**BEHNISCH** ARCHITEKTEN, Stuttgart
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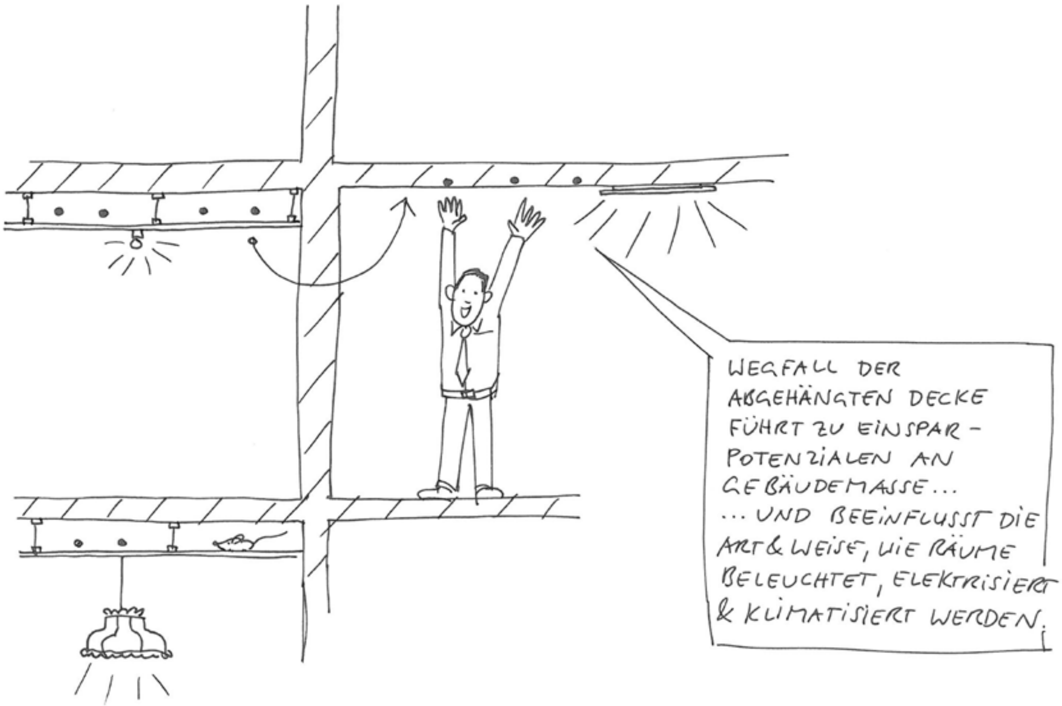
# Active intelligent façade
Press Information

**Project Aims**
Together with Transsolar Energietechnik, Bartenbach Lichtlabor and Zumtobel Lighting, we have investigated scenarios in our built world, in which light, power and air conditioning play a role, in order to develop concepts for the future. New, more intelligently used technology could definitely be used to ergonomically improve conditions for the user, as well as achieving ecological and economic goals. This can be achieved not only directly, through the use of new technologies, but also indirectly through synergy. For example, by changing the nature of the building, materials, and with more direct architectural concepts.

Sunways Solartechnik, LTG Raumlufttechnik, BÜFA Glas and OKALUX, were asked to meet with us, in many working sessions, to give us their experience of the latest technical possibilities. After the Light + Building Fair we will continue to work through technical details and develop individual components for the market.

**Changes in Architecture**
Architecture is being transformed, both technically and in form, by the present zeitgeist and themes. Planners, architects, engineers and clients, responsible for our environment, have to deal with new thinking in architectural development. The theme “sustainability” has for some time influenced architectural development and the ways in which we build.

Materials, also their number, and the trades involved, have all been reduced. This has made the remaining processes more complex, refined, and they must now take over and include other functions. So, for example, the suspended ceiling as an architectural feature more and more falls out of favour as the climatic advantages of concrete, the raw structure or even timber building, become more obvious. The unadorned ceiling, a structural element of the building, is revealed, and exposed, to the influence of air currents.




The very structure itself is used to acclimatize the spaces, building elements are activated. Moderate temperature water is pumped through the ceiling slabs to heat and cool. In such cases, suspended ceilings are no longer possible. If acoustically necessary, sails or decking can be suspended in appropriate areas.

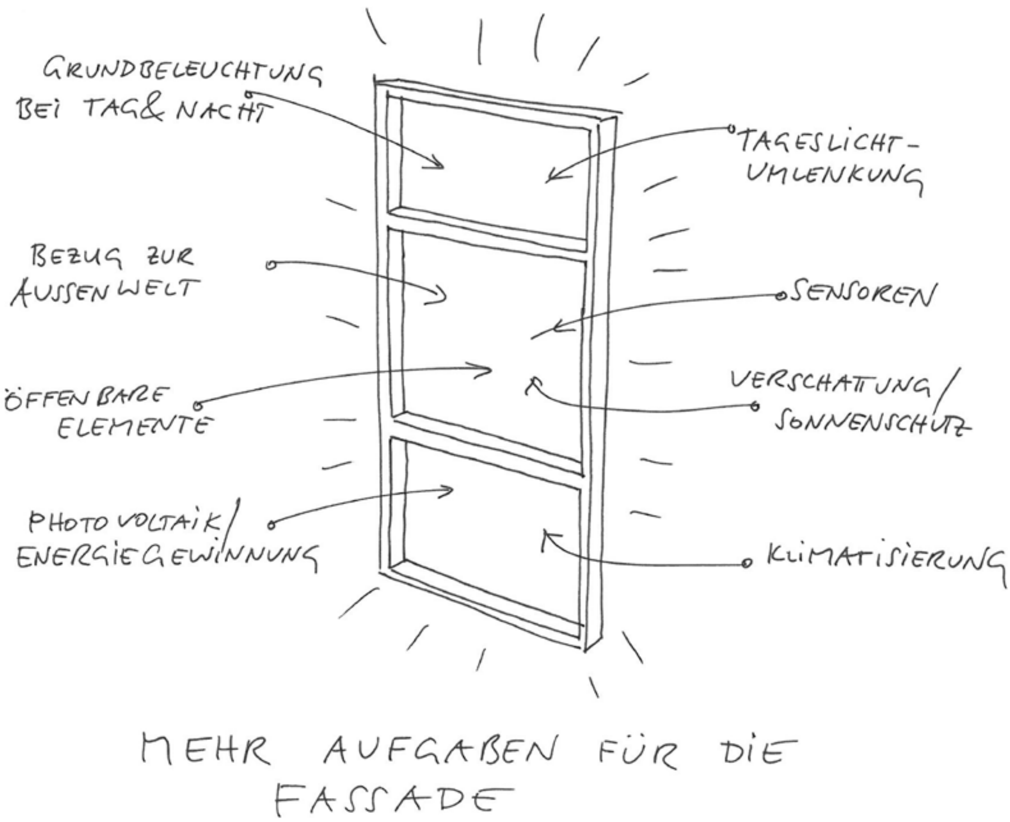
**Consequences for Room Lighting**
The consequence of all this is that lighting concepts have to be revised and restructured. In-built elements, such as cables laid within slabs, must be planned in advance in order to be included in the structure, but the trend is towards a lighting which is independent from the slab levels; standing lights, wall lights, task lighting with space illumination functions, and lighting elements incorporated in the façade.

Similarly in the floor slabs. In the past, raised floors for mechanical ventilation and for complex service installations were used. Nowadays, one tries to avoid these and, instead, optimize and activate the floor structure itself. New technologies, such as WLAN, make it possible to do without cable trays and conduits, and therefore the necessity for raised floors. In the future, cables or steel carriers could be laid in the concrete to deliver power supplies. With the increase in remote controlled building services one can do away with more and more cable connected solutions. The simple answer is to use the hollow floor slab for through ventilation. This would most optimally activate the structure.

To sum up, one can say that the buildings will become lighter, more slender, and less voluminous.

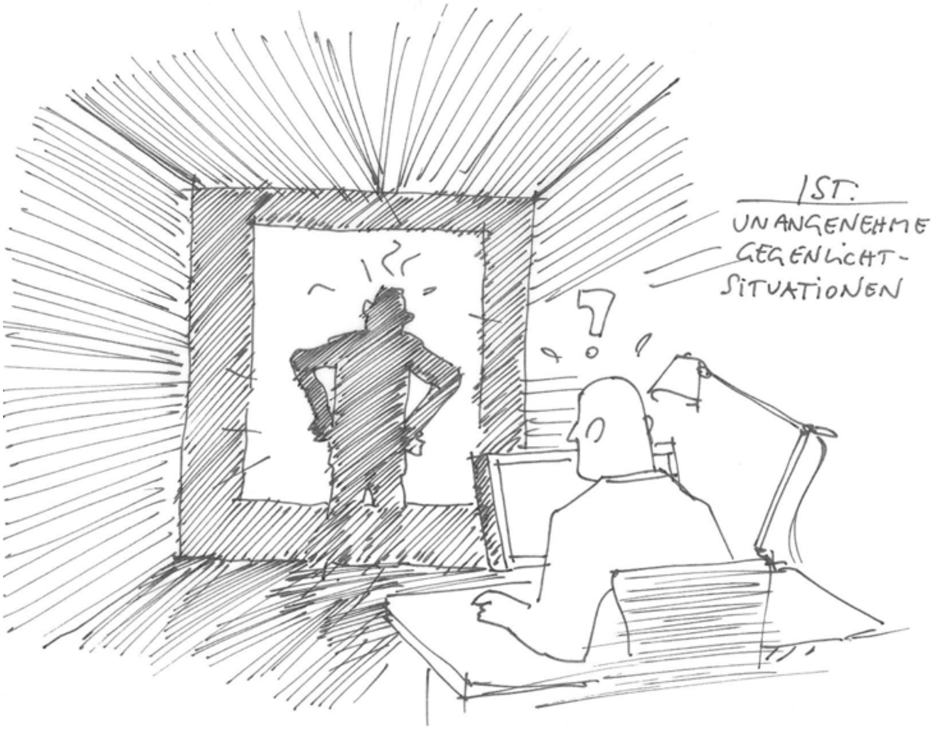
**More Tasks for the Façade**
With further developments in technical architectural solutions for complex works primary elements, such as in façades, will take on greater importance. Simple, less complex trades and processes will become even more simple, while complex tasks will become more intelligent, and therefore even more complex. Already, in the past, many elements, like control mechanisms, sun protection, etc. were integrated into the façade. In future, many more functions will be added.

So, the ideal façade will include not only sun protection, solar panels to capture energy, reflective elements in the upper areas of the façade to optimize daylight, opening elements for ventilation, but ideally also lighting elements for background night illumination, heat exchangers and mechanical air handling elements. Through the development of new lighting systems, like OLED and LED, it can happen that lighting requires such minimal invasion into the structure that it can be incorporated directly into the window units, in the glazing.




**Daylight**
In the upper third of the façade a reflector fully exploits daylight capacity, even when sun protectors are in use. In the lower parts, daylight can be complemented by LED lights, which are fed by photovoltaic areas within the façade. Ideally, these LED lights would match the light intensity outside the building. For example, if a passing cloud blocks the sun, and light through the window is reduced, then the LEDs illuminating the ceiling areas in corridors or in deep rooms would dim accordingly. The aim is to maintain the relationship between interior and exterior light levels, if possible one to one, and directly, without wasting energy, so that the contrasting blinding effect of daylight outside, seen against a dark window surround and deep room interiors can be avoided or, at least, reduced. Daylight, in comparison to artificial light, goes through a variety of changes. The time of day, seasons, weather, heat and cold, light and shadow, sunrise or sunset, misty or clear days, rain, light reflections, all influence daylight quality. By directly connecting the artificial light settings in the corridors and depths of the building with the façades photovoltaic systems, it will be possible to experience this lively quality of natural light deep into the buildings recesses.

# Active intelligent façade




**Indirect Lighting, Back Lighting**
Towards nightfall, as soon as artificial lights are necessary, it would be preferable to retain a background light emanating from the facade. Towards the end of the day, by slowly mixing light sources, a similar day and night light relationship can be maintained. To achieve this minute LEDs are placed near the daylight reflecting slats, which then throw light from the façade area on to the interior ceiling.

**Air Conditioning**
Air conditioning elements, highly efficient heat exchangers, air circulation heaters and coolers, can be built into the facade frame structure. Space wasting installations within the building itself will become superfluous, as room volumes will be directly served from the façade. Conditioning components can then be directly connected to the energy winning photovoltaic system. Eventually, surplus energy can also be supplied to the public power grid, via the medium of water. It is no longer necessary to construct costly ventilation channels and ducts, and the large building volumes, and energy wasting transport of air over long distances, become superfluous.

**Direct Current Networks**
Just as building interiors, for energy saving reasons, have different climate and temperature zones, so most likely, in the future, direct DC low-tension power grids will serve various functional areas. Office equipment, air conditioning and computer controlled building services will be DC. Until now, practically all equipment in office or residential buildings was supplied over transformers. Now, we want to use only equipment requiring low voltage DC, similar to the grid in a further development phase, which will feed light sources from the photovoltaic system in the façade. In present façade constructions we are still using AC, alternating current.

Stuttgart, 13.04.2010, Stefan Behnisch

# About Behnisch Architekten

The architectural practice, Behnisch Architekten, with headquarters in Stuttgart, is engaged worldwide with offices in Los Angeles, California, and since 2007, in Boston. In summer 2008 a Munich office was also opened. Behnisch Architekten have approximately 100 employees.

Current projects include the University of Baltimore's Law School, a Heidelberg centre for cancer clinical research and interdisciplinary medical care, an Ice-Sports Hall in Inzell, five laboratory buildings in Paris, a United Nations administration building with conference hall in Geneva, and administration and laboratory buildings in Ravenna and Ferrara, Italy. In 2009, planning for Harvard's Allston Campus, Boston, was completed. The practice is involved with various low budget residential projects, as well as those in the upper segment of the housing market.

Among their completed, and most well known, projects are; the St. Benno secondary school, Dresden, (1996), the service centre for LBBW "Am Bollwerk" (1997), the Museum der Phantasie for the Buchheim Collection, Bernried, (2001), the Norddeutsche Landesbank, Hanover, (2002), the "Haus im Haus" for Hamburg's Chamber of Commerce (2007), and the Maritime Museum OZEANEUM, Stralsund, (2008). In September 2009 Unilever Deutschland's new headquarters, which had already won international prizes, opened in Hamburg's HafenCity. Abroad, there are also the Institute for Forestry and Nature Research, Wageningen, Netherlands, (1998), the LEED Platinum awarded Genzyme Center, in Cambridge, Massachusetts, (2004), and the Terrence Donnelly Centre for Cellular and Biomolecular Research laboratory buildings at the University of Toronto (2005).

The practice was founded in 1989 by Stefan Behnisch, as a branch office of Behnisch & Partner (Günter Behnisch, Manfred Sabatke). Two years later, in 1991, the branch office became an independent firm with names reflecting the partnership configurations. Since 2005 it has been known as Behnisch Architekten with Stuttgart partners Stefan Behnisch, David Cook, and Martin Haas. Robert Hösle is the Munich office partner. In the U.S.A. Stefan Behnisch and Robert Matthew Noblett are partners in Boston, while the three partners in Los Angeles are Stefan Behnisch, Christof Jantzen and Kristi Poulson.

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