Galileo's Pavilion - Sustainable Features

Studio 804_12

Center for Sustainability

Johnson County Community College

HEAT ISLAND EFFECT

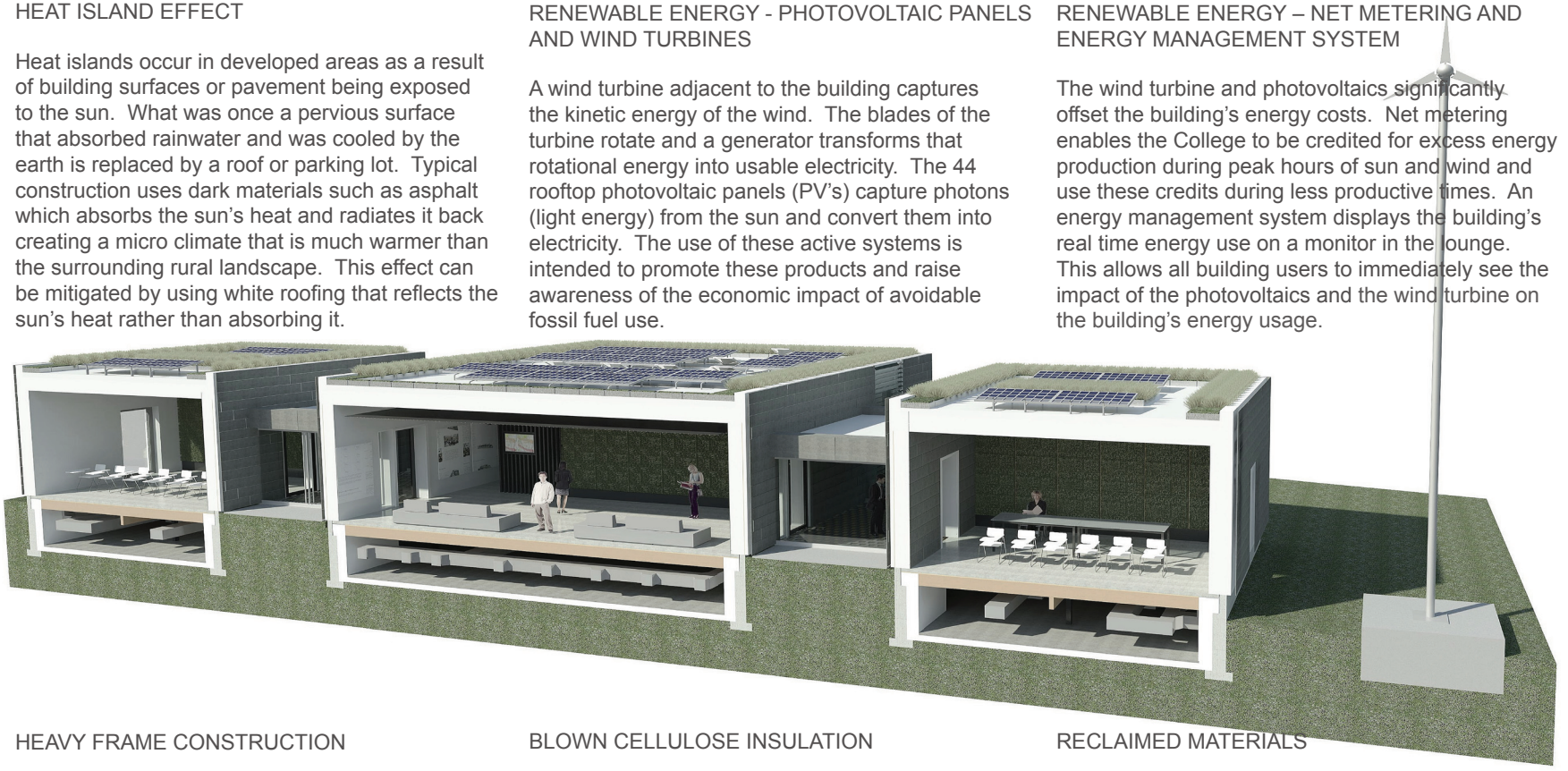
Heat islands occur in developed areas as a result of building surfaces or pavement being exposed to the sun. What was once a pervious surface that absorbed rainwater and was cooled by the earth is replaced by a roof or parking lot. Typical construction uses dark materials such as asphalt which absorbs the sun's heat and radiates it back creating a micro climate that is much warmer than the surrounding rural landscape. This effect can be mitigated by using white roofing that reflects the sun's heat rather than absorbing it.

RENEWABLE ENERGY - PHOTOVOLTAIC PANELS AND WIND TURBINES

A wind turbine adjacent to the building captures the kinetic energy of the wind. The blades of the turbine rotate and a generator transforms that rotational energy into usable electricity. The 44 rooftop photovoltaic panels (PV's) capture photons (light energy) from the sun and convert them into electricity. The use of these active systems is intended to promote these products and raise awareness of the economic impact of avoidable fossil fuel use.

RENEWABLE ENERGY – NET METERING AND ENERGY MANAGEMENT SYSTEM

The wind turbine and photovoltaics significantly offset the building's energy costs. Net metering enables the College to be credited for excess energy production during peak hours of sun and wind and use these credits during less productive times. An energy management system displays the building's real time energy use on a monitor in the lounge. This allows all building users to immediately see the impact of the photovoltaics and the wind turbine on the building's energy usage.



HEAVY FRAME CONSTRUCTION

The structural frame of Galileo's Pavilion is over three times as thick as conventional framing which allows more insulation to be used between the structural components. Engineered lumber, a product that maximizes wood's potential, is used throughout the frame construction. All of the construction joints are caulked or foamed and the entire assembly is pressure tested (a blower door test) to assure its tightness.

BLOWN CELLULOSE INSULATION

Cellulose is 75-85% recycled paper fiber produced from newspaper waste. It results in higher R-values than many traditional insulation techniques. On this project it is used with engineered lumber to create thick walls while reducing the volume of structural material and increasing the space for insulation. The result is a building envelope that is insulated to values that are four times the conventional methods.

RECLAIMED MATERIALS

To conserve natural resources and reduce the landfill demand several reclaimed materials were used during the construction of the project. Slate chalkboards recycled from regional schools throughout the Midwest and glass panels salvaged from the West Edge project in Kansas City. The waste slate product - leftovers from sizing the slate to the building - is used to skin the wet walls of the bathrooms.

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L.E.D. (LIGHT EMITTING DIODE) LIGHTS

The ceiling lights in the vestibules and lounge are composed of plate steel and L.E.D. lights. L.E.D.s are semiconductor devices that convert electricity into light. They last approximately six times longer and use about half the power of typical compact fluorescents. They also generate very little heat, and unlike traditional light fixtures do not have to be compensated for by the building's HVAC system.

GREEN ROOF BLOCKS

The roof space that is not covered in photovoltaics supports green roof blocks. These plant trays absorb water and reduce runoff as well as shade the roof surface to help mitigate the heat island effect. The blocks grow sedums which are plants that store water to survive dry times and rarely need irrigation.

THERMAL MASS

The direct sun that the louvers allow to enter the building in the winter will heat the rooms in the same way the sun heats a closed-up automobile in the summer, but this typically only lasts for a short while once the sun sets. To take full advantage of the sun for passive heating, a building requires a thermal mass that can store the heat during the sunny days and then release it back into the space by radiation at night. The concrete floors throughout the building will act as the thermal mass. The concrete will also stay cool during the summer when the sun is not allowed to enter the space. As air moves through the building it passes over the cool concrete floor reducing the ambient temperature.

RECYCLABLE MATERIALS

Glass, aluminum and steel are examples of materials that are highly recyclable and have been used extensively in the building. Aluminum and glass are used to create sun control louvers and steel is used for the curtain wall structural frames and numerous interior details.

SUPER INSULATED BASEMENT

Buildings commonly lose heat through the basement walls and slab which usually have little or no insulation. For this project, the basement floor has been designed with 6" of rigid insulation board beneath the slab and 12"installed on the inside of the foundation walls. All joints between insulation boards are sealed with a ten millimeter barrier wrap to assure an airtight crawlspace.

SUN SHADING

Large areas of glass on the building's facades necessitate management of the sun's impact on the spaces. The glass panels in the curtain wall include a film that will filter the sun's damaging UV rays and the aluminum and frosted glass louver system will allow the sun's heat to enter the building during the heart of the winter and shade the spaces during the summer. The glass is frosted to a transmittance that reduces the sun's heat while allowing the rooms to take advantage of energy saving daylighting.

WATER RECLAMATION

To reduce the use of potable water as well as the amount of storm water runoff from the building, rainwater is harvested from the roof and is diverted into an underground 1700 gallon cistern. This water is used to irrigate the living walls in the classrooms and lounge as well as supply the flush valve toilets and urinal.

LIVING WALLS

The north wall of the classrooms and the lounge support living plants that help improve the indoor air quality and acoustics of the spaces. The plants are irrigated using rainwater harvested from the building's roof.

LANDSCAPING

The landscape is designed to be low maintenance and to reduce the use of potable water through the use of native fescue grass through the collection and reuse of rainwater. Stormwater runoff not collected in the cistern is retained in a rain garden south of the building until it is absorbed into the earth.