

PLAINS TALK



Cedar Rapids WPE: Linn Mar Transportation Terminal



Did You Know?

• *West Plains Engineering was founded on January 1, 1984 by Dave Berg & Bob Thompson. This June, Dave Berg retired from the company. We welcome Bob Thompson in his new role as President. Catch an exclusive article in our Fall Newsletter to learn more about West Plains Engineering.*

Plains Talk is a quarterly publication of West Plains Engineering, Inc. in which we highlight a few of our most interesting projects. Your comments are welcome at any of our locations listed on the back cover of this newsletter.

• With an expanding school district and the need for a new stadium, Linn Mar School District in Marion, Iowa, sought to relocate their maintenance and bus parking facility now known as the Linn Mar Transportation Terminal and Bus Barn. With its completion in October of 2010, the campus consists of a 30,000 square foot office/maintenance facility, a 6,300 square foot storage facility, and a parking lot with fueling stations that can accommodate 80 buses and 125 vehicles. This project involved two different design phases with two different design teams, the first being the parking lot and the second being the structures.

The Bus Barn: Once the final location for the facility was selected, there was an urgency to get the bus parking designed and constructed prior to winter and prior to the design of the office/maintenance facility. This was a challenging task, as the electrical service had to be designed to accommodate the block heaters for 80 buses, the parking lot lighting, as well as the future building in a short timeframe. Fortunately there was an existing 7,000 square foot building located on the site to be used as a temporary facility and included in the future design. The owner did not want a fence or guardrail blocking the way for snow removal. The solution was to use a concrete pole base to house the receptacles. Each base would support four buses. The parking lot power and lighting was completed in early November 2009 and was

used through the winter by the school. Hall and Hall Engineers Inc, served as the civil design firm and West Plains Engineering as the Electrical Engineers.

Transportation Terminal: Once the parking lot was designed and completed, it was time for the Transportation Terminal to transpire. The facility contains a variety of spaces including two maintenance bays, an automatic bus wash bay, maintenance rooms, wood shop, bus dispatch, and general office areas. This facility was very interesting to design as each of the areas required different types of Mechanical and Electrical systems. Aspect Architecture Design served as the project architect, Hall and Hall Engineers Inc as the Civil Engineers, Foth Infrastructure and Environment, LLC as the Structural Engineer and West Plains Engineering as the Mechanical and Electrical Engineers.

Reduction of energy consumption was an important design criteria for this facility. The HVAC system for the bus barn integrated high efficiency gas furnaces with an energy recovery ventilator. The ventilator was synchronized to run in conjunction with the furnaces, providing the fresh air into the building while minimizing energy costs. The associated air-cooled condensing units were also selected for their high energy efficiency operation, as were the dual-stage infrared heaters. In addition to these energy-saving systems, an overhead furnace which could burn used engine oil was installed in the larger

Rapid City WPE: Utility Distribution Sectionalizing Part II *(continued from Spring issue)*

• In our last article we talked about the importance of completing a sectionalizing study and the benefits of knowing the voltage drop and fault currents at any point within your electrical distribution system. In this article we would like to address why the accuracy of your model is critical to system coordination and arc flash studies, as well as solving for voltage drop and fault current.

From a young age we have learned that the accuracy of any answer is only as good as the information used to calculate that answer. Electrical distribution system models are no exception. If we do not have accurate knowledge of the system impedances, conductor sizes, and load information with which to assemble our engineering model, our resulting voltage drop and fault current values will be incorrect. If our fault current values are not accurate, then our protective coordination will suffer as well. The results may range from mis-coordination of devices, to devices failing to operate at all. Other devices could end up being damaged if they are not properly rated to withstand the available energy on the system. Therefore, it is easy to see that inaccurate data in one area of your model may have detrimental effects in all areas.

One item in particular that greatly affects the accuracy of your results is the impedance of the transmission system supplying your substations. While the transmission system impedance influences the model as a whole, it has definite effects on all calculated fault current values. When it comes to coordination, accurate fault current calculations are essential. Similarly if you are updating or completing an arc flash study, accurate knowledge of the available system energy is a must. The accurate coordination of protective devices to clear any arcing condition can only be realized if your fault current is known. So one can see just how the two values work together in your system model. If you do not have access to your transmission system impedance, a phone call to your transmission provider will usually put you in contact with the engineering department that does. It is good practice to occasionally update this information within your model, as transmission switching and generation changes do take place.

Overhead and underground conductor lengths, types (alu-



minum vs. copper), and sizes are also very important to model correctly. These conductor impedances have a huge affect on voltage drop and fault current calculations as one looks farther out on the individual substation feeders. Most utilities have good documentation of their conductors, but occasionally a trip to the field may be required to verify a particular line section or underground conductor.

The accuracy of system loading and conductor knowledge are the two most influential factors affecting voltage drop along your lines. Since voltage drop is based upon current flowing through a conductor the importance of knowing exactly how much current is flowing at any particular point on your system is extremely important. If loading points are only estimated on the system, voltage drop calculations will suffer accordingly. And as a result accurate voltage regulator placement may not be possible.

Accurate documentation of all system upgrades and modifications is the key to reducing the time required to build a model. If you already have your system modeled, be sure to update both your records and your model as field modifications are made. Today there are a number of good commercial software programs available that help link the staking and construction process, with company inventory, mapping, and your engineering analysis model. Many of these programs are intended to reduce the amount of time required to keep your inventory and your model up to date.

I hope this brief explanation has been informative and helped some of you understand the importance of accuracy within your engineering model. For those of you that may not have an engineering model available, I hope this information demonstrates the importance of having your system modeled accurately. If anyone has further questions about this topic, or other utility issues, please give me a call at (605) 739-5211.

About the Author:

Kevin Groves is the Utility Division Manager in the Rapid City Office. He has been with WPE for over 4 years.



Cedar Rapids WPE: Linn Mar Transportation Terminal *(continued from front page)*

garage bay.

A unique feature of the facility was the bus wash bay which allows both automatic and manual washing of the district's busses and other vehicles. The wash bay equipment uses a variety of instruments to allow a complete washing of all outer surfaces of busses using the facility. A water reclaim system was also designed into the project to minimize the consumption of the total water used in for this system.

Working with the owner to determine the electrical needs for each of the areas was very important, as each area had unique requirements. Some of the electrical design features include hoists, wash bay equipment, cord reels, as well as lighting and lighting

controls.

As you can see by the picture, this is a very impressive and functional facility for the Linn Mar School District bus system. impressive and functional facility for the Linn Mar School District bus system.

About the Author:

Todd Baack is an Electrical Engineer in the Cedar Rapids office. He has been with WPE for two years.



Casper WPE: Community Health Center of Central Wyoming



Community Health Center of Central Wyoming by Boulder Associates, Inc.

- The Community Health Center of Central Wyoming has provided comprehensive health care for Wyoming residents for the past 10 years. They have grown to three offices throughout Casper and provide services for family medicine, dental, behavioral health and senior care.

The new 50,000 square foot, two-story facility in Casper will accommodate family medicine, dental, imaging, pharmacy, senior care, womens care and administration offices. The project is slated for completion in August of 2012.

The architect for this project was Boulder Associates, Inc. of Boulder, CO, assisted by GSG Architecture of Casper. Lower & Company provided the structural design, and CEPI was the civil engineer. The mechanical, plumbing, and electrical design was provided by West Plains Engineering, Inc.

About the Author:

Kurtis Sweat is a Mechanical Engineer in the Casper Office and has been with WPE for four months.



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Rapid City Office

Congratulations...**Michael Heinrich** who was recognized for 10 years with West Plains Engineering.

Congratulations...**Bernadette Holzer** who was recognized for 10 years with West Plains Engineering.

Congratulations...**John Huntley** who recently passed his P.E. Test. He is a mechanical engineer in the Rapid City Office and has been with West Plains Engineering since 2009.

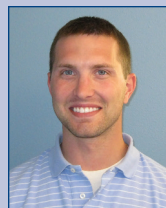
Cedar Rapids Office

Congratulations...**Arlo Wieczorek** who recently passed his P.E. Test. He is a mechanical engineer in the Cedar Rapids Office and has been with West Plains Engineering since 2009.

Casper Office

Congratulations...**Chris Kost** and wife Brenda welcomed baby boy Dexter Dale on May 12th at 11:42 AM. Dexter weighed 7 lbs. 2.6 oz. at birth.

Sioux Falls Office



Welcome...**Justin Henning** began working in the Sioux Falls office in March 2011 as a CAD technician. Justin graduated with an Associates Degree in Architectural Engineering in May of 2011. He enjoys spending time outdoors fishing and golfing in the summer and hunting and snowboarding in the winter.

Welcome Home!...**Chuck Hauck** from an extended active duty tour with the South Dakota Army National Guard. Chuck entered active duty in January 2010 to assist in preparing his unit the 196th Maneuver Enhancement Brigade in Sioux Falls for their deployment to Afghanistan. In June of last year, the 196th left for Ft. Hood, Texas, then onward to Kabul, Afghanistan, where they served as the Kabul Base Cluster Command. Chuck served as the Deputy Director of Public Works for the KBC and returned to South Dakota on May 3rd.

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Sioux Falls WPE: Animal Control

• The City of Sioux City built a new Animal Control facility that opened its doors in 2010. The facility has over 12,700 square feet of space complete with three dog rooms, one with doggie doors to the outside dog run. There is also a cat room, two large animal rooms, a small animal room, a pet adoption room, a bathing room, medical clinic, a disease isolation room, a drop off garage, as well as an office and meeting/training room. The meeting/training room is set up for use after hours when the shelter is closed. Animal Control is built to hold 100 dogs and 100 cats, as well as a few “exotic” animals.

To minimize any transfer of “animal smell” from the kennel area into the staff occupied office space, the mechanical systems included a 100% outside air heating and cooling system utilizing outdoor air handling units paired with energy recovery units for the kennel areas. Air distribution within the kennel spaces was achieved with fabric ductwork to minimize air noise and disturbance to the animals. The large animal spaces, receiving area is heated and cooled with a modular indoor air handling unit coupled with air to air heat pumps and energy recovery to maximize energy savings. The office spaces are served by high efficiency gas fired furnaces and air to air heat pumps.

To keep utility cost low, the majority of the



fluorescent lighting is controlled by using occupancy sensors. A few night lights are used in the dog areas for monitoring the rooms with the future cameras. The lighting in the majority of the animal rooms is water tight, so the areas can be hosed down for easy cleanability. The electrical systems include a 600 amp service to the building, energy efficient lighting, rough-in for door access system and security cameras, Fire alarm, and data/telephone systems.

The architect for this \$1.5 million facility was RML Architects from Sioux City, Iowa. Halman Construction was the general contractor for this project. West Plains Engineering, Inc. provided

electrical and mechanical design services and coordinated their efforts with C.W. Suter, Wrenn's Plumbing & Heating, and Thompson Electric.

About the Author:

Melanie Raap, PE is an Electrical Engineer in the Sioux Falls Office. She has been with WPE for 8 years.



About the Author:

Darrin Tille is a Mechanical Designer in the Sioux Falls Office. He has been with WPE for 4 years.

