VRF Misconceptions

Presented By:

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Misconception #1

Misconception:

VRF Systems Do Not Perform at Low Ambient Temperatures

Heating Considerations

- The system should be designed for the worst-case conditions to ensure performance:
- Why?
  - As temperature falls below design conditions, system capacity will be reduced.
  - What will happen to building temperatures as ambient conditions continue to drop?

Pittsfield, MA: Design Conditions

Design Condition

Country: USA

City: Pittsfield, MA

Design Condition (Air)

°F	Cooling		Heating	
	Outdoor	Indoor	Outdoor	Indoor
DB Temperature	87.1	80.6	-8.0	68.0
WB Temperature	71.1	66.2	-9.1	59.0
Relative Humidity	45.9	47.0	50.0	59.0

Misconception:

VRF Systems Do Not Perform at Low Ambient Temperatures

Let's compare…

- Adding supplemental heat?
- Oversizing systems?
- Installing outdoor equipment in conditioned spaces?
- Specialized High Heating VRF System!
  - 100 % capacity between zero to -13°F

Company M

Company D

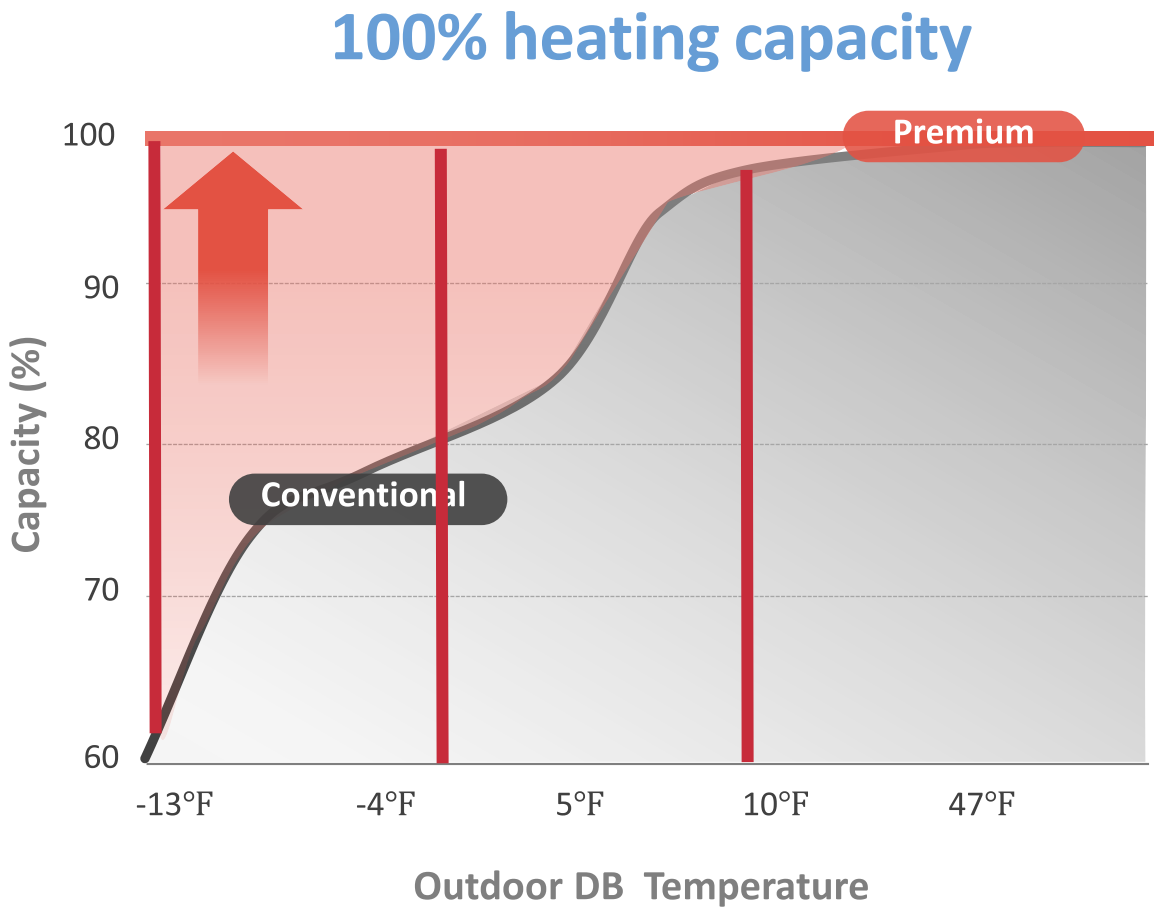
Company X

Company S

®

Low Ambient De-Rate Example

- Not all manufacturers de-rate at the same ambient temperature.
- Equipment that can provide 100% heating at lower ambient temperatures will perform better when ambient conditions continue to drop.
- Be sure to review manufacture's technical data books for de-rate values, not generic submittals.
- Generic submittal data will not present complete performance data and maximum lowest operating temperature.



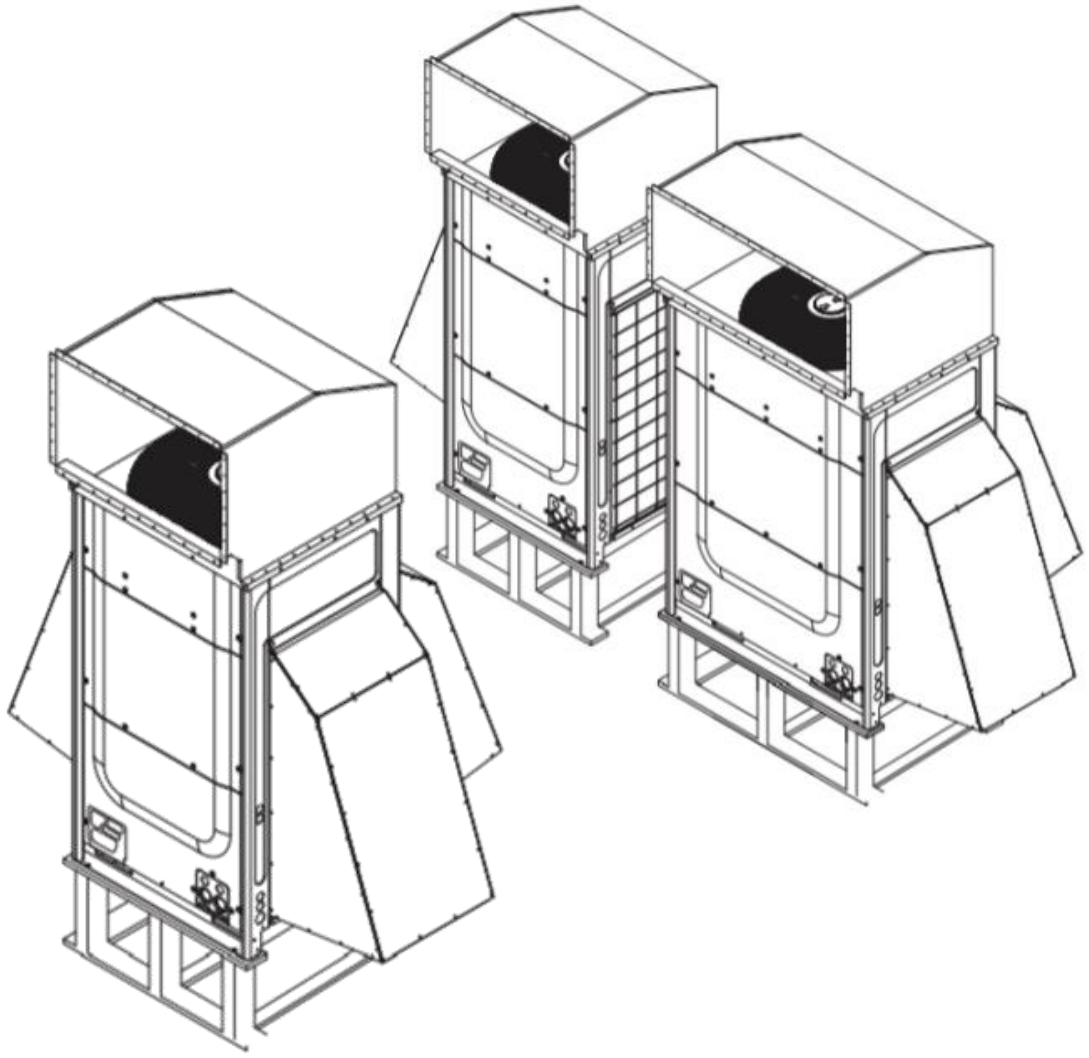
※ Heating Standard Setting vs DVM S Max Heat®

Misconception:

VRF Systems Do Not Perform at Low Ambient Temperatures

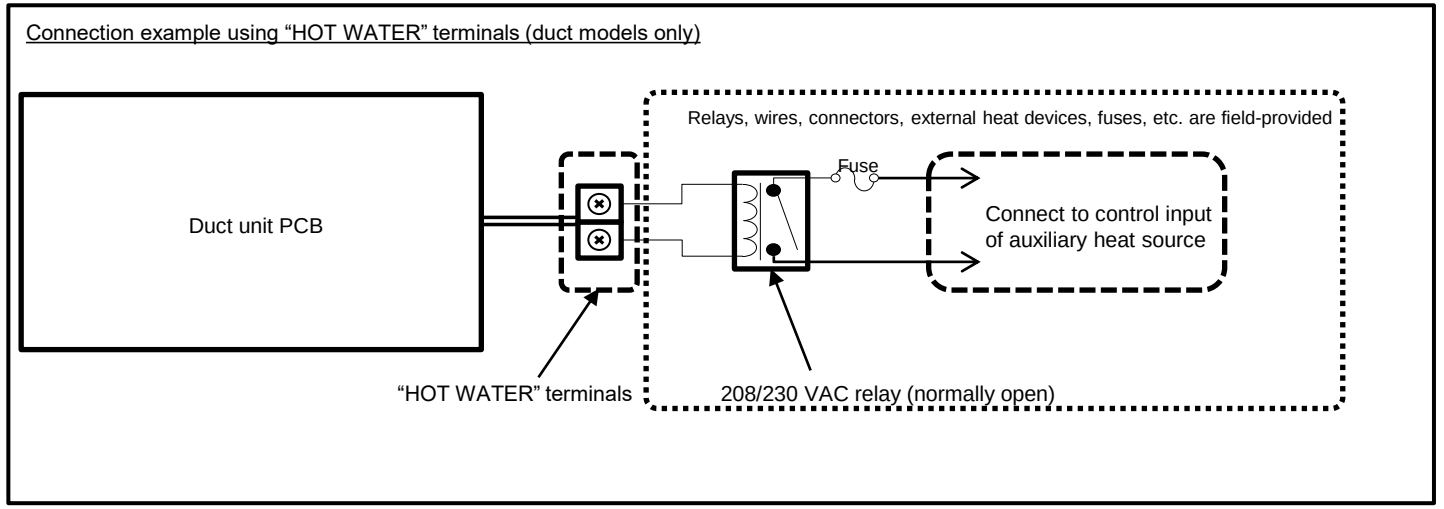
Heating Considerations

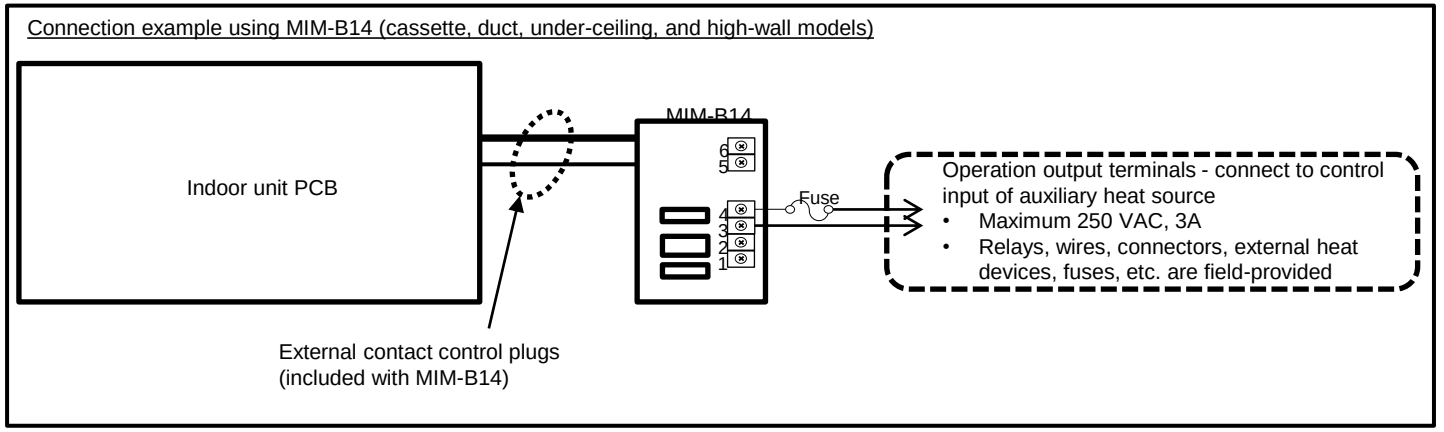
- Use wind and hail guards to:
  - Improve system performance by preventing wind chill effect on the condensing units at low ambient conditions.
  - Prevent defrost problems



DVM S Eco – External Heat Control

External Heat Connection Example





DVM S Eco – External Heat Control

External Heat Control Programming

- After programming the indoor unit for the desired auxiliary heat control output, you can specify how and when you would like to enable the external heat control signal.

- Below is a table that details the temperature difference between set temperature and room temperature and an optional 10 or 20 minute time delay.

05 Series Installation Options Settings (advanced options), segment 18			
Heater signal on (H)	Time delay (T)		
	No delay	10 minute delay	20 minute delay
THERMO-ON (1.8° F, 1° C, can vary depending on other settings)	0	1	2
2.7° F (1.5° C)	3	4	5
5.4° F (3° C)	6	7	8
8.1° F (4.5° C)	9	A	B
10.8° F (6° C)	C	D	E

Defrost Operation

Rotational Defrost

- Rotational defrost is used for module installations to provide continuous heating

Misconception:

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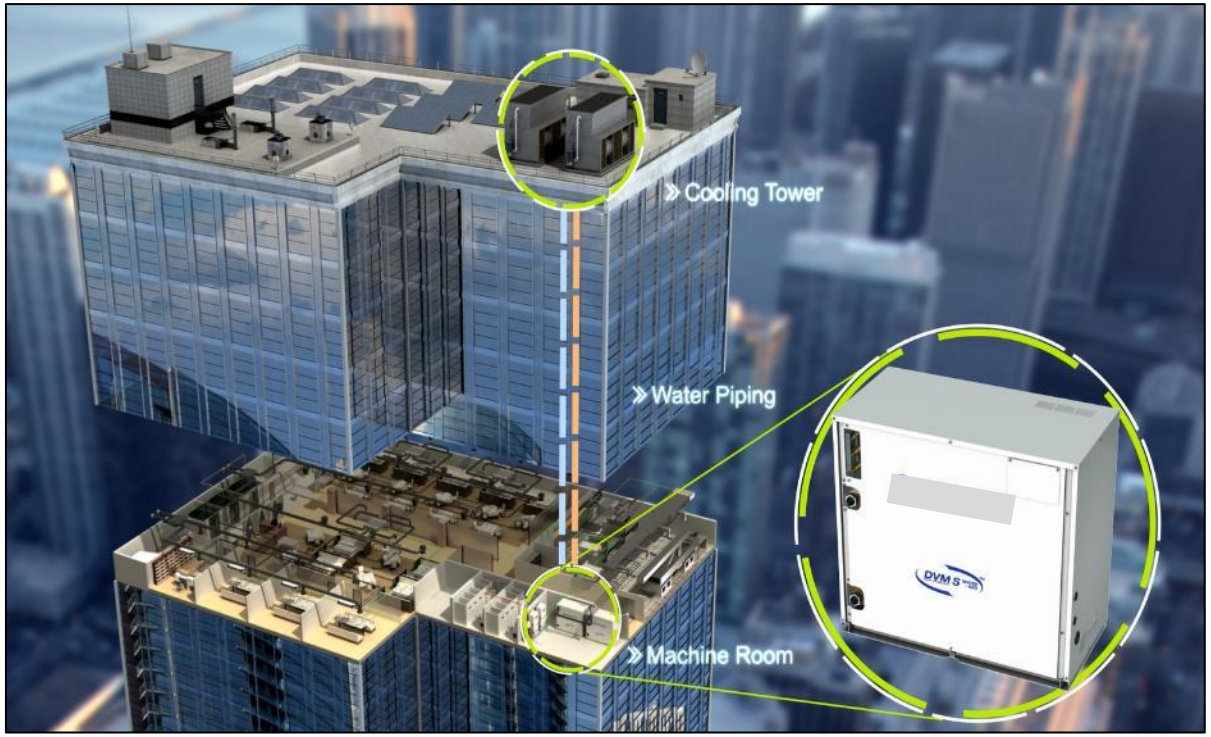
Water Cooled Solutions

Benefits of water-cooled systems at low ambient is they are not contingent on outside air

Consistent water temperature provides consistent performance

Can be placed inside the building without louvers

Water flow can be modulated to maintain water temperatures for stable performance and maximum efficiency



Misconception:

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Low Ambient Cooling

Indoor Installation

To compensate for low ambient conditions VRF outdoor units can be installed in a properly ventilated mechanical room.

CFD analysis can be performed to determine if the room is properly ventilated before installing the equipment.

Modification will be suggested to allow the system to operate properly

Misconception:

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Low Ambient Cooling Hoods

Improves cooling performance at low ambient conditions

- Most manufactures offer 100% cooling capacity between -9 to -13°F with the use of accessory hoods
- Advanced controllers monitors outdoor unit operating pressure, outdoor ambient temperature, compression ratio & other operation points
- Dampers are modulated and system operation is modified as needed to maintain system operation
- Below these temperatures system capacity is reduced
- Refer to manufacture's literature for de-rate values

Misconception #2

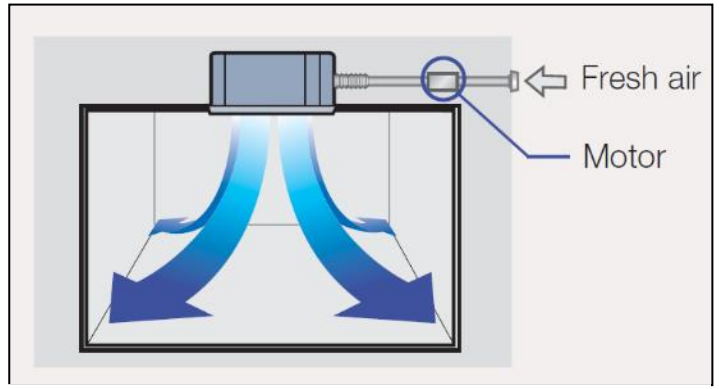
Misconception:

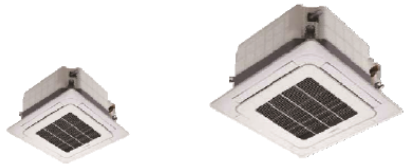
VRF Systems Cannot Manage Outside Air

Fresh Air Strategies

Considerations:

- Fresh air can be ducted into cassettes and ducted indoor units
- When ducting into cassettes booster fans are required
- The fresh air load must be accounted for on the load calculation
- Actual Fresh air percentage depends on unit size and configuration
- Another option is to decouple the fresh air from the HVAC load and treat it with a dedicated fresh air solution
  - This could allow for smaller HVAC equipment due to the reduced fresh air load





Small Chassis	
AM0**FNNDCH/AA	
P ("W.C.)	Q (CFM)
0	0
0.02	5
0.04	7
0.05	9
0.08	13
0.10	15
0.12	17
0.14	18
0.16	20

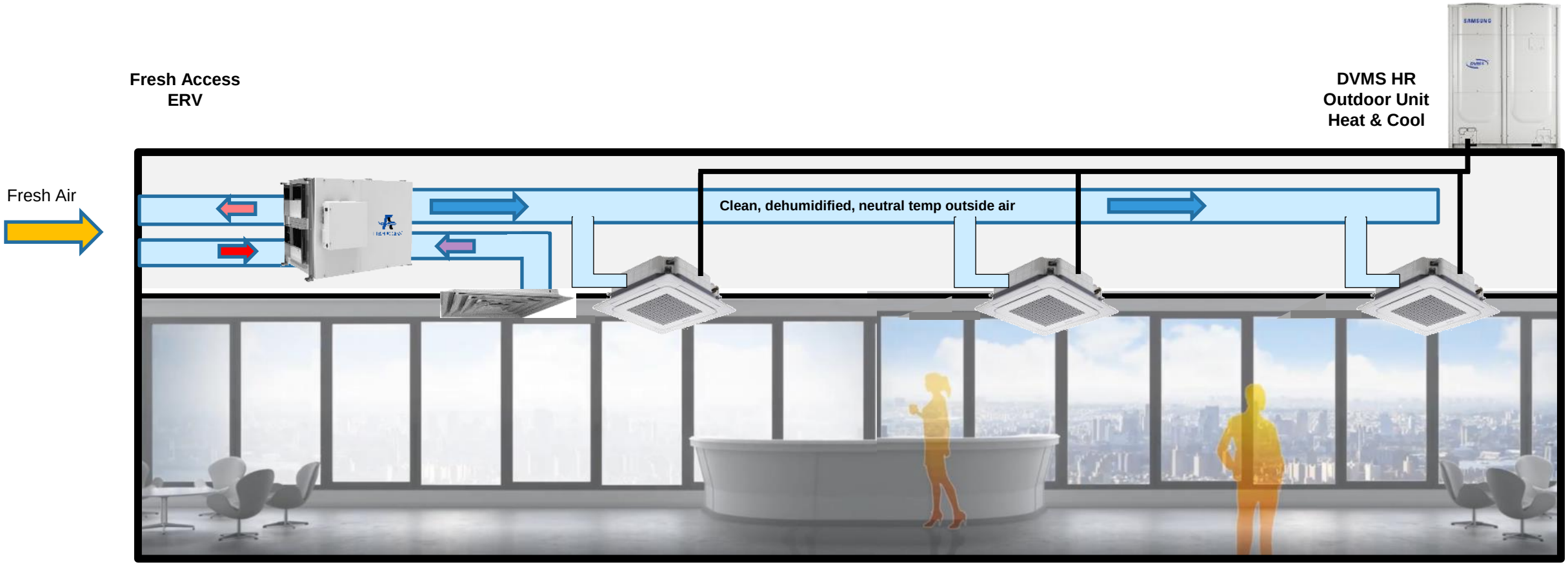
Medium Chassis	
AM0 09/12/18/24 FN4DCH/AA	
Q (CFM)	Q (CFM)
0	0
0.04	14
0.08	21
0.12	27
0.16	32
0.20	37
0.24	42
0.28	47
0.31	52

Large Chassis	
AM0 30/36/48 FN4DCH/AA	
P ("W.C.)	Q (CFM)
0	0
0.04	17
0.08	31
0.12	44
0.14	50
0.16	55
0.20	66
0.24	76
0.28	85
0.40	106

Misconception:

VRF Systems Cannot Manage Outside Air

ERV Direct Ducted Fresh Air

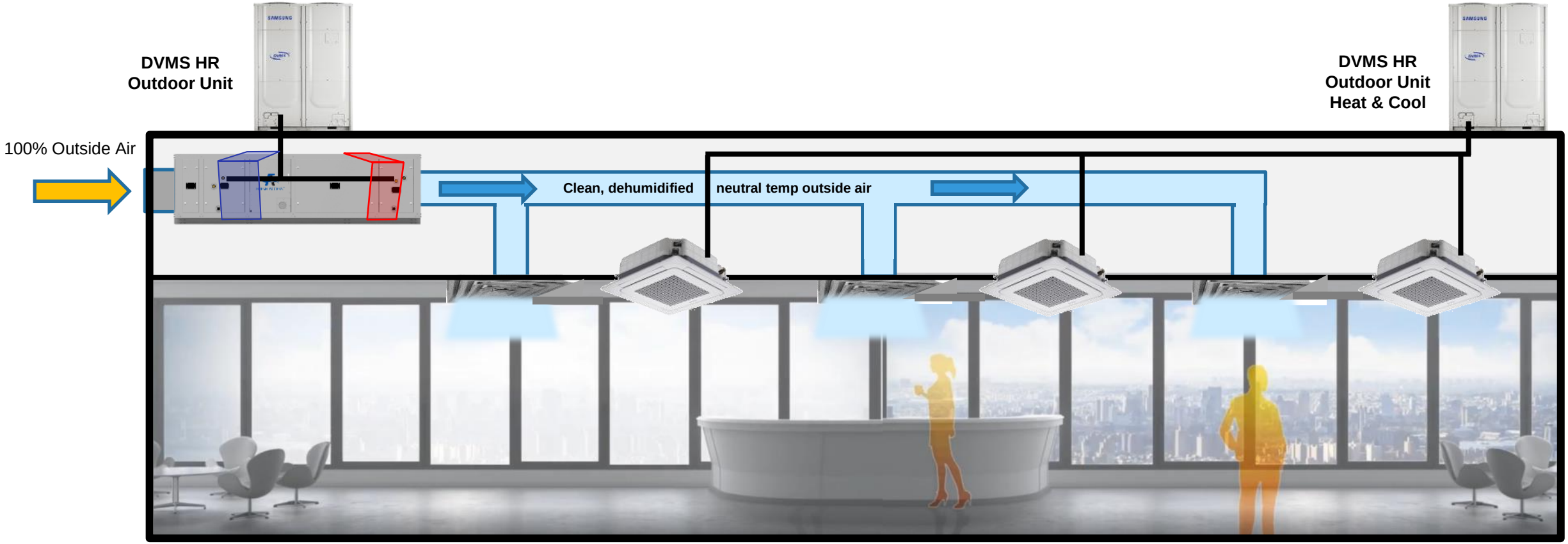


Account For the Load Brought in by the ERV

Misconception:

VRF Systems Can Not Manage Outside Air

Split DOAS Direct Space Ventilation



Misconception #3

Misconception:

VRF Systems are Complicated to Design

Design Software

Sales Mode

All design processes, including product selection, piping, wiring and system checks, are seamlessly integrated to provide a streamlined user experience, so you can respond to client requests rapidly. And, it includes an intuitive interface and a range of convenient features to simplify and speed-up the whole design process.

Product Selection

Simply find and quickly select any Samsung air conditioners with product thumbnails and "favorites" functions.

Reports

Supports various report formats to suit any of your needs. You can also selectively print by item, such as a floor or system.

Concurrent design for wiring & controls

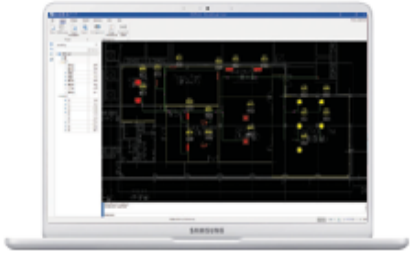
The wiring and controls of the indoor and outdoor units can be designed on one screen. With fewer steps, designs can be completed faster.

Design based on rooms & floors

A visualized structure, based on floors and rooms, lets you intuitively view the installation location and working load.

Designer Mode

A dedicated CAD program, developed by Samsung, lets you design systems without the need for any expensive commercial CAD programs. It is also optimized with specialized features to design air conditioning systems.



Piping design

Refrigerant piping and drainpipes can be drawn automatically, using the correct material and size to suit the installation guidelines perfectly.

Reports

As well as a basic report, it provides integrated drawing data, including the equipment, power supply, and communication wiring diagrams.

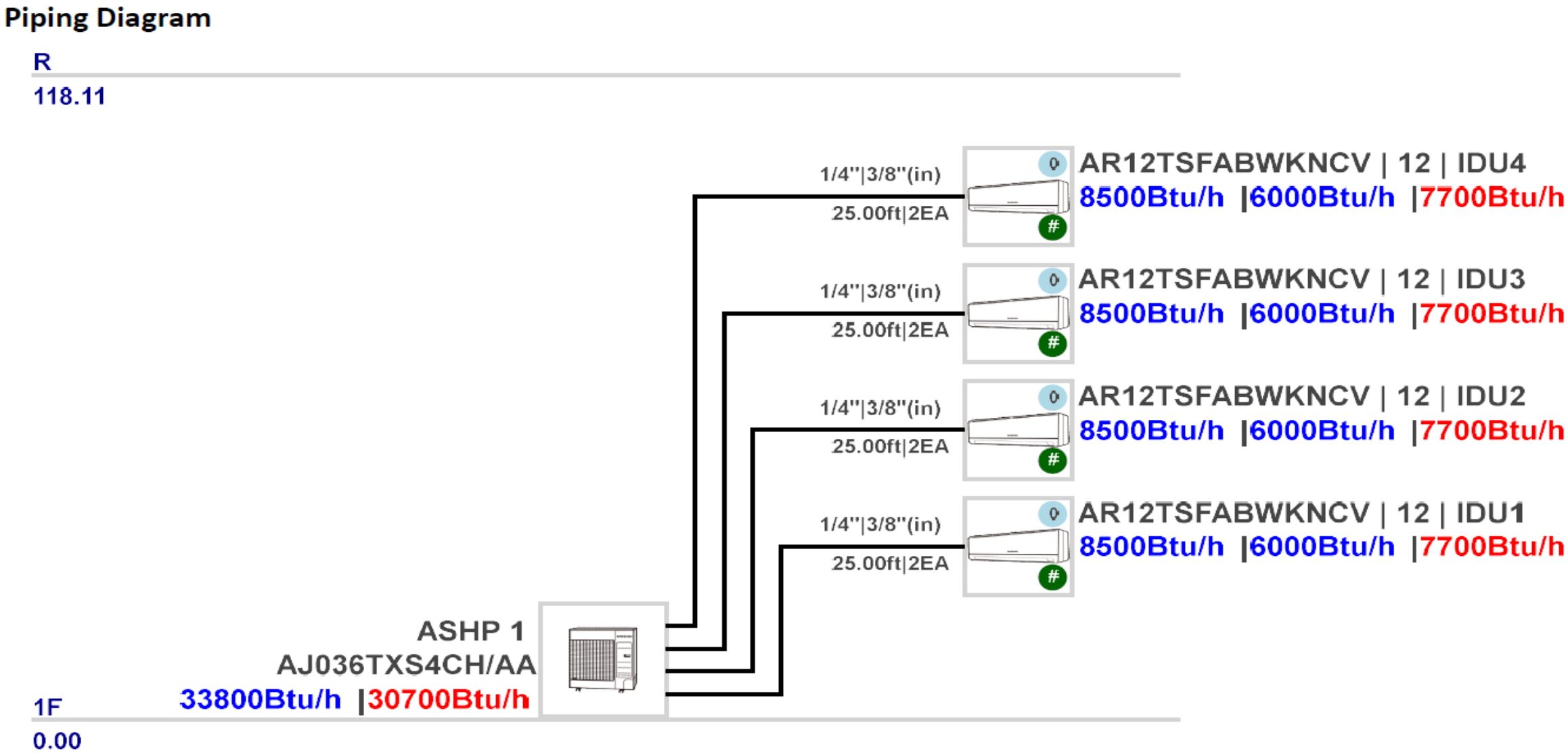
Compatible with AutoCAD

It is compatible with commercial CAD programs, including AutoCAD, for added convenience. Exported design and drawing data can be easily handled and modified separately.

Modular design

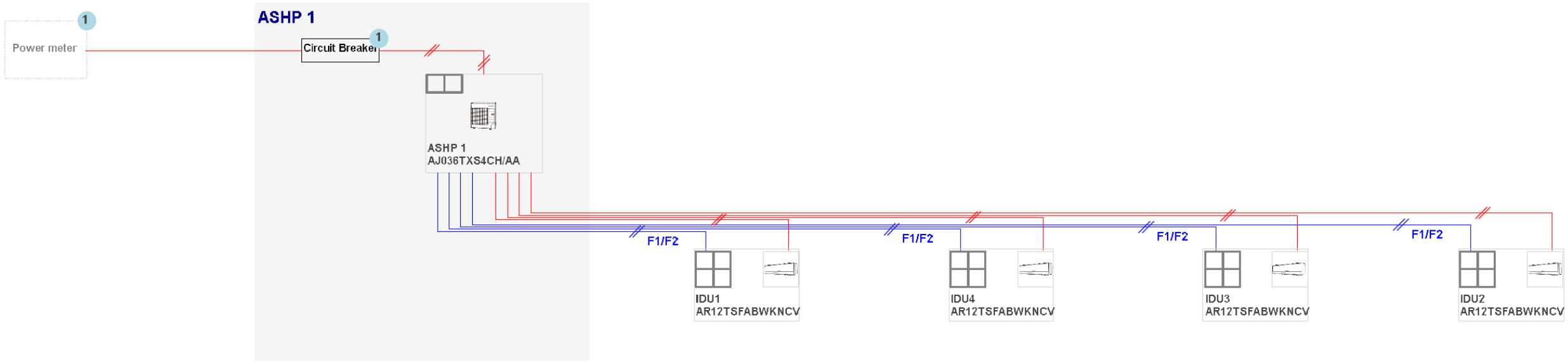
Lets you design the system in modules, which can be easily duplicated without wasting time and effort on repetitive tasks. So you can quickly complete a whole system.

VRF Systems are Complicated to Design



VRF Systems are Complicated to Design

Wiring and Controller Diagram



Misconception #4

Misconception:

VRF Systems Have High Overall Costs

The Economical Alternative

- While initial purchase price may be higher
- Total life cycle cost will be lower, this is due in part to…
  - Installation with little to no ductwork
  - Ability to select smaller systems
  - No need to condition spaces that are unoccupied
  - System modulates capacity instead of shutting on and off the system
- Energy efficiency must also be calculated

CT SM

mass save

U.S. DEPARTMENT OF ENERGY

Misconception:

VRF Systems Have High Overall Costs

Package Rooftop/ VRF EER Comparison

Shows Performance At Peak Load Capacity

6 Ton Rooftop Package = EER 11.2

6 Ton VRF = EER 11.3

How often is the equipment at full load?

Misconception:

VRF Systems Have High Overall Costs

Package Rooftop/ VRF EER Comparison

IEER Incorporates Part Load Performance

6 Ton Rooftop Package = IEER 11.3

6 Ton VRF® = IEER 29.3

40% Reduction in Energy Consumption

(Comparison of IEER ratings provided by Air Conditioning, Heating, and Refrigeration Institute, AHRI)

Misconception:

VRF Systems Have High Overall Costs

Configuration Features

The earlier VRF can be considered in the design process. The more cost savings will be realized because the other trades will design *around* VRF.

Develop a strong understanding of customer needs and requirements.
Build a strong working knowledge of Samsung products, capabilities, and solutions.

Misconception:

VRF Systems Have High Overall Costs

Configuration Features

- Smaller plenum/ floor-to-floor heights
- Smaller chases
- Lighter and smaller equipment
- Lower combined MCA and MOCP
- Simplified planning
- Installation efficiency
- Precise temperature control

Misconception #5

Misconception:

Heat Recovery is Unnecessary

Heat Recovery systems offer multiple solutions for end users, such as the ability to reclaim **heat** from one portion of the building and redistribute it to another location. This allows the system to **simultaneously** provide **heating** and **cooling** to various parts of the building. Not only does this improve part load efficiency, but it also allows for improved occupant comfort across the conditioned space.

- Systems offers improved comfort and efficiency by moving heat around the building.
- While it is true that heat recovery is not the correct fit for every application the following slides will show examples where heat recovery was the ultimate solution.

Misconception:

Heat Recovery is Unnecessary

Application Requirements

- Schools:
  - Not all spaces will be occupied at the same time
  - Auditoriums/gymnasiums
  - Computer labs
  - Server rooms
  - Classrooms

Misconception:

Heat Recovery is Unnecessary

Application Requirements

- Medical Buildings
  - Lobbies
  - Patient rooms
  - Operatories
  - Medical equipment rooms

Misconception:

Heat Recovery is Unnecessary

Application Requirements

- Hotel
  - Hallways
  - Guest rooms
  - Conference rooms
  - Dining rooms
  - Laundry rooms
  - Offices
  - Lobby

Misconception #6

Misconception:

VRF Controls are Not Flexible

Thermostat Adaptors

Features Vary By Manufacturer

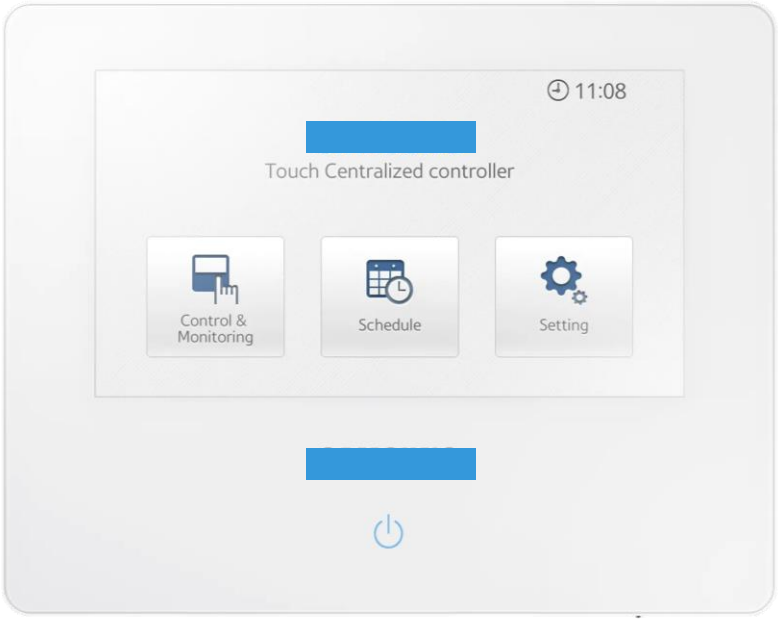
- Can be configured to operate the indoor unit as primary heating source, secondary heating source, or cooling only with heat from an external source only.
- "Emergency Heat" output to enable an external heating source when the unit is in heating Thermal-ON while in error status.
- Supports 1 or 2 stage cooling inputs and heating inputs.
- Separate Thermal-ON and Thermal-OFF fan speed options when using a single fan (G) input.

Basic control of: Power: ON/OFF
Mode: Heat, Cool, Fan (auto, low, medium, high)

Misconception:

VRF Controls are Not Flexible

Centralized Control

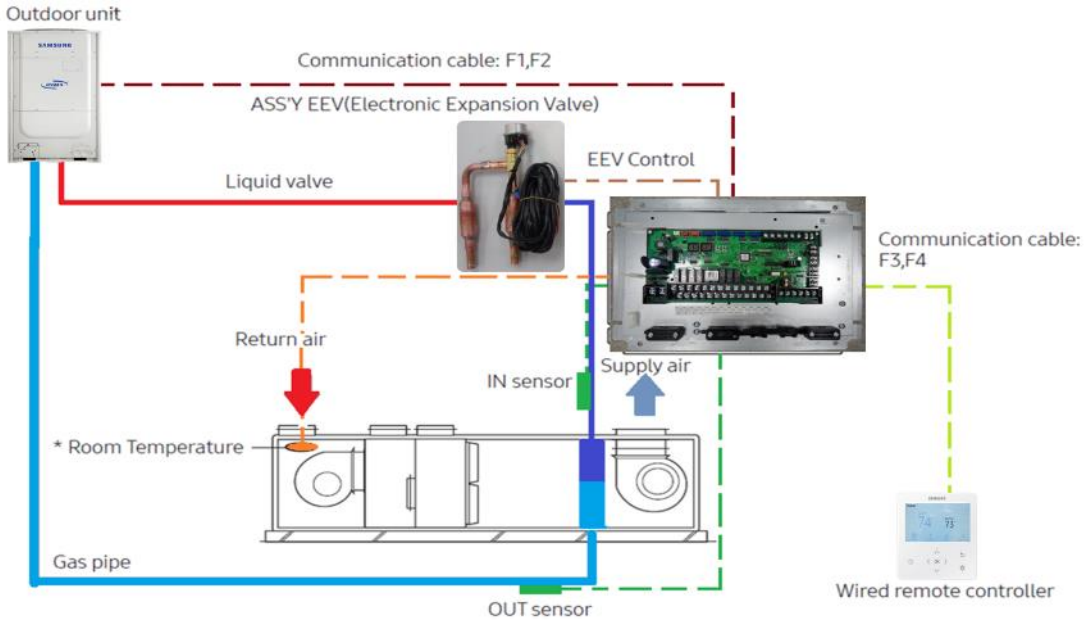


Misconception:

VRF Controls are Not Flexible

Control of 3rd Party Air Handlers

- Innovative control systems
  - Control board
  - Electronic expansion valves
  - Various sensors
- Combine 3rd party air handers and VRF
  - 1 – 40 Tons
- Total building control
  - OAP
  - DOAS
  - Central station air handler & VRF



Universal communication kit

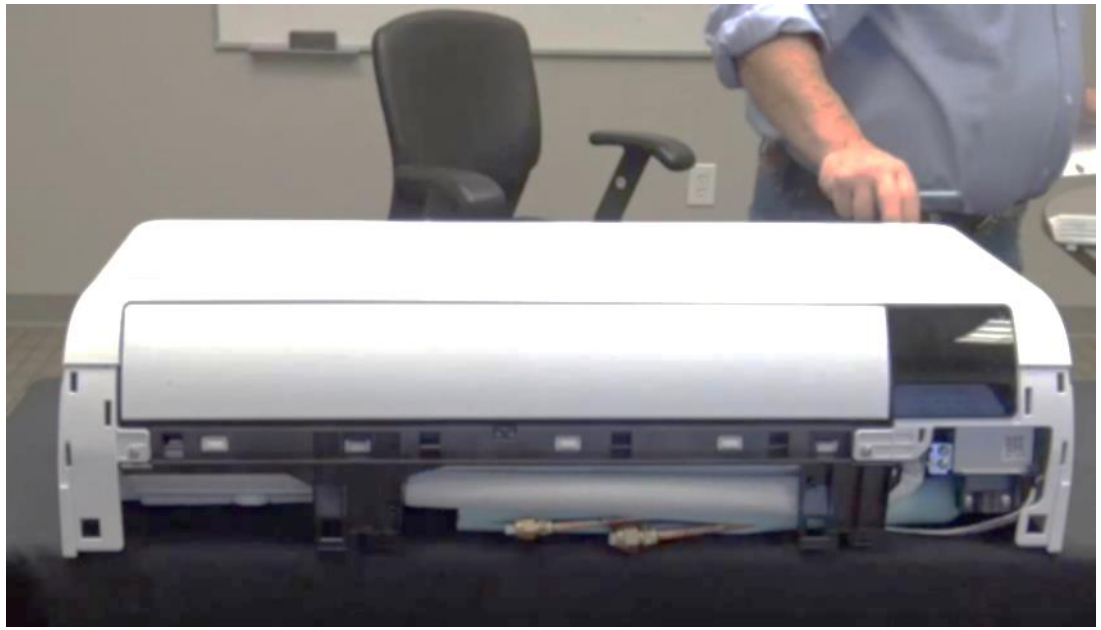
Misconception #7

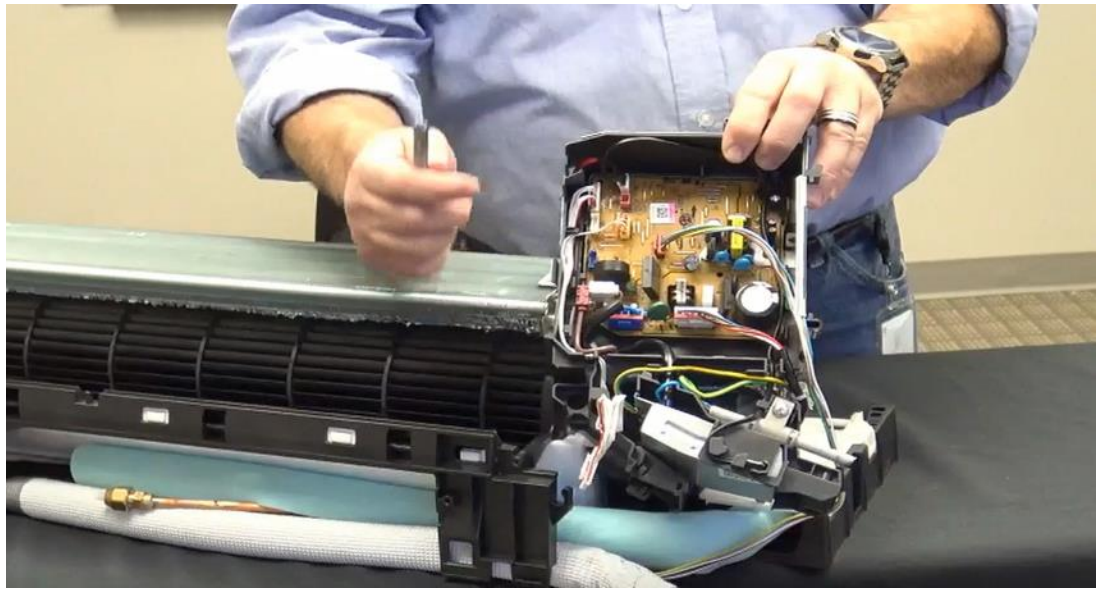
Misconception:

VRF is Difficult to Service

Easy To Service Wall Mounts

- Advancements in technology have made wall mount units easier to service with less screws and more interlocking tabs.
  - Bottom panel access to drain connection, pipe connections, high voltage, and low voltage connections.
  - Easy to detach front panel, louver, and blade assembly.
  - There are only three screws to be removed to access all major components.



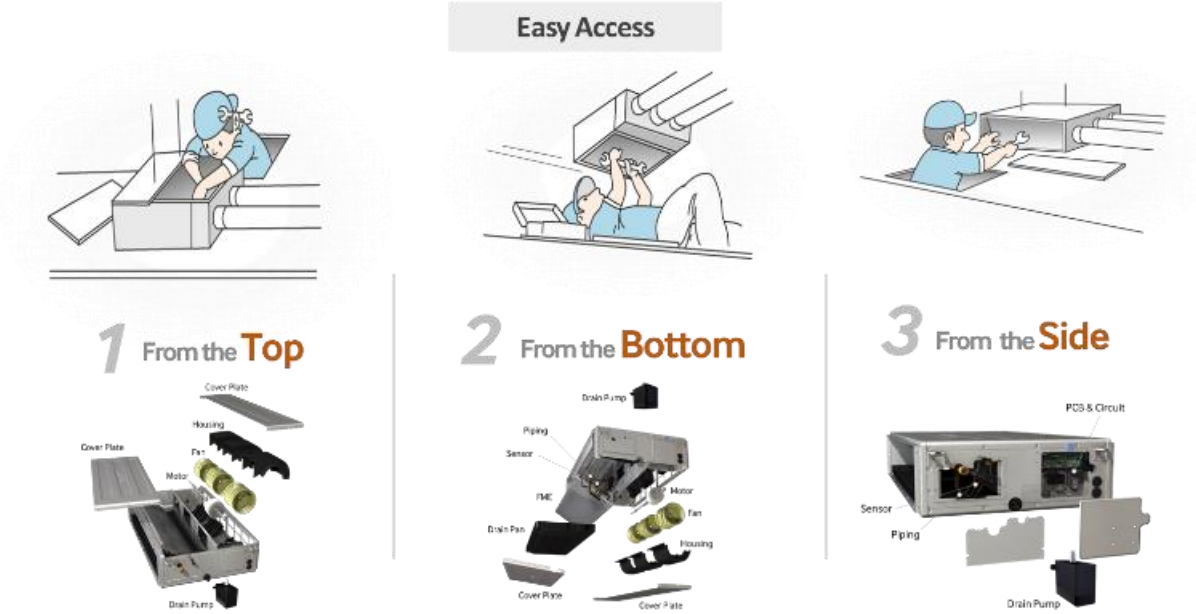


Misconception:

VRF is Difficult to Service

Cassette Service

- Controls, blowers, and coils for cassette units can be accessed from the bottom of the unit.
- Ducted units have multiple ways to gain access for service.



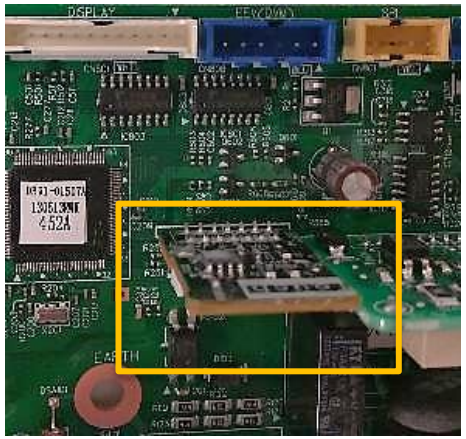
Misconception:

VRF is Difficult to Service

Plug and Play Technology

- The EEPROM board can be removed and placed on the new board without the need to program the replacement.
  - This allows the system to continue to run as designed
  - It is the HVAC equivalent of a SIM card

EEPROM Board

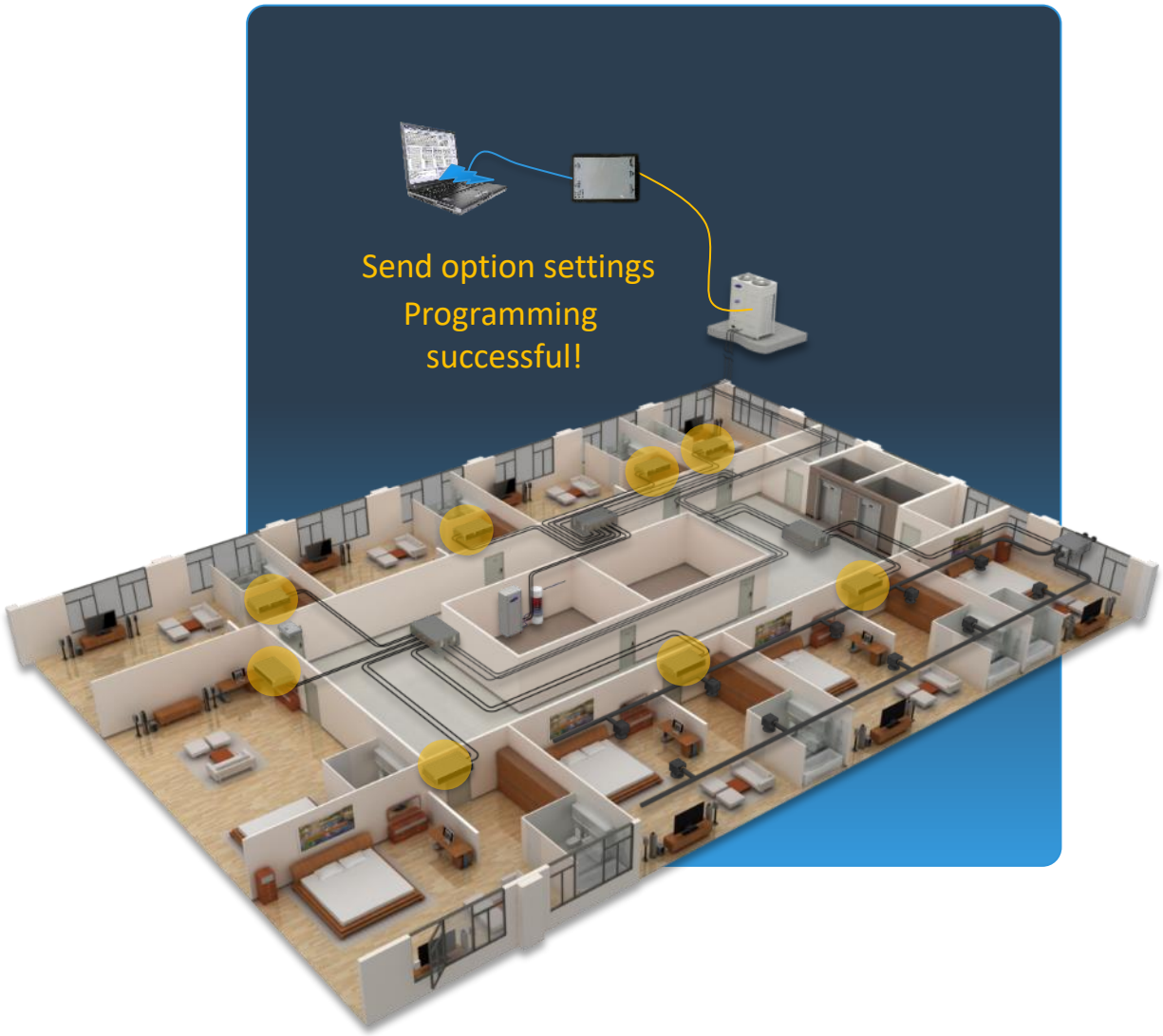


Misconception:

VRF is Difficult to Service

Service Software

- Service software can be used to:
  - Watch system performance
  - Record run data
  - Quickly change system settings
  - Send recordings to support personnel for technical support
  - Upgrade firmware to any unit on the network



Misconception #8

Misconception:

VRF Equipment Stands Out

- Wall mount units more popular globally
- VRF outdoor units and indoor units can enhance the aesthetics of the building

Misconception:

VRF Equipment Stands Out

Misconception:

VRF Equipment Stands Out

THANK YOU!

Q&A