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Press

Modern Architecture using Glass: The Concept as a Whole must Fit

The use of wide expanses of glass in modern, energy-efficiency focused architecture requires holistic planning as well as multi-disciplinary cooperation between architects, technical planners and facade installers.

For some years now glass has characterised modern architecture like no other material. Provided they are incorporated in an overall planning concept in line with their performance potential, glass materials not only characterise the appearance of facades but also make a decisive contribution to the energy efficiency of buildings. Based on experiences acquired with initial major projects involving a high percentage of glazing the aspect of thermal protection in summer plays an especially important role today. Solar protection devices compensate for a disadvantage that often goes hand in hand with the transparency of glass architecture – much to the architects' regret – the undesirable build up of room temperature in summer. The use of the latest generation of coated solar protection glass can substantially reduce but not entirely avoid this effect. In winter these solar gains are desirable by all means but in summer they can result in unpleasantly high air temperatures in building interiors.

Optimised Interplay

To avoid the undesirable heat build-up in interiors a wide variety of solar protection systems are installed in glass architecture. They are an essential component for the productive interplay between efficient thermal protection, maximum use of daylight and reliable ventilation of interiors. Controlling the complex correlations between external and internal influences on the building in such a fashion that pleasant

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temperatures prevail indoors throughout the year is one of the biggest challenges for modern glass architecture. Prof. Anton Maas, Head of the Construction Physics Faculty at the Kassel University, elucidated the current issue at the annual meeting of the German Flat Glass Manufacturers' Association in April 2010. He forecast that solar protection in summer would increase in importance while also stressing the performance of windows and facades as highly efficient energy "winners" suitable for saving massive amounts of heating energy.

Experts principally agree that integral planning is required to efficiently leverage the energy and architectural potential of large-surface glazing in building skins. Planners and facade installers must, where possible, already cooperate in the development stages of a project. Only this multi-disciplinary collaboration and the consideration of the given climatic conditions at the location can ensure an optimised interplay of summer-time solar protection, ventilation and heating and/or cooling technologies.

New Opportunities through building-integrated PV

Building-integrated or to be more precise facade-integrated photovoltaics will also play an increasingly pivotal role in boosting energy efficiency in the future. Although numerous product solutions are already available on the market installed systems can only be found in isolated cases. The reason for this is a lack of consideration on the part of architects – something which solar industry experts discovered at the international Solar Summits congress in 2009. Even so PV modules can now be installed as systematically as conventional facade elements made from other materials.

Against the background of the recently amended European Directive on Total Building Efficiency facade-integrated photovoltaics will necessarily gain in importance. The Directive requires a Near-Zero-Energy Level for newly erected public buildings from 2019 and

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private buildings from 2021 with the remaining energy requirements being largely met by regenerative sources. This provision will drive the development of corresponding systems and give architects the incentive to include integrated PV elements in their planning concepts.

Even today PV elements featuring the latest thin-film technology can be ordered in various colours thereby providing more design freedom for facades. Prof. Eike Weber, Director of the Fraunhofer Institute for Solar Energy Systems ISE, assumes that these new coloured solar cells will bring the desired breakthrough for building-integrated photovoltaics over the next few years. These cells, which were co-developed by the ISE, are based on completely different principles to the semi-conductor technology used so far. Since the technologies for their production are very similar to those already used in industrial glass processing, efficient manufacturing is possible. In addition to their use in new building integration-enabled photovoltaics modules also have multiple applications in facade refurbishment.

Comprehensive Market Overview

Knowledge of the available glass products and their working principles is imperative for realising sustainable, energy-efficient glass architecture. Only by considering any glass versions that qualify for a building project can multi-disciplinary cooperation come up with holistic building concepts that live up to the high requirements made by both legislators and building owners.

glasstec 2010 will show what the international glass market currently has in store for this important area of application. Furthermore, the world's biggest trade fair for the glass sector held from 28 September to 1 October will provide an excellent overview of the latest developments in glass facades. Alongside the Special Show glass technology live, which already presented pioneering products and applications in the past, Messe Düsseldorf has this year "given birth"

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to a so-called FacadeCentre involving renowned associations and scientific institutions. In a 2-day conference called “Engineered Transparency” to supplement the exhibition trade fair organisers in cooperation with the Dresden, Darmstadt and Delft Universities of Technology will offer construction engineers, designers, research and development staff and building authority representatives hands-on information on the latest developments for the structural use of glass. The programme of side events at glasstec will be rounded off by an architects’ congress entitled “Glass is Energy” which is organised in cooperation with the North Rhine-Westphalian Chamber of Architects, the Delft University of Technology and Ostwestfalen-Lippe University. Attendance is recognised as continuous professional education.

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Photos/Captions

Photo 1/Fig.:

The glass facade of the Düsseldorf Stadttor is a twin-skin structure. The internal element facade with timber windows that can be opened and the outer glass skin in 12 mm TSG is set off by a 1m wide climate buffer. Air supply and exhaust openings are located at floor/ceiling level. Photo: Messe Düsseldorf

Photo 2:

The TSG facade elements with bolt back assemblies at Düsseldorf’s Stadttor are fitted with inside Venetian blinds on the office floors of the building. Photo: Messe Düsseldorf

Photo 3:

Twin-skin facade set-up encompassing thermal insulation timber elements and attached glass scales. Photo: Messe Düsseldorf



Photo 4:

The glass facade elements of the Capricorn Haus in Düsseldorf are multi-functional. Next to each countersash window with integral solar protection there is a 1.80 m high red glass panel. It conceals a facade module with cooling, heating and ventilation functions including heat recovery as well as lighting, sound dampening and interior acoustic elements. Photo: Messe Düsseldorf

Photo 5:

High energy efficiency of the glass facade does not exclude classic gap ventilation. Photo: Messe Düsseldorf

Photo 6:

Building-integrated thin-film PV modules in variable colours with fine-lined pinstripe looks for use in back-vented curtain walling. Photo: StoVerotec

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