

## QUESTIONS & ANSWERS FOR MODULE 7: BEYOND HYDROFLUOROCARBONS (HFCS): REFRIGERANT MANAGEMENT IN DESIGN, CONSTRUCTION, AND OPERATIONS

APRIL 13, 2020: DAY 1 QUESTIONS

Question	Who Asked	Answered Y/N	Answer
Is ASHRAE standard 15-2019 going to be applied to the New York State Building Code or the New York City Code?	Matthew Brubaker	Y	New York State will be adopting ASHRAE Standard 15-2016. See 2020 Mechanical Code of NYS here <a href="https://www.dos.ny.gov/DCEA/pdf/pdf/2020%20MCNYS%20November%202019.pdf">https://www.dos.ny.gov/DCEA/pdf/pdf/2020%20MCNYS%20November%202019.pdf</a>
Is the ASHRAE space requirement total room volume or only unobstructed clear volume?	Indumathi Lnu	Y	Total room volume. ASHRAE Standard 15 does allow rooms to be counted together if there is a permanent opening between them, for example fixed louvers.
Less than 6.6 lbs was exempt from what?	Michael Armida	Y	Systems with less than 6.6 lbs of refrigerant charge are exempt from room volume determinations based on refrigeration concentration limits.
Can you please show that slide with Refrig's and GWP's again...?	Bill Mitchell		See slide 26
Would you be able to talk a little bit about positive vs. negative pressure chillers and pros and cons of each	Indumathi Lnu	N	Not covered by the presentation
How is it possible that there could be too much refrigerant in the system since measured by weight?	Tom Kelly	Y	The weight for adding refrigerant to a VRF system is found through calculating as-built line lengths and components. We see these calculations be completed using design line lengths instead of as-built, potentially leading to an over-charged or under-charged system.



<p>It still is necessary to do superheat or subcooling?</p>	<p>Michael Armida</p>	<p>N</p>	<p>Refrigerant system charging should be completed in accordance with the manufacturer's instructions, which typically include adding refrigerant based on as built system line lengths and piping diameters. It is recommended that startup technicians do still look at temperatures across the system as an additional confirmation that the VRF system is properly charged. However it can be difficult to correlate the temperatures and pressure in the system to a simple chart as was done with previous 1:1 split units that were not variable. Charging mu</p>
<p>Good morning: for large scale VRF systems does each apartment require refrigerant leak monitoring? Thanks</p>	<p>Robert McCabe</p>	<p>Y</p>	<p>No, refrigerant monitoring systems are needed when spaces exceed the refrigerant concentration limits of ASHRAE Standard 15., for example a chiller room.</p>
<p>why cant we use the refrigerant only between the outdoor unit and the hydro BC controller</p>	<p>Richard Gonzalez</p>	<p>Y</p>	<p>The refrigerant charge used for ASHRAE 15 is the total amount of refrigerant that could possibly be discharged into the space the valves in the branch controller could be open to the outdoor unit connecting the entire amount of refrigerant to an individual space served.</p>
<p>What is the relation between the number of compressor stages and number of rooms in VRF?</p>	<p>Mohamed Gaber Ghorab</p>	<p>Y</p>	<p>VRF systems have inverter driven compressors, These compressors are variable speed (rather than simply staged). The variable speed compressor allows the system to serve variable load in a single zone as well as loads across multiple zones. There is no relationship between the variable nature of the compressor and the number of zones, except that the variable speed technology enabled the development of a split system with multiple indoor units that could operate independently.</p>



<p>On slide 85 - What is the percentage of the total GHG emissions are we talking about attributing to A/C? Is that like 1%, 20%? I imagine agriculture, transportation, heating, industry, etc... are big GHG gas contributors as well.</p>	<p>Ben Tashjian</p>	<p>N</p>	<p>Yes - agriculture, transportation, heating and industry are all very large GHG contributors. IEA had estimated that global emissions from AC is about 700 million metric tons (<a href="https://www.energy.gov/sites/prod/files/2016/07/f33/The%20Future%20of%20AC%20Report%20-%20Full%20Report_0.pdf">https://www.energy.gov/sites/prod/files/2016/07/f33/The%20Future%20of%20AC%20Report%20-%20Full%20Report_0.pdf</a>)          With global emissions on the order of 49 GtCO<sub>2eq</sub>/yr emissions (<a href="https://www.ipcc.ch/site/assets/uploads/2018/02/03_figure_1.3.png">https://www.ipcc.ch/site/assets/uploads/2018/02/03_figure_1.3.png</a>)          GHG Emissions from air conditioning appears to be on the order of 1.5% of global GHG emissions.          On a global level it is important to consider (as outlined in the EPA report above) “While adoption of A/C in developed countries increased rapidly in the 20th century, the 21st century will see greater adoption in developing countries, especially those in hot and (possibly) humid climates with large and growing populations, such as India, China, Brazil, and Middle Eastern nations.”</p>
<p>Does the Real World chart include natural gas system leaks GHG effects?</p>	<p>Marc Rosenbaum</p>	<p>Y</p>	<p>Leakage charts do not include natural gas leakage – we will look to add that into future presentations.</p>
<p>as a refrigerant management: how much do we know about the Hybrid City Multi by Mitsubishi Electric. New Zealand have good ratings on this system with the use of a hydronic system.</p>	<p>Richard Gonzalez</p>	<p>N</p>	<p>We do not have experience with commissioning Hybrid VRF systems but thank you for calling out this newer technology that would limit total amount of refrigerant in the system. Per Mitsubishi representative: They are currently in the process of bringing our Hybrid VRF System to the United States, and expect it to arrive around March 2021. The only</p>



			US installation at this moment is at our training center in NYC
Any recommendations on how to get good flare fittings installed?	Marc Rosenbaum	Y	Asked other attendees  An orbital flaring tool is the required flaring tool for 410A. Special specific flare nuts are also required for 410 A systems due to the higher pressures. -Michael Armida
Can you elaborate on air-to-water systems and where they might be appropriate vs. where they pose challenges? Why wouldn't you use these in most cases where you'd otherwise use VRF?	Zoe Kaufman	Y	Commercial scale air to water heat pumps ready for use in the NYS market are difficult to find. See Module 4 for further discussion on air-to-water heat pump. We hope to see more commercial availability for these types of systems in the future
Is slide 120 for CA or NY?	Indumathi Lnu	Y	California
Are project achieving the LEED Enhanced Refrigerant Management Credit or is the search still elusive?	Lisa Mitten	Y	We do see projects achieve this by limiting the use of refrigerant based equipment.
In the current trend of going electric, do we know what Governor Cuomo's long term plan is to supply New York State with more affordable electric rates.	Gerald Beattie	Y	Not covered by the presentation series.
Is there a complete set of guidelines or specifications resource.	Michael Weatherly	Y	See final resources slide in presentation.
If heat-pump indoor units mounted high on the wall have reduced heating efficiency, why are those systems rated at the highest efficiency of all indoor options?	Zoe Kaufman	Y	The rated efficiencies do not necessarily reflect actual operating air temperatures. The issue is that wall mounted units may have higher incoming air temperatures in real life conditions that the floor mounted units.
Can VRF systems be used for preheat of HRV systems for cold climates? The question is in regards to fresh air ventilation systems. These don't have the	James Morier	Y	We typically recommend that VRF systems be decoupled from ventilation. Most VRF systems are not rated for 100% outside air.



temperature rise needed for cold climates without preheat and reheat.			
Slide 166: is BACnet compatibility still promoted as means for universal communication? Thanks	Robert McCabe	Y	Yes, however, systems integration is not as easy as checking for BACnet Compatibility. There can be significant issues actually controlling a VRF from a BMS, mapping points properly, providing clear communication between contractors. This isn't necessarily unique to VRF there are a lot of packaged controls for HVAC equipment that controls integrators have a difficult time interfacing with.
How do you can control based on the space temperature if you have many heating/ cooling zones?  How do you control the VRF system based on the space temperature when there are many heating/ cooling zones?4	Mohamed Gaber Ghorab	Y	Each zone should have a separate VRF indoor unit controlled by its own thermostat. Note that if zones served by one outdoor unit have different load profiles that may require heating in one while cooling is required in another, the VRF system must be a heat recovery system to allow for the simultaneous heating and cooling.
Low-temp. hydronic was mentioned as more popular than VRF. Is cost of installation the only driver of this, or are there code-related drivers for this?	Michael Miranda	Y	It is not necessarily more popular; however, it does limit the amount of refrigerant piping in a building, and therefore limits the potential of refrigerant leaks.
I was wondering in your review of refrigerant leakage studies, was there a difference in leakage rates between brazed connection VRF and non-brazed connection VRF systems?	Michael Miranda	Y	We have not seen a study comparing the leaks in brazing and non-brazed connections.
Question regarding the status of New York State Codes / New York City Codes and if the ASHRAE standard 15 - 2019 would be sighted, or adopted into the Building Code. New York State as an example has	Survey	N	2020 Mechanical Code of New York State will be adopting ASHRAE Standard 15-2016.



<p>historically been a few "versions" behind ASHRAE standards as they are adopted. In the context of GWP, Human Health, Lower Carbon Emissions, it seems like it would make sense to adopt the higher standard. I would also ask this question of the current iteration of the New York State "stretch" code?</p>			<p>NYS Stretch is an energy efficiency code and not a safety code and so does not reference ASHRAE 15.</p>
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