

Tensile
architecture



Summary



Parque Guadiana Mexico - Dünn

Enclosed building

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University of the Atlántico sports complex

Santander - Spain

Sport

credits

Architect:
Carlo Galianos - Arenas & Asociados, S.L.P
Client:
Centro de investigación y tecnología industrial de Cantabria
Roof engineering, fabrication, installation:
IASO
Roof membrane:
Flexlight Xtrem TX 30 Type III — 3.170 sqm
Facade membrane:
Frontside View 381 — 74 sqm
Completion date: 2017
Climatic conditions: sea side north of Spain



“This tensile structure is a cornerstone architectural element within the Science and Technology Park of Cantabria. The Flexlight Xtrem TX30 composite promotes conservation of natural light and allows the students to play undercover while enjoying an outdoor feeling”



Each roof panel has a gutter to collect rain water, connected to downpipes inside the pillars of the structure.



Roof measures: 90 x 30 m, maximum height 9 m with a slightly trapezoidal floor plan. Steel structure: 12 central lattices. Glass walls on each end, mid height glass partition in the length.

Covered outdoor: natural light & ventilation

This tensile building houses 2 indoor soccer and/or handball courts, 2 basketball courts, 2 volley courts, 1 tennis court and 1 badminton court completed with an area of stands for about 300 people and changing rooms.

The originality that characterizes its design enables the students to fully enjoy natural light and outdoor feeling while being protected from inclement weather.

The roof, with a true magnitude of 3,170 sqm, consists of 13 tensioned sections fixed independently to the steel structure by an aluminum profile and skirts between them to guarantee water tightness.



On the eastern side a breathable covering to protect from sun glare. Serge Ferrari Frontside View 381 mesh covers an area of 28,3m x 3,8m at its highest point and 1,9 m at its lowest point. 16 tensioned panels independently anchored to the structure with an aluminum profile throughout the perimeter.

Video



Zayed University Promenade Shade

Abu Dhabi - UAE

Education

credits

Architects: Pascall + Watson UK & Aecom Abu Dhabi

Client: Ministry of Education Abu Dhabi

Consulting engineers: AECOM

Membrane engineering, fabrication, installation:

Fiobco Factory Llc - Dubai

External membrane:

Flexlight Advanced 1002T2 — 40.000 sqm

Internal membrane:

Flexlight Lighting 402HT — 40.000 sqm

Completion date: 2011

“Funded by Sheikh Zayed to establish world-class tertiary education in the gulf, the university received a five-pearl rating, the highest possible, for its design under Estidama program (“sustainability” in Arabic) the Emirate’s green building guidelines which assesses the sustainability of all new buildings in the Emirates.”



The whole lightweight tensile roof is completely airtight with access provided in between the two skins for maintenance & cleaning.

Natural light & energy optimization

Located in the desert on the outskirts of Abu Dhabi, the university offers exceptional facilities for 6,000 students.

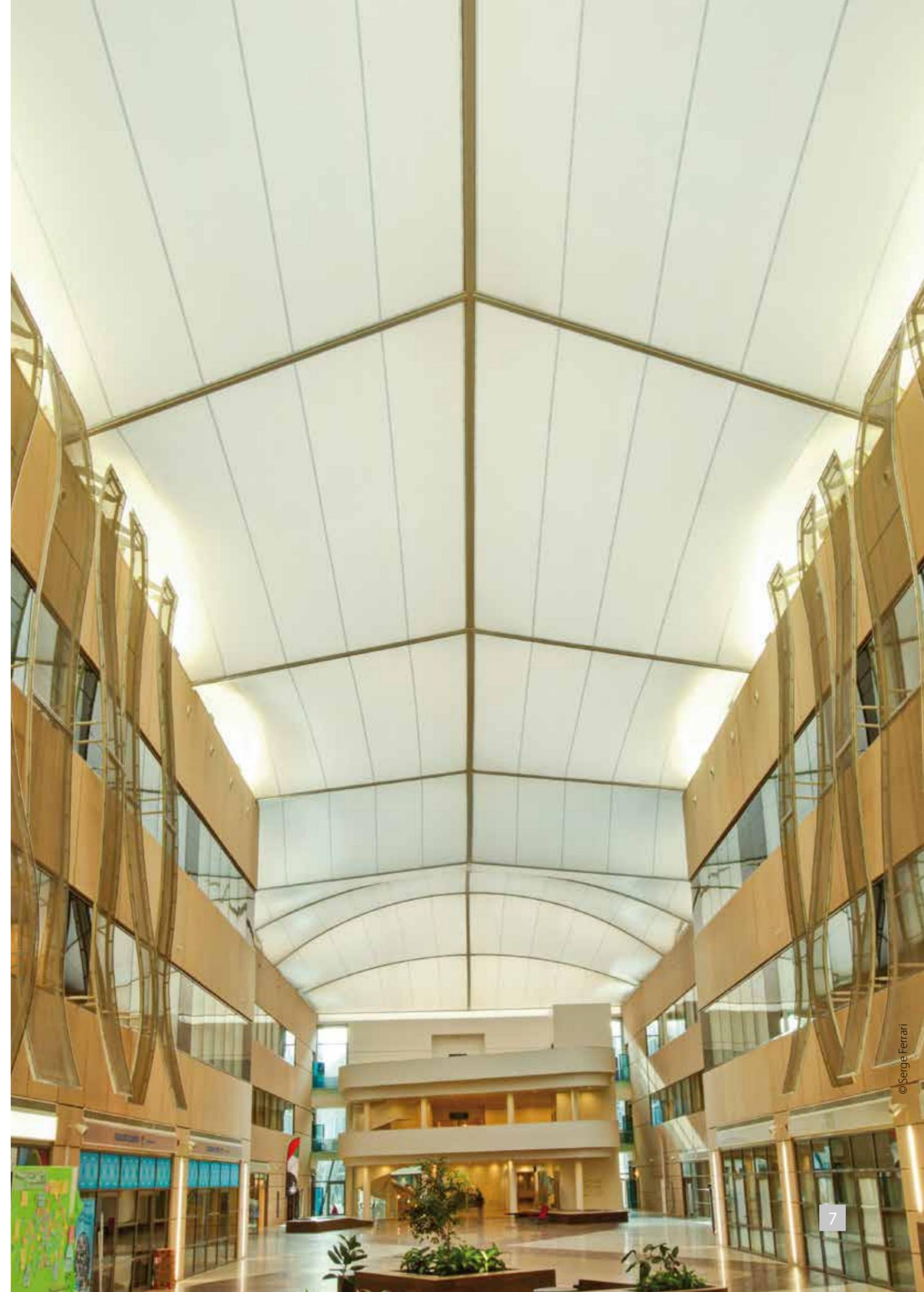
The site is arranged around a formal axis that divides the male and female campuses, while promenades connect the clusters to a centrally situated courtyard.

Natural light inflow and air-conditioned space were required for these two 200 m long by 40m wide promenades.

The compromise between natural light maximization and energy consumption for A/C is achieved by using a double skin made of Flexlight Advanced 1002 T2 for its long-term aesthetics and Flexlight Lighting 402 HT (Highly Translucent formula) to improve inside luminosity. Such combination achieves:

- Visible light transmission: 3.1%, which represents approx. 3 000 Lux input on a bright sunny day.
- Solar Reflectance: Index SRI: 81% (to limit heat island effect).
- U value: 2.9W/sqm/°K.
- G value: 4.4%.

(See technical documents page 36)



Stadium Miramas Métropole

Miramas - France

Sport

credits

Architect: **Chabanne & Partenaires**

Architect in charge of project execution:

Frédéric Rill, Architecte Associé Dumez

Client: **SAN Ouest Provence**

Membrane engineering & installation: **SMC2**

Structural engineering: **Structure Île de France**

Frame engineering: **Calvi Avignon**

Roof external membrane:

Flexlight Xtrem TX 30 Type II — 12.500 sqm

Roof internal membrane:

Flexlight Lighting 402 High Translucency
13.000 sqm

Facade membrane:

Flexlight Xtrem TX30 Type I — 6.000 sqm

Completion date: 2018

(study 24 months – installation 12 months)



“The kinetic and faceted architecture of the hall offers an attractive and contemporary image of athletics, marked by dynamism, movement and vitality.”

Guillaume Sallins

Architect Chabanne and Partners



Sport spaces: a circular track of 200 m (6 lanes) - a track of 60 m (8 lanes) - a training track of 110 m (3 lanes) - two perch jumpers - two long jumpers with triple jump - a high jumper - a mobile weight throw workshop - a gymnasium (basketball, handball and volleyball)

Day light autonomy for competitive environments

Stadium Miramas Métropole (15.000 sqm) is one of the largest covered athletic halls in Europe. It will host international competitions and will also be the training ground for professional athletes, school sports and a venue dedicated to sports research.

— 2 main volumes:

Athletic hall: 80x120m in lattice wood/steel

Gymnasium: 25x67 m in single girder timber frame

— Athletics competition capacity: 5.500 spectators

— Handball, basketball competitions: 7.500 spectators

A place for spectators: the interior design of the hall, inspired by the design of ancient arenas, aims to create a special relationship between spectators and athletes.

A place for sports: the hall has been designed to create a versatile and ideal space for training athletes and to provide a natural zenith light in the heart of the project.

The double membrane roof of the competition hall allowed a mastered solar factor and a natural light uniformity, ideal for the practice of athletics in competition.



Materials: 1.200 m³ of glulam - 200 tons of steel - 25.000 pins
30.000 sqm of membrane.

Frame and membrane cover budget: 5 M€

Sportzentrum Julius Hirsch

Fürth - Germany

Sport

credits

Architect: FAB Architekten, Mannheim

Membrane contractor: Graboplan

External membrane:

Flexlight Lighting 1202-2399 T2 Highly translucent — 2.300 sqm

Internal membrane:

Flexlight Lighting 1002-3399 S2 Highly translucent — 2.300 sqm

Timax translucent glass wool insulation 40 cm thick

Completion date: 2017

“Passive daylight usage in buildings improves visual comfort and lowers the final energy demand for artificial lighting. How much conservation can be achieved with translucent flexible composites and insulation material?”



From an architectural point of view, the shape of the roof reminds of a sprinter on the starting block. The lightweight impression of the building appears adequate to the dynamic activities inside.

The overall heat transfer coefficient (U value) is 0,23 W/sqm/°K for the opaque and 1,6W/sqm/°K for the translucent components which include tensile roof membrane plus 40 cm thick Timax insulation with U=0,25 W/sqm/°K.

Daylight performance & insulated roof

A full investigation (QR code access) quantifies the daylight and energy performance of a multi-layer membrane roof. The optical properties of the roof were measured with a total visual light transmission of 0,72%. A climate based annual daylight modeling delivers daylight indicators for different constructions scenarii. The results show that, in comparison to only one glass facade and an opaque roof, the additional translucent and thermally insulated membrane roof increase the continuous Day light Autonomy (continuous DA 700) from 15% to 38%. This results in a 30% reduction of the electricity demand for artificial lighting in the roof covered area of the sport field. These results shall be very valuable as a comparison and benchmark for planners, investors and future buildings of this type.

Download



Daylight performance Study carried out by Research Center for sustainable Energy Technology, University of Applied science Stuttgart.



The building has a glass facade in the northeast side with the so-called indoor “balcony”, a 45 x 27 m indoor field. The membrane spans the fields and the secondary room.

Center of Innovation and Circassian Research (CIRCA)

Auch - France

Event

credits

Architect: Nicolas Novello — Atelier Doazan Hirschberger & Associes
Membrane engineer: ABACA — Montpellier
Membrane contractor: VSO — Groupe BHD
Wood frame engineer: Anglade Structures Bois
Wood frame contractor: Pyrénées Charpente
External membrane:
Flexlight Advanced 1002 S2 White
2.200 sqm
Internal membrane:
Flexlight Dualtone 702 Opaque White/Blue
2.200 sqm
Ventilation grid membrane:
Frontside View 381 Black
Dimensions: 41 m x 25 m x 19 H
Completion date: 2012



A fully opaque dark blue inner membrane to reproduce the circus atmosphere and let the show light plays on the wood frame.

“A very contemporary look for this permanent circus that provides the thermal and acoustic comfort of a real theater while claiming the conceptual originality of lightweight architecture.”

Black out insulated double skin

CIRCA is part of a vast program of renovation to create a place of residence and rehearsal for circus artists. It includes a wooden frame auditorium and has a variable gauge between 400 and 1000 seats.

The envelope is made of 2 skins, 250 mm apart, between which is disposed a 160 mm thick rock wool insulation ($U = 0.2 \text{ W/sqm/}^\circ\text{K}$). The insulation layer sits on the inner membrane. The totally opaque inner fabric, is fabricated in a 2.200 sqm single piece, thus achieving a tight barrier between the outside and the inside.

To prevent condensation, the ventilation grids made of black Frontside View 381 mesh allow the entry of the plenum ventilation air. They are dimensioned at 1/500 of the panel surface.

Download



Structural membrane
Conference 2015 - Barcelona



The outer fabric includes 22 panels that are prepared on their contour to receive a watertight final seal cover to hide the outer lacing tube.

Download



CIRCA
Conference lecture by Nicolas Pauli

Kertajati International Airport (BIJB)

West Java – Indonesia

Transport

credits

Architect: PT Penta Rekayasa

Client: PT Bandara Jawa Barat International Airport

Membrane fabrication & installation:

PT Binatama Akrindo – Indonesia

Consulting engineers: TENSYS Australia

Membrane:

Flexlight Xtrem TX 30 Type II

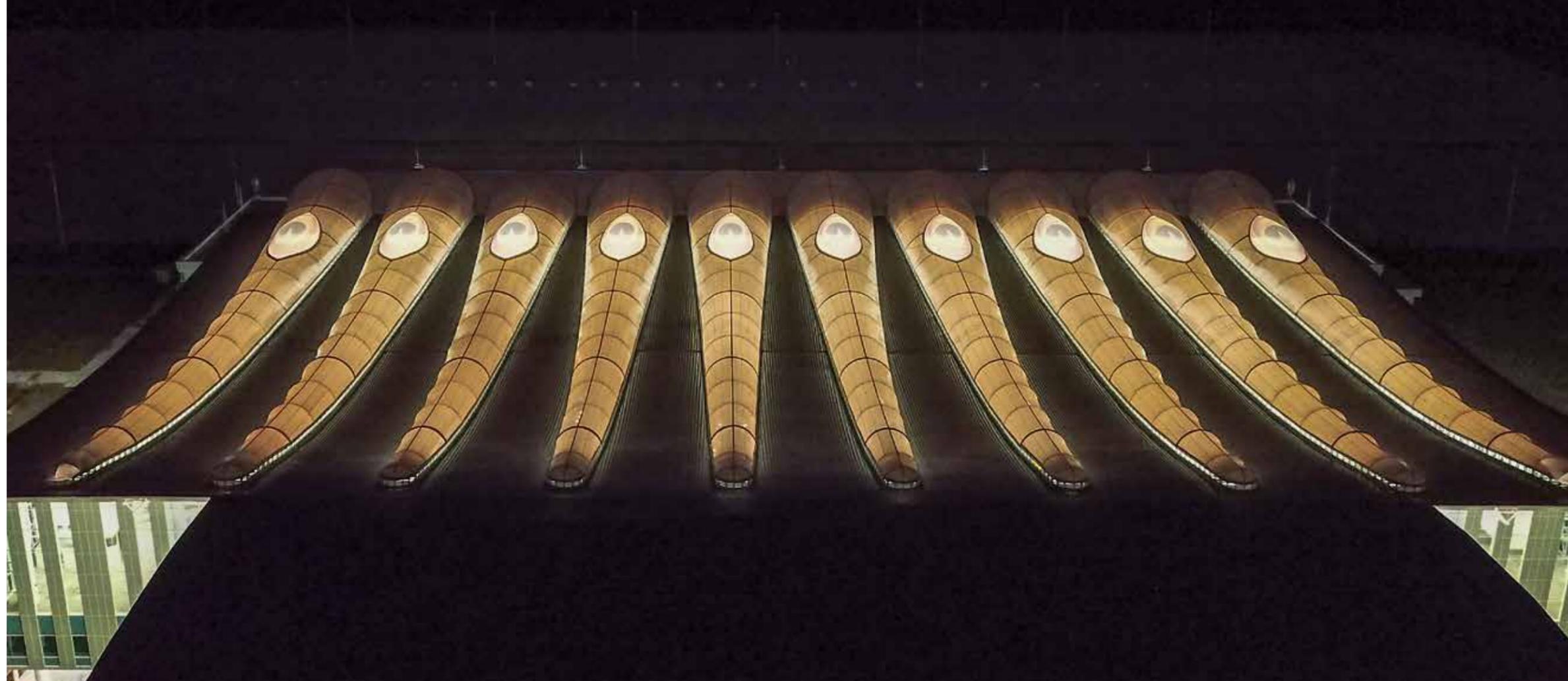
21.500 sqm

Completion date: May 2018

Climatic conditions: Tropical

Average annual temperature 27.2 °C

Annual average rainfall 2.497 mm



“The translucency of Flexlight Xtrem TX 30 Type II and its special formulation to stand tropical environment (ISO 846) had it singled out by PT Penta architects.”



10 Skylights made of 102 panels each. 1.020 panels in total for the complete project. Those “peacock” skylights have become an iconic feature of the new airport which is a beacon for the economic growth of the west java region.

Futuristic lightweight skylight as architectural statement

The new Kertajati International Airport, located in Majalengka regency in West Java province, is the second biggest airport in Indonesia. The first phase of operations began in May 2018 and the airport currently serves up to 5.6 million passengers a year. Annual passenger capacity is expected to reach 8 millions in the 2nd phase of operations and 18 millions in the 3rd phase.

A two-floor passenger terminal building with a floor area of approximately 96.000 sqm has two separate concourses for domestic and international passengers. To let a maximum of natural light through, the architect designed a roof with impressive peacock body shape skylights made with the highly translucent Flexlight Xtrem TX 30 II membrane.

PT Binatama integrated as well some etfe lenses which mimic peacock tail patterns.



Rostov Stadium 2018 Fifa World Cup

Rostov-on-Don - Russia

Sport

credits

Architects: Populous (UK)
Client: Youth-Sports Ministry
Engineering and manufacturing:
Tensaform Membran Yapilari Sanayi Ticaret A.S.
Membrane: Flexlight Xtrem TX30-IV
Capacity: 45.145
Surface: 49.500 sqm
Completion date: 2018



“This highly resistant and lightweight Flexlight Xtrem TX30-IV membrane is particularly well suited to the local climate, as it allows the structure to withstand heavy snow loads of 180 kg/sqm and wind of 130 km/h.”



Panel installation in progress.

Lighweight & resistant to extreme weather

With its corrugated shape, the roof as grandiose as delicate provides shelter for the arena's four tribunes.

The roof consists of 46 segments delineated by steel arches covered with Flexlight Xtrem TX30 panels, hold in tension by a system of steel cables attached to posts positioned along the outer wall of the building. The panel dimensions can reach up to 1.000 sqm a piece.

In addition to its aesthetic quality, the material was also chosen because of its extreme durability (exceeding 30 years), its high resistance to soiling thanks to its Crosslink PVDF surface coating and its GOST classification – fire safety certification required for large construction projects in Russia.



Installation in progress

Sakarya Stadium

Sakarya - Turkey

Sport

credits

Architects: **Alper Aksoy Mimarlık**
Consulting engineers:
Tensaform Membran Yapıları Sanayi Ticaret A.Ş.
Membrane contractor:
Tensaform Membran Yapıları Sanayi Ticaret A.Ş.
Roof membrane:
Flexlight Xtrem TX30-IV – 48.500 sqm
Facade membrane:
Frontside View 381 – 16.500 sqm
General contractor: **Ahes İnşaat - Turkey**
Capacity: **29.000 seats**
Installation time: **3 months**
Completion date: **2017**



“Customized colored facade to mimic the Sakaryaspor team logo and to become the new city landmark.”



260 facade panels were necessary to wrap up the whole facade with an iconic presence and a good see through capacity.

Full skin lightweight structure: roof & facade

With 1 M inhabitants, Sakarya is one of the important cities in Marmara region, east of Istanbul. The new stadium of the SAKARYASPOR team is the master piece of a 74.000 sqm brand new development located at 3 km from the city center.

There is a strong identification of the stadium with his city and team since the facade reproduces the colours and logo of Sakaryaspor team, a double S in a diamond shape green and black pattern. Given this context it was necessary to select durable colored facade material. The microperforated Frontside View 381 with a 20-year track record of facade projects under different demanding climates scored high in terms of colour longevity, mechanical resistance, aesthetics and good see through characteristics.



The roof is subdivided into 38 bays, some of them up to 1.100 sqm a piece which speed up the installation time. Both facade and roof membrane installation were performed in parallel and completed in only 3 months.

The Camp

Aix-en-Provence - France

Office

credits

Architect: **Corinne Vezzoni & associés**

Delegated project owner: **REDMAN**

Engineering, fabrication, installation :

ACS Production / BHD Group

Consulting engineers: **LEICHT**

Membrane: **Flexlight Xtrem TX30-V**

Surface: **8.500 sqm**

Completion date: **2018**

“ The idea was to protect this new community under a giant umbrella, like a biological incubator with cells undercover in an ideal environment. The building has no entrance hall, no corridor. The common spaces have no heating, no artificial ventilation, no need for artificial light during the day. This floating roof solution must be further explored.”

Corinne Vezzoni Architect

Micro climatic roof in high wind conditions

With a total surface area of 11.000 sqm, The Camp is the largest digital innovation campus of its kind in Europe. Designed as an open-air environment, The Camp is a celebration of modernism and new technologies, with its decidedly futuristic look.

The 7.000 sqm giant umbrella shaped roof is designed with 3 inverted cones. Each cone is subdivided in 5 sections to facilitate the handling and installation.

It took only eight months for the contracting company ACS Production to conduct feasibility studies, engineering, connection details, fabrication and installation.

The Flexlight Xtrem TX30-V high resistance (200 KN/m) was selected not only because of its strength but also thanks to its translucency and long term aesthetic.



“The selection of a Serge Ferrari fabric was first and foremost technical. What material could respond to this design notion of lightness, rapid installation and parasol effect? Serge Ferrari has now become a reference in this technique.” Corinne Vezzoni Architect

Video



Chrifia golf club house

Marrakech – Morocco

Event

credits

Architect: Youssef Méléhi, Rabat

Client: CGI

Engineering: Prat SA - France

Membrane fabrication, installation:

Ametema, Rabat, Morocco

Membrane:

Flexlight Advanced 1202 S2

Surface: 1.600 sqm – One piece panel

Completion date: 2015

“A beautiful confrontation of the soft form membrane and orthogonal robustness of the central tower to obtain a roof that combines lightness and resistance.”



Irregular geometry with 8 cones. Rigid anchoring to the stone tower

Micro climatic roof in desert environment

The club house is a flat roof waterproof building, typical “Marrakech” style with a central stone tower. The architectural statement is a large Bedouin tent inspired tensile roof that has 2 goals:

- cover and shade the perimeter terraces
- federate the building and its terraces under a tent cut like the snowy peaks of the nearby Atlas Mountains.

The natural light under the tensile roof is very pleasant and the tent protects from the Marrakech sun heat while remaining faithful to the allegory of snow-capped peaks.

The use of Preconstraint composite membranes with high dimensional stability and low creep is of paramount importance given the large single piece roof (50m x 30m) and the fixed boundary anchoring to the stone tower. Definitely optimized lightweight structure with no more than 5 kg/sqm including steel and membrane.



Reinforced cone center to stand stress concentration



Puerto Madero bus terminal

Buenos Aires – Argentina

Transport

credits

Architect: Architecture Department of the Buenos Aires City Government transportation + WAGG Arquitectura Textil

Client: Transportation Area Buenos Aires City Government

Membrane engineering, fabrication, installation: WAGG Arquitectura Textil

Structural analysis: VH Ingeniera Civil

Construction: Miavassa s.a

Membrane: Flexlight Advanced 1202

Surface: 2.568 sqm

Completion date: 2015

“The lightness and minimalism were a pursued expression from the very beginning.”



Semi-covered area of almost 80 linear meters by 25 meters wide

Urban landmark with elegant detailings

The program consists of an urban transfer center, where the tensile roof protects users at the time of waiting for hopping on and off the buses. Its distinctive anatomy turns it into an urban landmark that stands out by its organic form within the built environment.

Two families of conoids were developed. Four lanterns allow a considerable inflow of light. Three inverted cones, like gargoyles, allow to drain the rain water. The fabrication of the 2.500 sqm roof was fragmented into 3 pieces which were welded on site into one. The 4 pairs of masts and their lattices acted as lifting pivots, 4 cranes of 45T raised together the masts and the membrane which in turn, “dragged” the small masts. This carefully planned operation resulted in a successive positioning of all the pieces in one and only lift.



Video



Installation

Verrierdale House

Sunshine coast - Australia

Residential

credits

Architect: Sparks Architects
Membrane engineer: Fabritecture
Membrane contractor: Fabritecture
Membrane: Flexlight Xtrem TX 30 type II
Surface: 489 sqm one piece canopy
Installation time: 500 man hours
Completion date: 2017
Climate: Tropical 90% humidity
(Flexlight XtremTX30 passes ISO 846)



“ Australian Sparks Architects find the best of both worlds in the swooping forms of this residence, located in a clearing surrounded by rainforest at 20 minutes from the Sunshine Coast.”



Structural guy cables with stainless fittings hold large masts in place to support the membrane over the ceiling.

Award winning residence in rain forest

To make the most of this idyllic outdoor location, the home is topped with a canopy structure made out of durable Flexlight Xtrem TX30 composite which shades the interior spaces, while the glass walls allow for great views outside. The house features a retractable ceiling system to fully appreciate the surrounding environment. The walls and doors also manually slide away, allowing an exceptional interaction with nature. Fabritecture faced a number of challenges starting with complex engineering to match the customer demand from architectural appeal to weather protection, longevity and overall functionality. Site constraints were also demanding, the house was built in a remote location in the Sunshine coast so the team had to be self sufficient and last but not least the canopy was installed on a sloped degree dirt terrain! Fabritecture expertise overcame all those obstacles and Verrierdale house gained a lot of recognition.

- Australia by Design's Best of the Best 2018: 3rd Place for Best Building in Australia
- AIA National Architecture Awards: 2017 National People's Choice Award
- Houses Magazine: 2017 National Houses Award for Sustainability



True lightweight architecture with less than 9 kg/sqm for membrane and supporting masts.

Château La Coste Art Gallery

Aix-en-Provence - France

Culture

credits

Architect: RPBW Renzo Piano Building Workshop

Local architect: Tangram Architectes

General contractor: ESG

Consulting engineering: Arup

Membrane contractor: Architen Landrell

Membrane engineer: Tony Hogg Design and Tensys

Membrane: Flexlight Xtrem TX30 Type II

Surface: 5.000 sqm

Completion date: 2017



“The partly buried building highlights the roof covered with a sequence of “sails” fastened to thin metal arches. As a kite, the sail flies and lands, emphasizing all at once the lightness and horizontalness of the building.”



Landmark & durable aesthetics

Chateau La Coste is a place of multiple talents: vineyards, delicate food and contemporary art happily live together.

The gallery space is one of several of the estate designed by high-profile architects and there are numerous art installations around the site for visitors to admire.

The membrane roof is an architectural feature and is there to provide shading and UV protection for the artwork. It sits above a glass roof which forms the main barrier to the outside once you are inside the gallery space. The roof panels made of flexible composite form a ridge and valley design.

All panels supplied in Flexlight Xtrem TX30 type II were chosen due to its translucency, long lifespan, matt finish and aesthetical performance.



Renzo Piano Building Workshop alongside Architen Landrell designed a swallow shape hopper to gracefully remove water away from the steel.

Foucault'scher Pendulumtower Phänomena

Lüdenscheid - Germany

Culture

credits

Architects: KKW Architekten
Client: Science Center Phänomena
Project engineers: form TL
Supervision of construction: form TL
Membrane fabrication: A. Arnegger GmbH
Illumination: ERCO
Membrane: Flexlight Advanced 1202 S2
Surface: 990 sqm
Completion date: 2015

“In the course of an expansion, spatially as well as in terms of content the Science Center Phänomena got a framework tower with an inner membrane helix as visual anchor. Inside the tower a 30 m long Foucault pendulum is swinging.”



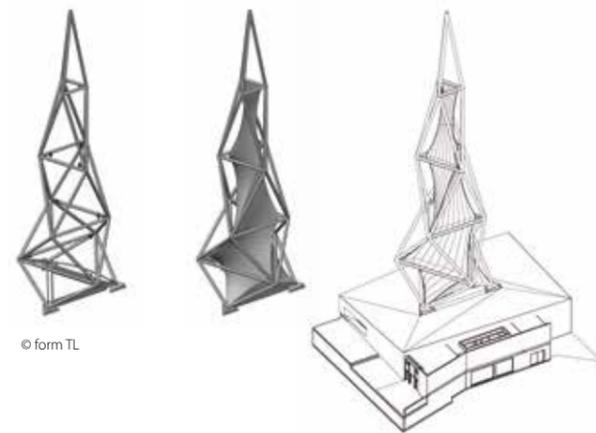
Top of the tower: 76,1 m — Top of the membrane: 58 m
Ground-level membrane: 12,5 m — Enclosed volume: 1400 m³

Light tower landmark

The architects planned the tower with a rhythmic design, enabling it to have a different appearance according to the angle of view. The membrane helix consists of only 3 parts: a back-lit membrane, three form-giving cables and nine tension points. The membrane follows the spiral structure of the tower which tapers to the top.

The challenge in terms of lighting design was to illuminate the building but not the surroundings. ERCO came to the conclusion that indoor lighting achieved better results than floodlighting on the outside. ERCO Powercast lighting tools were used to provide powerful accent lighting.

Flexlight Advanced 1202 S2 membrane offers a consistent 5% Visible transmission which reacts well to the luminaire which is dimmable, emits warm white light and avoids spill light.



© form TL



From zero to one

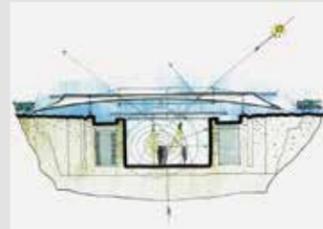
From conceptual design to completion

Château La Coste Art Gallery - Aix-en-Provence - France
 RPBW Renzo Piano - Arup - Tony Hogg Design - Tensys - ESG - Architekten Landrell

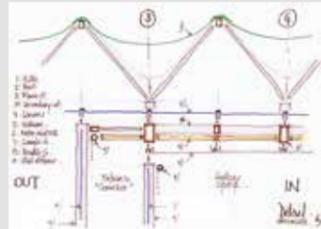
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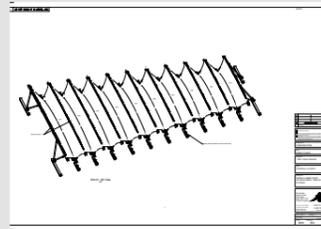
Detailing



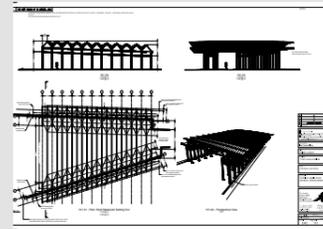
Sketch concept



Sketch details



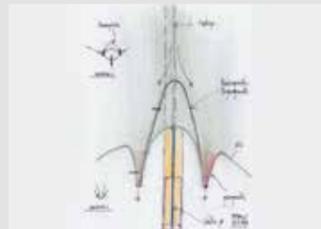
Detailed design



General arrangement



Swallow gargouille concept 1



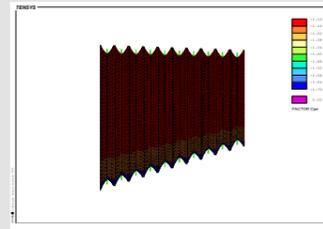
Swallow gargouille concept 2



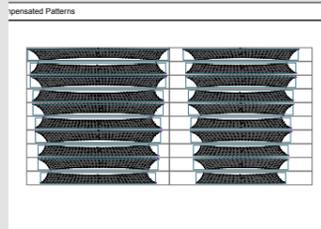
Unfinished edge



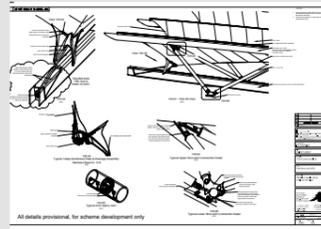
Completed swallow gargouille detail



Fabric analysis



Cutting patterns



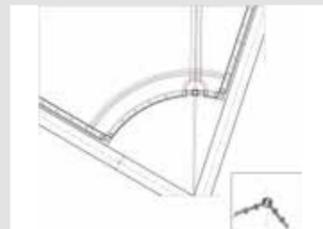
Connection detailing



Completion

Connection details

Phänomena, Lüdenschied – Germany
 KKW Architekten - form TL - A. Arnegger GmbH



Lower edge clamping and calbe clamp



Cable saddle with tension rod at tower node (9 tension points)



Cable saddle with clamp and membrane clamping



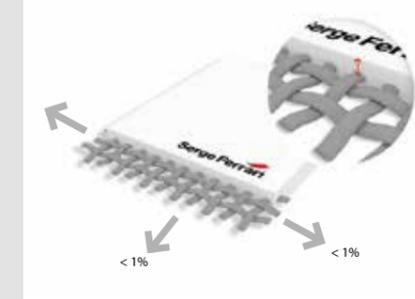
Tension rod between tower and cable structure

© formTL

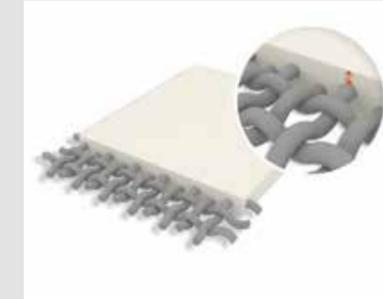
Reliability, longevity, sustainability

Précontraint technology

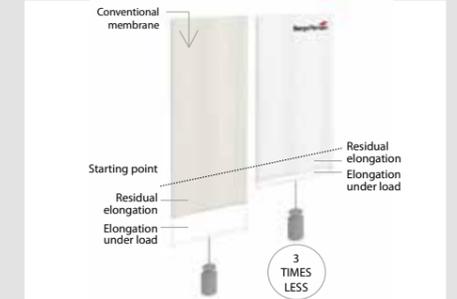
The worldwide patented Serge Ferrari Précontraint technology consists of pre-stressing the fabric media before and during all coating operations in both directions warp & weft.



Précontraint technology



Conventional membrane: Less protection against UV / Pollution / Abrasion and reduced dimensional stability



Under tension during 100 hours - Load: 200 daN/m (approx. 200 kg/m) - Traction in the weft direction

Précontraint material benefits

- Exceptional dimensional stability to guarantee tension and homogeneity. Précontraint allows welding warp to weft.
- Controlled consistency from batch to batch for better adequation of the membrane to the calculation and drawings.
- Enhanced mechanical longevity thanks to the thicker top coat protection on Précontraint than on conventional material.

Longevity: case studies



20 years – Belmont Car Wash - NSW Australia
Material Flexlight Perform 702 – Shade to order

	Unit	Completion date 1996	Replacement 2016	Remaining strength after 20 years
Tensile strength warp/weft NF EN ISO 1421	daN/5cm	341/299	271/255	79% / 85%



30 years – Storage Hall - South of France
Material Flexlight Perform 832 – Best Hall

	Unit	Completion date 1989	After 20 years	After 25 years	Remaining strength after 30 years
Tensile strength warp/weft NF EN ISO 1421	daN/5cm	446/472	89% / 87%	83% / 75%	81% / 72%

We have more numerical references for buildings with different exposure time under different climates. Please contact us.

Flexlight Xtrem TX30

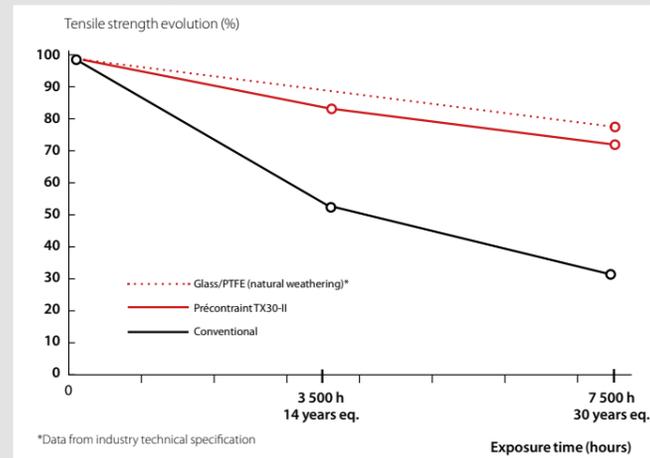
Flexlight Xtrem TX30 with Crosslink treatment combines mechanical and aesthetical performances for more than 30-year service life.

Extreme surface resistance

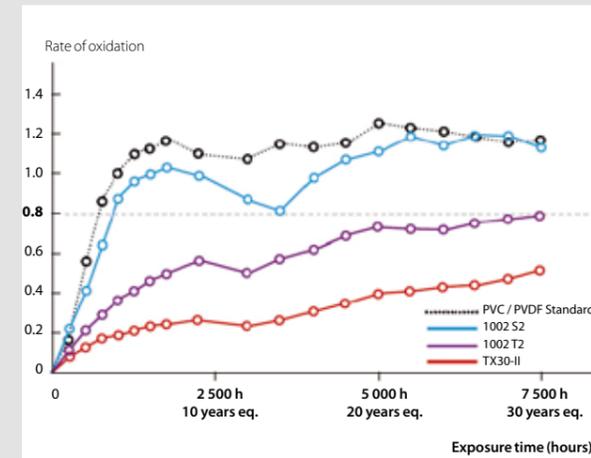
Product	High end & durable composites		
	Standard	Précontraint TX30 Crosslink Weldable after abrasion	Glass / PTFE Weldable with additional tape
Top coat	Non Précontraint Weldable PVDF		
Friction coefficient*	0.59	0.27	0.23
Accelerated weathering 4.500 H - 18 year Florida Eq.			
Accelerated weathering 7.500 H - 30 year Florida Eq.			
	Lots of micro cracks and exposed yarns – Irreversible degradation	No micro cracks, aesthetics is preserved, easy cleaning	No micro cracks, aesthetics is preserved, easy cleaning

* a lower friction coefficient minimises the accumulation of dirt and pollution resulting in better cleaning properties.

Mechanical performance



Surface oxidation



Low Wick: anti-capillarity treatment

Composite membranes must be protected against moisture penetration by capillarity through the polyester yarns.



Without Low Wick treatment With Low Wick treatment

Low Wick benefits:

- strengthens the composite against micro organisms and mould growth to increase the life span of the structure,
- perfect transparency is maintained overtime.

Sustainability

Corporate Social Responsibility report

Our background and beliefs correspond to a constant innovation approach. Our industrial activity is analysed in detail and the results are published annually in our CSR reports since 2014. These reports express our progress, as measured by legible, measurable and comparable data.

Download



English CSR report

Download

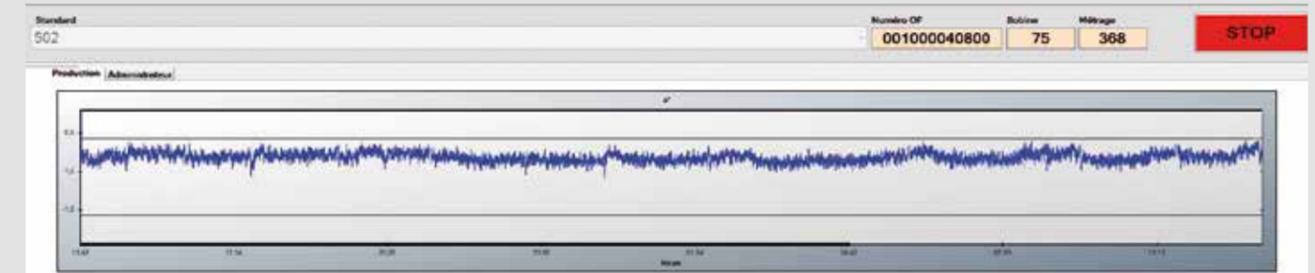


French CSR report

Transparency & Graphics

Visu Service

Natural light is a key criterion of tensile architecture, so it is essential to obtain a perfect homogeneity of color through transparency. Aware of this imperative, Serge Ferrari has developed a bespoke spectrophotometer embedded within production lines to precisely measure, control and adjust the color by transparency.



Visu Service : 3 benefits for your project

- **Beautiful end result** : assurance of measured, calibrated and traced homogeneity allowing the assembly of different batches.
- **Time savings** allowed by assembling material from different sources: fabricator stock, distributor stock, factory stock, new production batches No need to systematically wait for a new production
- **Material savings**: the ends of productions or end of jumbo rolls are no longer discarded and take their place harmoniously in the next project.



Without Visu Service



With Visu Service

Graphics

Customized graphics enhance the visibility of the structure and serve corporate identity.



Zwolle bus terminal — NL

Fabrication: Buitink / NL - Printing + Clear Top Coat: Printable / NL - Engineering - Ten Tech / NL

- 13 m x 70 m one piece roof with digital printing on the back side.
- Flexlight 902 S2 material was produced with custom SIGN varnish applied on the back side to facilitate ink adhesion.
- from the outside: it stays white for better solar reflection.
- from the inside: it offers the users of the station a unique visual.

To optimize graphic output, it is necessary to produce the membrane with a special Sign treatment on our Flexlight Advanced range, please consult us. Different ink technologies shall then be compatible: Eco Solv ent, Latex, UV. In order to protect the graphics for longer time it is recommended to apply a transparent PU based top coat which is applied by the printer. Welding is not possible on ink nor top coat and the graphic pattern shall require an allowance for the welding width.

Characterization of thermal, acoustic & natural light environments

Thanks to their flexibility and lightness the Flexlight précontraint composite materials lend themselves wonderfully to combinations of several skins to obtain a whole panel of functionalities and performances according to the requirements of the building. The materials are positioned as roofs, facades as well as interiors to ensure the continuity of the architectural choice.

Thermal & visual performance: Texterm calculation tool

Calculation tool to quantify the necessary power required from the air treatment unit to achieve a target indoor temperature. Different membrane solutions can be simulated and benefit calculated depending on geographic location, building size, activity, public... Please consult us to access Texterm tool.

Quality	Colour	U (W/sqm/°K)	G (%)	TV (%)
Simple membrane				
Flexlight Xtrem TX30-II	3000	5.6	14.0	8.0
Flexlight Lighting 1202 HT	3399	5.6	23.5	17.0
Flexlight Xtrem TX30-II blackout	White blackout	5.6	7.0	0.0
Flexlight Xtrem TX30-II blackout LowE	White LowE blackout	3.9	4.1	0.0
Double membrane				
Flexlight Xtrem TX30-II / Flexlight Lighting 402 HT		2.9	8.8	5.3
Flexlight Xtrem TX30-II / Alphaia Silent Aw Translucent		2.9	8.8	6.3
Flexlight Xtrem TX30-II / Flexlight Lighting 702 HT		2.9	7.9	4.0
Flexlight Xtrem TX30-II / Flexlight Perform 702 Low E		2.6	6.6	1.0
Flexlight Xtrem TX30-II opaque LowE / Flexlight Perform 702 opaque LowE		2.0	2.1	0.0

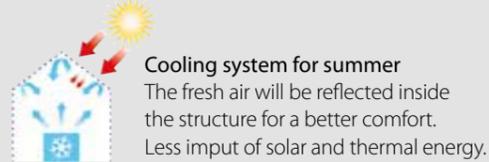
U = Heat transfer coefficient: W/sqm/°K — G = Solar Factor — TV = Visible light transmission EN 410



LowE treatment



Heating system for winter
The heat will be reflected inside the structure for a better comfort.



Cooling system for summer
The fresh air will be reflected inside the structure for a better comfort. Less input of solar and thermal energy.

Low E treatment consists of an aluminium top coat applied on the inner side of the membrane. Outside radiation barrier & excellent energy mirror inside. Effective in winter & summer.

Summary table

	Flexlight Lighting 1202 HT	Single skin Flexlight Xtrem TX30	Double skin Flexlight Xtrem TX30 Flexlight Lighting 402 HT	Double skin Flexlight Xtrem TX30 Alphaia Silent Aw
Natural light	Tv = 15% High natural light	Tv = 8% High natural light	Tv = 5% High natural light	Tv = 5.5% High natural light
Lifespan	> 15 years	> 30 years	> 30 years	> 30 years
Thermal insulation	U = 5.6 W/sqm/°K	U = 5.6 W/sqm/°K	U = 2.9 W/sqm/°K	U = 2.9 W/sqm/°K
Acoustic	Low absorption 10% Some echo	Low absorption 10% Some echo	Low absorption 10% Some echo	High absorption 65% Low echo

Maintenance, cleaning & Refit

Maintenance

One inspection visit is usually carried out within one year after installation by the contractor who checks membrane tension, connection details, cable tension... and issue a report with photos.

Maintenance contract

Tensile structures require tension, a regular inspection is recommended. The original contractor proposes maintenance contract to check on cable tension, detailing adjustments and overall structures. Précontraint(pre stressed) material guarantees dimensional stability. **No Précontraint membrane retention** over the lifespan of the structure.

Cleaning

A regular cleaning shall insure good aesthetics all along the structure service life, please consult our cleaning guidelines for approved detergent and adequate cleaning procedure. Cleaning frequency depends on environmental & climatic conditions as well as type of buildings.



Cleaning procedure requiring working at height ability and rope access training.



Serge Ferrari detergent
Basic Cleaning instructions: 5% solution light cleaning - 10% solution heavy cleaning Tepid water, soft nylon brush, no high pressure, rinse off.



For more difficult stain and dirt build up the use of rotative brushes (similar to PV cells cleaning) is recommended. Please consult our cleaning guidelines.

Refit

Zenith - Concert Hall - Paris - France

Architect: Chaix et Morel - Consulting engineers: AR&C - Contractor: Normandie Structures - Fabricator: Maine Baches & VSO

Refit of the full envelope originally installed in the early eighties. Project carried out in 2 phases, summer 2017 and 2018 to allow program of events to be conducted for optimized return of investment. It was necessary to conduct on site measurement of the current frame to obtain precise dimensions and fabricate perfectly fitting new panels.



Description

Roof: 25 panels of 13.5 x 13.5 m
Facade: 24 panels of 13.5 x 18 m

Installation duration

2 sessions of 8 weeks with 10 man crews



Membrane

— Flexlight 1502 Aluminium/Opaque / dark blue inside: 11.000 sqm for the overall envelope
— Flexlight 702 Aluminium/Opaque for the water flaps and connection detailings

Flexlight & Alphaia application guide

		Big top	Tensile shading		Tensile building	
		Circus	Small shading	Covered outdoor	Non enclosed	Enclosed
Flexlight Xtrem	TX30-V				•	•
	TX30-IV				•	•
	TX30-III			•	•	•
	TX30-II			•	•	•
Flexlight Advanced	1502 S2				•	•
	1302 S2				•	•
	1202 S2		•	•	•	•
	1202 S2 HT			•	•	•
	1002 S2		•	•	•	•
	902 S2		•	•		
	402 S2 HT Inner liner					•
Flexlight Dualtone	1202 Opaque	•				
	1002 Opaque	•				
	702 Opaque	•				
Alphaia	Silent Aw					•
	Arena SW				•	•

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