# opusC

Concrete Architecture & Design

issue 1
2009

**architecture** dressed with creativity – delicate concrete curtain in cormondrèche ▮ black box – roma forum in burgau ▮ icehouse – rohner boat and clubhouse ▮ light catcher at zolling power station ▮ school #9 **engineering & construction** military history museum in dresden **technology** coloured concrete ▮ acoustics and fair-faced concrete **art & design** concrete furniture ▮ time catcher – concrete bags

www.opusC.com

Boesel Benkert Hohberg Architekten

# Light catcher

## E.ON administration building at the Zolling power station

In Upper Bavaria, north of Freising, the Zolling high-tech power station produces electricity from hard coal and biomass, as well as district heating from combined heat and power generation. A new building was to be erected for the site's 50 employees, the power station archive and the works fire brigade with vehicle garage in order to create contemporary working conditions and at the same time define the new main entrance to the power station. A building planned by Boesel Benkert Hohberg Architekten from Munich was built between the power station block and the cooling tower; a building that sends out signals in every respect – a strong piece of work, a work of power.

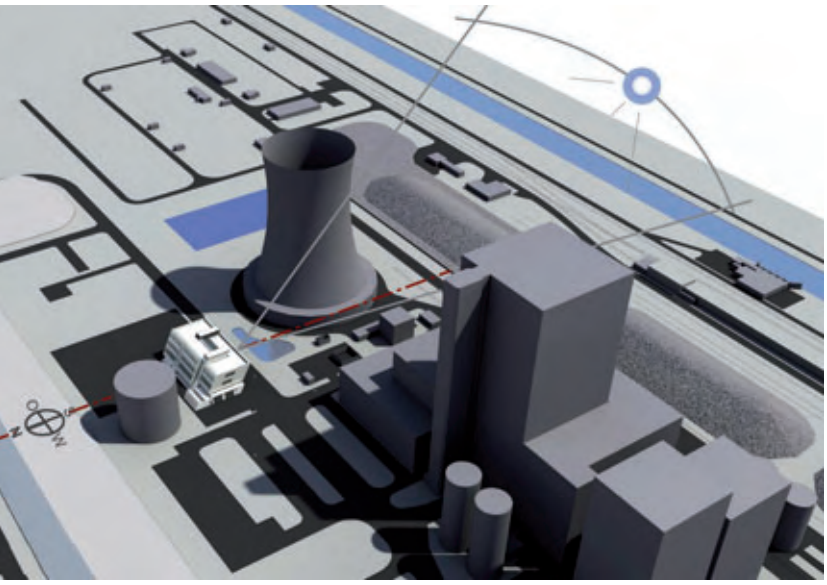
The aim was to implement the requirements of the space allocation plan in a qualitatively sophisticated way in terms of building design with a compact cubature, making resource-preserving use of the formerly built-on or sealed areas on the site of the old gate, near the eastern boundary of the power station site, and also, in an unpretentious manner, to give the site an unmistakable face that equally displays the content and claim of a modern power station and the philosophy of the energy generation of the future. This was certainly no easy task in the midst of the gigantic volumes of the silo, chimney, cooling tower and power station block 5. An additional goal was to make a contrasting reference, with respect and empathy, to the typically charming Upper Bavarian landscape that surrounds the power station site, in order to display confident signs of a future here also.

Without pretentious bric-a-brac, and in keeping with Louis Sullivan's guiding design principle 'form follows function', the architects developed a genuine 'crooked house', which managed to achieve considerable fame beyond the regional borders even during its construction.

The building lives in shape and material from the encountering, dealing with and budgeting of energy: the 26 degree inclination of the façades facing south prevents the sun from shining directly into the rooms in summer when the sun is high in the sky, hence preventing the undesirable input of energy, whilst in winter the low sun can enter the rooms – lower cooling load in summer, additive energy in winter. On the north side of the building, light-guiding lamellae steer the always diffuse light deep into the rooms. A daylight-orientated building form, therefore - little artificial light is required.

The form of the building is hence clearly defined by this basic principle. The logic of the design characterises an architecture which, although it should perhaps be described as 'small' in relation to the large shapes

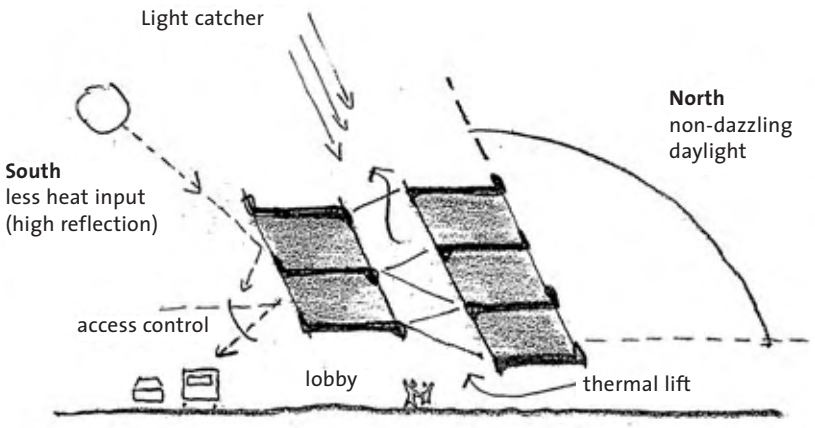
*Site plan*



*The new building is located in a strategically favourable position at the eastern border of the power station site and emblematically defines the new main entrance to the power station. The precisely aligned and, from a photometric point of view, calculated position of the building between the power station block and the cooling tower offers optimum sunlight and shade conditions. The free-standing building avoids noise emissions and vibrations from the power station. Overview and outlook onto the works are allowed.*

*The building, which is inclined towards the south, uses non-dazzling daylight to a greater extent in the north and reduces the irradiance of heat into the building in the south by the use of the Fresnel effect.*

surrounding it, places itself clearly, matter-of-factly in terms of content and without formal exertions or cramping of design at the architectural peak of the complex with its direct expression on a human scale and the clear intelligence shown, and sets the guiding theme for the coming years – an architectural work of power in terms of both creativity and content that answers the might and the dynamism of its surroundings playfully and confidently and connects them to that which is still most important to us: man and his house.




## More contents, support structure, form and energetics – with concrete

Just the form, which defines the urbanistic context, justified as it is by function and contents, is reason enough to look attentively. And yet the captivating and characterising structural and urbanistic logic of the design continues in its construction, its energetics and – last but not least – in its use.

With regard to the building design, two L-shaped halves placed together with a common, light-guiding atrium form a non-hierarchical matrix with a sequence of open, semi-open and closed zones. Single offices alternate with variously shaped communication zones and make concentrated working and the intensification of communication processes possible for the people there – the flexible cooperation which represents a formula that is considered to be future-proof.

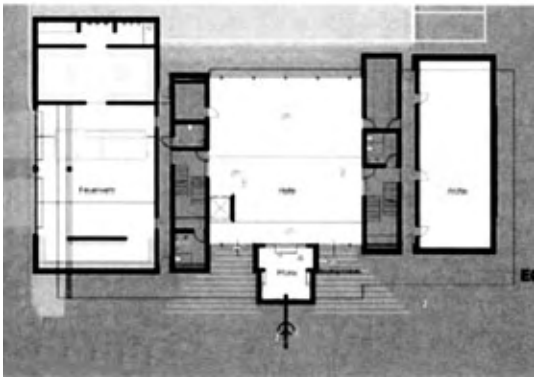
The implementation of the characteristics of this architecture demanded floor plans that, as a matter of consequence, can not tolerate disruptive columns. At the same time it was necessary to solve both the described goals of the overall energetics, with the continuation of the light architecture to the inside, and the horizontal development of the work zones. At this point the 'form follows function' principle is applied again, this time in the planning of the support structure:

*The reasons for this project were better working conditions and a new fire brigade. The previous administration rooms were situated directly by the power station block and were subject to high emission loads. It was necessary to increase the size of the works fire brigade in order to be able to increase the power station output from resource-preserving biomass. Therefore a new administration building with fire brigade garages had to be built in order to improve workplace conditions and to house the required fire engines.*

Z-shaped ceiling cross-sections, such as are only possible with cast-in-situ concrete, have such a large load bearing capacity in the longitudinal direction due to the upward and downward folds (façade balustrade: upstand beam, atrium zone: downstand beam) that it was possible to dispense with inner columns.
At the same time, due to the split-level offset and the statically relevant, seemingly organic increases in thickness – the 'light haunches' – in the atrium zone, this ceiling architecture as defined by the support structure assists the gentle, smooth guiding of light into the interior of the building – a diversion of light into the depths of the room.
The use of the space in the „light haunches" provides an elegant alternative possibility to solve the problem of the routing of technical building equipment for heating, cooling, ventilation and the electrical and data supply cables.
This form of ceiling that integrates statics, technical building equipment and light direction is only possible to implement using the ductile, easy to use material concrete. In addition to the adequate design of the fair-

*Standard storey*


*Ground floor*



*The new administration workplaces are organised on five offset office levels around a common atrium and are accessed via two staircase cores. The ground floor houses the archive and works fire brigade with vehicle garage in addition to the central entrance hall with gatehouse.*

faced concrete as regards use and content, with its slight colour variations in the natural surfaces coupled with a joint layout that is in turn heartily unpretentious, the whole thing is rounded off by a, near to the surface, thermo-active building system. This technique which, with the open concrete surfaces, utilises concrete's natural outstanding energy storage capability, allows the swift, individual, need-orientated temperature control even of single rooms despite the mass-related damping and phase shifting of energy peaks in summer and winter.

In order to reduce the proportion of the heating load caused by ventilation, a controlled ventilation system with energy recovery was planned, which provides for a good climate in conjunction with the flushing of the interior airy/open space-defining proportions.

This kind of integrally designed building energetics is matched overall coherently to the compact architecture, which, with its good ratio of usable area to volume and relatively small building surface (shell surface area), avoids additional energetically disruptive radiation into and out of the building.

**Author:** The architect Holger C. Heilmann is the owner of leanfield architectural research. He is involved in the cooperation between architects, investors and manufacturers in the development, optimisation and visualisation of the concept, construction and economy of architectures.

## Purism, concrete and the large shape

The described structural solution provides its users with a clear, sober environment in which they, the people, play the starring role. Concrete, used very attentively and holistically, 'sets the pace' in the interior of the building through its importance, which is clearly recognisable in shape, colour and surface. Wallpaper, wall claddings and suspended ceiling panels have not been installed, not only because they would only disrupt the architecture in every respect (formally, energetically and economically), but also because they are per se utterly superfluous. The clarity of this architectural language, clearly reduced as it is to its essentials, will give the residents of the house the requisite freedom to also concentrate on the essentials – no need for cumbersome formulations, but instead openness of the system and a role model for free thinking.

*Form follows energy + light: the subjects of light and energy were the factors that determined the shape of this building. The cross-section of the building that emerged from various studies resulted from considerations given to the saving of energy, the optimisation of daylight and the support of communication processes.*

Photos: BetonBild/Henning Koepke

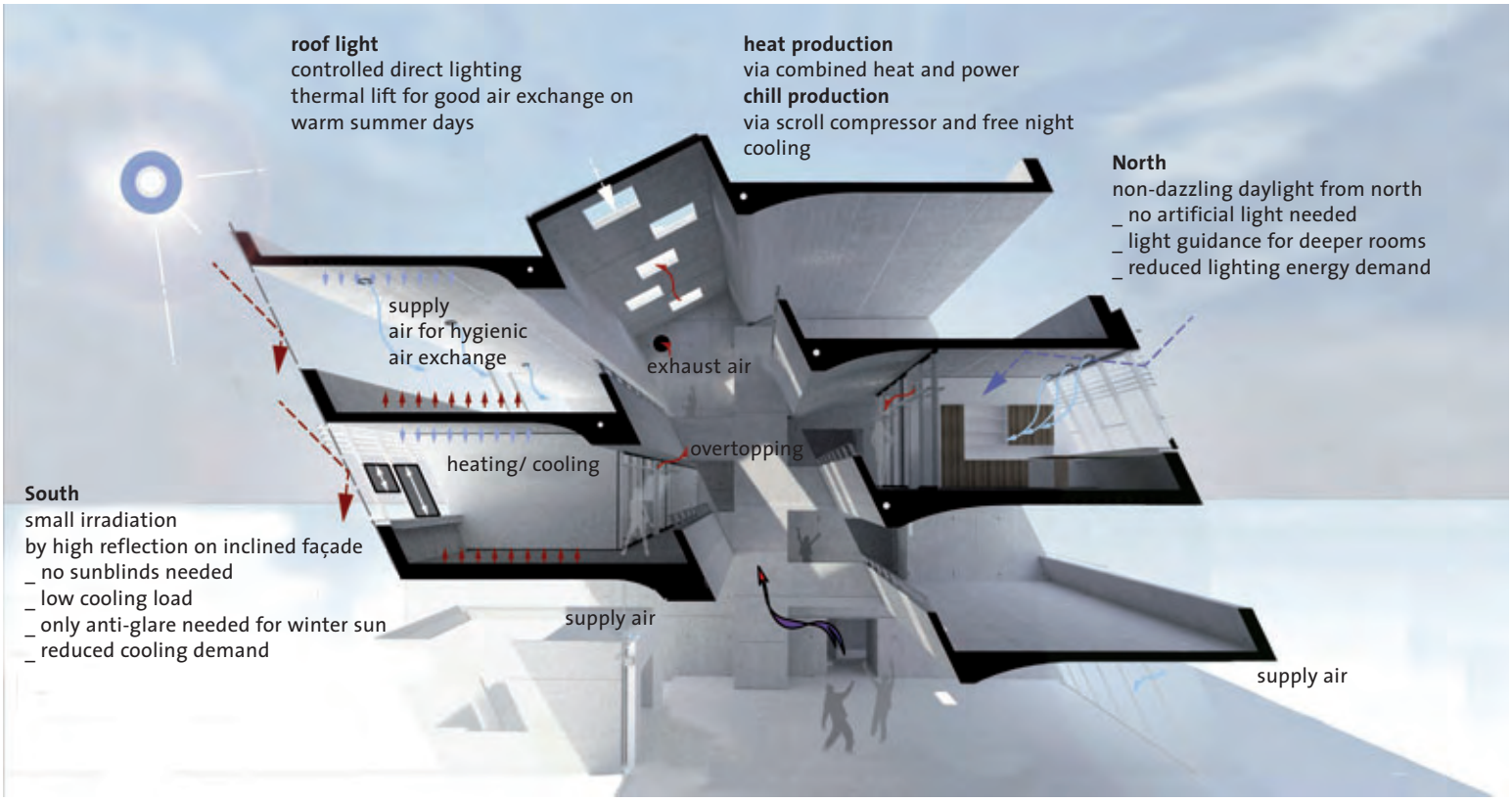
*The chosen room concept offers a coexistence of individually usable single offices and various communication zones – concentrated working is promoted, agreement processes intensified.*

## Integration as our chance for the future

Living as we do in these times of social and economic polarisation and against the backdrop of recessive national economies and increasing environmental problems, our chances for the future lie in efforts to promote integrative processes at all levels. The logical consequence is that this is also reflected by the architectures of our houses: we must strive towards planning the synergetic use of shape, material behaviour, form and energetics in unison with urbanism and landscaping. This approach has been implemented consistently in the new administration building at the Zolling power station. Claims to function, shape, and material as well as to economy and ecology have been combined in a fashion which serves totality and is of an original architectural mindset, thus actually representing a work of power.

*Dipl.-Ing. Holger Heilmann*

*Optimum room climate at the workplace: non-dazzling daylight, heating and cooling elements close to the surface in the ceilings and a controlled ventilation and exhaust system for the hygienic exchange of air contribute to well-being and comfort in the building. People are thereby at the centre of attention - individually controllable room temperatures and window sashes that can be opened increase user acceptance. Heat is generated from the power station's own district heating via combined heat and power generation. The required cooling in summer is provided by a chiller with a 'free-cooling element' that makes use of the free night chills.*



## Fair-faced concrete teamwork

The 38.0 m long and approx. 15.0 m deep building is made up of three office wings with two staircases in between and an atrium. The 26° inclination towards the south leads to trapezoidally shaped side walls and an overhanging façade on the south side and a reclining façade on the north side. The walls and the ceiling soffits in the centrally located entrance area, in the fire station located in the west wing and in the 3.30 m high standard storeys were supposed to be finished in class 3 fair-faced concrete according to the DBV datasheet.
A fair-faced concrete team was assembled even before building began in order to endure the required surface quality of the walls and ceiling soffits. Everybody involved sat down together at the table in order to achieve the best result. In addition to the building owner, the team comprised the designing architects from BBH, the general planner 'EFM – Großprojekte Bau und Technik' and a consultant specialist in fair-faced concrete.
All extensive ceiling areas are part of a thermo-active building system. The 5 metre high entrance hall provides for a wing-wise height offset. In the soffit, haunches stretch along the interior corridor on the north and south sides. These ceilings were concreted by the building contractor Porr storey-by-storey using formwork tables (Dokamatic) totalling 450 m2 with a special sheeting in the required joint grid size. This kind of table offers several advantages. Here in Zolling it was convincing on the one hand on account of its stiffness, and on the other due to its high load-bearing capacity in the area of the overhanging ceilings. As mould elements for the asymmetric haunches, the formwork specialists from Doka manufactured false edge boxes in two versions for every 38 running metres, similarly matching the joint grid size. A total of 30 running metres of K folding platform at the east and west edges of the ceiling offered the building site team the necessary safety barrier.

Photos(3): Doka

*The administration building, which is inclined by 26° to the south, can manage virtually without support frames thanks to the projecting form tables.*

*The Ready-to-Use service suppled exact-fit false edge boxes in the desired joint grid size for the interior-running asymmetric haunches.*

*The extensive ceiling areas including haunches were concreted by the building contractor storey-by-storey using formwork tables totalling 450 m² with a special sheeting in the required joint grid size*

Due to the forward inclination of the south façade, the ceilings overhang considerably in part. This would normally have meant the erection of a large-volume support for each storey that would have blocked the important site access road that lies to the fore for weeks on end. The extreme stiffness of the Dokamatic tables came to Porr's aid here: on account of their robust 12 cm high steel longitudinal beams and a spindle strut that can quickly be bolted diagonally to the edge tables, they can overhang accordingly at the edge of the ceiling - completely without support. Hence, due to the high load bearing capacity of the standard tables, expensive special tables and a great deal of assembly and disassembly work can be saved.
Large elements measuring 2.40 x 3.30 m (Framax Xlife) were used for the formwork for the vertical walls. With its plastic-coated formwork sheeting, this frame formwork fulfils both the fair-faced concrete requirements and the desired element and anchor pattern. Thanks to the hot-dip galvanised and powder-coated elements frames, there are no rust spots on the concrete surface – a decisive point for the surface quality of the concrete. In order to cope safely with the concreting loads of the two forwardly inclined staircase cores, Porr climbed here in 3.30 m steps with three panels of D22 dam formwork, which is normally used for the construction of dams. In combination with the large elements, the dam formwork saves elaborate support frames having to be built. For the backwardly tilted exterior walls on the north side, a platform of the MF 240 climbing formwork provided for fast, safe working.
However, it didn't quite go completely without supports, because neither the folding platform nor the projecting tables could support the corners of the building adequately. In this case, a support frame (Staxo 100) made of hot-dip galvanised steel frame for large support heights and high leg loads stood in each place. Undetachable integrated connectors enable fast, toolless assembly.

**Architecture**
Boesel Benkert Hohberg Architekten
Sandstrasse 33
80335 München – Germany
T +49 89 126654 0
F +49 89 126654 44
info@bbh-architekten.de
www.boesel-benkert-hohberg.de

**Structural engineering**
Muck Ingenieure
Maria-Ward-Straße 9
85051 Ingolstadt – Germany
T +49 841 97359 59
F +49 841 97359 73
ingolstadt@muck-ingenieure.de
www.muck-ingenieure.de

**Formwork technology**
Deutsche Doka Schalungstechnik GmbH
Frauenstraße 35
82216 Maisach – Germany
T +49 8141 394 0
F +49 8141 394 6183
Deutsche.Doka@doka.com
www.doka.com