

REPORT

## TEXTILE ROOFS 2022

## TEXTILE ARCHITECTURE FEST

PROJECTS

### "L'ARC DE TRIOMPHE, WRAPPED"



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**Tensinet** 2022  
partners

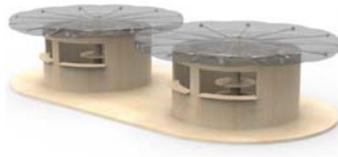
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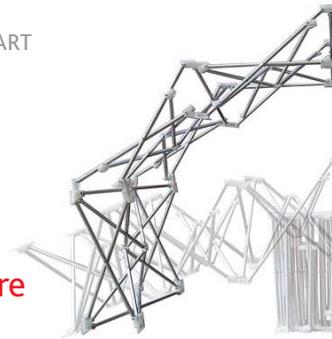
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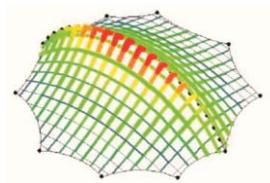
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# Edito

Dear Reader

I am sure all of you enjoyed to meet again in presence in different events happening this year. Textile Roofs took place in Berlin, as well as the Techtexil fair in Frankfurt, where we held our annual general meeting. Followed up by Contess 2022 in Brixen and the Essener Membranbau Symposium, there will now be soon the Advanced Building Skins Conference in Bern. TensiNet will chair two sessions and will have again a booth. The conference is be rounded up by our TensiNet and Friends meeting at the end of the first conference day. I hope that many of you have the chance to come.

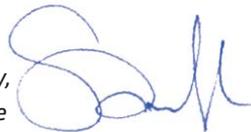
We are now official Partner of the New European Bauhaus, an initiative connecting the European Green Deal to our living spaces and experiences. Our partner, the Politecnico di Milano hosted The Architecture Fest, a side event of the Festival of the New Bauhaus in the TemporActive Pavilion, which was installed first in 2019 for our TensiNet Symposium in Milan. Earlier this year they hosted also the Textile Architecture Week in this pavilion. You find two articles in this TensiNews about the two events.

Just a few weeks ago, the future Technical Specification for membrane structures prCEN/TS 19102 has been submitted to CEN for formal approval. Our working group Specification and Eurocode has contributed to this document in order to make this standard become real. Please vote for it, or encourage the relevant people in your country to do so.

In only a few months we will have our 7th International TensiNet Symposium "Membrane architecture: the seventh established building material. Designing reliable and sustainable structures for the urban environment", taking place in Nantes beginning of June 2023. You find detailed information in this TensiNews, on our website, and on the conference website. As first teasers you can find here an article of a keynote lecture about pneumatic temporary structures, and an article provided by Jörg Tritthart about the Wrapped Arc de Triomphe, whose film on the progress between summer 2019 and the dismantling in October 2021 will be shown.

Please enjoy this issue of TensiNews and I hope to meet you soon.

Yours sincerely,  
Bernd Stimpfle



## Forthcoming Events

Please verify if events haven't been cancelled, postponed or replaced by a tele-conference due to COVID 19 virus



IFAI EXPO | 12-14/10/2022 | Charlotte, NC 28202 USA | <https://ifaexpo.com/>



International Conference on Advanced Building Skins 2022 | 20-21/10/2022 | Bern, Switzerland | [www.abs.green](http://www.abs.green)



Textile Roofs 2023 | 3-5/05/2023 | Berlin, Germany | [www.textile-roofs.com/](http://www.textile-roofs.com/)



TENSINANTES 2023 TensiNet symposium at Nantes Université | 7-9/06/2023 | Nantes, France <https://tensinantes2023.sciencesconf.org/>

## Advanced Building Skins 2022 Conference and Expo - 20-21/10/2022

TensiNet will be present at Advanced Building Skins 2022 with interesting presentations and a TensiNet booth

### SESSION Architectural Membranes for High-performance Building Skins

Chair Marijke Mollaert

- Fabric façades from recycled PET bottles  
Katja Bernert, Mehler Technologies
- Special grades of ETFE film for unique projects  
Ben Runhaar, AGC Chemicals Europe
- Prediction of rain noise in large halls covered by structural skins  
Monika Rychtarikova, KULeuven
- Transparent ETFE cushion roof - Fridolin Mall, formTL
- Moveable structures as 5th skin  
Christoph Paech, schlaich bergemann partner
- The long way to 1000m<sup>3</sup> ETFE-Cloud  
Thomas Toepfer, se cover

### SESSION Building a Sustainable World

Chair Carl Maywald

- Membrane structures and embodied carbon reduction  
Marijke Mollaert, Vrije Universiteit Brussel
- How can teaching influence the understanding of sustainable construction? - Heidrun Bögner-Balz, HFT Stuttgart

### SESSION Life Safety and Fire Prevention in Façades

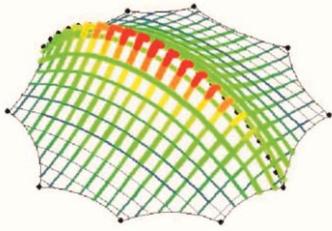
Chair Zomraude Chantal Chalouhi

- Classification of façade structures regarding fire safety  
Carl Maywald, Vector Foiltec
- Non-combustible vertical façade membranes  
Allan Hurdle, Serge Ferrari

Thursday 20th October 2022

18.00 – 19.00 TensiNet & Friends meeting

# TEXTILE ROOFS 2022



*Textile Roofs 2022, the twenty-fifth International Workshop on the Design and Practical Realisation of Architectural Membranes, took place on 9–11 May 2022 at the Archenhold Observatory, Berlin, and was chaired by Prof. Rosemarie Wagner (Karlsruhe Institute of Technology) and Dr.-Ing. Bernd Stary (Academus GmbH). It was attended by 104 participants from 18 countries covering three continents. Once again, the attendance demonstrated the success of the event, which has become firmly established since it was first held in 1995.*

## The energy of the early days, how Textile Roofs began...

Dipl.Arch Horst Dürr, ETH Zürich

Horst Dürr, in the first presentation referred to the motivation behind Textile Roofs. He qualified in 1995, the year of Textile Roofs' birth, as belonging to the Frei Otto era, characterized by a new building technique born in 1954 from the collaboration between Frei Otto and Peter Stromeyer. Four relevant works from this period were mentioned: the Music Pavilion, Kassel 1955; the High Tension Test Station, Köln 1962; the convertible roof of the open air theatre in Bad Hersfeld 1968 (Fig. 1) and the German Pavilion at the Expo Montreal 1967. "They arose the credo of textile buildings in Germany". There were major changes in the material development, especially due to the company Verseidag. The need for those buildings was created by some architects, for example AIC, together with engineers like Schlaich & Bergermann, IPL and IF. They made it possible to calculate the stability. Textile manufacturing companies should also be mentioned as Cenotec, Koch, Canobbio and Pfeifer because they developed the manufacturing methods and the necessary details. Installation companies should not be neglected either, and more important, the energy of that time that came from motivation, will, perseverance, interest, curiosity and enthusiasm. In the nineties Lothar Gründig founded TechNet, an engineering office. He was appointed to the Geodesic Institute of the University of Berlin and in 1995 he organized together with Bernd Stary the first public lectures on Textile Roofs bringing together experts from all over the world so that civil engineers, clients, architects and manufacturers met. Different tasks were dealt with such as professional experience, knowledge, factory information, problem solutions, etc. In addition, students worked in small groups while the majority of presentations were on work reports on the buildings of the past year, publicity and research. The client architects were a bit neglected because the engineering aspects prevailed but it's necessary to take into account that buildings have two fathers: the architect and the engineer. At present, times have changed the way and methods that architects and engineers work. Sustainability, climate, and digitalization have emerged, and more and more applications will be found. In addition, "old makers" are retiring and there is a lack of experience, so the decision of a builder for a textile building is becoming more difficult. It would therefore be advisable to make some changes to Textile Roofs incorporating new people, new working fields and new materials and above all insufflating again motivation, will, perseverance, interest,

curiosity and enthusiasm. He ended with a special mention to Bernd Stary and Lothar Gründig.



*Figure 1: Convertible roof of the open-air theatre in Bad Hersfeld 1968 (replaced in 2019).*

## 1. DESIGN

### Computational modelling

Dipl.Ing Jürgen Holl, technet GmbH

Jürgen Holl went into some important aspects of computing: model generation, form finding, statics, patterning and automation.

A computer model tries to represent the main features of the reality by sufficiently simple geometric and mechanical assumptions including discretization, boundary conditions and topology.

The form finding is the search for a geometry in equilibrium, with ideal force flow, and a favourable distribution of membrane stresses, considering aesthetic and constructional aspects. It should include bending elements if any in order to end up with the desired pre-stress. Static analysis is based on a non-linear system that need approximate values, material properties and external loads.

It achieves a solution with the energy method provided that equilibrium, material law and geometrical compatibility are fulfilled. Regarding the external wind loads,  $C_p$  values and load zones can be obtained through a digital wind tunnel test. In addition, the model integrates the membrane and its structural support to take into account the significant interaction between them. It has been illustrated by a chambered pneumatic structure confined in a ring subjected to bending. Disassembling them, as it is often done, leads to 0,5m of maximum deflection and 30.000kNm of maximum bending moment, while in the hybrid system these values decrease to 0,25m and 18.000kNm respectively. Therefore, separation of nonlinear lightweight systems is an imprecise and expensive estimation. The task of cutting pattern generation is to bring a double-curved pre-stressed surface onto a flat material of limited width to build up the shape modelled in the computer. The patterns are strips as straight and wide as possible with a reduction on size to give rise to the pre-stress when they are assembled. It is also worth checking the corresponding seam lines of the same length, especially in very curved surfaces. Cutting patterning generation can be automated as