

Comfort Zone

RADIANT HEATING AND COOLING DEFINE COMFORT IN A HIGH-PERFORMANCE UNIVERSITY BUILDING

PEOPLE ALWAYS ARE TALKING ABOUT INTEGRATED DESIGN in relation to green building, but what does that really mean? One example of the approach can be found in Chicago at Loyola University's Klarchek Information Commons. The high-performance building is aiming for a LEED Silver rating from the Washington, D.C.-based U.S. Green Building Council.

Devon Patterson, the project's chief designer and principal with Solomon Cordwell Buenz, Chicago, notes the elegant HVAC system was a collaborative effort between SCB; Stuttgart, Germany-based climate engineer Transsolar; Hillside, Ill.-based mechanical/electrical/plumbing engineer Elara Energy Services Inc.; and Chicago-based structural engineer Halvorson and Partners. "Each of them contributed unique ideas that were critical to this design," Patterson says.

The building is located on a walking-only portion of Loyola University's Lake Shore campus. The first time someone turns a corner and sees the building, he or she knows it is different. No matter which side it is approached from, Klarchek Information Commons is a unique building that stands out among the traditional brick buildings on campus.

COMFORT CONTROL

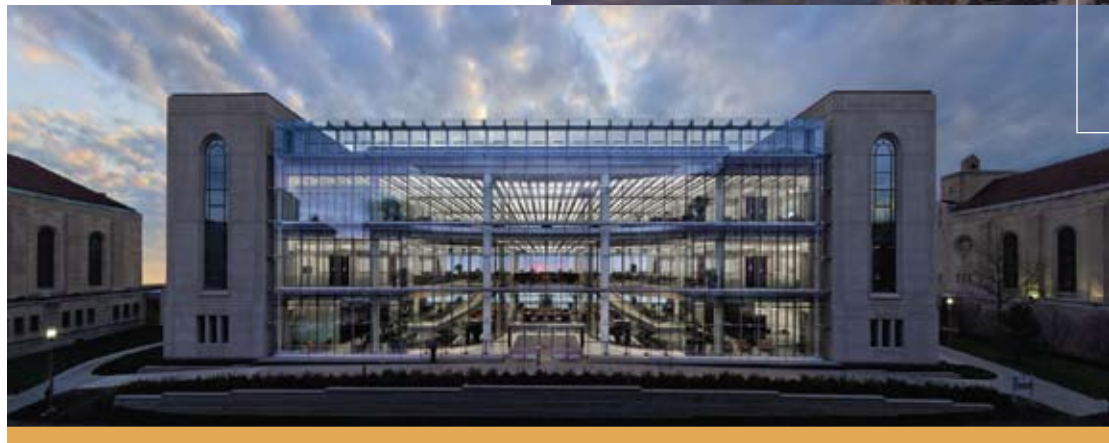
Perhaps the most interesting feature of the building isn't immediately visible. Klarchek Information Commons uses a radiant-slab system for heating and cooling. Although many are familiar with radiant heating, radiant cooling is less well known.

To combat high temperatures and humidity, the cooling system has four different modes of operation. On mild days, the building is cooled completely by natural ventilation. As the outside temperature warms, the radiant cooling system kicks in. For hot summer days, the underfloor-air

system starts up and cools the lower part of the space without expending energy to cool the air above the occupied area.

The primary reason for the different modes is to prevent condensation, which is a common problem with radiant cooling systems. The automation system was painstakingly programmed to respond quickly to temperature shifts and keep the building cool while avoiding excess energy use and condensation.

The primary spaces heated and cooled by this hybrid system are the three main floors of the building. The radiant tubing is in the ceiling; hot and chilled water are provided by an existing central plant located next to the building. A custom-designed, dual-path air handler is used to





> GREEN TEAM

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[ARCHITECT] Solomon Cordwell Buenz, Chicago, www.scb.com

[CLIMATE ENGINEER] Transsolar, Stuttgart, Germany, www.transsolar.com

[MECHANICAL, ELECTRICAL AND PLUMBING ENGINEER] Elara Energy Services Inc., Hillside, Ill., (708) 236-0300

[STRUCTURAL ENGINEER] Halvorson and Partners, Chicago, www.halvorsonandpartners.com

[SOLAR DESIGN] Solaris Solar Inc., Sebastopol, Calif., (707) 829-0342



THE USE OF A RADIANT SLAB ADDRESSES TWO MAJOR ISSUES—ENERGY AND COMFORT.

help control moisture. This unit includes a three-coil outside air path, which uses heat from one coil to later reheat the air when it becomes cooler and drier because at that point the air is too cold for use as underfloor supply air. The unit also has a recirculation path that is used for additional cooling and humidification.

The use of a radiant slab addresses two major issues—energy and comfort. On the energy side

of the equation, efficiency is a key concern. This topic is robustly debated as it relates to radiant-slab systems. Although some tout radiant comfort control as being much more efficient than a forced-air system, others claim radiant heating uses more energy than a forced-air system. Why the disparity? It all comes down to design. A radiant system can't be designed in the same way as a forced-air system or the

same way for each building. This is where comfort enters the equation.

The Atlanta-based American Society of Heating, Refrigerating and Air Conditioning Engineers Inc.'s Standard 55-2004, "Thermal Environmental Conditions for Human Occupancy," describes comfort in an objective way. Although most people recognize air temperature as a measure of comfort, the reality is much more complicated.

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MATERIALS AND SOURCES

<< **ECO-TECH** [continued from page 78]

[CUSTOM-MADE DUAL-PATH AIR HANDLER]

Temptrol Corp., Delanco, N.J., www.temptrolcorp.com

[GLASS] VIRACON, Owatonna, Minn., www.viracon.com

[DAYLIGHT-HARVESTING CONTROL SYSTEM AND SHADES] LUTRON ELECTRONICS INC., Coopersburg, Pa., www.lutron.com

[BLINDS AND BLIND CONTROLS] WAREMA INTERNATIONAL, Marktheidenfeld, Germany, www.warema.com

[PEX TUBING] REHAU NORTH AMERICA, Leesburg, Va., na.rehau.com



Some even may recognize humidity as part of the equation, but there are other considerations.

One of these considerations is draft. Everyone has sat beneath a diffuser in a restaurant or had one in line with his or her head while sleeping in a hotel bed. It's uncomfortable to have air blown directly onto your head. Another factor to consider is radiant sources. A person can be in a room with cold-air temperatures and be very comfortable during the heating season; that same person can be in a room with warm-air temperature during the heating season and feel chilled because the walls are cold.

Those factors need to be kept in mind to properly design a radiant heating system. Most of all, it is important to avoid using air temperature as the only baseline. If you do this, you'll lose the

efficiency advantage. A simple lesson to remember: It takes less heat to warm the objects in a room than to warm the entire room.

According to the students at Loyola University, the designers' comfort goals have been achieved in Klarchek Information Commons. Patterson recalls a photo taken in the winter when the building first opened. "The photo shows big chunks of ice on the lake, but you can see students in T-shirts standing right next to the glass." Although this might invoke memories of an overheated apartment building or school, this isn't your father's radiant system. The entire exercise of this building really is the basis of what a good design should be: simple but not too simple. The design team was careful not to under- or over-design the system. Perhaps the best way to put it is that Loyola University spent the time and money required to receive a proper design.

FAÇADE

Another notable feature of the building is its glass curtainwall construction and, more specifically, its ventilated double façade. A ventilated double façade is a glazed wall that allows the exchange of air between façades to provide displacement ventilation when outdoor air conditions are right. In this mode, the building takes cool, fresh air in from the lake side of the building through automatic louvers and then exhausts the air out the west side. There it flows out the top of the ventilated double façade in a stack effect. In this case, the stack effect also is assisted by wind blowing off the lake.


While a glass façade is a challenge in a conventionally air-conditioned building, it is even more problematic when using radiant cooling. To mitigate this issue, the design team hired Sebastopol, Calif.-based Solaris Solar Inc. to study sunlight on the building and design each elevation individually to handle its specific solar load. In addition to addressing the cooling load, the solar study was used to optimize natural lighting, an approach that saves energy and helps create a healthy

environment. Automatic blinds on the east and west sides of the building operate by computer algorithm to balance solar load and natural light.

PERFORMANCE AND INSPIRATION

Klarchek Information Commons is capturing a good deal of attention, even in Europe. It received the coveted, London-based Emirates Glass LEAF Award for Best Use of Technology in 2007. More importantly, Loyola University's administration and students love it. In fact, one problem the university now faces is that the 69,000 square-foot (6410-m²) facility often has a line of students waiting to get in. According to one student, "It feels like you're studying outside. Most libraries and computer labs make you feel like you are in a basement."

So how does it perform? Energy modeling has the building performing at a level 52 percent above ASHRAE 90.1-1999, "Energy Standard for Buildings Except Low-Rise Residential Buildings," and the designers believe the savings will exceed this projection. "The building only has been operating for about seven months; in another few months we will have a full cycle of data," says Wayne Sliwa, senior project manager for Loyola University. "At that time we will be able to optimize the system by fine-tuning the automation. But everyone at the university is very pleased with the results to date."

Today, green buildings need to do more than perform. They need to inspire others to promote the important trend of healthier and more efficient buildings. Loyola University's Klarchek Information Commons offers performance and aesthetics. In this case, a picture is worth a thousand BTUs. 

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