

REPORT

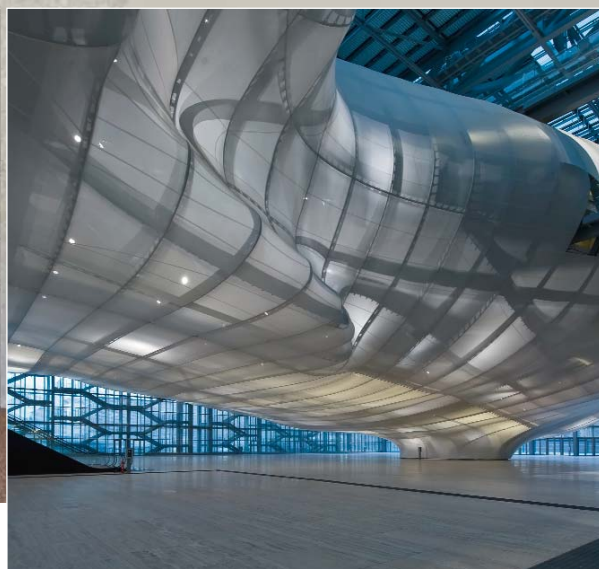
## TENSINET - COST ACTION TU1303 SYMPOSIUM 2016 NOVEL STRUCTURAL SKINS

RESEARCH

## CONCEPTUAL SMART TEXTILE AND BENDING-ACTIVE ARCHITECTURAL MODULE

PROJECTS

## DEPARTURE UNDER THE STARS "ZORGVLIED" WALK-IN CLOUD "NUVOLA"



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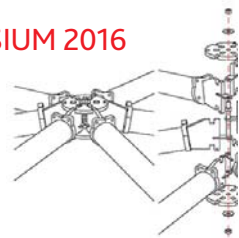
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## Edito

Dear Reader

*This is the first TensiNews which is distributed electronically only, except for Universities and public libraries. Based on the feedback we received from our readers the partners have decided to proceed with this type of distribution.*

*Half a year has passed since we held our TensiNet Symposium, together with the Cost action TU1303 at Newcastle University. It was a great success. The three days were full of excellent presentations from a wide range of researches and professionals. We are glad that Joseph Llorens prepared a report of this conference.*

*This issue of TensiNews contains articles about actual membrane and foil projects, as well as reports on new developments of industry and research institutions.*

*Two ETFE projects in England are presented. Both examples are combinations of timber and cushions. An extraordinary crematory has been realised in the Netherlands with a rising membrane. Two projects in Istanbul which have recently been realised are shown, a stadium roof and a second façade for a sports complex. It is a personal pleasure for me to write about the Nuvola in Rome, which has been inaugurated last October after 18 years. In Mexico an urban centre has been realized which received an award for design excellence.*

*Belgian and Italian researchers envision their result of a membrane with integrated sensors for biogas plants, and researchers from Portugal present the development of bending active structural modules with smart textiles.*

*We are again one of the main sponsors of the student competition at Techtextil, which will take place from the 9th of May at Messe Frankfurt. We invite you to join the award ceremony, and we will have the same day our partner meeting and two working group meetings (good practice and pneumatic structures). Many of us will be present in Berlin at Textile Roofs 2017, which will also take place in May. During Structural Membranes later this year in Munich, will have our annual general meeting and the next partner meeting.*

*Please enjoy this issue of TensiNews and I hope to meet you on one of these events.*

Yours sincerely,  
Bernd Stimpfle



## Forthcoming Events

### 6<sup>TH</sup> INTERNATIONAL TEXTILE ARCHITECTURE SEMINAR – IMS

Lima, Peru • 24-26/04/2017

[http://www.membrane-symposium.org/fileadmin/content\\_membrane\\_symposium/Programma\\_VI\\_Seminario\\_Internacional\\_de\\_Arquitectura\\_Textil\\_IMS\\_-\\_PERU.pdf](http://www.membrane-symposium.org/fileadmin/content_membrane_symposium/Programma_VI_Seminario_Internacional_de_Arquitectura_Textil_IMS_-_PERU.pdf)

### TECHTEXTIL 2017

Frankfurt am Main, Germany • 9-12/05/2017

<https://techtextil.messefrankfurt.com>

### TEXTILE ROOFS 2017

Archenhold Observatory, Berlin, Germany • 15-17/05/2017 <http://textile-roofs.com/>

### STRUCTURAL MEMBRANES 2017

Munich, Germany • 09 – 11/10/2017

<http://congress.cimne.com/membranes2017>

## Forthcoming Meetings

techtextil



### TensiNet Meetings at Techtextil

9/05/2017

10.00-11.30 WG GOOD PRACTICE

11.30-12.30 WG PNEUMATIC STRUCTURES

12.30-13.30 BREAK

13.30-15.30 PARTNER MEETING

16.00-17.00 STUDENT AWARD CEREMONY

## NEXT ISSUE

Architects of Air build *luminaria*: monumental membrane structures designed to generate a sense of wonder at the phenomenon of light. To celebrate their 25<sup>th</sup> anniversary, they are not only creating a brand new structure which will be revealed in May, but they are also promoting the skill of inflatable design through a series of workshops. More about Architects of Air and their latest *luminarium* in the September issue of TensiNews. Until then, you can find Architects of Air by checking: [www.architects-of-air.com](http://www.architects-of-air.com)

Inside a luminarium  
© John Owens Photography



**Brian Forster**

Arup  
1943 - 2016

We have just learned of and are sorry to report that Brian Forster, an original member of TensiNet and a Co-Editor of the European Design Guide for Tensile Structures, died on 5 September 2016 at the age of 73.

He had suffered with Alzheimer's Disease for many years which he faced with extraordinary courage before he passed away peacefully.

Brian worked for Arup in the Building Engineering team in London before his retirement in April 2003.

Brian is survived by his widow Gemma.



# CANARY WHARF STATION

London dock,  
UK

TIMBER AND FILM CUSHIONS CROWN BUILDING  
PUBLIC ROOF GARDENS

## Introduction

Sailing ships and the worldwide maritime trade formed the basis for the British Empire over several centuries. The great era of wooden sailing ships is permanently engraved in the collective memory of Great Britain. The new underground station in Canary Wharf, London, has adopted precisely this elegant timber construction look. A fascinating roof construction of wood and lightweight film cushions now rises out of the water of the former East India Dock, where the tea clippers of the East India company used to dock. London is currently the scene of the largest infrastructure project in Europe. A new underground railway line with a length of 42km, the so-called Crossrail, is being built right across London. The new East-West connection is intended to bring an additional 1.5 million people to their destinations in the city in 45min and help them to bypass the unavoidable traffic jams in the City of London.

## Floors under and above the waterline

The Canary Wharf Crossrail station, one of ten new stations, connects the business district with more than 100.000 workplaces along the new line. The new station was designed by the architects Foster & Partners. Three floors with shops and restaurants are situated below water level. Above the waterline the building rises up like a ship with further floors and a partly open rooftop garden. The station is crowned by a 30m high and 310m

long timber roof construction covered with ETFE film cushions, which are illuminated after dark. The high performance material 3M Dyneon ETFE is extremely resistant to chemical effects of all kinds. Films made from 3M Dyneon ETFE 6235Z are very resistant to tearing and to UV radiation.

## Roof cushions made of ETFE film

The curving support structure of the roof construction, manufactured by Wiehag GmbH Timber Construction from Upper Austria, consists of visible glued laminated spruce timbers. 780 triangular air-supported film cushions curve over it in an arch. ETFE films are fundamentally highly transparent and allow the sunlight with the UV-A radiation that is important for plant growth to pass through virtually without hindrance.

## Printed pattern translucently scatters the light




For the Canary Wharf station, the majority of the films were printed with a pattern of a varying density in order to scatter the light with a

pleasant translucence in plant-free areas. Seele Cover GmbH from Germany, the internationally renowned specialist for complex roof and facade constructions, began installing the triangular ETFE cushions even before the assembly of the timber construction was complete. The cushions were assembled in Seele's own production facilities. Seele was also responsible for the development, design, manufacturing and assembly of the aluminium clamping profiles, the made-to-measure cover plates to protect against the weather and the four air supply stations. The latter provide for the constant exchange of the air between the two-ply cushions via air distribution boxes. The company turns the visions of renowned architects for individual and often highly unusual constructions and building shells into reality. The roof and facade have a total area of around 10.000m<sup>2</sup>.

## Entire roof reachable without a crane

The position in the middle of a dock in London necessitated sev-

eral special structural features. Although the surface of the film cushions is so smooth that they are largely cleaned by rain showers, the entire roof must be reachable for maintenance work without cranes. Abseiling workers can securely fix their respective position to a large number of invisible attachment points between the cushions. The airlines for the pneumatically assisted cushions, which are supplied by four blowers, run below these intersections. In addition, an elaborate system of gutters was installed for the drainage of the curved roof, since the drainage of the rain into the dock is not permitted. ETFE film cushions have proven themselves in architecture for over 30 years as a durable and extremely resistant material with high mechanical strength. The cushions verifiably withstand hail, driving rain and high snow loads.

 *Helmut Frisch*  
 [hfrisch@3M.com](mailto:hfrisch@3M.com)  
 [www.dyneon.eu](http://www.dyneon.eu)

Name of the project	Canary Wharf Station
Location address:	London, UK
Client (investor):	Canary Wharf Contractors Ltd
Function of building:	shops, restaurants, offices, metro
Year of construction:	2015
Architects:	Foster & Partners
Structural engineers:	Arup
Contractor for the membrane (Tensile membrane contractor):	Seele Cover GmbH
Supplier of the membrane material:	Nowofol Kunststoffprodukte GmbH & Co. KG, Siegsdorf, Germany
Manufacture and installation:	Seele Cover GmbH
Material:	3MTM Dyneon™ Fluoroplastic ET 6235Z
Covered surface (roofed area):	11.500m <sup>2</sup>

