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Content

BBI-infotower – Kusus + Kusus Architecten

Photo material: Ulrich Schwarz, Karin Kusus

Project data

Berlin Schönefeld, 2007, Germany

Architect/ General planning: Kusus + Kusus Architekten

Building contractor: PORR Deutschland GmbH, Berlin

Structural engineering: Sailer Stepan und Partner GmbH Beratende Ingenieure für Bauwesen VBI

Tender/ site supervision: GMS Architekten+Beratende Ingenieure

Services: Janowski & Co Beratende Ingenieure GmbH

Client: Flughafen Berlin Schönefeld GmbH

Project description

On the site of the new airport Berlin Brandenburg a new "info-tower" has been built. There are several reasons on which the choice was based. On the one hand, the tower is a landmark; it shows that the construction of the new airport has started. On the other hand, it provides an overview of the work on site.

The routing of the building consists of a tube used for vertical transportation by a lift surrounded by a staircase which is guided by the form of the building. By the circular motion of the staircase each level offers a different view.

Climatic aspects

The BBI info tower is an example of a single layered membrane structure using ETFE-foil. The structure is constructed from triangular sections which are rotated a certain amount per section and are attached to a concrete core. Between the triangular frames the ETFE-foil is tensioned by frames and supported by steel cable on the surface. This way of constructing the façade was possible because the building is not heated, nor needed to be insulated. Compared to the use of ETFE in cushions, the use of the single layered ETFE-construction provides an even more transparent view. During daytime the material provides a good view from the inside out. During the evening the skin is illuminated from the inside of

the skin and provides a great effect from the outside.

The tower is left open at the top and the bottom. To cool the tower during summer, these openings are used to provide a natural airflow through the whole structure. In addition to this chimney-effect, the ETFE is printed with a pattern. The print is used to reduce excessive solar radiation to prevent the tower from overheating, as well as providing a visual effect.

Pictures: Karin Kusus

infotower_detail_03

Pictures: Ulrich Schwarz

schwarz_411-18_13x18_300dpi

schwarz_411-03_A4_300dpi

AP&P-Church Maassluis - Royal Haskoning Architects

Photos: Tentech

Project data

Maassluis, 2007, the Netherlands

Design: Royal Haskoning Architecten, Rotterdam

Architects: Mari Baauw, René Olivier

Structural design: Royal Haskoning, Rotterdam

Structural design, analysis and calculation membrane: Tentech, Utrecht

Installation advice: Stewitech Duurzaam BV, Sliedrecht

Lighting advice: Freestyle lightning, Uden

Acoustic advice: DGMR, Den Haag

General Contractor: De Klerk, Werkendam

Contractor Membrane: Buitink Technology, Duiven

Contractor Facades: Rodeca Systems, Alphen a/d Rijn

Project description

In Maassluis, a village near Rotterdam, the striking design of the AP&P church has been built. Almost futuristic materials and fluid lines contrast with the conventional Dutch housing which partially surrounds the building. With the traditional use of the form language of arches as used in ancient churches, the church was built from several individual shells. By overlapping the shells the interior was created. At the overlap section a transparent colored filling was placed. This technique also refers to the traditional church building with its use of stained glass.

Climatic aspects

The Maassluis church is an example of a double-layered, insulated membrane structure. The shells of the church are built from steel frames with membrane tensioned in between. The construction consists of one layer on the inside of the frame and one on the outside. Connecting the membranes round the skeleton created the required closed skin.

The membrane consists of a PVC coated polyester fabric. On top of this membrane a layer of Teflon was added. This way pollution can easily be removed. For the roof of 1400 square meters 248 different welded patterns were needed.

A layer of insulation fits between the outer and the inner skin. This insulation is attached to the inner layer. The cavity space between the two layers is 400-2000 mm and is ventilated by openings along the edge of the membrane. With this construction principle an insulated skin for the church was obtained.

Besides the advantage of the insulating effect of the double-layered structure, the construction can also respond to extreme snow and wind load. By loading the outer skin it will deform. Due to the cavity space in between the two layers, it can move freely. This way the inner membrane will undergo no major deformations.

Pictures: Tentech B.V.

01 – TvG

19 – TvG

31 - TvG

Booghal - Roel Gijsbers/ TU Eindhoven

Photo's: Roel Gijsbers

Project data

Dieteren, September 2006, the Netherlands

Architect/ designer: R. Gijsbers (Technical University of Eindhoven) / DLV Bouw, Milieu en Techniek BV

Engineering: R. Gijsbers

Contractor: Booghal BV

Advisor: DLV Bouw, Milieu en techniek BV

Client: Fam. Houben

Project description

In recent years economic and environmental concerns in the agricultural sector provided a stimulus for the development of a new system for housing cattle. Given the continuous change of rules and regulations the lifespan of 40 to 50 years of conventional shed constructions appeared to be too long to succeed in these rapidly changing situations. The cattle are often suffering from poor internal climate. Flexibility to adapt suffered due to high construction costs so the current standard had no effect. The design by the TU Eindhoven resulted in a construction methodology named "Booghal". The structure is semi-transparent, flexible in customization, cheap to purchase and an affordable alternative for its permanent static counterpart.

Climatic aspects

The Booghal is an example of a non-insulated double-layered membrane structure. The construction consists of a modular system that is built from straight trusses. The trusses can be coupled to arches of 30 to 50 meters resulting in a building height of 6 to 12 meters. By using multiple arches the building can be configured for any desired length.

Between the arches a double-layered membrane structure is positioned. Given the high susceptibility of livestock to climate change, several ways have been developed to regulate the indoor climate.

The outer skin layer consists of a half open mesh. This layer blocks part of the solar radiation. Solar radiation coming through is partly removed in the cavity between the two layers. Heat built-up under the construction is mitigated by ventilation openings.

The inner layer of the skin consists of a white layer of film. This serves as a rain screen and due to its translucency acts as a diffuse light distributor. The structural system results in a reduction of heat radiation of 75%.

Pictures: Roel Gijsbers

Boogstal buiten (R.Gijsbers)

111_1139

113_1349

La Miroiterie – B+W Architects

Photos: Thomas Jantscher, www.jantscher.ch

Project data

Lausanne, 2007, Switzerland

Architects: B+W architecture sàrl

Creative team and collaborators: Ueli Brauen, Doris Wälchli, Mattia Beltraminelli, Nicole Nay, Patrizio Longo

Structural engineers: Fellrath & Bosso

HVAC and Electrical engineers : Rigot + Rieben

Lighting consultants: Aebischer & Bovigny

Facades: Hightex International AG

Project description

In the center of the Flon district in Lausanne a modern department store contrasts with the surrounding traditional looking facades. By using a hybrid wall filling of open glass surfaces and closed cushioned skin, the block appears solid. Further examination of the slim structural building design gives a less dense experience. In the evening the openness of the building is highlighted by its illumination from within. The lines on the edge of the construction form a visible grid between the illuminated cushions. The facade looks almost like a soft quilted textile.

Climatic aspects

The La Miroiterie project is a building with a single skin of pneumatic cushions. The base consists of a steel and concrete frame construction around which the cushions are placed. The cushions are constructed of a four-layered structure. The first layer consists of a PTFE-membrane and the next three layers are made out of ETFE-foil. The cushion construction is tensioned by air constantly. This structural cushion design has multiple qualities. First, the choice of materials and layering of the structure is done in a way that the Swiss heat insulation standard is achieved. Secondly, the use of materials in

relationship to the amount of translucency results in a bright interior. The outer layer of PTFE has the ability to let daylight through but to obstruct direct view. Strong sunlight will not enter freely. A multiple-layer structure of this material would give an opaque result. The use of ETFE instead offers the possibility of a closed skin and transparency together so in that way a naturally lit interior is created.

Pictures: Thomas Jantscher

k-bw-mir006-04.jpg

k-bw-mir005-05-1.jpg

k-bw-mir007-07-1.jpg

Shearing – R&Sie(n)

Photo-material: R&Sie(n)

Project data

Sommières, 2001, France

Architect: R&Sie… Paris

Creative team and associated partners: François Roche, Stéphanie Lavaux, Alexandre Boulin, Olivier Legrand

Engineer: Abaca Engineer

Contractor: Christian Hubert de Lisle

Key dimensions: 160 m2

Client: Ami & Judith Barak

Project description

In the south of France the villa Barak is situated. The project is called "Shearing" and is based on the following assumptions.

1) Exacerbation of the landscape

2) Design of a house like a sheared up thrust rock layer alongside an existing stone wall in the middle of the field.
3) Tent-like construction to provide protection from weather, with living spaces inside.

This scenario resulted in a building that by its tent-like appearance, fragmented shape and natural color blends in with the green and rocky landscape. This stealth approach was necessary in order for the obtaining of permission to build the project. The building is located in a protected area around a medieval castle and needed to be approved by *Les Architectes des Bâtiments de France* before construction could be started. In order to avoid building in the stereotype of white walls and red roofs the camouflage approach was chosen. Like a stealth bomber invisible to radar, Shearing disappears as a fragment of the landscape.

Climatic aspects

Shearing is an example of a building in which the typology of the second skin façade is used. The second skin façade in this project is used in the façade as well as the roof. The details of roof and façade are almost identical which makes second skin instead of second skin façade a more applicable description.

The building consists of a concrete base with a skin around it. Similar to clothing that protects the body against climatic influences, we can speak of a basis-structure with a protective surrounding layer. This skin/dress is made of polyurethane panels which are connected to a pre-stressed cable structure by composite connections. Besides the function of camouflage, the skin functions as a protection against climatic influences and offers a transition zone between the core of the building and the outside environment. By dressing the concrete blocks with this translucent skin the solar energy is reduced. This way the concrete structure underneath warms up more slowly. Moreover, the semi-open structure of the canvas provides the possibility of ventilation in the spaces underneath during stormy weather. The addition of a reverse-cycle heating system by pipeline to the core of the building makes it possible to provide a pleasant climate in every season to the whole building.

Pictures: R&Sie(n)

Shearing 08

Shearing 11

Shearing 16

The Water Cube - PTW

Photo's: See PDF image credits

Project data

Beijing, 2008, China

Architect: PTW Architects

Structural design and engineering: CSCEC and ARUP

Client: People's Government of Beijing Municipality, Beijing State-owned Assets Management Co. Ltd

Project description

During the Olympic Games in Beijing, the National Swimming Center "Water Cube" was opened. Water along with the square, the basic form of housing in Chinese tradition and mythology provided the basis for the structural and conceptual "leitmotif" of the design. The form of the open, transparent and apparently random structure resulted from the structure of water bubbles. The strict geometry that is hidden in these structures was implemented in the structural design of the skin. With an infill of transparent cushions the façade remained translucent like water.

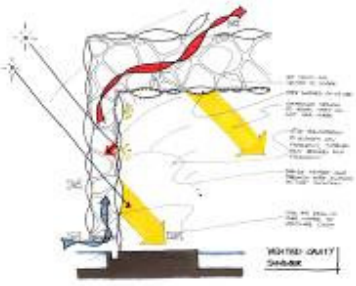
Climatic aspects

The Water Cube project is an example of a double-layered façade. The construction is assembled from a space frame of 22.000 steel members and 12.000 nodes. On both the inside and outside ETFE cushions are placed. The space between the inner and the outer skin varies from a cavity 3.6 meters to a cavity of 7.2 meters in the roof surface.

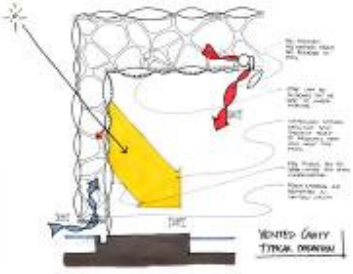
The ETFE covered skin is designed to behave like a large greenhouse where the solar energy enters the construction but is caught in the wide cavity. The trapped air is partially cooled by a water chilled air flow that enters the façade at the bottom of the construction.

During summer the heated air is ventilated through open areas in the outer layer of the roof surface. The inner part of the skin is equipped with a triple layered ETFE construction. By the use of prints on the foil, the internal layer is turned "on" during warm periods so annoying sunlight is blocked. During colder periods, this layer is turned "off" in order to let sunlight through. This way the heated air can mechanically be blown into the interior of the building to warm up the internal air and the swimming pool water.

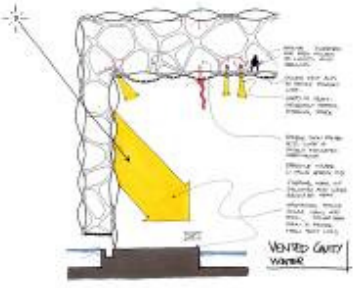
Pictures: PTW Architects



summer



typical



winter

PTWWatercube_28

PTWWatercube_08

Westraven - CEPEZED

Project data

Utrecht, 2007, the Netherlands

Architect: CEPEZED

Consulting engineer: ABT

Engineer mesh facade: Tentech

Contractor mesh facade: Poly-Ned/ Oskomera BV

Client: Rijkswaterstaat

Project description

Rising above the surrounding low-rise area, the Westraven building is dominant. The building for The Department of Transport, Public Works and Water Management is located in Utrecht and stands out in its progressive and innovative use of materials and structural performance.

Climatic aspects

The Westraven building is an example of a single layered skin façade. Given the consistency of the structural design of the building, the different building parts fit together like a puzzle. The floor dimensions are optimized to maintain sufficient capacity for installation of piping within a limited construction height while maintaining enough structural strength. The skin of the building appears opaque while remaining translucent. Instead of glass, this second skin façade is made by a mesh weave alternating with glass. The glass parts serve as a balustrade, the mesh weave serves as a windshield. The second skin is placed at a certain distance from the watertight skin. This way the inner-façade and outer-skin form an air chamber. When windows on higher levels of the building are opened, it is not to the outer climate, which would interfere with the internal climate, but to the intermediate climate of the air chamber. In colder periods heat loss of the building is reduced. In warmer periods heat entrance into the building is reduced. Because of the use of mesh weave instead of glass there is no heating of the air chamber.

Pictures: Cepezed

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Zénith de Strasbourg - Massimiliano Fuksas

Project data

Strasbourg, 2007, France

Architect: Massimiliano Fuksas

Design membrane façade: formTL

Wind specialist: Wacker Ingenieure

General contractor: Pertuy-Construction

Steel contractor: ZM

Membrane contractor: Canobbio

Pattern design: formTL

Project description

Close to Strasbourg a new Zenith has been built. The Zeniths are concert halls for modern and pop music from pop-rock to musicals. Because of the elliptic shape and the translucent and illuminated envelope the design of Massimiliano and Doriana Fuksas has become a true landmark.

Climatic aspects

The building is an example of a single layered second skin façade. Because of control over the acoustics a core of reinforced concrete was the best possible solution. To the massive concrete core a steel column structure forms the primary structure for the façade which supports the membrane. The circular contours of the building are formed by five horizontal steel rings of 500 mm in diameter that enclose the whole building. In between this horizontal tubing the membrane is enclosed.

Because color, translucency and surface quality were the main issues during the design phase several membranes were discussed. For PVC and PTFE the range of 6 – 7 % translucency seemed to be too limited. The use of Silicone coated fiberglass was a brighter alternative. Furthermore, a new top layer reduced dirt accumulation. Next to its translucent qualities it is also fire-resistant; while being a

visually opaque layer by day, the inside remained bright. By night the membrane is illuminated from the inside so the translucency of the membrane is revealed.

Pictures: Form TL

071006-1

Pictures: PHILIPPE RUAULT

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Pictures: **MORENO MAGGI**

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