



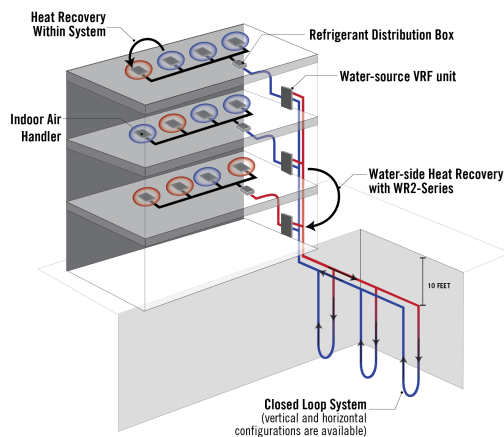
SUMMER 2014

## Eight Reasons Why Engineers Specify Mitsubishi Electric Geothermal VRF Zoning Systems

Geothermal systems are gaining popularity in the U.S., with more than 50,000 units installed each year, according to the [U.S. Department of Energy](#). These systems are among the most efficient and reliable cooling and heating technologies on the market.

The systems use the earth's relatively constant underground temperature to balance the temperature of the exchange medium. Water in the heat exchanger circulates through a series of loops below the surface, absorbing or expelling heat to the below-ground heat sink depending on the time of year. This function ultimately reduces the load on the compressor and results in significant energy savings.

### GEOTHERMAL COOLING AND HEATING WITH VRF



Note: Graphic created by Griffin & Company, Inc.

**Mitsubishi Electric US Cooling & Heating Division** (Mitsubishi Electric) is at the forefront of geothermal cooling and heating with its line of **CITY MULTI® water-source Variable Refrigerant Flow (VRF) zoning systems (W-Series)**. W-Series systems combine the convenience of geothermal systems with the sophistication of VRF zoning systems. Two versions of the W-Series are available: WY models, which independently cool or heat; and WR2 models, which simultaneously cool and heat through heat recovery.

Below are the top eight reasons why engineers are specifying Mitsubishi Electric geothermal VRF zoning systems.

1. **Flexible installation.** W-Series units can be installed in relatively small spaces like utility closets and need minimal access on either side of the unit. Refrigerant, water and electrical connections are housed on the front of the unit for ease of access.

Traditional water-source heat pump systems (WSHPs) require multiple condensers in each zone and the units must be installed in the ceiling space. A single W-Series condenser connects up to 50 indoor units, making installation quicker and easier for engineers.

2. **Application variety.** W-Series condensers can be connected to an array of **indoor unit styles** to accommodate the specific needs of the space. All models feature the same benefits for the user: Quiet operation, easy maintenance and optimal comfort.

The 20-ton **WR2-Series** and 30-ton **WY-Series** models can operate with water temperatures as low as 23 degrees Fahrenheit and as high as 113 degrees Fahrenheit. This allows more possibilities for geothermal applications in extreme climates.

The configuration of the below-ground loop systems can be customized to accommodate the building's surroundings. For example, the loops can be buried under a building or a parking lot by drilling either vertical boreholes or horizontal trenches.

3. **Low maintenance.** Fewer condensers mean less maintenance. The only upkeep required for water-source VRF zoning systems is occasionally cleaning the heat exchanger coils and regularly cleaning or replacing air filters. Condensers can be housed in floor-level utility closets for convenient access and minimal disruption to occupied spaces.
4. **10-year payback period.** Installing a water-source VRF zoning system is expensive for project teams up front, however, over time energy savings can offset the initial cost of the system. The average payback period is 10 years. The combination of geothermal and VRF zoning technologies results in significant energy saving potential due to the milder loop temperatures requiring less work from the condenser.
5. **Advanced controls.** The success and sustainability of any water-source system depends on the proper operation of the

system's controls. Mitsubishi Electric W-Series systems provide the benefits of the advanced **CITY MULTI Controls Network** (CMCN) for geothermal applications. The CMCN offers a selection of tools, software and mobile applications to provide local, centralized and remote monitoring and control over a building's HVAC system.

6. **Clean energy source.** W-Series systems use the earth's natural solar energy collection and heat storage capabilities to cool and heat buildings. This is a more environmentally friendly and efficient source of energy compared to non-renewable fossil fuels.
7. **System efficiency.** W-Series units are able to take advantage of a building's load diversity. The maximum allowable connected nominal capacity of units is 130 percent for the WY-Series and up to 150 percent for the WR2-Series.

The WR2-Series system offers further efficiency by simultaneously cooling and heating different zones to provide additional energy efficiency. The system captures energy from one zone that would otherwise be expelled to another location (i.e. outdoors or underground) with opposite condensing needs. This reduces the total amount of energy used by the system as compared to traditional WSHP systems, which require full condenser operation in each zone.

8. **Tax credits.** W-Series systems may qualify for up to a 10 percent commercial tax credit for the total installed cost of the geothermal system. Contact your local tax professional to determine eligibility.

Click [here](#) for more information about Mitsubishi Electric's W-Series systems.



SUMMER 2014

## Expanded BIM Content Available to Enhance Systems Specification

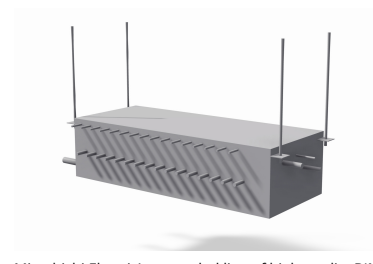
Engineers can now specify cooling and heating solutions more easily and quickly with the expanded offering of **Autodesk® Revit** (Revit) families from **Mitsubishi Electric US Cooling & Heating Division** (Mitsubishi Electric). The expanded offering includes 115 Building Information Modeling (BIM) content files that work within the Revit interface and include all Mitsubishi Electric products on the market.

The new content offering provides a faster optimization of building design, allowing engineers to save time and money directly from their desktop. The models are loaded with features to get the most out of BIM, including:

- MEP connectors.
- Shared parameters.
- Complete manufacturer metadata.
- Geometry that is constrained to references.

Also available are high-resolution model renderings, 3D CAD files, scheduling files for each equipment type as well as PDF content guides and tutorials for each Revit model.

Click [here](#) to access Mitsubishi Electric's featured Revit families.

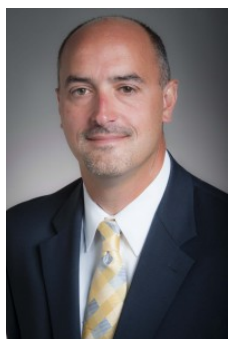


Mitsubishi Electric's expanded line of high-quality BIM content files allows engineers to easily understand how to specify and apply the division's products.



SUMMER 2014

## Interview with an Engineer: Heapy Engineering, Inc.



Alec R. Carnes, PE, CEM, LEED AP BD&C, senior principal, Heapy Engineering, Inc., Dayton, Ohio.

**Heapy Engineering, Inc.** (Heapy), Dayton, Ohio, is a nationally recognized leader in sustainability. Heapy delivers innovative and creative engineering solutions for the health care, education, commercial and government markets. Heapy provides professional services from the project's start, including mechanical, electrical and technology systems design, planning, LEED® and energy consultation and commissioning.

**Mitsubishi Electric US Cooling & Heating Division** (Mitsubishi Electric) interviewed Alec R. Carnes, PE, CEM, LEED AP BD&C, a senior principal at Heapy. Carnes shared the firm's experience with engineering the installation of Mitsubishi Electric's CITY MULTI® water-source **Variable Refrigerant Flow** (VRF) zoning systems in two of the nation's oldest dormitories – Elliott Hall and Stoddard Hall at the **Miami University of Ohio** (Miami University), Oxford, Ohio.

**Alec Carnes (AC):** Brian Isaacs, director of corporate sales for **The Habegger Corporation** in Cincinnati, brought Miami University's director of energy systems, Doug Hammerle, to a Mitsubishi Electric training center to demonstrate VRF zoning capabilities and benefits. Brian wanted to show Doug why Mitsubishi Electric's WR2-Series water-source VRF zoning system was the ideal solution for Miami University's campus wide utility master plan with geothermal cooling and heating as a centerpiece. We did a life cycle

cost analysis comparing VRF zoning technology to more traditional HVAC solutions like variable air volume systems and four-pipe units. We demonstrated to Doug how the simultaneous cooling and heating WR2-Series water-source system, coupled with Miami University's closed loop geothermal system and working together with Mitsubishi Electric's **Dedicated Outdoor Air System** (DOAS) air handlers, would produce premium energy efficiency.

**Mitsubishi Electric (ME):** What factors went into the decision to specify VRF zoning systems for the Elliot and Stoddard Halls?

**ME:** Why was the WR2-Series water-source VRF zoning system such a good fit for Elliott and Stoddard?

**AC:** We explained that Mitsubishi Electric systems are simply better engineered and, coupled with the geothermal wells, would be far more efficient than a traditional system and ideal for saving energy costs. The Mitsubishi Electric water-source VRF zoning systems use the earth's constant temperature to steadily absorb or expel heat to the indoor heat exchangers and air handlers. Mitsubishi Electric's DOAS is unique because of its energy efficiency and the fact that it can use the heat recovery feature to provide "free" reheat. The DOAS pre-conditions outside air for introduction into downstream HVAC units, lessening the load on HVAC systems.



The exterior of the Elliot Hall dormitory at the Miami University of Ohio.

Miami University did not want us to install refrigeration condensers in every unit in each student room. They did not want their maintenance guys going into the student rooms to service the system's typical units. We were able to accommodate this wish because of Mitsubishi Electric's advanced technology and equipment. We installed three of the condensing units in the historic attics of each dormitory, which was made possible by the compact size and weight of the WR2-Series water-source VRF zoning systems. The systems' performance efficiency is independent of outdoor ambient temperatures as they are easily installed indoors. The Mitsubishi Electric indoor units are so quiet that one doesn't even know they are operating. This low-ambient noise level is ideal for a student room.



The mechanical room in the Elliot and Stoddard Halls houses three Mitsubishi Electric water-source heat pumps.

**ME:** Why was Mitsubishi Electric's VRF zoning the most practical option for these historic buildings?

**AC:** A four-pipe HVAC system was impossible to install in these historic buildings. They are too complicated and require too much space. We told Doug that this unique VRF zoning, two-pipe option would enable Miami University to maintain the historical and architectural integrity of these two legacy structures.

We built wood cabinets with removable panels for periodic cleaning around the units and installed them where the old steam radiators used to be to further maintain the building's historic architecture and aesthetics. The reduced size of the indoor units made this possible. There are two small pipes where the steam radiators were formerly located that carry cooling and heating refrigerant quietly to the unit in each bedroom.



SUMMER 2014

## VRF Zoning Ideal for Rising Multifamily Market

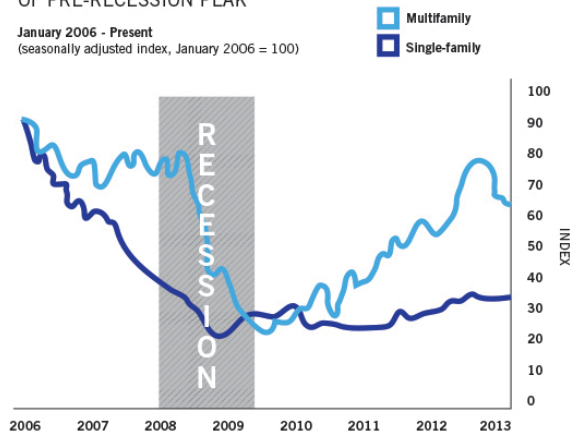
Multifamily is a significant part of today's construction marketplace. Consider these statistics:

- Roughly one-third of Americans live in multifamily buildings.
- Homeownership has been declining since 2004 (see chart below).
- Millennials prefer renting to buying.

According to the [National Association of Home Builders \(NAHB\)](#), this trend is likely to continue. Panelists at the 2014 [International Builders' Show \(IBS\)](#) in Las Vegas reported that strong demand for apartments will increase over the next several years.

HOUSING STARTS AS A PERCENTAGE OF PRE-RECESSION PEAK

January 2006 - Present  
(seasonally adjusted index, January 2006 = 100)



Source: Economics and Statistics Administration analysis of data from US Census Bureau

Data from the U.S. Census Bureau highlights multifamily and single-family market activity pre- and post-recession.

Engineers can expect multifamily projects to become a more significant part of their business. According to the [U.S. Environmental Protection Agency \(EPA\)](#), greater than half of the multifamily units in the U.S. are more than 30 years old with [similarly aged HVAC systems](#).

Purchasing a cooling and heating system for both new and existing multifamily projects is a major cost decision for building owners and developers. Multifamily design also presents unique challenges for engineers specifying an HVAC system. Below are **six benefits** of [Variable Refrigerant Flow \(VRF\) zoning systems](#) that address the challenges of multifamily HVAC design.

1. **Energy Efficiency.** According to the [EPA](#), multifamily tenants spend approximately \$22 billion on energy every year. Rising energy costs are contributing to the decline in housing affordability for many Americans. Housing industry studies project that, with the right energy reduction measures, multifamily properties can become 30 percent more efficient by 2020. VRF zoning systems consistently perform at 25 percent higher efficiency than traditional systems and can significantly reduce a building's energy use.
- Energy-efficient HVAC systems offer indirect benefits to multifamily building owners and developers. Lower utility costs and higher occupant comfort levels can result in decreased vacancy rates, reduced turnover, an edge over the competition and, in some cases, higher than average rent.
2. **Peak Load Flexibility.** Energy-use schedules in multifamily buildings are not as predictable as other applications. It can be difficult to estimate when tenants will occupy the space and how much energy will be used. The INVERTER-driven compressors in VRF zoning systems are ideal for buildings with unpredictable energy use schedules because they can accommodate a variety of partial and full load conditions.
  3. **Space Saving.** The lack of ductwork with VRF zoning systems maximizes existing square footage. The two-pipe design of the systems allow for easy installation in buildings without existing ductwork and the ability to reclaim spaces formerly devoted to larger mechanical systems. The small footprint of outdoor units can provide more rental space or free up other areas for community use.
  4. **Retrofit Capabilities.** VRF zoning systems are ideal for retrofit applications. The lack of ductwork enables the installation of a

modern HVAC system, while preserving the architectural integrity of the space that was not designed for ductwork.

5. **Maintenance.** VRF zoning systems offer easy maintenance including periodic cleaning of unit coils and cleaning or replacement of air filters. One unit can be serviced without taking the whole system offline for minimal tenant disruption.
6. **Individual Comfort Control.** Each tenant unit features its own comfort control system. This increases occupant comfort and decreases maintenance complaints. Centralized software gives building management control over hallways and unoccupied units. Also, it allows them to monitor and control the systems remotely through a smartphone or other Internet-enabled devices.



SUMMER 2014

## New Software Helps Engineers

### DIAMONDSYSTEM BUILDER

Mitsubishi Electric's new and improved Diamond System Builder software provides several enhanced features.

Mitsubishi Electric US Cooling & Heating Division (Mitsubishi Electric) has rolled out a new version of its **Diamond System Builder software**. This interactive equipment selection and system layout tool allows engineers to accurately configure **Mitsubishi Electric ductless and Variable Refrigerant Flow (VRF) zoning systems** faster and easier.

The updated software includes these enhanced features:

- Increased support for special piping length allowances and height differential checking.
- Improved control view layout.
- Revised selection capacities for the MXZ, M-, S- and P-Series systems, including AutoCAD output.
- Software maintenance and updates through remote database syncing.
- Simplified commissioning and startup checklist reporting process for an extended warranty.
- Enhanced schedule output functionality for specifying engineers.

To download the free Diamond System Builder software, click [here](#).





SUMMER 2014

## Product Updates

### Mitsubishi Electric Expands Hyper-Heating INVERTER™ (H2i®) Family for Residential Applications

Mitsubishi Electric US Cooling & Heating Division (Mitsubishi Electric) kicked off 2014 with the unveiling of its revolutionary Hyper-Heating INVERTER™ (H2i®) MSZ-FH model.



H2i® MSZ-FH model (outdoor unit)

The engineering behind the H2i MSZ-FH model introduces groundbreaking technology to the industry. It is the most energy-efficient ductless model on the market at 30.5 SEER. The patented H2i technology allows it to operate at 100 percent heating capacity at 5 degrees Fahrenheit, giving it the highest low ambient performance capability on the market.

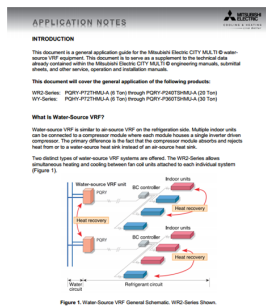
The advanced technology of the H2i MSZ-FH model provides engineers with other benefits apart from the system's industry-leading performance. The H2i MSZ-FH model is available in 9, 12 and 15 kBtu/h capacities, allowing engineers to specify the high-performing heat pump for any residential application, anywhere in the U.S. The Hyper-Heating capabilities of the H2i MSZ-FH model also reduce the need for a backup heat source, such as a gas furnace or boiler.

The system's small footprint means less labor, fewer materials and easy installation. These features allow trained contractors to install the H2i MSZ-FH model in less than a day, further reducing labor costs.

The H2i MSZ-FH model joins the most complete family of cold climate products, available from single-zone ductless systems to 16-ton Variable Refrigerant Flow (VRF) zoning systems for residential, light commercial and commercial applications.

For more information on the H2i MSZ-FH model, visit [www.mitsubishipro.com](http://www.mitsubishipro.com).

### New Geothermal Application Note Available



The geothermal application note from Mitsubishi Electric educates engineers on the various applications and benefits available with water-source VRF zoning systems.

The updated application note from Mitsubishi Electric US Cooling & Heating Division (Mitsubishi Electric) is a valuable resource for understanding and applying water-source VRF zoning systems. Geothermal systems are among the most efficient and comfortable cooling and heating solutions on the market today.

Application Note 2017 is a comprehensive guide to CITY MULTI® water-source Variable Refrigerant Flow (VRF) zoning systems. Engineers can download the application note on [mylinkdrive.com](http://mylinkdrive.com) to learn best practices for designing with Mitsubishi Electric's WY-Series and WR2-Series systems.

Application Note 2017 compares water-source VRF zoning systems to other types of HVAC systems, provides the systems' design and application requirements and features graphics and diagrams for added support (see Figure 4).

Click [here](#) to access the Application Note 2017: Water-source VRF Zoning System Application Guide and other valuable resources from Mitsubishi Electric.

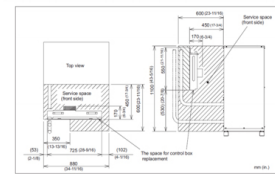


Figure 4. Service clearance drawing from the Engineering Manual. Application Note 2017 includes graphics, charts and diagrams for easier understanding.



SUMMER 2014

## Water-source VRF Zoning System Brings Comfort to 224-Year-Old Mansion

**Strawberry Mansion** is the largest of seven historic Fairmount Park houses in Philadelphia and one of the most celebrated homes in the city.



Strawberry Mansion needed an HVAC system that required minimal demolition and provided installation flexibility in order to preserve its historic architecture.

for the two-pipe **Variable Refrigerant Flow (VRF) zoning system** from **Mitsubishi Electric US Cooling & Heating Division** (Mitsubishi Electric). The two-pipe system and discrete indoor units could easily fit in the old chase walls and ceiling where there was no space for ducting. The extraordinary flexibility of the modular system and diversity of indoor units were perfectly adaptable for the restrictions posed by the 224-year-old structure. There is no HVAC system and technology better suited to historic preservation and adaptive reuse," Harper says.

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

The Mansion closed for an extensive, four-year renovation in 2009. One of the most pressing needs was a complete replacement of the 1930s radiators, steam and condensate piping in favor of a new central heating and air-conditioning system. It was a challenge to find an advanced HVAC system that would have an unobtrusive impact on the fabric of this historic house, which includes 10,000 square feet of space on four levels, 23 rooms and masonry-bearing walls.

Strawberry Mansion enlisted **Carter Mechanical**, Paoli, Pa., for the engineering design. Jeff Harper, Carter's project engineer, explains the HVAC selection process. "As soon as we saw the job, it was obvious that it was a perfect application



The slim, ductless design of Mitsubishi Electric's VRF zoning system is well-suited for the 1780s Mansion.