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SCHOTT
glass made of ideas

OUR GLASS
THEIR ARCHITECTURE

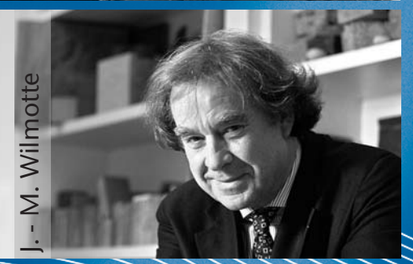
REALISING VISIONS WITH SCHOTT


Tobias Wallisser


Roger Narboni


Estudio FAM


Manfred Hegger


J. - M. Wilmotte

SCHOTT
glass made of ideas

SOLUTIONS
MADE OF GLASS FROM SCHOTT ...

... are rarely achieved single-handedly. Researchers have discovered that people develop 80 percent of all their ideas whilst working together on a task with others. We at SCHOTT have known this for quite some time. Therefore, close cooperation with architects is part of the creative work we do each day. We work together to look for project-specific solutions in the form of new developments or special glass processing capabilities.
We will be presenting only a few examples of the solutions we've come up with in recent years on the pages that follow. However, we not only offer you the products used in the buildings shown, but also our expertise in coming up with new ideas for your projects. In other words, we're looking forward to your challenges!

JEAN-MICHEL WILMOTTE

on the Museum of Islamic Art in Doha

Is a building as challenging as the Museum in Doha more of an exception or do you design rooms that are as unusual as this on a regular basis?

Jean-Michel Wilmotte:

This museum project is unique in the world today. The Emir Sheik Hamad Bin Khalifa Al-Thani decided to develop the Emirate of Qatar to become the cultural center of the Middle East. Nothing was left to chance in achieving this goal, neither the choice of the architect nor the building quality or the acquisition of the artworks.

How did you find working with an architect as famous as Ieoh-Ming Pei?

Jean-Michel Wilmotte:

Ieoh-Ming Pei is really almost an architectural guru who still has a lot of energy, despite his being 92 years old. He obviously put his complete trust in us with this museum and we tried not to create a contradiction or compete with the central room of the building.

What approach was your selection of the materials you used for the interior design based on, the exotic Brazilian wood, porphyry and metallic fabric, for instance?

Jean-Michel Wilmotte:

With this project, we wanted to dig down to the very roots of the architectural tradition of museum construction and create some sort of curiosity cabinet. To achieve this, we selected a range of precious and valuable materials that bring to mind a contemporary treasure chamber, without actually looking inappropriate.

What special demands did you have to meet with the display cases, some of which were even room-high?

Jean-Michel Wilmotte:

We were able to use anti-reflective, nearly invisible glass panes for the first time. The extremely large frameless display cases we designed give the exhibits the appropriate attention, without competing with them. The major difficulty consisted of installing these extremely large display cases safely in the room.

What do you consider to be the main advantage of lighting with fiber optics over conventional display case lighting?

Jean-Michel Wilmotte:

The building owner was looking for a way to exhibit all of the different types of art-works in various display cases in order to help expand the museum collection. Fiber optic technology allows for exact fine tuning of the lighting intensity for each exhibit and thus ensures that the display cases can be filled in a flexible manner.

Do you think it will be possible to improve today's high technological standard of presenting an exhibit?

Jean-Michel Wilmotte:

We'll probably be seeing a development when it comes to the conservation techniques and a new architectural language will be created that will allow for accentuation of the duality of the medium and its contents.

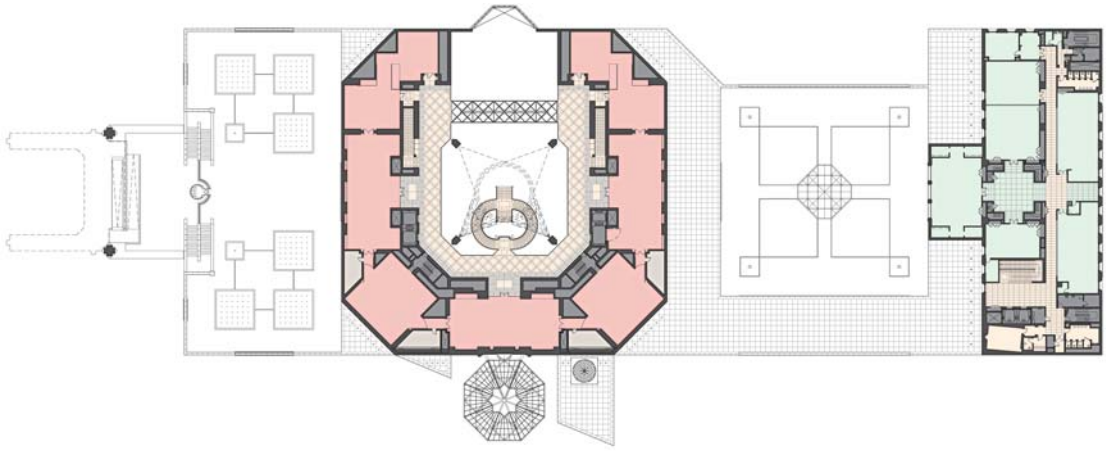
Photo: © Dahmane

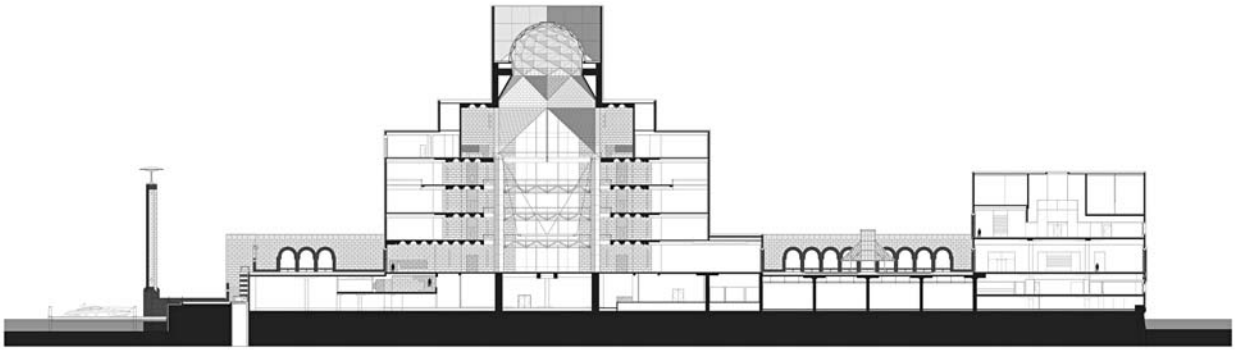
COMPLETELY TRANSPARENT: I.M. PEI AND JEAN-MICHEL WIL

LMOTTE WITH SCHOTT AMIRAN®

THE MOST PRECIOUS ISLAMIC ART EXHIBITS ARE PRESENTED INSIDE TALL DISPLAY CASES IN DOHA. THE ANTI-REFLECTIVE GLASS GUARANTEES AN UNHIBITED VIEW OF THE EXHIBITS THAT ARE ILLUMINATED BY FIBER OPTICS.

Photo: Ruder Finn, New York





ABOVE: FLOOR PLAN OF THE SECOND FLOOR
BELOW: CROSS SECTION WEST-EAST

MUSEUM OF ISLAMIC ART

To grant the request of the Emir of Qatar that a museum be built for Islamic art, the Chinese-American architect Ieoh Ming Pei took off for a trip around the world in 1997. At this time already 80 years old, he visited mosques in Spain and Syria, studied the Mogul residence Fatehpur Sikri in India and border fortresses in Tunisia, before he finally found his most important source of inspiration in Cairo: a fountain in the courtyard of the Ibn-Tulun Mosque. As he put it: “This small fountain for ritual cleansings [...] is a nearly cubist expression of geometric transformation from an octagon to a square and then to a circle. Its strict architecture with its tints and colour shades is awakened to life by the sun.” The fascination with this treasure and the many impressions from his two-year trip convinced I. M. Pei to build a museum that combines cubist modernity with Arabic traditions. However, this impressive building was not to be built between the sky scrapers that will one day grow out of the ground and cast shadows on everything else sooner or later. Instead, an island formed especially for the museum just off of the coast of Doha was to ensure the solitary status of this building.

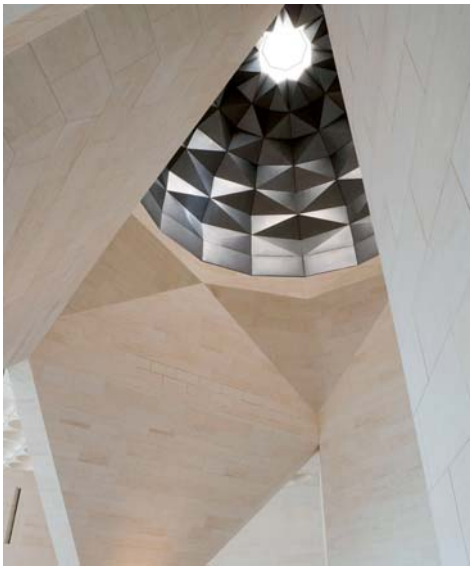
Strict geometry and oriental patterns

More than ten years later, the pyramid shaped building made from mussel coloured limestone now rises up at the end of an artificial alley of palms. The sun provides an expressive natural play of light that constantly changes the look of the facade. On the outside, the museum building follows geometry very strictly. On the inside, however, it expands to offer a generous openness. A bright atrium welcomes the visitor and guides his view up to the facetted cupola made of stainless steel with a circular eye at its zenith that refracts sunlight thousands of times. Although the facade is basically free from decorative oriental details, the interior design leads one into the world of a thousand and one nights: opulent decorated coffered ceilings made of concrete and star shaped inlays in the natural stone floor characterise the atrium, two arch-shaped handrails of a gala stairway in the shape of a wide open accordion lead into the surrounding galleries on the second floor. An impressive 45-meter high glazed opening at the north front brings light into the impressive high hall, at the same time creating the unique visual connection to Doha’s skyline.

FIBER OPTIC LIGHTING PROTECTS THE EXHIBITS WHILE DISPLAYING THE TRUE NATURAL COLOURS OF THE ARTWORKS. (UPPER LEFT)

ANTI-REFLECTIVE AMIRAN® GLASS FROM SCHOTT ENABLES VIEWING OF THE ARTISTICLY DESIGNED EXHIBITS WITHOUT ANNOYING REFLECTIONS. (LOWER LEFT)

VIEW INSIDE THE FOLDED STEEL CUPOLA IN THE CENTER OF THE ENTRANCE HALL (BELOW)



Photos: Ruder Finn A&CC, New York

Setting the stage artistically

The exhibit rooms located on five floors that surround the atrium were designed by the French interior designer Jean-Michel Wilmotte: Exotic Brazilian wood, dark grey porphyry and metallic fabric create a contrast with the light brick-work. 410 simple, partially room-high display cases made of anti-reflective SCHOTT AMIRAN® glass create a suitable environment for the oriental exhibits. The visitors enjoy a clear view of the exhibits, because AMIRAN® reduces annoying reflections to nearly 1%. This means the glass is hardly recognisable as such to the eye. Light transmission, on the other hand, increases to as high as 98%, whilst also offering unadulterated presentation of colours. Fiber optic lighting containing components from SCHOTT also set the stage for each one of the artworks inside the 300 display cases designed by Click Netherfield, without disturbing the viewer by emitting light that is too bright. There could hardly be a more suitable place for the art treasures of the Islamic world than this unusual museum building planned by I.M. Pei and enhanced by the well-balanced interior rooms of Jean-Michel Wilmotte.

FACTS

Architect: I.M. Pei, New York (USA)
Project manager: Emmanuel Brelot and Fabian Servagnat, Paris (F)
Interior design and exhibition design:
Jean-Michel Wilmotte, Paris (F)
Planning of the structural framework: Leslie E. Robertson Associates, New York (USA)
Light planning: Fisher Marantz Stone, New York (USA)
Display case approach and manufacturing: Click Netherfield Ltd., Livingston (UK)
Location: Doha (Q)
Year of construction: 2008

SCHOTT expertise:
Anti-reflective SCHOTT AMIRAN® glass for the display cases
High-precision edge processing of the glass
Flexibly designed glass fibers for ceiling and display case lighting
Fiber optic components in lengths of between 1.5 and 20 m

ROGER NARBONI

on the Reims Cathedral

Illuminating one of the world's most famous examples of architecture was definitely not an easy task. How do you as a light designer go about tackling this type of challenge?

Roger Narboni:

We generally start off by producing a sketch, without immediately giving too much thought to the problems we'll encounter. After all, if we start thinking about the challenges too early, we really won't get anywhere! The challenge in Reims was to perform all of the technical installation work as discretely and "invisibly" as possible. The condition of the facades was yet another problem. Parts of the stone were quite weather-beaten and maintenance work was constantly going on. Nevertheless, we still designed the lighting as if all of the facades had already been renovated, even if this meant that we could not install all of the light conductors and spotlights immediately.

When did you come up with the idea of splitting the lighting into basic lighting and effect lighting?

Roger Narboni:

We pursued this approach even during the competition. We had already realised a similar combination of headlights and fiber optic systems before for the Castle of Chambord in order to set the stage for the architectural details of the various fireplaces. At Notre-Dame in Paris, we also used fiber optics to accentuate the statues of the kings on the facades. The Reims Cathedral is similarly rich in sculptures; therefore we decided to put this tool to use once again.

Was there a master plan for the lighting of the center of the city that you were either able to follow or perhaps had to comply with?

Roger Narboni:

There was nothing of the kind. For this reason, we also developed a master plan for the immediate surroundings during the competitive phase. We do this quite often, because these types of plans seldom already exist. Nevertheless, our master plans are not always executed. They were in Reims, however. The architect who had been contracted to modernise the forecourt of the cathedral hardly deviated from our plans at all. In this particular case, one of the client's most important requirements was that the cathedral had to be easily visible from the highway, in other words as far as five or six kilometers away. On the other hand, we wanted to make sure that we created as little glare as possible for pedestrians at the foot of the cathedral and wanted them to be able to see the details of the facade. This is actually a contradiction in itself, but thanks to the fiber optic systems and basic lighting that gradually gets brighter from the top to the bottom of the facades, we were quite successful in achieving these objectives.

Where do you see an advantage in using fiber optic systems from SCHOTT, rather than other comparable products?

Roger Narboni:

For us, the glass is what makes the most important difference! All of the other fiber optic systems I know use light conductors made of polymers. These were out of the question for us for two reasons: First of all, they do not offer nearly the same long lifespan as glass and, secondly, they make the light look blue, which is something we did not want.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CLINA
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à
Idées

PRECISE ILLUMINATION: ROGER NARBONI AND MC2 WI

TH SCHOTT FIBER OPTICS

LIGHT COMPLETELY WITHOUT VISIBLE LIGHT FIXTURES ILLUMINATES THE SCULPTURES OF FRANCE'S LARGEST CATHEDRAL. FIBER OPTIC SYSTEMS FROM SCHOTT APPLY 200 LUX EXACTLY WHERE IT IS NEEDED.

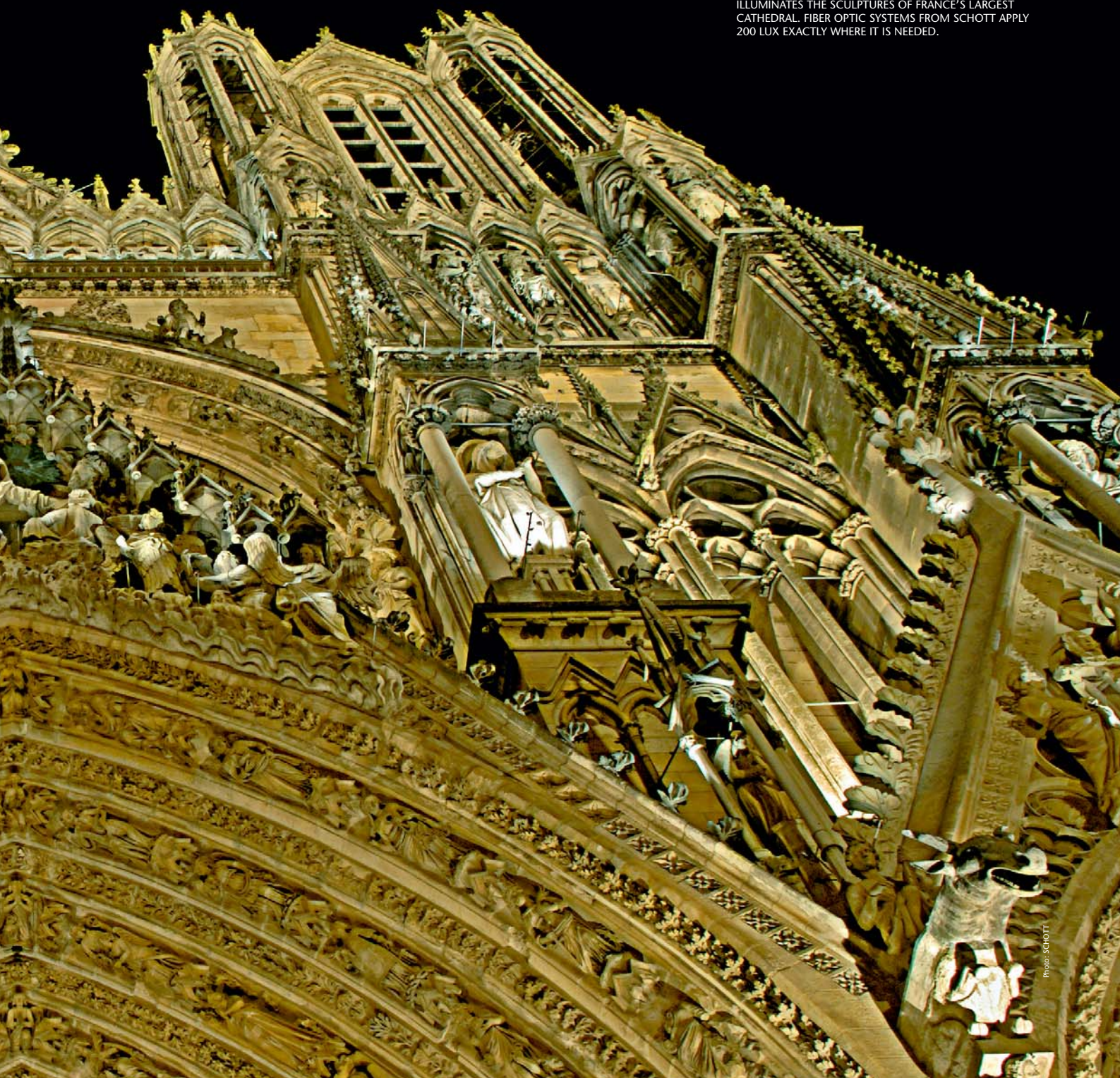
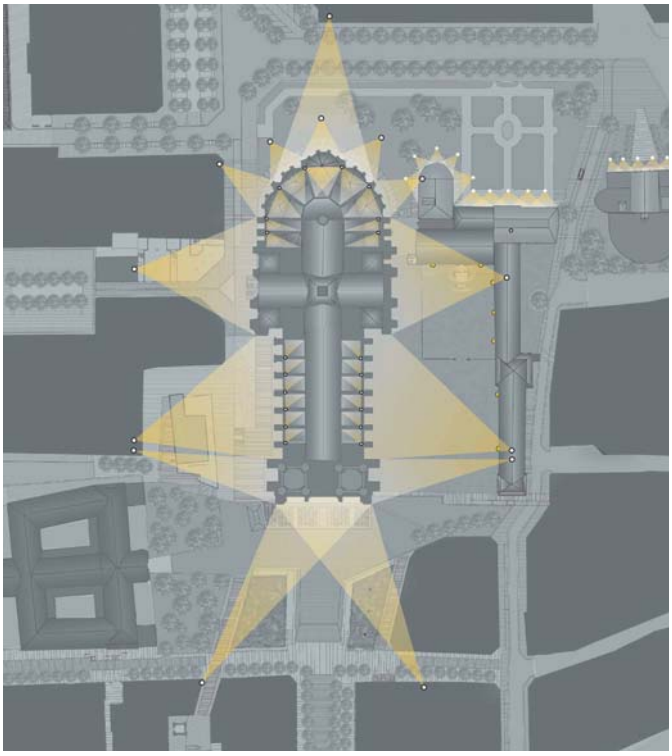
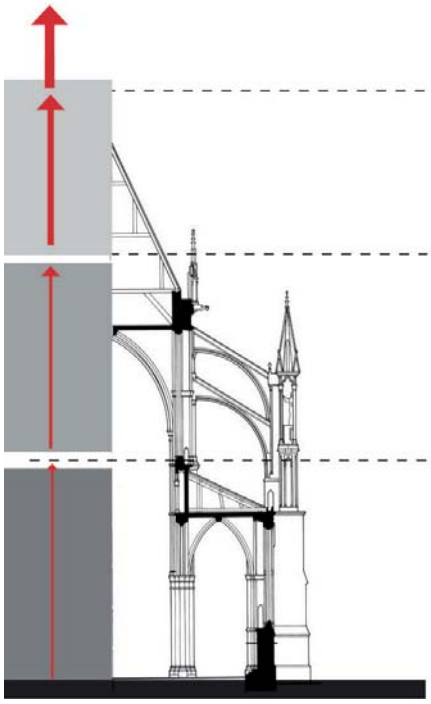


Photo: SCHOTT

FLOOR PLAN (BELOW)
CROSS SECTION OF THE DESIGN (RIGHT)





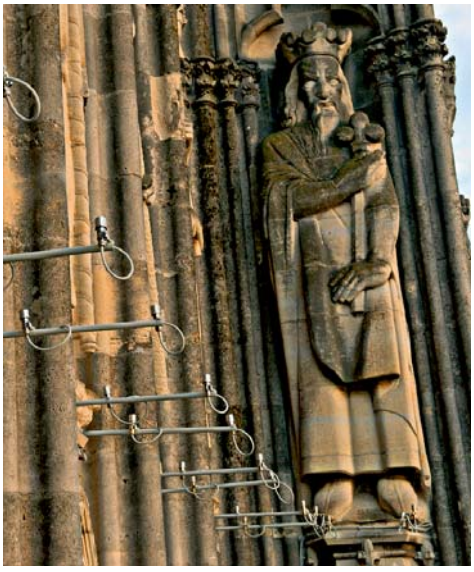
CATHEDRAL OF NOTRE-DAME IN REIMS

The Cathedral of Reims has written both art and French history. From Ludwig VIII to Karl X, a total of 24 French kings were crowned in this building. For the church that was built entirely during the 13th century, with the exception of its west front, the master builder Jean d'Orbais invented the Gothic measurement system and thus laid the foundation for such bold window constructions as the Rose Windows of Reims, which also rank as the first of their kind in the world. The dimensions of this house of worship are also quite incredible: its nave is 115 meters long and 30 meters high. More than 2,000 statues and animal carvings can be counted along the outside of the church. The largest of these are 4.3 meters high and are located in the so-called King's Gallery that surrounds the west building, just above the Rose Windows.
It is therefore not at all surprising that the sculptures play an important role in the lighting schemes developed by Roger Narboni and executed in 2006. Instead of immersing the entire building in one consistent bright light, Narboni decided to use a combination of basic lighting (for the building structure) and effect lighting (for important individual works of art). The colour champagne white, corresponding to a colour temperature of 3,000 Kelvin, was selected for the building to suit this location. 150 watt metal halide lamps arranged in groups of up to 14 spotlights allow for the west front of the cathedral, in particular, to be illuminated for miles above the town of Reims' silhouette. The spotlights were mounted as discretely as possible on the roofs of buildings and in green zones. Their position is for the most part mirror-symmetrical to the main axis of the cathedral. The lighting intensity that these produce on the face of the church increases from 5 lux in the pedestal area to up to 35 lux on the upper section of the building. This ensures that pedestrians are not blinded unnecessarily. Adjustable light shades in front of each individual spotlight also assist in this.

13 kilometers of fiber optics for better light
The church windows, including three Gothic Rose Windows, as well as the windows of Mark Chagall in the center apse of the chapel, are made visible to pedestrians with the help of subtle backlighting. A great deal of skill was required in illuminating the facade sculptures, due to the fact that no

THE LIGHTING INTENSITY ON THE WEST FACADE INCREASES FROM THE TOP TO THE BOTTOM. (LEFT)

THE FIBER OPTICS SYSTEM FROM SCHOTT ALLOWS FOR PRECISE EMISSION OF LIGHT, RATHER THAN VOLUMINOUS SPOTLIGHTS. (BELOW)



Photos: Cegelec

spotlights were permitted to be mounted onto the facades of the church.
Roger Narboni and his team decided to use a durable fiber optic system. A total of around 100 metal halide lamps were installed inside the church to provide easy maintenance access. They feed their light into a total of 13 kilometers of fiber optic cable from SCHOTT that conduct it to where it is needed: outside, in front of the church portals, at the foot of the impressive statues of the kings, or beneath the gargoyle on the eaves. Lenses at the exit points allow for exact focusing and directing of the light, while filter glasses from SCHOTT correct the colour changes that can occur during transmission of the light, depending on the length of the cable. In this way, the sculptures are eliminated in colour temperatures of 3200 to 3400 Kelvin with around 200 lux, 6 to 7 times the basic illumination of the facades. This distinct difference in brightness that can be seen from afar also electrifies the facade at night and makes it look dynamic. Furthermore, this allows for the sculptures on the facade to receive the appreciation they deserve from an art history standpoint.

FACTS

Light design: Roger Narboni / Agence Concepto, Bagneux (F)
Light planning for the fiber optics: MC2, Paris (F)
Electrical planning: Beture Infrastructure, Maisons Alfort (F)
Installation of lighting: Cegelec (F)
Location: Reims (F)
Year of construction: 1285

SCHOTT expertise:
Durable fiber optic components
Total light output: 37 kW
Colour filters (allow for the use of very long fiber optic light conductors of up to 20 meters in length)

PEDRO COLÓN

on the Madrid Memorial

In comparison to the very first visualisations submitted during the competition in 2003, the shape and construction of the memorial in Madrid changed considerably. What used to be a light and amorphous building shell has made way for a massive continuous glass cylinder. What were the reasons for this?

Pedro Colón:

Anyone who was interested in taking part in the ideas competition was allowed to – artists, architects or interested laymen. This is why we decided to focus on a strong and concise idea. We didn't start looking for practical solutions together with the engineers Schlaich, Bergermann and Partner until after we had won the competition. Out of all of the possible alternatives, we were most interested in finding a solution that would not require a support structure made of metal. All of this suggested that we go with a rather strict building shape. For this reason, we divided the cupola into two shells: an external load bearing shell that would be carried by glass blocks from SCHOTT and an internal shell consisting of an ETFE foil that had more of a random shape.

It took a long time to come up with the idea of a cylinder construction. How did you finally learn about specialised glasses from SCHOTT?

Pedro Colón:

We used ice cubes to design models for the cupola at the beginning - and then wanted to stick with this artisan way of working for the final building. Nevertheless, we ran into a few limitations early on. Manually manufactured glass would never be able to meet the static and technical demands of a cupola construction of this size. At the end, glass blocks from SCHOTT produced by pouring glass into molds, as well as floated borosilicate glass for the transparent roof construction, were the solution to our problem.

What demands did the glass used in this memorial have to meet?

Pedro Colón:

To start with, the way in which glass interacted with light was extremely important: Light passes through the entire transparent roof, as well as the glass blocks, to enter into the inside of the memorial. It is then reflected and exits again at a completely different position. On the other hand, the glass blocks also had to meet the demands of a load-bearing wall. In other words, they had to stand up to compressive, as well as shear and bending forces, very well. Then, of course, there were the extremely tight dimensional tolerances of less than one millimeter for each of the blocks. This made it necessary to monitor manufacturing processes very closely. The third main criterion was thermal resistance, an aspect that SCHOTT was able to document in laboratory testing.

To what extent does a theoretical way of working provide a foundation for progress in architecture?

Pedro Colón:

Most steps, regardless of how small they might be, represent progress – and this was also true for our project. I'm not sure yet whether very many people will be able to benefit from this progress in the foreseeable future, because the costs for this construction were actually quite high. History has shown, however, that most new constructions gradually become less expensive and can then be put to daily use in building, and this is something that all parties benefit from. One such aspect of progress was certainly how three partners were able to work together, who would normally not always be able to communicate well with each other: the architect, the engineer and the material manufacturer.

MASSIVE TRANSPARENCY: ESTUDIO FAM WITH BOROSILIC

CATE GLASS FROM SCHOTT

MAXIMUM LOAD BEARING, MAXIMUM TRANSPARENCY AND MAXIMUM DURABILITY: 15,600 GLASS BLOCKS FROM SCHOTT FORM THE WORLD'S LARGEST SELF-SUPPORTING GLASS CONSTRUCTION.

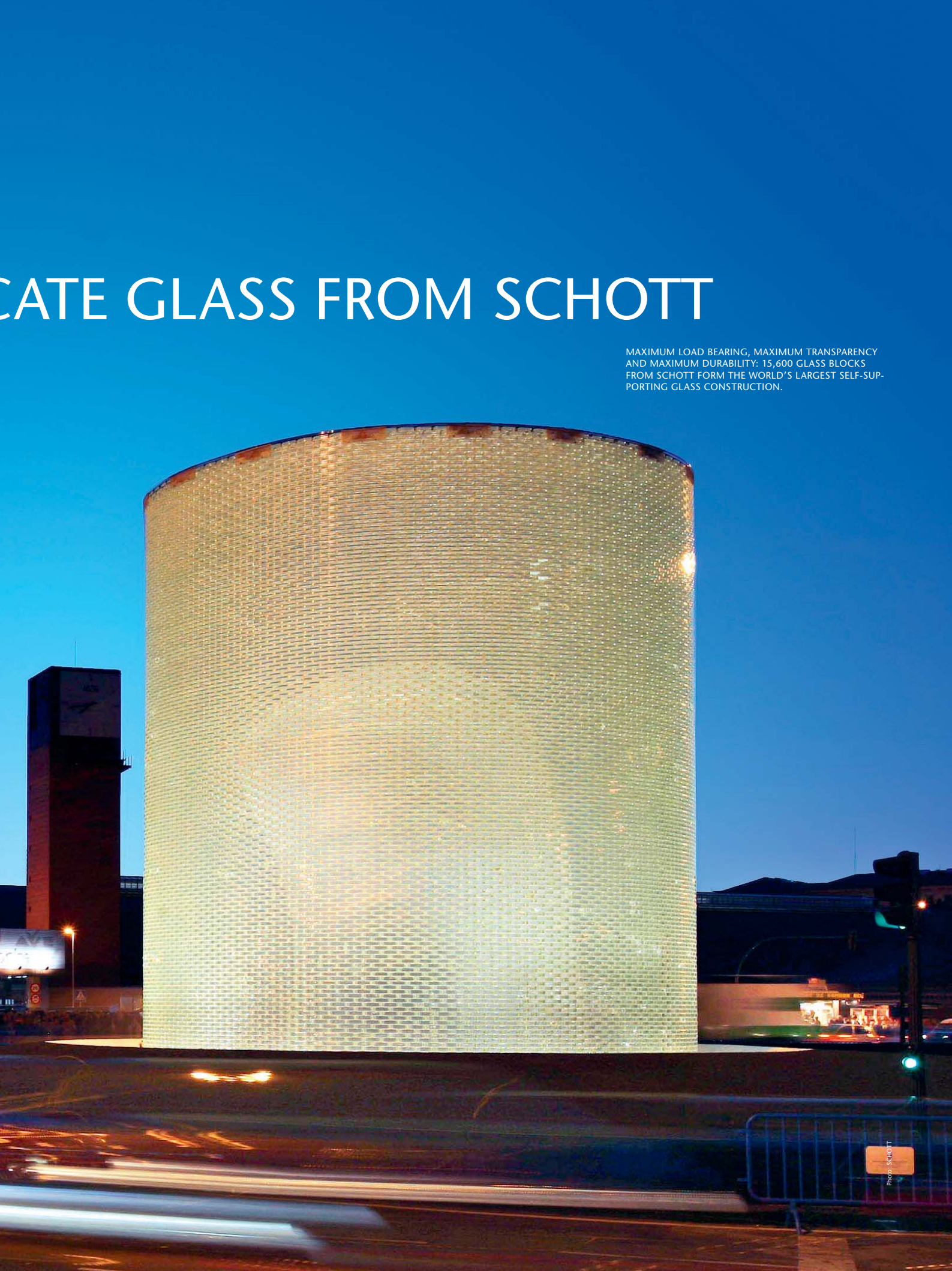
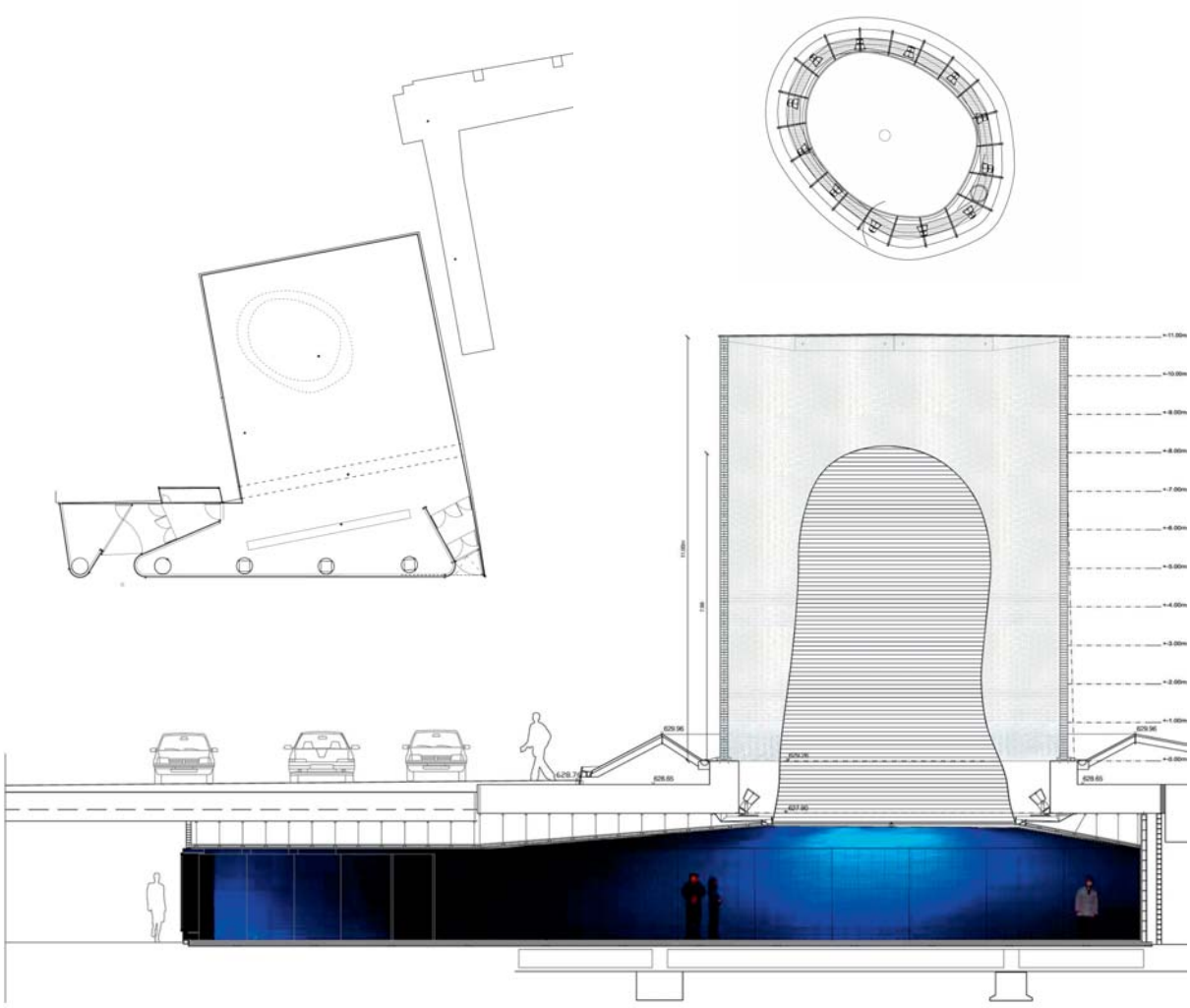


Photo: SCHOTT



THE MADRID MEMORIAL

FLOOR PLAN (UPPER LEFT)
FLOOR PLAN OF THE CUPOLA (UPPER RIGHT)
CROSS SECTION THROUGH THE MEMORIAL ROOM AND THE CUPOLA (BELOW)

The events of March 11, 2004, in Madrid shocked people all over the world. In their design for the memorial next to the Atocha Train Station, the five-member team of architects from Estudio FAM picked up on this image. “We wanted to preserve the most immaterial aspects of this day, how people felt, in our building,” says Mauro Gil-Fournier of Estudio FAM in describing his team’s intention. The central element of their design is a transparent cupola upon which the expressions of condolences of thousands of Madrilenians and tourists regarding March 11 were printed. The fateful nature of the number 11 (terrorist attacks on the World Trade Center in New York on September 11, 2001) was now to be emphasised once again in the height of the building 11 meters tall.

In search of transparency and high carrying capacity

Almost immediately, it became apparent that these cupolas would have to meet a number of contradictory demands. They had to be as transparent as possible, and yet capable of standing up to shifts in temperature and mechanical stresses. Thanks to extensive research and active support from SCHOTT, the architects managed to turn their vision into reality in the 2 1/2 years that followed. Inside the city, the 11-meter high elliptical cylinder made of borosilicate glass blocks from SCHOTT is all that points to the new monument. It rises up in the middle of a busy roundabout in front of the train station. Underneath it, ‘el vacio azul’ or (the ‘blue emptiness’), an approximately 500 square meter memorial room that can be entered from a tunnel that leads to the train station, opens up. With the exception of a black bench at the entrance way, it is completely unfurnished. The attention of those who are present focuses completely on the elliptic opening in the ceiling, above which the glass cylinder rises. Inside its interior, a bell-shaped interior cupola made of ETFE film is spanned upon which the messages of passersby and descendents can be read inside concentric circles. The film cupola retains its shape with the help of several blowers at the foot of the cylinder that create negative pressure between the cupola shells. For the outside cupola, a number of material experiments had to be performed before the architects were finally able to come up with the appropriate solution: brickwork made of large format glass blocks with transparent grout.

THE INSIDE OF THE GLASS CYLINDER BEGINS TO SPARKLE IN THE SUNLIGHT. EXCEPT FOR THE CROSS BEARERS OF THE ROOF, NO CONSTRUCTIVE ELEMENTS CAN BE SEEN. (UPPER LEFT)

'EL VACIO AZUL', THE 'BLUE EMPTINESS' IS WHAT THE ARCHITECTS CALL THE MEMORIAL ROOM UNDERNEATH THE CYLINDER. (LOWER LEFT)

THE GLASS BLOCKS OF THE CYLINDER CHANGE THEIR COLOUR DEPENDING ON THE ANGLE OF THE SUN BETWEEN MILKY WHITE AND TRANSLUCENT. (BELOW)

Photos: Jakob Schoof, Munich

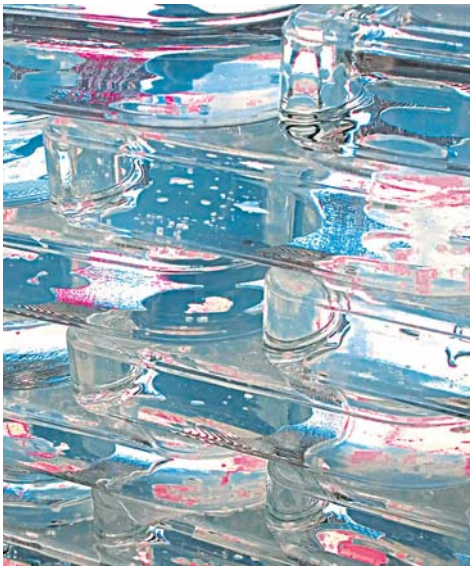


Photo: Estudio FAM, Madrid

A masoned cylinder made of glass blocks

SCHOTT was the only company that was capable of manufacturing the glass blocks in the desired size that were also able to stand up to severe shifts in temperature. 15,600 glass blocks made from clear borosilicate glass, each of them 30 x 20 x 7 cm in size, formed the glass cylinder – the largest ever to be built. In order to produce the elliptical width of the cylinder, they had to be curved to be convex on the one side and concave on the other. The glass blocks were joined together using a colourless acrylic adhesive that was hardened using UV light. This made it possible to do without bonding agents made of steel. The transparency was even extended to the flat roof of the cylinder, which also consists of colourless borosilicate float glass from SCHOTT. Thermally tempered and then bonded together in three layers, it offers the necessary breakage resistance. Five glassy cross beams of up to 7.8 meters in length bear the weight of the 12 glass panels on top of the ring of the cylinder. The glass panes of the linearly supported roofing have a maximum length of 3.98 meters and were adjusted to accommodate the geometry of the monument's floor plan.

FACTS

Architects: FAM Arquitectura y Urbanismo S.L., Madrid (E)
Esaú Acosta, Raquel Buj, Pedro Colón de Carvajal, Mauro Gil-Fournier, Miguel Jaenicke
Planning of the structural framework: Schlaich Bergermann & Partner, Stuttgart (D)
Location: Avenida Ciudad de Barcelona / Train Station Atocha; Madrid (E)
Completion: 2007

SCHOTT expertise:
Glass blocks and flat glass made from borosilicate glass
Dimensions of the glass blocks: 30 x 20 x 7 cm
Number of glass blocks: approx. 15,600
Total weight of the glass cylinder: approx. 135,000 kg
Total surface area of the glass roof: 63 m²

TOBIAS WALLISSER

on the Mercedes-Benz Museum in Stuttgart

What prompted an architectural firm to select such a complex geometric shape as the double helix for a museum building?

Prof. Tobias Wallisser:

A firm based in Stuttgart named HG Merz had come up with a specific competition for the Mercedes-Benz Museum, in which they always spoke of two different routes that the visitor would have to take while visiting the museum: the Myth Route and the Collection Route. From an urban development standpoint, UNStudio decided to go with a vertical construction. The double helix resulted from the idea of an automobile museum that was organised on the basis of its height and the two different tour routes it was to offer.

The unusual design of the museum in Stuttgart called for a special approach to fire safety. Did you, as the planner, already take the resulting difficulties into consideration or did you rely solely on the abilities of the engineers who were responsible?

Prof. Tobias Wallisser:

If you only rely on the knowledge that exists, you can never really build in an innovative manner. For architecture, this is much like a hop, step, and a jump: the vision, the technical execution that was necessary and a result that has to be so convincing that the effort that went into it cannot be seen. When the decision was made to build the museum in the shape of a double helix, we had not yet started thinking about the fire protection approach. Architects need to be able to work in an intuitive manner, in other words they must be able to determine how far one can go in stepping over the bounds without things becoming ridiculous. We work with several experts who have always been able to come up with the appropriate solutions.

What was the single largest challenge, once the fire protection approach had been finalised?

Prof. Tobias Wallisser:

The problem was really the interior hall. We presented our fire protection experts with the challenge of finding a glass that would meet our needs with respect to glazing the 47 meter high hall on the upper level and yet satisfy the fire regulations. SCHOTT is truly an expert in the area of specialised glasses. Pyran® S was exactly the right product that allowed us to meet our aesthetic demands.

What exactly did SCHOTT contribute that allowed you to realise your design ideas?

Prof. Tobias Wallisser:

With Pyran® S, SCHOTT was able to supply room-high fire resistant glazing of the fire resistance class E (G) 30 which was only a few millimeters thick. In addition, this could even be executed as frameless butt joint glazing. The two colour pattern that was printed onto the glass with silkscreen printing techniques resulted in a homogenous surface that appeared to be filigree, whose function as a fire protective wall can hardly be noticed.

What advantage do you as an architect see in working with SCHOTT?

Prof. Tobias Wallisser:

I appreciate the company's flexibility, even when it comes to finding a solution that meets the highest aesthetic demands.

FILIGREE FIRE PROTECTION: UNSTUDIO AND THE SPECIALISED C

GLASS PYRAN® S

ATTRACTIVE APPEARANCE AND SAFETY GO HAND IN HAND AT THE MERCEDES-BENZ MUSEUM IN STUTTGART: THE SPECIAL-PURPOSE GLASSES FROM SCHOTT REMAIN TRANSPARENT, EVEN WHEN TEMPERATURES PEAK. THEY ARE ALSO QUITE STRIKING IN TERMS OF THEIR LIGHTWEIGHT DESIGN.

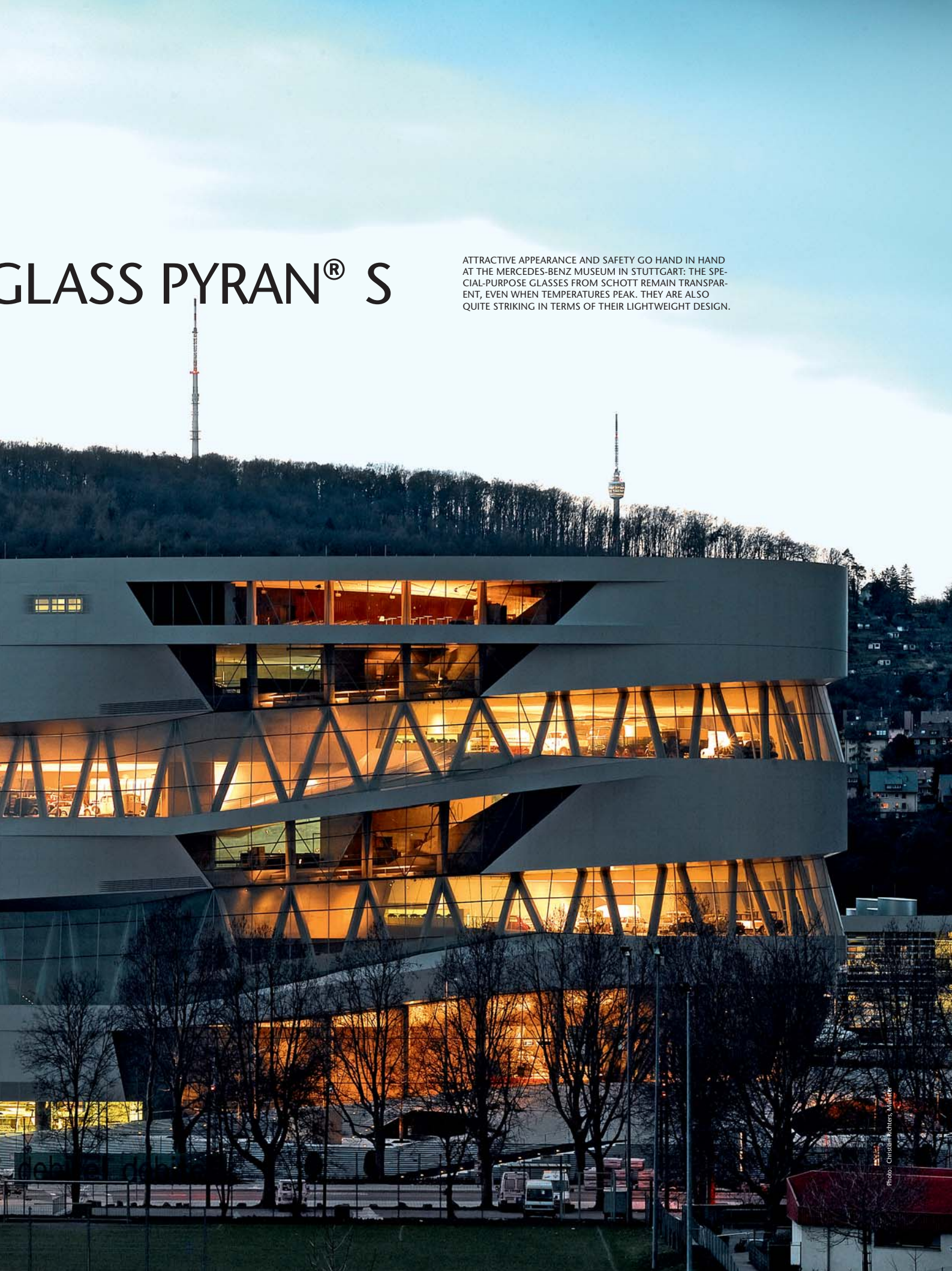


Photo: Christian Richters, Münster

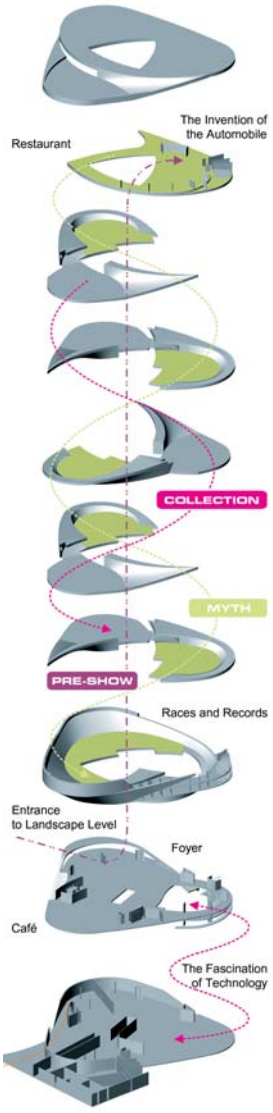
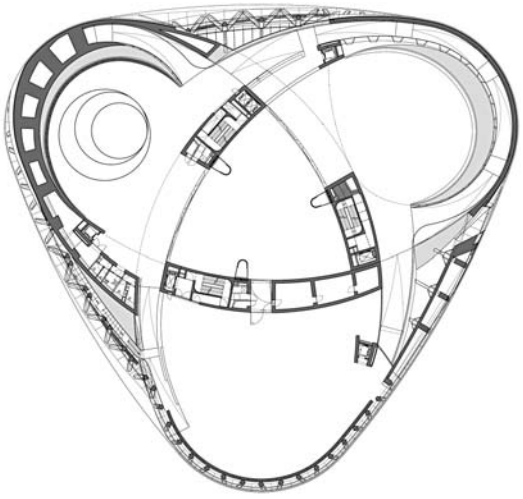
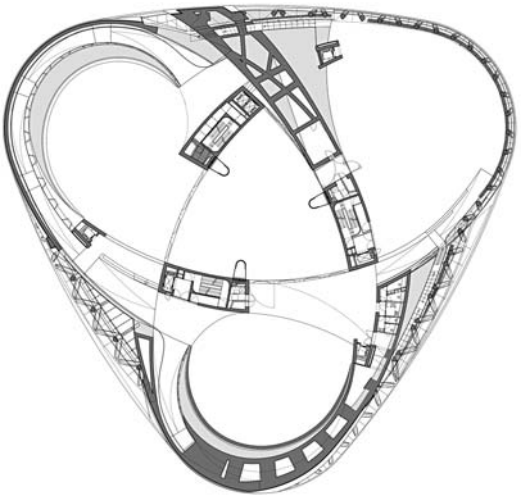


ILLUSTRATION OF HOW THE FLOORS WERE CARRIED OUT (RIGHT)

FLOOR PLAN OF THE ENTRANCE HALL (ABOVE)





MERCEDES-BENZ MUSEUM

According to the architect Ben van Berkel, the main difference between the Mercedes-Benz Museum in Stuttgart and conventional art museums lies in the type of exhibits that are shown. “We took a closer look at relevant museums and found that certain basic principles would not work for our idea: the visitor always approaches art exhibits from the front. But people do not always approach an automobile only from the front, but also from the side or from the top and then a little bit from the bottom. And we wanted to make this part of the museum’s design,” he explains.
The result of these considerations can now be seen: a 47 meter high building with a cloverleaf shaped ground plan and nine levels that were joined together to form interwoven exhibition routes in the form of a double helix . At the beginning of the tour, three elevators located in the central atrium bring visitors up to the top floor. Two different routes can be taken from here; either the Myth Route that explains the cultural history of the automobile in greater detail and whose floor space opens up to the atrium or the Collection Route, whose presentation opens up to the outside and is eliminated by daylight. It is here that the building owner shows the entire versatility of his product range: tow trucks, sedans, construction vehicles and cars for both police and fire departments.
The engineers who worked with Werner Sobek borrowed the load carrying structure of the building, for which numerous details were actually developed during the construction phase, from bridge building. The room-like pillars around the atrium, as well as a collar of floor-to-ceiling high concrete pillars surrounded by steel behind the glass facades, carry the vertical loads. Between them are gigantic curved boxed girders made of reinforced concrete that run through the entire building in a spiral manner. The installation technology required for media presentations and the ventilation system for the exhibition rooms is stored inside them.

Unique in terms of passive fire protection
Smoke extraction poses a big problem in public buildings. The museum was planned as a 9-storey high building sculpture with an open inside that could not be divided into fire zones. Instead, 144 nozzles along the internal walls of the

VIEW INSIDE THE 47 METER HIGH MUSEUM HALL (LEFT)

PRESENTATION AREA ON THE COLLECTION ROUTE (LOWER LEFT)

AESTHETICALLY DESIGNED FIRE RESISTANT GLAZING IN THE EVENT AREA (LOWER RIGHT)

Photos: Christian Richters, Münster

Photo: SCHOTT

atrium create an artificial storm in the event of a fire. This mini tornado is unique in the world today and creates a suction effect that extracts the smoke from inside the exhibition levels into the atrium, where it can be released to the outside by a special ventilator in the ceiling.
Challenging demands had to be met with respect to the technology and design of the fixed glazing on the top level, where both of the tours begin. The specialised PYRAN® S glass from SCHOTT was used for the room-high fire protective glazing between the event area found there and the atrium, as well as the slope of the ramp between the event area and the round tour of Myths. This monolithic, thermally tempered borosilicate glass seals off the room from flames, as well as hot gases, in the event of a fire. Both types of glazing at the Mercedes-Benz Museum were executed using these vertically flush panes. This not only made it possible for the architect to achieve the filigree appearance that he had desired, without disturbing pillars and frames, but also a homogenous subsurface for the two-colour, silkscreen printed pattern on the glass panes.

FACTS

Architects: UNStudio, Rotterdam (NL)
Project management: Tobias Wallisser
Interior design: UNStudio, Rotterdam (NL)
mit Concrete Architectural Associates, Amsterdam (NL)
Museum design: hg merz architekten museumsgestalter, Stuttgart/Berlin (D)
Planning of the structural framework: Werner Sobek Ingenieure, Stuttgart (D)
Location: Mercedesstraße 136, Stuttgart (D)
Completion: 2006

SCHOTT expertise:
Room-high butt joint glazing with Pyran® S, the special-purpose glass for fire resistant glazing
Fir resistance class E (G) 30
Fall protection with laminated safety glass
Two-coloured silkscreen printed pattern

MANFRED HEGGER

on the Learning Center in Wolfhagen

To begin with, the former military barracks were converted into domestic housing. The Pommern Caserne in Wolfhagen, Germany, has remained as it is, with all of its original military specification. When was the decision made to include the buildings that were not suited for living purposes in the conversion process?

Manfred Hegger:

We converted large halls for vehicles into workshops, as part of a conversion in Kassel Hasenhecke back in the early 90s. Back then, it was quite unusual for a construction company to advocate saving old halls. Despite all of the rezoning, a lot of building substance that was actually worth saving had been destroyed. With just a little bit of architectural imagination, this could have also been included.

When faced with the challenge of doing work on an existing building, each architect takes a different route. What were your design objectives?

Manfred Hegger:

Preserving valuable building substance and, thus, protecting the cultural building heritage. But, on the other hand, further developing this heritage in terms of its new use and the demand that arises from its use and its future users. We don't consider this to be an overlap. Our objective is to allow for the older layer to be experienced and remain visible.

It has been said that moving the Herwig-Blankertz Vocational School to the premises of the Pommern Caserne is less expensive than renovating the building at its old location. Where do you see the potential for savings?

Manfred Hegger:

In addition to the costs of renovation, there would be additional costs, for example two moves and an intermediate use at an interim location. These costs are often underestimated. With this in mind, I consider the moving of the school to be a major source of savings, even if new buildings need to be built.

It was only logical to use the 4,400 square meters of space on top of the roof for a solar power plant. How did you meet up with SCHOTT?

Manfred Hegger:

We had already worked together with SCHOTT on previous projects. And, of course, we remembered these. For this reason, we contacted SCHOTT at a rather early stage. In this way, we were able to collaborate very successfully. This, in turn, encouraged the building owner to contract SCHOTT.

How is SCHOTT different from other companies in the industry?

Manfred Hegger:

Only very few companies pay such close attention to architectural qualities and the specifics of building, as SCHOTT does. The hall in Wolfhagen does not really face in the right direction, with respect to the sky. But even the standard modules from SCHOTT still produce high yields, yet also offer high transparency. And they were available on short-term notice. Only companies who are prepared to get involved with their expertise and manufacturing are able to work like this.

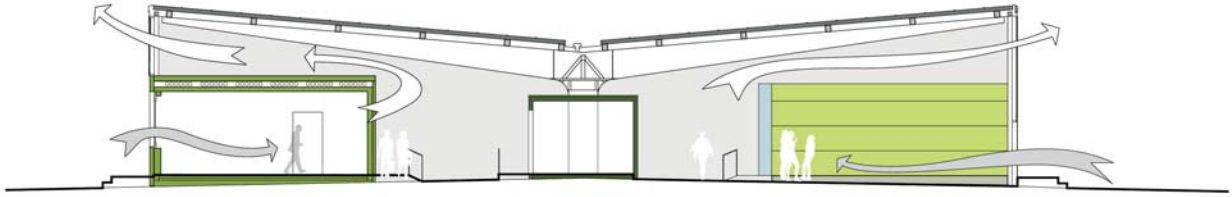
Photo: Klemens Ortmeyer, Braunschweig

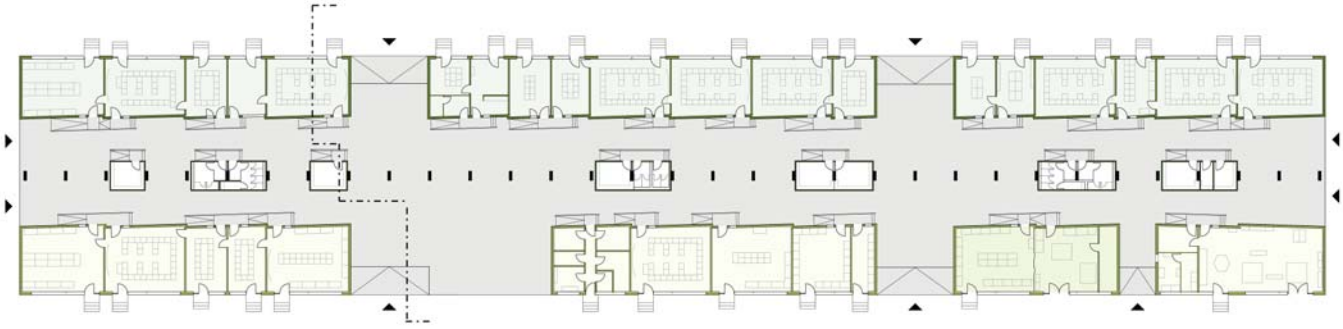
TRANSPARENT POWER PLANT: MANFRED HEGGER WITH SOLA

R TECHNOLOGY FROM SCHOTT

A SMALL POWER PLANT HAS BEEN BUILT ON THE ROOF OF A HALL IN WOLFHAGEN THAT WAS PREVIOUSLY USED FOR MILITARY PURPOSES. THE INNOVATIVE INTEGRATED SCHOTT ASI® GLASS SOLUTION RANKS AMONG THE LARGEST BUILDING-INTEGRATED SOLAR INSTALLATIONS IN ALL OF EUROPE.

CROSS-SECTION THROUGH THE
ARMORED VEHICLE HALL (ABOVE)
FLOOR PLAN (BELOW)





LEARNING CENTER IN WOLFHAGEN

In Cold War times, the Allied Forces sought to redeploy their troops in Germany. As a result, the Pommern Caserne was built in Wolfhagen, near Kassel. Not only "the Wolves", as the Tank Battalion 62 called itself, but also the Leopard 1 and 2 battle tanks were stationed here. In 2006, after nearly 50 years of use, the German Federal Armed Forces site in Wolfhagen closed. What remained were many other military buildings in addition to the armored vehicle hall. The county of Kassel was not at all keen to tear down the sturdy steel construction with its 4,400 square meters of roof surface. Then, with the Herwig Blankertz School, those responsible came up with the idea of laying the cornerstone for a major center for learning and education. The renovation work on the school that had already been planned was given up in favor of the new approach. In times of increasing energy prices, it was only logical to come up with the idea of using the flat roof of the armored vehicle hall for photovoltaics and then simply place the school "underneath it". To do so, the hall that used to be open was closed with single pane glazing and furnished with glass modules that were simple in design. The floor was retained as a concrete surface. Unlike the hall, the classrooms are insulated and can be heated. Instead of the conventional roof covering, a broad load bearing construction that is in good condition now bears the 7,160 ASI THRU® solar modules with a total output of 220 KWp. The semi-transparent installation glasses that are based on advanced thin-film technology are known for their particularly good power output, even when there isn't a lot of sunlight. The 100 x 60 cm modules lie on top of a secondary construction made of wooden beams. Whereas their long sides have been affixed with mounting strips, the glass joints in the direction that rainwater flows in have only been covered with silicon tape. The wiring that connects the modules with the power inverters runs inside the aluminum profiles that lie parallel to the rain drain and are mounted on steel supports. From here, the alternating current wiring runs to the existing transformer through a cable trough buried in the ground. This allows for the building shell to transform itself into a power plant. In order to prevent the hall from overheating, plans call for pivot-hung windows that can be opened by motors to be integrated into the facade. In case of fire, these will also remove the smoke. No additional sun protection is necessary, because the translucent modules not only provide weather protection, but also shade.

Photo: Solar Technology Stiens, 34260 Kaufungen

AERIAL VIEW OF THE GROUNDS OF THE FORMER POMMERN CASERNE. THE PHOTOVOLTAIC ROOF OF THE CONVERTED ARMORED VEHICLE HALL CAN BE SEEN IN THE FOREGROUND.

The innovative SCHOTT ASI® GLASS solution ranks among the largest building-integrated solar installations based on thin-film modules in Europe and can be expected to produce an annual yield of 1,500,000 kilowatt hours. Nevertheless, their model character and integration into vocational training are even more important than their output. Rather than only studying it, the students of the vocational school are now able to experience modern solar technology directly in front of their own classrooms. Nevertheless, the school is only the starting point. Offices and halls for startup companies will also be built on the grounds of the caserne. Not only new buildings, but also the existing building substance will be used for intelligent architectural solutions. The vocational school center, adult education center and branch office for the regional media are only the start. If the State Government of Hesse approves the University of Kassel's plans to build a bioenergy science park, this could also result in an exemplary project on how the school can co-operate with the university in Wolfhagen. As this suggests, students and teachers, rather than soldiers, will be walking across the former military grounds in the future.

FACTS

Builder: Project development society "Schools in the Rural District of Kassel"
Architects: HHS Planers + Architects, Hegger, Hegger, Schleif, Kassel (D
Location: Wolfhagen (D)
Project management: GHT, Kassel
Planning of structural framework: EHS engineering firm, Lohfelden (D)
Solar system (Builder and Operator): Planning and operating company of the rural district of Kassel, Hofgeismar (D)
Solaranlage (Ausführung): Solar technology Stiens, Kaufungen (D)
Completion of the armored vehicle hall: 2009

SCHOTT expertise:
7,160 ASI THRU® semi-transparent thin-film solar modules

LIVING WITH GLASS FROM SCHOTT

Solar architecture, fire resistant glasses, fascinating lighting effects, decorative ideas in glass, SCHOTT offers a wide variety of system solutions for use both indoors and outside. Many of the world's most modern buildings bear the signature of the international technology group. Look for the SCHOTT mark whenever glass and light join to create attractive appearances and instill fascination.

Novartis Forum in Basel

Facade

Architects prefer to be as free as possible with respect to their designs. This is particularly true for the shell of a building. Special-purpose glasses for fire resistant glazing, photovoltaic elements and anti-reflective or decorative glasses from SCHOTT comply with the technical, as well as economical and ecological standards. Planners have access to a variety of processing capabilities as SCHOTT comes up with effective solutions for virtually any customer-specific demand based on the physical characteristics of the building.

Lighting

From the subtle lighting of a room with illuminated ceilings to intentional light effects in high-quality display cases, SCHOTT offers a broad spectrum of lighting products for architecture. This results in an innovative hybrid solution through the unique combination of energy-efficient LED systems and long-lasting fiber optics or even a wireless energy supply that makes it possible to have LEDs glow inside glass in modern architecture. Today, SCHOTT offer innovative design capabilities based on unique lighting technologies, for outdoor applications or interior design.

Hamburger Bahnhof / Museum for Contemporary Art in Berlin

Primary school in München-Trudering

Solar architecture

Regardless of whether it is the facade or the structure of the ceiling, today the building shell must be able to do more than simply fulfill a protective function. The demands with respect to protection and providing shade are becoming more and more important. Building-integrated photovoltaic elements from SCHOTT can perform these functions reliably and even provide electricity. SCHOTT offers solar construction elements that meet the highest demands for functionality and attractive appearance. ASI® thin-film elements feature particularly high power output even with low incident radiation. Using the various designs from opaque (ASI OPAQUE®) to semi transparent (ASI THRU®), designs can be modified to meet the various demands of buildings.

Fire protection

Schott offers registered specialised glass and systems for transparent fire protection under the brand names PYRAN® and PYRANOVA®. PYRAN® S meets the demands of safety glass and offers up to 120 minutes of reliable protection against fire, smoke and hot fumes in the case of a fire. Together with system partners, SCHOTT develops integrated systems that meet the demands of modern architecture and can thus open up new perspectives. This can be seen particularly in cases where safety and room closure are to be realised in a user-friendly and nearly invisible manner.

Police Department in Mettmann

German Stock Exchange in Frankfurt

Interior design

Similar to the products that SCHOTT offers for facade design, the company also provides a wide variety of glass for various applications inside a building. These range from specialised fire protection glazing for use in doors for instance, to anti-reflective glass for display cases and coloured glasses for partition systems. Upon request, all of these glass types can be processed into electrically switchable LC Smart glass. Here too, SCHOTT is capable of finding a unique solution to suit even the most unconventional designs.