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# From the Editor

**W**hile not quite yet at the level of Europe or Asia, acceptance of ductless technology is growing fast in the U.S. market. Ductless is another market segment that allows the contractor an excellent opportunity for growth. This is a joint venture between *The NEWS* and the AHRI Ductless Section. All section members were invited to participate in a sponsorship. This ebook tackles ductless systems. In this book, you will learn how to promote the advantages of ductless, learn about training options, and also read about real world examples of where ductless was the right technology for a specific job. We hope that whichever way you are reading this ebook — PDF, digital edition, or iPad app — you will enjoy our coverage of the ductless market.



*Kyle Gargaro*  
*Editor-in-Chief*  
*The NEWS*

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# Contractors Offer VRF Advice

by Cherie Preville of *The NEWS* Staff 

**V**arious areas of the U.S. HVACR industry are considering variable refrigerant flow (VRF) technology these days. For example, ASHRAE added a chapter on VRF systems in the 2012 edition of the ASHRAE handbook, "HVAC Systems and Equipment." According to ASHRAE, the chapter describes VRFs and standards that apply to them in detail "and includes a system design example and important guidance on costs, controls, and safety."

It's not just the HVAC industry that is taking notice of VRFs, though. The U.S. government's General Services Administration (GSA), through the Green Proving Ground (GPG) program is looking at VRF technology in addition to other HVAC and energy management technologies. According to the GSA's website, the GPG "aims to drive innovation in environmental performance in federal buildings and help lead market transformation through deployment of new technologies."

Besides the associations and agencies, are contractors giving attention to VRF? Many contractors are interested in the technology but have expressed that they would like to know more before getting involved with these systems. Others have already made that decision and have integrated VRFs into their customer offerings.

## Background

According to the GSA's website, a "VRF uses refrigerant as the cooling/heating medium, and allows one outdoor condensing unit to be connected to multiple indoor evaporators, each individually controllable by its user,

while modulating the amount of refrigerant being sent to each evaporator. ... By operating at varying speeds, VRF units work only at the needed rate. Heat recovery VRF technology allows individual indoor units to heat or cool as required, while the compressor load benefits from the internal heat recovery."

A couple of other notable aspects of VRFs include that a VRF system's indoor units can be used for cooling/heating a zone and the systems are most commonly installed in ductless applications. One of the reasons the GSA listed as to why "VRF technology holds particular promise for GSA's historic buildings" is that "it enables the use of a large variety and configuration of inconspicuous indoor fan coil units."

Other applications can run the gamut from residential to commercial. Martin Hoover, president of Empire Heating and Air in Decatur, Ga., said that his company installed them in sun rooms and attic expansions, but has installed them in computer rooms, too. Bill Murcko, new construction project manager, Blair's Air Conditioning & Heating, Clearwater, Fla., said his company has installed them in residential houses ranging in size from 4,600-6,100 square feet. They are quite often found in commercial applications, too, such as university buildings and hotels.

## What to Do and Not Do

One piece of advice that various contractors said they'd give to another contractor who has never worked with or on VRF equipment is to go get train-



ing and become certified, and follow the proper procedures. Brian McDonald, general manager of Outer Banks Heating & Cooling, Kill Devil Hills, N.C., put it even more simply. “Read the install manual,” he said.

Scott Getzschman, president of Getzschman Heating LLC, of Fremont, Neb., said that he believes that “if the contractors that install the [VRF] systems go through the certification process, you will see better results on service and installation practices.” He added that his company provides “continued training to all employees that would ever install or service these systems.”

Proper training makes a difference, Hoover indicated. He said the only problems his company has seen on VRF projects are “with improper installation procedures.”

Something else that Getzschman said is helpful to know about VRFs is that “they are similar to mini-splits in operation. Condensate is critical; make sure you can remove the condensate.”

Murcko said a critical component to the VRF installation process is “in regards to refrigerant piping and brazing, as well as flaring the refrigerant lines to the indoor units (braze at outdoor unit). The entire refrigerant piping circuit must be 100 percent free of leaks and pressure tested to 500-psi nitrogen. During brazing, nitrogen must be flowed through to avoid any contaminants inside the refrigerant lines.” He also advised HVAC contractors who have little or no experience with VRFs to “go out and buy a good set of flaring tools if you don’t already have one.”




Scott Getzschman  
President  
Getzschman Heating LLC  
Fremont, Neb.

Hoover said that when it comes to installing and servicing VRFs, one must not exceed line lengths or lifts (part of the manufacturer’s specifications for the maximum length and vertical lift of the copper lines separating the indoor unit from the outdoor unit) or fail to properly evacuate (air and moisture from the refrigerant piping).

Getzschman also remarked on line lengths. “There isn’t a problem as long as you can remove the condensate, and your line lengths fall within guidelines,” he said.

Another point that Murcko said contractors should know is “the duct systems (on ducted concealed mount units) are limited to an external static pressure of 0.47 w.c. in most cases (on high-static concealed). So long duct runs are prohibited, as well as higher MERV filters because their initial resistance in w.c. are so high.”

His biggest surprise when he began working on VRF projects “was how quickly and efficiently the inverter technology was able to initially cool down a house at start-up.”

Though proper training is needed and one must be mindful of such things as line lengths; refrigerant piping, brazing, and flaring; condensation removal; and proper evacuation; adding VRF systems to your company’s knowledge base gives you another solution your company can provide to solve customers’ comfort needs. Hoover said that in terms of his business, VRFs have “given us a new tool to work with, but hasn’t changed our overall makeup.” 

# Promoting the Advantages of Ductless Technology

by Herb Woerpel of *The NEWS* Staff 

**W**hile ductless technology is a widely accepted form of air conditioning and heating worldwide — especially in Asia and Europe — the technology is still rather new to the U.S. market. Yet it is a rapidly growing and maturing branch of the U.S. HVAC market.

According to manufacturers interviewed by *The NEWS*, the maturation of the mini-split market is directly attributed to the technology's energy efficiency, space-saving capabilities, ease of installation, zoning capabilities, and quiet operation.

## Energy

Ductless technology provides a zoning solution that allows a user to condition only occupied spaces, rather than an entire house — regardless of occupancy. It is a common assumption that a central heating/cooling system may lose as much as 20 percent of its efficiency due to duct leaks or faulty installation. With a ductless system, because the indoor unit is located within the targeted space, there is no air/energy leakage through duct loss.

"Ductless systems offer individual temperature control, installation flexibility, energy efficiency, and quiet operation at a level that really sets them apart from other types of HVAC systems," said Marc Zipfel, director of



Contractors with Champion AC, San Antonio, carefully set a newly installed wall-mounted ductless air conditioner into place.





Technicians Carl Einsig and Jamie Schrum handle the indoor evaporator section of the new ductless units installed at the Heidelberg United Church of Christ in York, Pa.

product marketing, Mitsubishi Electric Cooling & Heating. "Ductless units are extremely energy-efficient, meaning end users can save money on energy bills over time."

## Space

A ductless system conditions a room without the use of ducts, saving space and allowing the unit to be retrofitted into spaces absent of ducts. Ductless mini-splits can be designed to cool several rooms, mimicking the sophisticated zone control of modern central air. The technology has especially been a hit in areas where real estate space is at a premium.

"Some multi-split ductless systems can have as many as four indoor air-handling units for four zones or rooms attached to one outdoor unit," said Christopher Wickman, marketing manager, ductless split systems, Carrier. "Since each zone or room has its own control, the homeowner can save energy and money by conditioning only the occupied spaces."

## Installation

Ductless systems are also gaining in popularity due to their simple installation. A qualified contractor can usually install the units in less than a day. Since there is little to no ductwork required, there are no worries about duct or ceiling issues interrupting the process. The unit mounts discreetly within the desired space, while a set of small refrigerant lines and power wires connect to the outdoor unit through a small opening in the wall.

"The ease of installation is a big advantage to the consumer and contractor," said Don Wojcik, senior manager of eastern distribution sales, LG Electronics. "For retrofit applications, it is easy to add the units, especially in older buildings that have never been equipped with air conditioning before."

## Zoning

In a central air conditioning system, refrigerant is pumped from the outdoor condenser coil inside to a single indoor coil, from which cooled air is distributed to each room through a system of ducts. In many houses and businesses, unless zone control dampers have been

installed, either as original equipment or as a retrofit, the amount of cold air in one room cannot be regulated without changing the temperature of every room in the building. Ductless systems allow an alternative to this practice, as users control the amount of air introduced to each room through each indoor unit. Multiple variations are available, creating single-zones, dual-zones, tri-zones, quad-zones, and more based upon the number of indoor installations.

“Efficiency is achieved through zoning,” said Mike Delwiche, director of sales, room air products, Heat Controller. “Increases in energy costs are driving the need for zoned cooling, and mini-splits help meet that need. The air handler is dedicated to the room being conditioned, which can be kept at a temperature and humidity level different from the rest of the house or building. A unit in a bedroom or a home office, for instance, can be easily programmed for the times when the room is occupied.”


## Sound

In some areas, buildings are so close together that sound is a major concern. Split ductless systems are recognized for their quiet operation because the outdoor unit is located outside the residence. In some cases, a ductless indoor unit may run at only 19 dBA — comparable to the sound of a desktop computer fan.



Ceiling cassette ductless air conditioners provide maximum comfort while utilizing minimal space.

“Indoor units operate at nearly whisper-quiet sound levels,” said Kimmy Do, product specialist engineer, Daikin AC Inc.

This low noise level is attributed to the isolation of the compressor from the other parts of the unit, and a ductless unit’s ability to cushion very well against vibration. 





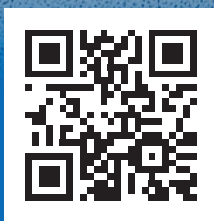
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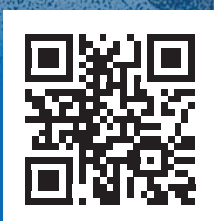
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# Evolution of Training for Ductless Mini-Splits

by Erin Mezle for *The NEWS* Staff 

**D**uctless mini-splits are taking the United States by storm. These systems started out as single-zone, spot-cooling solutions and are now easily installed for whole home or business heating and cooling for year round comfort. Some units have the ability to connect as many as eight indoor units to one outdoor unit, others have energy efficiency SEER ratings above 27 with incredibly comfortable, high heating outputs and HSPF ratings above 12. Homeowners and business owners alike are turning toward mini-splits for their comfort needs and finding minimal disruption to their home and property during installation.

As the popularity of mini-split HVAC systems rise, so does the need to train contractors. Mini-split technology is still very new for many contractors, so it's important for installers and technicians to be properly trained and for them to take refresher courses from time-to-time. It is critical to a system's functionality that it is installed correctly. The only way to ensure this is through contractor training.

## Mini-Splits Then and Now

In the early days, the few ductless companies in the market offered a product line of single-zone, wall-mounted systems that typically consisted of no more than 9, 12, and 18,000 Btuh cooling-only systems. Training consisted of classroom



As the popularity of mini-split HVAC systems rise, so does the need to train contractors.

style learning. Limited product offerings meant limited training options. Today, companies like Fujitsu offer over 57 models which can create almost 10,000 combinations of systems when considering Btu size and indoor model style. Indoor model styles are available in wall mounted, cassette, ducted, universal floor/ceil-





Quality manufacturers highly recommend that installers take some form of training before installing their equipment.

ing mount, and ceiling suspended. Multi-zone systems allow for up to eight indoor units to be connected to one outdoor unit. Technology has improved to include Inverter driven compressors and variable-refrigerant capacity operation which offers huge energy savings when operating at part load conditions.

Mini-splits have caught on. These systems are no longer purchased by skeptical consumers keeping their fingers crossed as they put their faith in their

contractor's recommendation. Instead contractors are hearing directly from consumers, asking to have mini-split systems installed in their homes and businesses.

### Training is a Necessity

As a low energy consuming device; demand will continue to increase, likewise, the number of contractors installing mini-splits will increase. Even the best quality products will need to be serviced someday and the technology utilized in variable-capacity mini-splits does require more of an investment in education than the standard HVAC system of the past. Companies are offering a wide breadth of training opportunities for contractors to best fit their skill level and busy schedules. Providing the contractors the ability to properly install and service mini-splits after the sale offers consumers peace of mind by leaving less chance of future support issues.

Many mini-split training classes earn contractors NATE Continuing Education Credits for attending. Contractors must provide their NATE I.D at the time of

training and sign in on official NATE sign-in sheets in the classroom.

- **Local Classroom Learning:** Quality manufacturers highly recommend that installers take some form of training before installing their equipment. The first step is usually local classroom and/or hands-on training. Fujitsu for instance, offers a national program of regionally accessible classes that provide detailed information about equipment, operating components, and installation requirements; as well as troubleshooting and diagnostics for their mini-split systems. Detailed course material is paired with interaction, involvement, and participation with students.

It is common for manufacturers to offer incentives to attend courses. Students that pass the course exam may be listed on the company's list of local installers, ultimately earning them sales leads.

- **Hands-On Local Training:** Students retain more information and truly gain experience when working hands-on with the actual HVAC units and components. Since many contractors have busy schedules that don't allow for travel, local hands-on courses are often ideal.

For example, Fujitsu offers an Electrical Diagnostics and Teardown Training course which is comprised of in-depth electrical diagnostics and troubleshooting. Students learn how to diagnose circuit boards and controls for mini-split systems and get to completely teardown and rebuild an indoor wall hung unit. In addition, students receive training on dc variable-speed technology and variable-capacity refrigerant metering devices.

- **Extensive Hands-On Factory Training:** Larger manufacturers like Fujitsu have training facilities at their headquarters or in regional locations that allow them to offer a combination of classroom and hands-on training. Training courses can provide in-depth job planning, design, layout, installation, and servicing of their HVAC systems. Even experienced installation and service technicians can use the provided installation hints, tips, and suggestions for how to maintain good customer relationships with follow-up maintenance and scheduled service.


- **Online Training, Testing, and Tutorials:** Would you like to learn more about mini-split systems, installation techniques, and service on your own time? Some manufacturers offer online courses day or night, from home or any other place you can get online. Various courses can be offered, individual test results are stored, and passing students can print out certificates upon completion.

- **Webinars:** A webinar is an online web conference that provides sales or technical training support even to those in outlying areas. It allows people



Large manufacturers like Fujitsu have training facilities at their headquarters or in regional locations.

from all over to share in classes without incurring travel expenses while still getting the personal attention of an experienced proctor. These are great when a refresher course is needed or training on a specific topic is required.

It's evident that ductless companies are trying to make it as easy as possible for contractors to receive the education required to successfully sell, install, and service mini-split systems. Training is the key to success for both manufacturers and contractors. 

#### About the Author:

Erin Mezle is the director of marketing for Fujitsu General America Inc.



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# Staying Ahead of the Ductless Curve

by Matt Bishop of *The NEWS* Staff 

**M**ichael Haines has always been on the cutting edge of technology. Haines, the owner of the Winter Park, Fla.-based AC4Life.com, has been selling air conditioners on the internet since 2001, starting that business when the market had no competitors.

But long before he was a business owner, Haines was always looking at the most technologically-advanced systems. As a salesman in the 1980s and 1990s, Haines started pitching a product few others were, ductless air conditioning systems, and that continues to this day.

"I noticed when I was selling them back in the '80s and '90s and my competition wasn't and that customers really appreciated it," Haines said. "They appreciated me telling them about it and it was easy for me to get the sale because I was offering something nobody else was."

But it wasn't until the internet got big that ductless systems really took off.

"It's immensely more popular now," Haines said. "I notice when I look at Mitsubishi's sales curves, it starts in 2001. Before that, it was relatively flat. You look at that and it's gone up fairly linearly over the last 11 to 12 years. When I see that, a lot of it is internet-based. Not that they're all buying on the internet, but the information is available to them and they have access to information they didn't have before."

## Starting Out

Haines first started selling heating and cooling items on eBay even before they had a category for it, and said the results were "almost immediate." When he started AC4Life.com in 2001, purchasing goods off the internet, especially big-ticket items like air conditioners, was in its infancy. "I tested it on eBay and I think I did something like \$30,000 my first week in sales," Haines said. "So about six months into that, I had a website built and the business took off. I re-did the website, launched a new website in January 2005, and business basically tripled overnight."

After the success of that site, he launched Orlando Air Conditioning & Heating three years ago to distribute and install in the local area. "I decided years ago that I never wanted to be an air conditioning contractor, even though I had a contractor's license," Haines said. "I just didn't like what I saw in the business. It didn't seem like it was very fun and compelling. But when I got more knowledge about it, I realized I didn't have to do business the old fashioned way, that there was a new way to do things."

And one of those new ways of doing things was continuing to push ductless air conditioning systems. Haines was named Mitsubishi's ductless air conditioning dealer of the year in 2010 and 2011, continuing a track of success with ductless systems that started as a salesman.



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As the internet got big, so did the ductless part of AC4Life.com.

“When I got more knowledge about it, I realized I didn’t have to do business the old fashioned way, that there was a new way to do things.”

“Even when I was working in sales back in the ‘80s and ‘90s, it seemed like I was the only one offering ductless systems as a solution to a customer with an unusual room or a bonus room or a Florida room,” Haines said. “Typically, dealers were offering to put in a bigger system and put ductwork in. I didn’t sell a ton of them back then, but I remember when I did recommend them, the customers didn’t know what they were and most of the competitors didn’t know what they were, so it was fairly easy to sell them because they weren’t getting quotes from anybody else on these things.”

Although Haines admits the cost of installing a ductless system can be intimidating for a large home, the benefits are clear, he said, noting the biggest one is zoning.

“You don’t have to heat or cool any room you’re not in,” he said. “The analogy I always give is when you walk into your house, you don’t turn on one light switch and turn on every single light in the house, yet we do that with our single most expensive appliance to operate and that’s our air conditioning system. We turn on the thermostat and we heat and cool every





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“The analogy I always give is when you walk into your house, you don’t turn on one light switch and turn on every single light in the house, yet we do that with our single most expensive appliance to operate and that’s our air conditioning system.”

single room in the house. But with ductless, you don’t have to do that. You can independently control each room and they are extremely efficient.”

As the ductless revolution continues to roll on, Haines credits the development and proliferation of the internet in helping consumers understand exactly what ductless systems are. And Haines takes full advantage of this, filling his company’s sites with all the literature one could possibly need to determine if they want to purchase a ductless system.

“People are looking for information on the internet,” Haines said. “They don’t care about me or my company. They want specific answers to questions. They want to know if a



ductless system is a good option for them and the only way they'll know is if I lay it out for them.


"Even if they don't buy from us, I've always made the information available. We're making it easy for them to make a decision and if they do decide they want to buy from us, we're more than happy to help them."

The wealth of information now available has led to ductless systems trending upward when it comes to sales and interest. "The ductless industry has probably benefitted more than any other manufacturer of air conditioning systems simply by the fact their information is available now," Haines said.

But what's the future?

Haines estimates that ductless systems currently comprise about 15-20 percent of his sales, but he expects that number to continue to trend upward as the

years go by because of its increasing popularity among consumers. He said that as the ductless industry continues to improve by offering things like multi-zone products, the traditional system model "is in jeopardy to a certain degree."

"I think the ductless industry believes they're going to replace traditional ducted systems," Haines said. "I don't doubt that. I think as energy efficiency becomes more and more important, it makes more sense to be able to control each room in your home individually. So to me, it's kind of like hybrid cars. You talk about combustion engines and that sort of thing, 10 years from now, I don't think you'll really be able to buy a combustion engine car that doesn't have some sort of hybrid or fuel or electric assist or something. I think the whole industry's changing and I think they're going to be going to the ductless system." 

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# VRF Product Installed in History Museum

**E**stablished in 1879, the Colorado Historical Society had longed served as the state's memory keeper, occupying a number of buildings over the course of its 133-year history. By 2008, the society had sought both a new home and an opportunity to reinvent itself for audiences of the 21<sup>st</sup> century.

Changing its name to History Colorado, the organization began a monumental effort to imagine a new headquarters and a groundbreaking history museum in Denver's Golden Triangle Museum District. In April 2012, the stunning 200,000-square-foot, \$110 million History Colorado Center opened to the public with new exhibits and programs, blending artifacts, environments, media, and technology in immersive environments to showcase Colorado's colorful stories.

Designed by Colorado architect David Tryba of Tryba Architects, Denver, the History Colorado Center's architecture is meant to be as monumental as the museum's ambitions, with expectations for LEED® Gold certification, a high honor for a structure of this size.



The History Colorado Center has expectations for LEED Gold Certification.  
(Photo by Frank Ooms.)

The center's high-tech and hands-on exhibits include multimedia programs, state-of-the-art technological displays, a media wall with 132 interlocking LCD screens showing a 10,000-year history of Colorado, and a research center and archival storage for more than 15 million items, including more than 750,000 photographs and 200,000 artifacts.

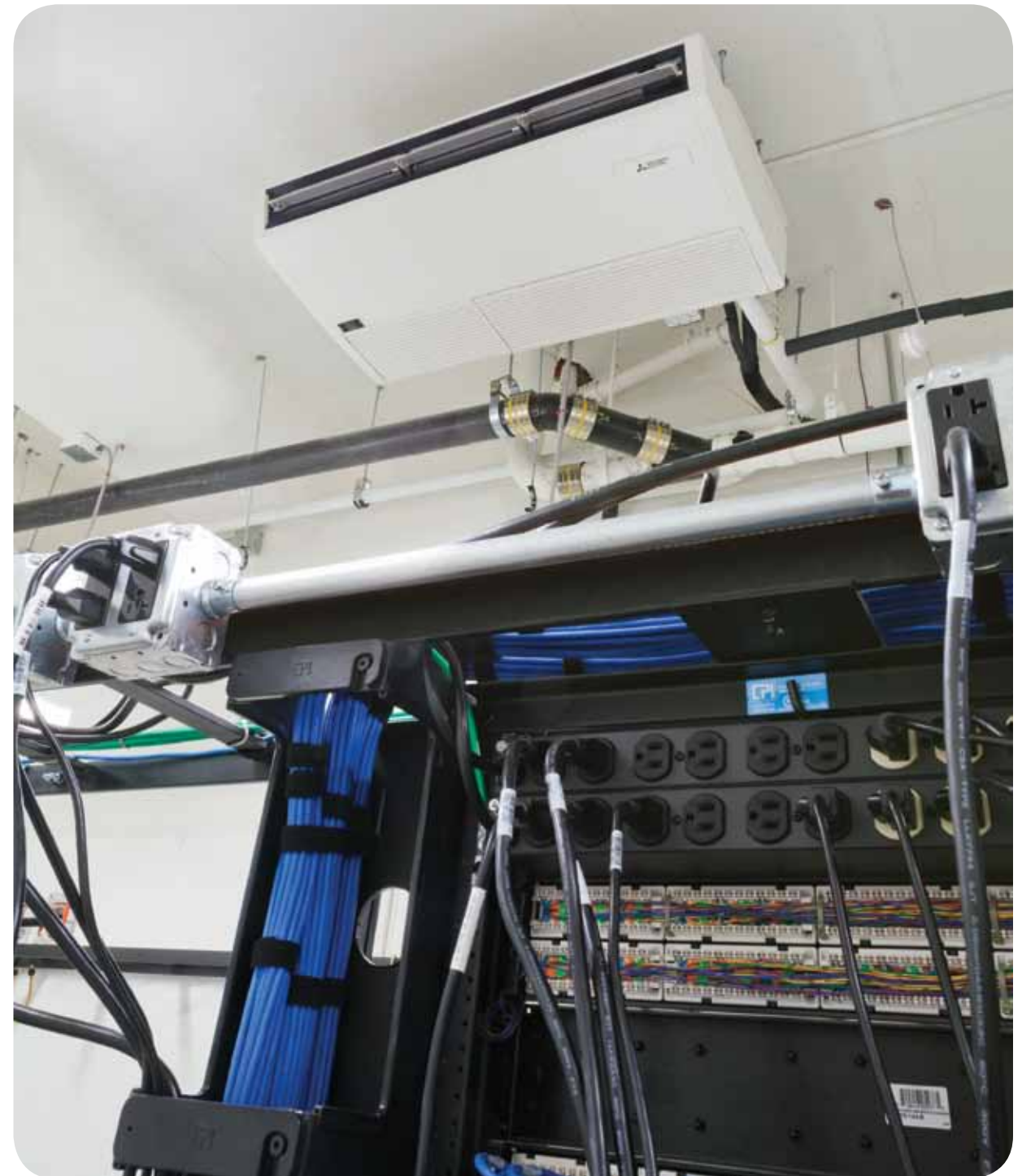
Craig Watts, PE, LEED AP, principal with MKK Consulting Engineers, Denver, set the direction for the museum's mechanical systems during the design phase. The team of MKK engineers was especially interested in finding a reliable, high-performance HVAC system to protect the museum's eight vital "nerve centers" — four electrical rooms containing large transformers, switchgear, Cisco network equipment, lighting and breaker panels, and four data closets loaded with database servers, IP phone connectivity, fiber optic equipment, an analog phone network, security equipment, and point-of-sale equipment. With the constant heat gain from these eight centers, MKK needed a bulletproof, mission-critical system to keep the temperature in these rooms at the constant 67°F required by the State Office of Information Technology (OIT).

These systems could not fail. A cooling failure in any one of these centers would have a disastrous impact not only on the loss of historical data, communications and security systems, but also on the function of all the sophisticated museum exhibits — the large display screen in the grand atrium, amplifiers, DVD players, and the entire network of sound and lighting controls throughout the building.

## Nerve Center Systems

MKK specified that the cooling system for these eight vital stations be separate from the large Variable Air Volume (VAV) mechanical systems that would cool and heat the museum's offices, conference rooms, and exhibit, presentation, and common areas.

Chief building engineer Doug Crowell said, "It is critical to have the controls for these nerve center systems be entirely separate from the control systems of the rest of the building. If the main VAV system fails, the IT, electrical and AV rooms will not be impacted. In fact, to be really secure, we maintain a constant temperature of 67° in all these eight centers."



The engineers were interested in finding a reliable, high-performance HVAC system. (Photo by Frank Ooms.)





VRF zoning systems can be used for applications that require precise temperature control.  
(Photo by Frank Ooms.)

The eight crucial nerve systems in the History Colorado Center needed to have reliable temperature control when Rocky Mountain temperatures dipped 0°, as they often do. Charles Landherr, commercial area sales manager for Mitsubishi Electric Cooling & Heating, urged Watts and his design team to consider specifying a Variable Refrigerant Flow (VRF) zoning system from Mitsubishi Electric equipped with a low ambient cooling kit, which guarantees cooling operation down to minus 10°.

VRF zoning systems are ideal for applications that require precise temperature control. Mitsubishi Electric compressors use inverter-driven technology that responds instantly to minute indoor and outdoor temperature changes. These systems vary the compressor speed to meet load requirements and maintain the set point temperature.

Chris Zalinger, History Colorado Center project manager of RK Mechanical in Denver, explained that a common challenge with providing cooling for server rooms and electrical closets is that they are often spread throughout the building, as was the case with the History Colorado Center. “Because of Mitsubishi Electric VRF systems’ flexibility and extremely long line lengths, designers can now combine these rooms on one system. This approach helps save on installation costs by reducing the amount of equipment electrical wiring and piping on a project.

MKK agreed believing, “It made better sense to specify Mitsubishi Electric’s VRF zoning system because it can serve up to 50 indoor units with one out-



One of the more important problems is maintaining adequate system head pressure due to reduction in temperature and uncontrollable winds blowing on the outdoor compressor. (Photo by Frank Ooms.)

door unit, greatly reducing the number of condensing units on the roof. This leads to a reduction of electrical connections and roof penetrations.”

Operating an air-cooled air-conditioning system in cold weather — when the condensing unit is installed outdoors — presents a unique set of problems that must be overcome for the system to operate reliably over a wide range

of weather conditions. One of the more important problems is maintaining adequate system head pressure due to reduction in temperature and uncontrollable winds blowing on the outdoor compressor.


The Low Ambient Cooling Kit from Mitsubishi Electric includes rear and side wind deflectors and a hood with damper controls. The kit features an outside air



“It is critical to have the controls for these nerve center systems be entirely separate from the control systems of the rest of the building. If the main VAV system fails, the IT, electrical and AV rooms will not be impacted.”

sensor that controls the damper position on the hood. When the outside air temperature drops below 23°F, the dampers will begin to close in pre-programmed increments, lowering airflow through the outdoor unit. The colder it gets, the more the dampers close, allowing reliable cooling operation down to subzero temperatures.

Zalinger added, “Mitsubishi Electric’s unique two-pipe heat recovery and heat pump systems provide unmatched flexibility to meet any building needs. With the introduction of the Low Ambient Cooling Kit, Mitsubishi Electric extended the cooling operation down to minus 10°F. This is unquestionably a beneficial technology for use with small data centers and electrical closets that generate a constant heat load.”

Crowell sums up his day-to-day involvement with Mitsubishi Electric’s VRF zoning technology this way: “Even though we have had record heat this summer in Denver, we have not had a single issue related to the units themselves. I am pleased and impressed with the excellent performance of our Mitsubishi Electric VRF zoning systems.” 

This article was provided by Mitsubishi Electric.



A common challenge with providing cooling for serving rooms and electrical closets is that they often spread throughout the building. (Photo by Frank Ooms.)

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