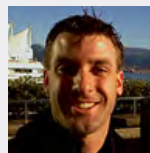


In This Issue . . .

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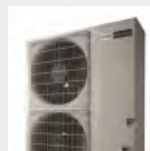
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Interview with an Engineer: Austin Allen, Henderson Engineers Inc.

An engineering design firm, Henderson Engineers, Inc. offers core mechanical, electrical and plumbing design, as well as fire protection . . .

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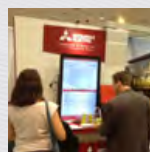
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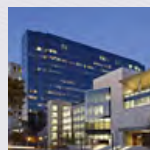
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Check out this 3D animation that shows a commercial installation of a VRF zoning system.

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White Paper Highlights VRF Zoning System for Schools and Universities

Mitsubishi Electric Cooling & Heating recently developed a white paper that describes how energy-efficient VRF zoning systems are ideal for schools. Click [here](#) to read the white paper.



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VRF Zoning Systems Ideal HVAC Retrofit Solution

Mitsubishi Electric CITY MULTI® Variable Refrigerant Flow (VRF) zoning systems are particularly good choices for retrofit and renovation projects, especially in older buildings with no air conditioning, where ductwork would be difficult or expensive to install. Here's why:

Design and installation flexibility. CITY MULTI is a simple, two-pipe system with easy non-polar, two-wire control connections. Depending on the renovation and the original structure, Mitsubishi Electric VRF zoning systems can be installed with minimal impact on the architecture and daily operation. Multiple indoor unit styles include ductless and ducted options for added flexibility.

Lighter weight. The compact outdoor units are 31 percent lighter than chilled-water systems, so they are easier to handle and install and cost less to transport. Moreover, the load can be distributed across the existing structure or avoided by mounting the units on the ground.

Discreet indoor units. The wide variety of ductless indoor wall-mounted, floor-standing (concealed and exposed), ceiling-recessed, suspended, and vertical and horizontal concealed-ducted styles provides an array of design options. Indoor units can be mounted within the ceiling, high or low on walls or in the floor.

Maximum energy efficiency. Traditional systems waste energy by cycling off and on, but Mitsubishi Electric's innovative INVERTER technology varies the compressor speed according to the zone's cooling or heating load and set temperature. Also, with flexible control, you can cool or heat only the spaces in use.

Quiet operation. Technologies built into each CITY MULTI system contribute to its quiet operation. The system's INVERTER-driven compressor technology modulates, rather than bang on and off, to ramp up and down to meet the needs of the space. The compressor is housed in its own compartment, surrounded by sound-dampening insulation and is mounted on vibration absorbing feet. Special fan designs add to the quietness of outdoor and indoor units which can operate at a whisper sound level.

Control Options. Several controller types are available (wireless, wall-mounted and hard-wired) to provide ultimate comfort control. The wireless remote controllers are easier to use than most TV remotes, featuring large displays and a variety of settings that can be controlled from anywhere in the room. Up to 2,000 indoor units can be managed together by the CITY MULTI Controls Network (CMCN).

Case Study: Union Mill

VRF zoning systems are uniquely suited for restoration projects, such as the historic Union Mill in Baltimore. The 86,000-square-foot duck-canvas mill was restored into a vibrant complex featuring one- and two-bedroom apartments and mixed-use space. Mechanical engineers recommended a Mitsubishi Electric CITY MULTI VRF zoning system for the restoration because the outdoor units are compact and quiet. They also said the diverse number of indoor unit styles provided the architects with lots of options.

The system required only two pipes from the outdoor unit to the branch circuit controller, and two pipes to each indoor unit. Just one small penetration was made through the mill's 26-inch-thick walls for the two bundled refrigerant lines.

An additional advantage of the VRF zoning system is its ability to simultaneously cool and heat different zones within the mill. Heat energy is collected from the zones in cooling mode and transferred to the zones that require heating. This helps maximize energy efficiency and translates into a monthly utility bill per apartment of only \$50.

Once completed, the restored Union Mill became the first project to be certified under the Baltimore City Green Building Standard.



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Interview with an Engineer: Austin Allen, Henderson Engineers, Inc.

Engineering design firm **Henderson Engineers, Inc.** offers core mechanical, electrical and plumbing design, as well as fire protection, architectural lighting, technology, commissioning and sustainable consulting services. Mitsubishi Electric Cooling & Heating interviewed mechanical engineer Austin Allen, P.E., LEED AP, of the firm's Kansas City, Kan., headquarters about his experiences with Mitsubishi Electric Variable Refrigerant Flow (VRF) zoning systems.

Mitsubishi Electric Cooling & Heating (ME): You have specified Mitsubishi Electric VRF zoning systems for several renovations and retrofits of retail tenants. Why is VRF zoning technology especially suited for those jobs?

Austin Allen (AA): Retail tenants, especially luxury retail tenants, have specific zoning requirements and extreme amounts of small zones in their spaces. I really like the ability to separately zone the equipment and provide resize control in these smaller zones, like in private sales areas and conference rooms. That's one of the real benefits.

ME: Many of your clients are in shopping malls. Are there specific benefits of a VRF zoning system for malls?

AA: The system's refrigerant line lengths allow us to be really flexible about where we locate our condensing units and where we route the refrigerant lines. A lot of times we go into an existing mall with pre-existing structures and adjacent tenants. The ability to route the linesets back to the service corridor and away from other tenants means we don't have to disrupt another tenant above us or beside us.

ME: Why do you prefer installing VRF zoning systems in your projects?

AA: We do a lot of work in high-rise office buildings in major metropolitan areas. A lot of times, those buildings have really shallow floor-to-floor heights, so we're not able to run ductwork to transfer heat. The VRF system allows us to maintain high ceiling heights and fit the equipment into tight spaces.

ME: Does the Mitsubishi Electric system help your clients achieve LEED certification?

AA: VRF technology makes that easier, especially for commercial interiors certification programs. With it, the project can earn LEED certification rating system credits for equipment efficiency and for appropriate zoning controls. VRF allows you significantly more zones than you would have otherwise, because you can isolate solar zones, interior spaces, private offices and other special occupancies.

ME: Would you say that compact size and energy efficiency are the top reasons for using a VRF zoning system?

AA: Those are important, and aesthetics is right up there, too. One thing we focus on is incorporating our design into the architect's vision of the space. In a lot of cases, the VRF system gives us the ability to do that because it is a very flexible system. It allows us to maintain high ceiling heights. Some manufacturers say the cost savings and benefits come from locating the interior unit on the wall or leaving it exposed on the ceiling, which eliminates the requirement for ductwork. But most of our clients won't accept that method because the units are exposed. Instead, the benefit we find is the flexibility to hide the equipment. It allows us to run refrigerant piping instead of ductwork anywhere. Plus, we don't know of another system type that is as quiet as these units.

ME: Have you used the Mitsubishi Electric VRF system in conjunction with other HVAC systems?

AA: We're working on a project in Toronto that combines the VRF system with a water-source heat pump in a high-rise office/luxury apartment building. We're using a water-to-refrigerant VRF system to handle the cooling-only applications within the space [to cool the elevator machine room and the computer rooms]. The VRF zoning system allowed us to have dedicated units for those relatively small loads even though there was a space constraint. The elevator machine room needed a dedicated unit, but water-source heat pump units weren't available to fit into the space.

ME: What advice would you give an engineer who is thinking of using VRF zoning technology in a design for the first time?



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AA: Don't be scared of it. From a design standpoint, it takes the engineer less time to design. Provided that the contractor has the appropriate training, it will save him time at CA [construction administration], too, and it will provide him a lot of flexibility to do a lot of things that he can't with other systems. It's not a hard sell; in fact, it's a very easy sell.

Have a great Mitsubishi Electric story to tell? Please [contact us](#) to share it in an upcoming issue.



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New S-Series Addition Is Only 5-ton, Single-Phase System on the Market

Mitsubishi Electric has announced an addition to its **Variable Refrigerant Flow (VRF)** zoning S-Series cooling and heating systems. The updated S-Series PUMY-P60 model is the only 5-ton, single-phase VRF zoning system available for homes and light commercial spaces.

The following are key aspects of the new S-Series model:

- Includes INVERTER-driven compressor and intelligent microprocessor controls.
- Operates at as low as 22 percent of total system capacity.
- Guaranteed heating performance down to minus 4 degrees Fahrenheit outdoor temperature.
- Has extended line length to 492 feet.
- Features improved efficiency at 16.7 SEER.
- Can connect to up to 12 indoor units.
- Features 130% connectable capacity.
- Is compatible with all CITY MULTI® indoor unit styles.
- Is compatible with the CITY MULTI® Controls Network (CMCN).

The S-Series opens up the benefits of VRF zoning technology to low-to mid-rise commercial buildings and larger homes. To learn more about the S-Series, click [here](#).



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VRF Zoning Systems: Misconceptions About ASHRAE Standard 15

Mitsubishi Electric Variable Refrigerant Flow (VRF) zoning is the leading technology worldwide, including throughout North America. Nevertheless, VRF zoning systems' unique features, including connecting multiple indoor units to the outdoor unit with space saving and effective refrigerant piping, have led to misconceptions about system applications in regards to [ASHRAE Standard 15](#) which instruct engineers and designers in the many aspects of refrigerant safety. This article highlights the guidance for specifying and applying VRF zoning systems MEUS has provided for many years.



ASHRAE Standard 15 History

ASHRAE Standard 15 specifies safe design, construction, installation and operation of refrigerant systems to protect building occupants and property. Written in 1914, Standard 15 was created to provide guidance for safety concerns in large refrigeration plants using ammonia and other early refrigerants. Over time, the scope of Standard 15 was expanded to cover most refrigerants and systems, but not VRF zoning systems. MEUS members have been working with the ASHRAE committee (SSPC-15) that has responsibility for updating this standard. It should also be noted that this standard applies to all types of HVAC equipment and not just VRF systems. Even rooftop systems with VAV systems can have issues with Standard 15.

R410A is the refrigerant used in newer and more energy-efficient systems. When Standard 15 was revised in 2007, it did not include a direct reference to R410A refrigerant, except for a footnote: "The refrigerant safety groups in Table 1 are not part of ASHRAE Standard 15. The classifications shown are from ASHRAE Standard 34, which governs in the event of a difference. So system designers need to refer to ASHRAE Standard 34 when applying Standard 15 safety principles to R410A refrigerant."

ASHRAE Standard 34 was developed "to establish a simple means of referring to common refrigerants. It also establishes a uniform system for assigning reference numbers and safety classifications to refrigerants. The standard identifies requirements to apply for designations and safety classifications for refrigerants, including blends, in addenda or revisions to this standard." A main point of discussion under ASHRAE Standard 34 is Refrigerant Concentration Limit (RCL), which is defined as "the refrigerant concentration limit, in air, determined in accordance with this standard and intended to reduce the risks of acute toxicity asphyxiation and flammability hazards in normally occupied, enclosed spaces." ASHRAE Standard 34-2010 limits refrigeration concentrations in these areas to 26 pounds per 1000 cubic feet for R410A and 12.5 pounds for R22.

In most cases, VRF zoning system components do not pose a safety or suitability issue. Because ASHRAE Standard 15 requires factory testing of all components that contain refrigerant, the likelihood of failure is remote. Field fabricated connections also require inspection and evaluation.

Refrigerant Leaks in Occupied Spaces

Engineers, designers and other professionals should keep in mind that ASHRAE Standard 15 primarily covers the catastrophic release over a short period of time from the refrigerant bearing system. But even in the unlikely event of a line rupture, not all of the refrigerant in a VRF system circuit would escape and it would take several minutes for the discharge to occur. To our knowledge, there has never been a serious incident or fatality related to a VRF system.

The term "permanent openings" is not clearly defined in the current version of the standard. There is guidance from a Japanese industry standard to use undercut doorways, transfer grilles or interconnecting ductwork between adjacent spaces in a similar manner as potential means to disperse refrigerant in the case of a leak. The effectiveness of such mitigation strategies is of course application dependent considering adjacent space volumes, face area of opening, pressure differential between adjacent spaces and other key design factors. Corridors and lobbies should be reviewed if refrigerant lines pass through them as well because their volume is, by definition, part of the connected spaces volume. The design team would be expected to evaluate the 'worst case' in a typical situation for each space in the building. Paragraph 7.3.2 in Standard 15 addresses "Ventilated Spaces" with regard to the inclusion or exclusion of ductwork systems yet does not discuss the impact of dilution air in a conditioned space.

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With all of these ambiguous situations it is still the engineer's responsibility to evaluate the space an HVAC system serves and the system's refrigerant line paths. If the HVAC components are in occupied spaces, they must be evaluated for safety and suitability. MEUS recommends that engineers review our published white paper on designing our systems with ASHRAE Standard 15 considerations and consulting with our sales engineering staff.

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Mitsubishi Electric Showcases New 5-ton Outdoor Unit at Greenbuild



VRF Zoning Technology Meets Tough Renovation Demands

In November, Mitsubishi Electric showcased its new **S-Series PUMY-P60** model at the leading green building trade show, and hundreds of attendees visited the booth for a closer look at the **Variable Refrigerant Flow (VRF) zoning system**.

The 2012 **Greenbuild International Conference and Expo** drew more than 30,000 building professionals to San Francisco's Moscone Convention Center, Nov. 14-16. The event featured networking opportunities, inspiring speakers, workshops, tours of some of San Francisco's greenest buildings and a chance for pros to learn about the latest in green building practices, products and technologies.

Sponsored by the **U.S. Green Building Council**, Greenbuild is the world's largest conference and exposition dedicated to green building design, construction and products. San Francisco was an ideal choice for the event because it was recently named the **greenest city in North America** and has the largest number USGBC LEED® certified buildings, including two structures in the Moscone Center.

The Mitsubishi Electric booth featured the only 5-ton, single-phase VRF zoning system designed for the light commercial and residential markets. Booth visitors were impressed that Mitsubishi Electric's VRF zoning systems can help new and renovated buildings earn valuable LEED points in the Energy & Atmosphere (EA) and Indoor Environmental Quality (IEQ) categories.

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VRF Zoning System Protects Colorado's History

Established in 1879, the Colorado Historical Society has long served as the state's memory keeper. In 2008, the society sought to reinvent itself for a 21st century audience, and four years later, the stunning 200,000-square-foot, \$110 million History Colorado Center opened. Designed by Tryba Architects, Denver, the center's architecture is meant to be as monumental as its exhibitions, and is slated for LEED® Gold certification.



To meet the design and high-tech exhibit requirements, Craig Watts, PE, LEED AP, principal with MKK Consulting Engineers, Denver, sought a flexible, high-performance HVAC system. History Colorado also needed consistent temperature control for when Rocky Mountain temperatures dip below zero.

MKK specified a Variable Refrigerant Flow (VRF) zoning system from Mitsubishi Electric Cooling & Heating. The system was equipped with a Low Ambient Cooling Kit, which guarantees performance to minus 10 degrees Fahrenheit.

Mitsubishi Electric VRF zoning systems are ideal for applications that require precise temperature control. The compressors use INVERTER-driven technology that responds quickly to indoor and outdoor temperature changes, varying their speed to meet load requirements and maintain a set temperature.

Providing cooling to server rooms and electrical closets is a challenge, especially when they are located throughout a building. The Mitsubishi Electric system has extremely long piping line lengths, so rooms can easily be connected to one system.

"This approach helped us save on installation costs by reducing the amount of equipment, electrical wiring and piping on the project," said Chris Zalinger, project manager, RK Mechanical, Denver.

Operating an air-cooled air-conditioning system in cold weather presents a unique set of challenges, like maintaining adequate system head pressure and battling uncontrollable winds. The Mitsubishi Electric VRF zoning system solved those issues.

"I knew the Low Ambient Cooling Kit was vital to the success of the data protection installation," Watts said. "It also became clear that a competitor's system did not have the technology to meet this need. Having the kit made my choice simple."

Likewise, the History Colorado's Mitsubishi Electric system performs admirably during the summer months. "Even though we have had record heat last summer in Denver, we have not had a single issue related to the units," said Chief Building Engineer Doug Crowell. "I am pleased and impressed with the excellent performance."

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

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