



IES VE(Virtual Enviornment) 2019 Modeling Guide for LG Multi V™

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The Guide

The IES VE Building Energy Modeling Guide for LG Multi V™ provides step-by-step instructions to design LG Multi V™ systems. The definitions of the code-words are based from the IES Virtual Environment User Guide and the ApacheHVAC User Guide.

Disclaimer

The building energy modeling guide should be used as a guideline only. Building load/energy has been approximated for modeling purposes or input value of equipment (capacity, power input, etc.), and actual results may vary. The conclusions of the modeling guide do not guarantee actual energy costs or savings.

This Modeling Guide is intended as a design-and analysis guide to help designers optimize the design of the LG Multi V™ VRF system based on energy utilization. Modeling accuracy is highly dependent on user-supplied data. It is the user's responsibility to understand how the data entered affects program output, and to understand that any predefined libraries are to be used only as guidelines for entering the data. Results and reports of the calculation by this guide are meant to help a designer, not a substitute for design services, judgment, or experience.

To Install the IESVE Software

Please purchase the IESVE Software or free 30-day trial.

System Design with IES VE (Virtual Environment)

What is the IES Virtual Environment?

The Virtual Environment is an integrated suite of applications linked by a Common User Interface (CUI) and a single Integrated Data Model (IDM). This means that all the applications have a consistent “look and feel” and that data input for one application can be used by the others.

This modeling guide contains instructions for modeling VRF systems in IES Virtual Environment (VE). To purchase and learn more about IES VE, please visit the IES homepage (<https://www.iesve.com>)

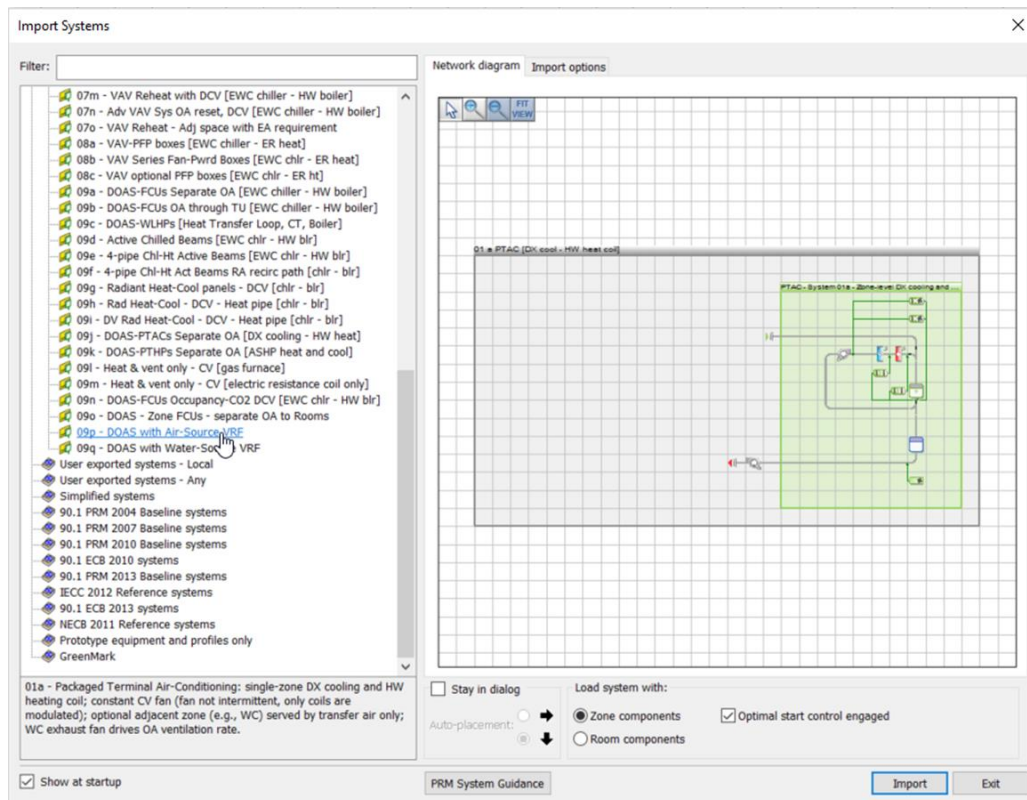


Figure 1: System Designing with the IES VE Software

What Is ApacheHVAC?

ApacheHVAC is used for modeling heating, ventilating, and air-conditioning (HVAC) systems, and falls within the Virtual Environment's Thermal application category. The ApacheHVAC supports the detailed definition, configuration, control, and modeling of HVAC systems. The simulation program itself is run from within Apache Thermal. ApacheHVAC is invoked as an adjunct to Apache Simulation by linking to a particular HVAC system file when the building model simulation is run, as described in the Apache User Guide.

There are two distinct means of space conditioning and HVAC simulation in the IES Virtual Environment, and these are suitable for very different tasks, levels of analysis, and stages of design.

To model a VRF system in IES-VE 2019, the system type is set to VRF which is an IES-VE program representing the Air-source or water-source VRF system.

- When you click the "ApacheHVAC" in Applications Selector or "Wizard-based workflow" in Navigators Selector, the "HVAC System Design Wizard" window will appear.

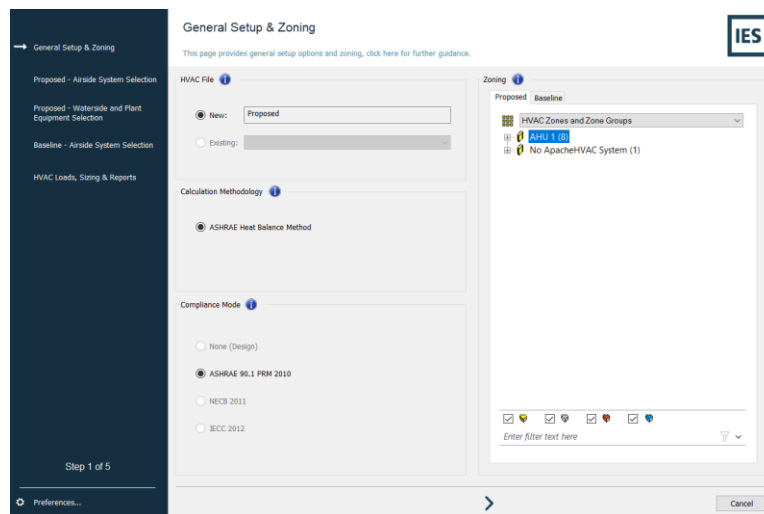


Figure 2: HVAC System Design Wizard

To Design VRF System in the IES VE 2019

1. In step 1 of 5 in the Design Wizard window, general setting and zoning can be performed.

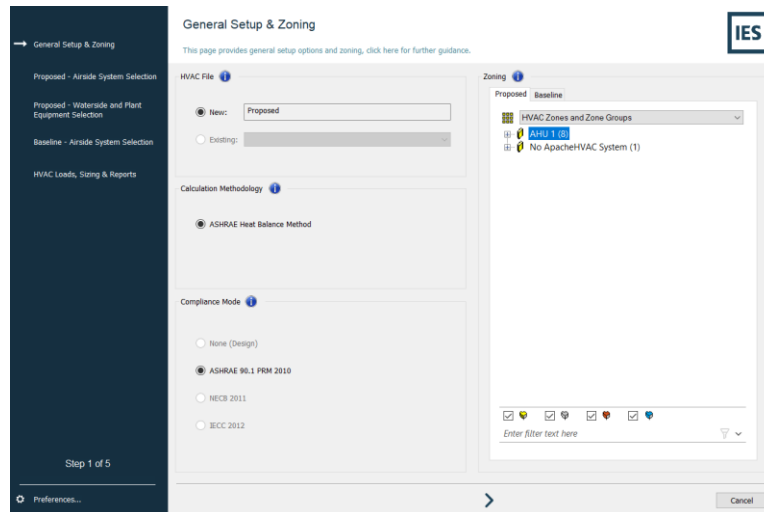


Figure 3: HVAC System Design Wizard (General Setup & Zoning)

2. In step 2 of 5 in the Design Wizard window, Proposed-airside system selection and assignment of pre-configured HVAC systems can be performed.
 - Select Air-source VRF or Water-Source VRF (Figure 4)
 - Assign HVAC zone and room groups (Figure 5)

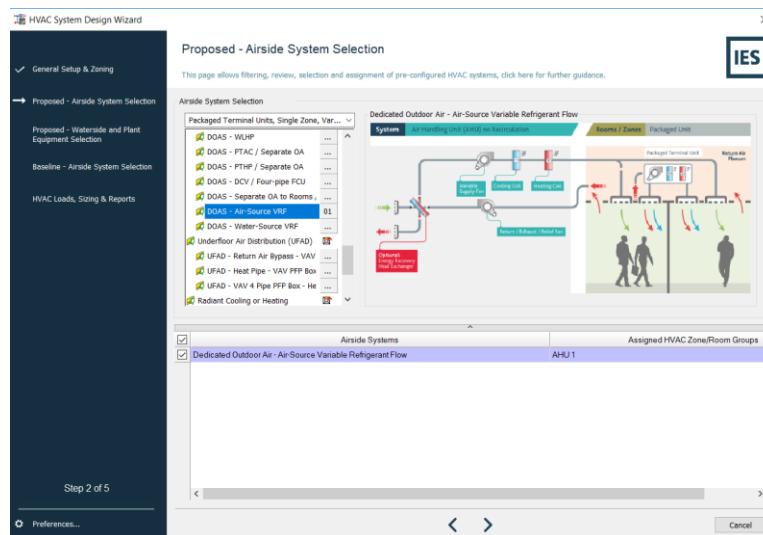


Figure 4: HVAC System Design Wizard (Proposed-Airside System Selection)

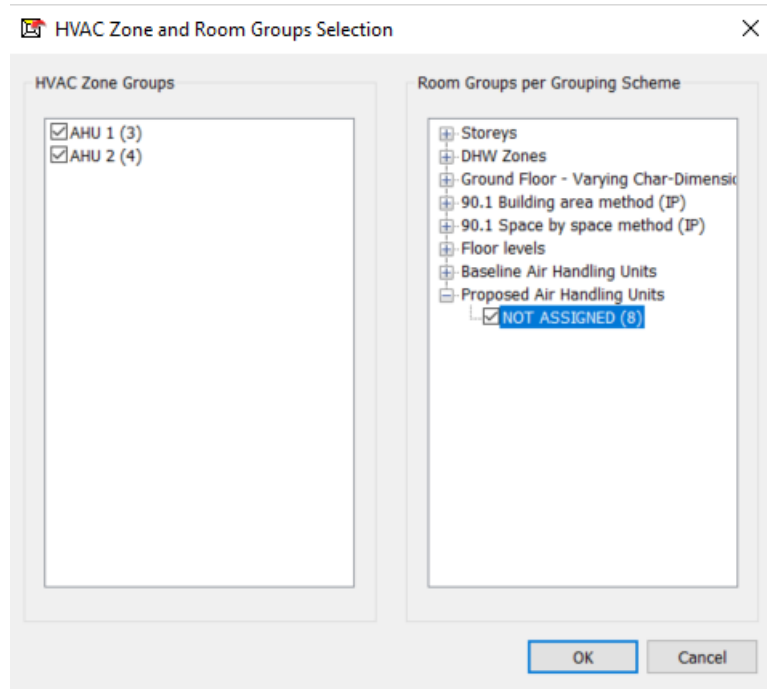


Figure 5: HVAC System Design Wizard (HVAC Zone Selection of the Proposed-Airside)

3. In step 3 of 5 in the Design Wizard window, Waterside system selection and assignment of pre-configured HVAC systems can be performed.
 - If you are modeling water-source VRF system, assign the waterside cooling system and the waterside heating system.

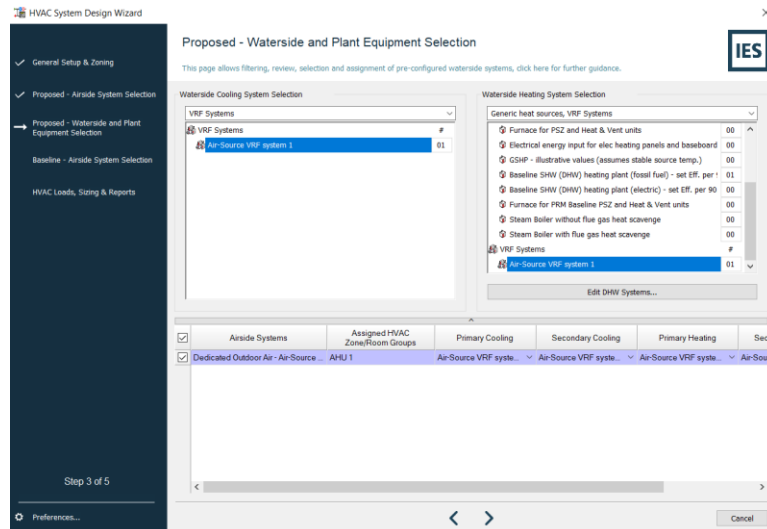


Figure 6: HVAC System Design Wizard (Waterside and Plant Equipment Selection)

4. In step 4 of 5 in the Design Wizard window, Baseline-airside system selection and assignment of pre-configured HVAC systems can be performed
 - Select building type, cooling/heating energy source, and baseline HVAC system.

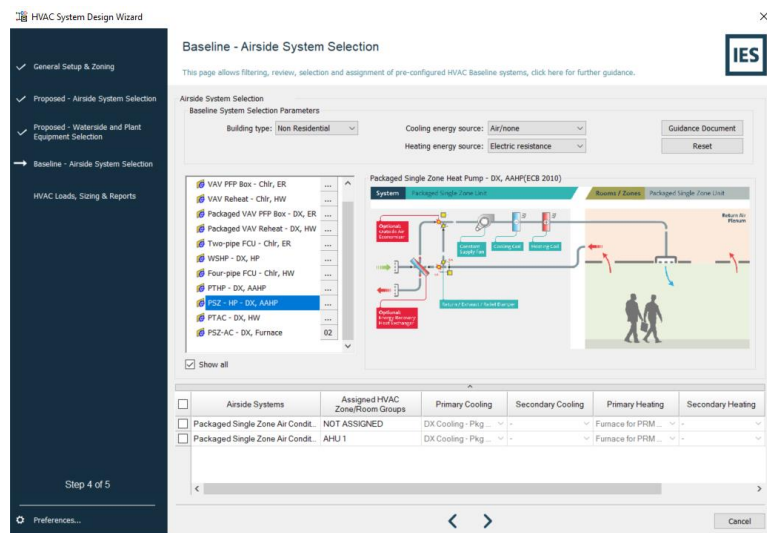


Figure 7: HVAC System Design Wizard (Baseline -Airside System Selection)

- Assign HVAC zone and Room Groups Selection (Figure 8)

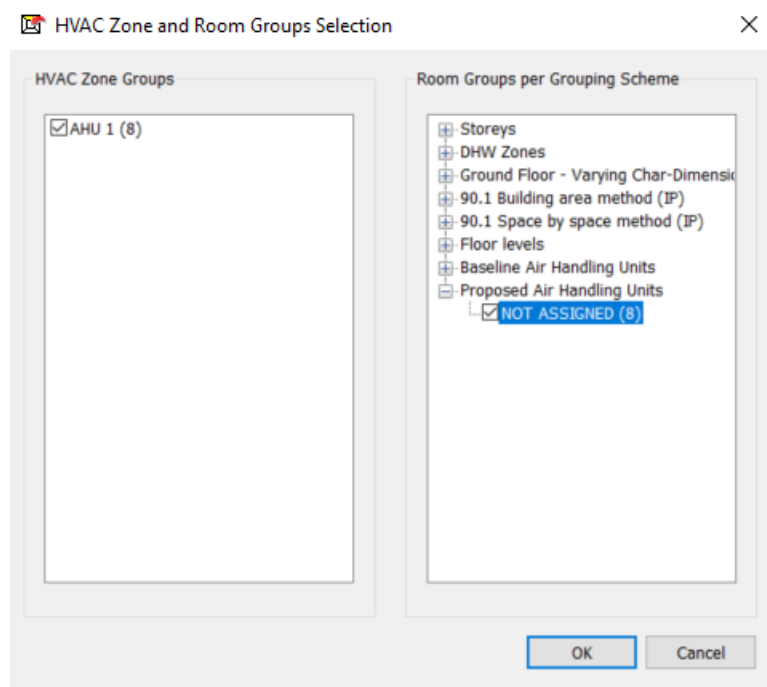


Figure 8: HVAC System Design Wizard (HVAC Zone Selection of the Baseline-Airside)

5. In step 5 of 5 in the Design Wizard window, HVAC Loads, Sizing & Reports can be performed.

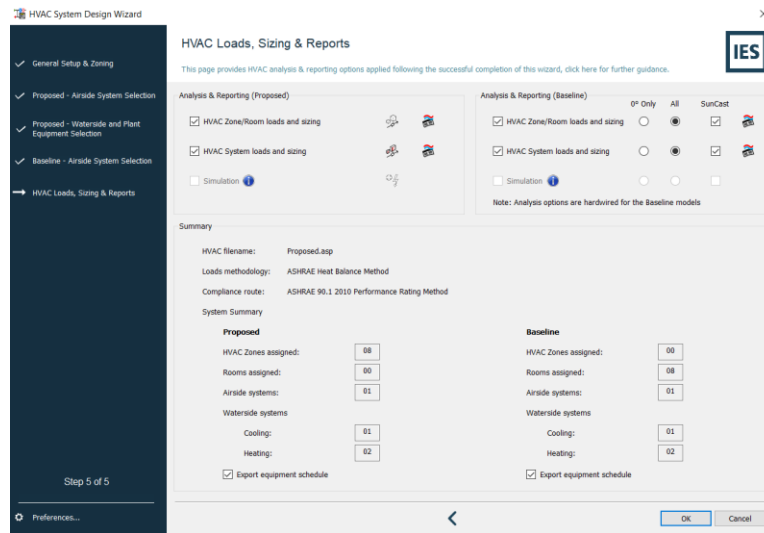


Figure 9: HVAC System Design Wizard (HVAC Loads, Sizing & Reports)

- Select results to generate a report (Figure 10).

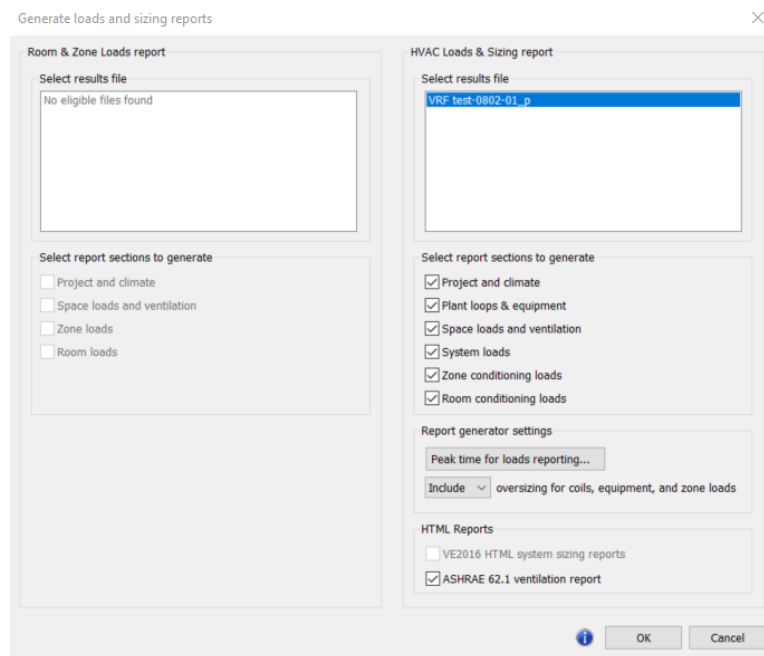
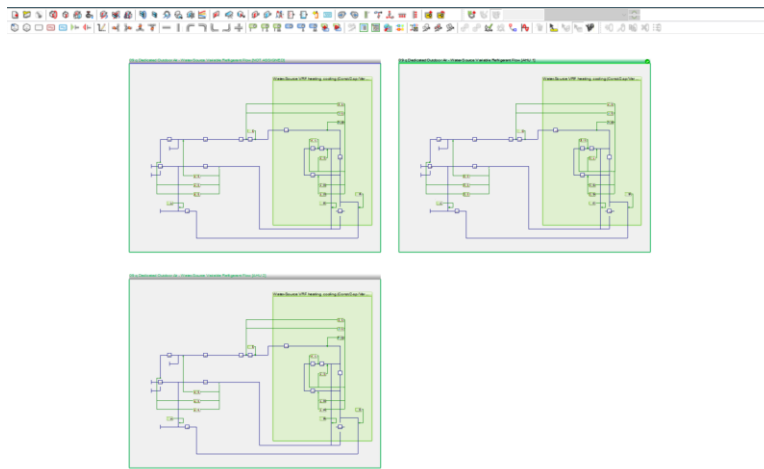


Figure 10: HVAC System Design Wizard (Generate Loads and Sizing Report)

Assigning LG VRF Performance Curves

1. Click the “Edit Current Proposed” in Navigators Selector.



The VRF prototype system view demonstrates the HVAC system air-side schematic and provides a graphical means of selecting, configuring, organizing, and editing airside component and controllers.



Figure 11: The ApacheHVAC Toolbars

The ApacheHVAC Toolbars, shown in Figure 11, provide quick access to menu functions, selection of components and controllers to be placed on the system schematic, creation and editing of system of multiplexes, and access to system prototypes.

2. Click the “VRF systems” button located at the far right on the ApacheHVAC Toolbars.

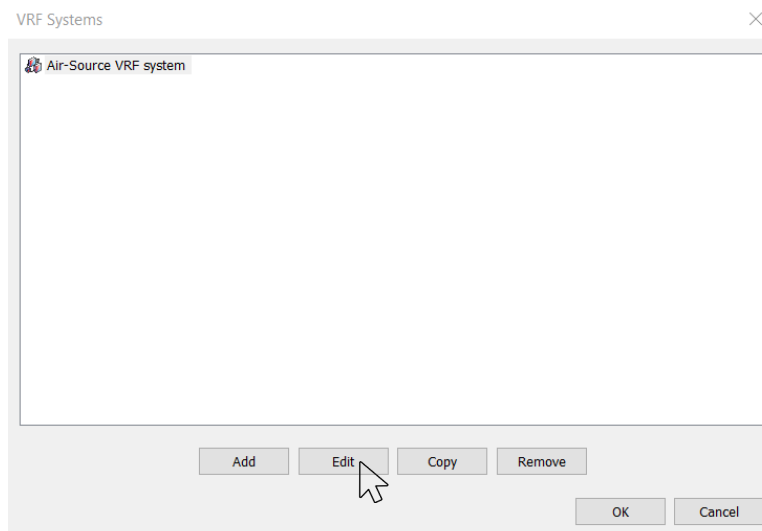
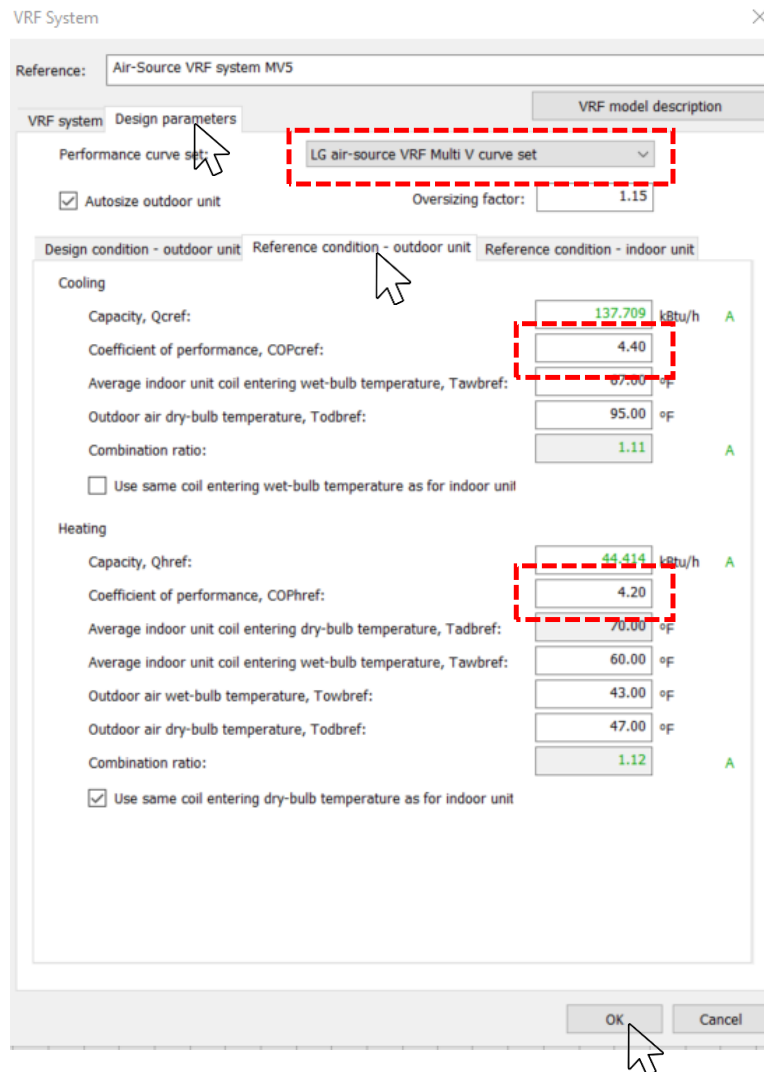


Figure 12 : VRF System Window

3. Select the “Air-Source VRF system” and click “Edit” button as shown in Figure 12.



The screenshot shows the 'VRF System' window with the 'Design parameters' tab selected. The 'Performance curve set' is set to 'LG air-source VRF Multi V curve set'. The 'Autosize outdoor unit' checkbox is checked. The 'Reference condition - outdoor unit' tab is selected, showing the following parameters:

Parameter	Value	Unit	Status
Capacity, Q _c ref:	137.709	kBtu/h	A
Coefficient of performance, COP _c ref:	4.40		
Average indoor unit coil entering wet-bulb temperature, T _{aw} bref:	67.00	°F	
Outdoor air dry-bulb temperature, T _{od} bref:	95.00	°F	
Combination ratio:	1.11		A

The 'Heating' section shows the following parameters:

Parameter	Value	Unit	Status
Capacity, Q _h ref:	44.414	kBtu/h	A
Coefficient of performance, COP _h ref:	4.20		
Average indoor unit coil entering dry-bulb temperature, T _{ad} bref:	70.00	°F	
Average indoor unit coil entering wet-bulb temperature, T _{aw} bref:	60.00	°F	
Outdoor air wet-bulb temperature, T _{ow} bref:	43.00	°F	
Outdoor air dry-bulb temperature, T _{od} bref:	47.00	°F	
Combination ratio:	1.12		A

The 'OK' button is highlighted with a mouse cursor.

Figure 13: VRF System Window

4. The “Air-Source ” window appears as shown in Figure 13.
5. Click “Design parameters” tab, select “LG air-source VRF Multi V™ curve set” of the performance curve sets. Click “Reference condition - outdoor unit” tab within the “Design parameters” window.
6. Enter the cooling Coefficient of Performance (COP) in the “COP_cref” box of cooling section and the heating COP in the “COP_href” box of the heating section. Please refer to the Design Parameters (Pg. 19).
7. Click “OK” and click “OK” to close the VRF system window.

Modeling Heat Transfer Loop

The heat transfer loop component is to demonstrate a simulation of water-source heat pump (WSHP) systems. First, the heat transfer loop is operated as water-source heat pumps. Later it supports heating, cooling, and collecting or rejecting heat via hot/cold-water coils on the airside network and to serve the purpose of transferring heat between other water loops (heat transfer loops, chilled water loops, hot water loops, etc.).

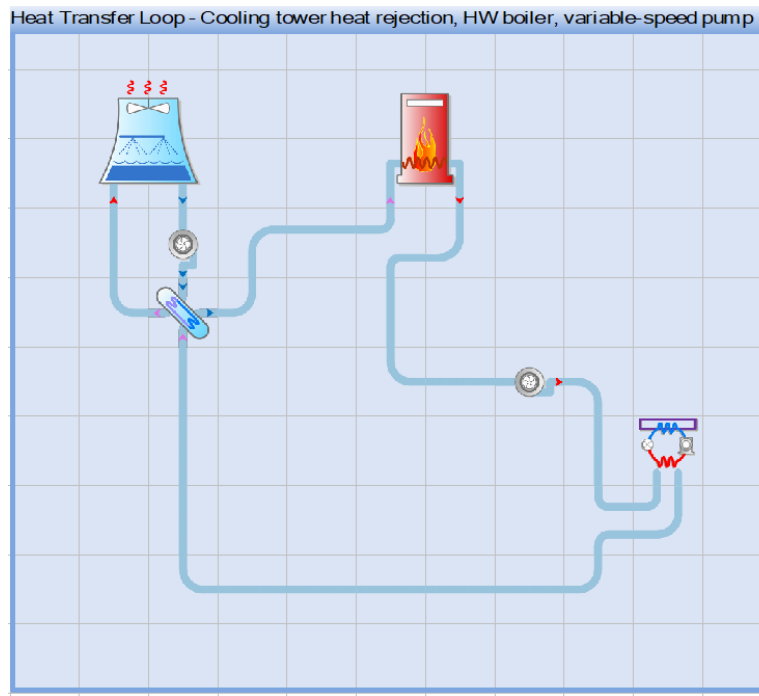


Figure 14: Heat Transfer Loop Diagram

1. Click "Heat transfer loops" of "Waterside" in "HVAC Network" of "HVAC Components" to open the heat transfer loop diagram in the Model Space as shown in Figure 14.

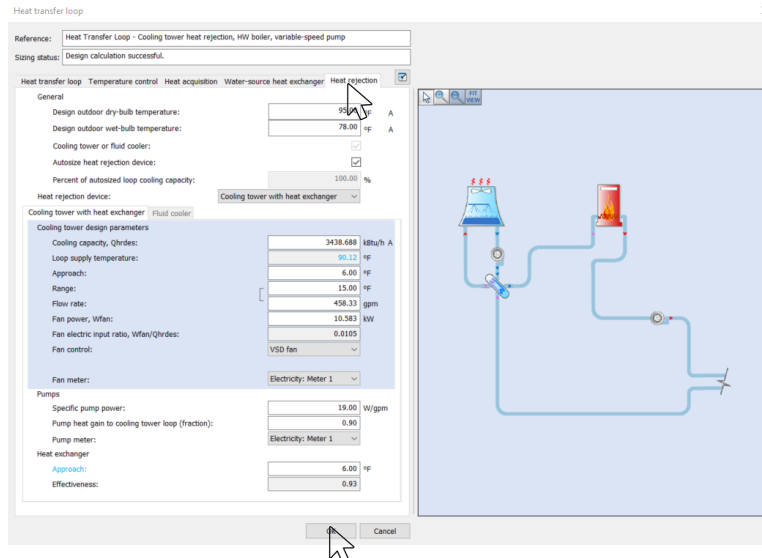


Figure 15: Heat Transfer Loop Window – Heat Rejection

2. Double click the cooling tower icon in the diagram to open the “Heat transfer loop” window as shown in Figure 15. Please set the parameters according to design conditions.

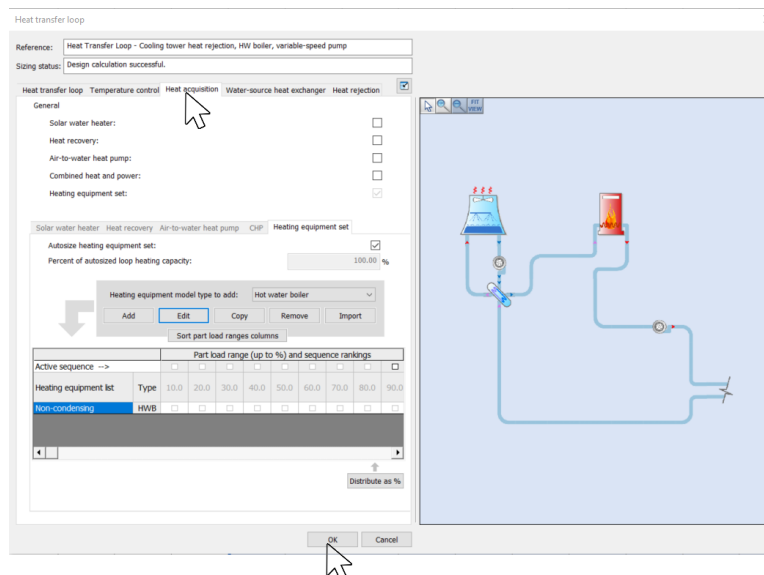


Figure 16: Heat Transfer Loop Window – Heat Acquisition

- Click "Heat acquisition" tab as shown in Figure 16 and set the parameters according to design conditions.

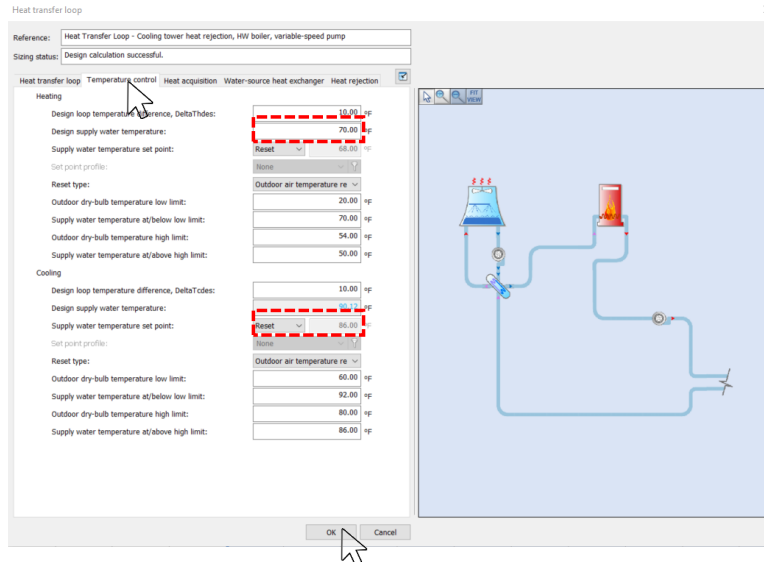
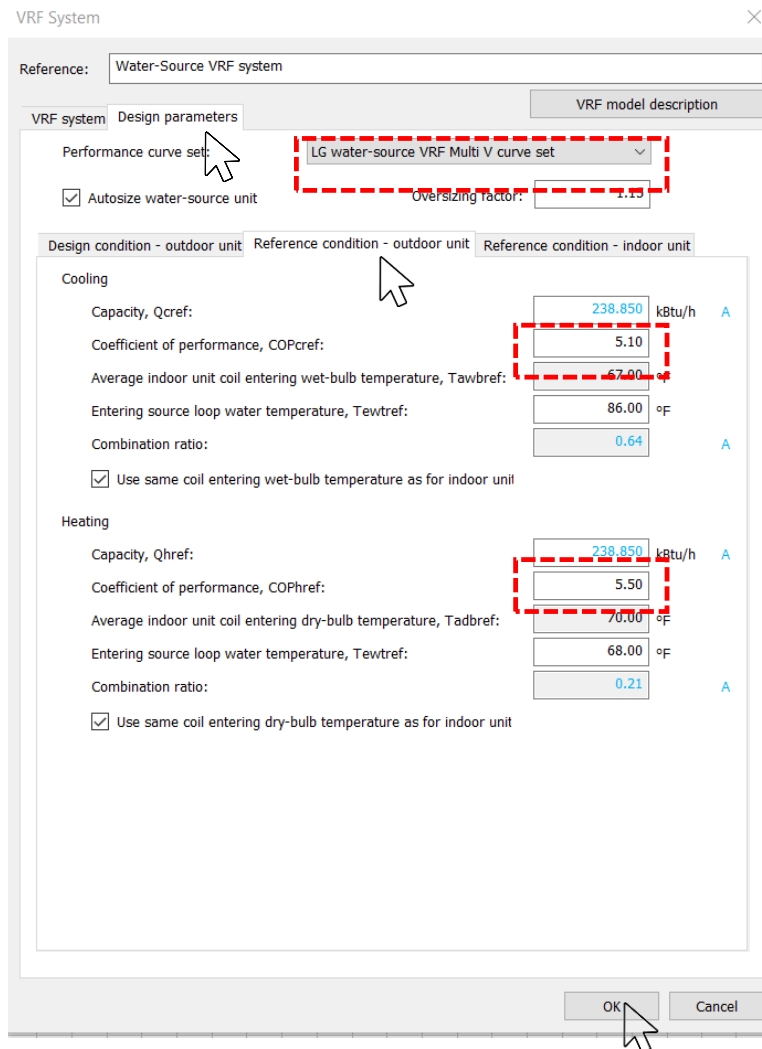


Figure 17: Heat Transfer Loop Window –Temperature Control

4. Click “Temperature control” tab as shown in Figure 17 and set the parameters according to design conditions.
5. Click “OK” to set the parameters and close the “Heat transfer loop” window.

Assigning LG Water- source VRF performance

1. Click the “VRF systems” button located at the far right on the ApacheHVAC Toolbars.
2. Select the “Air-Source VRF system” and click “Edit” button.



VRF System

Reference: Water-Source VRF system

VRF system Design parameters VRF model description

Performance curve set: LG water-source VRF Multi V curve set

☒ Autosize water-source unit Oversizing factor: 1.15

Design condition - outdoor unit Reference condition - outdoor unit Reference condition - indoor unit

Cooling

Capacity, Qcref: 238.850 kbtu/h A

Coefficient of performance, COPcref: 5.10

Average indoor unit coil entering wet-bulb temperature, Tawbref: 67.00 °F

Entering source loop water temperature, Tewtref: 86.00 °F

Combination ratio: 0.64 A

☒ Use same coil entering wet-bulb temperature as for indoor unit

Heating

Capacity, Qhref: 238.850 kbtu/h A

Coefficient of performance, COPhref: 5.50

Average indoor unit coil entering dry-bulb temperature, Tadbref: 70.00 °F

Entering source loop water temperature, Tewtref: 68.00 °F

Combination ratio: 0.21 A

☒ Use same coil entering dry-bulb temperature as for indoor unit

OK Cancel

Figure 18: VRF System Window (Water)

3. The “Water source” window appears as shown in Figure 18Figure 13.
4. Click “Design parameters” tab, select “LG water-source VRF Multi V™ curve set” of the performance curve sets. Click “Reference condition - outdoor unit” tab within the “Design parameters” window.
5. Enter the cooling Coefficient of Performance (COP) in the “COPcref” box of cooling section and the heating COP in the “COPhref” box of the heating section. Please refer to the Design Parameters (Pg. 19).
6. Click “OK” and click “OK” to close the VRF system window.

A water source heat pump system consists of multiple zone-level water-to-air heat pumps connected to a common water loop. The common water loop is used by each individual heat pump as a source for acquiring heat or sink for rejecting heat. Some of the WSHP units on the loop may be in cooling mode, while others may be in heating mode. For all WSHP units on given Heat transfer loop, this common loop simultaneously acts a resource for any WSHP in heating mode and a sink for any WSHP in cooling mode. A conventional WSHP system uses a boiler to add heat to the common loop and a cooling tower or fluid cooler to reject excess heat from the common water loop. This is also referred to as a “water-loop heat pump” (WLHP) system, and the WSHP model includes a set of WLHP performance curves for this type of application. Typically, the boiler operates to maintain the minimum loop supply water temperature around 68°F (20°C), while the cooling tower or fluid cooler operates to maintain the maximum loop supply water temperature of something like 86°F (30°C). Between the maximum and minimum, the loop supply water temperature is allowed to float.

A ground-water WSHP system uses an open water loop that draws water from a lake, well, or similar resource. The WSHP model includes a pre-defined set of GWHP performance curves for this type of application. The loop water temperature is assumed to float with both the loads and the lake/well water temperature, with the latter represented as an annual temperature profile on the source side of a water to- water heat exchanger. Typical rating conditions in terms of water loop temperatures for this type of system are 50°F (10°C) for heating and 59°F (15°C) for cooling.

A ground-source heat pump system uses a closed loop of polymer tubing acting as a “geo-thermal heat exchanger”. The loop water temperature floats with the ground temperature, loop load, and the characteristics of the geo-thermal heat exchanger. Typical rating conditions in terms of common water loop temperatures for this type of system are 32°F (0°C) for heating and 77°F (25°C) for cooling. User should be cautioned, however, that this model does not include detailed geo-thermal heat exchanger characteristics or the capacitance or thermal mass of the earth around the tubes, and therefore has no means of determining the extent to which this earth may become thermally depleted or saturated over time. So, while this model can be used to represent a ground-source heat pump system, it is limited to representing that which can be suitably described by a seasonal ground-source temperature profile.

Designing VRF Indoor Units

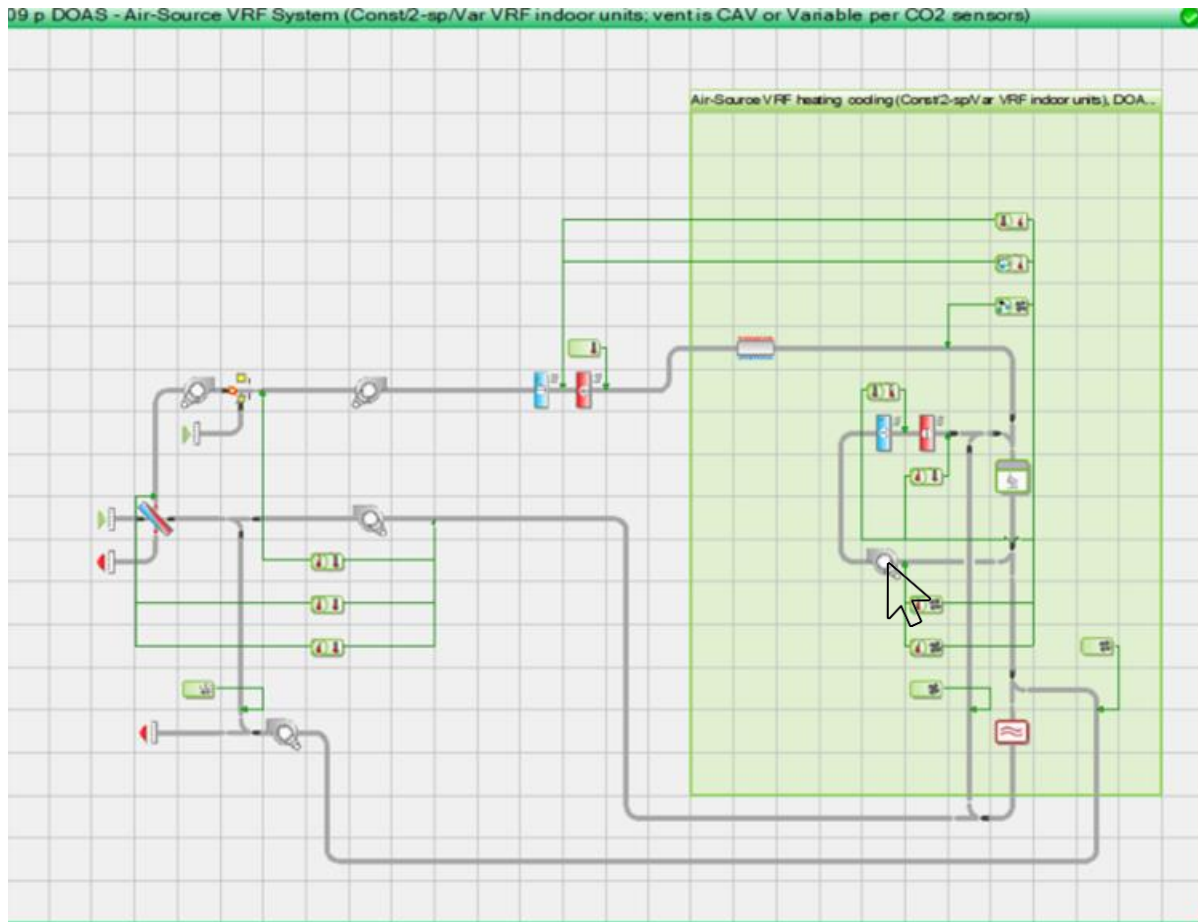


Figure 19: VRF System - Fan

The fan module is used to determine the required fan power at a given flow rate, and energy consumption of the fan, and to account for the temperature rise in the air stream. For variable-volume systems, flow, pressure, and efficiency characteristics need to be defined at multiple points on the fan curve.

Fan

Reference: M4: FCU Fan

Link: FCU fan Re-apply

Settings

Design flow rate: ☒ Autosize 722.32 cfm A

Oversizing factor: 1.00

Design total pressure: 0.80 in water

Fan efficiency at design flow rate: 48.00 %

Motor efficiency: 65.00 %

Motor airstream heat pickup factor: 100.00 %

Design fan power: 0.218 kW

Electricity meter: Electricity: Meter 1

Fan category: Interior local

Characteristic

☐ Variable volume

Airflow modulation performance curve: Custom fan curve

	Flow fraction (%)	Fraction of design motor power (%)	Motor efficiency (%)	Fan power (kW)
1 - (T)	100.00	100.00	65.00	0.218

Add Insert Remove

Multiple Edit

OK Cancel

Figure 20: The Fan Window

1. Double click the fan icon in the module as shown in Figure 19. The "fan" window appears as shown in Figure 20.
2. Enter "Design fan power" data in the "Design fan power" box. Please refer to the Design Parameters (Pg. 20-21).
3. Click "OK" to close the "Fan" window.



Design Parameters

For more detail info, please contact to LG Electronics USA, Inc. or LG Multi V™ Sales Representatives.

LG VRF Multi V™ (air)

Model Name	Cooling				Heating			
	Capacity (MBh)	Power input (kW)	EER	COP	Capacity (MBh)	Power input (kW)	EER	COP
ARUM072B(D)TE5	72	4.28	16.82	4.9	81	5.39	15.0	4.4
ARUM096B(D)TE5	96	5.33	18.01	5.3	108	6.74	16.0	4.7
ARUM121B(D)TE5	120	7.72	15.54	4.6	135	9.2	14.7	4.3
ARUM144B(D)TE5	144	9.3	15.48	4.5	162	10.54	15.4	4.5
ARUM168B(D)TE5	168	12.23	13.74	4.0	189	13.98	13.5	4.0
ARUM192B(D)TE5	192	13.61	14.11	4.1	216	15.46	14.0	4.1
ARUM216B(D)TE5	216	15.37	14.05	4.1	243	17.75	13.7	4.0
ARUM241B(D)TE5	240	16.8	14.29	4.2	243	17.75	13.7	4.0
ARUM264B(D)TE5	264	17.56	15.03	4.4	297	20.72	14.3	4.2
ARUM288B(D)TE5	288	18.94	15.21	4.5	324	22.2	14.6	4.3
ARUM312B(D)TE5	312	20.7	15.07	4.4	351	24.49	14.3	4.2
ARUM336B(D)TE5	336	23.09	14.55	4.3	378	26.95	14.0	4.1
ARUM360B(D)TE5	360	24.67	14.59	4.3	405	28.29	14.3	4.2
ARUM384B(D)TE5	384	27.6	13.91	4.1	432	31.73	13.6	4.0
ARUM408B(D)TE5	408	28.98	14.08	4.1	459	33.21	13.8	4.1
ARUM432B(D)TE5	432	30.74	14.05	4.1	486	35.5	13.7	4.0
ARUM456B(D)TE5	456	30.81	14.80	4.3	513	36.15	14.2	4.2
ARUM480B(D)TE5	480	32.39	14.82	4.3	540	37.49	14.4	4.2
ARUM504B(D)TE5	504	35.32	14.27	4.2	567	40.93	13.9	4.1

LG VRF Multi V™ (water)

208-230V	Cooling			Heating		
	Capacity (MBh)	Power input(kW)	COP	Capacity (MBh)	Power input(kW)	COP
ARWN(B)072BAS4	72	3.91	5.40	79.3	3.96	5.87
ARWN(B)096BAS4	96	5.41	5.20	105.7	5.46	5.67
ARWN(B)121BAS4	120	7.03	5.00	132.1	7.09	5.46
ARWN(B)144BAS4	144	8.79	4.80	158.5	8.83	5.26
ARWN(B)168BAS4	168	9.32	5.28	185	9.42	5.76
ARWN(B)192BAS4	192	10.94	5.14	211.4	11.05	5.61
ARWN(B)216BAS4	216	12.7	4.98	237.8	12.79	5.45
ARWN(B)288BAS4	288	17.58	4.80	317	17.66	5.26
ARWN(B)360BAS4	360	21.49	4.91	396.3	21.62	5.37
ARWN(B)432BAS4	432	26.37	4.80	475.5	26.49	5.26
460V	Capacity (MBh)	Power input(kW)	COP	Capacity (MBh)	Power input(kW)	COP
ARWN(B)072DAS4	72	3.98	5.30	79.3	3.96	5.87
ARWN(B)096DAS4	96	5.41	5.20	105.7	5.46	5.67
ARWN(B)121DAS4	120	6.9	5.10	132.1	7.09	5.46
ARWN(B)144DAS4	144	8.12	5.20	158.5	8.83	5.26
ARWN(B)168DAS4	168	9.66	5.10	185	9.42	5.76
ARWN(B)192DAS4	192	11.26	5.00	211.4	11.05	5.61
ARWN(B)240DAS4	240	13.53	5.20	264.2	13.3	5.82
ARWN(B)288DAS4	288	16.56	5.10	317	17.66	5.26
ARWN(B)336DAS4	336	19.32	5.10	369.9	19.48	5.57
ARWN(B)384DAS4	384	22.52	5.00	422.8	22.67	5.47
ARWN(B)480DAS4	480	27.5	5.12	528.4	27.51	5.63
ARWN(B)576DAS4	576	33.78	5.00	634.1	34.01	5.46

LG VRF Multi V™ Indoor Units

Non-ducted Type

Type	Model	Capacity (MBh)	Max Input kW (Motor-rated)	CFM(High)	Power input(kW) -High mode
4Way 2X2 CST	ARNU05GTRC4	5.5	0.03	265	0.013
4Way 2X2 CST	ARNU07GTRC4	7.5	0.03	265	0.013
4Way 2X2 CST	ARNU09GTRC4	9.6	0.03	283	0.014
4Way 2X2 CST	ARNU12GTRC4	12.3	0.03	307	0.017
4Way 2X2 CST	ARNU15GTQC4	15.4	0.03	388	0.024
4Way 2X2 CST	ARNU18GTQC4	19.1	0.03	396	0.025
4Way 3X3 CST	ARNU24GTPC4	24.2	0.033	600	0.031
4Way 3X3 CST	ARNU28GTPC4	28	0.033	671	0.04
4Way 3X3 CST	ARNU073TNA4	7.5	0.144	459	0.018
4Way 3X3 CST	ARNU093TNA4	9.6	0.144	477	0.019
4Way 3X3 CST	ARNU123TNA4	12.3	0.144	494	0.022
4Way 3X3 CST	ARNU153TNA4	15.4	0.144	530	0.025
4Way 3X3 CST	ARNU183TNA4	19.1	0.144	565	0.027
4Way 3X3 CST	ARNU243TNA4	24.2	0.144	742	0.051
4Way 3X3 CST	ARNU36GTNC4	36.2	0.144	883	0.07
4Way 3X3 CST	ARNU243TMA4	24.2	0.144	777	0.047
4Way 3X3 CST	ARNU283TMA4	28	0.144	812	0.052
4Way 3X3 CST	ARNU363TMA4	36.2	0.144	918	0.064
4Way 3X3 CST	ARNU42GTMC4	42	0.144	1,059	0.104
4Way 3X3 CST	ARNU48GTMC4	48.1	0.144	1,130	0.12
1Way CST	ARNU07GTUC4	7.5	0.04	290	0.020
1Way CST	ARNU09GTUC4	9.6	0.04	325	0.022
1Way CST	ARNU12GTUC4	12.3	0.04	353	0.024
1Way CST	ARNU18GTTC4	19.1	0.07	470	0.038
1Way CST	ARNU24GTTC4	24.2	0.07	515	0.051
2Way CST	ARNU18GTLC4	19.1	0.07	459	0.034
2Way CST	ARNU24GTLC4	24.2	0.07	601	0.04
Wall Mount	ARNU05GSBL4	5.5	0.021	230	0.009
Wall Mount	ARNU07GSBL4	7.5	0.021	247	0.01
Wall Mount	ARNU09GSBL4	9.6	0.021	290	0.012
Wall Mount	ARNU12GSBL4	12.3	0.021	336	0.016
Wall Mount	ARNU15GSBL4	15.4	0.021	371	0.021
Wall Mount	ARNU18GSCL4	19.1	0.0395	441	0.023
Wall Mount	ARNU24GSCL4	24.2	0.0395	494	0.039
Wall Mount	ARNU073SER2	7.5	0.4	247	0.012
Wall Mount	ARNU093SER2	9.6	0.4	282	0.014
Wall Mount	ARNU123SER2	12.3	0.4	353	0.020
Wall Mount	ARNU153SER2	15.4	0.4	371	0.022
Wall Mount	ARNU183S8R2	19.1	0.35	508	0.036
Wall Mount	ARNU243S8R2	24.2	0.35	632	0.053

Ducted Type

Type	Model	Capacity (MBh)	Max Input kW (Motor-rated)	CFM(High)	Power input(kW) -High mode
Vertical Air Handling Unit	ARNU123NJA4	12	0.228	530	0.080
Vertical Air Handling Unit	ARNU183NJA4	18	0.228	580	0.090
Vertical Air Handling Unit	ARNU243NJA4	24	0.228	710	0.120
Vertical Air Handling Unit	ARNU303NJA4	30	0.228	880	0.180
Vertical Air Handling Unit	ARNU363NJA4	36	0.228	990	0.230
Vertical Air Handling Unit	ARNU423NKA4	42	0.366	1,250	0.260
Vertical Air Handling Unit	ARNU483NKA4	48	0.366	1,400	0.330
Vertical Air Handling Unit	ARNU543NKA4	54	0.366	1,475	0.370
Ducted(Low)	ARNU07GL1G4	7.5	0.04	270	0.031
Ducted(Low)	ARNU09GL1G4	9.6	0.04	320	0.039
Ducted(Low)	ARNU12GL2G4	12.3	0.085	360	0.041
Ducted(Low)	ARNU15GL2G4	15.4	0.085	450	0.056
Ducted(Low)	ARNU18GL2G4	19.1	0.085	530	0.071
Ducted(Low)	ARNU24GL3G4	24	0.115	710	0.103
Ducted(Low)	ARNU07GB3G4	7.5	0.085	283	0.016
Ducted(Low)	ARNU09GB3G4	9.6	0.085	318	0.016
Ducted(Low)	ARNU12GB3G4	12.3	0.085	353	0.019
Ducted(Low)	ARNU15GB3G4	15.4	0.085	388	0.021
Ducted(Low)	ARNU18GB4G4	19.1	0.115	494	0.05
Ducted(Low)	ARNU24GB4G4	24.2	0.115	600	0.074
High Static Duct	ARNU07GBHA4	7.5	0.15	230	0.058
High Static Duct	ARNU09GBHA4	9.6	0.15	286	0.067
High Static Duct	ARNU12GBHA4	12.3	0.15	339	0.078
High Static Duct	ARNU15GBHA4	15.4	0.15	399	0.09
High Static Duct	ARNU18GBHA4	19.1	0.15	459	0.103
High Static Duct	ARNU24GBHA4	24.2	0.15	565	0.132
High Static Duct	ARNU073BGA4	7.5	0.45	441	0.050
High Static Duct	ARNU093BGA4	9.6	0.45	452	0.050
High Static Duct	ARNU123BGA4	12.3	0.45	477	0.052
High Static Duct	ARNU153BGA4	15.4	0.45	487	0.053
High Static Duct	ARNU183BGA4	19.1	0.45	537	0.058
High Static Duct	ARNU243BGA4	24.2	0.45	671	0.082
High Static Duct	ARNU283BGA4	28	0.45	915	0.125
High Static Duct	ARNU363BGA4	36	0.45	1,141	0.235
High Static Duct	ARNU423BGA4	42	0.45	1,218	0.267
High Static Duct	ARNU283BRA4	28	0.45	1,278	0.249
High Static Duct	ARNU363BRA4	36.2	0.45	1,381	0.300
High Static Duct	ARNU423BRA4	42	0.45	1,490	0.330
High Static Duct	ARNU483BRA4	48.1	0.45	1,582	0.425
High Static Duct	ARNU543BRA4	54	0.45	1,801	0.49
High Static Duct	ARNU363B8A4	36.2	0.8	1,730	0.478
High Static Duct	ARNU423B8A4	42	0.8	1,814	0.528
High Static Duct	ARNU483B8A4	48.1	0.8	2,019	0.538
High Static Duct	ARNU763B8A4	76.4	0.8	2,260	0.765
High Static Duct	ARNU963B8A4	95.9	0.8	2,542	0.8



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