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# **January/February 2020**

Planning A Sustainable Future: Black Hills State University Solar Arrays Strategic Direction Report: Evolution of Sustainable Design in the MEP World Not a G.I. Geothermal: South Dakota Army National Guard AASF Readiness Center Understanding the Reason for Change: Energy Audits

MECHANICAL ELECTRICAL PLUMBING POWER

AN ENGINEERING SOLUTION CENTER

# IN THIS EDITION...

Every time we sit down and plan an edition of Plains Talk, we ask ourselves - what matters right now?

To us, this newsletter is less about what our firm is doing, and more about what's happening in our industry and how we're approaching it. Recently, we've seen an increase in chatter around sustainable design. More RFQs are coming out asking firms to define their approach to sustainability. More projects want to design to a LEED level or at least look at sustainable options. And more often than not, teams need to get creative in designing systems that are functional, energy efficient and environmentally responsible, while also being maintainable and budget-friendly.

At the end of the day, sustainable systems are becoming the norm – and we're glad to see it because it benefits future generations and often times, the bottom line. From providing reliable emergency backup power generation to harnessing the renewable power of sustainable energy resources - we remain committed to finding creative, effective solutions for our clients.

We've shared a few of those solutions in this edition, but of course there's always more to say than there is paper. For more, visit our website.



Cover Photo: Increasingly, our electrical engineers are working with forward-thinking companies to install electric car charging stations. In Iowa, we've completed seven of these projects in the past six months alone for companies like Hy-Vee, Fareway, Casey's and the City of Waterloo.

# Kennedy Added to WPE Operation's Group

Sioux Falls Electrical Department Head, Jonathan Kennedy, was recently invited to join the West Plains Engineering Operation's Group (OG). The OG is a leadership group that focuses on setting firm-wide policies and goals, identifying operational initiatives and advancing WPE by understanding company challenges and opportunities.

The group is comprised of office managers and corporate management staff, but also includes rotating members from across the company to encourage employee involvement and input for the business side of our work.

Jonathan joined West Plains Engineering in 2017 as an

Electrical Engineer, and this past year, was promoted to Electrical Department Head. He will serve an 18-month term with the OG, which began during the group's biannual meeting this past February in Deadwood, SD.

Congratulations Jonathan!

# **All Work and No Play Makes a Dull Engineer**

Our Sioux Falls team dug out from under plans and specs on Thursday, February 20 to enjoy a night with their families at the new Great Shot golf entertainment complex.

WPE provided mechanical and electrical design for the new \$12 million space, which offers three floors of high-tech, interactive golf, as well as a restaurant and the Sanford POWER Golf program.

The facility is amazing and fun was had by all! (We just might want to come back and practice a few more times before the courses open this spring.)



L-R: Dustin Torguson, Jeff Metzger and Nick Carr.



We really hope this wasn't Jonathan Kennedy's attempt at calling this shot...



# **PLANNING A SUSTAINABLE FUTURE**

It's not uncommon for college and university campuses to have long-range facility master plans. In fact, our team frequently partners with schools in the region in both writing and executing these broad initiatives. But beginning in 2017, Black Hills State University pushed the envelope of innovation even further when they feed to track the inverter performance (image below). created their 2030 Sustainability Master Plan. This Check it out in real time by using the QR code below. forward-thinking strategy sets goals for improving the school's sustainability on multiple fronts - from reducing emissions by 33 percent to integrating sustainability into the academic curriculum. Another core concept in the plan is working toward carbon neutrality by aiming to reduce greenhouse gas this Spring.

emissions by 33 percent by 2030. According to a study conducted by the University in 2015, 69 percent of the install solar arrays across campus.

campuses overall emissions came from energy usage. To combat this, BHSU has embraced a series of projects to West Plains Engineering has teamed with local solar expert, GenPro Energy, on several of these projects. In 2019, we began by adding a 74 kW rooftop solar array to Thomas Hall, one of the residence buildings on campus. This 200 panel photo voltaic array produces enough energy to fulfill approximately 20 percent of Thomas Hall's energy consumption. As a cool feature to showcase its new tech, the University set up a real-time online power





Daren Beckloff, P.E. is an Electrical Engineer and manager of our Power Division. In the past two years, he has worked with both higher education and municipal clients on five separate projects to increase the use of solar arrays for both buildings and electrical infrastructure. daren.beckloff@westplainsengineering.com

Currently, we are working on two additional solar projects that will affect four buildings and an outdoor carport. This involves the Life Sciences Building (82kW), Berry Library (136kW), Facilities Building (36kW) and Donald E. Young Center (540 kW). This project is expected to be completed



Strategic Direction Report

# **EVOLUTION OF** SUSTAINABLE DESIGN

More than half of our LEED rated projects have been for public universities – including lowa State University, South Dakota State University, South Dakota School of Mines & Technology and the University of Northern Iowa.

# **OUR LEED HISTORY**

## PLATINUM

Lowe's Discovery Lab & Children's Village at Cheyenne Botanic Gardens – Chevenne, WY

# GOLD

Iowa State University – Small Animal Teaching Hospital – Phase II – Ames, IA Linn County Juvenile Justice Center – Cedar Rapids, IA Linn County Jean Oxley Public Service Center – Cedar Rapids, IA SD Mines Paleontology Building – Rapid City, SD SDARNG Barracks Classroom Building 802 – Rapid City, SD South Dakota Game Fish and Parks Outdoor Campus West – Rapid City, SD

### SILVER

Dakota State University MadLabs – Madison, SD (pending) Historic Swander Grocery Renovated into FourFront Design – Rapid City, SD Michael J. Fitzmaurice State Veteran's Home – Hot Springs, SD **SDARNG Joint Forces Headquarters** Readiness Center Camp Rapid – Rapid City, SD South Dakota Housing Development Authority – Pierre, SD South Dakota Public Universities & **Research Center University Center** North Building 2 – Sioux Falls, SD SDSU Animal Disease Research & Diagnostics Laboratory - Brookings, SD (Pending) SDSU Architecture, Math & Engineering Building – Brookings, SD SDSU Dykhouse Student Athlete Center – Brookings, SD SDSU Harding Hall– Brookings, SD (Pending) SDSU Stanley J. Marshall Center – Phase I - Brookings, SD (Pending) SDSU Student Wellness Center - Brookings, SD (Pending) USAF B-52 2-Bay Phase Maintenance Dock – Minot Air Force Base, ND University Center – Black Hills – Rapid City, SD UNI Panther Village – Phase I & II – Cedar Falls, IA

# **MORE THAN A TREND**

# At the end of the day, sustainable systems are becoming the norm.

Environmentally-friendly. Responsible. Green. Since we first put smartly generated when it's available isn't ultimately wasted, pencil to graphing paper in 1984, the terms used to describe but instead kept at the ready for when it's needed by the owner. sustainable design have certainly evolved. The reasons behind Clearly, there are multiple ways electrical engineers can make the movement, to a degree, have also come a long way. Twenty their mark on sustainability – but they don't get to have all the years ago, many in our field (maybe even a few of us) made fun. Mechanically, a major opportunity for sustainable building sustainable design choices chasing that all important LEED design are geothermal/water source heat pump applications. rating. While LEED is still a priority on some projects, today's Geothermal systems have many advantages because of their MEP professionals understand the true potential of sustainable lower cooling and heating costs, lower exterior noise and systems lies simply in creating the most efficient, highenvironmentally-friendly technology. These applications can performing space. consist of closed or open loops, slinky loops, pond loops, or well-fields. Interestingly, other water sources can potentially include industrial process water and water treatment process and electrical systems to improve sustainability. From simple water - both of which would typically considered a waste product.

Today, there are numerous opportunities for mechanical choices like occupancy sensors, low flow plumbing fixtures and daylight harvesting, to more complex decisions on photo voltaic arrays and geothermal well systems, a good MEP team All of these sustainable options clearly have their merit. should understand its worth in the sustainability game. But it's also important to understand that sustainable for sustainability's sake, doesn't always make sense. It has to meet Big players in this game include improved building envelope, the owner's goals, budget and use for their project.

solar energy, wind energy, battery storage and geothermal During our evolution, we've learned to be strong advocates in an integrated design approach – having a voice at the table early in the project. We coordinate with owners, architects explore implementing renewable energy sources. Reduction and other design team members to assure our decisions are in the best interest of the project, and space is adequate for equipment that will best serve the building. If this doesn't happen, equipment for sustainable systems might be relegated to a rooftop unit or other inadequate location which will impact it's ability to perform as it's designed. For example, air handling units that can be maintained and have a longer life expectancy are sacrificed for lesser rooftop units. Boilers that make sense for many reasons could be removed and gasfired heat placed in the RTU; centralized cooling changed to condensing units within the RTU's, etc. Most of these changes are not in the best interest of the owner, and do not lend themselves to sustainability. By being part of the conversation early on, the MEP team can help make sure this is avoided.

systems. The need to minimize the facility energy consumption through optimized building orientation, improved building materials and optimized control schemes - before moving to in energy needs is the first priority, application of renewables follows. Solar energy is more than collecting the power of the sun it's converting that energy and connecting it back to systems so it can be put to good use. This includes planning and procurement of the solar equipment itself, as well as effectively tying it back into owner electrical systems. Of all the sustainable design movements, this one has picked up the most steam in recent years. In fact, in the past five years, our firm has designed nearly 20 separate solar projects, including 11 in 2019 alone. Electrical engineers also assist wind farm developers and

owners to harness our region's abundant renewable wind transmission and distribution power systems behind it.

energy. These systems require experience not only in building Another important reason for having the MEP team involved level electrical distribution, but the medium and high voltage from the start is their relationship with the utility companies, and understanding of the rebates and special rates available. Certain systems will gualify more easily than others, and having While using renewable resources to generate energy is step that knowledge during the programming phase will maximize one in sustainability, finding a way to store that energy in a way the cost savings for the owner. that makes it available during peak demand is step two.

As we know all too well, we can't always predict what Mother Visit www.westplainsengineering.com/SDR or follow the QR code below to download other FREE engineer-authored white Nature will give us. Days without sun or wind shouldn't mean a papers from West Plains Engineering. poor performing building - it should just mean a backup plan. Designing a smart battery storage system means the energy

# **Download Other Strategic Direction Reports**





### NEW CONSTRUCTION

AASF Readiness Center Rapid City, SD

Team **Coover Clark Architects** 





Dave Riemenschneider has been a Mechanical Designer in our Rapid City office for more than 25 years. During this time, he has designed numerous geothermal systems for both government and private clients across South Dakota and Wyoming.

dave.riemenschneider@westplainsengineering.com

# **NOT A G.I. GEOTHERMAL**

Increasingly, Federal and State entities are focused on incorporating sustainable features into both new and renovated facility design. While these are often necessary to reach LEED requirements, sustainable design is also simply a smart approach to reduce costs and increase efficiency.

West Plains Engineering has worked with the South Dakota Army National Guard on several LEED projects, and we understand their goals when it comes to facility operations. So when we teamed up with architect Coover Clark Associates on a new \$20 million Army Aviation Support Facility (AASF) in Rapid City, we understood early on we would need to get creative with the MEP design.

Mechanically, our solution was to incorporate a hybrid geothermal system. With our Northern climate, geothermal well field systems are typically designed based on a heatingdominant operation because we have more heating days than cooling. The hybrid version we designed uses a well field system to meet all cooling needs and the heating needs 95 percent of the time. A small boiler system is used to supplement the heating side of the well field system. This allows us to reduce

installation costs by reducing the number of wells. The boiler system only operates when the well field loop temperature drops below a certain value. This typically is only needed one or two times a year so the SD National Guard gets the efficiencies afforded by a geothermal system almost all the time – but with a reduced installation cost.

This system also allows the SD National Guard to take advantage of the electrical utility's electrical storage rate for the entire HVAC system at a cost of six cents per kilowatt hour. The utility only allows equipment associated with the geothermal HVAC to be served off the energy storage service that provides power at that rate, so we utilized two 480Y/277 Volt, 3-phase electrical services in order to qualify.

This 58,700 square foot project broke ground in the Spring of 2019 and is currently under construction. Once finished, it will serve 154 personnel and includes an assembly hall, unit storage, arms vaults, catering kitchen, administrative offices, family readiness, learning center, classrooms, multi-purpose rooms, locker/restrooms, physical training space and a general purpose work bay.

# Team Spotlight

# DAVE RIEMENSCHNEIDER



Title: Mechanical Designer Years with WPE: +25 Years Home Team: Wife-Christina; Sons - Koen & Jesse

Few people in this world can go by a single name and get away with it. Oprah... Shaq...Sting - and at WPE...Riemenschneider. In western South Dakota, the name is almost as famous as it is difficult to spell. And the man behind it? Infamous to boot.

Dave Riemenschneider (or R-15 if you like), has been a staple in the A/E/C industry in South Dakota for nearly 30 years. He joined West Plains Engineering in 1991 and has since become one of our firm's most experienced, knowledgeable mechanical design professionals. He's been a driving force behind our geothermal well systems in recent years, creating sustainable solutions for clients like the SD Army National Guard; SD Game, Fish and Parks; Crook County School District in Wyoming, and multiple private owners.

But perhaps equally important have been the relationships Dave built as a consultant and a member of the Rapid City community. Everyone knows him, either because they worked on a project together, or they simply met him around town with his wife, Christina, or two sons, Koen and Jesse. A big guy with an even bigger presence, he's hard to miss, easy to like, and impossible to forget.



It was our honor to be part of a groundbreaking ceremony this past Spring for the South Dakota National Guard AASF Readiness Center. Our team got to join representatives from the State of SD, SD Army National Guard, City of Rapid City and the rest of the architectural and engineering design team to get dirt moving on the \$20 million project.



Plains Talk **7** 



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ENERGY AUDITS RENOVATIONS



Todd Weider, P.E. is a Principal Electrical Engineer and manager of the WPE Electrical Specialties Division. Todd's work focuses on utilizing assessments to improve electrical safety and efficiency in building systems and infrastructure. todd.weidner@westplainsengineering.com

### **UNDERSTANDING THE REASON FOR CHANGE**

When it comes to renovation projects, the approach to sustainable design becomes very different. In addition to considering upgrading to sustainable equipment like solar or geothermal, the design team should first conduct energy audits and assessments to establish a baseline on the existing space as a starting point to steer the course for positive change.

Energy audits provide the means to thoroughly review the existing facility infrastructures to analyze efficiency. Building envelope, MEP systems and processes are evaluated and compared against other similar systems to evaluate performance by performing life cycle analysis. These systems can then be evaluated for Return On Investment (ROI), life cycle cost and paybacks calculated to determine if an upgrade is worthwhile.

During a life cycle cost analysis, all systems and the building envelope's thermal components are analyzed. The building envelope system (walls, doors, windows, roof, insulation) are reviewed for potential deficiencies, as well as possible improvements. These building components are often overlooked in making energy saving upgrades. However, the ROI for some of these upgrades may not be great enough to move forward with a replacement project. It takes a full assessment, and careful consideration, to make that distinction. Mechanically, a life cycle analysis will compare an ASHRAE baseline system such as rooftop units versus boiler/chiller/VAV, geothermal heat pumps, variable refrigerant flow (VRF), or gas/electric hybrid VRF systems for example. Replacement of outdated central equipment such as chillers or boilers with new, more efficient equipment is also an option.

Additionally, control sequences may be reviewed for potential energy savings strategies such as demand control ventilation, water/air economizers, energy recovery and operational scheduling.

Electrically, a review may pit wind against photo voltaic systems, and outdated systems will be looked at for upgrade and/ or replacement. While LED lighting is now common, the types and controls are critical decisions in identifying ways to save even more energy.

The process for these energy audits involves applying energy modeling with a life cycle cost analysis to look at the facility as a whole using software systems and knowledge of the data. With these tools, as well as an understanding of any utility rebates available, decisions can be made about what, if any, MEP system changes should be made to improve building performance.