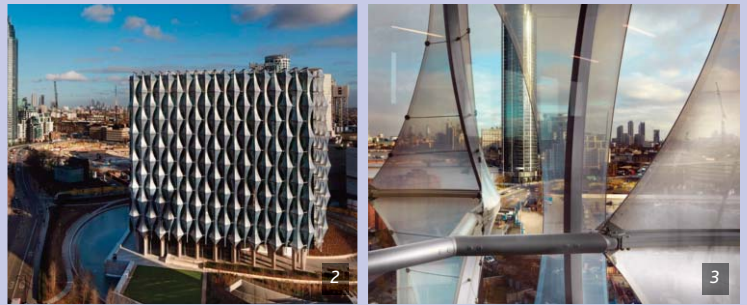




Figure 1. View on the US Embassy in London © BIRDAIR / Figure 2/3. Views on the membrane façade made of single-layer ETFE-sails © BIRDAIR

US EMBASSY IN LONDON

Distinctive building envelope made of ETFE
London, United Kingdom



Building / Envelope

In January 2018 the US Embassy in London was relocated from the Mayfair area to the urban district Nine Elms. The new building, designed by Kieran Timberlake architectural office, found the balance of transparency and the requested high security. The building is a 65m tall glass cube clad by a flexible translucent ETFE second skin, allowing a splendid view to the River Thames. 12-stories provide sufficient room for 800 staff and approximately 1.000 visitors per day.

The architects summed up their design idea as follows: "How can we build an embassy that reflects the core values of democracy - transparency, openness, and equality - and is welcoming, secure, and highly sustainable?"¹ They solved this task perfectly: With high sensitivity and precise knowledge of the materials used, they designed a pioneering envelope for the building with a double-shell façade: The inner shell is made of solid multiple-layer laminated glazing. It guarantees the security required for this utilization. The outer shell, constructed as a curtain façade, consists of a large number of organically shaped flexible sail surfaces made of ETFE-foils and a light supporting structure made of steel ropes, aluminium rods and carbon steel. Since both, the inner and the outer shell, are transparent, the view from inside to outside remains intact despite the double shell structure.

Material / Functions

For the 399 sail surfaces the TensoSky-System from TAIYO was selected. The very thin film (here 250µm) made of the fluoropolymer material Ethylene Tetrafluoroethylene (ETFE) offers many advantages: it is transparent, light weight, elastic, flame retardant and weatherproof. As a rule, it does not require any special cleaning, as the rain washes away dirt particles from the smooth surface. In addition, the material is largely resistant to chemical and biological exposures. As a thermoplastic material, the clear ETFE foil can be 100% recycled. At the end of its lifetime the film can be completely returned to the material cycle. However, it is mostly reused in form of other products, rather than foils for architectural applications.

The sails have a special function here: The ETFE foils are printed with different grades of silver patterns, letting only a part of the sunlight pass. The printing reduces the glare from the sun and minimizes the heat gain of the building. Despite the printing, one can look through the film as long as it is lighter on the other side than on the side of the viewer. The spectrum of visible light is hardly changed by the films. As a result, the colours behind ETFE foils remain almost unchanged. Since the north façade is not exposed to direct sunlight, it has no ETFE sail area. Even without the north façade, the sails form a total surface of 8.125m². They are held in place by a light supporting structure made of steel ropes, aluminium rods (180t) and carbon steel "headmounts". The supporting structure transfers the wind loads and the dead weight of the curtain facades into the building structure.

Assembly

Detailed design, execution planning and assembly of the curtain façades were done by a joint collaboration of two companies of Taiyo Group: BIRDAIR Inc. (in North America) and TAIYO EUROPE GmbH. The assembly of such membrane structures, i.e. technical fabrics and foils, requires precise design engineering, high quality in fabrication and full knowledge of the respective construction methods and materials used. The installation on site must be carried out by specially trained climbers. Such installations follow a precise plan of positioning the elements of the supporting structure and the stretching of foils and steel ropes, component by component. The installers do this work while hanging on a climbing rope and secured with personal protective equipment. It is a sophisticated job for professionals.

Resume

While the solid inner shell made of multiple-layer laminated glazing offers the security required for such a building, the light and flexible outer shell made of ETFE foils robs the building of its severity and detachment. The almost identical sails form an open, consistent and harmonic structure. While glass facades are nowadays a familiar sight in urban environment, membrane sails made of the sustainable material ETFE give this building an unmistakable identity. Congratulations to the architects: The US Embassy in London has received an all-round successful building envelope, which expresses the design idea they formulated in the forefront in a special way. TAIYO group has been honoured to have successfully executed the curtain facade for this outstanding landmark.

 Karsten Moritz, TAIYO EUROPE GmbH
 k.moritz@taiyo-europe.com
 <https://taiyo-europe.com/>
<https://www.birdair.com/>

Name of the project:	US Embassy
Location address:	Nine Elms, London
Client (Investor)	US Department of State
Function of building:	Embassy
Type of application of the membrane:	Curtain façade
Year of construction:	2017
Architects:	Kieran Timberlake
Structural engineers:	Weidlinger Associates
Consulting engineer (membrane):	Arup
Main Contractor:	B.L. Harbert International & Sir Robert McAlpine
Contractor:	Permasteelisa
Contractor (curtain façade):	Birdair Inc.
Installation (curtain façade):	Taiyo Europe GmbH
Manufacturer (membrane):	Flontex.eu.sp. z o.o. Sp.k.
Supplier of the membrane material:	Nowofol GmbH & Co. KG

Sources: ¹ <https://kierantimberlake.com>, 2020-09-09