



PLANT REPORT

BI-FOLDING DOORS

CARLSBERG BYEN, COPENHAGEN/DENMARK

In the Dahlerup Tower and the Carolin Hus at its feet, almost 40,000 m² of mixed use property are being built, of which 17,000 m² are residential. The planned completion date is in 2021. Animation: Carlsberg Byen/Cadwalk



BI-FOLDING DOORS: INNOVATIONS THAT ARE A CUT ABOVE THE REST

The initial idea for a bi-folding door from Solarlux was drafted on a beer mat in 1983. Now, the bi-folding doors from the German town of Melle are being installed in several residential towers that are currently under construction on the grounds of the former Carlsberg Brewery in the heart of Copenhagen. Coincidence? Not necessarily. After all, the product development for this ambitious project required the same lively drive for innovation that marked the beginning of Solarlux back in the day.

CARLSBERG BYEN: A NEW CITY QUARTER WITH A HISTORIC HERITAGE

By 2024, a new quarter will have been built on the former site of the Carlsberg brewery in the middle of Copenhagen: Carlsberg Byen - a lively mix of living, working, culture and entertainment. During the planning process, particular emphasis was placed on preserving the existing building fabric, which was well worth seeing in its own right. The goal: To keep the pioneering spirit and productive energy of the founding fathers alive, transform them like the site itself and lead them into the future.

The lighthouse at one of the former entrances has always been a symbol of the brewery site. Its construction in 1883 was a sensation, because electric lighting was not widespread in the Danish capital at that time.

LIGHTHOUSE PROJECTS: A NEW SKYLINE FOR COPENHAGEN

In the immediate vicinity of the Carlsberg Fyrtårn, as the small lighthouse is called in Danish, new lighthouse projects are currently being built. The existing buildings are being supplemented by several tall residential towers that will dramatically alter Copenhagen's skyline. These include the Pasteur Tower, which will be the highest building in Copenhagen at 120 metres.

The architecture of every high-rise building is a response to the buildings that already exist in its area. This prevents them seeming out of place in an established neighbourhood. And there is something else that creates a connection, too: The facades of all the residential towers can be opened up right to the top floors thanks to floor-to-ceiling windows and small pergolas.

The high-rise buildings are currently being built step by step. And just like their innovative predecessor, the small lighthouse, they are benefitting from technical innovation.

CHALLENGING HEIGHT: FRENCH BALCONIES THAT CAN HANDLE DANISH WEATHER

TRANSPARENCY, FUNCTION AND WATER TIGHTNESS - A CONFLICT OF GOALS?

The French balconies and pergolas are among the highlights of the apartments. They provide bright rooms and a natural ambience. This perfectly matches the lifestyle of Copenhagen's residents: They enjoy the long bright days in the summer and cosy up at home for the rest of the year when the weather is dominated by snow, wind and rain.

Several products from different manufacturers were shortlisted as options for the large window openings. Bi-folding doors met the design requirements exactly: The glass surface can be opened completely without large window casements protruding into the room and getting in the way, while the bundle of open panels that make up the bi-folding door can be "parked" out of the way at one side of the opening. But do they also meet the extremely high requirements for water tightness?

In the Bohrs Tower (height: 100 metres), French balconies create space and a relationship to the surrounding buildings. Photo: Andreas Raun

REQUIREMENTS FOR WATER TIGHT- NESS THAT GO FAR BEYOND THE STANDARD

Due to the unprotected facades at a height of 120 metres in some cases, a water tightness of up to 1,200 Pa (Pascals) was required. In Europe, water tightness is regulated by the DIN EN 12208 standard. The highest class, 9A for unprotected windows and doors, requires 600 Pa - which is equivalent to rain being driven against the building at wind force 11.





The Danish capital from a lofty perspective:
The various pergolas in the Dahlerup Tower, installed
at heights of up to 80 metres, provide the perfect
view of the city. Animation: Carlsberg Byen/Cadwalk

BOHRS TOWER
100 M

Client
Kai Andersen A/S
Facade construction,
Holte, Denmark

Requirement
1,200 Pa
water tightness

Architect
Vilhelm Lauritzen
Arkitekter A/S,
Wingårdhs

Product
Bi-folding door
system Highline

Quantity
176 systems
528 panels

VOGELUIS TOWER
80 M

Client
KG Constructions
Group UAB Facade
construction, Vilnius,
Lithuania

Requirement
900 Pa
water tightness

Architect
Schmidt Hammer
Lassen Architects/
Holscher Nordberg
Architects A/S

Product
Bi-folding door
system Highline

Quantity
80 systems
240 panels

DAHLERUP TOWER
80 M

Client
KG Constructions
Group UAB Facade
construction, Vilnius,
Lithuania

Requirement
900 Pa
water tightness

Architect
Schmidt Hammer
Lassen Architects/
Holscher Nordberg
Architects A/S

Product
Bi-folding door
system Highline

Quantity
82 systems
246 panels

PASTEUR TOWER
120 M

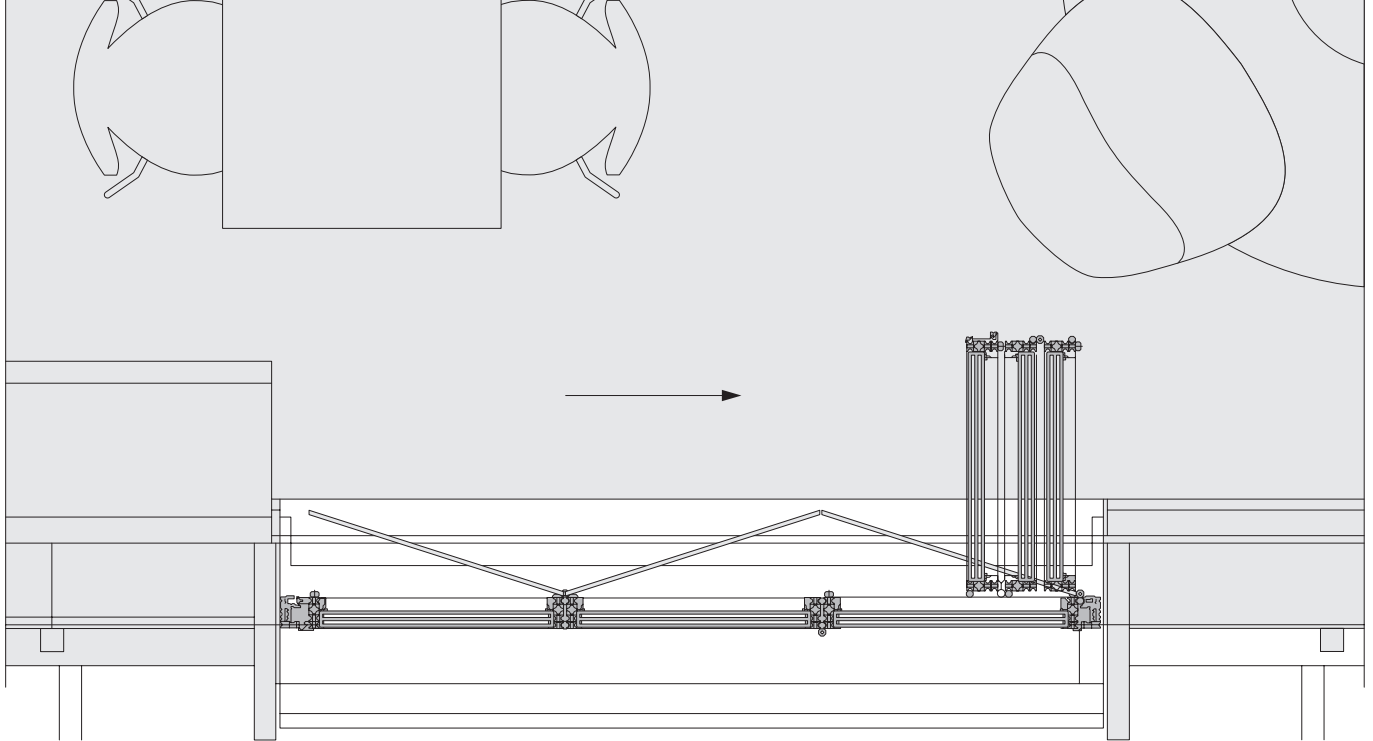
Kunde
HSHansen A/S
Facade construction,
Copenhagen, Denmark

Requirement
1,200 Pa
water tightness

Architect
Vilhelm Lauritzen
Arkitekter A/S,
Wingårdhs

Product
Bi-folding door
system Highline

Quantity
155 systems
380 panels
+ 125 fixed elements



In the Pasteur Tower, which is the tallest building in Copenhagen at 120 metres, French balconies have been installed in addition to small pergolas, which can also be opened across their entire width using bi-folding doors.

HIGHLINE SYSTEM: ON THE IN-HOUSE TEST BENCH

Solarlux accepted the challenge. In close cooperation with the client, the research department developed a three-panel bi-folding door based on the Highline system. In terms of water tightness, bi-foldings already have an advantage over sliding door systems, which can generally only withstand 450 Pa. But can the Solarlux system manage the required 1,200 Pa?

For this purpose, the specialist for bi-folding doors manufactured a prototype of the planned system at its plant in Melle, where it was then put it through its paces on the in-house test bench. But can you trust a test you have carried out yourself? In order to make sure that its test conditions were as realistic as possible, Solarlux tested not just the product, but the construction joints as well.

LOAD TESTS IN ADVANCE PREVENT PROBLEMS LATER ON

“We installed our system in the facade system and then tested it. This is an important detail, because the construction joints are usually the weak spots.” (Marc Heijne, Project Manager, International Property department)

Once the required 1,200 Pa had been achieved, the engineers took the test up a notch, and the system even withstood the new level of 1,350 Pa.



For the water tightness test, the Solarlux bi-folding doors were fitted in the metal frame of the facade structure and then subjected to rigorous testing at the company's plant in Melle.

AMBITIOUS REQUIREMENTS: THE DETAILS ARE DECISIVE

But water tightness was not the only challenge the folding systems had to overcome. Solarlux also adapted its system to the requirements of the respective project in terms of design and construction:

- Starting with the glazing, which had to have a Ug value (thermal transmission coefficient of the glass) of no more than 0.5 and also provide protection from the sun,
- through the colour design of the frame, anodised on the outside, RAL 9010 on the inside,
- to the connection details with accessible threshold including drainage, and
- with integrated system posts for corner solutions; the system posts can be "folded away" as an integral part of the system when the panel bundle is moved.

ENGINEERING BY SOLARLUX: MORE THAN THE TECHNICAL SYSTEM

A far cry from the beer mat sketches of Solarlux's origins, all this is now drawn using state-of-the-art software. Nevertheless, the attitude remains the same: The manufacturers of facade components look for the best solution - and then implement it themselves.

This makes the German company the perfect fit for a project as ambitious and innovative as the Carlsberg Byen. Solarlux bi-folding doors ensure that there is plenty of daylight in four residential towers, represent a direct link to the surrounding city, and make it cosy and safe inside during rain and storms.

Verification of performance characteristics
in acc. with
DIN EN 14351-1:2016-12
Closing condition:
Locked

Air permeability
in acc. with
DIN EN 1026:2016-09
DIN EN 12207:2000-06
Class 4

Water tightness
in acc. with
DIN EN 1027:2016-09
DIN EN 12208:2000-06
Class E1200

Resistance to wind load
in acc. with
DIN EN 12211:2016-10
DIN EN 12210:2016-09
Class B5/C4