The historic White Stag Block buildings were not originally designed for energy efficiency. Rather, they were created to meet their owners’ warehouse and factory needs when energy resources were newly considered plentiful. A century later, this has changed; we now perceive natural resources as scarce and expensive. Moreover, nowadays people expect buildings to provide comfortable indoor temperatures for activities such as working and studying.

**Energy Considerations**

The White Stag Block renovation team recognized energy consumption and user comfort as two critical components of the redesign of these leaky, inefficient historic buildings. In this case, the design team used an integrated design process from the beginning, taking into account the inter-relationship among different systems and how a change in one system will impact another. Mark Heizer, Senior Mechanical Engineer and LEED™ specialist at Interface Engineering believes that individual decisions do not work in isolation, but influence other decisions and their outcomes.

There were numerous constraints influencing this integrated design process. For instance, the historic nature of these buildings impacted the design process. Because of the buildings’ listing on the National Register of Historic Places, any modifications to the building visible from the street would require permission. This historic designation limits window replacement options and so it influences how much natural (rather than mechanical) ventilation can be used. The design process was also impacted by financial constraints that shaped choices about which green-building techniques would be employed. Furthermore, the building owner’s mix of prospective tenants can influence the ability to carry out innovative design opportunities.

Regardless of these constraints, the design process was successful. New openings were created between floors, which increased natural ventilation and daylighting, while reducing both mechanical and electrical consumption. The building team was also able to daylight stairwells and upgrade doors and windows while maintaining the buildings’ historic character. The integrated approach was used
in considering ways to decrease energy usage, increase equipment efficiency, and provide renewable energy. The Energy Performance: Heating, Lighting, & Windows section of this document details the design team’s approaches to the mechanical equipment, building envelope, and electrical considerations.

Educated Users Make the Building Work

Educating building users is a final and critical component of energy-efficient design because building users will put the plan into action and help the design team realize their goals. The White Stag Block’s energy conservation campaign includes an interpretive website, on-site signage, a self-guided tour, and a temporary energy monitoring installation. In addition, the building is envisioned to be part of a long-range ‘Energy Dashboard’ project supervised by UO Facilities’ Energy Project Manager Jeff Madsen. Madsen explained, “The plan is to have a campus-wide online system for monitoring usage of electricity, PV generation and eventually gas, steam and chilled water. Users could walk up to a kiosk or touchscreen and see an introduction and campus overview, then move to individual buildings. Each building will have a unique ‘flavor’ to its website within an umbrella identity and standardized data system.” The customized ‘Energy Dashboard’ software will allow visitors and interested Web viewers to see both real-time and historical consumption figures. By giving users a feedback loop that connects actions to energy costs, it will help them modify their behavior towards more sustainable living.

~ Ray Neff, Dawn Aurora O’Connor, Jason Owens, Nancy Cheng and Diana Fischetti

Photos: Ray Neff, RN, FreeFoto.com, Dawn Aurora O’Connor, RN

Graphic Design: Ray Neff

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Tran, Phillip. 2008.

“You can stuff a hybrid engine into a Hummer but it is still a Hummer. So I’d rather start out with a Prius and make it more efficient.”
Mark Heizer
Interface Engineering
The White Stag Block design team’s integrated design approach addressed mechanical, electrical, and building envelope considerations. Together, these improvements amount to seven LEED™ energy performance optimization points, awarded for a predicted increase in energy efficiency of ~24.5% above baseline.

**Energy-Saving Heating Equipment**

In most buildings, water heaters and HVAC (i.e. Heating, Ventilating and Air Conditioning) systems are the largest consumers of energy. At the White Stag Block, to heat both the building and its water supply, the owners have purchased high-efficiency, natural gas boilers that are 8-10% more efficient than industry standards and provide 2 million BTUs per hour. They have finely tuned combustion calibration points that allow the machine to provide sufficient heat while maintaining low emissions of air pollutants and greenhouse gases.

Hot water is only provided in limited locations: the showers and mop sink in the basement, the Duck Store coffee area, and the main restroom and kitchen for the conference center. There are also point-of-use water heaters in the custodial closets, and break room sinks throughout the buildings. However, there is no hot water in any restroom above the 1st floor.

With these historic buildings, citing the bulky mechanical equipment and ducting proved a significant challenge. Most of the mechanical equipment is located in the basement with the cooling tower on the flat roof of the Skidmore building. The building receives exhaust heat from a basement level transformer. The design team used one lightwell to locate very large ventilation ducts running conditioned and exhaust air from the basement to the upper floors.

**Electrical Savings: Lighting and Photovoltaics**

Mark Heizer holds that the biggest energy payback comes from reducing energy demand. The White Stag complex has reduced lighting electrical loads with the use of natural lighting and up-to-date controls. Robert DuPuy, the Lighting Designer from Interface Engineering explained that, “Occupancy and daylight sensors are installed throughout the building, so that fixtures draw energy only when necessary. A significant source of savings comes from adding natural light to the stairwells, where daylight-sensors save energy while providing ample light to meet safety standards.”

High-efficiency lighting systems are used throughout the White Stag complex. By providing workstations in open floor plan areas with task lighting, the lighting level can be lower and users can customize their light levels. Compact fluorescent light bulbs (CFLs) are used in corridor lighting, public lobbies, and lamps. Elsewhere, the main light sources are high lumen-output, electronic ballast fluorescents. In this way, this LEED project reduces the watts per square foot below those required by Oregon building codes.
Throughout planning the White Stag Block’s renovation, the owner, tenants, and design team discussed the possibility of including solar photovoltaic (PV) panels. While existing south-facing roof slopes provide an excellent angle for collecting solar energy, the initial cost of panels is high. In the final months of the renovation, tenant United Fund Advisors decided to invest in PVs. Through a collaborative financing arrangement with Venerable Properties, Inc., they supported installing a 23kW PV array on the sawtooth roof of the White Stag building. Recent net-metering legislation passed by the Oregon Legislature helped make the project more feasible. Increasing the maximum array size from 25kW to 2 MW has stimulated business interest in solar investment making financing more accessible.

Thermal Envelope

The thermal envelope of a building can be described as the combination of the building components that keep the outside air out and the inside air in. Heat loss can occur through windows, walls, roofs and foundation, and by infiltrating through cracks, especially at window and door openings. To maximize the effectiveness of the heating and cooling systems, the designers had to improve the antiquated building envelope. Architects and builders look carefully at the R-value (a measure of insulative capability) of each wall component to ensure that there is a thermal break between the exterior and the interior of the building. Architects also look for ways to create tight seals around windows and doorframes to ensure that the only air entering or leaving a building is under user control.

Because heat flows easily through and around windows, they were a big focus of the White Stag Block renovation. The design team examined all the windows in the three historic buildings, determining which windows could remain, be retrofitted, or replaced. In order to receive tax credits for the renovation of an historic building, the exterior appearance could not be changed except to return the building aesthetics to an earlier historic period. So the team retrofitted the historic wood windows and doors with double-paned glass, and reconstructed damaged windows and doors in the historic style. The owners received permission from the State Historic Preservation Office to add windows to the north face of the Bickel Building.

The top floor and south façade of the original White Stag building had seen a 1940s installation of industrial steel-frame windows and skylight monitors when a floor was added. These window frames were made of thin steel angles that held a single sheet of glass, a construction style that leaks heat. Because these existing window frames were thin and transmitted heat, the design team could not fit modern efficient glazing into them. Instead, they matched the aesthetic appearance of these windows but installed double-glazed, high-efficiency, low-emissivity (or low-E) windows, which have a special coating that allows visible light to pass through the panes of glass while reflecting the heat that would come in with sunlight.

In total, roughly half of the windows in the 3-building complex were replaced and the remainder upgraded. Without the window improvements, the three buildings of the White Stag Block simply would not have had an efficient thermal envelope. And without an adequate building envelope, most other strategies for reducing the buildings’ energy use would have been rendered moot.

~ Dawn Aurora O’Connor, Ray Neff, Jason Owens, Diana Fischetti, and Nancy Cheng

Photos: Dawn Aurora O’Connor, Ray Neff

Graphic Design: Ray Neff

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