



a volume of 1810m³, the roof of the bus station is the world's largest single-chamber membrane air cushion. Four 120m long polyethylene tubes under the road supply the pneumatic air cushion with recirculated clean, dry air, and another four tubes take the air back to the air control unit. Depending on the weather, the entire system comprising support air system, tubing and membrane cushion is maintained by sensors at 300 - 850Pa above the outside air pressure. As only the moisture has to be removed that is diffused over the 2140m² cushion surface, and both the cushion and the tubing are more or less airtight, the roof is highly economical to operate. Immediately after it was commissioned, the bus station canopy was included as an exhibit at the "architektur 0.13" exhibition held in Zurich. Between 26 April and 27 July 2014 the bus station roof can be seen at the exhibition entitled "Bauen mit Luft" (Building with Air) to be held in conjunction with a 10-year retrospective of formTL at the Air Museum in Amberg, Germany.

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Figure 1. Day and night views of the bus canopy
 Figure 2. Erection of the canopy
 Figure 3. Structural details, lightning and patterns of the cloud
 Figure 4. Printing on the ETFE membranes generate specific effects

Name of the project:	Bus Station Aarau
Client:	Stadt Aarau, Switzerland
Function of the structure:	weather protection
Planning and civil engineering:	suisseplan Ingenieure AG
Architect:	Vehovar & Jauslin Architektur AG
Lighting:	Atelier Derrer, Zurich, Switzerland
Structural planning, invitation to tender, workshop planning, construction management:	formTL
Contractor for the membrane installation:	Ruch AG & Vector Foiltec GmbH
Supplier of the membrane:	Nowofol
Material structure:	Colour-coated steel structure with a colour coating in C4 (long) & stainless steel spiral cables, cable nodes of anodized aluminium
Material underground pipes for support air:	8 butt-welded polyethylene tubes of 250mm outer diameter in the supports: stainless steel tubing, 100mm internal diameter
Material membrane:	ETFE membrane, 250 µm (clear or dyed blue, and printed by the Reisewitz company)
Dimensions:	Eaves height: 7m / Length: approx. 42m / Width: approx. 39m / Height of steel structure: 0.4m / Height of cushion: 1.3 - 3.2m
Covered area:	1.070m ²



IASS 2013



BEYOND THE LIMITS OF MAN

The 2013 Symposium of the International Association for Shell and Spatial Structures (IASS) "Beyond the Limits of Man" was held in the Conference Centre of the Wrocław University of Technology in Poland from the 23th until the 27th of September. Among a series of interesting presentations on Spatial Structures, Structural Morphology and Environmental Compatibility lightweight tensile structures were exhaustively discussed in the sessions organised by Working Group 6 Tension and Membrane Structures.

As stated on the website <http://www.iass-structures.org/index.cfm/page/TechAct/WG06.htm> the mission of WG 6 is to encourage and synthesize presentations, reports and publications on projects, designs and research related to tension structures, such as membrane structures, cable structures, tensegrities and hybrid structures. The current objectives are to organize sessions at IASS Symposia and Colloquia related to tension structures, to discuss and share the information about key trends and future issues about tension structures and to contribute to the organization and editing of Special Issues of the IASS Journal related to tension structures.

Tensile and Membrane Structures

A variety of New tensile structures in the Americas was discussed, covering different technical aspects like photovoltaics and parametric design. The New BC Place Stadium in Vancouver, Canada, was presented in more detail (Fig. 1). The different representations gave a very comprehensive and in depth description of this lightweight roof cover. The design and analysis of Air Inflated and Special Tension Structures was discussed through some examples; from shelters for disaster relief to large scale market coverings. Also Tensegrity Structures were highlighted during the WG 6 sessions, with presentations regarding their design, optimisation and controllability of the structural behaviour. In order to create adaptable building skins that respond to changing environmental conditions, Adaptive Membranes have been analysed, often combining structures with nature-inspired forms and concepts. Also the influence of temperature and aging on Materials was investigated, mainly on ETFE- films and PVC-coated membranes. Besides experiments and analytical calculations, the importance of Computational Problems for tensile structures was thoroughly discussed in different presentations.

Technical Tour

On Wednesday a technical tour took place, consisting of a visit of two technically interesting construction sites, namely the "Afyrykarium", a new pavilion at Wrocław Zoo (Fig. 2), and The National Forum of Music, the New Concert Hall of the Wrocław Philharmonic Orchestra. Afterwards participants were invited to a visit of the historic part of the city and the Cathedral Island.



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Figure 1. Interior view of the The New BC Place Stadium in Vancouver, Canada - © Christoph Paech / schlaich bergemann und partner
 Figure 2. ETFE-cushions in the roof of the "Afyrykarium", the new pavilion at Wrocław Zoo

IASS 2014 The IASS-SLTE 2014 Symposium Shells, Membranes and Spatial Structures: Footprints will encompass the annual IASS Symposium and the 6th Latin American Symposium on Tension Structures. It will take place in Brasilia (Brazil) from 15th to 19th September.