Sports, Recreation and Sustainability – The New U of L Student Recreation Center

Students entering the new U of L Student Recreation Center may not realize they are entering one of the most sustainable buildings on the Belknap Campus and a building that demonstrates the University's commitment to sustainability using a combination of strategies.

UofL Student Recreation Center Firsts

- First Solar Water Heating System
- First Geothermal HVAC System

Energy Dashboard

The Rec Center's Energy Dashboard system is one of the most visible sustainable strategies. This electronic dashboard, displayed in the lobby, allows students to see in real time the amount of energy the building is using. Not only does the Dashboard system reflect the University's mission to educate students about their impact on the environment, studies confirm that showing a building's occupants how their actions impact energy use can actually lower energy use.[1,2]

Solar Water Heating System

A supplemental solar domestic water heating system heats the domestic hot water at the Student Recreation Center. Solar collectors on the roof convert solar energy into heat energy with 15 south-facing, flat plate solar collectors installed to optimize sun angles and exposure. Each flat plate collector consists of 11 copper tubes with aluminum fins in a parallel configuration on an absorber plate and is fitted inside an insulated box covered with tempered glass. Sunlight passes through the glass to the absorber plate converting the solar energy into heat energy that can be transferred to the water passing through the pipes.

The system is a drain back system where pure water is pumped through the collector. The collector pipe uses a drain back reservoir to drain the loop when the pump is switched off; therefore, no fluid remains in the collector when heating from the sun is unavailable. This protects the collector from overheating and freezing, while eliminating the glycol/water mixture and associated maintenance required. Upon drain back the circulated water will collect into 250 gallon tanks, the first a master tank for circulation to the solar collectors and a slave tank with a heat exchanger to provide heating to the cold water prior to the instantaneous gas fired heaters.

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[1] Ward, Lisa. "Energy Dashboards Enter the Office Cubicle." *The Wall Street Journal*, September 22, 2013, http://online.wsj.com/news/articles/SB10001424127887324886704579052883651889864, accessed on May 7, 2014.

[2] Audin, Lindsey. "What Energy Dashboards Can Do." *Building, Operating, Management*. December 2010. http://www.facilitiesnet.com/powercommunication/article/What-Energy-Dashboards-Can-Do--12121?source=part accessed on May 7, 2014.

Geothermal HVAC

In addition to using the power of the sun to heat the building's water, a geothermal system will be used to heat and cool the building. Water circulates through 180 vertical loops extending 400' below the exterior field adjacent the building, pulling heat from the Earth in the winter and discharging heat from the building in the summer.

The ground beneath our feet is at constant 55^0 year round. As the water circulates through the loops, the Earth either heats the water or cools it. The water is then distributed to a series of heat pumps inside the Rec Center building and is used to heat the building to a set temperature in the winter or used to cool the building's air in the summer.[3,4] This method of heating and cooling a building is also called "geoexchange."

The geothermal HVAC system in the Student Rec Center is the first such system on UofL's campus. Demand control ventilation is another "first-time" strategy for the University. Occupancy sensors coupled with CO_2 sensors provide fresh air directly to the area that needs it based on the level of CO_2 in the space. Demand control ventilation prevents the HVAC system from delivering fresh air into an unoccupied space which also saves energy. As soon as the area is occupied and CO_2 levels rise, the HVAC system will begin delivering fresh air. Before the building's air returns to the outside it passes through an energy recovery wheel. This reduces the amount of energy required to heat, cool and dehumidify the air in the building.

Lighting

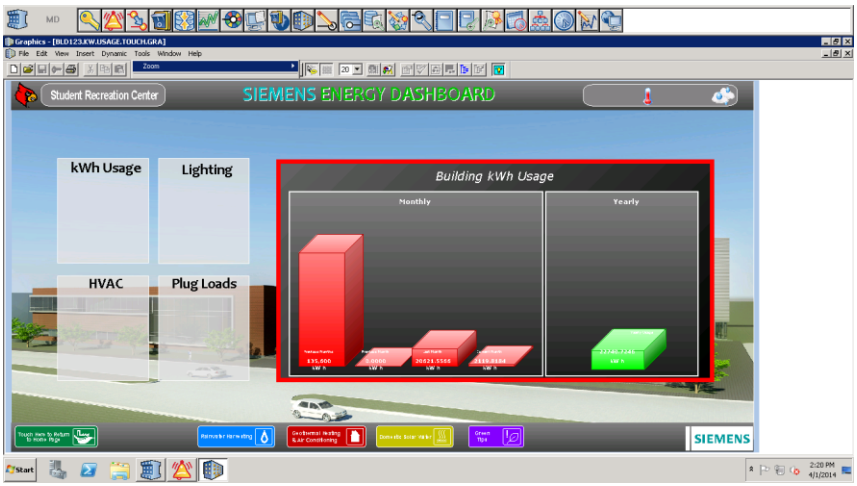
Lighting equals 12 percent of the total energy consumption of the United States.[5]
The interior lighting of the Rec Center was

Fact: To raise one gallon of domestic cold water with an average temperature of 50°F to 120°F would require (8.34 lbs per gallon × (120 − 50) delta T)= 583.8 Btu. The estimated annual energy generated by the solar collectors is 95,000 kBtu for a total of 163,000 gallons per year or an average of 445 gallons per day. This information is presented on the Vital Signs dashboard.

Heat and cool with dirt – not oil! The EPA and the U.S. Department of Energy recognize geothermal systems as the most environmentally friendly way to heat and cool a home. Unlike other comfort systems, geothermal does not emit carbon dioxide, carbon monoxide, or other greenhouse gasses which contribute to air quality pollution.

[3] Geothermal Genius, http://www.geothermalgenius.org/how-it-works/. Accessed on May 7, 2014.
[4] Environmental Protection Agency. http://www.epa.gov/climatechange/kids/solutions/technologies/geothermal.html. Accessed on May 7, 2014.
[5] U.S. Energy Information Center. http://www.eia.gov/tools/faqs/faq.cfm?id=99&t=3. Accessed on May 7, 2014.

designed to enhance the quality of the space. Even though the lighting is bright, energetic and lively, the advanced lighting design drastically reduces energy consumption and enhances the exterior view of the facility.



A linear theme was used throughout the building to create an inviting and attractive look to visitors yet minimizing maintenance and first costs. All of the downlights in the facility utilize LED lamping while all fluorescent fixtures utilize newer technology T5 and T5-High Output lamps. A 22 percent reduction in lighting energy was achieved in the interior of the building which was augmented by daylight harvesting and occupancy sensors to reduce consumption even further. Almost the entire building is controlled by occupancy sensors and scheduled by the building automation system for complete shutdown. The exterior lighting enhances security, brightens an attractive plaza area while reducing energy consumption for that lighting by 45 percent.

<u>More Water</u>

Those who remember the flood of August 4, 2009,[6] know how important it is to control stormwater runoff on campus. The Student Recreation Center is part of UofL and the Metropolitan Sewer District's plan to mitigate stormwater runoff on the west side of campus.

The west side of the University of Louisville's campus experiences combined storm sewer capacity problems. During intense rainfall events the existing storm system generally will overflow onto adjacent properties and streets. The innovative stormwater management system designed and implemented for the Student Recreation Center has decreased the stormwater discharge by approximately 90 percent from the pre-construction parking lot condition of the site. Until design capacity has been met the system captures all 7.2 acres of storm water runoff without discharge into the public storm sewer system.

The entire volume of stormwater discharge from all impervious surfaces, such as building roof areas, parking areas, plazas, synthetic turf fields and walkways, is detained in subsurface infiltration basins that are located below the parking and plaza areas. The purpose of the infiltration basin is to capture and detain the stormwater discharge and release back into the natural groundwater as conditions allow. The system design capacity is so efficient that it will accommodate the rainfall of a near 500

[6] University of Louisville, Sustainability Web site. https://louisville.edu/sustainability/sustainability-home-page/operations/stormwater.html. Accessed on May 7, 2014.

year, 6 ½”/ 24 hr rain event. This exceeds the local requirements of the Metropolitan Sewer District for reducing stormwater into combined storm and sanitary sewer systems and contributes to the overall storm water reduction on the West side of campus.

The rainwater harvesting system works in concert with the stormwater management system by capturing stormwater from impervious surfaces, primarily building roof surfaces, and using the captured water for site irrigation. In addition, condensate water, a byproduct of the building’s HVAC system, is completely discharged into the rainwater-harvesting tank and further contributes to the site irrigation needs, mitigating discharge into the sewer system. During times when the rainwater harvesting system is not in use, overflow systems are utilized to discharge the unused runoff into the infiltration basins where the rainwater can be absorbed into the permeable soil and aquifer without discharging into the public combined storm sewer system.

Walls, Roof and Windows

The building materials incorporated include high R-Value smooth and striated metal insulated wall panels with interlocking sealed joints. These “sandwich” type metal panels include a silver metallic color for added exterior performance characteristics (both life-span and solar reflectance) and provide an impressive thermal and moisture performance systems while boosting the building’s overall energy efficiency. Other regional materials were utilized, such as the exterior brick, which reduced the energy utilized in the transportation costs of delivery.

"R" means resistance to heat flow. The higher the R-value, the greater the insulating power.

Rigid insulation was utilized over the entire roof surface allowing for an average of R-30. Low-Emissivity Solar Ban 60 glazing (windows) with a ceramic fritted pattern was incorporated on the West and South facing elevations to reduce solar heat gain within the building. To reduce heat island effect (the tendency for urban areas to maintain higher temperatures than rural), providing a reflectivity of over 85 percent, a cool-white SBS Modified Bituminous roofing system was utilized to minimize the impacts on adjacent microclimates while simultaneously reducing heat gain within the building.

Summary

The recently completed Student Recreation Center designed by Omni Architects, Cannon Design, CMTA Engineers, and Carman Landscape Architects, incorporates the highest levels of sustainable design practices. The facility is registered with the United States Green

The sustainability vision of the University of Louisville is to create a university that is itself an example of sustainability with a campus community stewardship that leads by example. The University educates not only by what they say, but more importantly, by what they do.

Building Council (USGBC), and is scheduled to receive LEED GOLD certification in the summer of 2014.

The project site was selected near student housing to support the campus goals of providing a quality student life experience with a range of mobility options that support cycling, providing dedicated energy efficient vehicle use and carpool parking on site, and expanding enhanced bus and walking access. The facility follows sustainable initiatives in its use of renewable materials. It provides for improved indoor air quality, 100% subsurface rainwater detention, rainwater harvesting for landscape irrigation, supplemental solar thermal water heating, and reduced water consumption. Additionally LEED innovation credits have been achieved through the implementation of an interactive digital dashboard to serve as a teaching tool for students and building occupants by allowing real time monitoring of energy consumption rates and other sustainable initiatives.