As promised in our last issue's sustainable building supplement, this month's feature focuses on energy-saving activities in Key Tower (which became Seattle Municipal Tower in 2004)—particularly how a design based on penguins can create energy-efficiency in a highrise building.

case study

the penguin flipper

turning the city's tower green

A new energy-efficiency technology, called a "Penguin Flipper," is currently being tested in Seattle Municipal Tower (formerly Key Tower). It is designed to both reduce heat gain and light glare on the southern sides during the summer and also to lower energy and utility costs.

The City's Key Tower Design Team has struggled with heat gain and glare causing great discomfort to City employees working on the south side of Key Tower. They have been also been researching ways to reduce energy and utility costs in-line with the City sustainable building policy.

A solution currently being tested, called the "Penguin Flipper," addresses all these issues at once. This technology was named by Janine Benyus, author of *Biomimicry*, because it acts similarly to a penguin flipper by moving heat efficiently from one area to another.

How the Penguin Flipper Works

The penguin flipper is a fully integrated system composed of:

- **A solar shade**—allows a person to work comfortably next to the south facing window. It is translucent, made from woven micro-fiber polymer, which maintains the view and access to natural light. The shade would be manually operated by the building occupants and generally down on sunny days when the sunlight makes the occupant uncomfortable.
- **Air relief grilles**—installed in the ceiling between the window and the shade allows for the air near the window, which becomes superheated on sunny days, to be relieved into the air return plenum without flowing into the space. The shade will reduce the solar energy entering the space and the air relief will immediately remove the warm air at the window before it has a chance to heat the space. The energy savings modeled from the solar shade alone are 112,332 kWh or $5,739 per year.
- **Light shelf**—mounted on the window seven feet above the floor and protruding two feet into the space. The purpose is to reflect light from the window back further into the space. This light shelf will bounce daylight 20' into the space if it is assisted by low partition walls that run parallel with the windows. It reduces the need for artificial lighting when the lights within a 15-foot perimeter of the window are on a separate switch and can be turned off. The energy savings modeled from the light shelf are 357,320 kWh or $17,627 per year.

see **penguin flipper** *on page 2*

penguin flipper, *cont. from page 1*

- **Daylighting controls**—increase the effectiveness of the penguin flipper if installed within 15 feet of the perimeter of Key Tower. These controls and ballasts are set to automatically dim the overhead lights when the exterior light is of sufficient intensity to light the space. Combining the solar shade, light shelf and daylighting controls, energy savings have been modeled at 457,222 kWh or $22,538 per year.

Using the penguin flipper in Key Tower would improve the performance of the existing HVAC system, leading to a 96 percent reduction in the number of hours per year that the existing cooling system is unable to meet the cooling load.

A full-scale prototype of the penguin flipper is currently being tested to monitor whether the energy savings are as predicted in the model. Once the performance is verified and funding is established, construction documents will be completed and bid as part of a larger Key Tower Tenant Improvement Project. When funding is established based on the bids the flipper would be installed on three working floors. The last step will be installing the Flipper on the southeast and southwest facing windows of 47 floors of Key Tower. To learn more about DPDs involvement in sustainability goals, visit **www.seattle.gov/dpd/sustainability**, or contact:

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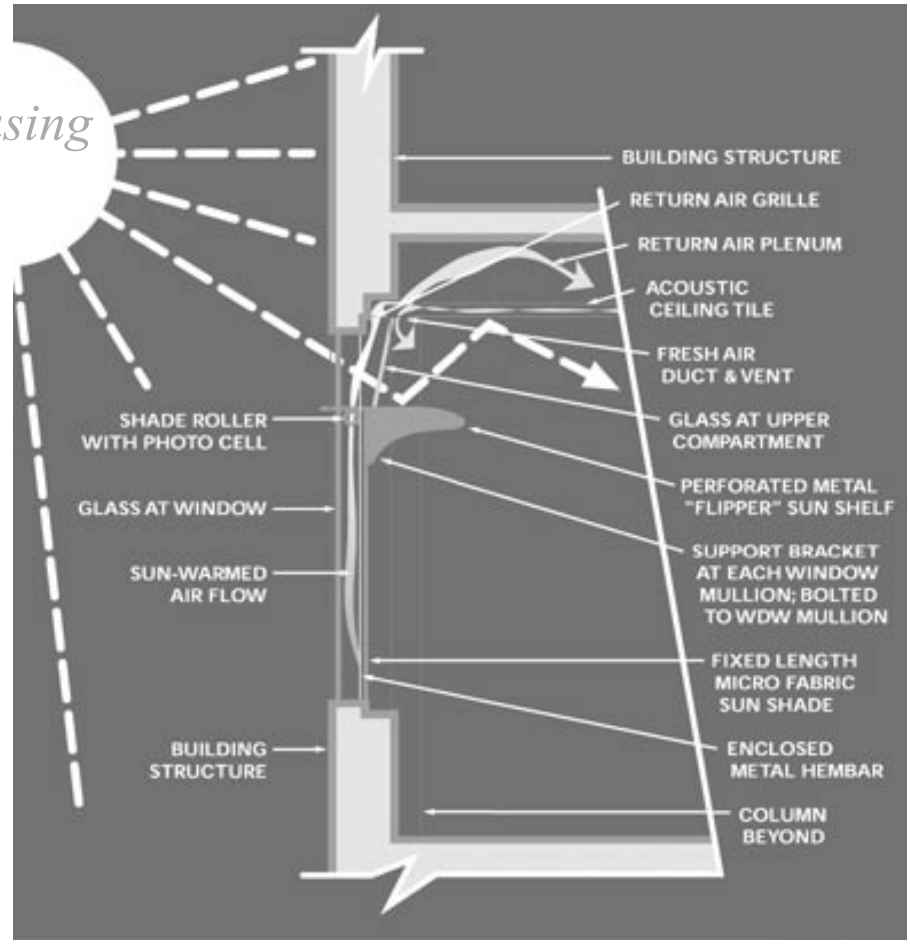
the penguin flipper *...increasing energy efficiency*



The "Penguin Flipper" (illustrated above) is designed to reduce total energy consumption, maintain views, and enhance comfort by optimizing the daylight design and improving thermal conditions during hot, sunny days. It has a see through micro-fabric solar flume operated with the assistance of a photocell. A full-scale prototype is being tested to monitor whether the actual energy savings match those predicted in the model.

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