



TensiNet Symposium 2019 participants in front of the TemporActive Pavilion, Milano



The TensiNews issue is published twice a year

**1999 – 2004**

European research project on tensile structures

**2004 – 2020**

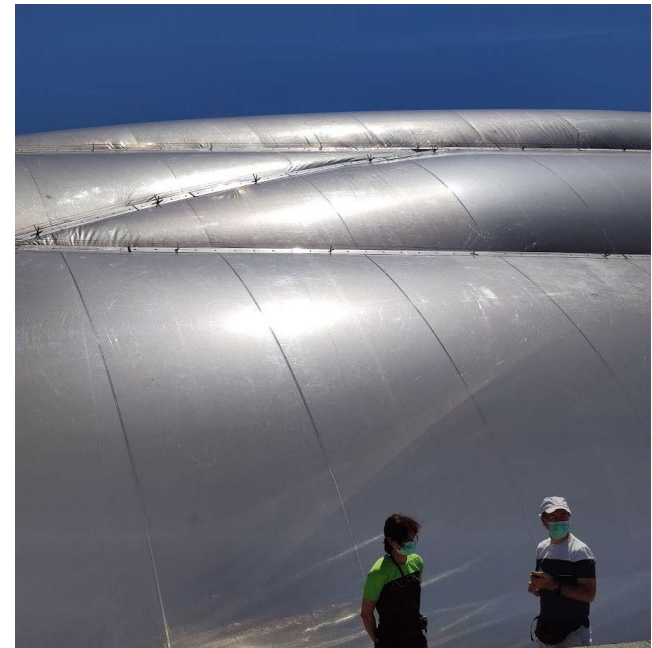
Cooperation is continued and TensiNet is founded as a network of experts under the wings of the Vrije Universiteit Brussel

**2020 – current**

TensiNet became an international non-profit association

***The aim of TensiNet is to enable its members to contribute more effectively, within the scope of their activities, to***

- Provide information and advice in the field of tensile membrane buildings;
- Inform about research and other technical studies necessary to support such advice;
- Inform about the application of research findings;
- Improve the quality of tensile membrane buildings;
- Increase the range of architectural applications;
- Get scientific results into practice and
- Stimulate research initiatives.



## **Objectives**

***TensiNet is an association or platform for all parties interested in tensioned membrane structures***

- Supports teaching and training activities;
- Supports workshop organised by one of its members and provides information about events;
- Disseminates information about ongoing research;
- Publishes the TensiNews newsletter twice a year;
- ...



## Objectives

*TensiNet is an association or platform for all parties interested in tensioned membrane structures*

- Organises every three year the **TensiNet Symposium**;
- Publishes reference documents, Working Group publications and proceedings of the TensiNet symposium;
- Maintains the website [www.tensinet.com](http://www.tensinet.com), containing a projects database, reference documents, research reports etc and
- Launched several Working Groups focusing on specific topics.



TENSINANTES2023 : TensiNet Symposium 2023  
at Nantes Université

Membrane architecture: the seventh established building material.  
Designing reliable and sustainable structures for the urban  
environment.

# Partners TensiNet

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## Architecture and engineering offices

- o formTL ingenieure für tragwerk und leichtbau GmbH – Germany

## Manufacturer and fabricator

- o Asma Germe - Turkey
- o Canobbio Textile Engineering Srl – Italy
- o Sefar AG – Switzerland
- o Vector Foiltec GmbH - Germany

## Material producer, Coater and Weaver

- o Mehler Texnologies – Germany
- o Saint-Gobain – United States
- o Serge Ferrari sa – France
- o Sioen Industries - Belgium

## Software Companies and Products

- o Softraxa Arquitectura i Software, SL - Spain
- o technet GmbH - Germany

& Messe Frankfurt Exhibition GmbH – Germany



# Associate Partners TensiNet

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## Architecture and engineering offices

- SBP - Germany
- Tensotech - Finland
- Tentech – The Netherlands

## Universities

- HFT Stuttgart – Germany
- Nantes Université - France
- Newcastle University - UK
- POLIMI - Italy
- UPM - Spain
- University of Nottingham - UK
- VUB - Belgium



***an  
interdisciplinary  
team***

***TensiNet Meetings are used to exchange experience, knowledge and opinions.***



Students at VUB during erection of lightweight structure

***An advantage of TensiNet is that all fields of the membrane business are represented: designers, universities, material suppliers and fabricators. All can give their individual input in the development of the technology. Even competitors work together to the benefit of each other.***

***Valorise & disseminate the outcome from research collaborations as well as from Working Group activities***

## **Working Groups**

**TensiNet discusses specific issues and prepares state of the art documents in the appropriate Working Groups:**

**WG analysis & materials**

**WG ETFE**

**WG Sustainability & Comfort**

**WG Pneumatic structures**

**WG Specifications & EUROCODE**

**WG Specifications GOOD PRACTICE**

TensiNet European  
Design Guide for  
Tensile Structures  
Appendix A5



**DESIGN  
RECOMMENDATIONS  
FOR ETFE FOIL  
STRUCTURES**

TensiNet ETFE Working Group

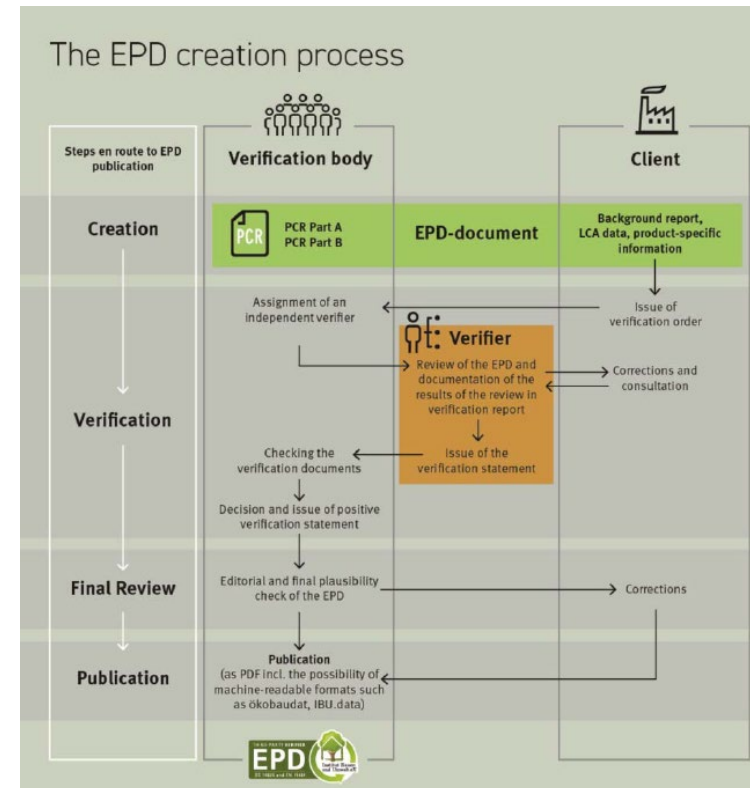


*Valorise & disseminate the outcome from research collaborations as well as from Working Group activities*

## Working Group Sustainability & Comfort

Carol Monticelli

*TensiNet has the intention to become a member of the German Institut Bauen und Umwelt, in order to set up the specific category rules and facilitate the EPD process for membranes.*



*Valorise & disseminate the outcome from research collaborations as well as from Working Group activities*

## **Working Group Eurocode specifications** CEN/TC 250/WG 5

Marijke Mollaert

### **Design of tensioned membrane structures**



***The improved quality and implemented standards reduce the risk of failures, which helps to increase the acceptance of lightweight structures!***

*Valorise & disseminate the outcome from research collaborations as well as from Working Group activities*

## **Working Group Good Practice**

Heidrun Bögner-Balz



*Rules for each branch (Membrane Material Producer, Raw Material Producer, Membrane Manufacturer, Designers/ Engineers, Architects, Testing Laboratories) have been formulated as well as general rules for all involved parties. **A quality seal “We follow the approved standards of good practice rules of TensiNet” has been established. Members can subscribe this Code of Conduct.***



Airport Canopy / Buro Happold

*Promote appropriate quality in design and construction performance through the provision of industry best practice requirements.*

*Disseminate the outcome of young designers **Techtextil Competition***





*Disseminate the outcome of young designers **Students & PhD students***

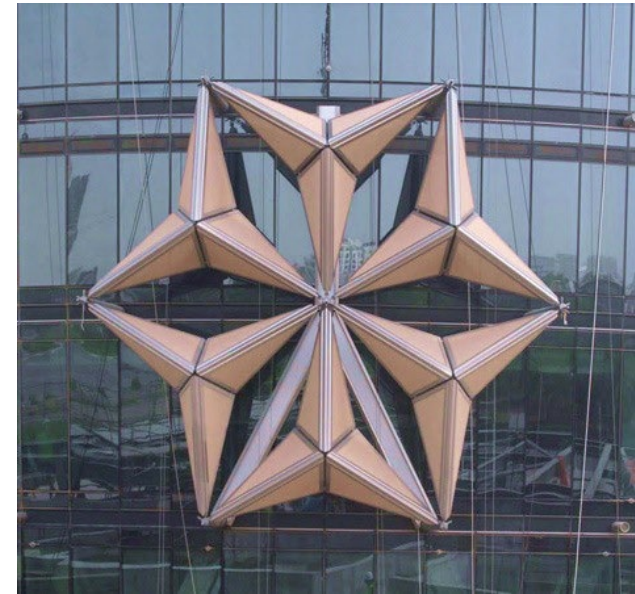


*TensiNet has the potential to raise the standards, reputation and profile of tensile architecture.*

*TensiNet informs about application of research findings to get scientific results into practice.*

*Disseminate the outcome of young designers **Students & PhD students***

***Kinetic membrane structures***





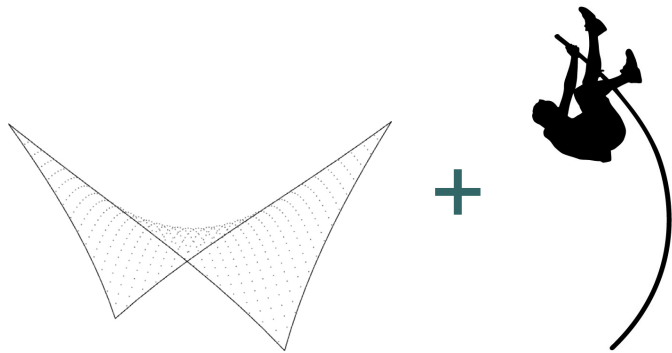
*Disseminate the outcome of young designers **Students & PhD students***

***Pneumatic structures***



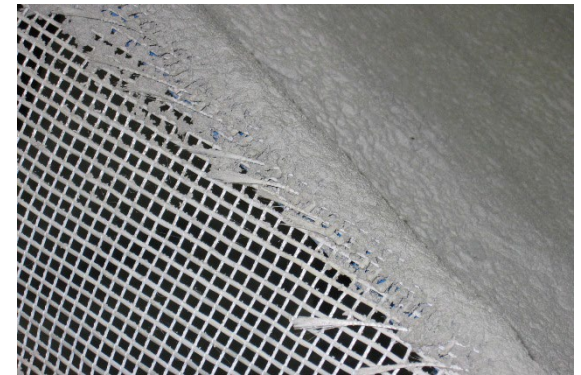
*Disseminate the outcome of young designers **Students & PhD students***

***Bending active structures***



*Disseminate the outcome of young designers **Students & PhD students***

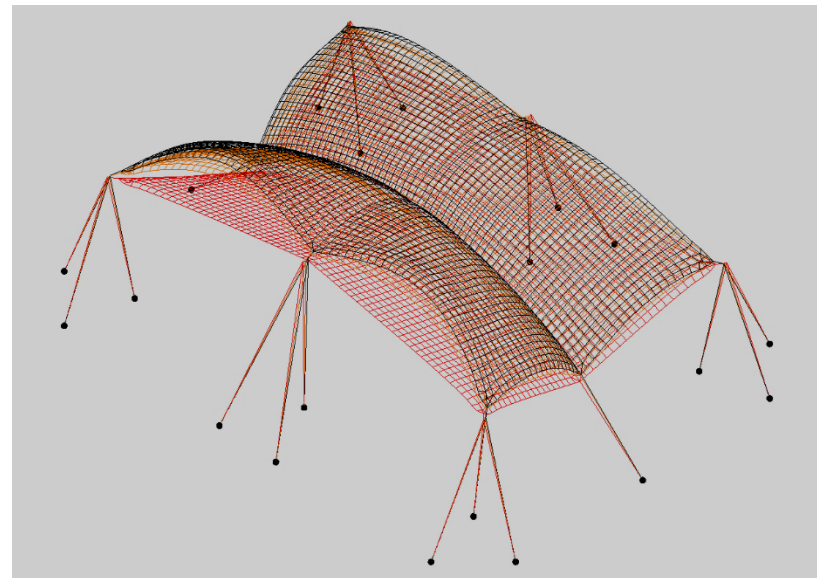
***Fabric formwork***





*Disseminate the outcome of research projects*

**Research project S(p)eedkits**  
*Shelter for disaster relief*



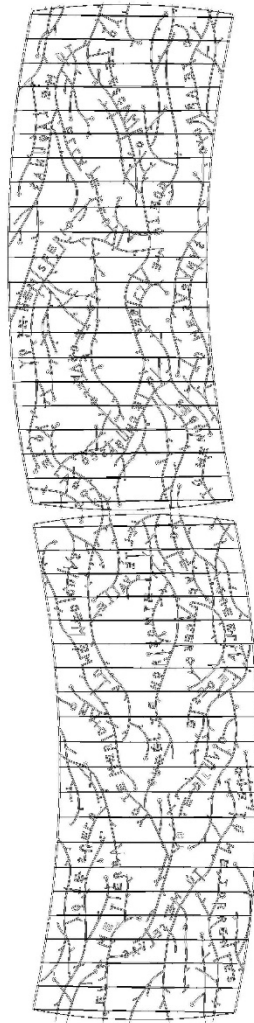
***Share your experience and learn from the TensiNet member's experience.***



Spikey Pod / Grimshaw Architects / McAlpine Design Group  
© Architen Landrell Associates

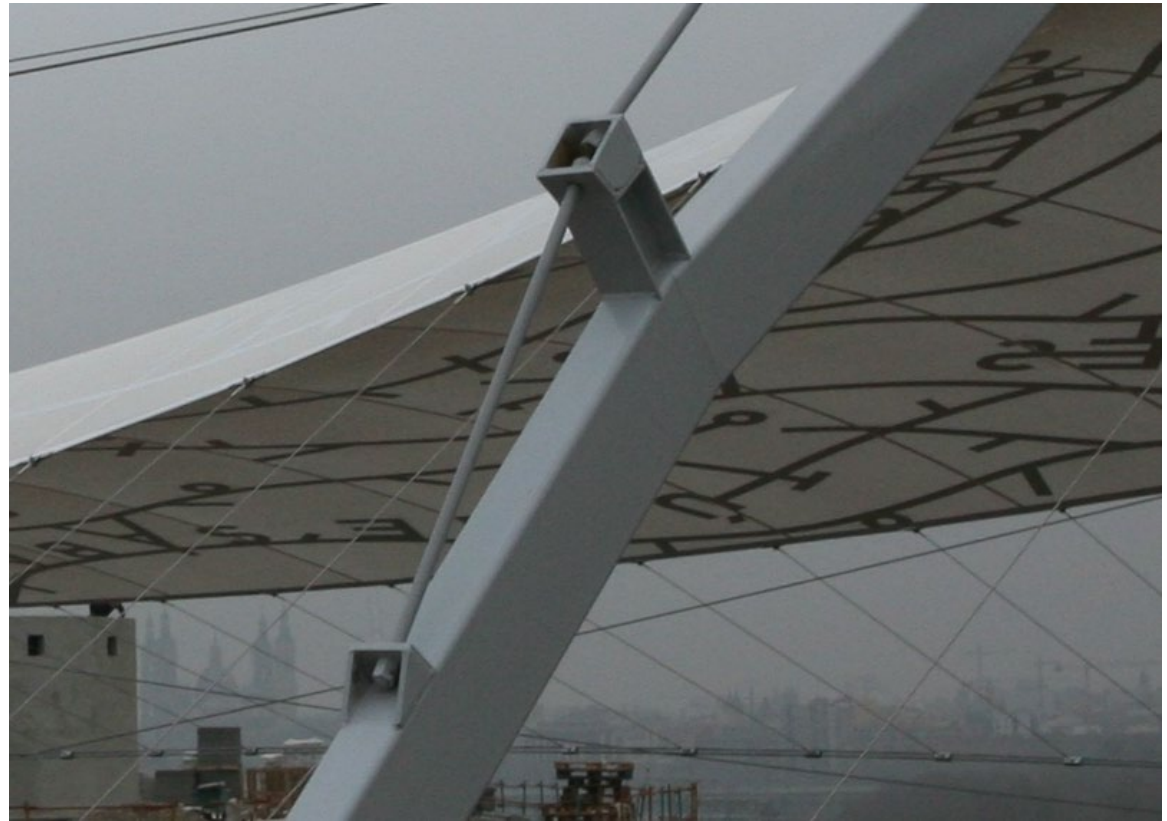
***Participate in efforts to improve the general knowledge and acceptance of tensile architecture.***

# REFERENCE APPLICATIONS **CANOPIES** Weather protection



**Expo Zaragoza 2008 : Felix Escrig & José Sanches / IASO © IASO**





**Expo Zaragoza 2008 : Felix Escrig & José Sanches / IASO © Felix Escrig**





**De Persgroep covered terrace / Amandus VanQuaille / The Nomad Concept © Amandus VanQuaille**



**De Persgroep covered terrace / Amandus VanQuaille / The Nomad Concept © Amandus VanQuaille**



**Carré des Arts / AGWA – Ney & Partners / Ney & Partners /  
Veldeman Structure Solutions / Buitink Technology © FM  
PLISSART**





**Carré des Arts / AGWA – Ney & Partners / Ney & Partners /  
Veldeman Structure Solutions / Buitink Technology © FM  
PLISSART**





**Kingly Court / MRP Architects / Architekten Landrell Associates ©  
Architekten Landrell Associates**



**Chapel of Rest / J. Desablens / Ney & Partners © J. Desablens**



## Chapel of Rest / J. Desablens / Ney & Partners © J. Desablens

# REFERENCE APPLICATIONS MEMBRANE ROOFS





**Turin University / Architect Sir Norman Foster / form TL /  
Canobbio © Canobbio & Michele d'Ottavio**



**Turin University / Architect Sir Norman Foster / form TL /  
Canobbio © Canobbio & Michele d'Ottavio**





## Railway station Wrocław / GRUPA 5 / k2 engineering



**Hagar Qim & Mnajdra temples/ Hunziker & Kiefer architects/ form  
TL © form TL**





**Hagar Qim & Mnajdra temples/ Hunziker & Kiefer architects/ form  
TL © form TL**



**Chateau La Coste, Aix-en-Provence / Renzo Piano Building  
Workshop, Tangram Architectes / Arup, Tony Hogg Design / Serge  
Ferrari / Architekten Landrell © Stéphane Aboudaram, Weare Content(s)**

# REFERENCE APPLICATIONS RETRACTABLE ROOFS



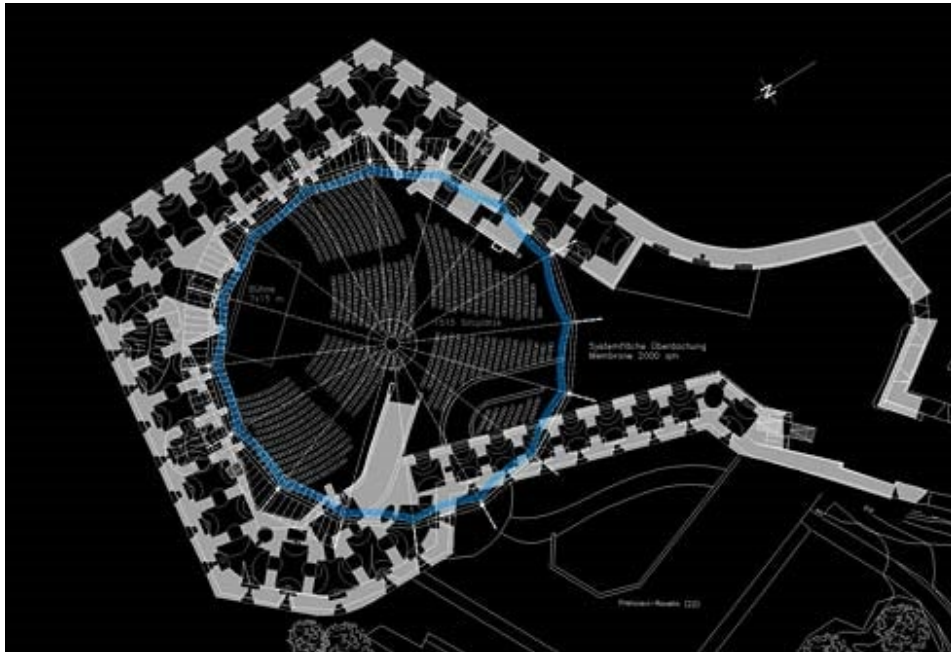


**Mobile coverage for the central patio at the Great Mosque of Paris / A.T.I.C. / AIA Ingénierie / Serge Ferrari © AIA**





## Mobile coverage for the central patio at the Great Mosque of Paris / A.T.I.C. / AIA Ingénierie / Serge Ferrari © AIA

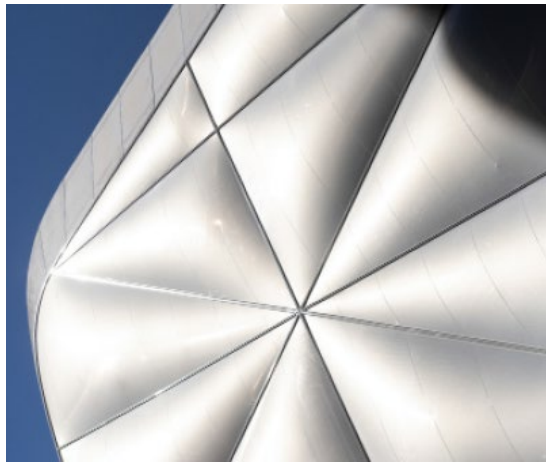


## Retractable roof – Kufstein / Kugel + Rein Architects and Engineers / Hightex GmbH © Kugel + Rein Architects and Engineers





**Retractable roof – Kufstein / Kugel + Rein Architects and Engineers  
/ Hightex GmbH © Kugel + Rein Architects and Engineers**



**The Shed – New York / Diller Scofidio + Renfro, Rockwell group / Thornton Tomasetti / Sciam Construction © Timothy Schenck**



# REFERENCE APPLICATIONS REMOVABLE & TEMPORARY

Assembly and disassembly



## Helicopter Hangar for navy / Ceris / Toile et structures / Ferrari



**Modern Teahouse / Kengo Kuma / form TL / Canobbio © form TL**





**Modern Teahouse / Kengo Kuma / form TL / Canobbio © form TL**





**Isoropia – Danish pavilion at the Venice biennale / Centre for IT and Architecture / str.ucture / AFF, DSM Dyneema © Anders Ingvarlsen**

# REFERENCE APPLICATIONS

## ART

Temporary structures

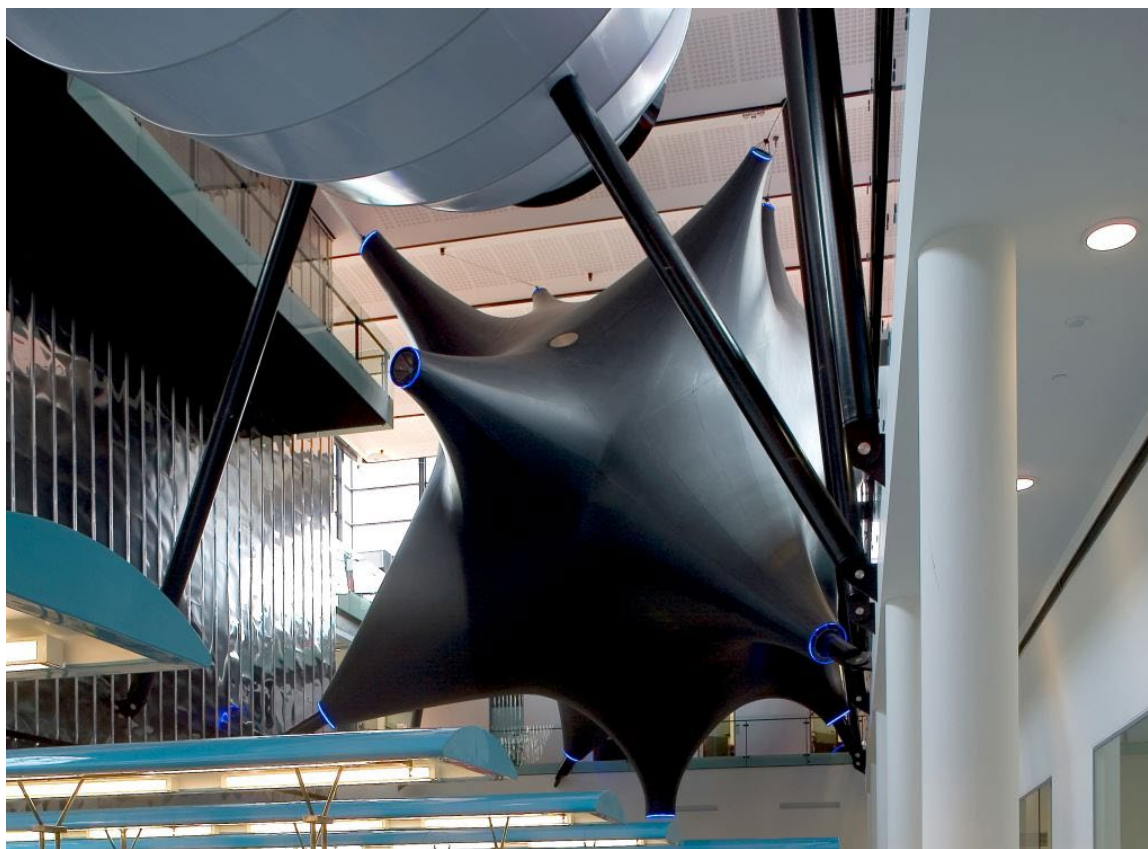


**Marsyas / Anish Kapoor / Arup / Tensys / Hightex**



**Marsyas / Anish Kapoor / Arup / Tensys / Hightex**

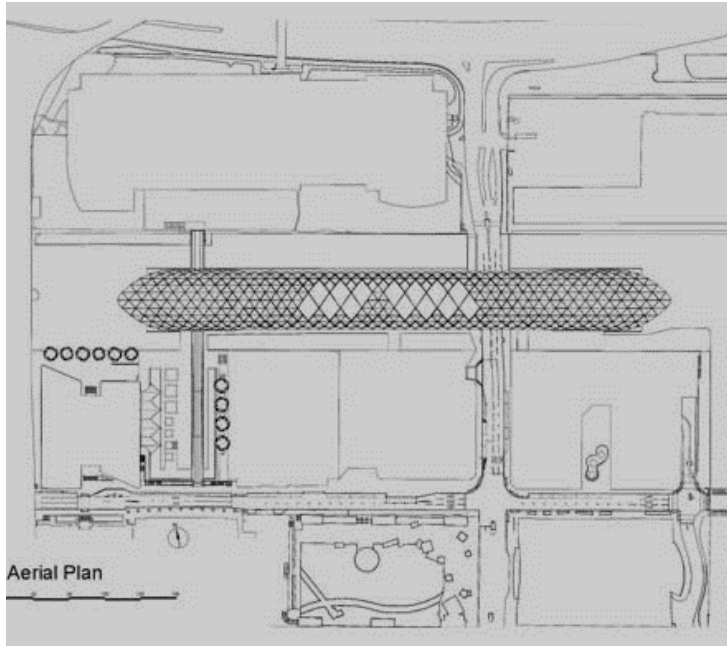




**Spiky Pod, Queen Mary University / Alsop architects / McAlpine design Group © Architect Landrell Associates**

# REFERENCE APPLICATIONS **ETFE CUSHIONS**

a highly insulating material for roofs & facades



## Canary Wharf Crossrail Station / Foster and Partners / Adamson Associates / Arup



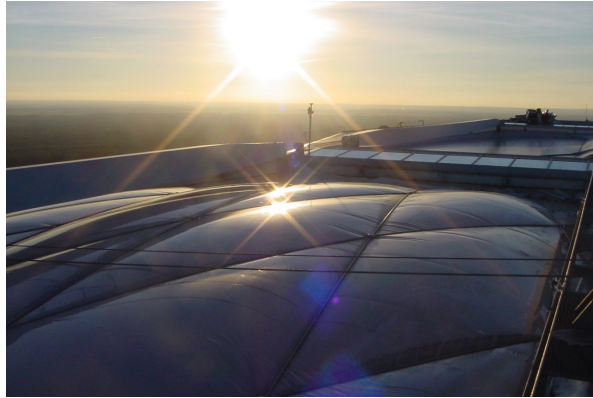


## Canary Wharf Crossrail Station / Foster and Partners / Adamson Associates / Arup



**Malaysia tunnel, Kuala Lumpur / Architen Landrell / 3M Dyneon,  
Nowofol © Architect Landrell**





**Tropical Islands (former CargoLifter Airship Hangar) / CL MAP /  
formTL / CenoTec**





**Tropical Islands (former CargoLifter Airship Hangar) / CL MAP /  
formTL / CenoTec**



**Facade Sports and Wellness Centre, Le Nuage / Ph. Stark / C. Destenay / Abaca - Nicolas Pauli © Abaca - Nicolas Pauli**

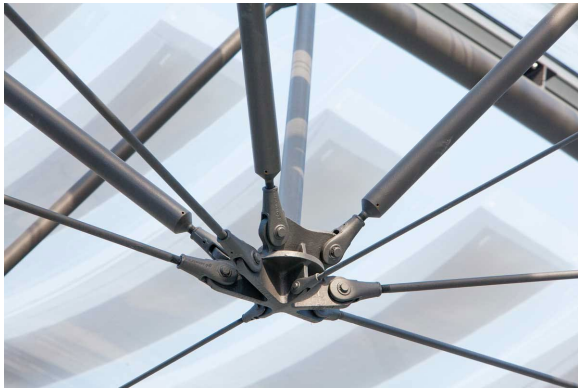


**Facade Sports and Wellness Centre, Le Nuage / Ph. Stark / C. Destenay / Abaca - Nicolas Pauli © Abaca - Nicolas Pauli**



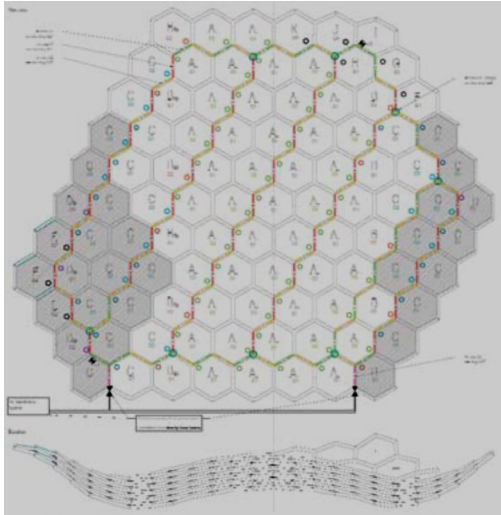


**ETFE film cushions roof for carport / Ackermann und Partner  
Architekten BDA / Taiyo Europe / 3M Dyneon © Taiyo Europe**



**ETFE film cushions roof for carport / Ackermann und Partner  
Architekten BDA / Taiyo Europe / 3M Dyneon © Ackermann und  
Partner Architekten BDA**





**ETFE roof Cubierta Voronoi / z3rch / form TL / 3dtex GmbH /  
Lonas Lorenzo SA / Nowofol GmbH © 3dtex**





**ETFE roof Cubierta Voronoi / z3rch / form TL / 3dtex GmbH /  
Lonas Lorenzo SA / Nowofol GmbH © 3dtex**



**Canopy Bus Terminal Aarau / vehovar & jauslin / form TL / Arge  
Foliendach RUCH AG + Vector Foiltec © Niklaus Spoerri**





**Canopy Bus Terminal Aarau / vehovar & jauslin / form TL / Arge  
Foliendach RUCH AG + Vector Foiltec**



# REFERENCE APPLICATIONS **SECOND SKIN**

Natural transition between exterior & interior



**Foil façade Unilever Building / Behnisch Architekten / form TL /  
Vector Foiltec © formTL**



**Cincinnati medical center – UC neuroscience institute / Perkins + Will / Structurflex / Low and Bonar © Structurflex**





**Textilakademie NRW, Mönchengladbach / slapa oberholz  
pszczulny architekten / form TL / Koch Membranen, Verseidag ©  
thomasmeyerarchive.de**



**South facade Santa Lucia Hospital / Francesc Pernas. Casa  
Consultors i Arquitectes, S.L. / IASO, S.A. © IASO, S.A**

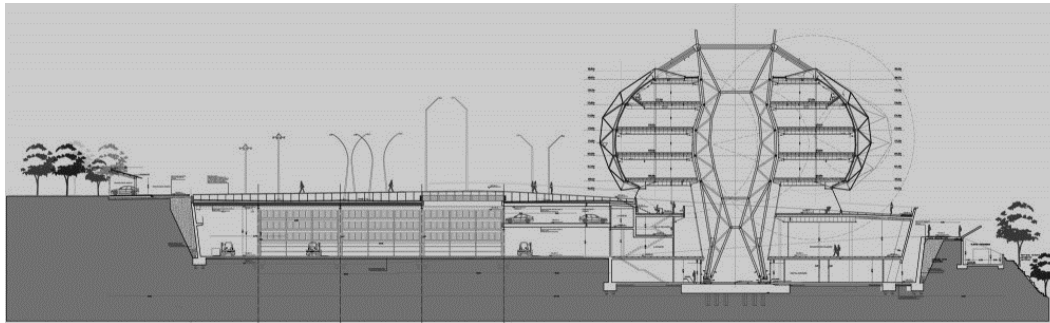


**South facade Santa Lucia Hospital / Francesc Pernas. Casa  
Consultors i Arquitectes, S.L. / IASO, S.A. © David Pernas**





**New Iguzzini Headquarters / Miàs Arquitectes / LANIK, S.A. /  
IASO, S.A. © IASO, S.A**



**New Iguzzini Headquarters / Miàs Arquitectes / LANIK, S.A. / IASO, S.A. © Adrià Goula**

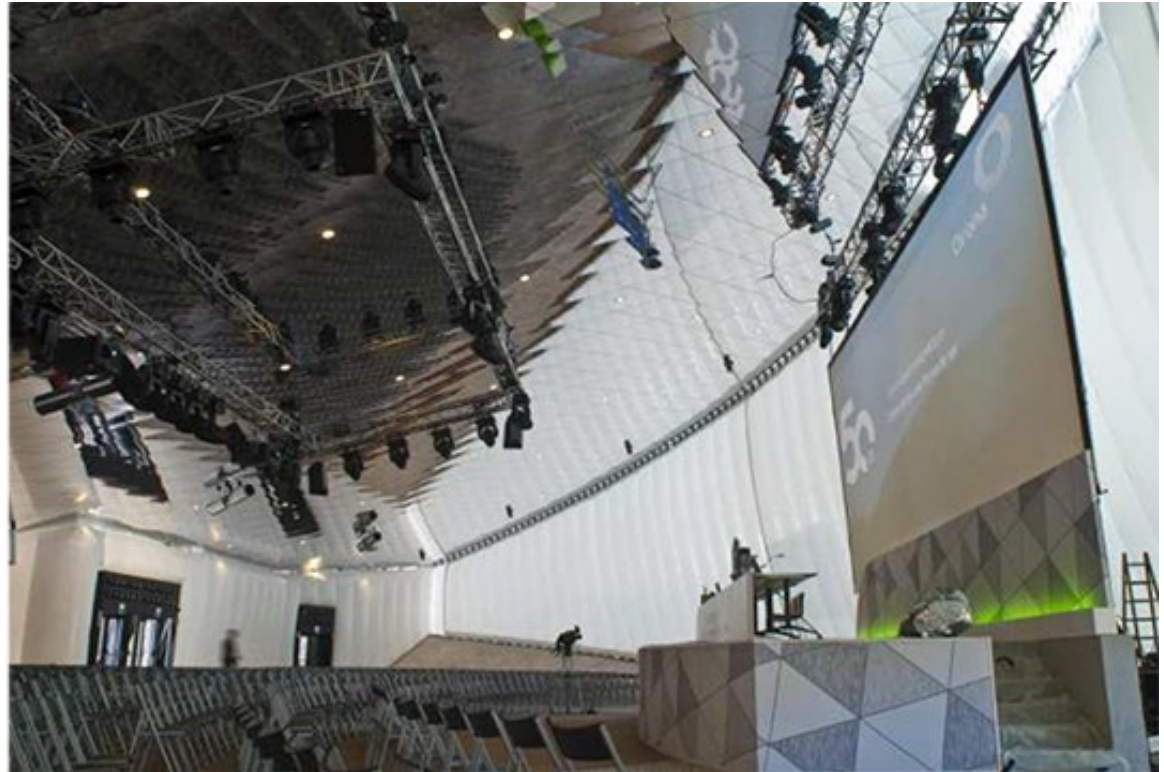
**REFERENCE  
APPLICATIONS  
PNEUMATIC  
STRUCTURES**

building with air





**Pneumatic wall with zero footprint ORONA / Xavier Barrutieta /  
R. Sastre, Àrea Cúbica, LKS Ingeniería SC © Àrea Cúbica**



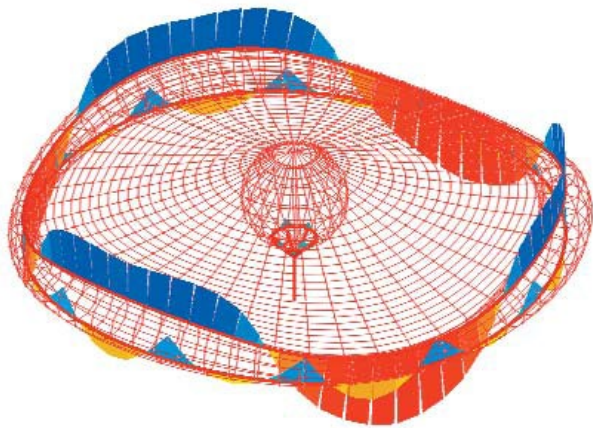
**Pneumatic wall with zero footprint ORONA / Xavier Barrutieta /  
R. Sastre, Àrea Cúbica, LKS Ingeniería SC © Àrea Cúbica**

# REFERENCE APPLICATIONS TENSAIRITY





**Inno-wave-tion / Silvain Dubuisson Architecte / Tentech / High Point Structures & Buitink Technology / Serge Ferrari © Tentech**



**Inno-wave-tion / Silvain Dubuisson Architecte / Tentech / High  
Point Structures & Buitink Technology / Serge Ferrari © Tentech**

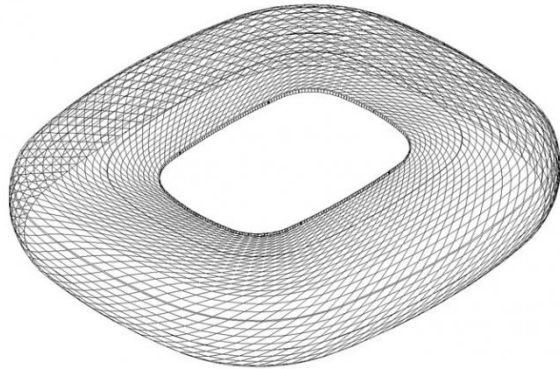
**REFERENCE  
APPLICATIONS  
SPORT INFRASTRUCTURE**

Ingenious and expressive architecture





Allianz Arena Munich / Herzog & de Meuron / IPL © form TL



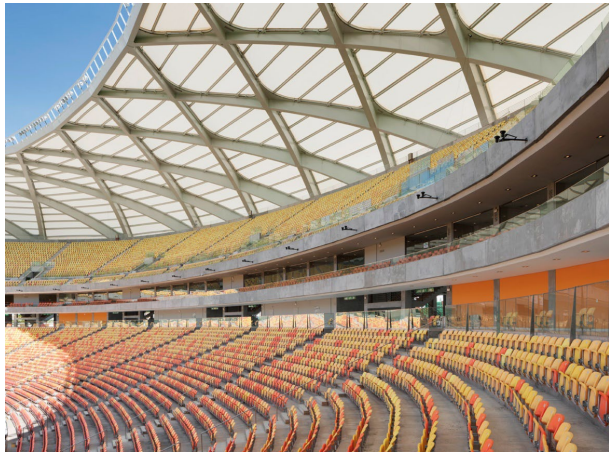
Allianz Arena Munich / Herzog & de Meuron / IPL © form TL





**Arena da Amazonia / gmp - Architekten Gerkan, Marg & Partner /  
Schlaich, Bergermann & Partner / Ceno Membrane Technology  
GmbH © Marcus Bredt, Germany**





**Arena da Amazonia / gmp - Architekten Gerkan, Marg & Partner /  
Schlaich, Bergemann & Partner / Ceno Membrane Technology  
GmbH © Marcus Bredt, Germany**



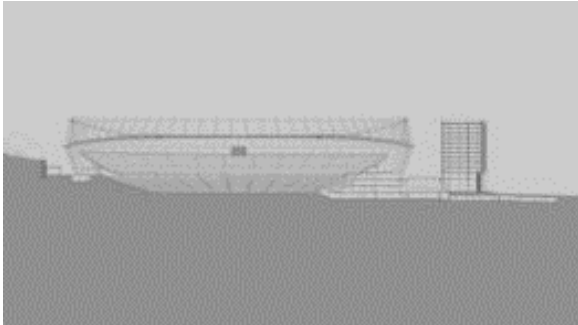
**Stade Allianz Riviera, Nice / Wilmotte & Associés SA / IASO, S.A.  
/ Serge Ferrari © Milène Servelle - Serge Ferrari**





**National Sports Complex Olimpiyskiy / Architecten von gerkan,  
Marg und partner / form TL / Hightex**





**National Sports Complex Olimpiyskiy / Architecten von gerkan,  
Marg und partner / form TL / Hightex © Marcus Bredt**



**BC Place Stadium / Schlaich Bergermann und Partner / Tensys /  
Tony Hogg Design / Hightex Tensile Structures Ltd / Sefar Tenara  
/ Saint Gobain © Grant Mattice & BC**



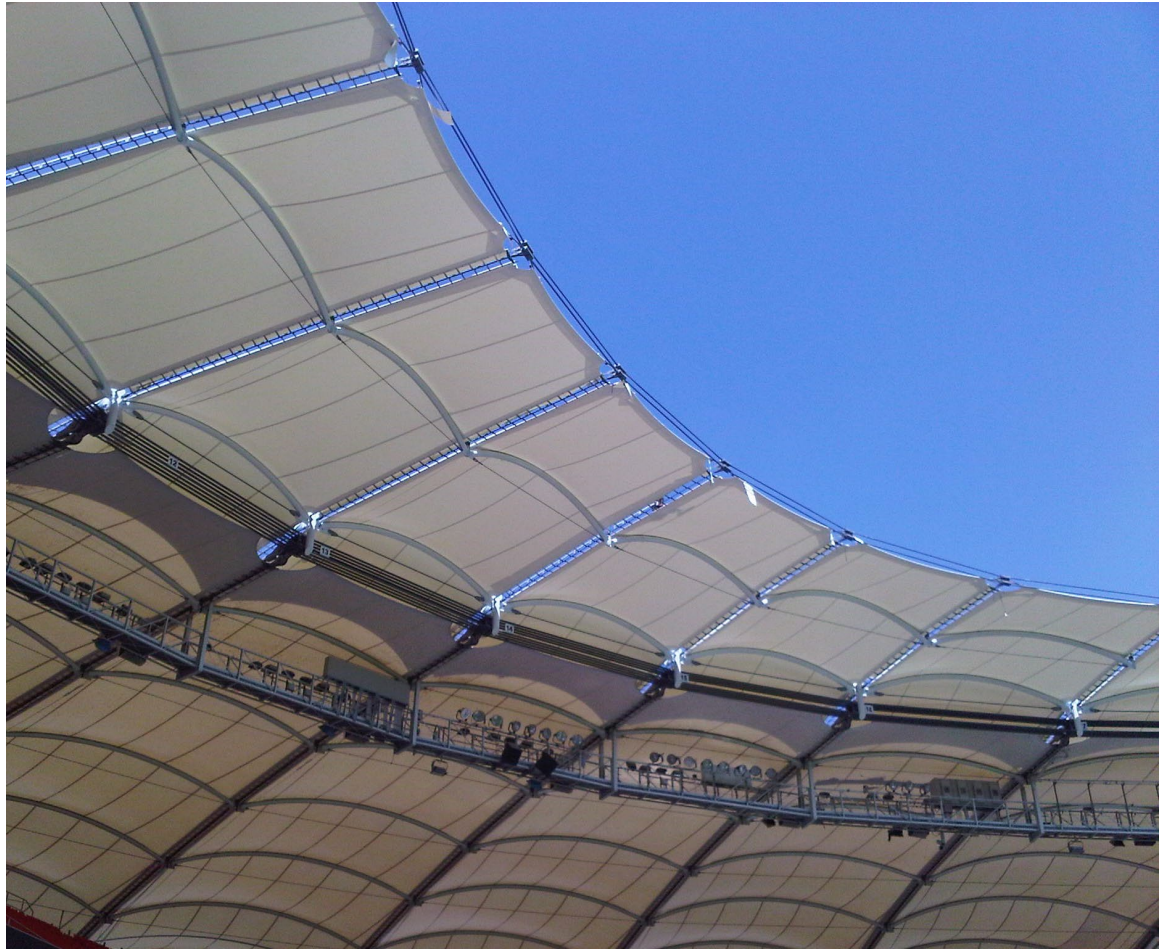
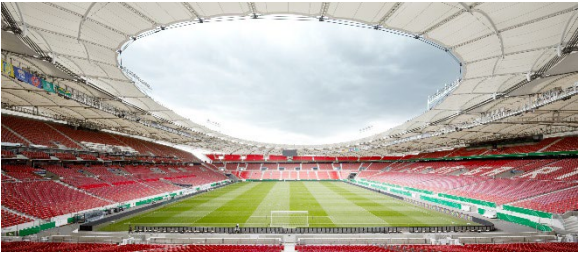


**BC Place Stadium / Schlaich Bergermann und Partner / Tensys /  
Tony Hogg Design / Hightex Tensile Structures Ltd / Sefar Tenara  
/ Saint Gobain © Grant Mattice & BC**





**Mercedes-Benz Arena / Weidleplan, Siegel & Partner, schlaich  
bergerman und partner © Herr Storck**



**Mercedes-Benz Arena / Weidleplan, Siegel & Partner, schlaich bergerman und partner © schlaich bergerman und partner**





**Rostov stadium 2018 FIFA world cup / Populous / Tensaform  
Membran Yapilari, Sanayi Ticaret A.S. / Serge Ferrari © Yandex**





**Volgograd Arena / gmp Architects, PI Arena / SBP, PG Maximum /  
Low & Bonar, Maffeis Engineering / Kurganstalmost © Mehler  
Texnologies**

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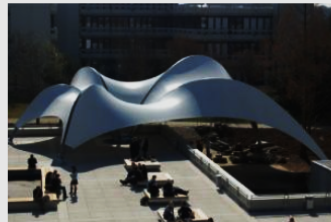
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"SPINNE" PH  
LUDWIGSBURG

Type	Location:	Gallery:
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001 HACIENDA REAL,  
RESTAURANT (GUATEMALA)

Type	Location:	Gallery:
Membrane	Guatemala	7



02 RIVERWALK

Type	Location:	Gallery:
	United Kingdom	2

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