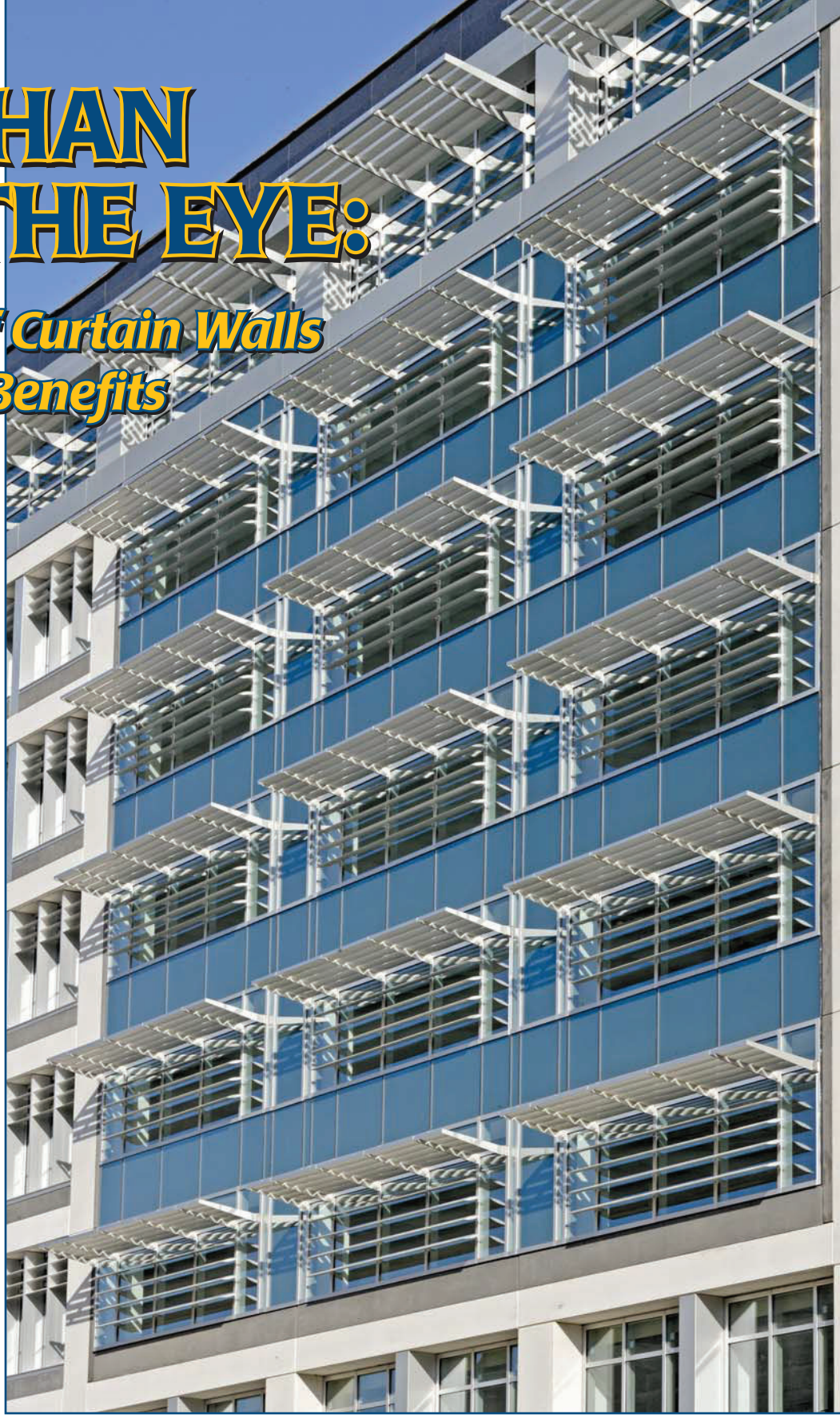
# MORE THAN MEETS THE EYE:

## The Evolution of Curtain Walls Provides Many Benefits to Buildings

By Kevin Robbins



*The Zorinsky Federal Building's 415,000-sq-ft (38,554-m²) interior and exterior renovation was overseen by the Washington, DC-based U.S. General Services Administration Public Buildings Services Heartland Region with a specially formed team of experts. The team conducted a study to determine how much energy and greenhouse-gas emissions would be saved by retrofitting light fixtures and using more natural daylighting. Renovation of the building featured 49,305 sq ft (4580 m²) of blast-mitigating curtain wall and 18,970 sq ft (1762 m²) of interior curtain wall. (Photo by Tom Kessler.)*

High-security and government buildings need not look like concrete bunkers where workers toil in windowless offices. On the contrary, it may be even more important than ever to ensure these high-stress workplaces benefit from the health and productivity attributed to natural light and outside views.

In a study presented at the American Council for an Energy Efficient Economy conference, William Fisk with the Indoor Environment Department at Lawrence Berkeley National Laboratory, Berkeley, CA, estimated annual potential productivity improvement from better thermal and visual comfort in buildings to be as high as $125 billion. Fisk's evidence was based on field studies completed in 1997 of respiratory disease as a function of building characteristics (eetd.lbl.gov/newsletter/cbs_nl/nl15/productivity.html). High-performance curtain walls offer such advantages and may help green-minded building teams achieve certification through the Washington, DC-based U.S. Green Building Council's LEED™ Rating System.

### Performance Concerns

Curtain walls clad structures ranging from schools to courthouses, hospitals to banks, high-rise condominiums to office

*The Birmingham High-Performance Centre, Birmingham, England, features constant light levels that are enhanced by curtain walls. To prevent light pollution, the translucent curtain walls prevent direct-beam nighttime illumination from leaving the building site while creating a warm glow to the building exterior. (Photo by Adam Wilson and courtesy of Kalwall, Manchester, NH.)*

*The City Hall Development Services Center, Henderson, NV, features curtain wall systems with a sun-shade product to minimize solar heat gain. (Photo provided by Vistawall, Terrell, TX.)*

towers. Typically, a curtain wall spans more than one story and is composed of metal framing with infill units of glass, metal, or stone. The systems can be assembled on site or prefabricated at a manufacturer's facility as multiunit stacks for quick installation and assured performance.

Performance criteria for secure and government facilities usually involve ballistic or blast mitigation. Depending on the region, they may also include seismic- or hurricane-impact resistance. Regardless of where a property is located, energy efficiency and thermal performance are key concerns.

Curtain walls are available in a variety of thermal barriers. To match the best product with the project, consider the differences between conduction, convection, and radiation:

- **Conduction** is heat transfer through a solid medium that can be controlled by the addition of low-conductance thermal barrier materials such as polyurethane, Insulbar®, or polyvinylchloride, into the framing.
- **Convection** is heat transfer through a fluid medium such as the air space of insulating glass or dual glazing.
- **Radiation** is heat transfer that does not require an intervening material. This can be reduced by the addition of low-E coatings on glass surfaces.

Energy simulations, thermal modeling, and structural analysis are just some of the engineering

capabilities and support that a window manufacturer may use to quantify potential heating and cooling savings from daylighting control and other strategies. These modeling tools help facility managers consider and compare a wide range of window characteristics, such as orientation, quantity, dimensions, glass type, shading elements, and more.

### Daylight Controls

Designed as integral elements of the curtain wall, operable vents and sun shades also aid in a building's thermal performance. Providing more than a stylish flourish, sunshades may reduce the initial cost and size of HVAC equipment as well as the ongoing use and expenses associated with artificially lighting and cooling a building. Similarly, operable windows and vents within the curtain wall can reduce demand on HVAC systems while alternatively relying on the fresh air and natural ventilation offered in favorable climates and seasons.

Dynamically adapting to seasonal and solar variations, electrochromic (EC) curtain wall systems present a new variable in commercial building design. EC systems switch electronically between a highly transmitting untinted state and a highly tinted darkened state. Operated as part of an automated building system, EC glass provides convenient daylight control. This gives buildings the power to conserve energy by reducing solar heat gain, protecting interior furnishings and valuables from fading, and maintaining productivity by eliminating glare without sacrificing the outside view. Incorporated within a curtain wall, buildings with EC glass have the potential to realize even greater efficiencies with fully integrated lighting, HVAC, and security systems.

EC windows have also received funding

## Curtain Wall Manufacturers

**A-1 Glass** — *Denver, CO*
**www.a1glassinc.com**

**CPI Daylighting Inc.** — *Lake Forest, IL*
**www.cpidaylighting.com**

**EFCO Corp.** — *Monett, MO*
**www.efcocorp.com**

**Haley-Greer Inc.** — *Dallas, TX*
**www.haleygreer.com**

**Kawneer Co. Inc.** — *Norcross, GA*
**www.kawneer.com**

**Major Industries Inc.** — *Wausau, WI*
**www.majorskylights.com**

**Vistawall** — *Terrell, TX*
**www.vistawall.com**

**Walters & Wolf Inc.** — *Fremont, CA*
**www.waltersandwolf.com**

**Wausau Window and Wall Systems** — *Wausau, WI*
**www.wausauwindow.com**

*Greenwood Elementary School, Glen Allen, VA. (Photo by Chris Cunningham and courtesy of Kalwall.)*

*Zorinsky Federal Building, Omaha, NE. (Photo by Tom Kessler.)*

by the U.S. Department of Energy (DOE) toward attaining zero-energy buildings—commercial structures that require no fossil fuels. As a midpoint goal, DOE seeks 30 to 50 percent reductions in energy use, showing $14.1 billion as a moderate prediction of net energy bill savings by 2010. Endorsing this goal, the American Institute of Architects (AIA) encourages its members to strive for zero-energy building designs by 2030.

## Looking Ahead

Forward-thinking architects and building owners are taking the next step with curtain wall systems by moving from energy conservation to energy generation. Energy-producing photovoltaic (PV) modules generate direct-current electrical power from sunlight without consuming fossil fuels or emitting toxins. Curtain walls with PV require a combination of disciplines to ensure a safe, code-compliant, façade-integrated array that meets the project's unique power, aesthetic, and installation criteria. At the same time, these curtain walls must provide the weather resistance, structural integrity, and performance standards expected in all curtain wall systems.

As EC, PV, and other "smart glass" technologies gain ground, expectations of curtain wall systems' sustainable design benefits will likely evolve from the passive advantages of natural light, ventilation, and views to actively harnessing and controlling solar energy.

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Kevin Robbins

Kevin Robbins is regional sales and marketing manager for Wausau Window and Wall Systems, Wausau, WI. He can be reached at krobbins@wausauwindow.com or 715-846-3343.