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There are many available options when it comes to heating and cooling buildings. Factors such as maintenance and cost are important when selecting which HVAC system to install. The choice of system should consider up front cost, operating cost, serviceability, expandability, and reliability.

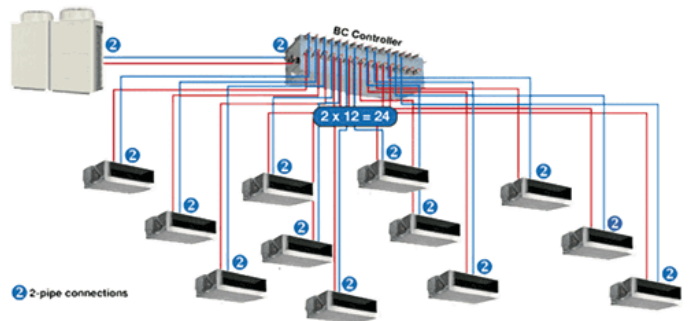
In the past five years, the North American market has seen an increase in VRF systems being used to heat and cool buildings. This approach uses refrigerant as the transport media to move energy through the building.

With a proven track record, Water Source Heat Pumps are known for unequalled heating and cooling comfort and still remain the gold standard when it comes to HVAC. Water Source Heat Pumps have been proven to reduce building energy consumption by at least 44% over VRF systems and provide decades of reliable and safe operation.

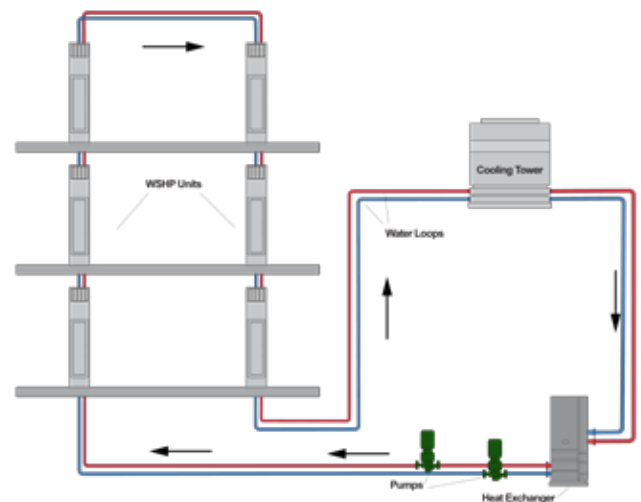
What is VRF?

Variable-Refrigerant-Flow (VRF) system: an engineered direct expansion (DX) multi-split system incorporating at least one variable capacity compressor distributing refrigerant through a piping network. Multiple indoor terminal units, each capable of individual zone temperature control, are served by a single condensing unit. A proprietary communications network is used to commission and operate the system. Variable refrigerant flow typically utilizes three or more steps of control on common, interconnecting piping.

VRF System



WSHP System



VRF vs Water Source Heat Pump

Comparison of VRF and WSHP

VRF

- **Building Size:** 15,000 - 60,000 sq. ft., otherwise there are less expensive options available.
- **Future Modification:** Does not allow for future modification. The existing piping and terminal units must be decommissioned or removed from the building during renovation and are not reusable.
- **Safety Concerns:** Refrigerant leaks are harmful and dangerous. VRF systems are difficult to determine where the leak is and if a large leak occurs, it can result in complete loss of refrigerant from the system and can require evacuation of building. Few manufacturers of VRF have developed protocols to address concerns of refrigerant leakage.
- **Power Distribution:** Power required for refrigerant distribution is much higher due to the length of the refrigerant pipe runs.
- **Cold Weather Operation:** Morning warm-up and back up electric heat can be expensive.
- **Controls and Parts:** Each vendor has its own proprietary controls and are not compatible with other brands. Must stick with the same manufacturer, installer and technician.

WSHP

- **Building Size:** WSHPs are a good application for any building size.
- **Future Modification:** Allows for future modification. When older buildings are renovated or HVAC is being upgraded, parts of the existing WSHP system are reusable.
- **Safety Concerns:** A leak in a WSHP system is easy to detect. Refrigerant is confined to individual units or the system can be design so that the refrigerant containing devices are confined to a mechanical room. WSHP systems have isolation valves which allow the portion of the system that contains a leak to be isolated from the rest of the system.
- **Power Distribution:** Power required for water distribution is much lower resulting in a higher efficiency system.
- **Cold Weather Operation:** Highly efficient in hot and cold climates.
- **Controls and Parts:** WSHPs are compatible with other parts and integrate into a full system with other manufacturer's equipment.

What Manufacturers Are Not Saying When Pushing VRF

- VRF systems are completely proprietary systems from the controls to the condensing units, refrigerant controllers and all the system components - Only non-proprietary item is commonly used refrigerant piping.
- NO flexibility to use "open source" building control and automation system to run these systems. (You can only monitor what it's doing but you can't control it).
- BacNet or Lonworks black box to the VRF through a building DDC system.
- Extensive training required for both maintenance and installation.
- Large amounts of refrigerant in an occupied space. Refrigerant leaks are more common in VRF systems since there are so many joints. Few VRF manufacturers have developed products and protocols to address the concerns of refrigerant.
- Higher Installation Costs - Initial component price and install can be more expensive than alternatives.

International Association of Plumbing and Mechanical Officials. Hydronics Industry Alliance, 2020.
<https://www.iapmo.org/hiac>. Accessed May 2020.



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