URBAN DESIGN TRENDS IMPACT INTERIOR DESIGN AND HVAC INTEGRATION

Open-concept, modern urban designs use Mitsubishi Electric VRF zoning systems to maintain comfort control.

Architecture and urban design continue to adapt to rapidly changing cultural and economic forces. *ARCHITECT* magazine names two of this year’s top design trends: **customizable building** and **non-invasive architecture**. Both directly relate to how architects incorporate comfort control systems into commercial and residential design.

**Variable refrigerant flow (VRF) zoning systems** are innately customizable and non-invasive. While they are best known for their energy-efficient operation, they are an integral part of urban building design for other reasons. The following points describe trends showing how VRF zoning systems satisfy customizable building and non-invasive architecture.

**Customizable Building**
“In the new economy—characterized by fluidity between living, working, and making—purpose-built structures will quickly become obsolete,” says writer Thomas Fisher, Assoc. AIA. “Buildings that will thrive in the new economy will have a switchable character, with high ceilings, hefty construction and open plans that allow people to mass customize their own space.”

Space-saving, Flexible Design

Mechanical systems in open, customized spaces need to be flexible to meet architect and occupant needs. VRF zoning systems from Mitsubishi Electric US Cooling & Heating Division (Mitsubishi Electric) meet these requirements. Modular outdoor units, smaller chases and ductless indoor unit options allow architects to reclaim up to 10 percent of space that would otherwise be sacrificed to conventional HVAC systems.

Mitsubishi Electric VRF zoning systems blend into their environments. A variety of indoor unit styles give architects more design options. Ductless options include wall-mounted, floor-standing (exposed and concealed), ceiling-recessed cassette and ceiling-suspended. Ducted options include vertical-concealed and ceiling-concealed. The systems do not require extensive ductwork, which frees up valuable space for higher ceilings or additional tenant space.

The smaller equipment footprint can minimize or even eliminate space required for mechanical rooms. The compact size of the outdoor units also frees up square footage, an invaluable asset in urban design. Architects have more design freedom without the limitations of conventional ducted systems.

If a building's usage changes, the design of the Mitsubishi Electric system can be easily modified to meet the new needs of the space. Indoor units can be moved or added to reconfigure the system. Ductless design means there are no duct systems or chases to work around. A VRF zoning outdoor air-source or water-source unit can be installed with minimal impact on the existing space design.

The systems also allow architects to use fewer condensing units outside or on rooftops rather than scattering dozens of split-type unitary condensing units across a site or one large central chiller plant. VRF zoning systems make it easier to design in urban spaces, especially when there's limited space for split system pads for individual apartments and retail units. Many mixed-use facilities require hundreds of individual traditional mechanical units. VRF zoning systems help reduce unit count.

Precise Temperature Control

Precise comfort control is important for customizable buildings. Mixed-use facilities are on the rise in fluid urban centers. These multi-purpose spaces have myriad temperature requirements across many zones.

VRF zoning systems feature INVERTER-driven compressor technology, which helps deliver and maintain precise temperature capacity in each zone. Select indoor units have built-in i-see Sensors™, which constantly monitor room temperature. Microprocessor controls communicate with the outdoor unit to dynamically deliver more or less capacity as needed.

A user-friendly central controller shows the locations of the VRF zoning indoor and outdoor units, allowing the building owner or facility manager to monitor and control the system. This technology reduces service calls by allowing facility managers to troubleshoot before sending technicians.
**Non-invasive Architecture**

“While a growing human population will still need a lot of buildings, architecture firms may morph along with the rest of the business world to become more the managers of networks and aggregators of expertise, with building design becoming just one of many services,” says Fisher. “And construction, when it occurs, may have to become, like modern surgery, more non-invasive and minimally disruptive.”

**Unobtrusive Outdoor Units**

Livable outdoor space is important in non-invasive designs. HVAC systems should not minimize the value of outdoor space in densely populated urban areas. Mitsubishi Electric VRF zoning systems use reduced-size outdoor units that can be placed in various locations depending on available space and visibility requirements. Units also can be grouped together to open up space for green roofs or entertainment areas. Outdoor units are typically small enough to place on the ground in less urban areas and can be camouflaged with hard- or soft-scaping.

The units’ operational sound levels are significantly lower than conventional systems, which limits noise pollution in tight outdoor areas. Sound levels for Mitsubishi Electric VRF zoning outdoor units range from 47 dB(A) at low speed to 65 dB(A) at high speed — quieter than a refrigerator.

Customizable buildings and non-invasive architecture are two urban design trends that continue to impact the design community. Mitsubishi Electric VRF zoning systems are well-suited to meet these needs whereas conventional HVAC systems are not.

Visit [www.mitsubishipro.com](http://www.mitsubishipro.com) to learn more about the benefits of VRF zoning systems in urban designs.
SUMMER 2014: DESIGNING IN URBAN AREAS

VRF ZONING TECHNOLOGY PUTS ADAPTIVE REUSE DESIGN WORRIES TO REST

The historic Doan School in Cleveland was built in 1904, but closed in 2008 because of its inefficient utilities and outdated interior.

Famicos Foundation (Famicos), Cleveland, a not-for-profit affordable housing developer, saw potential in the building's solid concrete and masonry shell. Famicos recognized an opportunity for adaptive reuse and turned the Victorian-era school into the Doan Classroom Apartments. The new building now provides modern, state-of-the-art apartment housing for senior citizens.

Ryan Grass of City Architecture describes the transformation process. "Creating 45 senior living apartments from the inflexible classroom arrangement was a major design challenge. The wooden roof allowed water to seep into all levels of the old building, which had to be totally gutted. Ancient boilers and through-the-wall air-conditioning units had to be removed." The firm also had to accommodate the building's enormous windows, spacious halls, skylights and 10-foot ceilings.

To navigate the inflexible environment, the engineering team installed an R2-Series Variable Refrigerant Flow (VRF) zoning system from Mitsubishi Electric US Cooling & Heating Division (Mitsubishi Electric). The system's adaptable piping and wiring, in addition to the compact size of the units, allowed the team to successfully transform the former school into affordable residential housing.

The VRF zoning system also helped Famicos earn an Enterprise Green Communities certification. The Doan Classroom Apartment building not only received an $8,000 rebate from Cleveland Public Power's Efficiency Smart Program, but is now regarded as a national landmark.

To view the full version of the case study, click here.
DUCTLESS SYSTEMS SAIL TO VICTORY FOR PORTLAND HOMEOWNER

Lisa Whitridge aimed high on the sustainability scale when planning her new 1,950-square-foot home. The Portland, Oregon house complies with the Passive House standard that focuses on an airtight building envelope to achieve a 90 percent reduction in space heating and an overall 60 to 70 percent energy reduction. The house also meets the more rigorous Living Building Challenge by achieving net zero energy, waste and water.

But the home's structure posed an HVAC dilemma. “The complicated framing in this house makes creating ductwork space within the walls almost impossible. We could not have made this installation without Mitsubishi’s (Electric) great ductless engineering,” Arnold said.

JRA Green Building worked with Imagine Energy, Portland, to specify and install a Mitsubishi Electric ductless system with an INVERTER-driven compressor and two 9,000-Btu ductless indoor units – one on each floor.

David Landau, project manager at Imagine Energy, says the Mitsubishi Electric ductless systems are the company's go-to system for Passive Houses. “You get very high efficiencies for low loads, and the units are variable-speed and adapt well to the environment. The SEER ratings are as good or better than the other products with INVERTER technology and the ductless system is nice because we need only a small amount of space to move the energy from the outdoor unit to the wall-mounted heads,”

A sailing enthusiast, Whitridge calls her new Passive House “Full Plane,” which means skimming over the water at high-speed under full sail, using natural energies from the wind.

Builder James Ray Arnold, JRA Green Building, Portland, called this a “dream Passive House project” because of its ideal siting on a south-facing slope and meticulous, airtight construction that provides a low cooling and heating load – about 11,000 Btu/h. The home's thermally broken double walls create a 12-inch-deep cavity packed with cellulose insulation, which provides R-values in the mid 40s.
“After observing the super efficiency, extreme quietness and low cooling and heating loads that helped us meet rigorous Living Building Challenge requirements, I am now specifying Mitsubishi Electric ductless systems for all my new residential projects.” – Michelle Jeresek, project designer

Click here to read the entire Full Plane Passive House Case Study.
INDOOR UNIT STYLES EXPAND DESIGN POSSIBILITIES

Selecting an HVAC system is one of the most important choices in the design development phase of a project. HVAC systems play a vital role in the operation of any building and occupant comfort, but temperature control is not the only factor that drives comfort. Aesthetics and the overall feel of the building also play an important role.

Conventional ducted cooling and heating systems require a substantial amount of space for the system's components. Indoor and outdoor units, ductwork and mechanical closets take up valuable square footage and can limit design possibilities.

VRF zoning systems from Mitsubishi Electric US Cooling & Heating Division (Mitsubishi Electric) allow architects and specifying engineers to maintain the building's aesthetics. The systems feature slim, compact components for each project's unique needs. Mitsubishi Electric offers a wide variety of indoor unit models, which gives architects and designers more choices for building projects.

Here are examples of different uses of each indoor model and some example applications where architects have benefitted from the system's design flexibility:

Miami University, Oxford, Ohio, and Muscatine County courthouse, Muscatine, Iowa, concealed Mitsubishi Electric floor-standing ductless indoor units inside custom cabinets to blend seamlessly into their historic interior design.
Many architects choose Mitsubishi Electric's *floor-standing* ductless models. These units can be left exposed or cleverly covered to meet specified design preferences. They are particularly useful when there is limited attic space or ceiling areas, when wall areas need to remain intact or where an existing radiator was replaced. These features lend themselves very well to historic renovations.

- For example, Miami University, Oxford, Ohio, and the historic Muscatine County courthouse, Muscatine, Iowa, both use *PFFY floor-standing ductless indoor units* encased in wooden cabinets. The cabinets give the look and feel of traditional radiator covers, preserving the historic aesthetic of each space.

Turner Construction, Columbus, Ohio, Towson City Center, Towson, Maryland, and a custom home in St. George, Utah, all use Mitsubishi Electric ceiling-recessed ductless and ceiling-concealed ducted indoor units to maximize vertical height and align with sleek, modern design elements.

Mitsubishi Electric's *concealed units* work well for a number of applications. Ductless options, including ceiling-recessed cassette and ceiling-suspended, as well as ducted options, including ceiling-concealed and vertical-concealed, are practical alternatives for spaces that have limited wall space, helping to maximize vertical height.

- **Turner Construction**, Columbus, Ohio, used Mitsubishi Electric's *ceiling-recessed ductless and ceiling-concealed ducted indoor units* in its new headquarters – an adaptive reuse of an early 20th-century mattress factory. The indoor units help capitalize on the finite amount of space available for ducting and enable them to keep the old factory's exposed ceilings and industrial look.

- The low-profile (9-7/8-inch) of Mitsubishi Electric's *PEFY ceiling-concealed ducted indoor units* also help overcome ducting height limitations posed by low decks. Traditional units can be twice as deep. **Towson City Center**, Towson, Maryland, used these *ceiling-concealed ducted indoor units* in the retrofit of a dilapidated building. The units help maximize the extremely low ceiling heights, and the system's small footprint enabled developers to reclaim an entire floor formerly devoted to mechanical equipment.

- Built in St. George, Utah, in an eco-conscious community, architectural standards for custom home **Terra Caelo** dictated that it be sited and designed in harmony with the existing terrain, resulting in a low, earth-colored structure. Consequently, when it came to designing for the HVAC system, there was no attic space and limited ceiling area to work with. Designers selected Mitsubishi Electric *vertical-concealed ducted indoor units* to sit on the floor in a recessed closet, which preserved ceiling height.
Hotel Wilshire, Los Angeles, uses Mitsubishi Electric ceiling-concealed ducted units to directly contrast with the building's dark grey walls, while a custom home in Chenequa, Wisconsin, disguises floor-standing ductless units behind a stone wall for a seemingly invisible HVAC system.

- Indoor units can blend into an existing design, but they can also be used as part of the design as well. Hotel Wilshire in Los Angeles incorporated ceiling-concealed ducted indoor units as a design element. In the hotel lobby, the steel finish of the rectangular units is highlighted as a geometric architectural element that contrasts with dark grey walls.

- In Chenequa, Wisconsin, the owners of a custom home demanded that all home technology be hidden – light switches, electrical outlets, kitchen appliances and the HVAC units. With floor-to-ceiling glass walls, and no room for ductwork, architect Robert Harvey Oshatz concealed floor-standing ductless indoor units behind locally-quarried stone walls throughout the home. The sections of the walls that covered the HVAC unit were constructed without mortar to allow for airflow.

These applications are just a few examples of the effectiveness, ease and modern-day adaptability of Mitsubishi Electric's indoor units. The wide variety of styles proves that indoor units are no longer an obstacle that architects and designers need to overcome but an opportunity to enhance designs.
FUTURE OF ARCHITECTURE DISCUSSED AT 2014 AIA NATIONAL CONVENTION

The American Institute of Architects (AIA) held its 2014 National Convention from June 26-28 in Chicago, the heart of America’s architectural epicenter. Mitsubishi Electric US Cooling & Heating Division (Mitsubishi Electric) was one of nearly 800 exhibitors. More than 20,000 architects, designers and building professionals also attended the event.

The convention’s theme was “design with purpose.” Jeanne Gang, FAIA, LEED AP, and founder of Chicago-based collective Studio Gang Architects, kicked off the three-day convention with a keynote speech addressing her work on the Aqua Tower. Completed in 2010, the tower is an award-winning, 82-story, 1.9 million-square-foot, mixed-use building. It stands as a symbol of architectural achievement, with uniquely shaped outdoor terraces designed to accentuate the views, solar shading and types of dwellings. The building also contains one of Chicago’s largest green roofs.

Other keynote speakers included:

- **Theaster Gates** – Acclaimed artist, urban planner, creative director and founder of the Rebuild Foundation. Gates shared his thoughts on architecture as a tool for mediation and meditation, transforming spaces, perceptions, relationships and communities.

- **Ed Mazria** – Founder and CEO of Architecture 2030. Mazria challenged attendees to think about the importance of carbon neutrality and the role that architects play.

The annual event also gives exhibitors the opportunity to present new materials, methods and technology to the largest gathering of architects and design professionals in the U.S. Mitsubishi Electric showcased the following equipment in its booth:

- **M-Series Single-zone Ducted Indoor Unit:** SEZ
- **M-Series Single-zone Ceiling-recessed Cassette Ductless Indoor Unit:** SLZ
- **M-Series Single-zone Heat Pump System:** Hyper-Heating INVERTER™ (H2i®) MSZ/MUZ-FH
- **M-Series Multi-zone Heat Pump:** MXZ-B
- P-Series Single-zone Heat Pump: PUZ H2i (Commercial Grade Applications)
- CITY MULTI Variable Refrigerant Flow (VRF) Zoning Air-source Heat Recovery System: R2-Series H2i
- Floor-standing Ductless Indoor Unit: PFFY
- Branch Circuit Controller

The presentations, products and technology featured at this year’s AIA Convention emphasized the change that’s happening in the architecture and design worlds. Each year, the convention offers an array of keynote speakers, hand-on workshops and seminars, allowing attendees to understand the current and future tone of the architecture profession.

Chicago’s 82-story Aqua Tower is more than 1.9 million square feet and creates a strong connection to the outdoors.
NEW TRADE ADS SPOTLIGHT VRF ZONING’S UNIQUE SOLUTIONS

Mitsubishi Electric US Cooling & Heating Division (Mitsubishi Electric) rolled out a 9-month-long print trade ad campaign featuring its industry-leading Variable Refrigerant Flow (VRF) zoning technology. The ads highlight VRF zoning’s unique solutions for solving difficult design challenges and the widespread acceptance of the technology in the HVAC industry.

The ads focus on three case studies in urban areas throughout the U.S.:

- Towson City Center, Towson, Maryland.
- Chandler City Hall, Chandler, Arizona.
- King County Housing Authority, Seattle.

The campaign’s first ad, which features Towson City Center, can be found in the June issues of BUILDINGS Magazine and Building Operating Management. The Chandler City Hall and King County Housing Authority ads are scheduled to hit the stands in upcoming ARCHITECT magazine issues.

Visit www.mehvaccasestudies.com to read more VRF zoning projects.
EXPANDED BIM CONTENT AVAILABLE TO ENHANCE BUILDING DESIGNS

Architects can now design 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 architects 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.