

POWER Grant

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Variable Refrigerant Flow Zoning RESEARCH PROFILE

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First National Plaza in Cloquet Tests Cool Technology

First National Plaza in historic downtown Cloquet, Minn., is a charming blend of old and new. The sturdy brick building, originally constructed in 1919, has been virtually transformed from a timeworn, nearly vacant office complex into an elegant boutique mall and business center, bustling with specialty shops and professional services. It also boasts one of the most advanced and energy-effective heating, ventilation and air conditioning (HVAC) systems in the world.

The innovative HVAC system, retrofitted into First National Plaza during the recent renovation, uses variable refrigerant flow zoning (VRFZ) technology, also known as variable refrigerant volume. It controls the indoor climate by capturing heat from areas, or zones, that are too warm and transferring it to those that are too cold, using refrigerant piped through thin tubes. The system controls where and when refrigerant

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Stephanie Sinnott-Wehr, Designer, Eclipse Paint Inc. & Design Studio

is circulated, based on the temperature requirements of each zone.

VRFZ has been used in buildings throughout Asia, Europe and other countries for nearly 30 years, but it is virtually unknown in the United

States. First National Plaza is a test site that will help determine if this technology makes sense in Northeast Minnesota’s climate. Minnesota Power provided a \$32,000 research grant to help offset the initial cost of the VRFZ system. Data loggers installed on the system’s condenser and evaporator fans, plus climate sensors positioned throughout the building, will be used to monitor and verify its actual performance.

Wehr & Associates, LLC, the company that owns First National Plaza, first contacted Minnesota Power early in the renovation process to discuss energy- and cost-saving



Left to right: (Photos 1-3) Tanuj Gulati, EMS; Jared Wehr, UF, Inc.; Matt Haley, EMS; Zachery Wehr, Wehr & Associates; Edlin Goalswyk, refrigeration consultant; and Craig Kedrowski, Minnesota Power, are partnering to research a variable refrigerant flow zoning HVAC system installed in the newly remodeled First National Plaza in Cloquet. (Photo 4) Building owner Zachery Wehr and project designer Stephanie Sinnott-Wehr.



opportunities. At the time, the 35,000-square-foot building was being heated with a steam boiler and cooled by a hodgepodge of chillers, split systems and window-mounted air conditioning units. Owners were concerned about the inefficiency and operating costs of the building.

“We are very environmentally conscious and didn’t want the same inefficient, short-lived technology that had been used in the building for years,” said Zachery Wehr, president, Wehr & Associates. “We also didn’t want running the building to run us into the ground.”

Wehr visited with Minnesota Power representatives and energy consultants from Energy Management Solutions (EMS), who suggested evaluating the potential for VRFZ. Minnesota Power had been seeking an opportunity to test the technology in its service territory. Together, they began researching available options, including the CITY MULTI® system by Mitsubishi Electric HVAC Advanced Products Division, which ultimately was installed in the building.

“The more I read, the more it made sense,” Wehr said. He even attended a Mitsubishi Electric HVAC training course to learn how the CITY MULTI® and other VRFZ systems were installed and commissioned.

That personal research combined with professional experience in the construction industry helped Wehr & Associates make an informed decision to pursue the technology. Its affiliated general contracting business, UF, Inc., specializes in energy recovery and installed the system.

Jared Wehr, vice president of UF, Inc., was impressed by how cost-effective the VRFZ system was to install.

Heat generated by aquariums in the Underground Aquatics store (above) is captured by a room unit and piped via small tubes of refrigerant to other shops, halls and offices, making the facility comfortable to visitors and employees as well as attractive.

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Craig Kedrowski
Regional Account Manager
Minnesota Power

Learn more about **POWERGrant**.

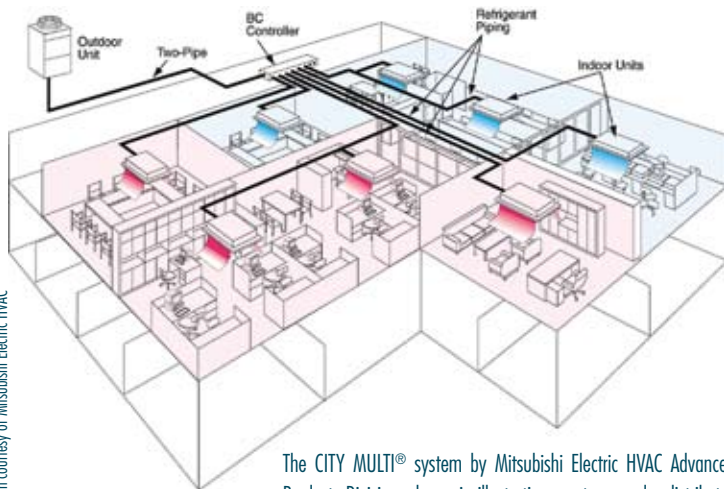
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“It reduces the amount of ductwork and materials that are traditionally used in a HVAC system because the refrigerant flows from zone to zone through two finger-sized tubes,” Jared Wehr said, adding that the VRFZ system also requires less floor space, is extremely quiet, gives the building owner more control of zones, and recycles energy that otherwise would go out the window. “We had a great team that helped with the professional design of the project, and it was a thrill to locate heat sources, recover energy and redistribute it throughout the building to where it was needed.”

The designer for the building renovation, Stephanie Sinnott-Wehr, loved the streamlined look of the interior VRFZ units and the versatility of choices. “They are sleek, unobtrusive and very quiet,” she said.



The CITY MULTI® system by Mitsubishi Electric HVAC Advanced Products Division, shown in illustration, captures and redistributes heat to areas where it is needed in a building.

Illustration courtesy of Mitsubishi Electric HVAC



POWER *Grants*

“Energizing Our Region” through Conservation Improvement

Minnesota Power’s Conservation Improvement Program (CIP) works with local leaders, businesses, community groups, other energy providers and government entities to help customers reap the economic and environmental benefits of sustainable energy savings. Minnesota Power and its partners accomplish this through research, education, evaluation and direct impact initiatives.



Find out how **POWERGrant** can help you.

Minnesota Power awards grants to commercial/industrial customers who use innovative technologies, improve manufacturing processes, undertake renewable electric energy projects, or who need project design assistance. **POWERGrant** is available for a wide variety of projects employing diverse technologies.

Here are some examples of activities or products that could qualify for Minnesota Power funding under the **POWERGrant** Program:

- New electro-technologies that lower energy costs per unit of production in a manufacturing process
- Innovative technologies that are new and underutilized in our regional marketplace
- Inclusion of energy-efficient options in the design phase of a project

Maximum annual grants are determined by a customer’s average billing demand:

Customer Demand	Maximum Grant
Less than 100 kW	\$10,000
100 to 300 kW	\$25,000
Over 300 kW	\$50,000

Minnesota Power may consider higher rebate levels.

Other Minnesota Power Products and Services

In addition to **POWERGrants**, Minnesota Power offers commercial, industrial and agricultural customers other energy efficiency products and services. These include energy audits, rebates, dual fuel, storage/off-peak services, outdoor and area lighting, and economic development assistance.



Minnesota Power representatives tour the First National Plaza with owners and HVAC system installers. They are monitoring performance to see if VRFZ technology saves energy when retrofitted into historic buildings in Northeast Minnesota.

Minnesota Power energy consultants estimate the new HVAC system will lower First National Plaza’s monthly electric demand by 43.1 kW per month and save 98,483 kWh per year. Those savings qualified building owners for an additional **POWERGrant** rebate of \$8,807.

“Heating commercial buildings is a major expense for companies in our region,” said Craig Kedrowski, regional account manager, Minnesota Power. “We are very pleased that owners of the First National Plaza were eager to partner with us and invest in innovation. Their decision could stimulate real interest in this technology and have a dramatic impact on energy conservation.”

First National Plaza’s renovation already has energized Cloquet’s historic downtown, bringing in new businesses and traffic. First floor tenants include Eclipse Paint Inc. and Design Studio, Zoe’s Boutique, The Banana Leaf, Underground Aquatics and several other unique shops. Owners are remodeling the upper levels for commercial office space. They are proud to be showcasing the new VRFZ system and eager to share their experience with others.

“Our goal was to reduce our carbon footprint and show that historic buildings can become green and turned into something beautiful rather than torn down,” Sinnott-Wehr said. “There are many older buildings in our region that potentially could benefit from VRFZ technology. They don’t build them like this anymore.”

“If VRFZ works as well in this climate as other parts of the world we want it available so Minnesota Power customers can save electricity and money,” Kedrowski said. “Hopefully, this research will provide answers.”