TensiNews

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

REPORT

TEXTILE ROOFS 2019
TENSINET SYMPOSIUM 2019

PROJECT

TEMPORACTIVE
An Ultra-Lightweight Temporary Pavilion

CONSTRUCTION DETAIL OF THE TEMPORACTIVE PAVILION, TEXTILESHUB POLIMI

TensiNews INFO

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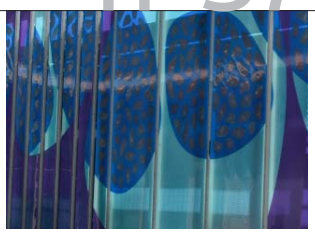

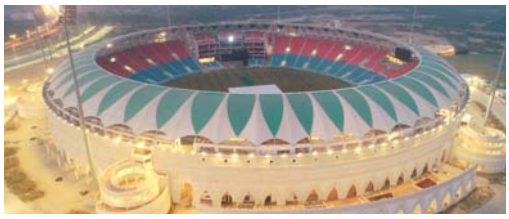

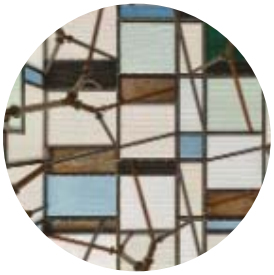

Edito

Dear Reader

A lot of exciting events happened in the first half of this year, Textile Roofs in Berlin and the Techtextil fair in Frankfurt took place, together with the award ceremony for the fifteenth Student competition 'Textile Structures for New Building'. The first prize for Macro Architecture is show herein.

Just before the summer we held our 6th TensiNet Symposium "Softening the Habitats" in Milan. If you had been there you certainly agree that it was a great success. We enjoyed three days with excellent presentations, we have seen contemporary or historical architecture and we have had many fruitful discussion. Again Josep Llorens was so kind to prepare a summary of the TensiNet Symposium and of Textile Roofs too.

Just in time during the night before the TensiNet Symposium a prototype was installed. This pavilion is a bending active structure cladded with printed PVC foil, and will now be used for further research. You will find a detailed report prepared by our colleagues from Politecnico di Milano in this TensiNews.

Two other research and innovation projects are presented too: a façade realised with organic PV applied on ETFE foil, and the development of new bio based material.

Beside the detailed information about the events this spring, this issue of TensiNews presents recent projects: the new aviary in a zoo in Belgium, textile façades in the USA and in Germany and a stadium in India. A retractable roof designed by Frei Otto in 1968 has got its second refurbishment.

Beginning of October the next great event of this year will be the combined Structural Membranes and IASS symposium Form & Force in Barcelona. During this symposium our next partner meeting and the annual general meeting will take place. You are kindly invited to join one of our working groups.

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

Yours sincerely,
Bernd Stimpfle

Forthcoming Events

Joined International conference **IASS SYMPOSIUM 2019 & STRUCTURAL MEMBRANES 2019** | *FORM and FORCE 2019* | *7-10/10/2019* | Barcelona, Spain | **http://congress.cimne.com/formandforce2019/frontal/default.asp**

Nonwovens Innovation Academy 2019
16 – 17/10/2019 | Deutsche Institute für Textil- und Faserforschung Denkendorf | **https://www.edana.org/education-events/conferences-and-symposia/event-detail/nonwovens-innovation-academy2019/**

International Conference on Advanced Building Skins | *28 – 29/10/2019* | Bern, Switzerland | **www.abs.green**

AACHEN-DRESDEN-DENKENDORF INTERNATIONAL TEXTILE CONFERENCE 2019
28 – 29/11/2019 | Dresden, Germany | **https://www.aachen-dresden-denkendorf.de/en/itc/**

TensiNet Meetings

TensiNet WG5 eurocode – meeting
26/09/2019 | Afnor, Paris

TensiNet Annual General Meeting &Partner Meeting 2/2019 | *08/10/2019 at 19.00* (during symposium Form and Force 2019)

Group photo of the TensiNet Symposium 2019 participants in front of the TemporActive Pavilion

Belgium

THE ANTWERP ZOO

A PLACE TO OBSERVE ANIMALS AT CLOSE DISTANCE

"I remember visiting the zoo some years ago and eating at the restaurant there. The experience was one of detachment from nature. With our project, we aimed at delivering an innovative visitor experience. We want visitors to feel close to the birds, apes and buffalos in their natural habitat."
Giuseppe Farris

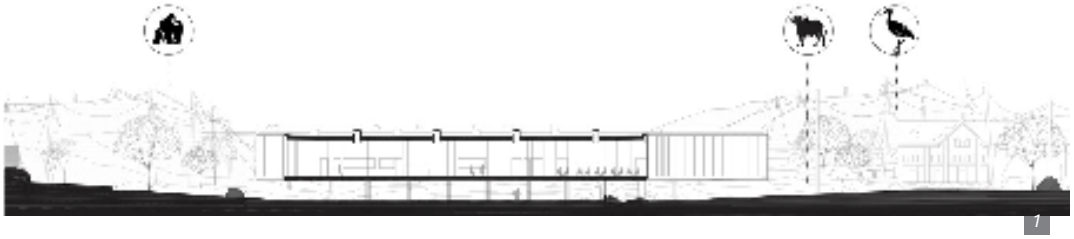

Figure 1. Section ©Studio Farris Architects

Since its founding, the Antwerp Zoo has been managed by KMDA, the Royal Zoological Society of Antwerp.

In 2013 KMDA has appointed ELD NV (architects, engineers, project managers & cost controllers) to create a new masterplan and to act as supervising and steering architect for the realization of a new restaurant, aviary, and apes- and buffalo-shelter.
For the design of the restaurant Studio Farris was the conceptual designer, while the savanna with Aviary was designed jointly by the team ELD/Studio Farris/Fondu landscape/Officium.

The site of the project is situated at the eastern side of the zoo, bordering a mostly residential neighborhood. The intervention defines the eastern boundary of the zoo, in continuity with its historical perimeter wall. On the zoo side, the restaurant opens up to the main plaza, facing historical pavilions. Visitors of the restaurant can enjoy observing the apes on one side and the buffalos and birds on the other side. In the new buffalo savannah more than 250 bird species live. A walk-through the aviary provides an unexpected experience bringing visitors close to the birds and buffalos.
For the design process Officium started with physical models at scale 1:100. Next more advanced numerical models were made for the simulations.

The structural system of **the bird's aviary** is first subdivided into primary structures forming a synclastic curved and rhombic net. This cable net is hold in shape by 8 masts of about 20m high, placed on a 3D hinge; the masts are hold back by 16 stay cables, which are anchored separately into the ground. From the mast 30 cables in V-shape and 25 stay cables are with secondary nets made of double curved anticlastic mesh nets of 35mm mesh size.

Along the boundary the mesh net is fixed continuously by rails or along existing and new buildings.
Officium designed the system in such a way that the primary structure is a stable system under its dead load before the filling secondary nets are attached.

The mounting of the net started with the primary structure only tensioned to 35 - 50% of the design value of the pretension. The filling nets, for which per field a special cutting pattern was created (to assure the design pre-tension at the end of the installation) were added between the primary net cables field by field. The structure was further tensioned after the filling net was fully installed. All outer stay cables and the cables of the primary net connected to the foundation have turn buckles. The tension force of these cables had been adjusted to the pretension as result of the numerical calculation.

The following loads (characteristic loads) have been considered: (1) pretension of the secondary net 0.5kN/m in the main directions of the cable net, which leads to the pretension forces in the primary cable structure, (2) self-weight of the secondary cable net 0.012kN/m² (surface area), (3) self-weight of the primary cable net 0.025kN/m² (projected area), (4) self-weight of the masts 340kN in total, (5) self-weight of the boundary rail 11kN in total, (6) a life load (three persons on 2m²) of 1.5kN/m², (7) snow load 0.5kN/m² (reduction factor considering the mesh 0.6, reduction in relation to the inclination according to DIN EN 1991-3, 5 different load dis-

Figure 2a/b: Physical model of the aviary ©Officium