

HARDNESS TESTING

How a specialist unit tests building façades for resistance to fire and ballistic penetration

THE LIGHT GUARDIAN

Freely designed glass roof

THE SHAPE OF THINGS TO COME

What is the new THERM⁺ FS-I steel façade system capable of?

A DAY'S WORK IN ETERNAL ALPINE ICE

A fitter at the mountain station of Germany's highest peak: the Zugspitze



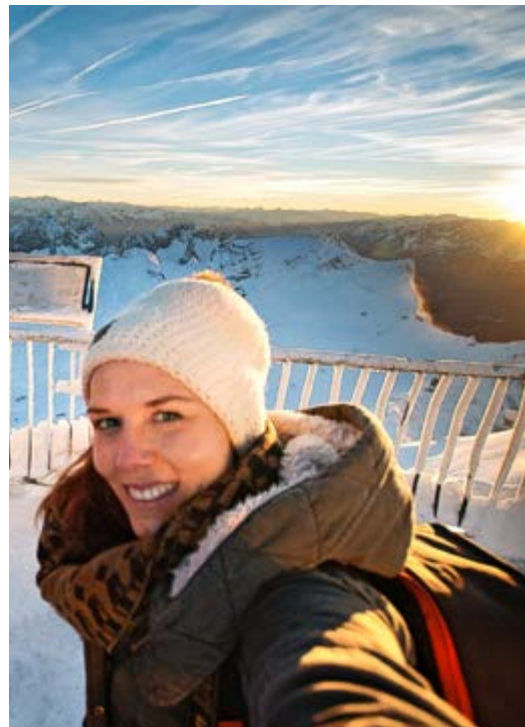
THE BOYS GET THE HANG OF IT

It is often the men who call the shots in the construction industry. But this changed a bit when it came to this new issue of *Objektiv*. The men involved suddenly started doing exactly what I wanted, to the extent that I had them wrapped around my little finger - or at least the forefinger that I use to trigger my camera's shutter.

I was amazed at the influence that having a camera in my hand gave me. "Please come a little closer, now give us a twirl. Everyone down on one knee, please." The boys in the test

team hung on to my every word. My colleague Michael Kaufmann fussed about the prototypes of the new THERM⁺ FS-I at my behest as if he were the father of new-born babies. And Martin Moser, a fitter engaged by Pichler Steel Erections to work on the Zugspitze, spoke to me about his thermal underwear and the hot showers needed to thaw out his freezing toes after a hard day's work on the icy summit.

I hope you gain as much enjoyment from reading the articles in this issue as I did from producing them. Thank you, gentlemen, for your cooperation.



Yours, **Andrea Jall,**
Art Director
RAICO Bautechnik GmbH

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What architects have lying around on their desks



THE ART OF HEADING THE BALL

They both share a joint passion for football and architecture: Marius Ellwanger (on the right), a project manager at Leipzig Architects Schulz & Schulz Architekten, and Hagen Weber, RAICO's sales manager for Germany and China, practice their heading skills in front of the Red Bull Arena. They couldn't be more united when it comes to joint project solutions, but their sporting loyalties are a different story: while Marius Ellwanger supports the local football club of his adopted city, RB Leipzig, Hagen Weber's heart has for many years belonged to all-conquering Munich. But they ultimately both agree that keeping the ball in the air is the key when it comes to delivering a project solution. □

THE SHAPE OF THINGS TO COME

Text: Roman Felden

Just like a proud new dad — at RAICO: the latest member of the company's family of curtain wall systems is the THERM⁺ FS-I. Michael Kaufmann and his team have developed this steel curtain wall system using screw-in tubular profile sections. It is in fact a multi-parent affair, albeit with "custody" awarded to Mr Kaufmann. So what were the team's thoughts as they planned the design?

"We wanted to create a steel curtain wall system with integrated screw channel, for combining with our THERM range", explains Mr Kaufmann, before adding: "This gives architects greater freedom of movement to design, with these high-load-capacity system components at their disposal, and the people responsible for assembly are no longer obliged to put together the rigid-frame steel structure with welds, bolts or rivets. They can now screw the pressure profile directly to the structural system.

He adopted the original idea in his role as team leader for curtain walls, and lovingly nurtured the fledgling project that resulted. "I continued to develop, and then implement, the basic idea along with my team. So I am perhaps a mid-wife rather than a single dad."

An uncomplicated birth. Right from the start, Kaufmann and his team were at the heart of the THERM⁺ FS-I project: a functional groove with correspondingly matched, screw/clip-on profile. When it came to fixing the pressure profile and structural system directly to each other, the key question was how to design the groove into which the screw is anchored. It took some time to determine the exact size →

of the gap that would allow easy insertion of the screw into the clip opening, while eliminating any play between the elements concerned. Mr Kaufmann even had to develop a new screw for the purpose. It had to be hard enough to self-tap into the steel profile and also highly resistant to corrosion, as its head may be exposed to the weather. "We have opted for a special screw that fulfils both of these requirements", he says.


Another clue lies in the innovative T-connection system: The standard SC connector for mullion and transom profiles has a variably adjustable fixing element designed to match internal tube-diameter tolerances. It can be transported easily, and is suitable for

use with threaded tubes and standard press-on steel profiles, and also as a screw-on expansion transom and for subsequent transom installation. The SCL ladder connector can also be screwed in to provide contact pressure.

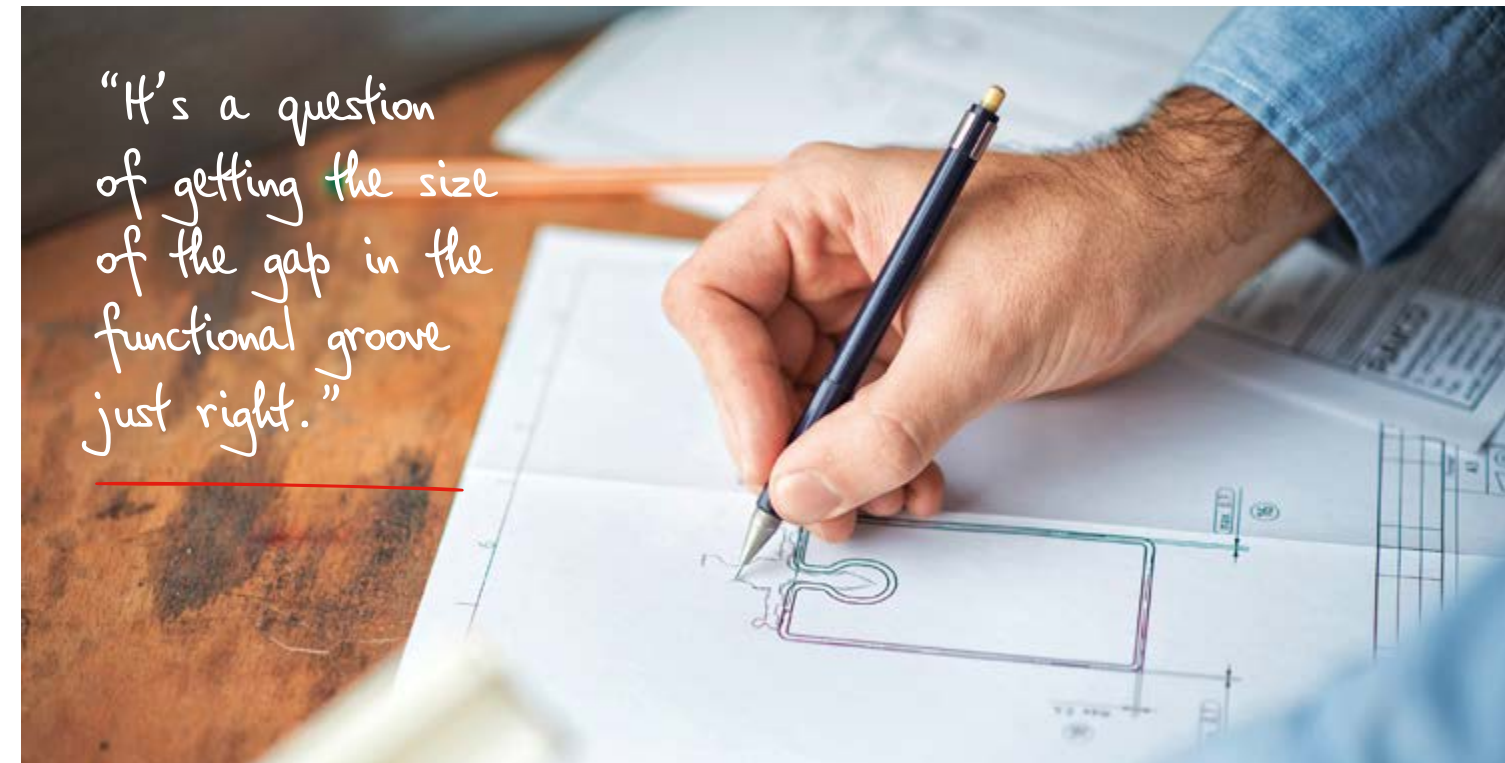
The newly born FS-I is kept nice and dry with a cover seal to stop surrounding water penetrating the screw. It is also largely impervious to temperature changes, as its one-piece plastic profile conducts considerably less heat than one made of metal. Various insulating blocks based on the existing THERM⁺ system can be used, depending on the required heat insulation and desired heat transfer coefficients. FS-I is thus certified for use in all "passive house"

systems – with maximum thermal insulation of up to $U_f=0.77 \text{ W/(m}^2\text{K)}$, with screw factor included.

"And it's also really good to look at", says the proud joint parent. He is referring here to the reduced radii of the profile tubes, which give the FS-I its sharp-edged appearance. Architects appreciate this characteristic, because it allows them to create seamlessly merged glass façades and curtain wall profiles.

Confidential sources report that Mr Kaufmann and his helpers have already wet the new baby's head with a well-deserved beer or two. This was outside working hours of course, as midwives aren't allowed to drink on the job. 

"It's a question of getting the size of the gap in the functional groove just right."



FUNCTION TESTING WITH THE FIRST PROTOTYPES FROM THE 3D PRINTER



WHAT IS THERM⁺ FS-I CAPABLE OF?

This curtain wall system with integrated screw channel is compatible with all other THERM systems. Architects can employ it freely with a massive range of dimensions and wall thicknesses, and use its sharp-edged look to create elegant, seamlessly merged glass and curtain wall profiles. Installers no longer need to worry about welding or riveting, as the FS-I system lets them screw the pressure profile and structural system directly to each other. The system also includes two different T-connectors for single-bar and ladder installation.



MISSION ACCOMPLISHED:
A PROFILE TUBE WITH
INTEGRATED SCREW CHANNEL
AND CLIP ATTACHMENT

GUARDIAN OF THE LIGHT

A glass roof is, for the people underneath it, more than just the decorative topping of a building. It supplies light, regulates heat, helps determine their mood and gives them something nice to look at, while also providing a playground of ideas for the architects involved. Such is the case at the Fischapark shopping centre, where the architect has managed to finesse his vision of a unique glass roof design with the corresponding details in the detail, like energy absorption, drainage, ventilation and illumination.

Text: Lars Thieleke



UNIQUE: THE OUTLINES OF THE FISCHAPARK SHOPPING CENTRE ARE MODELLED ON THOSE OF AN ALPINE PEAK



THE VISIONARY:
ARCHITECT PHILIPP URABL

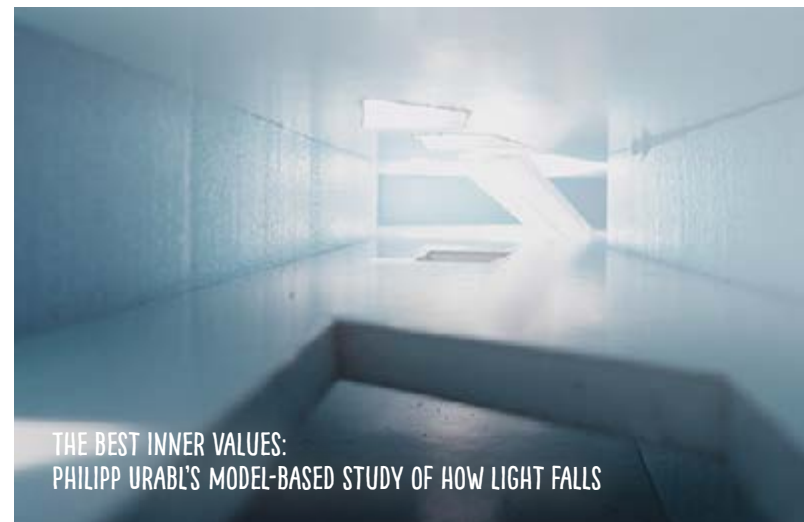
"The building recreates the silhouette of a snowy mountain peak."

How could a shopping centre have anything to do with mountains? "If you ever go to the town of Wiener Neustadt in Lower Austria, you won't be able to miss the view of a 2,000-metre high peak known as Schneeberg, which literally means 'snowy mountain'. I have incorporated an interpretation of this view into my design for Fischapark, which is why the contours of the building suggest the outline of the Schneeberg", explains Philipp Urabl of Vienna architects ArchitekturConsult.

A building with Alpine pedigree. And a perfect example of how today's architects are able to play freely with glass roof designs. Visitors to the Fischapark Centre have what amounts to a privileged view of the summit, as this circular shopping wall is topped with a steel-and-glass roof structure, measuring 1,730 m² in area, which seems to float on its two conical supports. Mr Urabl has in fact managed to square the geometry of a towering mountain peak with the practical requirements of a shopping centre. Part of his mission was to supply the indoor sales areas with muted, dispersed and therefore pleasant lighting. The architect's biggest challenge lay in finding a balance between abundant light and low heat absorption, and he has left nothing to chance in this respect.

As part of his effort to calculate precisely the lighting factors affecting the glass roof, he built a model and took it into a test lab belonging to Bartenbach, a firm based in Aldrans, in the Austrian Tyrol, where he simulated sunlight conditions for various times of day and the →

"The outer shell shines like silver under sunlight, acquiring a golden glow as night falls."

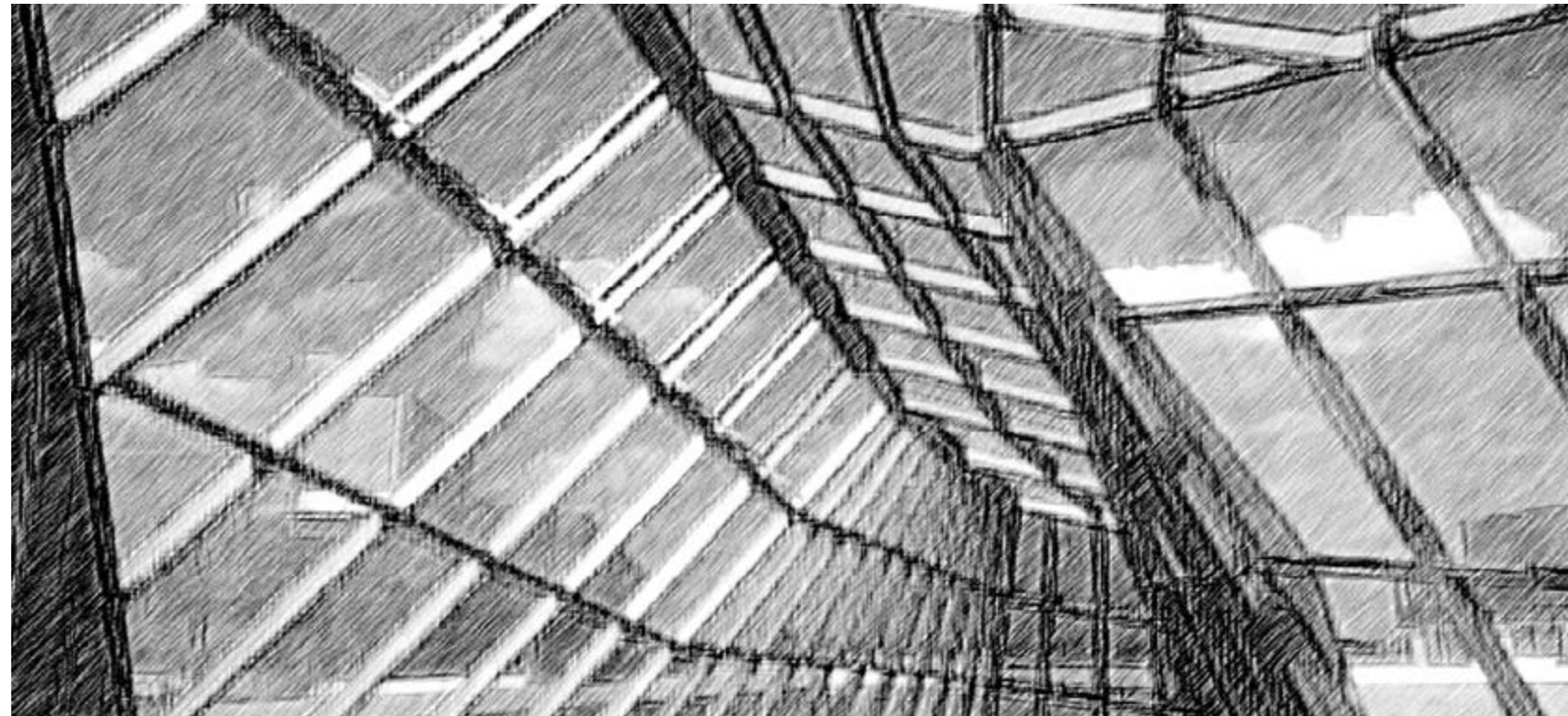


year's different seasons. The model took a lot of punishment as Mr Urabl knocked it into suitable shape, until he was able to control the light and create the desired internal ambience. He then had to implement it in the real world. He started with a silicone-based approach to the curtain wall profile, only to reject this method. He ended up forming the glass domes on a substructure made of steel, for which he chose a screw-on base profile from the RAICO curtain wall system THERM⁺ H-I. "This system is what finally did it", he recalls, before going on to explain: "The modular structure of the system and the continuous screw channel in the steel profile left me free to choose, without having

to worry about screw positions. And the drainage system and seals work reliably, despite the sharp angles of incline involved." Heat buildup nevertheless proved to be something of a headache. His solution: two different skylight designs. One is frosted in a similar way to that of the Elbphilharmonie concert hall in Hamburg, while Mr Urabl has given the other a homogeneous pattern of dots. He still needed further thermal protection however, and chose to use laminated safety glass (i.e. multi-layer glass containing embedded metallic mesh) for the outer shell. His plan also included sliding ventilation sections, which can be moved in a staggered way depending on the time of day. They are

opened fully at night to let in cool air, and close again in the morning to guard against excessive heat.

A glass roof like an Alpine peak – As Philipp Urabl's masterly vision deserved adornment to match, he duly gave the whole building the look of precious metal. While the metallic mesh of the glass roof gives it a shimmering bronze appearance, a two-layer curtain wall made of golden, undulating sheet metal and natural anodised aluminium encases the rest of the complex. The architect: "The outer shell shines like silver under sunlight, acquiring a golden glow as night falls." □



THE SCRIBBLINGS OF AN ARCHITECT: A STEEL STRUCTURE BASED ON BASKETWORK



THE DANCE OF THE ELEMENTS

The new Fischapark shopping centre in the Austrian town of Wiener Neustadt is topped with a 2,200 m² glass roof and encased in more than 2,300 m² of curtain wall. Intensive planning has managed to make the whole thing look easy. Architect Philipp Urabl opted for the THERM⁺ H-I mullion-and-transom curtain wall system, into which he has inserted various windows. The two cone structures incorporate 26 x WING 50 SK-R units, while other roof surfaces include no fewer than 68 x WING 105 DI sections; all with either a diamond or a trapezoidal pattern. The openings in the curtain wall are meanwhile equipped with 18 x FRAME⁺ 75 WB concealed sash windows.

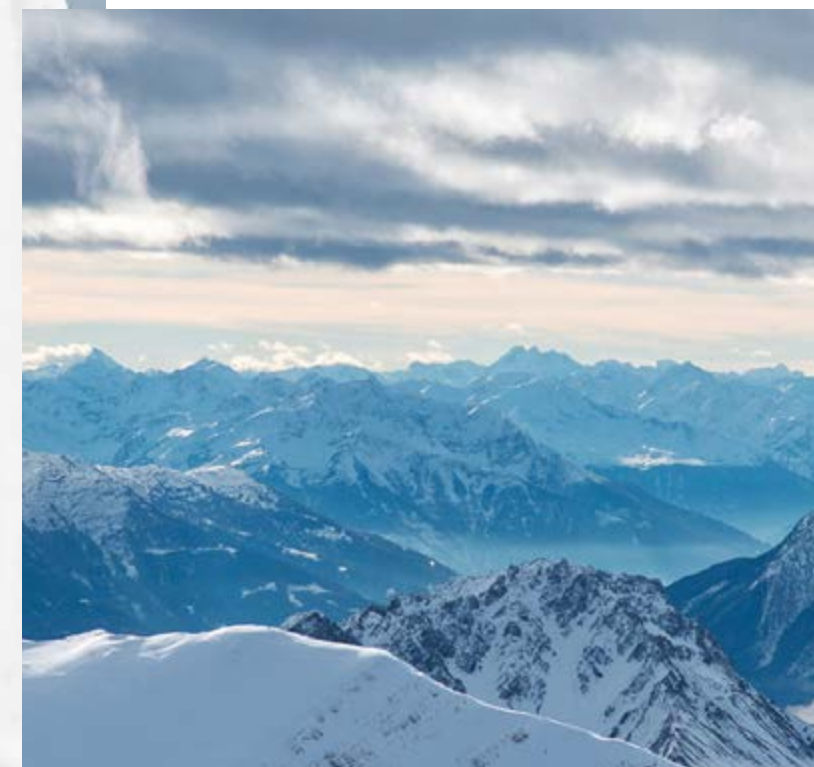


THE CRUX OF THE STRUCTURE: THE THERM⁺ H-I CURTAIN WALL SYSTEM

A DAY'S WORK IN ETERNAL ALPINE ICE

Office getting a bit cramped? Noisy workmates? Anyone complaining about their workplace might like to swap jobs with Martin Moser. He is a fitter working in Antarctic-like conditions on Germany's highest building site, where he and his colleagues are busy modernising the former Eibsee cable-car line up to Germany's tallest mountain, the Zugspitze. We went with Martin, to see what it's like to spend a working day almost two miles up and at temperatures of 20 below zero.

Text: Lars Thieleke; Photos: Andrea Jall



"Thinking creates fear. Fear is bad. So I don't do that much thinking.", says Martin Moser as he sinks a powered screwdriver into the curtain wall. He works on scaffolding at an altitude of almost 3,000 metres (i.e. the best part of two miles). The structure is encased in so much ice that it looks like some mythical giant beast. There is indeed something odd about it all; being surrounded by snow up here on Germany's highest mountain, as people saunter →

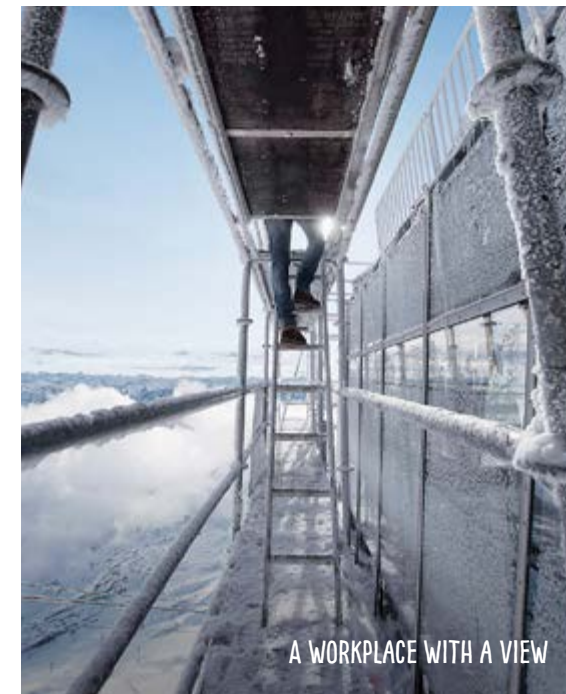
around in swimming trunks and bikinis by the Eibsee, the lake in the valley below. When Martin packs his rucksack in the morning to take the cable-car up to the peak, he includes just the essential equipment for the job in hand: skiing goggles to prevent snow blindness, factor-50 sun cream and thermal underwear. "I'm not sensitive to the cold. Four body-layers are enough. But some of my workmates wear three pairs of socks to stop their toes dropping off", explains the 33-year-old fitter.

Permafrost at the mountain station.

It is not uncommon to see temperatures of 20 below zero around here, so today's temperature of -5°C makes it Mediterranean by comparison, although Martin still has to cope with the icy, dry wind. "I

change my thermal gloves several times a day, and regularly apply Nivea cream to stop my hands chapping while I'm working." His fingers are not always fully at his command, especially when he has to take off his frozen gloves to handle small screws.

The cold is not the only serious hazard he has to deal with in the course of every working day however: "You need to stay really focused while you're working up here on the scaffolding, so as not to slip or lose your balance in the wind. You also need to be naturally sure-footed and not afraid of heights. And you have to get used to the thin air, as the lack of oxygen can dull your senses at first," says the father of three. Martin doesn't set much store by lucky charms, but if you ask him



"An Alpine-acclimatised fitter goes up in the crane every morning to remove the ice with a hot-air blower."

whether he entrusts his welfare to any superstitious ritual, he replies jokingly: "Not changing your underwear more than once a month."

By the time the spring of 2015 saw the modernisation of the mountain and valley stations of the Eibsee cable-car line (which is now more than 50 years old), contracts for the static engineering and draft architectural design had been awarded to Baucon of Vienna and Hasenauer Architects of Saalfelden respectively. The man in charge of design was Sebastian Kroesen, whose ideas held sway from the very beginning. He proposed the inclusion of a spacious viewing terrace at the summit and recommended an extension to the restaurant, thereby allowing visitors to

enjoy fully the north-facing panorama. According to Mr Kroesen, visitors to the summit of the Zugspitze are mainly interested in two things: the view from the top and their experience of their stay – which includes the dining on offer.

Intensifying the summit experience.

Putting this idea into practice required a daring overhang on the north side of the ridge, protruding over the incoming cable line with its angle of approximately 45°. The new cable-car line had to be positioned in front of the north ridge, in an area where fissures in the rock and permafrost prevent the direct inclusion of foundations in the mountain's structure. Baucon's sophisticated static engineering made this possible. The structure now handles the considerable tensile forces


of the cable line and overhang by way of the entire existing building, right around to the other side of the summit ridge.

The tricky factor in all this is that while the static loads created by the cable-car line and the corresponding load capacities were relatively easy to calculate, the calculations for wind and snow load in such an exposed place varied significantly from the norm. A firm called Wacker Wind Engineers therefore had to use a wind-tunnel model to try out various geometrical configurations for the area of the curtain wall. The overarching question in this respect was how to incorporate an insulating shell into a steel structure that has to cope with such forces. Sebastian Kroesen's solution was to leave the large curved sections →

cold, as they provide access for the cable-car line, and cannot be enclosed. His design then envisaged the inclusion of heated rooms in this cold steel structure, on the box-in-a-box principle, with as little direct contact between them as possible.

The mountain station still fails to feel like a warm room to Martin after four months, but more like a normal, everyday building site. Well almost. Given that tourism needs to continue uninterrupted, one of the Alpine-acclimatised fitters has to go up in the crane every morning and remove the ice with a hot-air blower, to eliminate any danger of visitors being speared by falling icicles. There is at least a crane at the summit. The concrete for the crane's foundations was flown up the mountain by helicopter, and the first anchoring points were created with a technique involving high-performance manual power drills, designed to penetrate 15 metres into the rock, before a large, specially chartered Russian helicopter flew in the crane components. An extra piece of equipment was installed alongside the

crane to help normalise building work at the summit: a cable-car line for materials. It runs in parallel with its passenger-carrying counterpart, taking tools, steel profiles and material up to the mountain station. It is to be dismantled when it becomes redundant at the end of 2017.

Over a stone (8 kg) lighter is how Martin reports his weight after five weeks up the Zugspitze, despite his daily lunch diet of curried sausage and chips. "I just burn it all straight off," he says, adding "The restaurant gives us their left-over pretzels every evening, and we have an all-day, all-you-can-eat deal on gummy bears" (the German version of jelly babies). He takes the downbound cable-car at 7 pm every evening, and always looks forward to a hot shower in his hotel room. He occasionally allows himself a treat. "I'm usually quite tired when evening comes, but I will sometimes go out for a beer. Whenever I do, a pint of draught Augustiner is what does the trick." 

PROJECT Rebuilding of the Zugspitz cable-car line

LOCATION Zugspitze, Germany

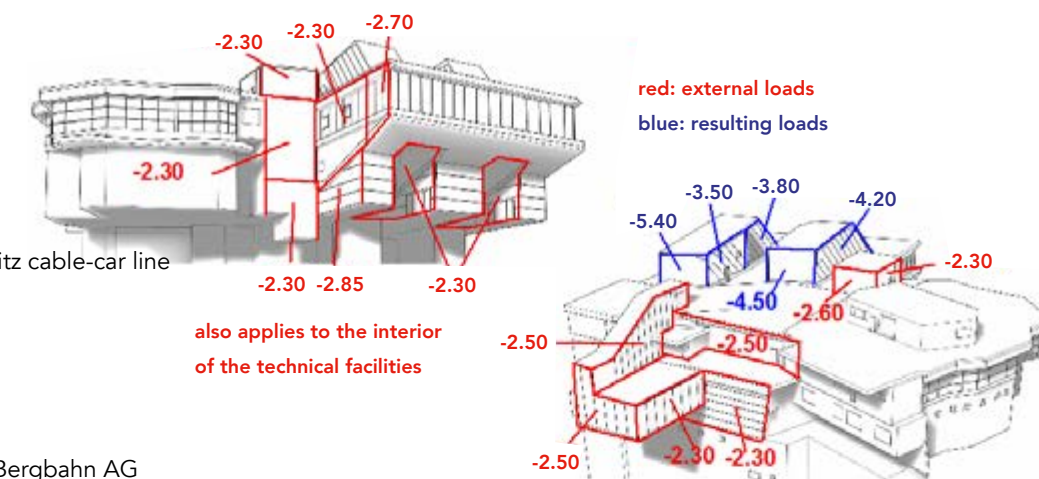
DURATION 2014 – 2017

CLIENT Bayerische Zugspitzbahn Bergbahn AG

GENERAL PLANNING ARGE: Baucon – Hasenauer – AIS

CURTAIN-WALL CONSTRUCTOR Stahlbau Pichler GmbH/Srl, Bozen

RAICO SYSTEMS Curtain-wall system THERM⁺ A-I 56 mm and THERM⁺ H-I 56 mm on a steel substructure



A METICULOUS ARCHITECTURAL TASK: THE PRECISE CALCULATION OF WIND LOADS



WHICH CURTAIN WALL WITHSTANDS WIND AND SNOW?

The mountain and valley stations of the Zugspitz cable-car line are equipped with the systems THERM⁺ A-I 56mm and THERM⁺ H-I 56mm, along with a steel substructure. Handling slopes and roof glazing in the same way. This is where one of the strengths of our range of systems comes to the fore. The modular design of its various components allows virtually limitless combinations.



"Clear the area! About to fire!" is the deafening instruction. Forty-eight times. Silence. Not a soul is to be seen. But something at the back begins to move, very slowly. A haze of dust and the smell of gunpowder likewise slowly permeate the air.

It might sound like the start of an action thriller, but we are actually talking about a product test. The venue is not Hollywood, but the south-German city of Ulm. We are, to be precise, in the German state of Baden-Württemberg's only test-firing range for the certification of weapons, ammunition and associated safety technology – one of the most modern facilities of its type.

It all began in the autumn of 2014 when Philipp Thüsing, a member of our sales staff, called our project service. He had a great project in hand, which promised to be a real challenge. A glass company called Wagener from Kirchberg in the Rhineland-Palatinate had an order from BLB, a Duisburg-based client, to work with FPS Funke Popal Storm, a firm of architects from Oberhausen, on the construction of a new six-storey headquarters building for the Mönchengladbach police force. The design envisages the use of the FRAME⁺ 90 WI system for the build-

FOR SAFETY'S SAKE

Testing for wind load and air permeability – along with resistance to driving rain, fire and burglars – is part of their job. (From left) Tobias Sigg, Bernd Seemüller and Oliver Döring make up the RAICO test team. Their mission: to check our products for safety. Whenever anything new or extreme arises, the special team gets out its kit.

Text: Andrea Jall




ing's fixed glazing. The range already comes with RC3-certified break-in prevention, but it still needs a certificate confirming resistance to ballistic penetration. The starting pistol is now in the hands of Werner Wölfe, the head of department in charge of RAICO's project services, and his team. Ideas are researched, sketched out and rejected, until – after a series of joint brainstorming sessions, meetings and calculations – the team comes to a unanimous verdict: "Our profiles can do it." It is now just a matter of getting the idea officially stamped and certified.

Hardness testing at the lab in Ulm:

The test target, which measures 1.3 x 2 metres (about 4¼ by 6½ feet) and weighs almost half a ton (430 kg), is kept at an absolutely constant room temperature of 21 °C. Action! A .44 Remington Magnum and a .357 Magnum are fired at the target from a range of just 5 metres (about 16 feet). The RAICO product test requires three shots of each calibre at the relevant points - a total of 48 shots. Each one accounts for up to 440 +/- 10 m/s.

"It's looking good!" Tobias, Bernd and Oliver, together with the firing range safety officer, examine the test target after use. The RAICO 90 FRAME⁺ WI fixed glazing system has indeed passed its "baptism of fire" in the truest sense of the term. Not a single projectile has managed to penetrate into the interior, and there is no trace of glass splinters on the inside of the test target. This glazing system is also the first of its type ever to withstand the so-called "90° edge shot". Mission accomplished. BR4 NS certificate in the bag.

Another bullet-proof project: the International Criminal Court. The fact that RAICO and its products are able to meet ever-increasing security requirements is amply demonstrated by the rebuilt security complex in The Hague, which was finished last year. The collection of buildings concerned, with its surrounding glass curtain wall, has been built to blend into the dunes of the Dutch landscape. However: "One special challenge associated with the commissioning of this building

arose from the high security specifications of the International Criminal Court regarding protection against break-in, and also explosions and gunshots", in the words of the project's architect, Pim IJsendoorn. Some of the enormous glass elements, which are up to 75 mm/ 3 inches thick, weigh 1.2 metric tonnes – making a special structure absolutely vital. The THERM⁺ S-I mullion-and-transom system, with its profile width of 76 mm, was used for this reason. 

PROJECT ICC International Criminal Court

LOCATION The Hague, Netherlands

DURATION 2013 - 2015

CLIENT The International Criminal Court

ARCHITECT Schmidt Hammer Lassen

CURTAIN-WALL CONSTRUCTOR Oskomera

RAICO SYSTEM THERM⁺ S-I mullion-and-transom curtain wall

TESTED FOR RESISTANCE TO BREAK-IN, EXPLOSION AND GUNSHOT:
THE CURTAIN WALL OF THE INTERNATIONAL CRIMINAL COURT IN THE HAGUE



A CASTLE OF GLASS

The foyer curtain wall of the new International Criminal Court in The Hague, which measures 2000 m² in area, consists of 3.5-metre-high glass elements in widths of 1.2 and 2.4 metres. Some of them are 75 mm/3 inches thick and weigh 1.2 metric tons in order to fulfil the requirements of break-in resistance classification RC5. RAICO's THERM⁺ S-I system was used to fulfil the exacting security requirements of the design of the ground-floor curtain walls.



AN ORGANIC TAKE ON THE BIG APPLE

It might vaguely remind you of a designer allotment shed. Instead of discreetly nestling next to some railway track or other, the **Solar RoofPod** is proudly located three floors up from ground level, so the tomatoes and cucumbers growing there reach up into the skies of Manhattan. Few other common or garden cucumbers can boast of growing in the shade of a building called "Solar RoofPod", with roots in the roof of the Spitzer School of Architecture. But the roof garden itself also provokes discussion as one of New York City's first architecturally net zero energy buildings. It even has its own power base.

roof space that had previously lain fallow. It involved enthusiasm for one material in particular: wood. RAICO supplied the technology. The firm's team was quickly enthused by the idea, and it donated material, help with installation and – ultimately – an impressive amount of money. The RoofPod project was a question of (literally) aiming high, namely at the roof of the School of Architecture.

www.solarroofpod.com



SOLAR ROOFPD: THE VEGETABLE PLOT ABOVE MANHATTAN

Prof. Christian Volkmann, who initiated the project, confirms this as he juggles some very large numbers. He speaks of between 150,000 and 200,000 roofs in New York City, which could be used to install such roof gardens. What now sounds like a vision of the future actually started life as a student project designed to finally make beneficial use of urban

A FURTHER THOUGHT: "DO YOU JUST EXIST, OR ARE YOU LIVING?"

What could this famous slogan of a Swedish furniture shop have to do with the situation of the many people obliged to leave their homeland? Many of them can barely imagine a proper home in a far-off place, and end up at best in something amounting only to accommodation. Architects and town planners do indeed find it an enormous challenge to provide a really satisfying answer to this question of tackling the structural aspect of immigration in a manner that delivers solid integration rather than crumbling brickwork.


In 2015, the Hans Sauer Foundation used this as the basis for a project entitled **Home not Shelter!**, in which students of architecture at Jade Hochschule Oldenburg, a college governed by the University of Hannover, and the technical universities of Berlin, Vienna and Munich developed their



own visions of how to make it easier for refugees to encounter our culture. The project approach is based on joint living communities of students and migrants, and is intended to show whether opportunities to integrate and participate can be improved by urban planning and architectural measures. It is not merely a matter of creating theoretical models. Students and refugees live together and actively work on the structural transformation of buildings and rooms such as those in Vienna's Kempelengasse, thereby allowing them to sound out the actual possibilities on offer. We are eager to know whether viable, intercultural urban-planning approaches will result. □



STRICTLY ORDERED CHAOS

"Our office is staffed by individualists", say Volker Swiatkowski (bottom right) and Andreas Suerkemper, "so we work with a combination of strict order and organised chaos." The designs of Stuttgart-based architects Swiatkowski-Suerkemper are famous for their clarity and the wide scope of their vision, with so-called "unregulated elements" to generate tension and catch the eye. The two partners who run the office call it "special accents within a fixed pattern". 



DESK WANTED!

Show us what you have on your desk, as an architect: RAICO offers architects' offices the opportunity to appear in the print and online editions of Objektiv magazine.

Just send us a few snapshots of your day-to-day working environment and half a dozen lines of text on your professional approach. IMPORTANT: Don't clear up the mess first! In the same way as a master carpenter creates sawdust, we would like to see your desk just as it is, littered with pencils, family photos, coffee mugs with your favourite club's logo, and maybe with your dog cosily curled up underneath.

Looking forward to receiving your photos,

Andrea Jall
a.jall@raico.de

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