Sefar Architecture
Experiences, ideas and new ways with architecture fabrics

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Carrying the familiar – risking the new

Let’s be honest about this – humans are creatures of habit. We love our rituals and what’s predictable, not unlike small children who night after night want to hear the same bedtime story. At the same time, however, we are inquisitive, curious, and enjoy trying out new things.

This dormant bivalency frequently leads to some strange decisions in our daily lives: we like to eat lots of different foods but at the same time usually have one favorite restaurant. We want to see as much of the world as possible but are happiest in familiar surroundings. The world of architecture is also exposed to these paradoxical patterns of human behavior and grapples with them from time to time. When a design reflects local or regional building traditions, it may attract criticism for being uncourageous, without inspiration, or simply boring. If you go for the contrasting style or perhaps even the spectacular, then it’s egotistic and shows no consideration for its surroundings. Architecture occupies uneasy ground in the human psyche.

A possible resolution is offered by David Chipperfield*. In suggesting a formula for good architecture he says: “I truly believe that architecture depends on getting the balance right: seizing the familiar and mixing it with the unexpected and unfamiliar.” The decision to use SEFAR® Architecture VISION at the London Design Festival may be a result of this great architect’s efforts to find that balance. Two traditional materials, textile and glass, are combined to create something completely new and original. As you read this publication, see for yourself how tradition and sensation are harmoniously merged together in architecture through the intelligent combination of different materials. Or in the words of David Chipperfield: “If we carry the familiar with us, then we are in the position to engage with the unfamiliar.” We at Sefar are proud to be making a contribution to this belief and hope our readers will feel encouraged to carry the familiar and risk the new.

In this spirit, then, we hope you enjoy reading this second issue of Sefar Architecture.

Ingo Thalhammer
Head of Sefar Architecture

* Interview “Die Zeit”, March 1, 2012
INTERNAL

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Detail from “The Tree” –
a sculpture at Auckland Airport, New Zealand
Photo: Fabric Structure Systems
Where the clouds live

The best address is sky-high.
To lie in a meadow and watch the clouds as they form endlessly changing shapes – isn’t that one of the things city people long for? In Zurich at any rate ceiling solutions form clouds too, and each one is unique in shape – fluffy and gently shimmering. Clouds is the name of the gourmet restaurant with patio and bistro situated on the 35th floor of the 126 m (413 ft) Prime Tower. But the clouds up here can do much more.

Around 2000 people from all over the world work in Prime Tower, which has 40,000 m² of floor space. Prime Tower together with its annexes Cubus and Diagonal forms a single, 36-storey architectural entity – the tallest building in Switzerland – and it is a desirable commercial property. Up-market service providers have already made their company base here in downtown Zurich, with fantastic views of the city, mountains, and lake.

Those in search of some peace head for the 35th floor where first-class cuisine and an adventurous ceiling design await guests.

Proven grandeur
The Prime Tower octagon was one of the entries to a competition for professionals ultimately won by Zurich-based architectural practice Gigon/Guyer. “A richness of diversity and the incorporation of culture and gastronomy” was the design brief given by stock-exchange listed Swiss real-estate investment corporation Swiss Prime Site AG. And as a result, top restaurant Clouds, bar and lounge, is now located high above the city. The task of providing the special acoustic and thermal ceiling went to project partners Schmid from Simmerberg in Bavaria and Staab Architects in Berlin. A key stipulation was that work or adaptation on-site was not permitted.

Close to the heavens
Just as clouds change and constantly create new pictures, so does the designer ceiling: all membrane elements in the special ceiling solution have different sizes and, attached to metal cassettes, they are installed at different heights. In keeping with special fire regulations, the fabric is
Unusual optics.
The different-sized ceiling panels are finished with printed SEFAR® Architecture VISION AL 260/25.
attached to inflammable metal ceiling panels to ensure conformity with the Swiss Cantonal Fire Insurance Classification (VKF) 6.3. The material chosen was SEFAR® Architecture VISION AL 260/25. The ceiling panels were developed in such a way that they could be mounted in a covered, fitted substructure, and are comprised of fitted boxes secured to the join cross point. In combination with the mounted support profile, the ceiling elements can be removed for maintenance. They are fitted beneath one another with engineered height offsets and the boxes are evenly arranged. The base is the flush lowest level of the ceiling panels, while the visible faces and upstands are finished to an optically high standard by the height offsets and corner formations with closed, coated/fabric-concealed edges.

Hanging out is in

The impression the room makes is not only visually remarkable — the indoor climate is also perceptibly positive: the visible side of the special metal ceiling with its canted panels is concealed by SEFAR® Architecture VISION Fabric which has been coated and printed in aluminum. In this way, the ceiling meets the acoustic requirements of the space as well as warming and cooling it. Finally, there are cooling elements concealed behind the printed elements. For the purposes of echo absorption, a flat acoustic fleece is attached to the reverse side of the ceiling panels and in addition there is an acoustic lining made of mineral fibers sealed in PE film, building material class A.
A church sees the light

The world comes together in Fátima.
Those who make their way to Fátima hoping for relief from severe pain or possibly for some spiritual enlightenment are certain to experience an almost heavenly light. Pilgrims may marvel at what the future holds but connoisseurs of modern architecture view the roof construction itself as a miracle.

People from all over the world come to Fátima, a pilgrimage site about 130 km (81 miles) north of Lisbon, the Portuguese capital. It is the country’s most important shrine as well as one of the most significant in the Roman Catholic Church. And now lovers of architecture are also discovering the Igreja da Santíssima Trinidade, the fourth-largest Catholic Church in the world. The roof of the church interior measures 100 meters (328 ft) in diameter and is held in place by two huge joists. Of particular interest is the suspended ceiling for the completely self-supporting construction, which uses a total of 18 single membranes, each one covering an area up to 600 m². The material employed is SEFAR® Architecture IL-80-OP.

A golden glow

Visitors to the church speak of a very special lighting effect. Despite the circular building having a diameter of 125 meters – SEFAR® Architecture IL-80-OP Fabric ensures an evenly illuminated church interior and a perceptible sense of being safe and protected. Newly constructed in 2007, the Roman Catholic Church has deliberately chosen an unpretentious design. Contemporary works of art and bright, inviting light are intended to make it easier for visitors to engage spiritually.
**Religious site for all under one roof**

The bright, circular, concrete building was financed entirely by donations at a cost of €70 million and took 3500 builders around five years to construct. Greek architect Alexandros Tombazis planned seating for up to 8600 people.

The subconstruction, designed specifically for the material and the extraordinary dimensions involved, was developed by Koch Membranen GmbH, making both the assembly of the huge partition surfaces as well as the homogenous pre-tensioning remarkably straightforward. During the course of the day, the lighting conditions inside the church change. However, the atmosphere of calm in this house of God remains constant – by means of some remarkable sound absorption characteristics.

Strict safety precautions also had to be adhered to when designing the roof and SEFAR® Architecture IL-80-OP Fabric satisfies all these requirements. It is fire resistant according to DIN 4102, Class B1, and owing to its very low net weight is able to span vast areas such as the Igreja da Santíssima Trindade.
An astonishingly diverse range of applications

Hans-Jürgen Koch is managing partner of Koch Membrane Structures in Rimsting at Lake Chiem in Germany. The corporation has been involved in the field of traditional textile construction since 1969. Convinced of its many advantages, he once again used technical fabrics by Sefar for the ceiling of the church building at the Fátima shrine in Portugal.

Mr. Koch, you are known and acknowledged by the architectural world as a specialist – particularly when it comes to “textile architecture” – and you frequently use Sefar technical fabrics in your designs. How did this partnership evolve?

Hans-Jürgen Koch: For us, design and innovative textiles have always played a central role, which is why we have made a name for ourselves with light and acoustic solutions in textile architecture. In our quest to seek out technical fabrics for new, innovative areas of application, we discovered Sefar. We have found their products especially suitable because of their physical properties – as the Fátima project has once again proved.

How can the collaboration between Koch and Sefar be realized in practice?

Take the Fátima ceiling project for example – as manufacturer, we were on board from a very early stage. Over the course of a lengthy planning and consultation process, we at Koch Membranes devised and developed the construction and assembly concept, as well as producing the large-scale membrane itself. The light fabric was supplied by Sefar and the suspended ceiling made up of 18 single membranes, each one up to 600 m² in surface area. The result is an evenly illuminated church interior which offers visitors a very pleasant and calming atmosphere. Many different projects have since been completed to the total satisfaction of the architects and the contractors as a result of this partnership between Sefar products and Koch as the membrane manufacturer. The application of this innovative technology applies equally to new builds and renovations, but is also very suitable for refits.

From our point of view, technical fabric provides fascinating opportunities for innovative architects. What applications can you envisage in the future?

In addition to standard products such as acoustic screens and awnings, light and
acoustic elements, acoustic boxes, and various tensioned ceiling systems, we are increasingly being asked by clients at home and abroad to work with special, tailor-made membrane materials. With membrane materials, individual lighting requirements can often be fulfilled in combination with a solution to reverberation issues in the spatial acoustics.

**Designing a church building is certainly a rather unusual challenge. Where do you see an increasing need for the application of modern membrane fabrics?**

Wherever there is a need for more light and translucence, and an inviting yet peaceful ambiance – that’s where the future lies for membranes. It works just as well in a time-honored building such as a district courthouse as it does in a completely new office block for example. Image what a positive difference membranes would make in a call center; on the one hand, they provide pleasant, gentle, diffuse light and at the same time they reduce background noise. In any office environment, our products make a significant contribution to people’s comfort and well-being. This leads in turn to increased employee motivation, a better working climate and ultimately to better productivity. Similarly, I also see a great need for them in canteens, foyers, conference rooms, or waiting areas.

*Missed the first issue? Please send an e-mail with the subject line “Re-order Issue 1” to info@sefararchitecture.com. We will be happy to provide you with a personal copy without delay.*
The installation “Two Lines” links form and special material effects in a surprising new way.
The London Design Festival is the largest of its kind in the world and therefore a benchmark indicator for leading architects, corporations, partners, and sponsors. Visitors to “Size + Matter” at Southbank Centre Square, one of five focal points at the London Design Festival 2011, appeared to be both excited and fascinated by architect David Chipperfield’s installation “Two Lines”. For their latest contribution to this temporary installation, David Chipperfield Architects chose SEFAR® Architecture VISION. The finishing on this technical architecture fabric using aluminum and copper coatings gives the installation a new and extraordinary symbiosis in form and perception.

The “Two Lines” concept by David Chipperfield Architects
“Two Lines” is a dialog between two identical forms which differ from one another only in their orientation and the metal finish of the SEFAR® Architecture VISION Fabric. The forms consist of a series of unframed glass panels with translucent, metal-coated fabric inserts and color-corresponding steel connections. The concept of “Two Lines” is to focus on the interplay of the orthogonal forms with simple vertical elements. The fabric inserts emphasize the strong material-like quality of the glass surfaces and lend the installation panels a translucent and at the same time reflective appearance. To the observer, the result is a multitude of different visual impressions both inside and outside the installation.

Design – Art as a valuable transfer of ideas
The artistic application of SEFAR® Architecture VISION is regarded as an exciting area for the architectonic possibilities of this technical fabric. By taking part in the London Design Festival, Sefar was given the opportunity to present this new architectural material to an international public motivated by creativity and new vision.

The complexity of the solution
This challenging project required the involvement of a range of respected specialists. As manufacturer of the laminated Sentry Glass® interlayer, DuPont produced the optimum correlation of fabric and glass as a result of extensive research and comprehensive testing. Finishing and the technically sophisticated lamination process for this special architecture fabric was undertaken by Glas Trösch AG, BGT Bischoff Glastechnik AG and INGLAS GmbH & Co. KG as accredited glass processors. Arup Engineers was responsible for the constructive planning of the installation and, within the framework of this project, they recognized the practically limitless possibilities for SEFAR® Architecture VISION. As a result of this intensive period of collaboration, new projects featuring SEFAR® Architecture VISION are already being planned and implemented.
The software
The hand sketch in the draft phase of architectural design is still a traditional starting point, enabling an impartial visualization of initial ideas. What makes the design software Formfinder unique is that it translates these scribbled sketches directly into a spatial, three-dimensional model which immediately meets all structural and stability requirements. In addition, there is the possibility with the help of a constantly updated database to recall the project details of similar objects at any time so as to make design decisions directly qualifiable and comprehensible. Object recognition is conducted, for example, by analyzing geometrical determinants such as the size or shape of its floor area, boundary conditions, the position of objects in relation to their surroundings, or the choice of materials and details.

This presents new and original opportunities for form-active supporting structures even in the planning stages. Previously unexplored areas of construction and application possibilities can be opened up using aesthetically attractive and frequently unconventional shapes which are suitable for futuristic architectural demands. Irrespective of whether the construction is conceived as an awning, arched, or peaked area, the diversity of form is practically endless. Formfinder also takes into account the fact that flexible fabrics or membranes have completely different physical properties to rigid construction materials since they carry only tensile force and not compressive force.

Intuitive optimization
Based on all the available project information and a physical model, Formfinder then follows a strategic process of quantification and qualification to improve and refine the geometrical design. By means of intuitive operation, all the elements can be modified and further developed. In addition to precise data entry, it is possible to manipulate the variables with a slide control where exact details are missing. The slide control enables the geometry to be changed and thereby examines the form in relation to its geometrical proportions. In this way, it is possible to determine the proportions from “footprint to apex, edge rope sag, or stress ratio in radial to tangential direction”. The slide control is additionally equipped with readable values so that number entry is also possible.

Communicative foundation
Communication and critical discussion concerning the design are just as important as the actual processes of Formfinder. Formfinder offers a dialog platform for architects, building contractors, structural engineers, and other professionals. What is essential is that everyone involved in the construction business has a common design base, despite having different points of view. Building contractors, for example, are concerned with staying on budget and producing something original, while architects want to know which forms are still feasible without deviating from the goals of the original concept. Just as relevant is knowledge about comparable projects which have already been realized. Structural engineers need to investigate the effects of different forces on a construction: wind, rain, snow, etc. Contractors are interested in being able to implement technical details easily, placing value on early integration in the project.
Software development and advancement

The development of Formfinder involved a close network of international experts such as Professor Lothar Gründig at technet in Stuttgart. Specialists in programming, network and form generation, as well as object and typology recognition worked in collaboration with renowned university professors. Also involved in the joint development were the technological universities in Vienna, Berlin, Stuttgart, Duisburg-Essen, and the UNSW Sydney. Further expertise in the shape of practical experience for incorporation in Formfinder was provided by recognized research partners such as Lenzing Plastics Austria, Carl Stahl in Germany, and Sefar Architecture in Switzerland.

At present, significant developments are being carried out to expand the manipulation possibilities of spatial models. A major step forward was made through the integration of detail solutions such as TENNECT by the Carl Stahl corporation. Similarly, it will soon be in a position to handle steel components such as hinged supports; by means of simple click on the desired position, details can be inserted and automatically optimized. Formfinder will, for example, be able to place these supports automatically in an optimum position and depict them with the necessary tensioning ropes. The dimensions of the supports are made visible in the sense that the line thickness varies according to the compressive force. In order to prevent trivialization, no data concerning tensile strength or compressive force is provided – this remains the responsibility of the structural engineer. Supporting structure measurements can also be made using the engineering program EASY by technet, which is 100% compatible with Formfinder since it is based on a common system. Interchanges with other programs are possible via XML, respectively a DXF/DWG Formfinder interface.

The future

The market for modern membrane construction has a promising future. Low net weights, intelligent supporting structures, and eccentric shapes enable constructions to demonstrate a light, floating, flowing use of form. New, unique, light-suffused, and acclimatized spaces can be created thanks to column-free roofing which is able to cover large areas. Other areas of application include the tourism and gastronomy industries, parks and landscaping, open-air theaters, and leisure facilities. Formfinder as an instrument of the future has already shown considerable success, and inventor and enterprise owner Dr. Robert Wehdorn-Roithmayr is currently receiving enquiries about Formfinder from places as far afield as Russia, Asia, Africa, and America.

University lecturer, architect, chartered engineer Dr. Robert Wehdorn-Roithmayr
Managing Director of Formfinder Software GmbH Vienna, chartered civil engineer; Chair of “Architecture and Planning” group for the Austrian association of engineers and architects (ÖIAV)
Well-known beyond Switzerland’s borders, Rüti is much more than a meadow – this is the place where the country was founded and is therefore a cultural monument of national importance. In recent years, various modifications and construction work has taken place to improve the general infrastructure. During the final stages, the terrace at the Restaurant Rütlihaus underwent some gentle modernization in the form of a light roof construction.

Even today, the five-hectare (approx. 12 acre) meadow on the bank of the Urnersee, a branch of Lake Lucerne, can only be reached by boat, or on foot via the Swiss Path from Seelisberg. According to legend, the Rüti Oath declaring an eternal alliance between the three founding cantons (Uri, Schwyz, and Unterwalden) was sworn in the year 1291 on this spot. Today it is home to the Restaurant Rütlihaus, a picnic field, the “three lands fountain”, and a small exhibition covering the history of the site.

Each year, around 1 million visitors, among them many high-ranking people from home and abroad, enjoy the facilities at Rüti.

Preserving symbolism and charisma
When inviting tenders back in 2007, the Federal Department of Construction and Logistics (BBL) in Berne made it clear they wanted to provide additional working and storage space for the many public events taking place here such as the traditional Rüti shooting. High priority was placed...
on ensuring the harmonious addition of a new building to the original Rütli structure, conceived in 1865 as a landscaped park.

The winning architectural practice was Aschwanden Schürer AG, whose concept lay in a decentralized organization of the various buildings for a wide range of uses. As a follow-up to these improvements in the general infrastructure, the canopy of Restaurant Rütlihaus terrace would now be replaced.

**Unique embedding of the roof construction**

Developed in close consultation with the Heritage Protection Department, the new terrace covering at the Restaurant Rütlihaus blends into the landscape in the form of a graceful and elegant membrane construction. It remains pleasantly discreet thanks to its low height and the ingenious play between a slightly inclined roof surface and the use of spruce wood. The canopy consists of five combined gables. Protection from the weather and UV radiation is ensured by a translucent membrane made of SEFAR® Architecture TENARA® Fabric 4T40HF, whose almost 40% light permeability allows a comfortably gentle amount of sunlight to pass through it. In this way, the roof functions like an airy pergola.
Rütli, Seelisberg, Switzerland

Contractor
Federal Department of Construction and Logistics (BBL), CH-Bern
www.bbl.admin.ch

Architect
Aschwanden Schürer Architects AG
CH-Zurich
www.aschwanden-schuerer.ch

Engineer
Gabathuler AG dipl. Construction Engineers ETH, CH-Buchs

Manufacturing
HP Gasser AG
MEMBRANE CONSTRUCTION
CH-Lungern, www.membranbau.ch

Planning and supply of timber supporting structure
neue Holzbau AG, CH-Lungern
www.neueholzbau.ch

Wood crafting
Gotthard Holzbau GmbH
CH-Schattdorf
www.gotthardholzbau.ch

Fabric
SEFAR® Architecture TENARA® Fabric 4T40HF

SEFAR® Architecture TENARA® Fabric 4T40HF

Fabric-technical specifications
Fabric material
Fluoropolymer-coated fabric made from ePTFE fibers
Fabric width 1.575 m
Fabric thickness 0.55 mm
Surface weight 1080 g/m²
Highest tensile strength (ASTM D4851)
Warp/Weft (N/5 cm) 4,000/4,000
Trapezoidal tear resistance
Warp/Weft (N) 798/752
Fire performance EN 13501 B-s1, d0 ASTM E84 – Class A NFPA 701 – Small Scale – Pass

Light-technical specifications
Grade of transmission 38% (ASTM D 1003)
PLACE

Going for open

Sefar plays for safety.
air
Unique. The new roof system covers 8500 m² – the largest of its kind in the world.
Even the glorious backdrop of one of the world’s favorite cities with the nearby Grouse Mountain can offer no certainty of glorious weather conditions. For this reason, operators at BC Place in Vancouver decided to have its original roof – constructed in 1983 – replaced. The solution in the form of a retractable roof was provided by Geiger Engineers, and schlaich bergermann and partner, engineers and roof designers in New York. For this project, Geiger Engineers chose SEFAR® Architecture TENARA® Fabric.

BC Place in Vancouver is a regular venue for international competitions and top-class events. While in the past visitors, players, and other participants were forced to endure hot and humid conditions during the summer months, a way was found using a light, shell-like roof construction to switch from weather-proof safety to an open-air feeling by means of...
an electronic control system at the touch of a button. Illumination, ventilation, and indoor climate are all noticeably better with the new concept.

**A new fixed star has risen**

Today, spectators sit beneath a completely new roof construction with a retractable inner roof. In the center of the cable-supported roof structure lies the pneumatically aided inner roof – one of the largest moveable membrane constructions in the world. The material used to make the retractable pillows is the flexible SEFAR® Architecture TENARA® Fabric 4T40HF with a translucence of almost 40%. The 100 x 85 m roof opening is the same size as the field below – a playing field in every sense of the word. Explains Christoph Paech from schlaich bergmann and partner: "The demands made on the membrane material in a
Architecture TENARA® Fabric 4T40HF is extremely durable.
BC Place Stadium Vancouver
Canada, www.bcplace.com

Owner
BC Pavilion Corporation (PavCo),
Canada, www.bcpavco.com

Architect
Stantec Architecture Ltd, USA
www.stantec.com

Engineer of Record
Geiger Engineers, Suffern NY, USA
www.geigerengineers.com

Development and planning
of roof support structure
schlaich bergermann and partner
LP, NY, USA, www.sbp.de

Manufacturing/implementation
(Retractable Tenara-roof):
Hightex GmbH, DE-Rimsting
www.hightexworld.com

General contractor
PCL Constructors Westcoast Inc.,
Canada, www.westcoast.pcl.com

Fabric
SEFAR® Architecture TENARA®
Fabric 4T40HF

SEFAR® Architecture TENARA®
Fabric 4T40HF

Fabric-material specifications
Fabric material
Fluoropolymer-coated
fabric made from ePTFE fibers

Fabric width 1.575 m
Fabric thickness 0.55 mm
Surface weight 1,080 g/m²
Highest tensile strength ASTM
D4851
Warp/Weft (N/5 cm)
4,000/4,000

Trapezoidal tear resistance
Warp/Weft (N) 798/752

Fire performance EN 13501
B-s1, D0 ASTM E84 – Class A
NFPA 701 – Small Scale – Pass

Light-technical specifications
Grade of transmission 38%
(ASTM D 1003)

Designed for extremes
In just twenty minutes, the pneumatically
supported membrane construction opens
from the center outwards to form a roof
which keeps out precipitation and bad
weather. Once closed, the roof can
withstand even a snowstorm and the
weight of up to 7000 tons of snow –
something not unusual here in British
Columbia. Commented David M.Campbell
from Geiger Engineers: “We decided on
TENARA® – in view of its flexibility and
suppleness, but also because of its high
translucence. Whether folded or extended,
the TENARA® roof is a major boost to the
entire stadium complex.” In comparison
to the old construction, energy savings of
around 25% can be made; equivalent to
around $350,000 annually.

Vancouver shines
The new roof construction has given the
city of Vancouver a new architectural icon
and today the reconstructed area of
around 45,000 m² acts as a magnet for
spectators – and at night it shines like a
glowing beacon. Events are regularly
booked out well in advance, able to take
place according to a reliable schedule, and
considered highlights by those playing
here. Before departing for the venue,
guests can use Twitter or the BC Place
homepage to find out whether the
forthcoming event will be open-air, and
dress accordingly.

project such as this are extreme. It is essen-
tial it possesses sufficient strength, but at
the same time it must be sufficiently soft
and flexible to withstand the many folding
cycles. Because of its two-layer pillow
construction, the highest possible light
transmittance is necessary. Many tests
were conducted during the design phase
to find the most suitable material.”

Falling attendance figures were giving
sport event promoters cause for concern
and events sometimes had to be canceled
owing to insufficient light. The Canadian
planners charged Stantec Architecture
with finding a material for the two-ply
interior ceiling which had to be markedly
resistant to water and more translucent
than either PVC or fiber glass. The choice
of the engineer was SEFAR® Architecture
TENARA® Fabric 4T40HF.
In the last issue of Sefar Architecture, we described outstanding material properties of fluor-polymers in general, and of polytetrafluoroethylene (PTFE) in particular. Manufacturing PTFE presents some very specific technical challenges at every stage of production. To make a fabric from this high-tech material requires, before anything else can happen, a complex yarn production process.

The polymer is produced using the mineral “fluorspar” (CaF₂), sulfuric acid, and peroxide, and the initially fine powder is agglomerated into 500-micrometer-diameter grains in much the same way as a snowball forms. The result is so-called PTFE paste, whose grains are extremely shear sensitive, so they have to be added using a lubricant in a process known as paste extrusion. The lubricant diffuses into every pore and gap between the PTFE grains, and the resulting shear stress in the extrusion process works as a kind of spacer, influencing the level of shear energy introduced. Because the extrusion nozzle is narrow, the mixture of PTFE and lubricant is exposed to shear deformation as it passes through, with the character of the extruded material produced dependent on the style and geometry of the nozzle. Other production stages (e.g. sintering) take place in conjunction with the extrusion process, depending on the final application.

Films, bindings, and sealing cords can be made using undrawn, drawn, unsintered, or sintered PTFE pastes; in yarn production, the dried films are drawn. In practice, free-running PTFE film is drawn at temperatures between 280 and 300 °C. The film is then stretched in its running direction through two roller systems turning at different speeds, being held in place by a combination of steel and rubber rollers. It is important for the future weavability of the yarn that the film is drawn without any imperfections and there are only very small variations in width or thickness. This procedure produces a highly porous structure resulting in a considerable reduction in the specific weight of the film, which can be either mono- or biaxially drawn. Monoaxial PTFE is used as sealing tape while biaxial PTFE has many uses in the clothing industry as a breathable, water-permeable membrane, not to be confused with the fabric employed in membrane construction.

For yarn production, the film is now sintered, cut into fine bands, and drawn once more; this process can be carried out monoaxially or biaxially. The term ePTFE (e = expanded) applies in cases where the cut bands undergo biaxial drawing. Both
types of drawing are used when manufacturing Sefar Architecture fabrics; which depends on the intended end application. Drawing the bands, like the final twining, is a crucial production step when achieving particular strength values. Only when twining can a virtually round, weavining yarn be created. In yarn production and application, typical distinctions are made between staple fibers, monofilaments, and multifilaments. Twined PTFE bands are a special case; since the extruder does not produce a round strand, the term monofilaments is not really appropriate. The same difficulties apply to multifilament or staple fibers, and it is this particular situation which is responsible for the special demands being placed on the weaving technology. In comparison with yarns made from other raw materials such as polyesters or polyamides, the complex manufacturing process for PTFE yarn leads to significant variations in the diameter of the thread. Only warp equipment (to process the yarn for the weaving machine) and weaving machines which have been specially equipped and configured are able to work with such variations. A further challenge comes in the form of the high electrostatic charge arising from PTFE and the special measures necessary to overcome this problem.

Mastering these highly specialized refinements throughout the entire PTFE production cycle (from the manufacture of the polymer to yarn production and finally weaving), including its mass production, means that projects such as the large-scale sun shades in Madinah (see Sefar Architecture Issue #1) can actually be achieved. The top-quality end products once shaped into textile architecture are impressive expressions of the uniqueness of these materials both functionally and aesthetically.

High-precision, technical fabrics are produced to meet the exact specifications of the final application.
Monofilament yarns have a minimum diameter of 20 μm, single and multifilament yarns can be as fine as 1 μm. Depending on the type of fabric, there can be up to 6000 warp threads per width meter.
A secure bank  
acrevis goes for transparency.

The conversion of the customer hall at acrevis bank in Gossau, Switzerland, emphasizes its identity, underlining both its transparency and discretion. At the same time, the use of light-acoustic membrane elements in the interior area offers obvious advantages: private meeting rooms are well illuminated and inviting, discussions are safe from unwanted eyes or ears, aesthetic requirements are reflected in the decor, and best of all the attractive play on transparency is a remarkable example of design engineering.

Local architects Fürer and Gastrau have spanned the ceiling of the generously fashioned interior with around 171 m² of material. In addition, there are individual sections in the conference rooms and about 2 m² per element for the separate private meeting room area. The material, SEFAR® Architecture IA-80-CL, is a light-technical and acoustic fabric, ideally suited to this situation because its uncoated textile structure makes it particularly effective in reverberation absorption.

"Boutique" bank with the customer in the center

The conceptual idea by the architects, who are also designing objects for American projects through their offices in Milwaukee, was a “boutique” bank with the character of an art gallery in which the spatial objects play a decisive role. Consequently, the customer hall at acrevis bank is a platform with a clear focus on the client.

Subtle aesthetics thanks to a special lightframe solution

As an integral part of the architecture, it was taken for granted that the ceiling should have no visible hanging devices or
other “distracting” construction elements. The chosen Sefar partner, Schmid GmbH in Simmerberg, then decided to opt for an unusual filigree solution. Thanks to a specially developed carrier system, the individual elements are fully serviceable, yet the seams have no visible supporting profile. The slim-line frame profile is unobtrusive to the eye while the background lighting casts virtually no shadow.

The fabric is also employed in the private consultation area as an unadorned lighting element. Next to the skylight, which introduces natural light in the private meeting rooms, there is a section in the suspended plaster ceiling supplemented by SEFAR® Architecture IA-80-CL, acting as both an exciting design feature and acoustic dampener. Factory-made, pre-assembled elements make them possible to be fitted within a short time frame.

Spacious and at the same time invitingly comfortable, the newly designed customer hall appears both transparent and harmonious. The balanced illumination is tangible while simultaneously maintaining an agreeable sense of discretion and openness towards the needs of the bank’s customers.

acrevis Bank AG
CH-9201 Gossau www.acrevis.ch

Architect
fg architecture
monika fürer david gaschau
dipl. architekten sci-arc swb aia
CH-9200 Gossau
www.fgarch.com

Project partner
Schmid GmbH
DE-88171 Weiler-Simmerberg
www.schmidgmbh.de

SEFAR® Architecture IA-80-CL

Fabric-technical specifications
Fabric material
PVDF (polyvinylidene fluoride)
Fabric width (cm) 270, 340
Weave Twill 1/3
Surface weight (g/m²) 440
Highest tensile strength
warp/weft (N/5cm) 1,800/1,000 according to EN ISO 13934-1

Highest tensile elongation
warp/weft (%) 35/27 according to EN ISO 13934-1

Tear propagation force
warp/weft (N) 40/80 according to DIN 53859-5

Fire performance B1 according to DIN 4102; B-s1, d0 according to DIN EN 13501-1

Light-technical specifications
Grade of transmission (%) > 80 according to ASTM D 1003

Degree of reflection (%) 19
Absorption (%) 1

Open-plan, bright, and inviting: the customer center at acrevis bank.
New Zealand’s lightness of touch

With SEFAR® Architecture Fabric, a primeval tree comes to life at Auckland Airport.

New Zealand thrives on nature, expanse, sun, and light. And naturally these qualities are to be found at Auckland Airport as well. With an almost endless lightness of touch, SEFAR® Architecture Fabric provides shade for the new shopping center in the terminal building, capturing the very essence of the country in a section of the tree which recreates the history of the Maori people.

Thousands of passengers arrive and depart each day from the nation’s largest international airport, situated in Auckland on the North Island. However, New Zealand intentionally stays close to its roots. The vast sculpture which occupies the large shopping and restaurant zone in the departure area is known by its Maori name “Pou Manawa” — the tree. First inhabited around the 13th century by the Maori people, modern New Zealand is still very much characterized by its indigenous roots. In this spirit, Ignite Architects together with Adrian Nancekivell Design have demonstrated empathy with the heart of an entire culture in their oversized creation “The Tree.”

The tree – a powerful symbol of Maori culture

In place of traditional foliage, there is a nine-meter-high “crown of light” made from SEFAR® Architecture EL-55-T0 Fabric. Providing a secure and smooth attachment of the textile construction between floor and ceiling, presented a particular challenge. Today the tensioned membrane is held in place by a giant, circular frame attached to the roof construction. At the same time, the membrane originates in the “tree trunk,” which acts as a fixed point below and is fashioned out of native meranti wood in the shape of a cornucopia – the horn of plenty.

“The Tree” at Auckland International Airport, New Zealand

Architect
Ignite Architecture, Auckland, New Zealand, www.ignitearchitects.com
Engineering
Wade Design Engineers, Brisbane, Australia, www.wadeconsult.com
Manufacturing/implementation
Fabric Structure Systems, Auckland, New Zealand www.fabricstructure.co.nz
Fabric
SEFAR® Architecture EL-55-T0
A powerful attraction instead of a boring artifact

Travelers from all over the world find calming ambience and protection under one roof, with a relaxing oasis of gentle light in the midst of a busy international airport. At the same time, the streamlined fabric forms an even, translucent surface and, like the “trunk,” is discreetly protected internally by steel casing.

Behind the oversize projection surface which is created, there are cleverly concealed projectors and LED lights depicting traditional Maori themes, forest moods, sunrises and sunsets, the night sky, and the ocean in a continuous, seemingly unbroken 360° sequence.

Increased satisfaction in the departure area

Switzerland to New Zealand has always been a long trip, so a comprehensive range of tests were conducted which centered on the design possibilities, physical characteristics, and projection qualities of the fabric. In addition to its durable UV-light fastness and dirt/water-resistant properties, SEFAR® Architecture EL-55-T0 displays a particularly high diffused light ratio and minimal color shifting.

The Pou Manawa project reached its apex with the opening of the redesigned departure area and since then has gained an excellent reputation in specialist circles including being named “New Zealand’s best retail interior for 2011.”

SEFAR® Architecture EL-55-T0
Light-technical fabric

Fabric-technical specifications
Fabric material
PTFE (polytetrafluoroethylene)
Material coating 100% fluor polymer
Fabric width (cm) 160
Weave Cross twill 2/2
Surface weight (g/m²) 250
Highest tensile strength warp/weft (N/5 cm) 1,500/1,600 according to EN ISO 13934-1
Highest tensile elongation warp/weft (%) 7/9 according to EN ISO 13934-1
Hydrostatic head (mm) > 2,000
Fire performance 81 according to DIN 4102; B-s1, d0 according to DIN EN 13501-1

Light-technical specifications
Grade of transmission (%) > 55 according to ASTM D 1003
Degree of reflection (%) 44
Absorption (%) < 1
Luxury in the best possible light

Flagship store with UV protection.
Louis Vuitton is the embodiment of fashion and haute couture. Designers of the 25,000 m² (approx. 270,000 sq ft) Louis Vuitton flagship store at busy Raffles Place on Marina Bay in Singapore have created a customized glazed pavilion.

Large and uninterrupted glass fronts and a nautical flair have quickly turned the Louis Vuitton store – their first in South-East Asia – with its light-suffused atmosphere into a magnet for visitors in a metropolis with a discerning shopping clientele.

**Island house surrounded by water**

With the “Island Maison,” New York-based interior architect Peter Marino adopted the core themes of Louis Vuitton: travel and worldly sophistication, maritime ease, and relaxed elegance. The result is a crystal-like construction which lies on a separate island in Singapore harbor.

Special attention was paid by the designers to ensure the luxury goods were protected from the effects of intense sunlight. Covered with SEFAR® Architecture EH-35-T2, custom-made cassette elements were used to protect the precious materials, fabrics, and leather articles from too much daylight. At the same time, they had to provide the store with sufficient natural light for a warm and welcoming shopping ambience. All this, and the skyline of the inner-city bay always in view.

**Pre-tensioned and installed directly on site**

Over 300 tensioned ceiling panels in aluminum frames specially made by FTL were used. Key requirements that coverings were free of creases and illumination reached right into the corners. Today the ceiling panels appear to hover in space, floating like the sails of a luxury yacht while client and designer Nicholas Goldsmith from FTL Design Engineering Studio has even likened them to flying carpets. A cable mechanism gives access to the lighting system behind the panels.

"It’s a great product"

Unbeatable in terms of its translucence, durability, and resilience, the decisive advantages of the low-maintenance fabric are also listed by designer Goldsmith, while at the end of the project, interior architect Peter Marino once more highlighted its functionality and light quality. The strong exterior light – further reflected by nearby water – is visibly softened by the use of SEFAR® Architecture EH-35-T2 and its exceptional UV protection. In this way, the color scheme harmonizes with the goods on display, discreetly underlining their special value.

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**Louis Vuitton Store**

Singapore

www.louisvuitton.com

**Architect**

Peter Marino Architect

150 East 58 Street, New York

www.petermarinoaearchitect.com

**Tensile engineer**

FTL Design Studio, 44 E 32nd Street,

New York, NY 10016

www.ftlstudio.com

**Manufacturer**

EventScape, 4 Bestobell Road,

Toronto Ont, Canada

www.eventscape.net

**Fabric**

SEFAR® Architecture EH-35-T2

Light-technical fabric

**Fabric-technical specifications**

Fabric material

PTFE (polytetrafluoroethylene)

Material coating

100% fluor polymer

Fabric width (cm) 160

Weave Plain weave 1/1

Surface weight (g/m²) 550

Highest tensile strength warp/weft (N/5 cm) 4,100/4,000 according to EN ISO 13934-1

Highest tensile elongation warp/weft (%) 23/19 according to EN ISO 13934-1

Hydrostatic head (mm) > 3,000

Fire performance

81 according to DIN 4102; B-s1, d0 according to DIN EN 13501-1

Light-technical specifications

Degree of light transmission (%)

> 35 according to ASTM D 1003

Degree of reflection (%) 64

Absorption (%) < 1
Eyes for art

Light domes: natural and artificial light in perfect harmony.

What’s to be done when a museum can’t relocate? When it wants to remain in the heart and soul of the city? When green spaces should be preserved? When every possibility for expansion appears to be exhausted? Then go underground – and almost double your floor area!

The Städel Museum in Frankfurt am Main, built in 1878 and one of the most important art museums in Germany, solved all its needs in a very discreet manner; they relocated beneath the ground. Instead of somber exhibition rooms, there are now bright, subterranean halls along Frankfurt’s popular riverside “Schaumainkai” which give a successful impression of vastness.
and – very important for an art museum – allow in the right amount of natural light from above.

A well-formed solution: light domes as an architectonic design element

The central design element in the concept devised by Frankfurt architectural practice Schneider + Schumacher: 195 ground-level skylights with an axis grid of 3.70 m x 3.70 m and diameters from 1.50 m to 2.50 m which reflect the topography of the existing garden. Through the use of these vaulted glass elements, there is now a green area outside featuring a remarkable design directly above a new 3,000 m² underground exhibition area.

Illumination concept

The multiple light domes with their spherical, cold-bent, insulating glass discs break through the self-supporting and slightly bulbous ceiling of the subterranean exhibition hall beneath. In so doing, they provide natural light while at the same time being a source of artificial light – with a ring of warm white combined with cool white LED elements.

Art in and within the building

Every single light dome is a work of art in its own right: here a two-ply membrane tensioning concept was applied using SEFAR® Architecture IA-80-CL Fabric. Depending on the diameter of the light dome, the two fabric layers are pre-
tensioned with the help of a strong, circumferential, 4 mm carbon bar and between 18 and 28 springs. The upper membrane protects the element from dirt and the lower one functions as a diffuser. In addition to all this, the light-technical and acoustic PVDF fabric is over 80% light transmissive and can conceal accent lighting, diffuse lighting, LEDs, and dimmer elements, as well as protecting the exhibits from too intensive sunlight. For cleaning and maintenance purposes, every light dome can be accessed in no more than five minutes.

**Natural artificial light**

A deciding factor when choosing SEFAR® Architecture Fabric was its high diffused light ratio and minimal color shifting. As a result, the exhibits always appear balanced, true to the original, and carefully illuminated irrespective of the actual lighting conditions outside. Based on the amount of natural light available and tailored to the requirements of the artwork on display, the light management system selects the maximum setting and adjusts the level of artificial light from the skylights.
Salzburg Main Station in a new light
A masterly, on-track achievement.

With the conversation of Salzburg Main Station from terminus and transit station to a transit station only, new design possibilities were created for the landmarked barrel vault in the platform area. The final result is a skillful lighting effect and cosmopolitan atmosphere, protection from wind and weather, and conformity with the structural specifications.

The greatest challenges were the historic arched roofs which were to be kept intact but relocated, plus the fact that a normal railway service was to operate during the redesign, reorganization, and renovation work.

Structural specifications for transit traffic

For over a century, the elegant arched roofs of the main station have been a landmark on the city skyline; their gently curving steel framework strong yet delicate to the eye of the passing traveler. However, the new requirements of a transit station coupled with analysis of weather observations over many years concerning snow and wind load meant changes were necessary for the longitudinal roofing structural system.

The contractor therefore specified the construction of a membrane roof including a substructure on the basis of the historical roof construction. For this reason, the Austrian national railway (ÖBB) stipulated a translucent membrane roof made from PTFE fabric whereby just external loads – snow and wind – would be transferred onto the existing construction at precisely determined points.

The arched roof: from tradition to trend

SEFAR® Architecture TENARA® Fabric 4T40HF was the preferred choice of architects kadawittfeldarchitektur and building contractors Zeman & Co from Vienna in view of its flame resistance, water resistance, and durability.

With the dismantling of the steel framework – around 2500 individual pieces with
a total weight of 250 tons – and the reconstruction by Zeman, the two roof arches which were originally separated by a restaurant are now riveted directly together above platform 2 and platform 3. These are fitted with 1400 running meters of Sefar fabric, divided into 24 single panels. The membranes are arranged lengthwise in sections running from the eaves to the roof ridge, and in width they always take up the space between girders and rafters, or rafters and rafters. On the eaves, there is a two-level snow guard system fitted to the membrane construction.

A plus for comfort

The 1700 m² covered area provides fixed protection from the elements and natural lighting which also matches the new structural situation, and Salzburg Main Station has been transformed into an inviting and agreeable international shopping mall. At the same time, the unmistakable, historical appearance of the main station has been preserved.

While in the past a large number of trains terminated at Salzburg Main Station, the new transit station is able to handle more train connections. As a consequence, east–west connections have improved and Salzburg Main Station is now integrated effectively into the trans-European network from Paris and Stuttgart to Bratislava via Vienna.
Star-level
High-end restaurant with high expectations.

sun protection
Sitting outside – an absolute must in Miami Beach. But even here in Florida, the sun doesn’t shine all the time. Guests at the Juvia, a first-class restaurant serving international specialties, love sitting in the open air and dining under the stars until late in the evening. The client therefore had to take into account the need for both protection from the strong sun as well as a reliable roof covering for the sizeable terrace during wet weather.

The terrace at the Juvia holds a particular attraction for locals used to spending time outside, as well as for vacationers along the southeast coast of the United States. Secluded and high above the busy Lincoln Road, the terrace affords its guests extensive views across the legendary Miami Beach. Being able to offer seating here irrespective of weather conditions was obviously an important consideration for the client.

An intimate atmosphere at the touch of a button

Guests can now enjoy the Juvia’s famous cocktails and its combination of Peruvian, French, and Asian cuisine in the open air or beneath a light, retractable roof made from SEFAR® Architecture TENARA® Fabric 4T40HF. Fully extended, it can safely withstand wind speeds of over 80 km/h (50 mph) and on cloudy days conjures up a gentle, uniform light. In addition, the material is fire resistant, extremely durable, and can be extended and retracted many
Meeting the need for protection from sun and rain – even with wind speeds of over 80 km/h (50 mph).

Meeting the need for protection from sun and rain – even with high wind speeds. With almost 40% light transmission – twice that of conventional industrial fabrics – it offers guests exactly the right degree of light-shade intensity, as well as protection from sunlight and rainfall.

“Our penthouse is your penthouse”

It is quite possible that the many trend-setters who gather here have popularized this saying. Lunch, dinner, or after work – first opened in February 2012, the Juvia employs chefs from all over the world. It even has its very own horticultural artist. The penthouse on the 9th floor of the Sun Trust Building is an informal and cosmopolitan meeting place which is regularly booked out weeks in advance. With the all-weather guarantee from Sefar, it is now possible to determine more accurately the seating capacity, and you needn’t wait for nightfall to enjoy the spectacular views of South Beach and Biscayne Bay.

SEFAR® Architecture TENARA®
Fabric 4T40HF

Fabric-technical specifications
Fabric material
Fluoropolymer-coated fabric made from ePTFE fibers
Surface weight 1,080 g/m²
Thickness 0.55 mm
Width 1.575 m

Highest tensile strength (warp) 4,000 N/5 cm (ASTM D4851)
Highest tensile strength (weft): 4,000 N/5 cm

Trapezoidal tear resistance (warp) 798 N (ASTM D4851)
Trapezoidal tear resistance (weft) 752 N

Fire performance EN 13501
B-s1, D0, ASTM E84 – Class A,
NFPA 701 – Small Scale – Pass

Light-technical specifications
Light transmission 38%
(ASTM D 1003)
Preview
In the next issue of “Sefar Architecture” we will be reporting on ...

Rorschach: the new Würth Administration Building
The new Würth Administration Building – an imposing seven-storey complex attractively located on the Lake of Constance in eastern Switzerland – will reach completion early in 2013. During the construction phase, the characteristic outer glass layer of this remarkable administration building has been a clearly visible landmark. The glass panels of the curtain facade are fitted with SEFAR® Architecture VISION Fabric AL 140/70.

New Kassel Gallery: daylight improves quality
Since its reopening, the upper floor is now much more appealing thanks to the installation of a modern daylight ceiling. Staab Architects in Berlin and Sefar project partner Schmid GmbH decided to use a specially developed and adjustable supporting structure, torsion-resistant aluminium tentering frames, and SEFAR® Architecture IA-80-CL Fabric.

Frankfurt: a new start for Westend Gate
Following extensive renovation, the commercial tower is once more an attractive proposition for both investors and tenants. Ceiling solutions have been installed in the interior of this skyscraper, which fulfill the requirements of fire safety and durability, as well as being easy to dismantle and to refit. The desire to create a bright atmosphere was achieved by Frankfurt architects Just Burgeff using SEFAR® Architecture IL-80-OP Fabric.
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