Vol XIX, Issue 2

PLAINS TALK

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May 2017

Turning Waste to Warmth: Michael J. Fitzmaurice State Veteran's Home

Strategic Direction Report: High Performance Buildings

Designing for the Future: SDSU Architectural, Math & Engineering Building

westplainsengineering.com

NEXT ISSUE

Don't wait until someone on your team has a "close call" to talk about electrical safety. Our engineers and certified safety professionals will explain why it's important to have the conversation now – as well as offer tips on where to start.

MECHANICAL ELECTRICAL PLUMBING POWER

AN ENGINEERING SOLUTION CENTER

IN THIS EDITION...

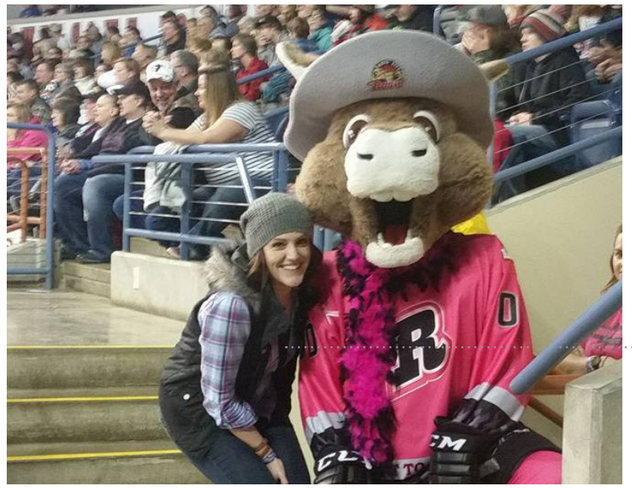
Telling a senior engineer that you want him to write a comprehensive technical paper, with reference material, while he is knee-deep in project design, doesn't exactly make you popular. Telling him that the reason you want him to write it is because his clients deserve access to the wealth of knowledge and experience he brings to the table – and his tune quickly changes (flattery will get you everywhere).

Flattery or not, it's the truth. We understand that our clients deserve more from us than just talking about what we've done in the past. Our engineers are brought onto a project for our expert knowledge and ability to solve problems. But we don't have to wait until a contract is signed to show our stuff. When a client makes us part of the team, we believe they should already know what they're getting.

In this issue, we unveil an excerpt from our new Strategic Direction Report on High Performance Buildings, and encourage you to go online to our website to download the full white paper (all 10 pages!). We also share a couple of projects where performance was put to the test, and how we approached the solution. A big thank you to all of our engineers who contributed – both on the page, and behind the scenes.

Principal Engineer Mark Grebner made an appearance in the March/April issue of Engineering, Inc. magazine - a national publication of ACEC. Mark and his fellow ACEC South Dakota leaders met with Senator John Thune last summer.

Hot off the press! The first edition of our new engineer-authored **Strategic Direction Reports** is now available! Read the excerpt on Pages 4-5, then head to our website to download the full length white paper.



Welcome New Team Members

Anthony Barella
Draftsperson
Casper

Luke Ganschow
Mechanical Designer
Sioux Falls

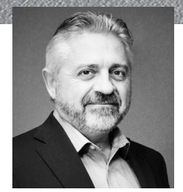
Tim Torres
Draftsperson
Rapid City

Our Rapid City team attended the annual Rapid City Rush Pink at the Rink hockey game to support the fight against cancer. Marketing Director Kelli Crouse *(pictured)* even stepped out from behind the camera to hang out with Nugget!

PROJECT PROFILE
NEW CONSTRUCTION

Michael J. Fitzmaurice
State Veteran's Home
Hot Springs, SD

Team
West Plains Engineering
TSP, Inc.
Scull Construction



Doug Feterl is a Principal Mechanical Engineer and President of West Plains Engineering. He has been with WPE more than 25 years and was a leading member of the mechanical design team for the Michael J. Fitzmaurice State Veteran's Home.
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As engineers, we're trained never to settle. A big part of our role in this industry is to continually push for innovative approaches, better solutions and more efficient outcomes. Frankly, it's what makes our job fun.

Little did we know we'd find a partner in that effort when working with the South Dakota Department of Veteran Affairs. The government agency was not only looking to build an entirely new concept in veteran's homes – but to do so using creative, renewable energy sources. Needless to say – we were in.

Working with architects from TSP, Inc., some of our most experienced engineers collaborated in making the VA's dream a reality. The 145,000 square foot Michael J. Fitzmaurice State Veteran's Home in Hot Springs, S.D., is the one of the first of it's kind created to feel less like a long-term care facility – and more like home.

The three-story building consists of 100 residential rooms situated around eight neighborhoods with a full complement of administrative and support services. In essence, it's a self-contained community, offering residents dining, entertainment, a chapel, a library, movies and social events, in addition to a complete range of health care options, including a pharmacy, clinic, physical therapy gym and much more.

While the facility may have all the comforts of home – it certainly requires an industrial effort to function. The building's multi-purpose performance means a complex array of mechanical and electrical systems all working together at optimal efficiency.

Before plans were ever drawn, the VA and the South Dakota Office of the State Engineer clearly communicated the need for a LEED Silver rating on the building. That meant careful consideration and coordination among all members of the design team, particularly in selecting HVAC, plumbing and lighting systems that would meet the high performance building standard.

Notable in that effort is the Home's BioMass Boiler Plant – a unique and forward-thinking approach to heating the facility using a renewable fuel source.
(continued on Page 8)

Strategic Direction Report

HIGH PERFORMANCE BUILDINGS

Michael Heinrich, P.E., LEED AP BEMP
Senior Mechanical Engineer

When it comes to developing high performance buildings, no one area of the team can afford to work in isolation. Architects, engineers, contractors and owners must collaborate on design choices, or risk unknowingly impacting the efficiency of other components of the building. For instance, engineers must look at all elements of the building in relation to one another and how they impact the performance of the mechanical and electrical systems.

As will be discussed in the following pages, selecting an appropriate lighting or HVAC design to meet code and owner requirements may be the task at hand. But to achieve high performance design, the engineer must go the next step and determine how decisions such as site location, building orientation, envelope construction and the use of renewables will affect those systems' ability to perform as expected. While these decisions may seem out of the purview of an engineer's expertise, it is their responsibility to be knowledgable about the use of each and advise the design team and owner on its impact toward building performance.

Load Calculations and Modeling

The good news is that engineers have a wealth of tools at their disposal to accurately predict building performance before the shovels ever hit the ground.

Perhaps most important among these are building energy models and heating and cooling load calculations – which are the "microscope" we use to see how a building will operate. Each has its specific use and reports completely different pieces of information, but when used in partnership, they provide valuable decision-making insight.

Energy models provide a snapshot of building energy consumption factoring in numerous end uses simulated over an entire year of operation. Typically, two energy models are constructed, with the first establishing a baseline, which is often a standard building just meeting code compliance. The second model includes the proposed building and its associated components, which are anticipated to be constructed. The comparison between the baseline and the proposed energy end uses can then be used to evaluate the feasibility of a particular energy conservation measure (ECM) upgrade.

The heating and cooling load calculations provide the extreme operating conditions for worst case equipment sizing. In other words, the load calculation establishes how much heating and cooling is required during the worst case heating or cooling design day. This information is then tabulated, evaluated for validity and used to select the appropriate HVAC equipment to be installed within a building to keep it operational even under the most extreme circumstances.

Download the Full Strategic Direction Report

Visit www.westplainsengineering.com/SDR or click on the QR code below to download the FREE full 10-page white paper on High Performance Buildings, which includes a detailed approach on engineering considerations toward building location and site, building orientation, envelope construction and the use of renewables.

Michael Heinrich is the Lead Mechanical Engineer in our Rapid City office, and has been with West Plains Engineering since 2000. Michael has special interest and experience in building performance design and evaluation, and holds certifications as both LEED AP and BEMP (Building Energy Management Professional). During his career with WPE, Michael has designed dozens of high performance building designs in the states of South Dakota and Wyoming.
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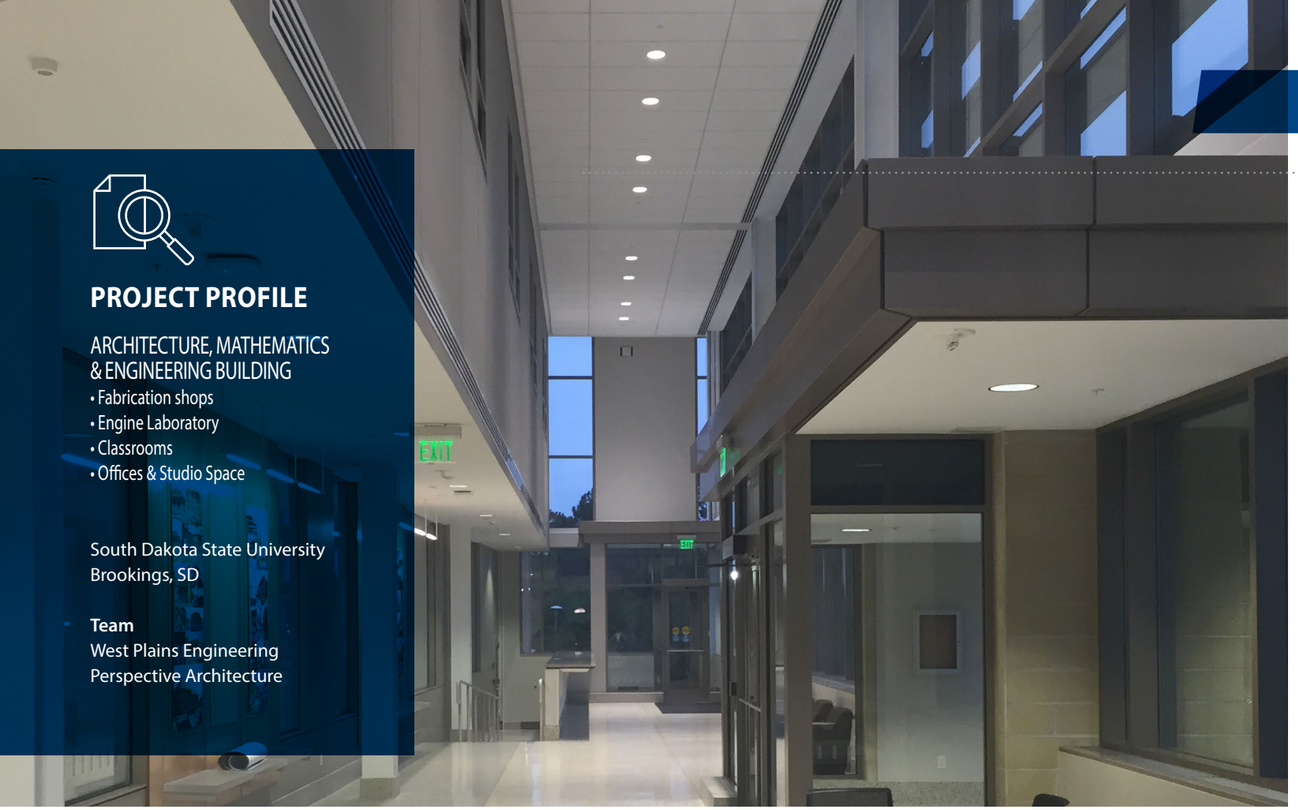

PROJECT PROFILE

ARCHITECTURE, MATHEMATICS & ENGINEERING BUILDING
- Fabrication shops
- Engine Laboratory
- Classrooms
- Offices & Studio Space

South Dakota State University
Brookings, SD

Team
West Plains Engineering
Perspective Architecture

Marty Christensen is a Principal Mechanical Engineer and Office Manager of our Sioux Falls office. A 1994 graduate of South Dakota State University, Marty has worked extensively with SDSU and other universities in the region.
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DESIGNING FOR THE FUTURE

Everyone has a favorite project. Sometimes it's the biggest, most unique or most challenging thing to come across your desk. In others, it's got a special place in your heart. And sometimes, as was the case with the new Architecture, Mathematics & Engineering (AME) Building at South Dakota State University – it's a bit of both.

Like me, many members of our team were educated in the SDSU Engineering program, and happily, get to return there to work on projects. For the 61,000 square foot AME Building, we had the special opportunity to design systems that the architects and engineers of tomorrow, our future colleagues, would experience every day.

Above all, for us that meant using technologies and processes that would deliver a high performance building - from the HVAC system to lighting. Ultimately, our efforts exceeded many of the ASHRAE standards and earned AME a LEED Silver rating.
Here's how we got there...

- The HVAC system consists of two central air handling systems & multiple local fan coils units.
- The AHU incorporated a total energy recovery wheel and utilizes variable air volume (VAV) boxes with reheat coils.
- Many units are water-source heat pumps, which use return water from chilled water cooling coils to provide heating/cooling while conserving energy.
- Extensive bus duct and cord drops were used for facilitating the open shop and studio areas.
- The lighting is controlled by individual occupancy sensors for energy savings – these controls, coupled with the overall system, assist in achieving a more energy efficient building.

Team Spotlight

MIKE FISHER, PE

Title: Electrical Engineering Department Head
Years with WPE: 4 and counting
Home Team: Mike and his wife Terri enjoy camping and attending Sioux Falls Storm indoor football games.

It's a little unbelievable that Mike Fisher has only been a part of our team for four years. With more than 25 years as an engineer in the Sioux Falls area, he's been around nearly as long as we have. (No Mike, we're not calling you old!) And when he, and several other former Ulteig employees, joined our staff in 2013 – we hit the jackpot.

Mike is a talented engineer to be sure. He's designed electrical systems for some of the landmark buildings in Sioux Falls, including the Sanford Pentagon and the Avera Medical Group Family Health Center (which has South Dakota's first freestanding emergency department). But over and over, what we hear his clients appreciate most, is simply getting to work with Mike. His sense of humor, easy-going attitude and commitment on every project sets him apart – and frankly, it's what we like best about having him around the office.

But certainly all work and no play would make Mike a dull engineer, so we do let him out occasionally. He and his wife Terri spend their free time camping and traveling anywhere there is a beach to relax, snorkel and scuba dive.

Partner Spotlight

South Dakota State University

South Dakota State University is the largest public university in the state of South Dakota, with more than 12,000 students enrolled across 73 majors. Located in the relatively small "college-town" of Brookings, SDSU has been a staple in higher education for many families across the generations. A land-grant university, SDSU is nationally recognized for its scientific research, development and academic programs – many of which focus on the agricultural industry that's at the heart of the state.

As generations of students return to follow in their parents' Jackrabbit footsteps, SDSU has been committed to setting the bar for innovative facilities. West Plains Engineering has been proud to work with the university on nearly 50 campus improvements – currently, a new Animal Disease Research & Diagnostics Laboratory and an expansion to the Stanley J. Marshall Center athletic complex. Additionally, we annually sponsor a pair of engineering scholarships to help educate tomorrow's industry leaders (and hopefully...WPE staff).

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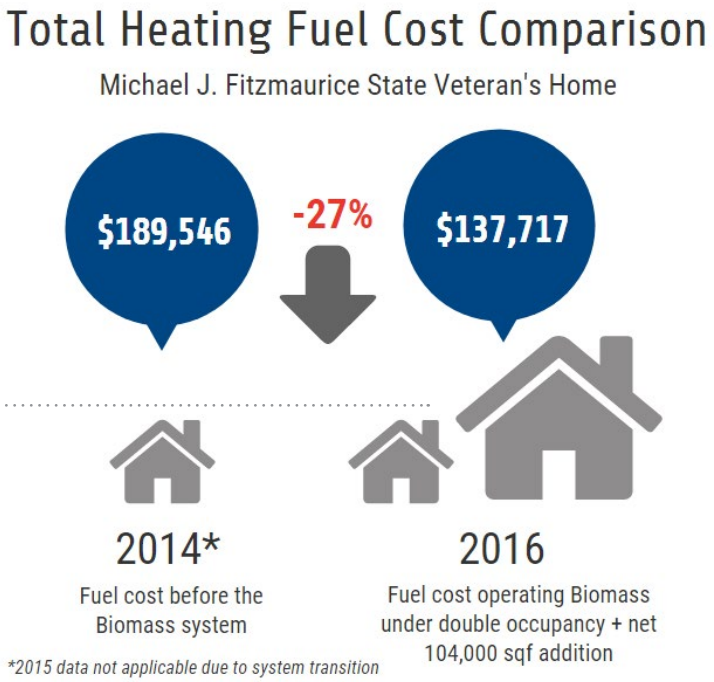
Biomass Boiler

This environmentally conscious method uses waste shavings and other waste wood materials from sawmills or other sources. Since the Veteran's Home is located in the heavily wooded southern Black Hills, this source is both readily available and economical for the VA.

Biomass boilers are being used due to their benefits in reducing heating costs and reducing carbon emissions, in this instance, where forest byproducts and sawmill waste are available, essentially "carbon neutral". The system is a great solution for the Veteran's Home in part due to the much lower cost of fuel than the alternatives in Hot Springs, S.D. This new system connects to the old boiler plant and back feeds the remaining campus buildings for an addition savings and reliability.

For instance, 2016 was a year of dual occupancy and transition between the original Building #3 and the new Veteran's Home. Both were open, occupied and heated/cooled during completion, certification and relocation of residents. During this year, the new biomass boiler plant operated to serve the entire campus and used a total value of $137,717 in fuel. Previous systems had needed between $250,000 and $375,000 (circa 2008-2010) in fuel. Simply put, this means the Veteran's Home spent 27 percent *less* for heating fuel, even though the biomass system was serving multiple buildings – including the additional net 104,000 square foot new facility.

It should be noted that the new building is much larger and more efficient, with appropriate ventilation systems. However, it is still expected to use far energy than Building #3. These calculations continue to be monitored and we look forward to sharing more details in the future.



The Michael J. Fitzmaurice State Veterans Home opened in November of 2016, and is currently at full residential capacity (plus an ever-growing waiting list). For additional photos of the facility, as well as more specific details about the mechanical and electrical systems behind it, visit www.westplainsengineering.com or follow the QR code.