## Design Fabrication TENSILE ARCHITECTURE Installation Service







Setting the Global Standard for Tensile Architecture













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## THE TAIYO GROUP WORLD'S LEADING TENSILE MEMBRANE CONTRACTOR

ounded 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 Birdair Kogyo Corporation China, MakMax Australia Australia. Birdair 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 Center 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 awardwinning 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, 1972), the world's first PTFE-coatedfiberglass 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, Birdair is your partner to bring it to life.

impact and carbon footprint.

#### STRUCTURAL ANALYSIS





## THERMAL ANALYSIS





## **RESEARCH & DEVELOPMENT** SHAPING THE FUTURE OF MEMBRANE ARCHITECTURE

t Birdair we believe that self-improvement shall Always be our innate driving force to be industry leaders in tensile 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 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 quality standards.

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 center of excellence for the whole industry.

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



### TAIYO KOGYO CORPORATION



## HISTORY

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



## WORLDWIDE PRESENCE

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



HQ – Taiyo Kogyo Corporation, Osaka HQ – Taiyo Kogyo Corporation, Tokyo

#### COMPANIES OF THE TAIYO GROUP

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

Germany Taiyo Europe GmbH

#### 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

#### Thailand

Ayutthaya Cambodia Phnom Penh

Australia

Brisbane

FACTORIES

Hirakata Mizuho Fukui

Japan

China Songjiang

#### UAE Taiyo Middle East, UAE





# Steel installation

## **UNDER ONE ROOF: DESIGN-BUILD CAPABILITIES**

WE FOCUS ON OUR CLIENTS & ON QUALITY

years architects, engineers, contractors, owners and developers have relied on Birdair 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: Birdair offers a complete range of technical services, ensuring that you receive unparalleled experienced and reliable commitment right from the start.

#### DESIGN ASSISTANCE

Birdair'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. Birdair 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, Birdair delivers reaction loads, connection details, member sizing, interface details, and construction methodologies.

commercial aspects.







## **AND DURING CONSTRUCTION & BEYOND** FOR OUTSTANDING STRUCTURES BUILT TO LAST

#### FABRICATION AND QUALITY CONTROL

Birdair, a member of the Taiyo Group, is ISO 9001 (Quality Management) and ISO 14001 (Environmental Management) certified. During the manufacturing phase of a project and with six fabrication facilities worldwide, we have the essential capability to fabricate over 1,000,000 ft<sup>2</sup> 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

#### 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. Birdair 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 Birdair to promptly respond to any service requests.

## MEMBRANE MATERIALS

BIRDAIR DESIGNS, FABRICATES, INSTALLS, AND MAINTAINS UNIQUE ROOFS, FACADES, ATRIUMS





## **TENSOSKY® ETFE FILM** TRANSPARENT. FLEXIBLE & LIGHTWEIGHT

TFE (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. Birdair'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-COLOR

VC (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 colors 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<sub>2</sub>) 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, colorful, 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 colors and combinations.



## **PTFE-COATED FIBERGLASS** DURABLE, NON-FLAMMABLE, SELF-CLEANING

#### **Key Benefits**

Extremely resistant to UV radiation, and to chemical and biological attack, translucent, high reflectance, non-flammable flammable Class A, long lasting, TiO<sub>2</sub> (titanium dioxide) 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.

TFE (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.

## TENSOTHERM™ INSULATED TRANSLUCENT TENSILE MEMBRANE

ensotherm, an 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.





### SELF-CLEANING



## PHOTOCATALYSTS (TiO<sub>2</sub>) MEMBRANES NATURALLY KEEP THEIR WHITENESS

ridair's architectural membrane materials have Dbeen 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), TiO<sub>2</sub> is 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 TiO<sub>2</sub> are what give membrane materials their incredible resistance to dirt and grime. In the past, white and other light colors were avoided due to the conspicuousness of stains. Now, however, thanks to this dirt-resistant technology, white has become the dominant color of choice.

This graph shows the protective effects of membrane materials with TiO<sub>2</sub> coatings against dirt. This selfcleaning mechanism uses the natural powers of sunlight and rain to fight against grime.





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

TiO<sub>2</sub>, a photocatalytic compond, has the function of absorbing natural sunlight (UV) and decomposing organic matter. For this reason, a phenomenom occurs: natural sunlight irradiates the membrane and stains from organic matter.

## Iltraviole TiO₂ decomposes the dirt and suspends it 2. Rain suspends and washes away the dirt

## NO<sub>x</sub> REDUCTION

One of the contributors to air pollution in cities is the emissions from automobiles that include nitrogen oxide  $NO_x$ , TiO<sub>2</sub> coated membrane decompose  $NO_x$  through an oxidation reaction, and purify the surrounding air.



## PHOTOCATALYSTS (TiO<sub>2</sub>)

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

#### **6 MONTH EXPOSURE TEST**

PROTOTYPE WITH PVC-COATED POLYESTER FABRIC

Material NOx removable volume per		per time	Decomposition Capability per 1000m		er 1000m		
Nominal Name Product Name	Quantity	ity Weight		Popular trees	Car gas	Truck gas	
	µmol/50cm/5h	g/1000m/h	g/1000mi/day	(unit tree)	(unit: car)	funit truck	
Everfine Coat	FGT800 TFB	0.55	0.66	15.H	292	2.2	16
Air Purify 450	AP450	1.66	1.87	44.9	83	63	46
	P55200 i	2.46	2.95	70.8	131	10	72
POS325 i	PSS325 i	2.24	2.69	64.5	119	91	66
			NOx disch	aroe (o/h)	0.0225	0.295	0.400

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

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A REAL PROPERTY AND A REAL PROPERTY AND





## 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).

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 915,000 ft <sup>2</sup> PTFE-glass fabric
Location:	Madrid, Spain











## USTA ARTHUR ASHE

Architect:	Rossetti Architects
Engineering:	WSP
Size/Material:	210,000 ft <sup>2</sup> PTFE-coated fiberglass
Location:	Flushing, New York USA

## McCLAIN ATHLETIC FACILITY

The new upgraded Tensotherm roof allows McClain Athletic Facility to maintain the barrel vault look of it previous roof non-insulated PTFE by Birdair in 1988.

Year of Construction	on: 2012
Architect:	VOA Associates
Engineering:	Berners Schober Associates
Size/Material:	42,000 ft² Tensotherm™ - Insulated Translucent Membrane System
Location:	Madison, Wisconsin USA

## KHALIFA STADIUM

The New Khalifa Stadium is the first soccer stadium in the Arabian Gulf to use single-layer ETFE. With four stars by the Global Sustainability Assessment System (GSAS).

#### Year of Construction: 2017 Architect DAR Al-Handasah, Lebanon Maffeis Engineering SpA, Italy Size/Material: 600,000 ft<sup>2</sup> TensoSky singlelayer ETFE, PTFE-glass fabric and Tensotherm system Location: Doha, Qatar

# STADIUM











# MERCEDES-BENZ

## 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 TiO<sub>2</sub>- coated architectural fabric membrane roofing system.

### Year of Construction: 2009

Architect:	HKS, Inc., USA
Engineering:	Walter P. Moore, USA
Size/Material:	150,000 ft² TiO₂ coated PTFE-glass fabric
Location:	Arlington, Texas USA

## 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 97,000 ft<sup>2</sup>. Taiyo Europe was responsible for the detailed engineering, fabrication and installation of the tensile membrane roof.

Architect:	IDOM, Spain
Engineering:	Taiyo Europe GmbH. Germany Maffeis Engineering SpA, Italy
Size/Material:	97,000 ft² PVC-polyester
Location:	Valencia, Spain

# TRANSPORTATION

## WHEREVER YOU GO: WE WILL PROTECT YOUR W







## **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 38,000 ft<sup>2</sup> 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: 2019Architect:AREP, FranceEngineering:MAP3, France,<br/>LEICHT France SAS, FranceSize/Material:56,000 ft² of a mix of TensoSky ETFE<br/>single-layer and cushions, including<br/>movable-middle-layer systemLocation:Rennes, France









## HEATHROW TERMINAL 2A

rear of Construction	1: 2014
Architect:	Luis vidal +

End	ineei	rina
Cizo	1110	

## 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 32,300 ft<sup>2</sup> uniquely printed ETFE roof and 6,500 ft<sup>2</sup> of transparent facade, supported by stainless steel cables.

#### Year of Construction: 2014

Arabitaat	FODOOM Deland
Engineering:	Buro Happold, Poland;
	konstruct AG, Germany
Size/Material:	38.750 ft <sup>2</sup> TensoSky ETFE
	single-layer, digitally printed
Location:	l odz. Poland

## SPLIT AIRPORT

In the 1990 's Birdair has already built the PTFE front then asked Birdair 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:	15,000 ft² TensoSky ETFE four-layers and 43,000 ft² PTFE-glass fabric
Location:	Split, Croatia

# **AIRPORT**







# DENVER INT'L.

	Fentress	Bradburn	
Assc	ciates		

## THE RAPID **CENTRAL STATION**

The two-tiered, PTFE membrane tensile canopy designed and built by Birdair undulates dramatically over the terminal and platform, rising and falling from 14 to 45 ft to remind patrons of the swiriling rapids of the Grand River, calmed long ago by dams and locks.

#### Year of Construction: 2004

	•
Architect:	Progressive AE
Engineering:	Wendel Duchscherer
Size/Material:	56,000 ft <sup>2</sup> PTFE-coated fiberglass
Location:	Grand Rapids, Michigan USA

## HAJJ TERMINAL

Considered the largest cable-stayed tensile membrane roof structure in the world, 210 semiconica PTFE-coated fiberglass roof units supported by 135 ft high steel pylons were constructed to handle the large flow of pilgrims using the King Abdul Aziz Int'l Airport on their way to the nearby Holy City of Mecca.

Architect:	Skidmore, Ownings & Merrill (SOM)
Engineering:	SOM & Geiger-Berger Associates
Size/Material:	4.5 million ft <sup>2</sup> PTFE-coated fiberglass
Location:	Jeddah, Saudi Arabia

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

RETAI





## **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 140,000 ft<sup>2</sup> 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.

Architect:	MSCEB, Bahrain
Engineering:	Maffeis Engineering SpA, Italy
Size/Material:	140,000 ft² TensoSky ETFE four-layer
Location:	Manama, Bahrain









## SCALO MILANO

Architect:	Metrogramma Srl, Italy
Engineering:	Maffeis Engineering SpA, Italy
Size/Material:	25,000 ft <sup>2</sup> PTFE-glass fabric, steel and cables
Location:	Locate di Triulzi (Mi), Italy

## 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:	43,000 ft² TensoSky double-layer ETFE cushions
Location:	Plaisir, France

## 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 24,750 ft<sup>2</sup>.

#### Year of Construction: 2007

Architect:	Archicon Ltd., Greece
Engineering:	Maffeis Engineering SpA, Italy
Size/Material:	30,150 ft² retractable roof PTFE-PTFE fabric Silicon; Extension roof ePTFE
Location:	Talima, Greece

## SONY CENTER

Murphy/Jahn, Inc. Architects, USA
ARUP, Germany
57,000 ft² PTFE-glass fabric
Berlin, Germany

## PLAZA LAS AMERICAS

One of the first malls in the area, the dramatic flying sail tensile membrane roof design provides shoppers with shade and protection from inclement weather while delivering natural daylighting for the space underneath.

#### Year of Construction: 2012

Architect:	Interdisenos
Engineering:	Interdisenos
Size/Material:	18,840 ft <sup>2</sup> PTFE-coated fiberglass
Location:	Morelia, Michoacan Mexico

## WEST PALM BEACH OUTLETS

An outdoor shopping mall that features six areas around the retail center with PTFE conical shaped tensile membrane structures designed and built as walkway canopies protecting shoppers from the hot sun and daily precipitation.

Architect:	Dorsky Yue International LLC.
Engineering:	Mcnamara / Salvia Inc.
Size/Material:	48,000 ft <sup>2</sup> PTFE-coated fiberglass
Location:	West Palm Beach, FL USA

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

ENDE







## THE O2

The O2, also referred to The Millenium Dome, is one of the largest dome-shaped buildings in the world. For this project, Birdair executed more than 1 Million sq. ft. 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 328 feet, representing the role played by Greenwich Mean Time.

Richard Rogers Partnership, UK
Buro Happold, UK
1,075,000 ft <sup>2</sup> of double-layer PTFE-glass fabric (inner accoustical liner)
London, UK







## RIVER CULTURE PAVILION THE ARC

Architect:	Asymptote Architecture, Hani Rashid, USA
Engineering:	Withworks, South Korea; Konstruct AG, Germany
Size/Material:	21,500 ft² TensoSky ETFE four-layer
Location:	Daegu, South Korea

## ARKANSAS MUSIC PAVILION

The AMP's three-cone shaped PTFE fiberglass membrane structure creates an open, inviting space that comes to life in the evenings with glowing lights and cheering fans.

Year of Construction: 2014	
Architects:	CORE
Engineering:	Tatum-Smith
Size/Material:	37,500 ft <sup>2</sup> PTFE-coated fiberglass
Location:	Rogers, Arkansas USA

## MTV MUSIC AWARDS STAGE

Standing 40 feet high and 131 feet wide, the colossal unsupported tubular structure was created with 27,000 ft<sup>2</sup> 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 & award winners.

#### Year of Construction: 2009 Architect: LAVA, Australia MakMax Australia Size/Material 4,300 ft² Lycra Location: Sydney, Australia

# AT YONKERS



# **EMPIRE CITY CASINO**

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	U,	

## CENTRE POMPIDOU

With its hat shape, the glued laminated wood frame is covered by the PTFE TiO<sub>2</sub> membrane (membrane with self-washing effect) with an area of 86,100  $ft^2$ . 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

Shigeru Ban Architects Europe, Jean de Gastines Architectes, France; Gumuchdjian Architects, England
Ove Arup & Partners, UK; Terrell Group, France
86,000 ft² TiO <sub>2</sub> PTFE-glass fabric
Metz, France

## SUN VALLEY MUSIC PAVILION

nspired by its natural setting, the Sun Valley Music Pavilion is a 3,000 square-foot stage is housed under a proscenium arch that supports the free-flowing PVC tensile canopy structure.

Architect:	Ruscitto/Latham/Blanton Architectura
Engineering:	FTL Design Engineering Studio
Size/Material:	18,000 ft <sup>2</sup> PVC
Location:	Sun Valley, Idaho USA



Architect:	Studio Tecnico Majowiecki, Italy
Engineering:	Maffeis Engineering S.p.A, Italy
Size/Material:	732,000 ft <sup>2</sup> PVC-polyester fabric
Location:	Milan, Italy











## **FUJI PAVILION**

Architect:	Yutaka Murata
Engineering:	Mamoru Kawaguchi
Size/Material:	36,600 ft² Vinylon
Location:	Osaka, Japan

## STRONG NATIONAL MUSEUM OF PLAY

More than 4,000 sq. ft. of PTFE tensile membrane stretches 30 feet high and 50 feet in diameter to form the architectural equivalent of a butterfly's wings, allowing an abundance of natural daylight into the space below.

Year of Construction	on: 2006
Architects:	Macon Chaintreuil Jensen & Stark
Engineering:	Jensen Engineeering, PC
Size/Material:	4.000 ft <sup>2</sup> PTFE-coated fiberglass
Location:	Rochester, New York USA

## UNIVERSITY OF LA VERNE

Since 1972, the world's first permanent tensioned membrane roofing system has topped the Sports Science and Athletics Pavilion at the University of functionality of the Birdair structure remains as innovative as it was 50 years ago.

#### Year of Construction: 1972

Architect:	John Shaver, Shaver Partnership
Engineers:	Bob Campbell, Campbell & Co.
Size/Material:	47,500 ft <sup>2</sup> PTFE glass fabric
Location:	La Verne, California USA

# CENTER







# AMBAR INTERACTIVE

Pedro Ramierz,	Gerardo Gallo
& Modulo 7	

## FLORIDA HOSPITAL WATERMAN

From the onset, Birdair's design goals were to create a warm, casual, and relaxed environment that did not look like a traditional hospital, while achieving a tranquil setting encouraging healing and alleviating anxieties. PTFE folded plate membrane roof design was used to cover the lobby, as well as extending out over the driveway of the hospital's main entrance.

Year of Construction	2003
Architect:	RTKL Associates, Inc.
Engineering:	Zinser Engineering
Size/Material:	31,715 ft² PTFE glass fabric
Location:	Tavares, Florida USA

## 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.

Architect:	Pernilla Ohrstedt & Asif Khan, UK
Engineers:	AKT II, UK, Leicht, Germany
Size/Material:	16,800 ft² TensoSky ETFE double-layer, with incorporated sound system
Location:	London, UK

# ECONOMY, FUNCTION AND FLEXIBILITY FOR YOUR DAILY ROUTINE

COMMERCIA



![](_page_17_Picture_3.jpeg)

![](_page_17_Picture_4.jpeg)

## SWATCH HEADQUARTERS

The roof of Swatch Headquarters (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 39,900 ft<sup>2</sup>. 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	Cons	truc	tion:	2018

Architect:	Shigeru Ban Architects, Japan
Engineering:	LEICHT GmbH, Germany
Size/Material:	39,900 ft <sup>2</sup> TensoSky ETFE multi-layer composed system incorporating movable shading and polycarbonate panels
Location:	Biel, Switzerland

![](_page_18_Picture_0.jpeg)

![](_page_18_Picture_1.jpeg)

![](_page_18_Picture_2.jpeg)

![](_page_18_Picture_3.jpeg)

## THYSSENKRUPP **TEST TOWER**

## **US EMBASSY**

The US Embassy in London is a project which stretches the boundaries of single-layer ETFE. The tensile 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:	87,500 ft² TensoSky ETFE single-layer, cable and aluminium skeleton
Location:	London, UK

## 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 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:	43,000 ft² TensoSky ETFE four-layer, main steel structure
Location:	St. Petersburg, Russia

![](_page_18_Picture_25.jpeg)

![](_page_18_Picture_26.jpeg)

## AWM CARPORT

## SAN DIEGO CONVENTION CENTER

Originally constructed in 1989, the iconic PTFE Sails Pavilion roof of the San Diego Convention Center was recently renovated and replaced with a new PTFE tensile membrane roof. The white sails roof atop of the exhibit space has made the convention center one of the most recognizable venues worldwide.

Year of Construction: 2018	
Architects:	Arthur Erickson Architects (original)
Engineering	Thorton Tomasetti
Size/Material:	106,000 ft <sup>2</sup> PTFE-coated fiberglass
Location:	San Diego, California USA

## NISSAN PAVILION

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

Architect:	Nissan Global Design HQ, TBWA/HAKUHODO, Archicept city, CBRE, Japan
Engineers:	Taiyo Kogyo Corporation, Japan
Size/Material:	10,800 ft² TensoSky ETFE 37,700 ft² PVC-polyester fabric
Location:	Yokohama, Japan

![](_page_19_Picture_0.jpeg)

![](_page_19_Picture_1.jpeg)

![](_page_19_Picture_2.jpeg)

## MEMBRANE CEILING SOLUTIONS A SAFE SOLUTION FOR AESTHETIC. THERMAL AND ACOUSTIC IMPROVEMENTS

unction 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.

Birdair's 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, membrane interior ceilings 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

building shape.

All buildings can benefit from membrane facades. Birdair tensile membrane facade solutions are ideal for realizing intricate designs, creating stylish

![](_page_19_Picture_21.jpeg)

## **TENSILE MEMBRANE FACADE SOLUTIONS** THE ECONOMICAL ALTERNATIVE TO STANDARD FACADE SYSTEMS

ensile 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

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 solar heat gain issues.

separations, and staying on budget. Parking garages can also greatly benefit from Birdair tensile membrane facades, by creating 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 option 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 PTFEcoated fiberglass membrane, 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

![](_page_20_Picture_0.jpeg)

![](_page_20_Picture_1.jpeg)

![](_page_20_Picture_2.jpeg)

## CONSTRUCTION CAPABILITIES OUR GOAL IS TO MAKE YOUR DESIGN REALITY

structures membrane designed and executed by Birdair 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 Birdair 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 -25° F to +130° F,

heights of 850 ft and more. We also develop methodologies to best fit the project, from installing from simple scaffoldings and manlifts, to adopting hydraulic jacking systems, rampant platforms and helicopters.

Birdair 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 ranging in size, from small entrance or curbside 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

ETFE Environmental Product Declaration.

![](_page_20_Picture_19.jpeg)

## **QUALITY & SUSTAINABILITY** A COMMITMENT WE FOLLOW AT EVERY STAGE

V /e 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. Birdair's solutions can support clients aiming to achieve LEED<sup>®</sup>, BREEAM<sup>®</sup> and DGNB certifications, as well as requiring our TensoSky

#### QUALITY

Birdair's primary commitment is to quality. Our dedication to excellence follows our strict Quality Management Procedures. By implementing this system in every aspect of our business, we ensure that we deliver superiority in our product and services.

#### HEALTH & SAFETY

Safety is our priority. Birdair 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.

#### RECYCLABILITY

Birdair'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 Birdair's TensoSky ETFE system are 100% recyclable.

#### ■ ENVIRONMENT AND SUSTAINABILITY

Birdair 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.

![](_page_21_Picture_0.jpeg)

![](_page_21_Picture_1.jpeg)

![](_page_21_Picture_2.jpeg)

## FABRICATION

#### MANUFACTURING CUSTOMIZED AND INNOVATIVE STRUCTURES SINCE 1922

igh quality membrane structures are the core of The architecturally innovative and aesthetically appealing custom tensile structures Birdair 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 project location 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-coated fiberglass and PVC, Tensotherm and TensoSky ETFE film systems.

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

Birdair also supports a network of qualified fabrication partners, committed to Birdair'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.

V /ith more than 65 years of worldwide experience, W Birdair provides quality post-project resources and assistance - all under one roof. Our commitment to customer service extends far beyond project completion, delivering satisfaction to architects and owners who wish to achieve results surpassing the ordinary, both aesthetically and functionally.

![](_page_21_Picture_17.jpeg)

## **SERVICE & WARRANTY**

#### BECAUSE MAINTENANCE IS THE FIRST STEP TOWARDS LONG-LASTING PERFORMANCE

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 film 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 Birdair 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, Birdair's on-going commitment to training ensures we are 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 Birdair's tensile structures will perform over the course of the building's life, and beyond.

- 24/7 ON CALL SERVICE
- INSPECTION, SURVEY & MONITORING
- PREVENTIVE MAINTENANCE & REPAIR
- CLEANING OF MEMBRANE MATERIAL
- RE-TENSIONING AND TENSILE STRUCTURE ENHANCEMENTS
- COMPLETE MEMBRANE **REPLACEMENT & RENOVATIONS**
- REINFORCEMENTS, STEEL MODIFICATIONS, WATER & SNOW MANAGEMENT, & MORE

![](_page_22_Picture_0.jpeg)

**Birdair, Inc.** 6461 Main St. Amherst, NY 14221

 Toll-Free
 1.800.622.2246

 Ph
 1.716.633.9500
 birdair.com

![](_page_22_Picture_3.jpeg)

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