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SWEETS NEWS AND PRODUCTS
A PUBLICATION OF THE McGRAW-HILL COMPANIES
AUGUST/SEPTEMBER 2011

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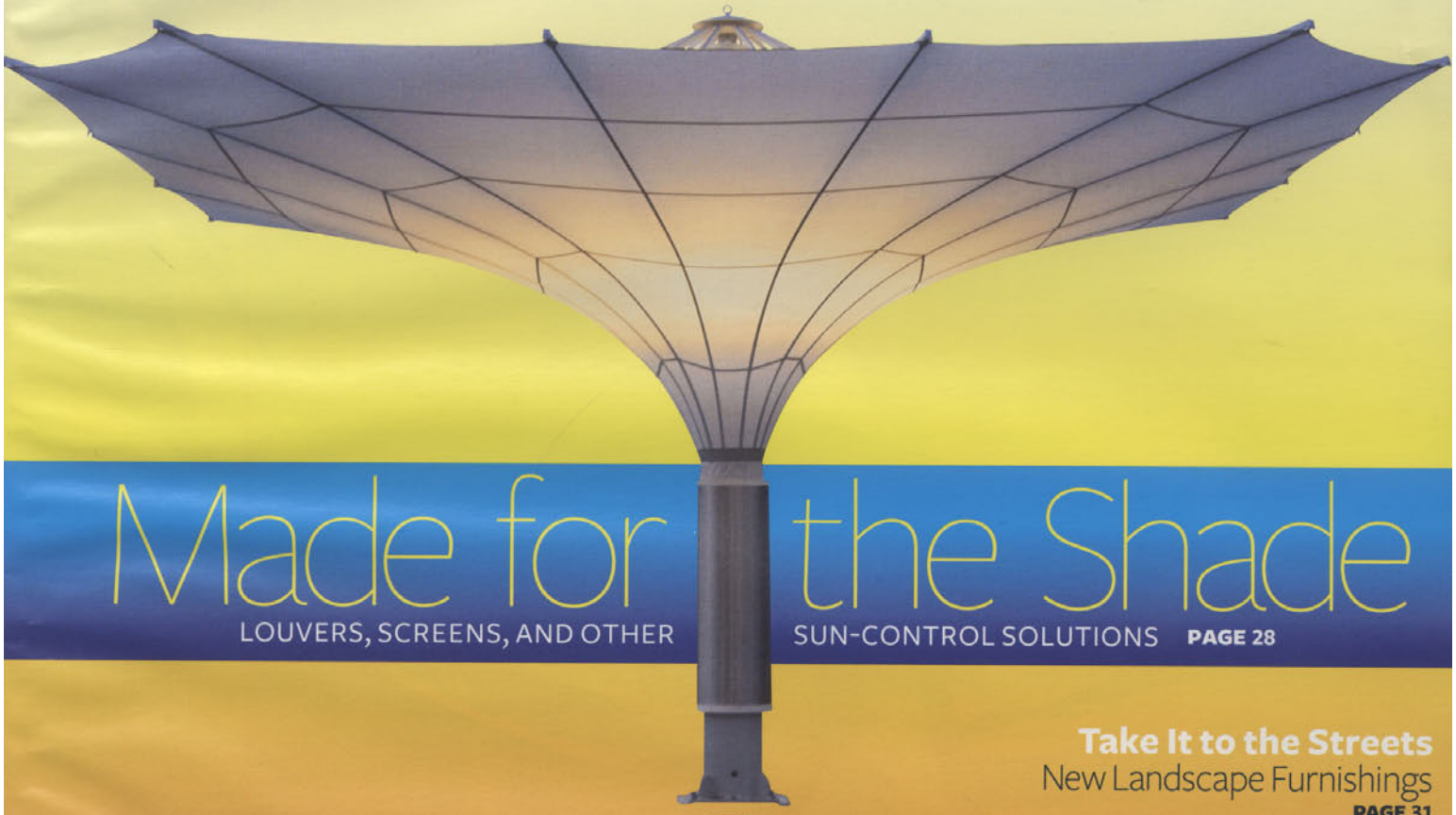

Made for the Shade

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McGraw-Hill CONSTRUCTION

FOR THE NEW Pola headquarters in Tokyo, design architect Koichi Yasuda tapped Hoberman Associates to integrate shading into the office's curtain wall. In response, the studio conceived 185 acrylic, fritted shutters that move by linear actuator and CPU, and that are illuminated at night.

Sustainable Skins

Facades that shade, display, and generate. BY DAVID SOKOL

BY SOME ESTIMATES, envelopes are responsible for as much as half of a building's energy consumption. Sustainability-minded designers and manufacturers are responding to envelopes' significant involvement in performance by creating products and systems that can shade and ventilate building skins, and even turn them into energy generators. Whether firms are inventing such an application or adapting familiar materials to that end, these technologies promise to transform utility consumption and the marketplace.

TRACKING THE TOKYO SUN

Shading holds the potential not only to reduce operating load on a building's mechanical systems but to lessen mechanical capacity altogether. For a new showroom for the Japanese cosmetics manufacturer Pola, **Hoberman Associates** transformed a curtain wall into a kinetic sculpture that expressly filters light. Located in Tokyo's glitzy Ginza neighborhood, the 14-story building features 185 individually controlled shutter mechanisms mounted inside its double glazing. Each 1-by-3-meter acrylic sheet is curved and fritted.

Studio namesake Chuck Hoberman explains that the shutters have a hinged connection to the mullions on the inner glazing. "In their closed position, they visually float symmetrically between the mullions. When opened, they retract behind the mullions on the outer glazing, and seemingly disappear to a viewer on the street."

While the shutters turn individually, they are synchronized in groups of 14. Movement is initiated by a linear actuator at the base of the shutters, with a CPU controlling the entire 3,000-square-foot system. "During the day, the position of the shutters is directly tied to exterior light levels, with a manual override if occupants wish to change shutter position," Hoberman explains. The system was projected to reduce cooling demand by 30 percent, and a postoccupancy study to pinpoint the reduction is still forthcoming.

At night, the facade takes a more dramatic turn, the shutters dancing to an LED-based lighting design by **Shozo Toyohisa**. Overall, the Pola project was a collaboration between Hoberman Associates and the design architect **Yasuda Atelier** and executive architect **Nikken Sekkei**, as well as the **Adaptive Building Initiative**, a three-year-old joint venture between **Buro Happold** and Hoberman Associates dedicated to developing environmentally responsive building systems. "For the work we do, solar shading is simply a starting point. Other systems that would benefit from moment-by-moment dynamic adaptation include acoustics, water, ventilation, and lighting," says Craig Holland, director of business operations of Hoberman Associates.

WHEN OPEN, the acrylic shutters in the Pola building in Tokyo retract behind the mullions on the outer glazing, and appear to disappear to those on street level.

PHOTO CREDIT: COURTESY MAMORU ISHIGURO (POLA BUILDING IMAGES)

ENVELOPE AS POWER PLANT

When the Syracuse Center of Excellence opened in March 2010, an 8′ x 8′ section of the 55,000-square-foot building's skin glittered in a way that the rest of the exterior did not. The anomaly actually is an inaugural panel of ICSF, or **Integrated Concentrating Solar Facade**. Developed by the **Center for Architecture Science and Ecology** (CASE) — a research collaboration cohosted by **Rensselaer Polytechnic Institute** and **Skidmore, Owings & Merrill** — and licensed by **HeliOptix**, ICSF synthesizes known technologies into unprecedented products.

The Syracuse prototype comprises 64 1′-square glass pyramids that focus the sun's rays on multi-junction photovoltaic cells made by the Boeing company **Spectrolab**. Each small cell has three semiconductor layers that absorb different ranges of the light spectrum. According to HeliOptix managing director Mark Ours, this particular composition makes the Spectrolab cell more efficient than traditional silicon photovoltaics.

The special PV cells and concentrated lenses are packaged as a single unit. Mounted on a universal joint to move in two axes simultaneously, each pyramid tracks the sun, a feature that Ours calls absolutely necessary. "It's important to the system's advantage over traditional flat-plate technologies, whose output decreases when light strikes them at an angle." Because overheating also reduces PV production, the universal joint connects ICSF's cells directly to a water block-type heat sink, through which a fluid is run in a closed loop. The configuration has the added benefit of capturing waste heat for uses like heating water.

"By concentrating the light and using more efficient cells, only a small amount of expensive PV material is needed per unit area, thereby reducing the initial cost of the system," Ours says of ICSF's economic feasibility. "But where the ICSF system really gains its advantage is in multi-functionality." Indeed, ICSF's additional benefits include its diffusion of sunshine to the interior and its insulating properties.

HeliOptix continues to improve the system according to data collected in Syracuse. Meanwhile, the commercially available product is framed in light-gauge aluminum or steel, and panels arrive on site as complete, factory-assembled units. HeliOptix has plans to standardize some modules according to region and building type.

PHOTO CREDITS: CLOCKWISE FROM TOP: © PAUL RIVERA; ARCHITECTURAL ELEMENTS COURTESY DECKER YEADON LLC

PERMUTATE, TESL8

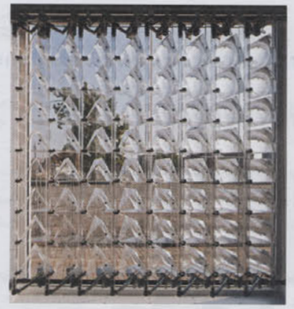
A building product may improve the environmental performance of a building, and be environmentally responsible in itself. That would describe **TAKTL**, a new ultrahigh-performance concrete (UHPC) made by the Glenshaw, Pennsylvania–based company of the same name (for more on TAKTL, see Product Focus on page 47).

What makes the material so high-performing, says TAKTL design strategist Dee Briggs, is a formulation of cement, fine-grain sand, silica fume, optimized admixtures, and alkali-resistant glass fiber reinforcement, which optimizes packing density. "This tight packing of particles creates stronger chemical bonds, which yields extremely high compressive, tensile, and flexural strength," Briggs says, making it six times stronger than traditional concrete. The material can be crushed and recycled, too.

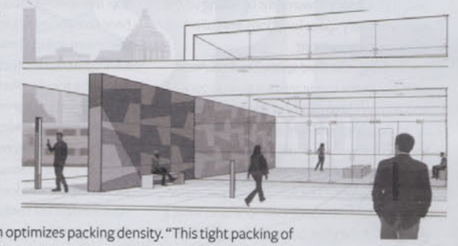
In August, TAKTL launched a prefabricated version of the UHPC, called **TESL8**. "This unique wall panel system is designed to give architects and designers wide design latitude with a standard, affordable product," Briggs explains. There are eight individual panels included in the TESL8 system, and each panel includes two textures that enhance the eight patterns. "An architect or designer can use any number of the panels to create a variety of subtle or prominent facade or wall patterns."

Prior to ordering, architects download drawings of each 3′ x 6′ panel to design a pattern and determine a total number. Used either as a traditional building envelope or in a more sustainable application like a ventilated cavity, they require less substructure than their thicker, less durable predecessors. ■

INSIDE THE ICSF system, motorized multi-junction photovoltaic cells track the sun's movements to maximize electricity production. Designed as complete, factory-assembled units, the "arrays" also block light and provide insulation.



TESL8 IS A NEW product TAKTL has made using its ultrahigh-performance concrete. The proprietary formula is six times stronger than traditional concrete, making the panels unexpectedly lightweight.



PUSHING THE ENVELOPE

THE NEXT WAVE OF SMART BUILDING-ENVELOPE APPLICATIONS IS ARRIVING SOONER THAN YOU THINK.

THE HOMEOSTATIC Facade System comprises dielectric-elastomer ribbons that open and close.

CASE'S NEXT BIG THING

A collaboration between SOM, Permasteelisa, and the Adaptive Building Initiative, the HelioTrace Facade System features kinetic shades that trace the path of the sun.

MADE TO SHADE

The Homeostatic Facade System, by the New York City studio Decker Yeadon, also would occupy the interior of a double-skin glass facade. With little power consumption, its dielectric elastomers open and close — according to interior room temperature — to prevent solar gain.

CONCRETE COMPETITION

In 2010, Material ConneXion's best-material prize went to Carbon Negative Cement, from U.K.–based Novacem. Here, magnesium silicates replace the calcium carbonates of traditional cement formulation. Using a low-temperature production process that runs on biomass fuels, the cement can absorb as much as 50 kg of carbon emissions per ton poured.