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Newsletter of the European based Network for the Design and Realisation of Tensile Structures

REPORT

TEXTILE ROOFS 2025

PROJECTS

Tensile structure covering a Padel Court
Membrane Magic in Croatia

Illuminated parts in combination with special membranes by SATTLER PRO-TEX create the most spectacular atmosphere in Dubrovnik ©Belina d.o.o.

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AT GRUŽ MARKET

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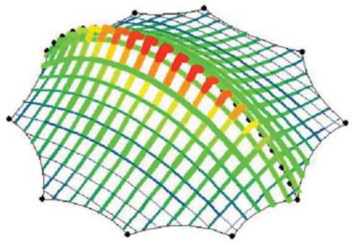

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"Shaping the pathway
to future tensioned membrane design"

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INTERESTED TO PARTICIPATE
in the TensiNet Symposium 2026 & Essener Membranbau Symposium 2026 ?!

TensiNews INFO

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Edito

Dear Reader

I am glad to present the 49th edition of our TensiNews, which is again full of inspiring information. This year, TensiNet became 25. We celebrated this with a cocktail party directly after the 100 years Frei Otto event at ILEK, where almost everybody from our industry was present.

Our Sustainability and Comfort working group continues its work to find a solution to avoid a PFAS ban for our products, and is working on a general LCA for membranes. Especially the first topic is very important for our future as an industry, so please contribute with your individual knowhow to support our efforts.

Our Specifications and Eurocode working group supports TC 250 WG5 on its way to transform our technical specification into Eurocode 12. Beside the main part we establish at the moment execution rules along side with the design part. We are convinced that execution quality is an essential fundament to support our design approach, that's why we are allowed to integrate this into a Eurocode which is typically just related to design. We would be glad to consider more voices from manufacturing and installation into this work. If you are not involved yet, please contact us, to get also your input integrated.

Some of us were present at Textile Roofs, the yearly conference and workshops about textile architecture taking place in Berlin. Josep Llorens prepared a very comprehensive report filling a major part of this issue of TensiNews. The report summarizes all the contributions form history over design and projects to research, products, manufacture and maintenance. Beside this you find in this TensiNews the presentation of two recent projects, a Padel court in Belgium, and a rather special tensile structure covering a market in Croatia.

In a year from now the 8th edition of the TensiNet Symposium 2026 "Shaping the pathway to future tensioned membrane design" in Essen, which will be held in collaboration with the University Duisburg-Essen as a joined symposium with the 7th Essen Membranbau Symposium. The call for abstracts has been sent out, and we are working on the program which is split into the three main topics: "Design, Modelling and Simulation of Structural Membranes", "Materials and Execution" and "Sustainability and Building Physics". You find more details in this issue and on the conference website.

Hope to meet you soon on one of the next events. Meanwhile please enjoy this issue of TensiNews

Yours sincerely,
Bernd Stimpfle

TensiNet

Forthcoming Events

XII International Conference on Textile Composites and Inflatable Structures | **Structural Membranes 2025** | *8-10/10/2025* | München, Germany | **https://structuralmembranes2025.cimne.com/**

IASS Annual Symposium 2025 | *27-31/10/2025* | Mexico City, Mexico | **https://iass2025.unam.mx/**

Advanced Building Skins Conference & Expo | *3–4/10/2025* | Bern, Switzerland | **https://abs.green/2025**

Techtextil and Texprocess 2026 | *21-24/04/2026* | Frankfurt, Germany | **https://techtextil.messefrankfurt.com**

Textile Roofs workshop 2026 | *26-28/04/2026* Berlin, Germany | **www.textile-roofs.com/**

8th TensiNet Symposium 2026 & 7th Essener Membranbau Symposium 2026 | *Shaping the pathway to future tensioned membrane design* | *30/09-02/10/2026* | Institute for Metal and Lightweight Structures, University of Duisburg Essen, Germany | **www.uni-due.de/iml/tensinet-ems2026.php**

The symposium Shaping the pathway to future tensioned membrane design is dedicated to the latest developments in membrane structures. Choose one of the topics and upload your abstract
(Text only, 400 Words, 5 Keywords).

- Design, Modelling and Simulation of Structural Membranes
- Materials and Execution
- Sustainability and Building Physics
- Others

Timing: Due to repeated requests, we are extending the
Abstract deadline submission to 30.09.2025
Abstract acceptance 31.10.2025
Paper submission 15.02.2026
Paper acceptance or feedback 31.03.2026
Paper submission 30.04.2026

Accepted papers will be published Open Access for high visibility of your contributions. The symposium papers will be published with ce/papers. Proceedings in Civil Engineering. Every paper will have an own DOI.

Please notice also the **Young Engineers Awards TensiNet Symposium 2026 & Essener Membranbau Symposium 2026**. We encourage young researchers and practitioners, structural designers and architects, as well as students to participate in the TensiNet Symposium 2026 & Essener Membranbau Symposium 2026 Young Engineers Awards. The best papers will be published in a peer-reviewed journal!

For more information and the terms and conditions, see www.uni-due.de/iml/te26-id12.php
Conference website: www.uni-due.de/iml/tensinet-ems2026.php#

ARTICLE

TensiNet symposium 2026 & Essener Membranbau symposium 2026

"Shaping the pathway to future tensioned membrane design" A shared mission

Tensile architecture: Lightness, Sustainability and Future Potential

Tension structures, which are built using lightweight fabrics and cables, provide an elegant alternative to traditional, heavy, rigid buildings. Membrane materials, such as PVC-coated polyester, PTFE-coated glass and ETFE, are valued for their lightness and translucency. Although tensile fabrics generally lack thermal and acoustic insulation, they still offer opportunities for creative and innovative applications.
The recent publication of CEN/TS 19102:2023, 'Design of tensioned membrane structures', aims to boost confidence in the analysis and safety of tensioned membranes, thereby strengthening their role in modern architecture.

Iconic masterpieces have been created using tensile structures by renowned architects such as Frei Otto, Anish Kapoor, Kengo Kuma and Zaha Hadid. In the face of urgent sustainability challenges, the potential for reuse and adaptability in design could elevate textile architecture to new heights. There is much to be explored.

Tensile structures are inherently climate-positive: they require fewer raw materials, can be easily dismantled, and their structural elements can be reused. Adaptive skins can further enhance performance by opening and closing in response to daylight, temperature or wind.

When coupled with parametric or advanced design tools, tensile structures can be optimised according to multiple criteria.

As well as providing shade, environmentally friendly designs can incorporate energy generation through photovoltaic textiles and water harvesting through canopy surfaces that direct rainwater into pools or cisterns. They can also feature integrated air purification systems.

Projects at the Osaka Expo 2025 showcase such innovations, pointing towards a future of more adaptive and resource-efficient designs. However, if textile architecture is to fulfil its potential as a sustainable, future-ready technology, the industry must accelerate its efforts to develop fully recyclable membranes.

The lightweight nature of tensile systems is a key advantage that should be emphasised. Using less material means consuming fewer resources, which is in line with the urgent need for the construction industry to rethink 'business as usual'.

Figure 1. Future of life pavilion by Hiroshi Ishiguro © www.youtube.com/watch?v=uCibXq6gDH8

Designing Future Society for Our Lives

Expo 2025, themed "Designing Future Society for Our Lives", is running until 13 October in Osaka, Japan. Aesthetic precision and innovation are characteristic of Japanese architecture. The national pavilions focus on future-oriented solutions for a more sustainable society. Innovative construction methods and materials, the circular economy and resource-efficient construction are central themes. See also https://www.expo2025.or.jp/en/official-participant/

Several lightweight designs showcase remarkable innovations or advancements in sustainable concepts:

Australia Pavilion (architect: Buchan Architects): The Australia Pavilion at Expo 2025 sets a new benchmark for sustainability, repurposing key build assets from events such as the London 2012 Shooting and Water Polo venues, the Birmingham Commonwealth Games, and the Tokyo 2020 Shooting venue to minimise waste.

Osaka Healthcare Pavilion (architect: Tohata Architects & Engineers): To appropriately filter and diffuse natural light from the roof, a new material was used, made by twisting yarn from recycled pulp and sewing it into a textile-like fabric. Lightweight and flexible perovskite solar cells are suspended in banner form.

NOIZ Pavilion (media artist: Yoichi Ochiai): This pavilion features warped, or geometric, reflective volumes framed in steel and wrapped in a newly developed mirrored membrane.

Joint Pavilion Iida Group × Osaka Metropolitan University (architect: Shin Takamatsu): The biggest challenge was affixing the Nishijin textiles to the curved surface of the structure. According to Takamatsu, the slightest error would cause the patterns on the pavilion structure to misalign when Nishijin textiles were applied. "That's why we took meticulous care with every step, focusing on making sure that the Nishijin textiles looked beautiful no matter what."

Dynamic Equilibrium of Life Pavilion (architect: Naoki Hashimoto Architects, Inc.): The pavilion minimises material consumption through its lightweight design, with the structural components strategically earmarked for post-expo disassembly and repurposing.

Luxemburg Pavilion (architect: STEINMETZDEMEYER architects – Mikan / Engineering: Ney & Partners JPN - Ney & Partners BXL – Technics: ZO Engineering Consultants): The pavilion highlights Luxembourg's know-how in the field of circular economy, shows respect for materials, and is built with standard and reusable Japanese materials.

Switzerland Pavilion (architect: Manuel Herz Architects, Basel): The architecture itself focuses on sustainability and consists of modular constructions made from reusable, recyclable materials. The result is an

extraordinary lightweight building with the smallest ecological footprint of any Swiss pavilion at a World Expo to date.

Future of life (architect: Hiroshi Ishiguro): The feedback loop between body, environment, and architecture reinforces the pavilion's central theme: that life is fluid, adaptable, and interdependent with its surroundings.

Blue Ocean Dome Pavilion (architect: Shigeru Ban Architects): The design accounts for dismantling, component reuse, and relocation, as the pavilion is scheduled to be relocated to the Maldives after the Expo concludes.

Marijke Mollaert
marijke.mollaert@vub.be

Figure 2. Luxembourg Pavillon Osaka World Expo 2025 © Ondrej Piry
Figure 3. Switzerland Pavillon Osaka World Expo 2025 /a © sbp Andreas Schnubel /b. © sbp David Sommer

With the Blue Ocean Dome, the Shigeru Ban Architects addresses the urgent issue of plastic pollution in the oceans and aims to raise awareness. The project was commissioned by Zero Emissions Research and Initiatives (ZERI). The central question is how materials can be used and managed sustainably. The design consists of three domes, constructed from both traditional materials such as paper and bamboo and innovative materials such as carbon fibre reinforced plastic (CFRP). After Expo 2025, the domes will be easily dismantled and transported in standard shipping containers, then rebuilt in the Maldives.
Dome A (entrance pavilion) is made of laminated bamboo, skilfully crafted into a dome with a diameter of 19m, inspired by traditional Japanese bamboo hats. The use of bamboo as a fully-engineered building material is emphasised here.
The central dome is the largest structure with a diameter of 42m, constructed from carbon fibre reinforced polymer (CFRP). This is an advanced material with an extraordinary strength-to-weight ratio: four times stronger than steel, but only a fifth of the weight. This made it possible to minimise the weight of the foundation.
Dome C, which is the same size as dome A, consists of a three-dimensional truss structure made of paper tubes and wooden spheres, all of which are recyclable.
For more information on the project see: Shigeru Ban tackles marine plastic pollution with Blue Ocean Dome at Osaka Expo 2025; https://shigerubanarchitects.com/news/blue-ocean-pavillion/

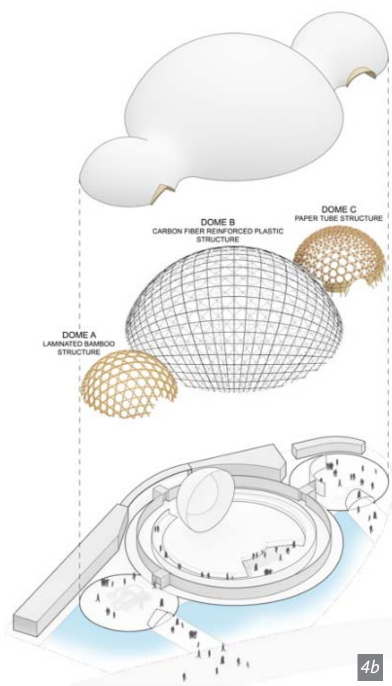

Figure 4a. Exterior view of the Blue Ocean Dome Pavilion ©Shigeru Ban Architects
Figure 4b. Axonometry of the Blue Ocean Dome Pavilion ©Shigeru Ban Architects

Tensile structure covering
the Padel Court


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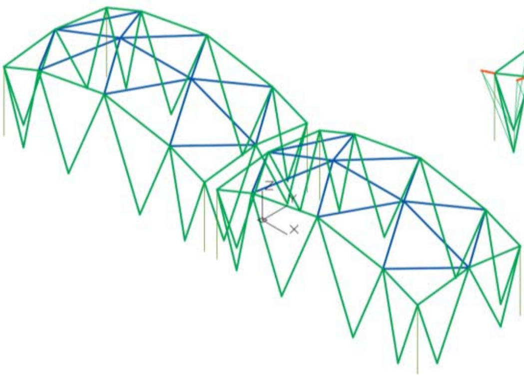
Jambes, Belgium

Since his studies, Amandus VanQuaille has been fascinated by nature and 'natural' organic forms. Designing optimal organic forms is also a question of responsibility towards our ecological environment and ourselves.

Figure 1. Grid in the roof and in the facades
Figure 2. The cables in the facade
Figure 3. The cables supporting the floating masts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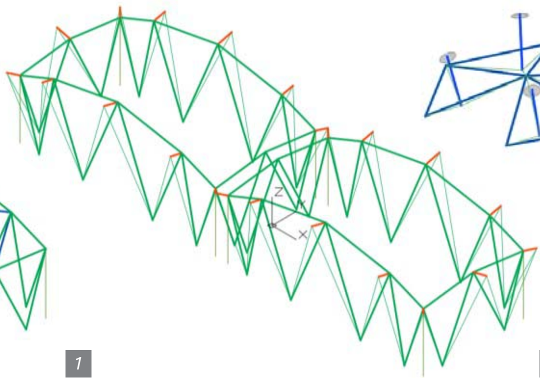
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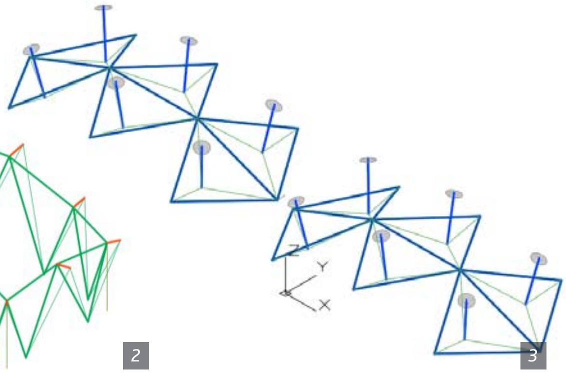
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During an extensive preparatory phase, architects Ridha Haraket (Fédération Wallonie-Bruxelles) and Amandus VanQuaille meticulously developed and refined the structural concept. The innovative design features a membrane that covers two padel courts, extending approximately 1,5m beyond the courts' dimensions to provide protection from rain.
The analysis model integrates both the metal structure and the tensioned membrane.
The nodes of the metal structure are designed as 3D hinges, allowing the entire structure to function as a freestanding grid shell with triangular meshes. Despite being a 3D grid shell, the structure maintains the appearance of a 'classic' structure with vertical walls and a roof (fig. 1).

The structure, composed of steel bars, cables and membrane, is entirely 'form active'. The membrane is supported by cantilevers at the boundaries and flying masts within the structure (figs. 2 and 3).

The stiffness of the membrane structure is achieved by tensioning the cables.
There are only 2 types of 'force' in the structure: compression and tension. As there is no bending, the full cross-section of each member is used to the optimum. The advantage is undoubtedly the significant reduction in weight.

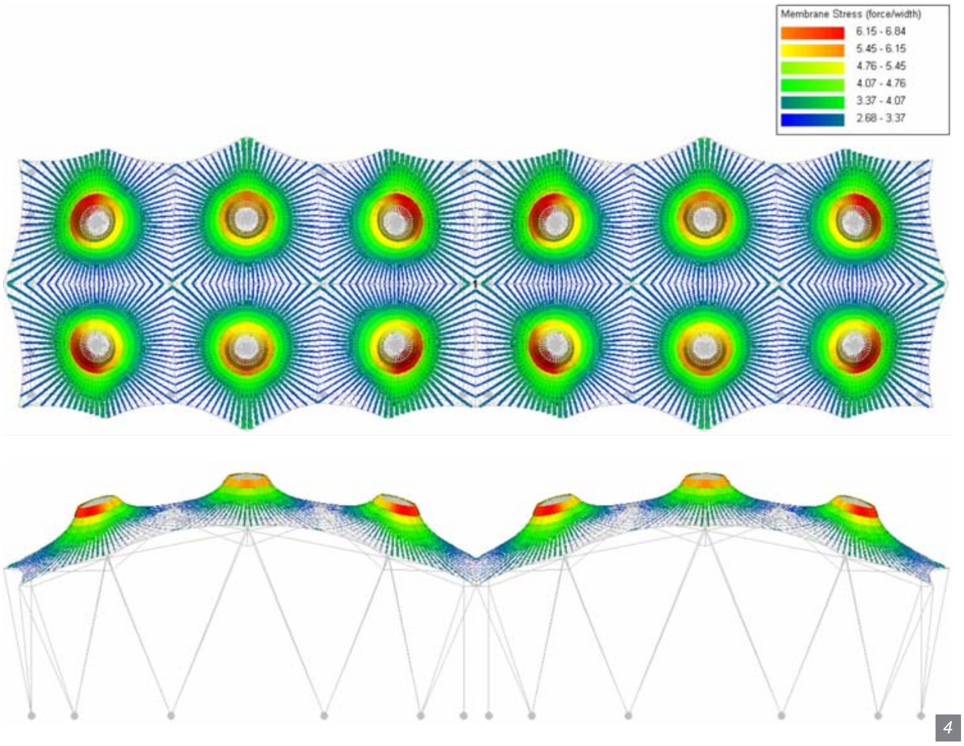
Perhaps the biggest challenge is to integrate the engineering process into the design - these cannot be seen as separate processes because the design of this structure is 'form-active'. Architects are accustomed to design in a 'free' way, by sketching, with the engineer then coming up with solutions to ensure stability and strength. In a form-active structure, the form of the structure together with the prestress define the stability. It takes experience to 'play' with the forms to achieve both stability and an appropriate architectural form (fig. 4).
It is clear that each stage, from the initial concept, through the calculation and optimisation of the form, is of great importance. The general form, the details and workshop drawings, the fabrication, the precision of the elements, including the foundations, all contribute to the quality of the whole system... and finally, the assembly and tensioning are crucial for stability. Each phase must be carefully checked and controlled (figs 5 to 10).

The free height needed for playing padel influenced the structural concept, especially the large angle between the cables supporting the flying masts.
Other side walls - in the language of tensioned membranes - were suggested, but the cheapest solution was chosen (fig. 11).

An annual control for this type of structures is important, as the structural safety depends on the prestress in the structure.

The creation of a light, translucent, dome-shaped space cover fits well and could be reused for other padel or sports fields.
The study of additional properties such as the benefits of daylight, the life cycle analysis with global warming potential (GWP) and the improvement of urban climate through textile architecture could typically be options for a master's thesis.

Figure 4. The integrated model after formfinding
Figure 5. The supporting grid shell
Figure 6. a/b Adding the membrane during the erection phase
Figure 7. Adding the floating masts
Figure 8. Internal view without the textile walls
Figure 9. Overall shape without the textile facades
Figure 10. Detailed view of the roof and the side walls
Figure 11. Tensioned membrane facades
Figure 12. The skylights provide additional daylight
Figure 13. Verification of the cable forces
Figure 14. Structural check in January 2025



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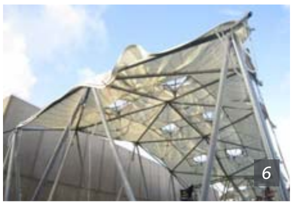

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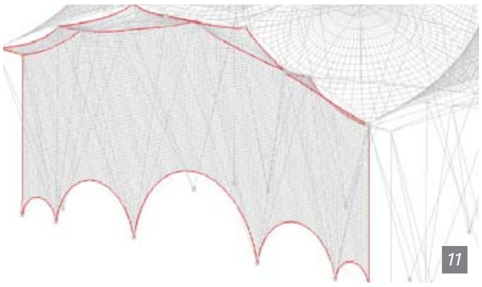

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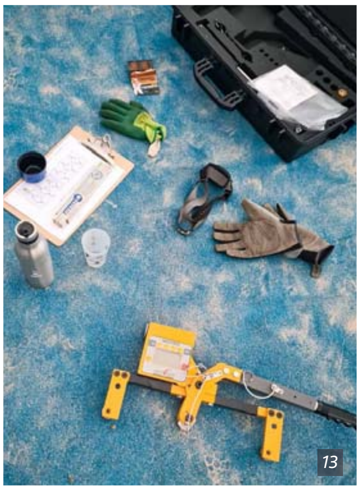

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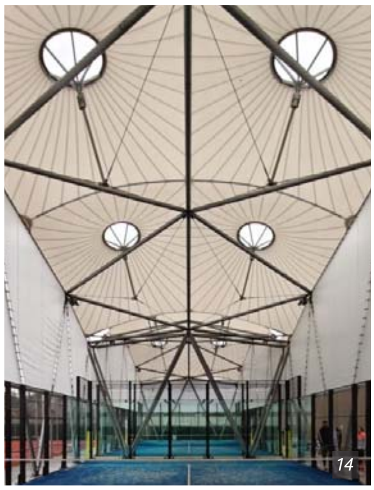

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Client:	Fédération Wallonie-Bruxelles - Adeps La Mosane (Namur-Jambes)
Project date:	2021
Structural check date:	January 2025
Architects:	Arch. Ridha Haraket (Fédération Wallonie-Bruxelles) Arch. Amandus VanQuaille (The Nomad Concept)
Material used:	PVC-coated polyester from Hiraoka, High Translucency, PVDF topcoat
Dimensions:	45x14m, highest point 12m

Amandus VanQuaille, NOMAD CONCEPT
amandus@nomadconcept.com
https://nomadconcept.eu/portfolio/padel-jambes-namur/
https://archello.com/nl/project/padel-court-namur-belgium

photos © NOMAD CONCEPT

TEXTILE ROOFS 2025 REPORT

Textile Roofs 2025, the twenty-seventh International Workshop on the Design and Practical Realisation of Architectural Membranes, took place on 25–28 May 2025 at the AEDES Architectural Forum, Berlin, and was chaired by Prof. Rosemarie Wagner (Karlsruhe Institute of Technology) and Dr.-Ing. Bernd Stary (Academus GmbH). It was attended by 81 participants from 21 countries covering four continents. Once again, the attendance demonstrated the success of the event, which has become firmly established since it was first held in 1995.

History

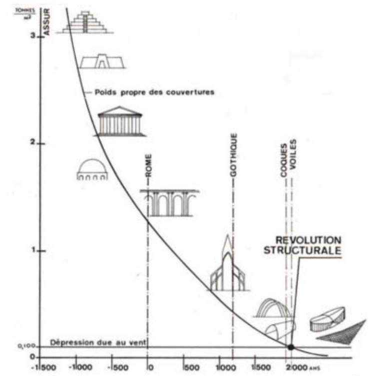
Structures. Then and now

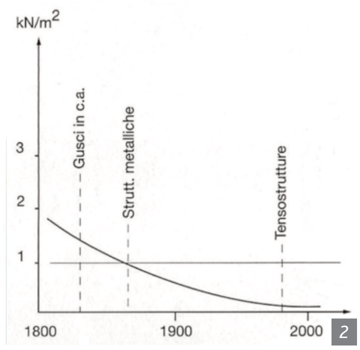
Prof. Ruy Marcelo Pauletti,
University of Sao Paulo.

Professor Pauletti made a long journey in a short time showing the footprint that men leave on the earth, regarding the world of structures. He highlighted the progressive decrease of the self weight in relation to the loads to be supported (figs 1 and 2), until the middle of the XXth century when finally the structure became lighter (fig. 3).

The application of ropes and cables in the construction of suspended bridges (fig. 4) and roofs (fig. 5) marked the beginning of a commented slide show that also featured cable-stayed bridges and structures as well as spoke wheels and tensegrities. Reference was also made to compression and bending illustrated with natural (fig. 6) and artificial arches, skyscrapers and intricate patterns (fig. 7).

Some clarifications were made regarding the difference between suspension bridges and cable-stayed bridges (fig. 8).





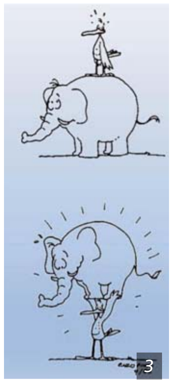


Figure 1. Self-weight through history (R-Sarger, 1967).
Figure 2. Detail (M.Majowiecki, 2012).
Figure 3. From more self-weight than load (top) to more load than self-weight (E.Pinto, 1985).
Figure 4. Rope suspension bridge under tension.
Figure 5. Dulles Airport.
Figure 6. Rainbow bridge.
Figure 7. Intricate pattern (Louvre Abu Dhabi).
Figure 8. Suspended and cable-stayed Brooklyn Bridge.

Design

Textile roofs: building system or architecture?

Prof. J. Llorens, School of Architecture, Barcelona.

Most literature and contributions referred to textile roofs structures deal with engineering issues as if they were only a building system. Form finding, computer modelling, patterning, energy consumption, life cycle analysis, materials or project descriptions are preferred topics. But the architectural characteristics have been very little addressed which does not favour appropriate applications, to the point where the paradox of heavy lightweight structures occurs. Therefore, the architectural and urban characteristics of the tensioned surface structures have been reviewed, illustrated with references to the history of architecture and works completed to date.

Membranes can completely configure the architectural space (figs. 9 and 10) but they can also be used dialoguing with conventional structures (fig. 11) or hybridized (fig. 12). The variability of forms is one of their hallmarks, that allows to fit a wide range of building footprints, a feature that makes them very useful for refurbishment (fig. 13).

They can even be used only as enclosure (fig. 14) or cladding (fig. 15), but in these cases the spatial configuration, (that is architectural), is given by the rules of steel or concrete. The membrane becomes a building system only, which is not without interest as demonstrated by the growing number of textile facades and claddings being built.

Computational modelling of lightweight tensile structures

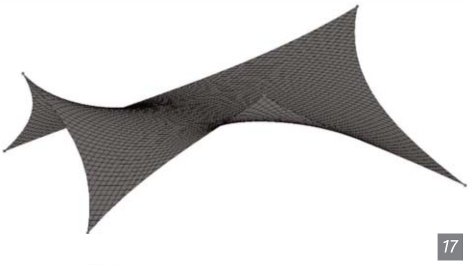
Dipl.-Ing. Jürgen Holl, technet GmbH.

Membrane structures are lightweight, load-bearing systems primarily under tension. Their form is not free, it results from a balance of acting forces. This is why a key concept is form-finding, the process of finding a shape in equilibrium with a favourable distribution of membrane stresses, considering aesthetic and building aspects. It can be approached physically (to gain direct knowledge) and digitally (for a fast and intuitive shape generation, calculation of equilibrium states and integration into digital planning workflows).

In terms of mechanical description, textile membranes are defined with warp, weft, crimp and shear stiffnesses with additional boundary conditions for pneumatic structures. The static analysis has to ensure structural safety, guarantee serviceability, size and optimize components and check the global and local stability, avoiding buckling, collapsing, or local failure.

As for the model, the systems (membrane and supports) should not be separated, pneumatic systems should consider the gas law and the form finding should consider bending elements. The separation of the structure into different subsystems (membrane, steel sections and cables) leads to inaccurate results and increased costs as has been illustrated in previous editions of Textile Roofs. Regarding the cutting pattern, flat fabric panels have to be converted into three- dimensional curved pre-stressed surfaces according to efficient flattening strategies, minimizing material waste, compensating for elongations under tension, checking the length of the corresponding seam lines and evaluating the results (figs 16 and 17).

Application: Design and development of lightweight cable structures with innovative photovoltaic modules for the architectural and energy upgrade of urban and residential environments including the development and construction of a lightweight equidistant cable net covered with PV modules including the energy yield in the planning (figs 18 and 19).



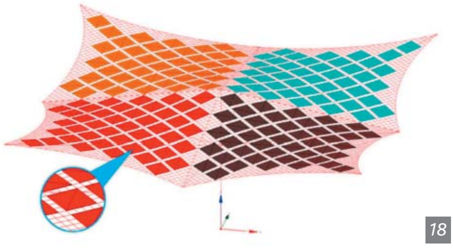


Figure 16. Flat fabric panels.
Figure 17. 3D curved pre-stressed surface.
Figures 18-19. Lightweight cable structure covered with PV modules.

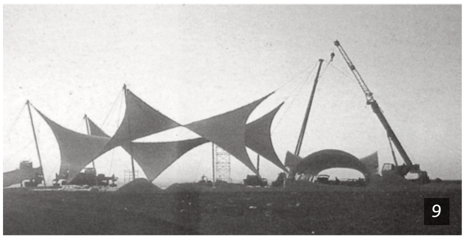
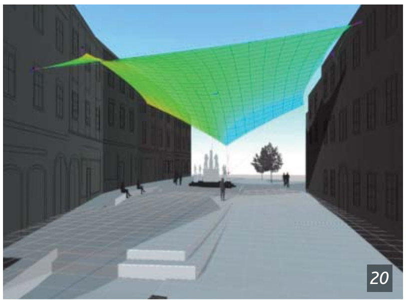
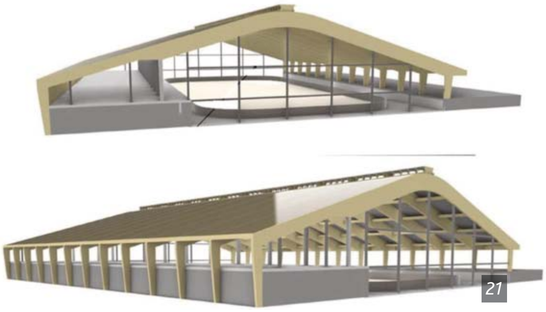


Figure 9. Tensoforma. Bretella Autostradale.
Figure 10. sbp: Wolfgang-Meyer Sportanlage, Hamburg.
Figure 11. SMS Campus.
Figure 12. Ephesus Roman terrace house.
Figure 13. Levante Stadium.
Figure 14. Plasencia Congress Centre.
Figure 15. Messe South Entrance Düsseldorf.





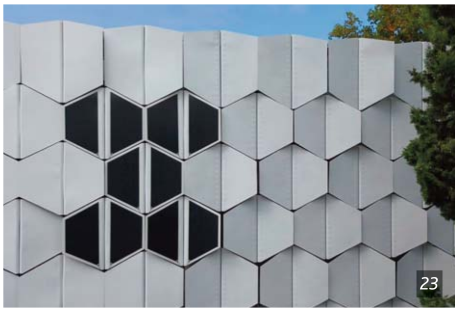


Figure 20. Scan of the environment and mesh. *Figure 21. Indoor skating ring.* *Figures 22-23. FlectoLine façade.*

Lightweight footprint: membrane design

Dl Dr.techn. Robert Roithmayr, formfinder GmbH.

Robert Roithmayr recalled basic aspects of membrane design such as curvature, sagging, waterponding, wind load, geometry and proportion. He also showed the 3D scan facilities provided by "formfinder", the design tool for proper design of tensile pre-stressed surfaces with light footprint. So that the environment can be scanned precisely to define a boundary and create a mesh (fig. 20).

The second part of the presentation was dedicated to Strategyfinder, a software platform to work with complexity. It enables a distributed team to visualize interconnections, uncover deep patterns and develop effective solutions. Working in distributed teams online has unique challenges since online discussions can be confusing and hinder progress. Instead Strategyfinder assists the collaborative work clarifying complex issues and making informed decisions. All voices are heard, interconnections become visible and shared insights emerge providing structures, method-based workflows to help teams understand complexity and develop sound, actionable solutions. It was illustrated with the design of an indoor ice-skating ring (fig. 21).

He finally showed the "FlectoLine Façade", the first large scale active outdoor demonstrator of responsive fiber reinforced façade shading elements to harmonize with their environment minimizing building energy consumption while maximizing comfort and functionality (figs. 22 and 23). The system calculates optimal panel angles by continuously analyzing real-time and forecasted inputs, ensuring efficient operation throughout the day and balancing occupant comfort, energy efficiency, and renewable energy generation. Thin-film organic photovoltaic cells are incorporated into the design to harvest solar energy, ensuring the responsive façade sustains its energy needs independently.

Beyond specialization: the expert's role in lightweight tensile fabric structures

Raju Mahadevan, Techno Specialist Consulting Engineers.

Raju Mahadevan introduced Techno Specialist Consulting Engineers as a civil and structural engineering company, committed to providing services taking up complete solutions for tensile fabric structures, roofs and canopies. Their specialized services cover all aspects of tensile fabric structures, encompassing feasibility studies and engineering, from the manufacturing to the installation processes. Projects include retail, leisure, health, residential, commercial, entertainment, institutional, transportation and sports, that require these kind of specialized engineering services: schematic design, detailed design development, structural analysis, production details, fabric patterning, tender specification, construction documents, third party review, checking, cost evaluation, analysis, value engineering and construction support services.

For the Anantara resorts in Sri Lanka the client challenge was to construct an iconic structure in the form of a coconut shell (figs. 24 and 25). Techno Specialist was appointed directly by the client to support the fabricator to address the needs of the architect. In this case the fabric acted only as a cladding that had to comply with the geometry of the tilted ellipsoidal domes.

The challenge of the tensile fabric roof for the Nagpur metro station was to build a unique structure above a working station supported by the existing steel structure (fig. 26). The role of Techno Specialist was to work in entire coordination with multi-disciplines and seek authority approvals including erection strategy. A combination of translucent and opaque fabrics was chosen to play with the shading.

The Ø120m cable supported structure for shade in Dubai needed comprehensive engineering from concept to detailing together with methods for fabrication and installation. They included tied tapered columns, cost optimization, generation of BIM models, adoption of CKD for framing aimed to quick installation and the generated fabric patterning using the Technet Easy software (fig. 27).

Figures 24-25. Anantara Resort, Sri Lanka. *Figure 26. Nagpur Metro Station.* *Figure 27. Gulf Fab Shade, Dubai.*

Projects

Designing for the future: embracing lightweight materials in versatile architectural solutions.

Antonio Diaferia, Maffeis Engineering SpA.

Antonio Diaferia showed 3 recent examples of application of membranes as building systems for exterior and interior envelopes.

The first was the Sulaibikhat football stadium in Kuwait that covers an area of 102.000m² for 15.000 spectators (fig. 28). Maffeis Engineering for Taiyo Europe GmbH carried out the full design of the ETFE cladding system including clamping and air distribution layout. Its roof and façade are clad with double layer ETFE inflated cushions anchored directly to the steel structure, with no need for subframe. The outer layer is printed to provide protection from solar radiation while the inner layer is transparent ensuring natural light transmission inside the stadium concourses. The cushions are completed with upper suction cables and lower ponding cables.

The ETFE façade of the Under Armour building in Baltimore offers a fluid continuous surface that envelops the building without adding excessive structural weight (fig. 29). It is a second skin for solar control and architectural expression, installed as a single-layer printed membrane allowing diffused daylight to penetrate, minimizing glare and reducing energy loads. With a thickness of 500µm, it is stretched across a series of vertical steel trusses fixed to the timber slabs. The edges are secured using aluminium clamping profiles, while horizontal stainless-steel cables provide additional tension control and wind resistance.

The third example was the added ceiling to the Grand Palais, Paris, to host the Olympic Fencing Games (fig. 30). A temporary shading solution was needed to protect the interior from direct sunlight without invasive anchoring and preserving the integrity of the historic structure. A PVC-coated polyester fabric was selected for its shading capabilities, fire resistance and light diffusion properties. It was suspended delicately across the vast spans, shaped to evoke classical drapery and respect the elegance of the architectural space. A previous mock-up made it possible to reduce the seams to a minimum.

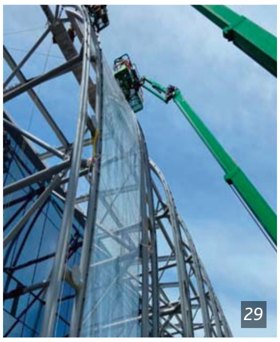


Figure 28. Sulaibikhat Stadium Kuwait.
Figure 29. Under Armour Building, Baltimore.
Figure 30. Temporary ceiling, Grand Palais, Paris.

Transparent and translucent roofs in open spaces.

Bernd Stimpfle, form TL.

With a collection of works made by form TL, Bernd Stimpfle illustrated the performance of the translucent and transparent membranes that provide not only protection against environmental impacts because they enrich the architecture by creating comfortable places. Structural membranes are characterized by their low self weight, wide span and high light transmission. The wide range of available materials gives many possibilities for architectural applications (figs. 31 to 45).

Translucent material provides shading, but in comparison with metal or other opaque materials, still a reasonable amount of natural light under the roof is provided. Transparent material like ETFE opens the view to the sky. Even with a dense printing still a relative clear view is possible so that also clouds and birds can be seen. Whereas in the evening or at night, illuminated membranes appear like a bulb, coloured or white and they can be used as projection screens.















Figure 31. Bundestagsarena.
Figure 32. Meilenwerk.
Figure 33. Botanic Garden Arhus.
Figure 34. Tropical Islands.
Figure 35. Bushof Aarau.
Figure 36. Lilientalhaus.
Figure 37. TemporActive Pavilion.
Figure 38. SMS Campus.
Figure 39. Velodrome Abuja.
Figure 40. Luigi Einaudi Campus, Torino.
Figure 41. Zanith Strasbourg.
Figure 42. La Nuvola, Roma
Figure 43. Batumi Stadium.
Figure 44. Rauwelten Pavilion.
Figure 45. Park Belval.

Integration of computational and CAD software in membrane structure projects

Lukasz Dlucik, abastran sp.z.o.o.

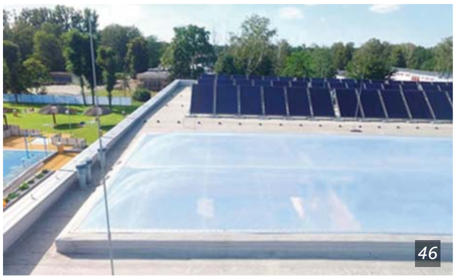
Lukasz Dlucik presented his company "abastran" dedicated to structural membrane design and implementation using SolidWorks, easy, Sofistik and AutoCad software. He showed some of their completed works such as the ETFE Kedzierzyn Kozle 2020 and the PVC summer amphitheatre in Szczecin, 2022.

The skylights of the swimming pool of the Activity Centre in Kedzierzyn Kozle have been covered with two longitudinal ETFE cushions with a total area of 102m² (fig. 46). They are stretched over the steel frames of the building and provide natural light. Additionally, the air supply system keeps the cushions in the right tension, which guaranties their durability and proper shape.

The Summer Theatre in Kasprowicz Park is the cultural centre of Szczecin and its architectural icon (figs. 47 to 49). It is one of the largest facilities of its kind in Europe. Designed by Zbigniew Abrahamowicz in the 1970s, it has been the venue for many important cultural events ever since. The reconstruction was carried out according to the winning concept of the British architectural firm Flanagan Lawrence, which aimed to preserve the original symbol of the amphitheatrethe reinforced concrete arch. In addition, the new roof was designed as a structure composed of membrane rhombuses, lined with special acoustic fabric on the underside to improve significantly the acoustics, which is crucial for the reception of musical and theatrical performances.

Last example was a tent-like structure supported by wooden A frames without concern for visible joints (figs. 50 and 51).

Figure 46. Activity Centre, Kedzierzyn Kozle.
Figures 47, 48 and 49. Summer Theatre, Krasprowicz Park.
Figure 50-51. Tent-like structure.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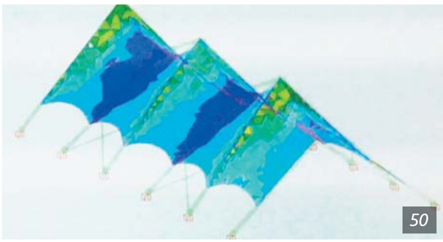
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Research

Tensile structures and energy benefit?

Rosemarie Wagner, Karlsruhe Institute Prof.

Rosemarie Wagner discussed some tests carried out to harvest wind and solar energy from membranes. As for the wind, in addition to traditional solutions (figs. 52 and 53), vertical axis windmills have been tested (figs 54 to 56).

She mentioned the energy efficient textile building, experienced in the Deutsches Institute für Textil und Farserforschung, Denkendorf, inspired by the polar bear as solar collector complemented with seasonal chemical heat storage (figs. 57 to 59). It was based on a multilayered membrane, including foils, black collector, insulations, spacers and cable nets.

Their combination resulted in an energy independent house with high solar and storage efficiency, able to manage the harvested energy in a seasonal level. The energy of the summertime is stored to wintertime, where it is needed without any technical losses.

She noted that the supposedly promising solution of combining PV modules with membranes faces the problem that PV modules are not flexible enough (fig. 60). To keep them flat, they could be fitted into a double curved cable net, resulting in an energy harvesting and sun protection device, which could be favourable for certain crops (figs. 61

Figure 52. Mandrakis windmill.
Figure 53. Chinese windmill.
Figure 54. Computer model of vertical axis windmill.
Figure 55. Physical model of vertical axis windmill.
Figure 56. Test of vertical axis windmill.


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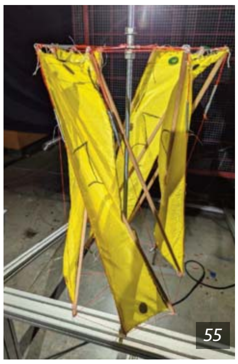
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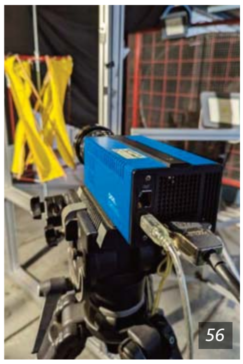
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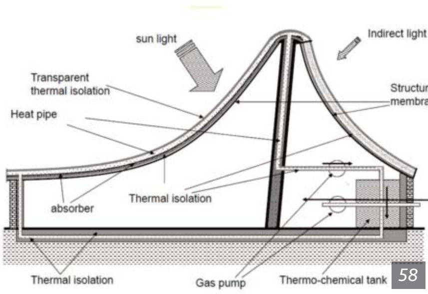
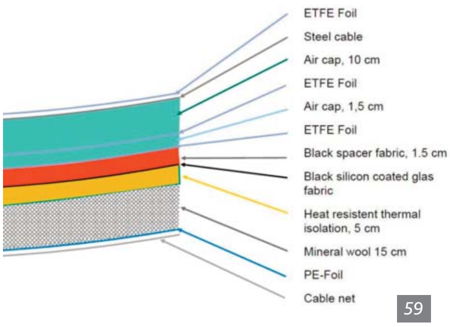
and 62). If a complete enclosure were necessary to obtain 100% coverage for waterproofing, a continuous membrane would have to be added, which would increase the cost considerably.





Figures 57, 58 and 59. Energy efficient textile building, Denkendorf.
Figure 60. PV modules with membrane.
Figure 61. PV modules with cable-net.
Figure 62. PV modules with cable-net. Detail.

Textile potentials. Of soft constructions and active materials.

Prof. Christiane Sauer, Weißensee School of Art and Design.

Professor Christiane Sauer proposed the use of fabrics, beyond passive and complementary applications for specific purposes to become a means of constructing, as the pioneers of textile construction did. Since ancient times, curtains have been used to configure or complete interior spaces (figs. 63 to 66).

She led the research "Architectures of Weaving" to encompass not just the crossing of warp and weft on a loom, but all textile construction techniques, as well as theoretical approaches such as woven mathematical topologies, and political contexts such as social fabrics or even trans-species practices like bacterial weaving. She presented several examples beginning with traditional practices such as woven bamboo houses (fig. 67) and black hair tents (fig. 68).

The woven paper bridge was inspired by muscle contraction. Two paper stacks were fixed and interleaved. Upon pulling the two stacks apart, a perpendicular force is created that holds the sheets together at the overlap region. As a result, the total friction between the sheets grows exponentially. A 4,5m length bridge was built which, with a weight of 55kg, is capable of supporting 400kg (fig. 69).

Wooden filaments can be triggered by environmental stimuli such as temperature or humidity. The cell walls of wood consist of cellulose micro fibrils that swell with humidity (fig. 70). This causes the plant structure to move, twist or bend in relation to the angle and orientation of the micro fibrils, so its behaviour can be programmed. Shape memory alloys (SMAs) are smart metals that react to temperature by changing shape. The research prototypes Adaptex Mesh (fig. 71) and Adaptec Wave (fig. 72) use the SMA wire as filament for a textile structure. This enables to transfer its performance onto a building scale using temperature to close or open their textile structure.

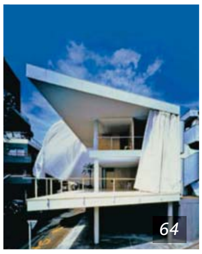
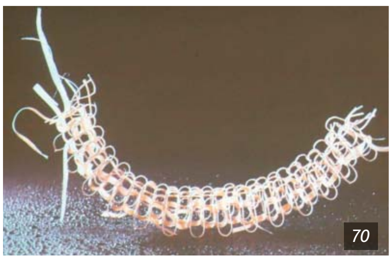
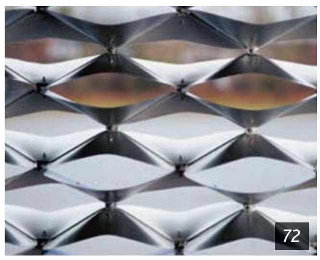


Figure 63. Changing the space with curtains: Lily Reich & Mies.
Figures 64-65. Changing the space with curtains: Shigeru Ban.
Figure 66. Changing the space with curtains: Aires Mateus.
Figure 67. Woven bamboo house.
Figure 68. Black hair tent.
Figure 69. Paper bridge.
Figure 70. Humidity changes the form.
Figure 71. Adaptex Mesh.
Figure 72. Adaptex Wave.





Self-cooling textiles. Energy free method using radiative cooling technology

PD Dr.-Ing. Thomas Stegmaier, DITF, Denkendorf.

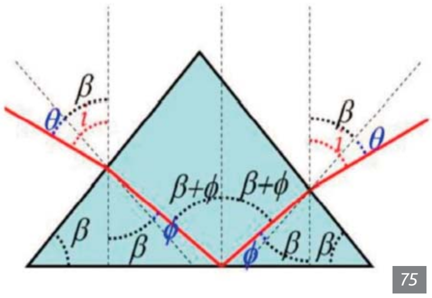
Due to climate change, population increase, and the urban heat island effect (UHI), the demand for cooling energy, especially in urban areas, has increased and will further increase in the future. Conventional solutions for cooling consume a lot of energy and produce additional waste heat and CO2 emissions (fig. 73). Instead, nature offer heat protection when needed. It is the case of the silver ant (fig. 74), one of the land creatures best adapted to high temperatures of the Sahara, Sinai and deserts of the Arabian Peninsula under >50ºC daytime temperatures. The heat protection enables the silver ant to come out of their nest at lunchtime to look for heat-stricken animals. Due to its hair triangular geometry, the light is completely reflected back, depending on the angle of incidence (fig. 75).

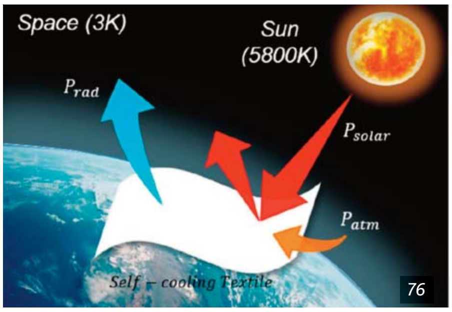
Technologies such as radiative cooling offer a sustainable and energy-free solution. Radiative cooling is a common process in which a surface loses heat through thermal radiation. Effective daytime cooling is realized when the emitted thermal radiation exceeds the absorbed solar and atmospheric radiation (fig. 76).

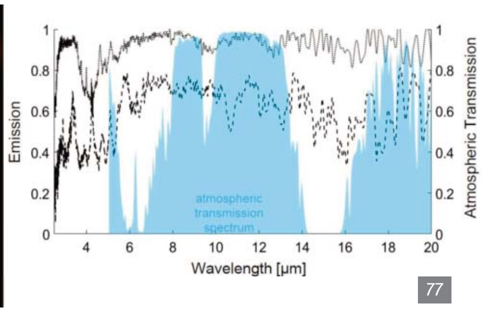
This research describes the development of a novel substrate-independent coating with spectrally selective radiative properties. By adapting the coating parameters and combining low-emitting and solar-reflective particles, along with a matrix material emitting strongly in the mid-infrared range, substrate-independent cooling below ambient temperature is achieved (fig. 77).

Moreover, the coating is designed to be easily applicable, with a low thickness, to ensure high flexibility and scalability, making it suitable for various applications such as membrane architecture, textile roofs, or tent construction. The results show a median daytime temperature reduction.

Figure 73. Conventional solution for cooling.
Figure 74. Silver ant.
Figure 75. Triangular geometry.
Figure 76. Psolar: solar radiation; Patm: atmospheric downward radiation; Prad: thermal radiation between 8-13µm.
Figure 77. Upper curve: textile with cooling coating. Lower curve: textile without coating.







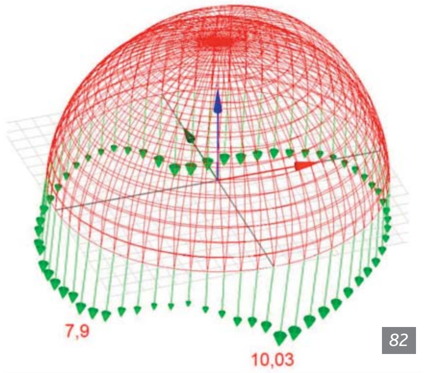
DWA Conform static dimensioning of gas storages

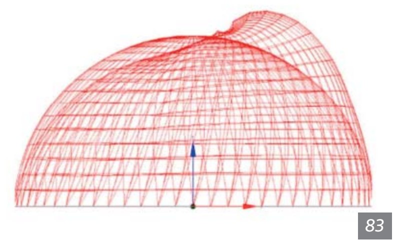
B.Sc. Oliver Lippert, Ryklin Engineering.

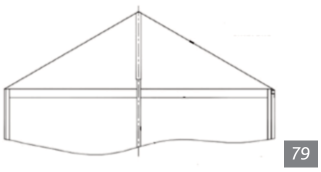
Oliver Lippert attempted to compare different guidelines for the static analysis of biogas membrane storage systems (fig. 78), including the DWA-M377 "Biogas storage systems-Ensuring the usability and load-bearing capacity of membrane covers" and DIN 4134 "Air-supported structures; structural design, construction and operation".

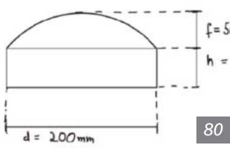
Models included were the cone shaped (fig. 79), 1/4 calotte (fig. 80) and hemisphere (fig. 81) considering inner pressure, wind (pressure or suction) and snow loads.

He showed the results regarding stresses, forces (fig. 82) and deformations (fig. 83) finding significant differences. The study could have been more complete including different temperatures, pressures, volumes, filling level of biogas and material properties.









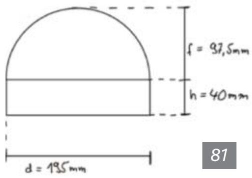


Figure 78. Biogas storage with membranes.
Figure 79. Cone shaped.
Figure 80. 1/4 Calotte.
Figure 81. Hemisphere.
Figure 82. DIN EN resulting forces.
Figure 83. DIN EN deformation x 3

A Photogrammetric based method for surface stress and strain measurement

Xuetao Zhao, Shanghai Jiao Tong University.

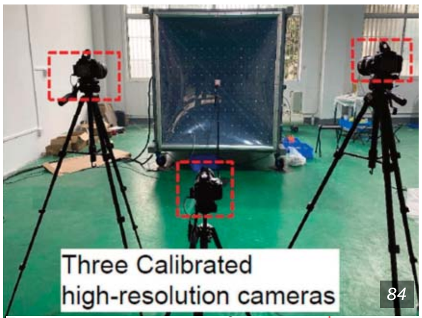
Xuetao Zhao presented an interesting method for measuring strains based only on geometry, assuming that the stress/strain relationship is known. It is based on photogrammetry and applicable to large surfaces.

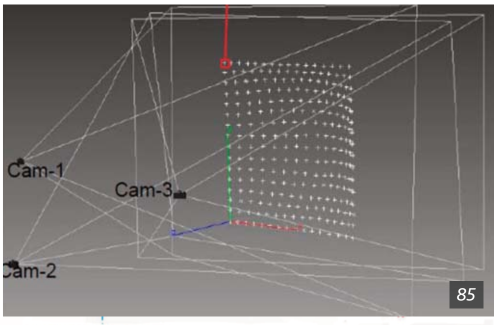
The surface, previously marked with reference points, is photographed with high resolution cameras (figs. 84 and 85). Deformations are measured and stresses computed.

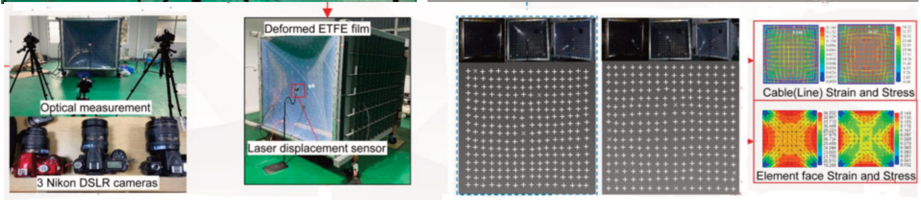
Two methods were applied (fig. 86):
1) from the virtual cable network the elongations were measured, the cable strains and, the cable stresses (resorting to stress-strain curves).
2) from triangular face elements delimited by the surface point-cloud array, the deformed geometry is measured, the element strains and from this data the element stress distribution.

The procedure was verified testing an 1x1m ETFE specimen together with a finite element analysis which led to the following conclusions:
• The two methods are valid and accurate for measuring strains in large sizes and deformations.
• The computation complexity of the triangular element method is higher but its results are more precise.

Some limitations were also mentioned:
• The constant strain element assumption is not accurate enough in large size surfaces.
• Stress estimations depend on material properties which rely on tests.







Suction load	4 kPa				12 kPa			
	Max LE	Error	Max S	Error	Max LE	Error	Max S	Error
Method 1	0,02	-13%	17,36	-4,2%	0,152	-4,4%	34,70	+2,8%
Method 2	0,021	-8,7%	17,57	-3,1%	0,152	-4,4%	34,68	+2,8%
FEA	0,023	-	18,14	-	0,159	-	33,73	-
LE=principal strain; S=principal stress								

Figure 84. High resolution cameras.
Figure 85. 3D measurement.
Figure 86. Verification of the two methods employed (cable network and triangular elements) and results.

Products

Modern solutions for traditional requirements: Antalya fruit wholesale market

Bahadir Senol, snl tensi

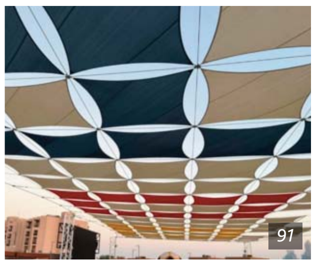
SNL tensi is specialized in steel wire ropes and load tensioning elements, with expertise in tensioning systems and providing steel wire ropes ad fitting equipments with in-house production capabilities delivering fast project-specific solutions with technical support.

For centuries, marketplaces have been the heart of civilizations, where merchants trade, cultures meet, and communities thrive. Despite the passage of time, the demand for reliable, durable and aesthetically pleasant shading systems has remained constant. Increase of efficiency, reduction of energy consumption and sustainable agriculture can be reached by combining traditional market needs with modern technology. As the demand for high-quality agricultural products grows, so does the need for well-designed market infrastructures, such as the Antalya Wholesale Fruit Market. The goal is to protect the products from the harsh sun and heat, create healthier storage conditions and improve productivity.

The Antalya Wholesale Fruit Market Project required a custom-designed shading system to increase market functionality and efficiency, with 5.000m² of total shade area (figs. 87 and 88).

Other realizations are the Misir Mall of Arabia, the Atakoy International Youth Centre, Istanbul and the FIFA Düya Kupasi (figs. 89 to 91).

Figures 87-88. Antalya wholesale fruit market. The approach of snl tensi focused on: • High-strength steel cables and membrane materials, ensuring resistance to Antalya's high temperatures and strong winds. • Light and robust design, maximizing coverage while minimizing structural loads.
Figure 89. Misir Mall of Arabia.
Figure 90. Atakoy International Youth Centre, Istanbul.
Figure 91. FIFA Dünya Kupasi.



Beyond the surface: the art and science of architectural façade mesh

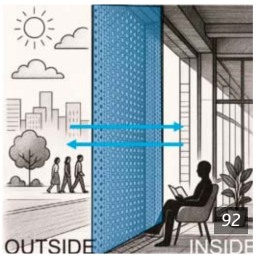
Maxime Durka, Sioen.

New Sioen façade meshes were presented by Maxime Durka for the purpose of satisfying specific conditions and requirements (fig. 92).

Among many applications, he mentioned:
• improvement of energetic performances, as in the King Saud Medical City, Riyadh (figs. 93 and 94)
• creating additional structures on top and around existing buildings as in the King Fahd National Library, Riyadh (fig.95)
• reusing sails, as in the Luna Rossa America's Cup Base, Valencia (fig. 96)
• creating transitions as in the "Cours d'Appel", Fort de France (fig. 97)
• reducing noise pollution as in the Central St.Giles Court, London • lightweight sustainable building practices such as passive airflow, solar shading and visual privacy as in Al Bahar Towers, Abu Dhabi (fig. 98)
• creating iconic structures as the Burj Al Arab Hotel, Dubai and the Thyssen Krupps Tower, Rottweil.

In short: building pertinent systems with adapted materials.

Figure 92. Textile façade systems must play a role.
Figures 93-94. King Saud Medical City, Riyadh.
Figure 95. King Fahd National Library, Riyadh.
Figure 96. Luna Rossa America's Cup Base, Valencia.
Figure 97. "Cours d'Appel", Fort de France.
Figure 98. Al Bahar Towers, Abu Dhabi.



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Textile netting constructions: from granulate to the application

Achim Wichtler, Manfred Huck GmbH..

An introduction to the nets produced by Manfred Huck GmbH was presented, comprising around 1.000 different types of knotless nettings. It is a wide variety of nets with thicknesses ranging from 0.5 to 22mm, mesh openings between 5 and 360mm, various mesh designs and colours. General, safety related requirements and test procedures are regulated by "EN 1263 (1) Safety nets" and "EN 1176 Playground equipment and surfacing".

Manufacture is divided into two processes: the net fabric (with its production, cut and connection) and the confection of the net overlapping the edges and pulling in the edge ropes. In the case of knitted, knotless nets made of multifilament yarns, the manufacture in a large machine width means fewer joints in the mesh panel for higher quality and productivity. In the braided knotless nets the yarn is braided, not knitted. As a result, the net has minimal elongation and high breaking strength suitable for cages for American football, cricket, baseball, catamaran nets and work platform nets (table 1 and figs. 99 and 100).

Wire rope nets are also possible for enclosure and protection of playgrounds and sport fields (fig. 101) and horizontal nets for fall protection (fig. 102).

Figure 99. Work platform net.
Figure 100. Side protection (railing net).
Figure 101. Wire rope net for enclosure and protection.
Figure 102. Horizontal net for fall protection.
Figures 103-104. 685 kg rock fall test on Ø 6mm wire rope net, mesh size 100mm and specially produced steel frame.


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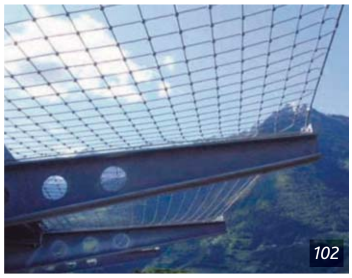
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	Construction	Flexibility	Durability	Application
Knotted	Individual ropes are knotted or connected at the knot points. Knots provide stability	Knots restrict the flexibility of the ropes.	Knots can curl, loosen or wear out over time. The durability is reduced by displaced knots	Fishing Sports Agriculture
Knotless	Smoother surface and less material	The nets are more adaptable and soft	More stable and higher structural durability	Building Industry, sports, safety nets

TABEL 1

Comparison of knotted with knotless meshes. Knotted meshes are not as flexible as knotless meshes and therefore they are more suitable for applications that require more stability.


103


104

Manufacture

High frequency welding solutions

Björn Bojara, FIAB HF.

Principles of HF-Technology: • Material is placed between upper and bottom electrodes (under pressure)
• Upper electrode is connected to RF supply (moves up and down during welding)
• Lower electrode is connected to electrical earth
• RF generator converts energy from supply network to radio frequency (usually 27,12 MHz)
• Dipole polarization process (orientation of dipoles is changing 27mln times a sec to follow reversing electric field)
• Internal molecular friction heating
• Materials melt and fuse to produce a strong weld.

The range of FIAB welding machines (fig. 105) for tarpaulins, halls, roofs, furniture, automobile industry, tents, outdoor advertising, stretched ceilings, water and gas tanks and oil barriers (among others) includes:
• FIAB 960 with Impuls welding: 2 in 1 machine with quick switching between the two welding technologies.
• FIAB 860 and FIAB HPS mini new welding solutions smaller and cheaper.
• FIAB Spider XYZ for large pieces.

105


106

Figure 105. FIAB Welding machines.
Figure 106. Projects made with FIAB machines.

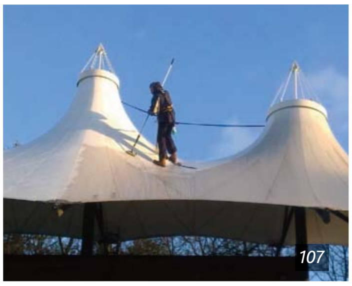
A selection of projects made with FIAB machines was also shown (fig. 106).

Maintenance

Give a little love to your structure

Aoife Brennan, Fabric Architecture.

Aoife Brennan made a timely call to action regarding the need for maintenance (figs. 107 to 109). She mentioned the need for extending the life cycle, reducing the carbon footprint and extending the customer satisfactions. Canopies can be subject to vandalism, wind damage, dirt and grime, missing sections, lack of care and lack of knowledge (figs. 110 to 112). Focus is needed on installers, fabric components, cables, fixings, steelwork and also increasing the awareness of the costumers.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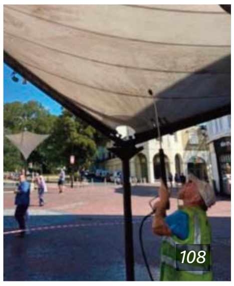
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111


112


113

Maintenance must be considered. A proactive maintenance programme is recommended that could mean the difference between the structure lasting 10 years or 50 years. Cleaning tensile fabrics preserves their long-term integrity

This should happen every 12 months with warm soapy water. It's important to design access for this maintenance into the structure with lugs for harness connections to enable appropriately qualified riggers to walk safely on the canopies, which can easily support the weight of several people.

Inspection and maintenance can be carried out by specialized companies such as Fabric Architecture, that also develops, manufactures and builds projects of tensile fabric structures (fig. 113).

Figures 107, 108 and 109. Maintenance and inspection.
Figure 110, 111 and 112. What can go wrong?
Figure 113. Chester Racecourse by Fabric Architecture

Practical project and workshops

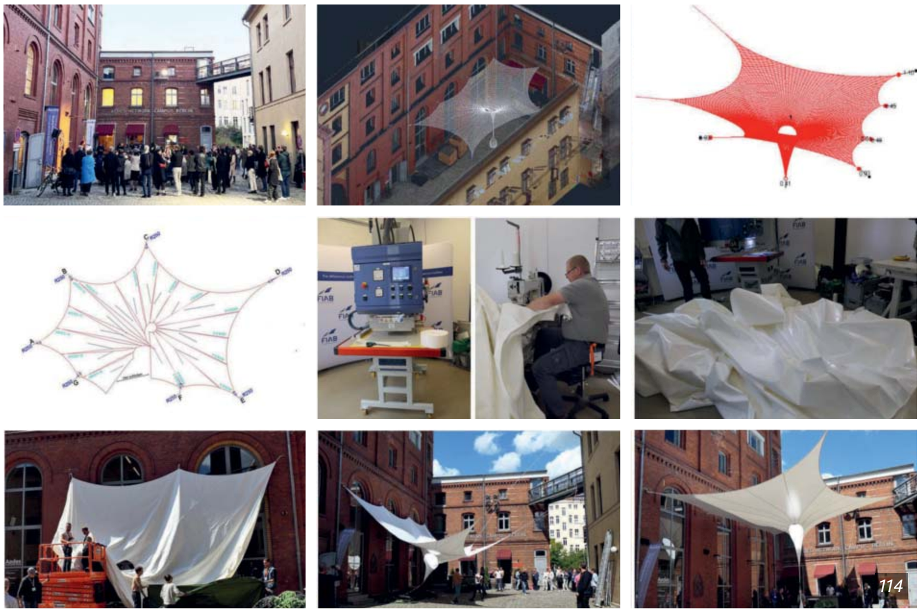
Experimental project Aedes Gallery.

Formfinding and patterning: *Technet GmbH, Dieter Ströbel.* - Fabric*: Sioen Industries NV; Maxime Durka.* Welding machine: *FIAB Sp. Björn Bojara.* - Confection (HF): *Karsten Daedler, Karl Matthies.* - Webbings (stitching): *Stoffdach GmbH, Janek Jeschke.* - Installation*: 3dtex, Stev Bringmann.*

A temporary cover was designed and built for the Aedes Architectural Forum courtyard. So that the intervention affected the existing building as little as possible, a funnel was designed to be anchored to the walls without drilling and the low point tensioned by a water bag instead of an anchor (fig. 114).

Workshops and tension tests.

In parallel, physical *(Ruy Pauletti and Josep Llorens)* and computer modelling *(Technet GmbH)* workshops and tensile tests *(Claudius Dangel)* were carried out (fig. 115).



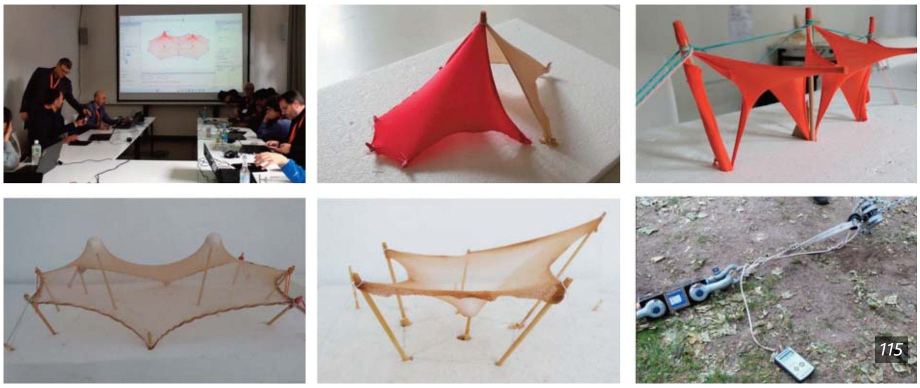
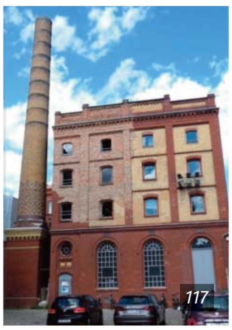


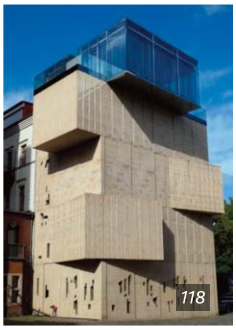
Figure 114. Design and installation of the experimental project.
Figure 115. Computer, physical modelling and tension test.

The venue

Dunya Bouchi, AEDES Metropolitan Laboratory.

Textile Roofs took place at the AEDES Architectural Forum in the former industrial complex at Pfefferberg in Berlin-Prenzlauer Berg (figs. 116 and 117), which has since become home to the studios of artists as well as the Tchoban Foundation, Museum for Architectural Drawing and the ICI Berlin (Institute for Cultural Inquiry).





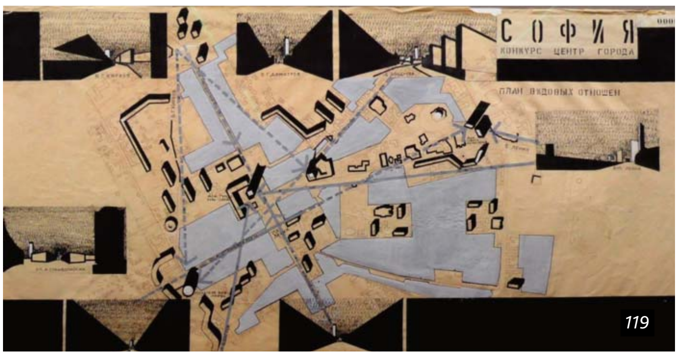


Figure 116. Pfefferberg Brewery 1900.
Figure 117. Pfefferberg Brewery today.
Figure 118. Museum of Architectural Drawing.
Figure 119. Russian constructivist drawing.

AEDES Architectural Forum is an internationally independent network platform for the exhibition, discussion and mediation of contemporary space making. It was established in 1980 as the first private architecture forum in the world. It is complemented by the AEDES metropolitan laboratory, founded in 2009, it curates an international discussion and enquiry programme. Its goal is to foster an interdisciplinary dialogue on spatial design, while framing it within broader societal contexts and provide a space for the next generation of architects and planners to explore and experiment.

Also belonging to the former Pfefferberg brewery, the Museum for Architectural Drawing (fig. 118) appears as a striking four-storey solid corpus made of sculptural concrete topped by a glass penthouse. It contains outstanding drawings made by architects from the 16th to the 21st century with a focus on Russian Constructivists (fig. 119).

Social programme

Textile Roofs was completed with a barbecue in the Aedes garden, the cruise on the "Kaiser Friedrich", built in 1886 and refitted with an emission-free drive system (fig. 120), and the workshop banquet at the Pfefferberg Schankhalle in the brewery founded in 1841 by the Bavarian Joseph Pfeffer (fig. 121).

Figure 120. Kaiser Friedrich cruise.
Figure 121. Pfefferberg Schnakhalle.

Prof. Dr.-Architect Josep Llorens
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This report is a summary of the presentations during Textile Roofs 2025. Concerning copyrights see the contributions of each author.

TEXTILE ROOFS 2026

The twenty-eighth International Workshop on the Design and Practical Realisation of Architectural Membrane Structures will be held on 26th to 28th of April 2026 in Berlin. Its format will be similar to that of TR 2025, with seminar-style lectures and hands-on activities. The main objectives of the workshop are to provide fundamental information, as well as presenting the state-of-the-art in textile roof engineering. More information at: https://www.textile-roofs.com.

Europe Membrane Structures Market Key Highlights, Sustainability, Future Outlook & Size 2026-2033

Key Highlights

- Europe's membrane structures market is witnessing accelerated growth in public infrastructure and event venues, with tensile architecture adoption rising by over 8% YoY.
- PTFE-coated fiberglass and ETFE films are gaining momentum due to superior durability, UV resistance, and self-cleaning capabilities—positioning them as future-proof materials.
- Germany, France, and the Nordics are leading in sustainable urban development projects, fueling demand for eco-friendly, lightweight membrane solutions.
- Smart membrane systems integrated with IoT sensors and AI-based structural health monitoring are being rapidly prototyped across high-value commercial projects.
- The sports and recreation sector remains the dominant application area, while transportation hubs and retail complexes emerge as high-growth verticals.
- Market players are intensifying R&D investments into recyclable, modular membrane designs—driven by evolving EU regulations and green-building certification standards.

Download Full PDF Sample Copy of Europe Membrane Structures Market Report @ https://www.marketsizeandtrends.com/download-sample/596800/?utm_source=Pulse-NSB-Aug7-EU&utm_medium=376&utm_country=Europe

A sample of recent projects from the TensiNet database:
https://www.tensinet.com/index.php/projects-database/projects

"GADGET" - AN ARTWORK BY OLAF NICOLAI
Type: Membrane | Location: Germany | Gallery: 13

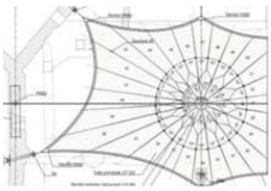
"SPINNE" PH LUDWIGSBURG
Type: Membrane | Location: Germany | Gallery: 5

001 HACIENDA REAL, RESTAURANT
Type: Membrane | Location: Guatemala | Gallery: 7

ALLIANZ FIELD STADIUM
Type: Membrane | Location: United States | Gallery: 1

ENTRANCE CANOPY FOR TORNASCENT CARE
Type: Membrane | Location: India | Gallery: 2

HASAN KALYONCU UNIVERSITY
Type: Membrane | Location: Turkey | Gallery: 4



KOERICH CASTLE, TENSILE MEMBRANE COVERING
Type: Membrane | Location: Luxembourg | Gallery: 5

TEXTILE ENVELOPE FOR TEXTILE ACADEMY NRW
Type: Membrane | Location: Germany | Gallery: 9

WALKWAY CANOPY THE LINK
Type: Membrane | Location: Australia | Gallery: 7

Membrane Magic
at Gruž Market
Croatia

What does it take to successfully revitalize a market space?

Last year SATTLER PRO-TEX was proud to contribute to an outstanding project in Croatia. Our membranes were used for a moveable roof which revitalized an important place in Dubrovnik. Illuminated parts in combination with special membranes create the most spectacular atmosphere.

UNESCO World Heritage Known from Star Wars

Dubrovnik, a city with a history going back to the 7th century, is located at the southern tip of the Dalmatia region of Croatia looking out onto the Adriatic Sea. The city boasts with many old buildings, such as the oldest arboretum in the world, which dates back to 1492 and the oldest pharmacy in Europe, founded in 1317. The city's architectural heritage was recognized very early and quickly added to the UNESCO list of World Heritage Sites. The city's beauty can be seen in parts of the Star Wars movies as well as in the HBO series Game of Thrones. The outstanding medieval architecture and fortified old town are held in great respect and safe guarded by strict requirements of the conservatory for the preservation of cultural heritage. So, what a challenge to revitalize Gruž Market!

Vision and Implementation with Special Membranes

The vision of the market was created by architects Dinko Peračić and Miranda Veljačić from ARP, the realization of the rotating roof was meticulously planned and implemented by Belina d.o.o. – with the best available fabrics to withstand the Mediterranean climate and the gushes of storm from the sea. We are of course talking about ATLAS by SATTLER PRO-TEX. With its special coating it stays white for longer and withstands harsh climatic conditions.

The special feature is an advanced moveable roof that rotates along a longitudinal axis, allowing for optimal space ventilation and adaption to weather conditions.

A series of large triangular prisms protect from sun, wind and rain. Nine identical three-sided prisms, tightly wrapped in SATTLER PRO-TEX membranes that enable light transmission, were installed within and outside of the contours. In that way, the market space is a unified, compact public building. When the awnings are opened, light and air pass through without obstructing the view of the heritage building. In case of rain, the awnings can be closed by slow, hydraulically driven axles. The space underneath remains well-lit and airy, yet still protected from the weather conditions. The rotatable parts are illuminated from within providing light for the entire market and creating the most magical atmosphere. The roof made of lightweight and durable membranes, CANDY 684 and ATLAS Architecture Type II 739, is designed to provide a pleasant ambience in all seasons, meet the strict requirements and still blend in harmoniously.

Supporting Community Life

Gruž Market is the most favorite place for locals to buy fresh meat, vegetables, flowers and more importantly - this morning's fish! Next to the sea, the fish is brought right in from the fishing boats to the market stands. Now the market meets the highest standards selling fish no longer in plastic grates but on ice. Outside of market hours, Gruž Market is a place of lively community life - whatever the weather. This revitalization brings fresh, dynamic architectural design to a key location, transforming the space into a vibrant and welcoming destination for all, while still honoring the existing style.

Textile membranes are playing an increasingly important role in shaping forward-looking architecture.

Mag. Gudrun Rath
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Slobodan Vučićević
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Project Name:	Reconstruction of open market in Gruž, Dubrovnik
Location:	Obala Stjepana Radića 21, 20000 Dubrovnik, Croatia
Client (Investor):	Sanitat d.o.o. Dubrovnik
Function of the Building:	Open market
Type of Application of the Membrane:	Tensile structure
Year of Construction:	2023
Architects:	Dinko Peračic
Structural Engineers (Roof):	Belina d.o.o., Mirko Lež
Consulting Engineer for the Membrane:	R&D Belina
Engineering of the Controlling Mechanism:	Davor Derniković
Main Contractor:	Magnum Supra d.o.o.
Tensile Membrane Contractor:	Belina d.o.o.
Supplier of the Membrane Material:	SATTLER PRO-TEX GmbH
Manufacture and Installation: B	elina d.o.o.
Material Used:	759 11C | ATLAS Architecture Type III TFL
Covered Surface (Roofed Area):	21,6x37,8m