staying on budget. Parking garages can also greatly benefit from membrane Taiyo facades, which create an innovative cladding for any structure. Solutions for this application provide the ventilation necessary for the garage space, along with light transmission and a lightweight economical solution that will create a lasting impression.

The materials adopted for these applications show extremely high resistance to external weather conditions and vary from single or multi-layered ETFE systems to tensioned PVC-polyester or PTFE-glass modules, frequently employed as mesh panels.

- CREATIVE LIGHTWEIGHT PROTECTION
- COST-EFFECTIVE
- REDUCTION OF SOLAR GAINS
- IMPROVED BUILDING THERMAL PERFORMANCE
- SURFACE FOR SCREENS, BRANDING, & GRAPHIC DESIGN
- TRANSLUCENCY & RETRO-ILLUMINATION
- DURABLE WITH EASY MAINTENANCE

CONSTRUCTION CAPABILITIES

OUR GOAL IS TO MAKE YOUR DESIGN REALITY

The Custom Membrane Structures designed and executed by Taiyo require experts in specialty construction in order to achieve the ultimate results. Our Group offers many of the most experienced, well-trained and dedicated construction professionals available in our industry.

Our global construction capabilities lead Taiyo to build a plethora of outstanding projects which have resulted in lasting partnerships with our customers.

Throughout the years, we had the chance to work in many different geographical climates and conditions, working at temperatures ranging from -32 °C to +55 °C, heights of 260 m and more. We also design methodologies to best fit the project, from installing from simple scaffoldings and manlifts, to adopting special hydraulic jacking systems, rampant platforms and helicopters.

Taiyo currently employs construction managers, site supervisors and a global network of experienced technicians, climbers, H&S personal and installers of steel, cables, and tensile membranes.

Our portfolio speaks for us: as a leader and pioneer specialty contactor we efficiently install tensile membrane projects of any size, from small canopies to large stadium roofs.

- DESIGN AND BUILD
- PIONEER IN MEMBRANE STRUCTURES
- SPECIALIST IN STEEL & CABLE STRUCTURES
- COMMITMENT TO HEALTH & SAFETY
- INNOVATIVE INSTALLATION METHODS TO MEET EVERY ENVIRONMENT
- SOLUTIONS FOR NEW & OPERATING BUILDINGS
- SPECIALIST ROPE ACCESS TEAMS

QUALITY & SUSTAINABILITY

A COMMITMENT WE FOLLOW AT EVERY STAGE

We recognize the importance of achieving global quality standards through the implementation of excellence in the processes that permeate our business, from early-stage design all the way to installation and maintenance. We also believe in a greener future, where high-performance building membranes can be the front line of a world with higher energy savings and reduced environmental impact. Taiyo's solutions can support clients aiming to achieve LEED®, BREEAM® and DGNB certifications, as well as requiring our TensoSky ETFE Environmental Product Declaration.

QUALITY

Taiyo´s primary commitment is to quality. Our ISO 9001 certification follows our strict Quality Management Procedures. By implementing this system in every aspect of our business, we ensure that we consistently deliver excellence in our product or services.

HEALTH & SAFETY

Safety is our priority. Taiyo is committed to upholding the highest safety standards across our business. Our attention to details is embedded in our values, organization culture, and operating systems with our OHS management system being ISO45001 certified.

RECYCLABILITY

Taiyo´s tensile membrane structure uses steel and aluminium materials, as well as different membrane materials that support improved environmental conditions. Moreover, ETFE films that compose Taiyo´s TensoSky ETFE systems are 100% recyclable.

ENVIRONMENT AND SUSTAINABILITY

Taiyo believes that operating in a sustainable, responsible manner is an important business practice. We are conscious of our responsibility to the environment and we constantly raise environmental awareness throughout the projects.

FABRICATION

MANUFACTURING CUSTOMIZED AND INNOVATIVE STRUCTURES SINCE 1922

High quality membrane structures are the core of the architecturally innovative and aesthetically appealing custom tensile structures Taiyo creates. Each material requires a specific fabrication process mastered by our team.

The Taiyo Group has six state of the art production facilities located on three continents, making us the largest membrane fabricator in the world and assuring our capabilities in providing our clients with full customized design-to-build solutions.

Geographically located in strategic cities, our production facilities allow us to efficiently cater to any projectlocation with the shortest lead time, providing our customers with the assurance and unconditional commitment to their schedule.

We are dedicated to delivering projects to the highest standard of quality. Our ISO-90001 certified factories are capable of fabricating a wide array of fabric and foil structures, including PTFE and PVC membranes, Tensotherm and TensoSky ETFE film systems.

During all stages of fabrication, Taiyo adheres to a strict Quality Management Program, improved over decades of experience, & involving self and independent third-party monitoring. Additionally, our facilities rely on the latest machinery and equipment, developed and optimized for each application.

Taiyo also supports a network of qualified fabrication partners, committed to Taiyo's quality program, and which supports our technology and expertise in membrane systems reaching projects in every place.

Our years of experience are passed down through the generations of specialists in our team. Each process of production is strictly monitored, optimized and managed to ensure that our projects are aesthetically and functionally first-rate, not only at the time of completion, but also during their lifetime of use.

SERVICE & WARRANTY

BECAUSE MAINTENANCE IS THE FIRST STEP TOWARDS LONG-LASTING PERFORMANCE

Taiyo is committed to delivering satisfaction to architects and owners who wish to achieve results surpassing the ordinary, both aesthetically and functionally. To keep their investments looking beautiful and functioning perfectly, Taiyo offers clients a wealth of post-project resources and assistance.

Building owners may partner with our company to ensure their structures look as breathtaking years from now as they did the day the last piece of steel, cable, tensile fabric or ETFE was put into place. These services can range from simple cleanings to comprehensive structural reviews and modifications.

Our site superintendents are on call 24/7, allowing Taiyo to promptly respond to any service requests, along with our dedicated rope access teams, specially trained to maintain your tensile structure to the highest standard.

Moreover, Taiyo's on-going commitment to training ensures our team is able to provide advice on all aspects of the technology. Our vast technical knowledge and expertise provides clients with assurance and peace of mind that Taiyo's tensile structures will perform over the course of the building's life, and beyond.

- 24-HOUR RESPONSE SERVICE
- INSPECTION, SURVEY & MONITORING
- PREVENTIVE MAINTENANCE & REPAIR
- CLEANING OF ALL MEMBRANE MATERIAL
- RE-TENSIONING AND TENSILE STRUCTURE ENHANCEMENTS
- COMPLETE MEMBRANE REPLACEMENT & RENOVATIONS
- REINFORCEMENTS, WATER & SNOW MANAGEMENT, STEEL MODIFICATIONS, & MORE

Taiyo Europe
MakMax
Setting the **Global Standard** for Tensile Architecture

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