



WINTER 2014: FOCUS ON HEALTH, WELLNESS FACILITIES

Top Three Reasons to Specify a VRF Zoning System for a Health, Wellness Facility

The fastest-growing segment of the U.S. HVAC market is **Variable Refrigerant Flow (VRF) zoning** – a flexible, cost-effective and environmentally friendly HVAC option. VRF zoning systems work well in all building designs (e.g., commercial, residential, industrial), turning the usually cumbersome and expensive process of trying to cool and heat a building that has multiple floors and areas into something easy and cost effective.

VRF zoning technology allows each zone to be controlled separately. With some systems, one zone can be cooled while another is heated. This is possible with technology from **Mitsubishi Electric US Cooling & Heating Division** (Mitsubishi Electric). The proprietary **INVERTER-driven compressors** offer full-range variable capacities, providing only the amount of conditioned air needed for a zone.

VRF zoning technology is especially effective in health and wellness facilities, such as hospitals, hospices and clinics. These facilities face a series of challenges that come from balancing running a business with serving an ailing population. Below are the top three reasons to specify a VRF zoning system in response to those challenges.

- 1. Patient Wellness and Comfort.** Patient comfort and health is the primary concern for facility managers and workers. When asked about their comfort, patients in hospitals and other health and wellness facilities often refer to their room's temperature. A too-hot or too-cold room might mar a patient's experience, or even be detrimental to their health. Meanwhile, there is no one-size-fits-all approach; one patient may require the soothing comfort of heat, while a patient in the very next room may require the



This H2i P-Series outdoor unit can make a world of difference for patients in health and wellness facilities.

refreshing briskness of cold. Hospitals can respond to these varying needs with HVAC systems that allow patients to set their own temperature, and so their own comfort. This is possible with the INVERTER-driven compressors found in Mitsubishi Electric's VRF zoning systems.

Air humidity plays into patient comfort, as well, and can also be a factor in patient health. Overly humid conditions can cause fatigue and can work against a facility's attempts to control microbial growth. Mitsubishi Electric's VRF zoning dry mode helps remove humidity from patient care rooms and laboratories.

Temperature and humidity regulation must happen quietly, as patients want to feel relaxed, not constantly aware of a blowing fan. Mitsubishi Electric's VRF zoning systems indoor units are manufactured to run between 19 and 34 decibels – quieter than a whisper (at 35 decibels).

- 2. Energy Efficiency.** Health and wellness facilities are in the business of making patients comfortable, but they are also a business and need to make an income. They want HVAC systems that save money, and a great way to save money is by using energy more efficiently.

Mitsubishi Electric VRF zoning systems are energy efficient largely thanks to their proprietary INVERTER-driven compressors. The compressors found in other systems stop and start repetitively, but the Mitsubishi Electric systems vary compressor speed to match the indoor cooling or heating demand and use only the energy that is needed. The system performs at only minimum energy levels and does not waste electricity when partial-load conditions are present.

Significant energy savings also result from pushing refrigerant through small pipes versus pushing huge volumes of conditioned air through costly, expensive-to-install and potentially contaminated, leaky ductwork.

- 3. Smart Design & Low Installation Costs.** The topic of small spaces is always a critical design issue. Engineers specify for all sorts of projects – whether a retrofit or new construction – but no facility has endless room to spare, especially since space often equals money. Health and wellness facilities are no exception; they seek to serve their patients, but their space is limited and valuable, and their HVAC selection must be cost efficient.

VRF zoning systems are a smart choice for such facilities. Efforts to provide patients with a calm, healthy experience are complemented by VRF zoning systems' small footprint. Installation costs are kept low, meanwhile, due to their installation being easier and quicker than other systems' installation, requiring fewer labor hours. Further money can be saved during installation because small VRF zoning units can be brought to the roof through the elevator instead of using a crane, and any work that needs to

happen once units are running can occur without disturbing the systems' operation. VRF zoning systems offer health and wellness facilities an easy and cost-efficient installation, and then an ideal and highly efficient product.

Click [here](#) for more information about Mitsubishi Electric's VRF zoning systems.

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Interview With an Engineer: Shawn Brill, Bighorn Consulting Engineers, Inc.



Bighorn Consulting Engineers specified Mitsubishi Electric VRF zoning systems for the Plateau Valley Medical Center.

Bighorn Consulting Engineers, Inc. (Bighorn), Grand Junction, Colorado, offers consulting engineering services for commercial, educational, institutional and residential building clients. **Mitsubishi Electric US Cooling & Heating Division** (Mitsubishi Electric) interviewed Shawn Brill, **LEED AP**, **BD+C** and **Certified Energy Manager**

(CEM). Brill is a founding partner of Bighorn and a 30-year HVAC engineer. He shared the firm's experience with **Variable Refrigerant Flow** (VRF) zoning systems.

Mitsubishi Electric (ME): How did you start specifying VRF zoning systems?

Shawn Brill (SB): About seven years ago, we looked hard at VRF zoning systems. We were sold on the concept – the zoning capabilities, heat recovery and lack of noise – and then the Mitsubishi [Electric] representative in our area called. He gave great reports and talked about the service training, so we went with Mitsubishi Electric.

ME: Please offer an example of a Mitsubishi Electric VRF zoning system design Bighorn worked on.

SB: We did a fire station remodel in Grand Junction. This was a concrete and steel structure, so we couldn't poke a lot of holes for ductwork. Meanwhile, the architect wanted high ceilings, and we needed a heat recovery system given the climate. Between the space constraints, the owner's desire for a flexible system and the fire district's desire for an efficient system, the answer was clearly a VRF zoning system.

ME: Bighorn also worked on Plateau Valley Medical Center's installation. **You've described the choice of that system as a "no brainer."** Can you talk about that?

SB: This was a medical office building that needed flexible and numerous zones. The climate here is so disparate; you can be cooling on one side of the building while heating on the other. The owner wanted an energy-efficient building. Meanwhile, the architect designed this classy look, so we couldn't have big equipment on the roof and ductwork hanging out of the walls. We were putting it all together and the light came on: *We have to do VRF.*

ME: What advice would you give an engineer who is considering using VRF zoning technology for the first time?

SB: Don't be afraid of it. It's been tried and tested over 20-plus years, and we've had very few issues with reliability here in the states. The VRF folks know that, in America, they need to take care of heating issues – when it's zero degrees outside. Mitsubishi Electric has worked through this; their systems are very robust. And the energy efficiency is out of this world, which is helpful when it comes to LEED® and Green Globes.

ME: Finally, what are your thoughts about using VRF zoning systems in health and wellness facilities, specifically?

SB: Zoning is so important here. You have people of different states of undress and different ages. You have patients next to staff. You might have a staff member running around, right next to a half-undressed grandmother. VRF zoning answers that, meanwhile the heat recovery means you're not wasting heat by bringing it outside to the condensing unit.



WINTER 2014: FOCUS ON HEALTH, WELLNESS FACILITIES

Important Updates to ASHRAE Manual for HVAC Engineers Working on Hospital Projects

All HVAC systems are installed to ensure clean and comfortable air, but HVAC systems in hospitals face a particularly heavy burden due to the importance of mitigating the transmission of airborne disease. [The American Society of Heating, Refrigerating and Air-Conditioning Engineers \(ASHRAE\)](#) states that “Health care HVAC systems serve facilities in which the population is uniquely vulnerable and exposed to an elevated risk of health, fire and safety hazard. These heavily regulated, high-stakes facilities undergo continuous maintenance, verification, inspection and recertification; typically operate 24/7; and are owner occupied for long life.” Engineers brought on to specify HVAC systems in hospitals have more to contend with than usual.



HVAC systems in hospitals face specific challenges.

ASHRAE offers a manual written specifically for experienced mechanical and HVAC engineers to help navigate this difficult terrain. Their manual educates readers on meeting infection control criteria in terms of energy efficiency and from a business standpoint. It recently underwent a revision, and some key features have changed.

The 2008 publication of ASHRAE Standard 170 – Ventilation of Health Care Facilities – defined ventilation system design standards for infection control. The updated ASHRAE manual is based on the guidelines issued in Standard 170, and concerns several changes made to ventilation, air changes, temperature, humidity, filtration and design practices in health and wellness facilities. The updated manual also reflects the industry’s move toward greater energy efficiency, newly addressing energy recovery. Health and wellness facilities can consume large amounts of energy, making energy recovery a potential source of savings.

Ultimately, the manual helps HVAC engineers understand the importance and process of designing safe, dependable and money-saving hospital HVAC systems. For instance, it details the fact that all hospitals have cooling loads throughout the entire year due to their many heat-producing devices (e.g., imaging technology). At certain points in the year hospitals' HVAC systems will need to simultaneously cool and heat.

ASHRAE's updated manual ("HVAC Design Manual for Hospitals and Clinics," second edition) is available for purchase on [their website](#) in PDF or print. ASHRAE members pay \$109 for the manual; the general public pays \$129.

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WINTER 2014: FOCUS ON HEALTH, WELLNESS FACILITIES

Case Studies

Five Installations and Still Going Strong



Choctaw General Hospital's 44,000-square-foot addition.

Rush Health Systems (Rush), Meridian, Mississippi, opened the first hospital in Choctaw County, Alabama in 2012. The **Choctaw General Hospital**, a 74,000-square-foot critical access hospital, needed a unique HVAC system to meet patients' comfort needs.

Fred Rogers, Rush's veteran vice president, chief resource officer and facility manager, decided to renovate an existing building for the administration portion of his new hospital and create a 44,000-square-foot addition to house the patient care section.

For the addition, Rogers easily selected the **Variable Refrigerant Flow (VRF) zoning system** from **Mitsubishi Electric US Cooling & Heating Division** (Mitsubishi Electric). "Fortunately, I installed my first Mitsubishi Electric VRF [zoning] system years ago in our flagship Rush Health Systems hospital in downtown Meridian. That system saved me \$36,000 the first year. I now specify this excellent VRF zoning system for all new critical access hospitals we build: Choctaw is our fifth. This technology is the finest for the very specific needs of the health care industry," Rogers said.

Rogers' loyalty to VRF zoning systems took hold in 2005. Rush started a multimillion-dollar renovation on **Rush Foundation Hospital**, Meridian, Mississippi. The facility desperately needed a renovation. Rogers said that, with their old system, they faced "increasing patient dissatisfaction with the temperature and comfort factor in our patient rooms." Rogers needed

a system to provide individual zones for each room – a system to satisfy one patient who wanted his/her room very warm next door to one who wanted it very cold. Did such a system exist, he wondered?



Mitsubishi Electric's simultaneous cooling and heating systems boost patient comfort.

Rogers searched online for answers and discovered VRF zoning systems from Mitsubishi Electric. A local distributor explained the basics, then a Mitsubishi Electric training class taught Rogers about the compressor technology and the exclusive Branch Circuit (BC) controllers that made the system's two-pipe simultaneous cooling and heating possible. He concluded that a comfortable interior environment would be maintained, while saving the hospital considerable energy costs.

Rogers returned home and worked with local contractors to design and install the system. The entire installation – the equipment, piping and wiring – was in place and running in less than two weeks. "I have a very strong instinct that my Mitsubishi Electric investment was the right thing," Rogers said at the time.

Almost a decade has passed since; Rogers' continued investment in and excitement about Mitsubishi Electric VRF zoning technology suggest that his instinct was right.

To view the full version of the Choctaw General Hospital case study, click [here](#); to view the full version of the Rush Foundation Hospital case study, click [here](#).

An Engineer's Decade-long Interest in VRF Zoning Technology

America's history with **Variable Refrigerant Flow (VRF) zoning system** from **Mitsubishi Electric US Cooling & Heating Division** (Mitsubishi Electric) traces back to one engineer's 2002 trip to Naples, Italy. Charles VandenBulck, **Smith and VandenBulck**, A Division of SAV Engineering, Inc., Savannah, Georgia traveled to Naples for an HVAC conference, where he was introduced to VRF zoning technology from Mitsubishi Electric. "I had to learn more about this innovative, new technology," he said at the time.



One engineer's decade-long interest in VRF zoning technology began with an HVAC installation in Hospice Savannah.

The systems had not yet been launched in the U.S., so to learn more VandenBulck traveled to Japan to tour the Mitsubishi Electric plant and receive a technical briefing. He learned about the systems just as he began work on a new project in the U.S. – a renovation of **Hospice Savannah**, Savannah. VandenBulck had originally planned to propose a residential gas system with a traditional chiller fan coil for the hospice. But as he learned about VRF zoning technology, he knew he had found the ideal solution – zone control with simultaneous cooling and heating. "It was just what I was looking for and didn't know existed," he said.



VandenBulck oversaw the installation and design of the hospice's new cooling and heating system; he chose these outdoor units to offer the patients comfort and quiet.

VandenBulck returned home and set out to design America's first Mitsubishi Electric VRF zoning system. His team selected 10 **PURY-100TMU** outdoor units (100 tons of overall capacity) for the heart of the system. The handling of outside air became a critical design factor due to the nature of terminal patient care. The client wanted the indoor units to be non-obtrusive and out of sight, so the team selected 50 **PLFY four-way airflow ceiling-recessed cassette units** that they neatly hid in the soffit. Code required the infusion of outside air, so the team introduced **energy recovery ventilators (ERV)** to exhaust air

from the buildings' bathrooms. Everything was then connected to a central branch controller, which orchestrated the air handling and the simultaneous cooling and heating.

“The VRF system by Mitsubishi [Electric] is simply amazing,” said VandenBulck at the time. Each patient has “the pleasure of controlling their own comfort zone [and] better indoor air quality. All bathrooms and hallways [have] odors removed instantly. Overall, there is a great sound of silence. The real kicker, however, was that, when compared to the competition, the Mitsubishi Electric system was the least expensive option!”

A decade has since passed in which VandenBulck has remained committed to the technology. “I still spec VRF [zoning systems] because of the system efficiency,” he said almost exactly ten years after the hospice renovation. And he specifies it often: “We’re currently installing VRF [zoning systems] in a conversion of a privately built structure into the county office building. We’re also working on a renovation converting a parking garage into the county courthouse and offices, and that will include VRF [zoning systems]. There’s also a house we’re working on that will have VRF [zoning systems]...”

Mitsubishi Electric’s VRF zoning systems have now been installed in thousands of projects throughout the country, and across various building types and designs. With U.S. early adopters like VandenBulck, acceptance of VRF zoning systems in this country continues to exceed expectations.

To view the full version of the Hospice Savannah case study, click [here](#).



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Industry Members Talk About VRF Zoning Systems for Health, Wellness Facilities

Specifying an HVAC system for a health and wellness facility means satisfying the demands of the project team – architects, facility managers, owners, builders, developers, etc. Happily these professionals all agree that **Variable Refrigerant Flow (VRF) zoning systems** from Mitsubishi Electric US Cooling & Heating Division (Mitsubishi Electric) are ideal for such facilities. Here's why:

- Comfort Control.** "I control each indoor unit from my office computer. I can bump the temperature up or down in each patient suite keeping everyone happy." – Linda Swart, executive director, **Life Touch Hospice House**, El Dorado, Arkansas
- Air Quality.** "The coil units are small and limit the amount of possible cross contamination of air flow between individual zones." – George Skinner, HVAC contractor for **Lamb Foggo Urgent Care Center**, GSC Limited, Hamilton, Bermuda
- Energy Savings.** "In 2008, I installed my first VRF system; I was able to save \$36,000 a year." – Fred Rogers, vice president, chief resource officer and facility manager, **Rush Health Systems**, Meridian, Mississippi
- Space Savings.** "The outdoor compressor units have the smallest footprint in the industry – and with the two-pipe system there is no wasted space." – Stan Williamson, McLain Plumbing & Electrical Services, Inc., Philadelphia, Mississippi, on **Rush Hospital Stennis Center**



Products like the VRF zoning R2-Series outdoor unit are ideal for health and wellness facility HVAC needs.



WINTER 2014: FOCUS ON HEALTH, WELLNESS FACILITIES

What to Consider When Specifying an HVAC System for a Health, Wellness Facility



Health and wellness facilities like Plateau Valley Medical Center of Colorado, have unique needs that engineers must consider when specifying an HVAC system.

Engineers are key to HVAC installations; their expertise is highlighted in capturing the unique needs of different facilities. A residential project has different requirements than a fast food restaurant, a fast food restaurant has different requirements than an office building, and so on. **Mitsubishi Electric US Cooling and Heating Division** (Mitsubishi Electric) products have been installed in every building design, each time with an engineer's knowledge guiding the specification and design process. Engineers who have worked on Mitsubishi Electric installations have, over the years, developed a set of tenets to abide by when specifying for a health and wellness facility:

- Patient comfort can be maximized by providing separate temperature control in each room.
- Patient health is paramount and can be supported by proper ventilation.

- A hospital's HVAC system must be quiet and not disturb patients or practitioners.
- A hospital's HVAC system must be efficient to minimize energy costs.
- It is necessary to balance the owner's expectations with budget, space and energy-use constraints.
- Facilities located in areas with wide-ranging climates benefit from a system with a heat recovery function.

To read an example of a Mitsubishi Electric installation in a health and wellness facility, click [here](#).