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WPE WEST PLAINS ENGINEERING, INC.

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PLAINS TALK

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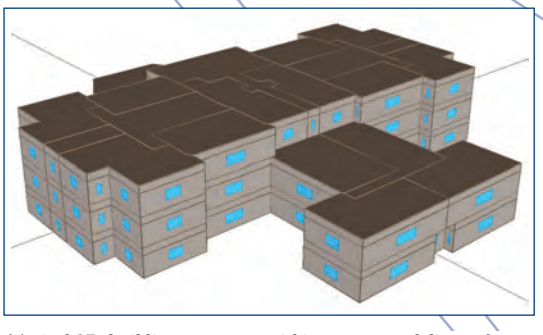
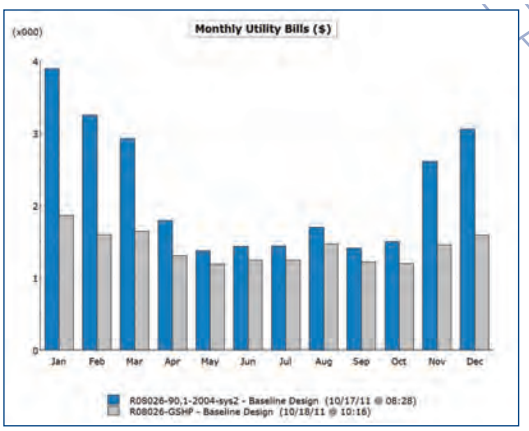
Rapid City WPE: Energy Modeling – A Design & Economic Decision Making Tool

• What is an energy model? An energy model is a virtual computer based model of a building or building complex that closely represents the actual building in the form of energy consumption, energy demand, and energy costs. This type of model requires a number of comprehensive and sophisticated building properties including, but not limited to:

- Overall geometry/orientation
- Wall/window/door insulation
- Electric/gas utility rates
- Electrical lighting power densities
- Process/plug load power densities
- Heating/air conditioning/ ventilation loads



Typical 3D building geometry within energy modeling software



Sample monthly bills report obtained from energy modeling software

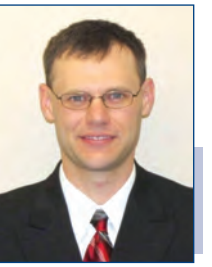
With all of this building information entered into an energy modeling software, a simulation is conducted with the appropriate climate and building operation information. The results are most helpful as a relative estimate when comparing simulations and changing parameters.

Even though information obtained from an energy model is an estimate of how a building will perform, it should not be used to predict the actual building performance. The reasoning is that it is very difficult to predict future utility rates, occupancy schedules, weather conditions, and plug loads to name a few variables. However, information obtained from an energy model can be very useful when selecting potential energy efficiency upgrades to retrofit an existing building or making critical design decisions on a new building.

Another use of an energy model is outlined in the USGBC – LEED rating system where one could earn up to 19 LEED credit points under LEED 2009 For New Construction and Major Renovations. This is done by generating two energy models (one based on the actual building and the other based on a minimally code compliant building) to obtain a percent cost savings which correlates directly to the number of points earned.

In the past, a typical design would not have included an energy model as a part of the design process. However, with energy costs constantly increasing and more jurisdictions requiring some form of energy efficiency rating system, this design tool is essential in the design of energy efficient buildings. The value of an energy model for design teams and building owners can be found in the unique ability to pinpoint energy saving measures that reduce energy consumption, energy demand, and energy costs.

The process of generating an energy model can become rather involved due to the complex nature of the inputs required. However, the energy modeling process does give a unique insight into how design decisions affect a building's energy cost and can be used as an effective tool when considering upgrades.



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Sioux Falls WPE: UNI Housing Complex

• University of Northern Iowa Department of Residence is home to 4,953 students living in residence halls, apartments and suites covering 1,500,000 square feet on campus. The addition of Panther Village fulfills a plan to make living on campus the first choice for freshmen, sophomores, juniors and seniors. Students who live on campus earn better grades and are more likely to graduate. Offering more housing options for students makes it possible to retain the social and academic advantages of living on campus for four years.

An aerial view of the Panther Village Lobby

Exterior walkways to residence halls

The first phase of the Panther village complex includes 93,000 gross square feet and is home to 204 students. It includes 44 four-person apartments, 12 two-person apartments and 4 studio apartments. Several apartments are accessible to students with special needs. Panther Village is co-ed, though the apartment units are for men or women only. Phase II will accommodate an additional 246 students and includes 113,000 gross square feet.

Each apartment has private bedrooms, a living space and a full kitchen within the apartment each student bed location has one high speed digital data connection, one coax television outlet and tamper resistant power outlets. In the living space one coax television outlet, one high speed digital data connection and a wireless access point for wireless network connection has been provided. The bathrooms feature water saving fixtures including low flow water closets, shower heads, and lavatory faucets. Each apartment has individual stand alone heating and air conditioning controls for comfort of the residents. Each apartment living room features floor to ceiling windows.

Common spaces include lounges on each floor, a grand lobby, fitness room, computer lab, meeting room and laundry facilities. The lighting for these common spaces is controlled with occupancy sensors. Photo sensors are utilized in the stairwells and in the grand lobby to control lighting to turn on and off based on the absence or abundance of natural light that exists in these spaces. A security system has been installed to ensure the safety of the students, and includes cameras, motion sensors and keypads.

A fire alarm system has been installed throughout the entire building with analog intelligent devices, pull stations, tamper and flow switches, audio, voice and visual notification appliances.

This complex has a 40 Kva generator for emergency lighting and other emergency power needs.

The building is heated and cooled using water to water heat pumps that produce heating and chilled water that runs throughout the building in a four pipe system. If supplemental heating or cooling is needed, cooling towers and steam heat exchangers either reject or inject heat back into the heat pump loop when it is needed. Steam piping is provided in the building and sized for the current phases 1 and 2 and the future expansion of Panther Village.

The environmental controls for the building are served by a complete BAS (building automation system) that also ties into the current campus wide BAS system.

The building is protected by a fire sprinkler system that includes individual zones on each floor for easy service in the future.

The project site has LED site and walkway lights installed throughout the new complex which will result in energy savings and lower maintenance cost.

This apartment complex project is designed to achieve a minimum of LEED (Leadership in Energy Environmental Design) Silver certification for sustainability and lower long-term operational and **Continued p. 4**

Cedar Rapids WPE: Camanche Community School

• When the Camanche Community School District conducted a complete review of their facilities, one of the critical issues identified was the need to upgrade the Heating, Ventilating and Air Conditioning (HVAC) systems at their middle and elementary school buildings. Almost all the HVAC equipment was installed during the original construction of those buildings and subsequent additions. In general, this equipment was in poor condition and past its normal serviceable lifetimes.

Energy recovery ventilators

The overall project combined several new additions at the middle school with the complete retrofit of the HVAC systems at both schools. During the design, West Plains Engineering kept its focus not merely on equipment replacement but also on maximum energy efficiency. The systems for both buildings selected were ground-source heat pumps. Some of the energy efficiency concepts integrated into this design were energy recovery ventilators for conditioning of all outside air intakes, variable speed drives on all HVAC pumps, and low pressure piping design. The individual ground source heat pumps were two-stage heat units with ECM motors and only the highest efficiency commercially available category of these were allowed to be bid for this project.

To allow the district to monitor performance of this system, the Building Automation System (BAS) was designed to datalog all energy used specifically by the HVAC systems. As part of our company's ongoing commitment to our clients, we perform post-construction services as needed. The completed systems have now been in operation for several months and are performing well. We have already assisted this client in receiving several energy efficiency incentives. We also anticipate helping the district obtain the EPA's Energy Star rating after a full year's worth of utility bills are available. The general contractor for this project was Swanson Construction. The mechanical subcontractor was Ryan and Associates, while the electrical contractor was GPX Electric.

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☆ WPE COMPANY NEWS ☆ WPE COMPANY NEWS ☆

• **Congratulations..Jeff Eidsness** and his wife Lindsey celebrated the birth of their baby boy Hudson Robert on March 30, 2013. Hudson was born at 8:26 pm and weighed 6 lbs. 15 oz. at birth and was 19 inches long.

• **Welcome...Joel O'Daniel** who joined West Plains Engineering as a drafting intern with the Power Engineer Division in February and became a full time employee in May. He is married to Megan, who gave birth to their first child Beckett Tyce on April 24th. Joel is currently a member of the SDARNG and in his free time, he enjoys golfing, hunting, and watching college football.

• **Congratulations...Todd Weidner** who was recently elected to the Board of Directors of West Plains Engineering. Todd has been with West Plains Engineering at the Electrical Department Head in the Sioux Falls office since 2000.

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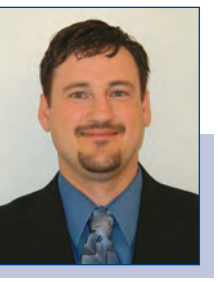
Sioux Falls WPE: UNI Housing Complex, continued

maintenance costs. LEED certification is a recognized standard for measuring building sustainability. Building sustainability features include:

Panther Village exterior entrance and skywalk

- An energy recovery wheel to recover some cooling from exhaust during the cooling season and to recover heat from the exhaust during the heating season
- Daylight sensor lighting in shared spaces on the bridge lounges
- Independent temperature control in each apartment with heating and cooling units
- Bioswales to filter water runoff from the building and from the parking lot. These natural water treatment systems are obscured by landscaping around the building
- Automated motorized shades that will activate for shading depending on the sun's angle
- Recycling bin in each unit
- Construction materials that contribute to energy efficiency
- A green vegetation roof
- Regional materials to building site

The architect for this $16.5 million facility was INVISION Architects from Waterloo, Iowa. Larson Construction was the general contractor for this project. Mackey-Mitchell was the programming consultant and JPSE provided structural engineering. West Plains Engineering, Inc. provided electrical and mechanical design services and coordinated their efforts with Young Plumbing and Heating and De Vries Electric Inc. Phase I was occupied in August 2012, while Phase II will be occupied in the Fall of 2013.



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