

TensiNet

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TensiNet – the multi-disciplinary association for all parties interested in tensioned membrane construction

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Content

TensiNet Association

What is the aim of the TensiNet Association?

TensiNet Working Group Sustainability and Comfort

TensiNet Working Group Specifications and Eurocode



TensiNet – the multi-disciplinary association for all parties interested in tensioned membrane construction

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TensiNet Association

1999 – 2004: European Thematic Network on Tensile Structures (EU funded Growth)

2004 – 2020: the TensiNet association is established and continues under the wings of the Vrije Universiteit Brussel

2020: TensiNet Association becomes an international non-profit association



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Partners TensiNet

Architecture and engineering offices

- o formTL ingenieure für tragwerk und leichtbau GmbH - Germany

Manufacturer and fabricator

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

Material producer, Coater and Weaver

- o Mehler Technologies - Germany
- o Serge Ferrari Group - France
- o Sioen Industries - Belgium

Steelwork and Ropes

- o PFEIFER Structures GmbH - Germany

Software Companies

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



TensiNet – the multi-disciplinary association for all parties interested in tensioned membrane construction

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Associate Partners TensiNet

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



TensiNet – the multi-disciplinary association for all parties interested in tensioned membrane construction

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TensiNet Association: a platform for all parties interested in tensile membrane structures



It is an advantage that **all areas** of the membrane business are represented: designers, universities, material suppliers and fabricators. Even competitors work together to develop the state of the art.

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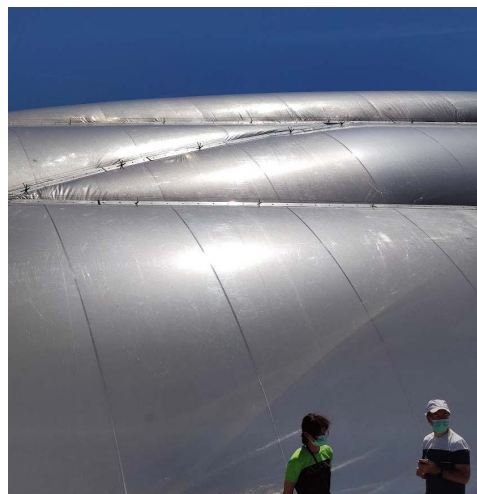


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TensiNet Association

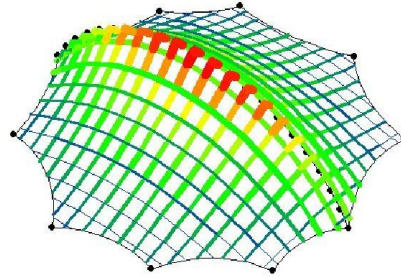
- Aims to improve the quality of membrane structures
- Provides information and advice
- Stimulates research initiatives
- Informs about research results
- Aims to expand the range of applications



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TensiNet Association

- Supports **teaching** and training activities
- Supports **workshops** organised by one of its members (like Textile Roofs)
- Publishes the TensiNews **newsletter** twice a year



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TensiNews is published twice a year, TensiNews 48 is being made

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TensiNet Association

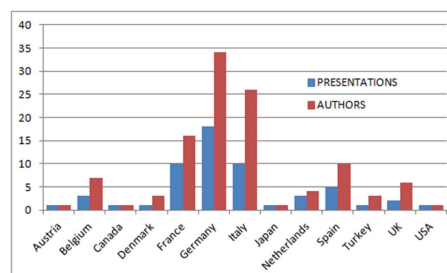
- Organises the TensiNet **Symposium** every three years
- Publishes the proceedings of the TensiNet Symposium

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TensiNet Symposium Nantes 2023

Membrane architecture: the seventh established building material

Proceedings are available at:
https://tensinantes2023.scienceconf.org/data/pages/2023.06.16_PROCEEDING_DEF.pdf



TENSINANTES2023 : TensiNet Symposium 2023 at Nantes Université

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

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The last symposium was organised in Nantes, 134 participants attended



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TensiNet Symposium Nantes 2023

“Establishing fabrics and foils along the traditional building materials such as bricks and concrete is one step, looking at the dimensions of the envelopes we build, reassessing the need for space as Hans-Walter Müller and José Miguel de Prada did, is yet another.” Katja Bernert



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TensiNet Symposium Nantes 2023

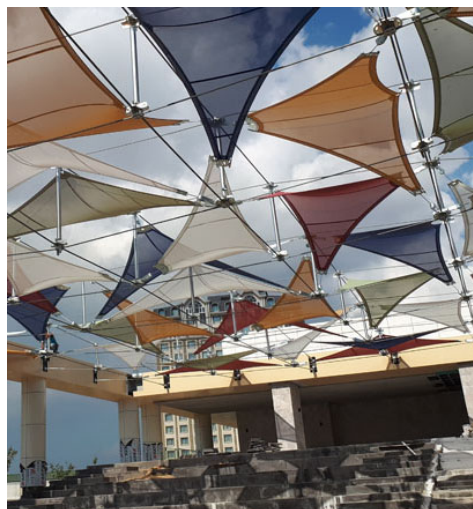
Milestones of **ETFE construction methods** and starting points for further developments were presented by Karsten Moritz and Jean-Christophe Thomas



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TensiNet Symposium Nantes 2023

Fevzi Dansik showed an **optimization of a tensegrity system** with tensioned fabric obtaining a cost reduction of nearly 40%

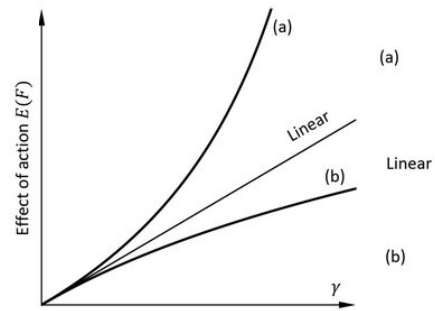


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TensiNet Symposium Nantes 2023

The **partial safety factor concept**

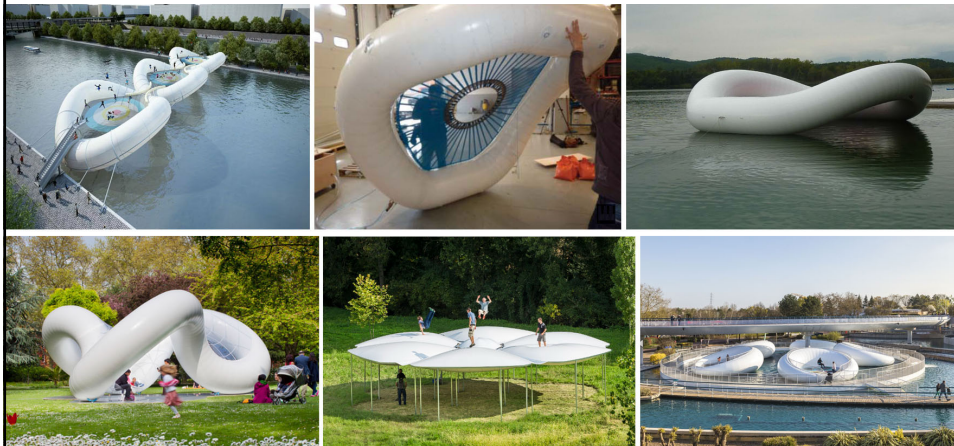
applies for limit state functions that are linear or almost linear
Martin Füsseder found out that it is not possible to predict whether a conservative or a non-conservative design is obtained by characterizing it as over- or under-linear



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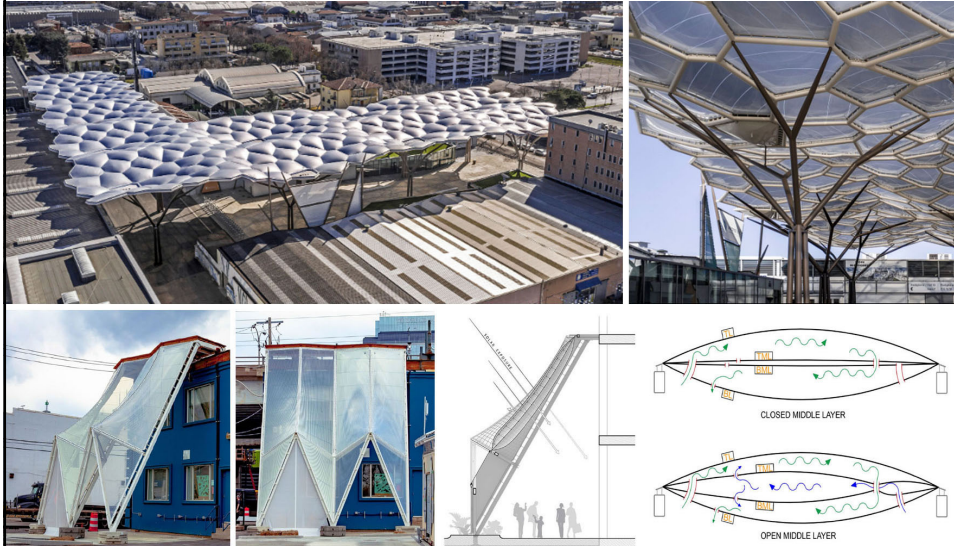
TensiNet Symposium Nantes 2023

A lot of presentations were dedicated to applications, case studies and realizations



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TensiNet Symposium Nantes 2023



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TensiNet Symposium Nantes 2023



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TensiNet Symposium Nantes 2023



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TensiNet Symposium Nantes 2023

Thomas Bonneville showed the Chrifia Golf Club House covered with a membrane or with a conventional metallic roof
The metal option **weighs** 45,2kg/m², has a **GWP** of 75kg CO₂e/m²
The membrane option **weighs** 4,5kg/m², has a **GWP** of 21kg CO₂e/m²



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TensiNet Symposium Nantes 2023

Another comparison was made by Zehra Eryuruk
The membrane roof has a **GWP** of 196kg CO₂e/m²
The metallic roof has a **GWP** of 333kg CO₂e/m²
Different designs, metal components can be recycled



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TensiNet Association

- Established several Working Groups focusing on specific topics
- Publishes reference documents and Working Group reports

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TensiNet Working Groups

Discuss specific issues

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

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TensiNet

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Working Group Sustainability & Comfort

Consider

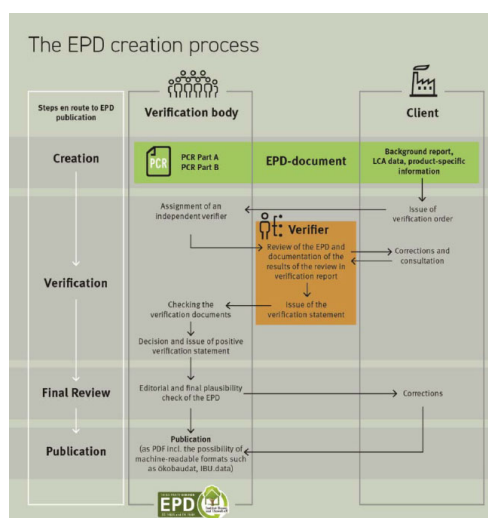
- the production,
- the use phase, and
- the end-of-life treatment of components and materials



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Working Group Sustainability & Comfort

TensiNet is member of the German Institute for Building and Environment (IBU) 1st step to develop the specific Product Category Rules (PCR) for structural membranes



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Working Group Sustainability & Comfort

In February 2023
the TensiNet Association
submitted to IBU
the Product Category Rules
(Part B)

These rules include
the requirements for the EPDs
for **structural membranes**
(fabrics, coated fabrics and foils)

PCR Guidance-Texts for Building-Related Products and Services

From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU)

Part B: Requirements on the EPD for structural membranes (fabrics, coated fabrics and foils)

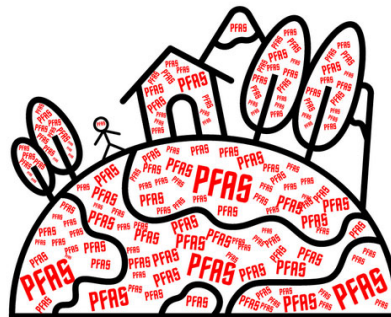
www.bu-epd.com

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Working Group Sustainability & Comfort

PFAS Ban proposed by ECHA:

- TensiNet submitted comments against the PFAS restrictions on fluoropolymers used in textile architecture
- A petition for the members was available online (> 50% of the members signed)



<https://banpfasmanifesto.org/en/>

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Working Group Sustainability & Comfort

On 8/11
the TensiNet Association
was accepted as
one of ECHA's accredited
stakeholder organisations



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Working Group Sustainability & Comfort

Committee for Risk Assessment(RAC) meeting 25-28 November

26/11

Evaluation of sector-/use-specific aspects of the Universal PFAS restriction proposal:

Construction products



<https://efcnetwork.org/forever-chemicals-pfas-in-water-and-3-ways-to-treat-them/>

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Working Group Sustainability & Comfort

Committee for Socio-economic Analysis (SEAC) meeting 25-28 November

27/11

Universal per- and polyfluoroalkyl substances (U-PFAS): **Construction products**



<https://chemicalinsights.org/pfas/>

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Working Group Sustainability & Comfort

Topics to be developed in future

- **Recycling** of membranes for architecture
- The use of **bio-based** biodegradable materials for membrane structures

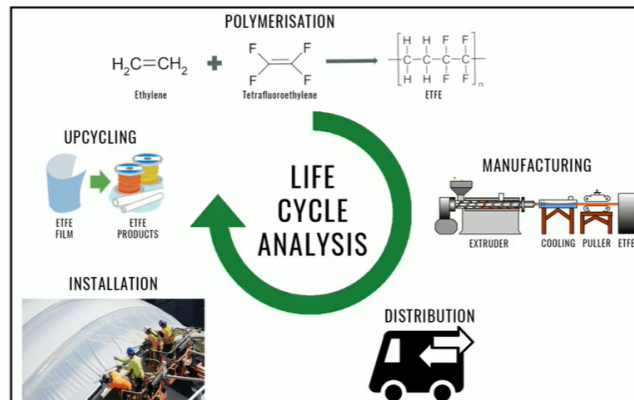


Uncoated Abaca Fabric, Tensinews 17

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Vodafone project

Vector Foiltec takes back all old foil material to recycle it, and purchases flexible pipes and valves made from recycled ETFE



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Working Group Specifications and Eurocode

+ CEN TC 250 WG 5
 Standards

- reduce the risk of failure
- help to increase the acceptance of membrane structures



Design of membrane structures

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Working Group Specifications and Eurocode

CEN/TC 250
 unanimously approved
 the Technical Specifications
CEN/TS 19102
 Design of tensioned membrane
 Structures

Is available for purchase at
<https://genorma.com/en/standards/cen-ts-19102-2023>



CEN/TC 250/WG 5 N 189

CEN/TC 250/WG 5 "Membrane Structures"
 WG Secretariat: AFNOR
 Convenor: Mollaert Marijke Prof. dr. ir.



CEN-TC 250_N3612_Ballot result - Formal Vote FprCEN-TS 19102 Design of tensioned membrane structures APPROVED

Document type	Related content	Document date	Expected action
Project / Other		2023-07-25	

Description

Ballot result - Formal Vote FprCEN-TS 19102 Design of tensioned membrane structures APPROVED

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Working Group Specifications and Eurocode

WG 5 started
 the preparation of
 a working document
 on **execution issues**
 on which the design provisions
 of tensioned membrane structures
 are based

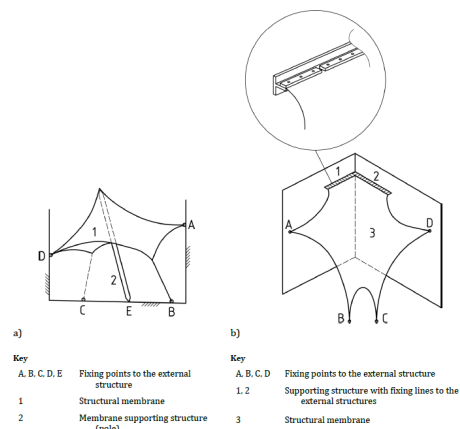
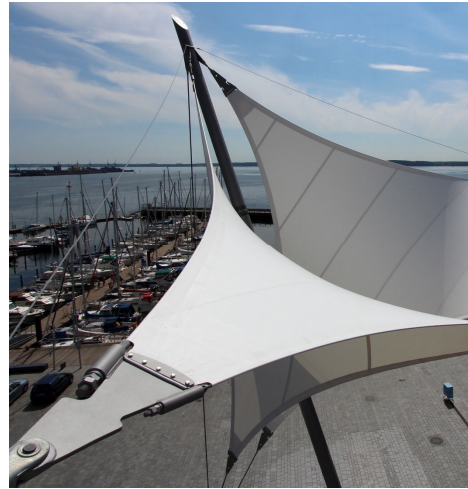


Figure 3.3 Examples of supporting structures: (a) Fixing points to the external structure, (b) Fixing lines to the external structure

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Working Group Good Practice

Promotes quality in design and construction performance by providing industry best practice requirements



Membrane "Harbour Point", TensiNews28

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Working Group Good Practice

Rules for

- Raw Material Producers
- Membrane Material Producers
- Membrane Manufactures
- Designers/ Engineers
- Architects
- Testing Laboratories

as well as general rules for all involved parties



A quality seal has been established:

We follow the approved standards of good practice rules of TensiNet

Members can **subscribe** this Code of Conduct





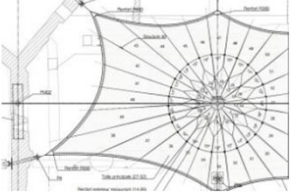

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TensiNet Association

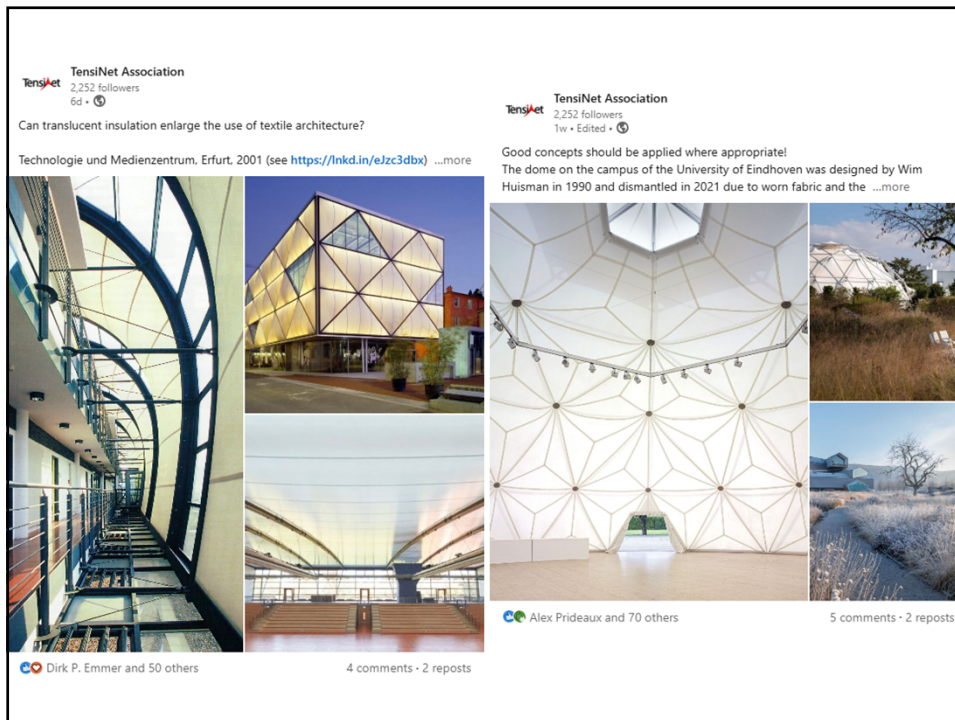
Maintains the website www.tensinet.com, which contains a **database of projects**, reference documents and research reports

2250 followers on LinkedIn

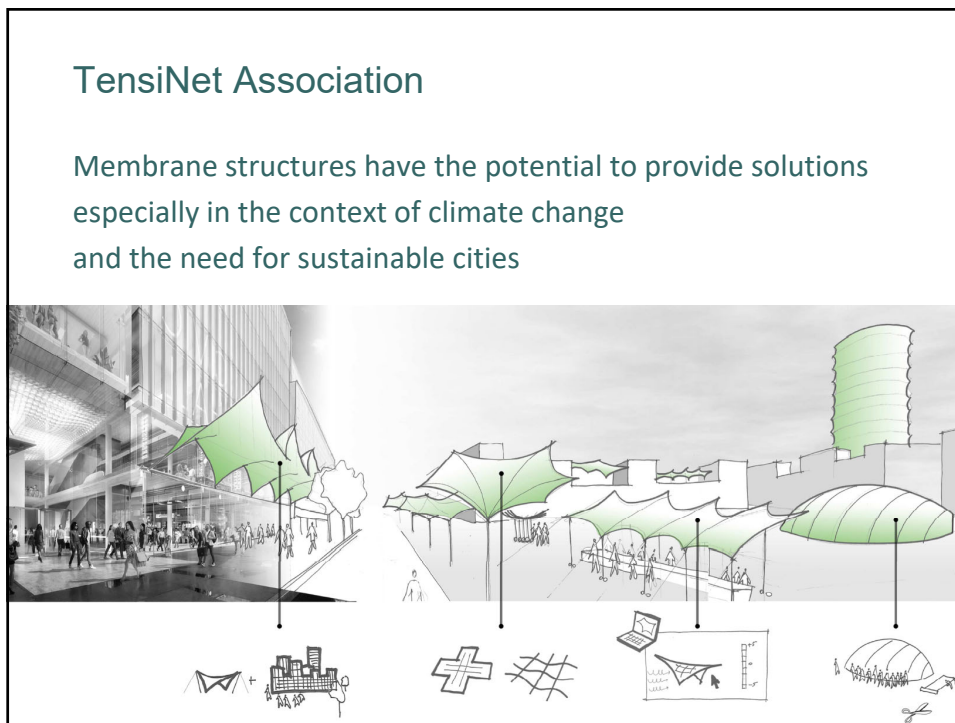
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<p>HASAN KALYONCU UNIVERSITY AMPHITHEATRE</p>	<p>KOERICH CASTLE, TENSILE MEMBRANE COVERING</p>	<p>LUNAR DOME SPACE THEATRE</p>																		
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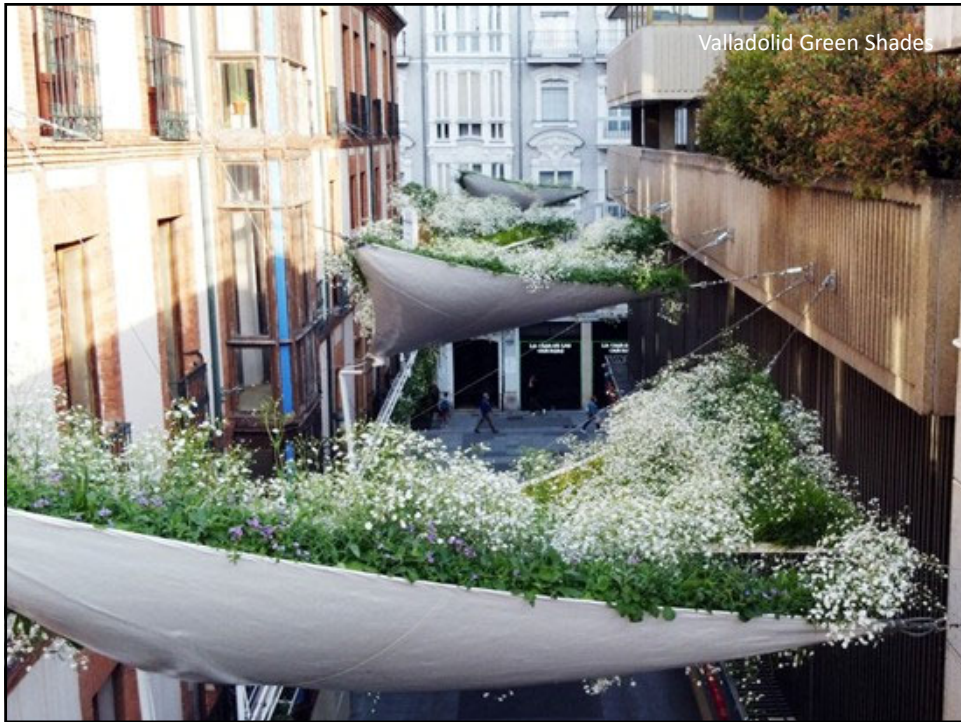
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