

2019-2020 MECHANICAL HVAC UPGRADES to
Flat Rock & Rugby Middle Schools
Henderson County Schools
Hendersonville, North Carolina
DEI Job No. 19005

Section 15M700 – Mechanical HVAC VRV Systems & Accessories

VARIABLE REFRIGERANT VOLUME (Heat Recovery) AIR CONDITIONING SYSTEMS

Part 1 – GENERAL

1.01 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SYSTEM DESCRIPTION

The variable capacity, heat recovery air conditioning system shall be a Daikin Variable Refrigerant Volume Series IV X split system as specified. The system shall consist of multiple evaporators, branch selector boxes, REFNET™ joints and headers, a three pipe refrigeration distribution system using PID control and Daikin VRV® condenser unit. The condenser shall be a direct expansion (DX), air-cooled heat recovery, multi-zone air-conditioning system with variable speed inverter driven compressors using R-410A refrigerant. The condensing unit may connect an indoor evaporator capacity up to 200% of the condensing unit capacity. All zones are each capable of operating separately with individual temperature control. A dedicated hot gas pipe shall be required to ensure optimum heating operation performance. Two-pipe, heat recovery systems utilizing a lower temperature mixed liquid/gas refrigerant to perform heat recovery are not acceptable due to reduced heating capabilities.

The indoor units shall be connected to the condensing unit utilizing Daikin's REFNET™ specified piping joints and headers to ensure correct refrigerant flow and balancing. T style joints are not acceptable for a variable refrigerant system.

Operation of the system shall permit either individual cooling or heating of each indoor unit simultaneously. Each indoor unit or group of indoor units shall be able to provide set temperature independently via a local remote controller, an Intelligent Controller, an Intelligent Manager or a BMS interface.

Branch selector boxes shall be located as shown on the drawing. The branch selector boxes shall have the capacity to control up to 290 MBH (cooling) downstream of the branch selector box. Each branch of the branch selector box shall consist of three electronic expansion valves, refrigerant control piping and electronics to facilitate communications between the box and main processor and between the box and indoor units. The branch selector box shall control the operational mode of the subordinate indoor units. The use of three EEV's ensures continuous heating during defrost (multiple condenser systems), no heating impact during changeover and reduced sound levels. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.

1.03 Required VRV-VRF FEATURES AND BENEFITS

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- A. Voltage Platform –Heat recovery condensing units shall be available with a 460V/3/60 power supply.
- B. Advanced Zoning – A single system shall provide for up to 64 zones.
- C. Independent Control – Each indoor unit shall use a dedicated electronic expansion valve with 2000 positions for independent control.
- D. VFD Inverter Control and Variable Refrigerant Temperature – Each condensing unit shall use high efficiency, variable speed all “inverter” compressor(s) coupled with inverter fan motors to optimize part load performance. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions.
- E. Indoor units shall use PID to control superheat to deliver a comfortable room temperature condition and optimize efficiency.
- F. Configurator software – Each system shall be available with configurator software package to allow for remote configuration of operational settings and also for assessment of operational data and error codes. If this software is not provided by an alternate manufacturer, for each individual outdoor unit the contractor shall do the settings manually and keep detailed records for future maintenance purposes.
- G. Autocharging – Each system shall have a refrigerant auto-charging function.
- H. Defrost Heating – Multiple condenser VRV systems shall maintain continuous heating during defrost operation. Reverse cycle (cooling mode) defrost operation shall not be permitted due to the potential reduction in space temperature.
- I. Oil Return Heating – Multiple condenser VRV systems shall maintain continuous heating during oil return operation. Reverse cycle (cooling mode) oil return during heating operation shall not be permitted due to the potential reduction in space temperature.
- J. Low Ambient Cooling – Each system shall be capable of low ambient cooling operation to -4°F DB.
- K. Independent Control – Each indoor unit shall use a dedicated electronic expansion valve for independent control.
- L. Flexible Design –
 - 1. Systems shall be capable of up to 540ft (623ft equivalent) of linear piping between the condensing unit and furthest located indoor unit.
 - 2. Systems shall be capable of up to 3,280ft total “one-way” piping in the piping network.
 - 3. Systems shall have a vertical (height) separation of up to 295ft between the condensing unit and the indoor units.
 - 4. Systems shall be capable of up to 295ft from the first REFNET™ / branch point.
 - 5. The condensing unit shall have the ability to connect an indoor unit evaporator capacity of up to 200% of the condensing unit capacity.
 - 6. Systems shall be capable of 98ft vertical separation between indoor units.
 - 7. Condensing units shall be supported with a fan motor ESP up to 0.32” WG as standard to allow connection of discharge ductwork and to prevent discharge air short circuiting.
- M. Oil Return – Each system shall be furnished with a centrifugal oil separator and active oil recovery cycle
- N. Simple Wiring – Systems shall use 16/18 AWG, 2 wire, multi-stranded, non-shielded and non-polarized daisy chain control wiring.
- O. Outside Air – Systems shall provide outside air capability.
- P. Space Saving – Each system shall have a condensing unit module footprint as small as 36-5/8” x 30-1/8”.

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- Q. Advanced Diagnostics – Systems shall include a self diagnostic, auto-check function to detect a malfunction and display the type and location.
- R. Each condensing unit shall incorporate contacts for electrical demand shedding with optional 3 stage demand control with 12 customizable demand settings.
- S. Advanced Controls – Each system shall have at least one remote controller capable of controlling up to 16 indoor units.
- T. Each system shall be capable of integrating with open protocol BACnet and LonWorks building management systems.
- U. Low Sound Levels – Each system shall use indoor and condensing units with quiet operation as low as 27 dB(A).

1.04 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 – Heating and Cooling Equipment and bear the Listed Mark.
- B. All wiring shall be in accordance with the National Electric Code (NEC).
- C. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- D. Mechanical equipment for wind-born debris regions shall be designed in accordance with ASCE 7-2010 and installed to resist the wind pressures on the equipment and the supports.
- E. The condensing unit will be factory charged with R-410A.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendations.

Part 2 – WARRANTY

STANDARD LIMITED WARRANTY

Daikin North America LLC warrants original owner of the non-residential building, multifamily residence or residence in which the Daikin products are installed that under normal use and maintenance for comfort cooling and conditioning applications such products (the "Products") will be free from defects in material and workmanship. This warranty applies to compressor and all parts associated with the outdoor unit(s), indoor unit(s) & branch selectors for a duration of ten (10) years starting from the "installation date" which is one of the two dates below:

- a. The installation date is the date that the unit is originally commissioned, but no later than 18 months after the manufacture date noted on the unit's rating plate.
- b. If the date the unit is originally commissioned cannot be verified, the installation date is three months after the manufacture date.

Wall mounted controllers & central controllers are covered by the warranty for a duration of (10) years starting from the same "installation date".

The cost of labor for the first year of the warranty period shall also be included.

Complete warranty details available from your local Daikin representative or at www.daikincomfort.com –

Part 3 – PERFORMANCE

3.01 The VRV-VRF system shall perform as indicated below:

MODEL NUMBER	SYSTEM IEER (Ducted)	SYSTEM IEER (Non-Ducted)
REYQ72XAYD*	21.30	25.20
REYQ96XAYD*	21.90	27.80
REYQ120XAYD*	22.60	25.50
REYQ144XAYD*	21.60	23.50
REYQ168XAYD*	20.40	22.30
REYQ192XAYD*	21.40	22.60
REYQ216XAYD*	21.70	23.10
REYQ240XAYD*	20.00	22.20
REYQ264XAYD*	18.00	21.60
REYQ288XAYD*	17.90	21.00
REYQ312XAYD*	18.00	20.40
REYQ336XAYD*	17.30	20.00
REYQ360XAYD*	18.80	20.00
REYQ384XAYD*	17.60	19.00
REYQ408XAYD*	17.70	17.20
REYQ432XAYD*	17.30	16.20
REYQ456XAYD*	16.70	16.20

MODEL NUMBER	SYSTEM SCHE (Ducted)	SYSTEM SCHE (Non-Ducted)
REYQ72XAYD*	22.00	26.10
REYQ96XAYD*	21.10	26.40
REYQ120XAYD*	22.00	26.00
REYQ144XAYD*	22.00	25.50
REYQ168XAYD*	22.20	25.50
REYQ192XAYD*	22.80	26.60
REYQ216XAYD*	21.90	25.50
REYQ240XAYD*	21.80	25.60
REYQ264XAYD*	18.20	26.10
REYQ288XAYD*	19.90	23.30
REYQ312XAYD*	20.70	24.30
REYQ336XAYD*	19.80	23.30
REYQ360XAYD*	19.40	23.00
REYQ384XAYD*	17.00	21.90

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REYQ408XAYD*	18.30	21.80
REYQ432XAYD*	18.10	20.20
REYQ456XAYD*	17.90	18.80

MODEL NUMBER	SYSTEM EER (Ducted)	SYSTEM EER (Non-Ducted)
REYQ72XAYD*	13.90	15.80
REYQ96XAYD*	12.50	14.60
REYQ120XAYD*	12.30	13.20
REYQ144XAYD*	11.60	11.90
REYQ168XAYD*	10.60	10.70
REYQ192XAYD*	13.00	13.00
REYQ216XAYD*	12.30	12.40
REYQ240XAYD*	11.70	11.60
REYQ264XAYD*	10.40	11.20
REYQ288XAYD*	10.30	11.00
REYQ312XAYD*	9.90	10.10
REYQ336XAYD*	9.50	9.90
REYQ360XAYD*	10.60	10.90
REYQ384XAYD*	9.90	9.70
REYQ408XAYD*	9.70	9.80
REYQ432XAYD*	9.70	9.80
REYQ456XAYD*	9.50	9.30

MODEL NUMBER	SYSTEM COP@47°F (Ducted)	SYSTEM COP@47°F (Non-Ducted)
REYQ72XAYD*	3.68	4.30
REYQ96XAYD*	3.56	4.23
REYQ120XAYD*	3.48	3.81
REYQ144XAYD*	3.42	3.75
REYQ168XAYD*	3.24	3.49
REYQ192XAYD*	3.67	3.85
REYQ216XAYD*	3.52	3.76
REYQ240XAYD*	3.39	3.68
REYQ264XAYD*	3.20	3.62
REYQ288XAYD*	3.20	3.51
REYQ312XAYD*	3.20	3.56
REYQ336XAYD*	3.20	3.53
REYQ360XAYD*	3.20	3.56
REYQ384XAYD*	3.20	3.21
REYQ408XAYD*	3.20	3.21

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REYQ432XAYD*	3.20	3.21
REYQ456XAYD*	3.20	3.21

MODEL NUMBER	SYSTEM COP@17°F (Ducted)	SYSTEM COP@17°F (Non-Ducted)
REYQ72XAYD*	2.25	2.50
REYQ96XAYD*	2.31	2.63
REYQ120XAYD*	2.28	2.54
REYQ144XAYD*	2.12	2.16
REYQ168XAYD*	2.05	2.08
REYQ192XAYD*	2.37	2.50
REYQ216XAYD*	2.20	2.34
REYQ240XAYD*	2.16	2.34
REYQ264XAYD*	2.07	2.22
REYQ288XAYD*	2.06	2.20
REYQ312XAYD*	2.05	2.09
REYQ336XAYD*	2.05	2.12
REYQ360XAYD*	2.10	2.25
REYQ384XAYD*	2.06	2.22
REYQ408XAYD*	2.05	2.09
REYQ432XAYD*	2.06	2.08
REYQ456XAYD*	2.05	2.07

3.02 OPERATING RANGE

The operating range in cooling or cooling dominant simultaneous cooling/heating will be (-4°F) 23°F DB ~ 122°F DB.

Each system as standard shall be capable of onsite reprogramming to allow low ambient cooling operation down to -4°F DB

The operating range in heating or heating dominant simultaneous cooling/heating will be -13°F WB – 60°F WB.

If an alternate equipment manufacturer is selected, the mechanical contractor shall provide, at their own risk and cost, all additional material and labor to meet low ambient operating condition and performance.

Cooling mode indoor room temperature range will be 57°F-77°F WB.

Heating mode indoor room temperature range will be 59°F-80°F DB.

Part 4 – PRODUCTS

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- 4.01 The HVAC equipment basis of design is VRV IV X By Daikin North America. All bidders shall furnish the minimum system standards as defined by the base bid model numbers, model families or as otherwise specified herein.
- 4.02 Any potential alternate equipment supplier shall provide to the bidding mechanical contractor a complete equipment data package 15 days prior to the bid date. This package shall include, but is not limited to, equipment capacities at the design condition, power requirements, indoor units CFM/static pressures, fan curves, installation requirements, physical dimensions and sound power levels for all components. Nominal performance data is not acceptable. If the alternate manufacturer meets the specified and scheduled criteria they will be listed in an addendum to the bid package.

The contractor shall be responsible for the cost of creating new mechanical project drawings based on the alternate manufacturers equipment.

4.03 CONDENSING UNIT

- A. General: The condensing unit is designed specifically for use with VRV IV X series components.
1. The condensing unit shall be factory assembled in the USA and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of Daikin inverter scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports, liquid receiver and suction accumulator.
High/low pressure gas line, liquid and suction lines must be individually insulated between the condensing and indoor units.
 2. The condensing unit can be wired and piped with access from the left, right, rear or bottom.
 3. The connection ratio of indoor units to condensing unit shall be permitted up to 200%.
 4. Each condensing system shall be able to support the connection of up to 64 indoor units dependent on the model of the condensing unit.
 5. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced noise during night time or via an external input.
 6. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
 7. The unit shall incorporate an auto-charging feature. Manual changing should be support with a minimum of 2 hours of system operation data to ensure correct operation.
 8. The condensing unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
 9. The following safety devices shall be included on the condensing unit; high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.

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10. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature.
 11. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation. Each system shall maintain continuous heating during oil return operation.
 12. The condensing unit shall be capable of heating operation at 13°F wet bulb ambient temperature without additional low ambient controls or an auxiliary heat source.
 13. The multiple condenser VRV systems shall continue to provide heat to the indoor units in heating operation while in the defrost mode.
- B. Unit Cabinet:
1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
- C. Fan:
1. The condensing unit shall consist of one or more propeller type, direct-drive 350 or 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter.
 2. The condensing unit fan motor shall have multiple speed operation of the DC (digitally commutating) inverter type, and be of high external static pressure and shall be factory set as standard at 0.12 in. WG. A field setting switch to a maximum 0.32 in. WG pressure is available to accommodate field applied duct for indoor mounting of condensing units.
 3. The fan shall be a vertical discharge configuration with a nominal airflow maximum range of 5,544 CFM to 24,684 CFM dependent on model specified.
 4. Nominal sound pressure levels shall be as shown below.

MODEL NUMBER	SOUND PRESSURE LEVEL dB(A)
REYQ72XAYD*	58
REYQ96XAYD*	61
REYQ120XAYD*	61
REYQ144XAYD*	65
REYQ168XAYD*	65
REYQ192XAYD*	64
REYQ216XAYD*	64
REYQ240XAYD*	64
REYQ264XAYD*	66.5
REYQ288XAYD*	68
REYQ312XAYD*	68
REYQ336XAYD*	68
REYQ360XAYD*	66
REYQ384XAYD*	67.5
REYQ408XAYD*	69
REYQ432XAYD*	70
REYQ456XAYD*	70

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5. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
6. The fan motor shall be provided with a fan guard to prevent contact with moving parts.
7. Night setback control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from 3 steps as shown below.

Operation Sound dB(A)	Night Mode Sound Pressure Level dB(A)
Step 1 max.	55
Step 2 max.	50
Step 3 max.	45

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins are to be covered with an anti-corrosion Ultra Gold coating as standard with a salt spray test rating of 1000hr (ASTM B117 & Blister Rating:10), Acetic acid salt spray test: 500hr (ASTM G85 & Blister Rating:10)
5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.
6. The outdoor coil shall have three-circuit heat exchanger design eliminating the need for bottom plate heater. The lower part of the coil shall be used for inverter cooling and be on or off during heating operation enhancing the defrost operation.
7. The condensing unit shall be factory equipped with condenser coil guards on all sides.

E. Compressor:

1. The Daikin inverter scroll compressors shall be variable speed (PVM inverter) controlled which is capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity (INV frequency) shall be controlled to eliminate deviation from target value. Non inverter-driven compressors, which may cause starting motor current to exceed the nominal motor current (RLA) and require larger wire sizing, shall not be allowed.

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2. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll "G-type" or "J-type".
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The capacity control range shall be as low as 3% to 100%.
5. The compressors' motors shall have a cooling system using discharge gas, to avoid sudden changes in temperature resulting in significant stresses on winding and bearings.
6. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
7. Oil separators shall be standard with the equipment together with an intelligent oil management system.
8. The compressor shall be spring mounted to avoid the transmission of vibration eliminating the standard need for spring insulation.

9. Compressor configurations

MODEL NUMBER	COMPRESSOR MOTOR OUTPUT (W)	QUANTITY	COMPRESSOR TYPES
REYQ72XAYD*	3,900	1	Inverter controlled
REYQ96XAYD*	5,400	1	Inverter controlled
REYQ120XAYD*	7,200	1	Inverter controlled
REYQ144XAYD*	8,000	1	Inverter controlled
REYQ168XAYD*	9,700	1	Inverter controlled
REYQ192XAYD*	5,400 + 5,400	2	All inverter controlled
REYQ216XAYD*	6,200 + 6,200	2	All inverter controlled
REYQ240XAYD*	7,000 + 7,000	2	All inverter controlled
REYQ264XAYD*	6,800 + 8,000	2	All inverter controlled
REYQ288XAYD*	7,300 + 7,300	2	All inverter controlled
REYQ312XAYD*	8,100 + 8,100	2	All inverter controlled
REYQ336XAYD*	8,700 + 8,700	2	All inverter controlled
REYQ360XAYD*	6,900 + 6,900 + 6,900	3	All inverter controlled
REYQ384XAYD*	6,700 + 6,700 + 7,700	3	All inverter controlled
REYQ408XAYD*	6,400 + 6,800 + 6,800	3	All inverter controlled
REYQ432XAYD*	6,600 + 6,600 + 6,600	3	All inverter controlled
REYQ456XAYD*	6,800 + 6,800 + 6,800	3	All inverter controlled

10. In the event of compressor failure the remaining compressors shall continue to operate and provide heating or cooling as required at a proportionally reduced capacity. The microprocessor and associated controls shall be designed to specifically address this condition.
11. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours and extending the operating life of the system. When

connected to a central control system, sequential start is activated for all system on each DIII network.

F. Electrical:

1. The power supply to the condensing unit shall be ___ volts, 3 phase, 60 hertz +/- 10%.
2. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded, stranded 2 conductor cable.
3. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one condensing unit with one 2-cable wire, thus simplifying the wiring installation.
4. The control wiring lengths shall be as shown below.

	Condenser to Indoor Unit	Condenser to Central Controller	Indoor Unit to Remote Control
Control Wiring Length	6,665 ft	3,330 ft	1,665 ft
Wire Type	16/18 AWG, 2 wire, non-polarity, non-shielded, stranded		

4.04 BRANCH SELECTOR BOX FOR VRV IV X HEAT RECOVERY SYSTEM

A. General: The branch selector boxes are designed specifically for use with VRV IV X series heat recovery system components.

1. These selector boxes shall be factory assembled, wired, and piped.
2. These branch controllers must be run tested at the factory.
3. These selector boxes must be mounted indoors.
4. When simultaneously heating and cooling, the units in heating mode shall energize their subcooling electronic expansion valve.

B. Unit Cabinet:

1. These units shall have a galvanized steel plate casing.
2. Each cabinet shall house 3 electronic expansion valves for refrigerant control per branch.
3. The cabinet shall contain one subcooling heat exchanger per branch.
4. The unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.
5. Nominal sound pressure levels must be measured and published on the submittals by the manufacturer. These sound levels must not exceed the values below.

Model Number	Sound Level dB(A) Operating	Sound Level dB(A) Max
BSQ36TVJ	42	32
BSQ60TVJ	43	32
BSQ96TVJ	44	34
BS4Q54TVJ	38	45
BS6Q54TVJ	39	47
BS8Q54TVJ	39	47
BS10Q54TVJ	40	48

BS12Q54TVJ	40	48
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If an alternate manufacturer is selected, the mechanical contractor shall provide, at their own cost and expense, any additional material and labor to meet the published sound levels above.

C. Refrigerant Valves:

1. The unit shall be furnished with 3 electronic expansion valves per branch to control the direction of refrigerant flow. The use of solenoid valves for changeover and pressure equalization shall not be acceptable due to refrigerant noise.
2. The refrigerant connections must be of the braze type.
3. In multi-port units, each port shall have its own electronic expansion valves. If common expansion/solenoid valves are used, redundancy must be provided.
4. Each circuit shall have at least one (36,000 Btu/h indoor unit or smaller for the BSQ36TVJ, 54,000 Btu/h indoor unit or smaller for the BS(4/6/8/10/12)Q54TVJ, 60,000 Btu/h indoor unit or smaller for the BSQ60TVJ and 96,000 Btu/h indoor unit or smaller for the BSQ96TVJ) branch selector box.
5. Multiple indoor units may be connected to a branch selector box with the use of a REFNET™ joint provided they are within the capacity range of the branch selector.

D. Condensate Removal:

1. The unit shall not require provisions for condensate removal. A safety device or secondary drain pan shall be installed by the mechanical contractor to comply with the applicable mechanical code, if an alternate manufacturer is selected.

E. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
2. The unit shall be capable of operation within the limits of 187 volts to 255 volts.
3. The minimum circuit amps (MCA) shall be 0.1 and the maximum overcurrent protection amps (MOP) shall be 15.
4. The control voltage between the indoor and condensing unit shall be 16VDC non-shielded 2 conductor cable.

4.05 INDOOR UNIT: ROUND FLOW SENSING CEILING CASSETTE UNIT (FXFQ_T)

- A. General: Daikin indoor unit model FXFQ_T shall be a round flow ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, direct drive DC (ECM) type fan, for installation into the ceiling cavity equipped with an air panel grill. It shall be available in capacities from 7,500 Btu/h to 48,000 Btu/h. It shall be a round flow air distribution type, fresh white, impact resistant decoration panel, or optional self-cleaning filter panel. The supply air is distributed via four individually motorized louvers. To save energy and optimize occupancy comfort, the indoor unit shall be equipped with built in occupancy sensor and surface temperature sensor. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. The indoor units sound pressure shall range from 30 dB(A) to 45 dB(A) at High speed measured at 5 feet below the unit.

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B. General Features:

1. The Daikin indoor unit FXFQ_T shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Refrigerant lines shall be insulated from the outdoor unit.
4. The round flow supply air flow can be field modified to 23 different airflow patterns to accommodate various installation configurations including corner installations.
5. Return air shall be through the concentric panel, which includes a resin net, mold resistant, antibacterial filter.
6. The indoor units shall be equipped with a condensate pan with antibacterial treatment and condensate pump. The condensate pump provides up to 33-1/2" of lift from bottom of unit to top of drain piping and has a built-in safety shutoff and alarm.
7. The indoor units shall be equipped with a return air thermistor.
8. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
9. The voltage range will be 253 volts maximum and 187 volts minimum.
10. To save energy and optimize occupancy comfort, the indoor unit shall be equipped with built in occupancy sensor and surface temperature sensor.
11. Supplied air shall be directed automatically by four individually controlled louvers.

C. Unit Cabinet:

1. The cabinet shall be space saving and shall be located into the ceiling.
2. Four auto-adjusted louvers shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
3. The airflow of the unit shall have the ability to shut down outlets with multiple patterns allowing for simpler installation in irregular spaces.
4. Fresh air intake shall be possible by way of Daikin's optional fresh air intake kit.
5. A branch duct knockout shall exist for branch ducting of supply air.
6. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
7. Optional high efficiency air filters are available for each model unit.

D. Fan:

1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.08 to 0.16 HP.
3. The airflow rate shall be available in three manual settings.
4. The DC fan shall be able to automatically adjust the fan speed in 5 speeds based on the space load.

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5. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings to allow operation with the high efficiency air filter options.
 6. The fan motor shall be thermally protected.
- E. Filter:
1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin and antibacterial treatment.
 2. Optional high efficiency disposable air filters shall be available.
 3. Optional Self-Cleaning Filter Panel, which performs automatic filter cleaning up to once a day, with dust collection box that indicates when to be emptied.
- F. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
 2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
 3. The coil shall be a 2, or 3-row cross fin copper evaporator coil with up to 21 FPI design completely factory tested.
 4. The refrigerant connections shall be flare connections and the condensate will be 1 -1/4 inch outside diameter PVC.
 5. A condensate pan with antibacterial treatment shall be located under the coil.
 6. A thermistor will be located on the liquid and gas line.
- G. Electrical:
1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
 2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
 3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- H. Control:
1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
 2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
 3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.
 4. For the Sensing functions and the optional Self-Cleaning Filter functions, Remote controller BRC1E73/BRC1E52B7 shall be used. Consult with Daikin prior to applying controls.
- I. Optional Accessories Available:
1. A high efficiency disposable air filter kit
 2. Air intake kit
 3. Self-Cleaning Filter Panel, which performs automatic filter cleaning up to once a day, with dust collection box that indicates when to be emptied.
 4. Remote "in-room" sensor kit (KRCS01-4B).
 - i. The Daikin wall mounted, hard wired remote sensor kit is

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recommended when a NAV controller is not used or when the NAV controller is not located in the space that is being controlled. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).

- 4.06 INDOOR UNIT: 4 WAY 2' X 2' CEILING CASSETTE UNIT (FXZQ-VISTA)
- A. General: Daikin indoor unit model FXZQ-TAVJU shall be a ceiling cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity equipped with a decoration panel grille. It shall be available in capacities from 5,800 Btu/h to 18,000 Btu/h. Model numbers are FXZQ05TAVJU, FXZQ07TAVJU, FXZQ09TAVJU, FXZQ12TAVJU, FXZQ15TAVJU, FXZQ18TAVJU to be connected to outdoor unit model RXYQ / RXYMQ / RWEYQ / RWEQ heat pump and REYQ / RELQ / RWEYQ / RWEQ heat recovery model. The decoration panel shall be a four-way air distribution type, with fresh white (Munsell N9.5) or Daikin Silver color, impact resistant with a washable decoration panel. The supply air is distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 90°. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature when used with Daikin remote controls. The indoor units sound pressure shall range from 25.5 dB(A) to 33 dB(A) at low speed measured at 5 feet below the unit.
- B. Indoor Unit:
1. The Daikin indoor unit FXZQ-TAVJU shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
 2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 3. Both refrigerant lines shall be fully insulated from the outdoor unit or nearest branch connection into the refrigerant network.
 4. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
 5. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
 6. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 24-13/16" of lift, measured from the drain outlet, and has a built in safety shutoff and alarm.
 7. The indoor units shall be equipped with a return air thermistor.
 8. The indoor unit will be powered with 208~230V/1-phase/60Hz.
 9. The voltage range will be 253 volts maximum and 187 volts minimum.

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C. Unit Cabinet:

1. The cabinet shall be space saving and shall be located into the ceiling.
2. Three auto-swing positions shall be available to choose from via field setting.
3. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
4. Fresh air intake shall be possible by way of direct duct installation to the side of the indoor unit cabinet.
5. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Decoration Panel:

The FXZQ-TAVJU series shall be compatible with three optional decoration panels:

1. VISTA Decoration panel – white or silver.
 - i. The decoration panel shall be a four-way air distribution type and constructed of impact resistant polymer.
 - ii. The decoration panel dimensions shall measure 24-7/16" x 24-7/16" and shall fit into a standard 2x2 ceiling grid with no overlap of adjacent tiles.
 - iii. The four air discharge outlet louvers shall be independently motorized and controllable. Each louver shall have a visual indicator to easily identify the louver and simplify the airflow configuration.
 - iv. The louver outlets shall be capable of closure to allow for 3-way and 2-way air distribution.
 - v. The decoration panel shall be a low profile design, extending 5/16" below the ceiling.
 - vi. The decoration panel shall be compatible with the optional space and presence sensor kit, model BRYQ60A2W.
 - vii. The decoration panel color shall be fresh white or silver.

E. Optional Space and Presence sensor kit:

1. The space and presence sensor shall be color matched to the decoration panel.
2. The sensor kit shall be capable of sensing occupancy within the space and automatically controlling the indoor unit set point in response to the detection of occupancy.
3. The sensor kit shall be capable of automatically adjusting the direction of individual air discharge outlet louvers in response to the detection of occupants in the vicinity of the unit.
4. The sensor kit shall be capable of automatically adjusting the direction of individual air discharge outlet louvers in response to the sensed floor temperature.

F. Fan:

1. The fan shall be driven by a direct-drive DC motor with statically and dynamically balanced impeller and shall have three user-selectable speeds available: high, medium, and low.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output of 50W.
3. The airflow rate shall be available in high, medium, and low settings.

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4. When FXZQ-TAVJU is connected with either the BRC1E73 Navigation Remote Controller or the DCM601A71 I-Touch Manager, the Auto fan mode shall be selectable.
- G. Filter:
1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
- H. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
 2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
 3. The coil shall be a 2-row cross fin copper evaporator coil with 22 FPI design completely factory tested.
 4. The refrigerant connections shall be flare connections and the condensate will be 1 -1/32 inch outside diameter PVC.
 5. A condensate pan shall be located under the coil.
 6. A condensate pump with a 24-13/16" lift, measured from the drain outlet, shall be located below the coil in the condensate pan with a built in safety alarm.
 7. A thermistor will be located on the liquid and gas line.
- I. Electrical:
1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
 2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
 3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- J. Control:
1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
 2. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.
- K. Optional Accessories Available:
1. VISTA Decoration panel – white (BYFQ60C3W1W)
 2. VISTA Decoration panel – silver & white (BYFQ60C3W1S)
 3. Legacy FXZQ decoration panel (BYFQ60B3W1)
 4. Space and Presence sensor kit – white (BRYQ60A2W)
 - a. Sensor kit shall be color matched to pair with the VISTA decoration panel BYFQ60C3W1W. Space and presence sensor kit is not compatible with BYFQ60B3W1.
 5. Space and Presence sensor kit – silver (BRYQ60A2S)
 - a. Sensor kit shall be color matched to pair with the VISTA decoration panel BYFQ60C3W1S. Space and presence sensor kit is not compatible with BYFQ60B3W1.

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6. Sealing member of air discharge outlet (BDBHQ44C60)
7. Panel spacer (KDBQ44BA60A)
 - a. Panel spacer is compatible only with BYFQ60B3W1.
8. Direct fresh air intake kit (KDDQ44XA60).
9. Infrared remote controller and receiver - white (BRC082A42W)
 - a. Receiver shall be color matched
10. Infrared remote controller and receiver – silver (BRC082A42S)
11. Infrared remote controller and receiver (BRC082A41W)
12. Wired remote controller (BRC1E73)
13. Adaptor for wiring (KRP1C75)
14. Wiring adaptor for electrical appendices (KRP4A74)
15. Installation box for adaptor PCB (KRP1BA101)
16. Remote “in-room” sensor kit (KRCS01-4B).
 - i. The Daikin wall mounted, hard wired remote sensor kit is recommended for ceiling-embedded type fan coils, which often result in a difference between set temperature and actual temperature. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).

4.07 INDOOR UNIT: CONCEALED CEILING DUCTED MED. STATIC UNIT (FXMQ_M)

- A. General: Daikin indoor unit FXMQ_M shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be available in capacities from 72,000 Btu/h to 96,000 Btu/h. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. The indoor units sound pressure shall be 48 dB(A) at low speed measured 5 feet below the ducted unit.
- B. General Features:
 1. The Daikin indoor unit FXMQ_M shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an adjustable external static pressure switch.
 2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 3. Refrigerant lines shall be insulated from the outdoor unit.
 4. The indoor units shall be equipped with a return air thermistor.
 5. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
 6. The voltage range will be 253 volts maximum and 187 volts minimum.
- C. Unit Cabinet:
 1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
 2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

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D. Fan:

1. The fan shall be direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz, with a motor output of 0.51 HP.
3. The airflow rate shall be available in high and low settings.
4. The fan motor shall be thermally protected.
5. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.
6. Fan motor external static pressure for nominal airflow:

Model Number	Fan ESP (in. WG)
FXMQ72MVJU	0.95 – 0.72
FXMQ96MVJU	0.95 – 0.8

E. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1-5/16 inch outside diameter PVC.
5. A thermistor will be located on the liquid and gas line.

F. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

G. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

H. Optional Accessories Available:

1. Remote "in-room" sensor kit KRCS01-1B (recommended).
 - i. The Daikin wall mounted, hard wired remote sensor kit is recommended for ceiling-embedded type fan coils, which often result in a difference between set temperature and actual temperature. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).

4.08 INDOOR UNIT: CONCEALED CEILING DUCTED MED. STATIC UNIT (FXMQ_PB)

A. General: Daikin indoor unit FXMQ_PB shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, direct-drive DC (ECM) type fan with auto CFM adjustment at commissioning, for installation into the ceiling cavity. It is constructed of a galvanized steel casing. It shall be available in capacities from 7,500 Btu/h to 48,000 Btu/h. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. Included as standard equipment, a condensate drain pan and drain pump kit that pumps to 18-3/8" from the drain pipe opening. The indoor units sound pressure shall range from 29 dB(A) to 43 dB(A) at low speed measured 5 feet below the ducted unit.

B. General Features:

1. The Daikin indoor unit FXMQ_PB shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall be equipped with automatically adjusting external static pressure logic that is selectable during commissioning. This adjusts the airflow based on the installed external static pressure.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Refrigerant lines shall be insulated from the outdoor unit.
4. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 18-3/8" of lift from the center of the drain outlet and has a built in safety shutoff and alarm.
5. The indoor units shall be equipped with a return air thermistor.
6. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
7. The voltage range will be 253 volts maximum and 187 volts minimum.

C. Unit Cabinet:

1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:

1. The fan shall be direct-drive DC (ECM) type fan, statically and dynamically balanced impeller with three fan speeds available.
2. The unit shall be equipment with automatically adjusting external static pressure logic selectable during commissioning.

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3. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range of 0.12 to 0.47 HP respectively.
4. The airflow rate shall be available in three settings.
5. The fan motor shall be thermally protected.
6. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.
7. Fan motor external static pressure range for nominal airflow:

Model Number	Fan ESP (in. WG)
FXMQ07PBVJU	0.40 – 0.12
FXMQ09PBVJU	0.40 – 0.12
FXMQ12PBVJU	0.40 – 0.12
FXMQ15PBVJU	0.80 – 0.20
FXMQ18PBVJU	0.80 – 0.20
FXMQ24PBVJU	0.80 – 0.20
FXMQ30PBVJU	0.80 – 0.20
FXMQ36PBVJU	0.80 – 0.20
FXMQ48PBVJU	0.80 – 0.20
FXMQ54PBVJU	0.56 – 0.20

E. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 3 row cross fin copper evaporator coil with 15 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1-1/4" outside diameter PVC.
5. A condensate pan shall be located under the coil.
6. A condensate pump with an 18-3/8" lift shall be located below the coil in the condensate pan with a built in safety alarm.
7. A thermistor will be located on the liquid and gas line.

F. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

G. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

H. Optional Accessories Available:

1. Remote "in-room" sensor kit KRCS01-4B (recommended).

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- i. The Daikin wall mounted, hard wired remote sensor kit is recommended for when a NAV controller is not used or when the NAV controller is not located in the space that is being controlled. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).
2. MERV 13 Filter kit. Can be configured for right or left access. Filters replaceable without tools.
3. Air side Economizer designed for connection to the rear of FXMQ30-54PBVJU.

4.09 INDOOR UNIT: SLIM DUCT CONCEALED CEILING UNIT (FXDQ)

- A. General: Daikin indoor unit model FXDQ shall be a Slim, built-in ceiling concealed fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity. The unit shall be constructed of a galvanized steel casing. It shall be available in capacities from 7,000 Btu/h to 24,000 Btu/h. It shall be a horizontal discharge air with horizontal return air or bottom return air configuration. All models feature a very low height (7-7/8") making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. Included as standard equipment, a long-life filter that is mold resistant and a condensate drain pan and drain pump kit that pumps to 23-5/8" from the drain pipe opening. The indoor units sound pressure level shall range from 29 dB(A) to 32 dB(A) at low speed and 33 dB(A) to 36 dB(A) at high speed 5 feet below the suction grille.
- B. General Features:
 1. The Daikin indoor unit FXDQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have adjustable external static pressure capabilities.
 2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 3. Refrigerant lines shall be insulated from the outdoor unit.
 4. Return air shall be through a resin net mold resistant filter.
 5. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 23-5/8" of lift from the center of the drain outlet and has a built in safety shutoff and alarm.
 6. The indoor units shall be equipped with a return air thermistor.
 7. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
 8. The voltage range will be 253 volts maximum and 187 volts minimum.
 9. Switch box shall be reached from the side or bottom for ease of service and maintenance.

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C. Unit Cabinet:

1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:

1. The fan shall be direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 62W to 130W.
3. The airflow rate shall be available in high and low settings.
4. The fan motor shall be thermally protected.
5. The fan motor shall be equipped as standard with adjustable external static pressure (ESP) settings.
6. Fan motor external static pressure range for nominal airflow:

Model Number	Fan ESP (in. WG)
FXDQ07MVJU	0.12 - 0.04
FXDQ09MVJU	0.12 - 0.04
FXDQ12MVJU	0.12 - 0.04
FXDQ18MVJU	0.17 - 0.06
FXDQ24MVJU	0.17 - 0.06

E. Filter:

1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 2 or 3-row cross fin copper evaporator coil with 14 FPI design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1-1/32" outside diameter PVC.
5. A condensate pan shall be located under the coil.
6. A condensate pump with a 23-5/8" lift shall be located below the coil in the condensate pan with a built in safety alarm.
7. A thermistor will be located on the liquid and gas line.

G. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.

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3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

I. Optional Accessories Available:

1. Remote "in-room" sensor kit KRCS01-1B (recommended).
 - i. The Daikin wall mounted, hard wired remote sensor kit is recommended for ceiling-embedded type fan coils, which often result in a difference between set temperature and actual temperature. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).

4.10 INDOOR UNIT: CEILING SUSPENDED CASSETTE UNIT (FXHQ)

- A. General: Daikin indoor unit FXHQ shall be a ceiling suspended fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation onto a wall or ceiling within a conditioned space. This compact design with finished white casing shall be available in capacities from 12,000 Btu/h to 36,000 Btu/h. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. A mildew-proof, polystyrene condensate drain pan and resin net mold resistant filter shall be included as standard equipment. The indoor units sound pressure shall range from 32 dB(A) to 38 dB(A) at low speed measured at 3.3 feet below and from the unit.
- B. General Features:
 1. The Daikin indoor unit FXHQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops. The remote controller shall be able to set five (5) steps of discharge angle. The front grille shall be easily removed for washing. The discharge angle shall automatically set at the same angle as the previous operation upon restart. The drain pipe can be fitted to from the rear, top or left and right sides of the unit.
 2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 3. Refrigerant lines shall be insulated from the outdoor unit.
 4. Return air shall be through a resin net mold resistant filter.
 5. The indoor units shall be equipped with a condensate pan.
 6. The indoor units shall be equipped with a return air thermistor.
 7. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
 8. The voltage range will be 253 volts maximum and 187 volts minimum.
- C. Unit Cabinet:
 1. The cabinet shall be affixed to a factory supplied wall/ceiling hanging brackets and located in the conditioned space.
 2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

- D. Fan:
 - 1. The fan shall be a direct-drive cross-flow fan, statically and dynamically balanced impeller with high and low fan speeds available.
 - 2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range 62W to 130W.
 - 3. The airflow rate shall be available in high and low settings.
 - 4. The fan motor shall be thermally protected.
- E. Coil:
 - 1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
 - 2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
 - 3. The coil shall be a 2-row cross fin copper evaporator coil with 15 fpi design completely factory tested.
 - 4. The refrigerant connections shall be flare connections and the condensate will be 1 inch outside diameter PVC.
 - 5. A thermistor will be located on the liquid and gas line.
 - 6. A condensate pan shall be located in the unit.
- F. Electrical:
 - 1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
 - 2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
 - 3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- G. Control:
 - 1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
 - 2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
 - 3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.
- H. Optional Accessories Available:
 - 1. Remote "in-room" sensor kit KRCS01-1B.
 - 2. A condensate pump (DACA-CP3-1).

4.11 INDOOR UNIT: WALL MOUNTED UNIT (FXAQ)

- A. General: Daikin indoor unit FXAQ shall be a wall mounted fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation onto a wall within a conditioned space. This compact design with finished white casing shall be available in capacities from 7,500 Btu/h to 24,000 Btu/h. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature.

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A mildew-proof, polystyrene condensate drain pan and resin net mold resistant filter shall be included as standard equipment. The indoor units sound pressure shall range from 31 dB(A) to 41 dB(A) at low speed measured at 3.3 feet below and from the unit.

B. General Features:

1. The Daikin indoor unit FXAQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops. The remote controller shall be able to set five (5) steps of discharge angle. The front grille shall be easily removed for washing. The discharge angle shall automatically set at the same angle as the previous operation upon restart. The drain pipe can be fitted to from either left or right sides.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Refrigerant lines shall be insulated from the outdoor unit.
4. Return air shall be through a resin net mold resistant filter.
5. The indoor units shall be equipped with a condensate pan.
6. The indoor units shall be equipped with a return air thermistor.
7. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
8. The voltage range will be 253 volts maximum and 187 volts minimum.

C. Unit Cabinet:

1. The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space.
2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:

1. The fan shall be a direct-drive cross-flow fan, statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range 0.054 to 0.058 HP.
3. The airflow rate shall be available in high and low settings.
4. The fan motor shall be thermally protected.

E. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 2-row cross fin copper evaporator coil with 14 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 11/16 inch outside diameter PVC.

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5. A thermistor will be located on the liquid and gas line.
6. A condensate pan shall be located in the unit.

F. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

G. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

H. Optional Accessories Available:

1. Remote "in-room" sensor kit KRCS01-1B.
2. A condensate pump (DACA-CP3-1)

4.12 INDOOR UNIT: FLOOR CONSOLE UNIT (FXLQ)

- A. General: Daikin indoor unit FXLQ shall be a floor or low wall mounted console fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation within a conditioned space. It shall have a top discharge air grill and resin net mold resistant filtered bottom return air. This compact design with finished ivory white casing shall be available in capacities from 7,500 Btu/h to 24,000 Btu/h. The cabinets can be mounted on the floor with refrigerant and condensate lines directed downward or affixed to the wall with horizontal refrigerant and condensate knockouts. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. A mold-resistant, resin net air filter shall be included as standard equipment. The indoor units sound pressure shall range from 35 dB(A) to 40 dB(A) at high speed measured at 5 feet away and 5 feet high.
- B. General Features:
1. The Daikin indoor unit FXLQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops.
 2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 3. Refrigerant lines shall be insulated from the outdoor unit.
 4. Return air shall be through a resin net mold resistant filter.

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5. Condensate draining shall be made via gravity or external condensate pump.
 6. The indoor units shall be equipped with a return air thermistor.
 7. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
 8. The voltage range will be 253 volts maximum and 187 volts minimum.
- C. Unit Cabinet:
1. The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space.
 2. The cabinet shall be constructed with sound absorbing fiberglass urethane foam insulation.
 3. Maintenance access shall be a minimum of ¾ inch in the rear, 4 inches on the right and left sides.
- D. Fan:
1. The fan shall be a direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
 2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range 0.034 to 0.047 HP.
 3. The airflow rate shall be available in high and low settings.
 4. The fan motor shall be thermally protected.
- E. Filter:
1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
- F. Coil:
1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
 2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
 3. The coil shall be a 3-row cross fin copper evaporator coil with 17 fpi design completely factory tested.
 4. The refrigerant connections shall be flare connections and the condensate will be 27/32 inch outside diameter PVC.
 5. A thermistor will be located on the liquid and gas line.
- G. Electrical:
1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
 2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
 3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- H. Control:
1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
 2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
 3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.
- I. Optional Accessories Available:
1. Remote "in-room" sensor kit KRCS01-1B

2. Condensate pump (DACA-CP1-3)

4.13 INDOOR UNIT: FLOOR CONSOLE CONCEALED UNIT (FXNQ)

A. General: Daikin indoor unit FXNQ shall be a floor or wall mounted console fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation within a conditioned space. It shall have a top discharge air grill and filtered bottom return air. This compact design unfinished casing shall be available in capacities from 7,500 Btu/h to 24,000 Btu/h. The cabinets can be mounted on the floor with refrigerant and condensate lines directed downward or affixed to the wall with horizontal refrigerant and condensate knockouts. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. A mold-resistant, resin net air filter shall be included as standard equipment. The indoor units sound pressure shall range from 35 dB(A) to 40 dB(A) at high speed measured at 5 feet away and 5 feet high.

B. General Features:

1. The Daikin indoor unit FXNQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Refrigerant lines shall be insulated from the outdoor unit.
4. Return air shall be through a resin net mold resistant filter.
5. Condensate draining shall be made via gravity or external condensate pump.
6. The indoor units shall be equipped with a return air thermistor.
7. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
8. The voltage range will be 253 volts maximum and 187 volts minimum.

C. Unit Cabinet:

1. The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space.
2. The cabinet shall be constructed with sound absorbing fiberglass urethane foam insulation.
3. Maintenance access shall be a minimum of $\frac{3}{4}$ inch in the rear, 4 inches on the right and left sides.

D. Fan:

1. The fan shall be a direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range 0.034 to 0.047 HP.
3. The airflow rate shall be available in high and low settings.
4. The fan motor shall be thermally protected.

E. Filter:

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1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 3-row cross fin copper evaporator coil with 17 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 27/32 inch outside diameter PVC.
5. A thermistor will be located on the liquid and gas line.

G. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

I. Optional Accessories Available:

1. Remote "in-room" sensor kit KRCS01-1B
2. Condensate pump (DACA-CP1-3)

4.14 INDOOR UNIT: 4 WAY CEILING SUSPENDED CASSETTE UNIT (FXUQ)

A. General: Daikin indoor unit model FXUQ shall be a ceiling suspended cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation onto a ceiling within a conditioned space. It shall be available in capacities from 18,000 Btu/h to 36,000 Btu/h. It shall be a four-way air distribution type, fresh white, impact resistant with a washable panel. The supply air is distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 60°. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. The indoor units sound pressure shall range from 36 dB(A) to 40 dB(A) at low speed measured at 5 feet below the unit.

B. General Features:

1. The Daikin indoor unit FXUQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate

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- safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Refrigerant lines shall be insulated from the outdoor unit.
4. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
5. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
6. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 23-5/8" of lift and has a built in safety shutoff and alarm.
7. The indoor units shall be equipped with a return air thermistor.
8. All electrical components are reached through the decoration panel, which reduces the required side service access.
9. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
10. The voltage range will be 253 volts maximum and 187 volts minimum.

C. Unit Cabinet:

1. The cabinet shall be space saving and shall be located into the ceiling.
2. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
3. The airflow of the unit shall have the ability to shut down outlets with multiple patterns allowing for simpler installation in irregular spaces.
4. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:

1. The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with three fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.06 to 0.14 HP.
3. The airflow rate shall be available in three settings.
4. The fan motor shall be thermally protected.

E. Filter:

1. The return air shall be filtered by means of a washable long-life filter with mildew proof resin.

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 3-row cross fin copper evaporator coil with 21 FPI design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1 inch outside diameter PVC.

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5. A condensate pan with antibacterial treatment shall be located under the coil.
6. A condensate pump with a 23-5/8 inch lift shall be located below the coil in the condensate pan with a built-in safety alarm.
7. A thermistor will be located on the liquid and gas line.

G. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

I. Optional Accessories Available:

1. Remote "in-room" sensor kit (KRCS01-4B).
 - i. The Daikin wall mounted, hard wired remote sensor kit is recommended for ceiling-embedded type fan coils, which often result in a difference between set temperature and actual temperature. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).
2. Sensor Kit (BRE49B1F)
 - i. The infrared presence sensor can detect human presence and adjust the airflow direction automatically to prevent drafts. Optional and configurable energy saving occupancy control can be performed when no presence is detected
 - ii. The infrared floor sensor can detect the floor temperature and automatically adjust operation of the indoor unit to provide an improved and even temperature distribution
3. Air Outlet Blocking Decoration Panel (KDBTP49B140)
4. Blocking Material Kit for 2-way Discharge (KDBHP49B140)

4.15 INDOOR UNIT: ONE WAY BLOW CASSETTE UNIT (FXEQ)

- A. General: Daikin indoor unit model FXEQ shall be a ceiling suspended cassette fan coil unit, operable with R-410A refrigerant, equipped with an electronic expansion valve, for installation onto a ceiling within a conditioned space. It shall be available in capacities from 7,500 Btu/h to

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24,000 Btu/h. It shall be a one-way air distribution type, fresh white, impact resistant with a washable panel. The supply air is distributed via motorized vertical and horizontal louvers which can be adjusted from 0° to 45° and 20° to 70° respectively. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature. The indoor units sound pressure shall range from 26 dB(A) to 38 dB(A) at low speed measured at 3.3 feet below the unit.

B. General Features:

1. The Daikin indoor unit FXEQ shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate lift pump, condensate safety shutoff and alarm, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. The indoor unit shall be able to process up to 15% fresh air
3. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
4. Refrigerant lines shall be insulated from the outdoor unit.
5. Return air shall be through the flat back panel, which includes a white resin net mold resistant filter.
6. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 33-716" of lift and has a built in safety shutoff and alarm.
7. The indoor units shall be equipped with a return air thermistor.
8. Motor and some of the electrical components shall be reachable through the decoration panel.
9. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
10. The voltage range will be 253 volts maximum and 187 volts minimum.

C. Unit Cabinet:

1. The cabinet shall be space saving and shall be located into the ceiling.
2. The cabinet shall have a built in 4" knock-out to connect fresh air intake
3. The cabinet shall be constructed with sound absorbing foamed polyurethane noise insulation.
4. The cabinet shall be equipped with foamed polystyrene and foamed polyethylene heat insulation.

D. Fan:

1. The fan shall be direct-drive Sirocco fan type with statically and dynamically balanced impeller with five selectable fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range from 0.11 to 0.15 HP.
3. The airflow rate shall be available in five settings.
4. The fan motor shall be thermally protected.

E. Filter:

1. The return air shall be filtered by means of a mold resistant Resin net filter.
2. The filter shall be accessible from the decoration panel

F. Coil:

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1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
 2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
 3. The coils for units up to 1 ton shall be a 2-row cross fin copper evaporator coil with 20.5 FPI design completely factory tested for the
 4. The coils for units from 1.25 ton to 2.0 ton shall be 2-row cross fin copper evaporator coil with 20.5 FPI and an additional row with 15.9 FPI.
 5. The refrigerant connections shall be flare connections and the condensate will be 1-1/32 inch outside diameter PVC.
 6. A condensate pan with antibacterial treatment shall be located under the coil.
 7. A condensate pump with a 33-7/16 inch lift shall be located below the coil in the condensate pan with a built-in safety alarm.
 8. A thermistor will be located on the liquid and gas line.
- G. Electrical:
1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
 2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
 3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.
- H. Control:
1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
 2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
 3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.
- I. Optional Accessories Available:
1. Remote controller wire type (BRC1E73)
 2. Simplified remote controller (BRC2A71)
 3. Remote "in-room" sensor kit (KRCS01-4B).
 - i. The Daikin wall mounted, hard wired remote sensor kit is recommended for ceiling-embedded type fan coils, which often result in a difference between set temperature and actual temperature. The sensor for detecting the temperature can be placed away from the indoor unit (branch wiring is included in the kit).
 4. Central remote controller (DCS302C71)
 5. Electrical box (KJB311AA)
 6. Unified ON/OFF controller (DCS301C71)
 7. Electrical box (KJB212AA)
 8. Scheduled timer (DST301BA61)
 9. Intelligent Touch controller (DCS601C71)
 10. DIII-NET expander adaptor (DTA109A51)
 11. Wiring adaptor printed circuit board (KRP1C75)
 12. Group control adaptor printed circuit board (KRP4A74)

13. Adaptor mounting box (KRP1B101)

4.16 INDOOR UNIT: VERTICAL AIR HANDLING UNIT (FXTQ_TA)

A. General: Daikin indoor unit FXTQ_TA shall be a floor mounted vertical or horizontal right air handling unit, operable with refrigerant R-410A, equipped with an electronic expansion valve and direct-drive ECM type fan with auto CFM adjustment, for installation within a conditioned space. When installed in a vertical configuration it shall have top discharge air and bottom return air. When installed in a horizontal right configuration it shall have a horizontal discharge air and horizontal return air. This compact design with pre-painted heavy-gauge steel casing shall be available in capacities from 12,000 Btu/h to 60,000 Btu/h. A KRCS01-4B remote temperature sensor kit shall be required for all FXTQ indoor units not utilizing the thermistor in the Daikin remote controller BRC1E72. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The unit shall be equipped with a programmed drying mechanism that dehumidifies while limiting changes in room temperature.

B. General Features:

1. The Daikin indoor unit FXTQ_TA components shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, brazed connections, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Refrigerant lines shall be insulated from the outdoor unit.
4. Return air shall be through an optional or field supplied filter.
5. Condensate draining shall be made via gravity or external condensate pump.
6. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
7. The voltage range will be 253 volts maximum and 187 volts minimum.

C. Unit Cabinet:

1. The cabinet shall be constructed with sound absorbing, foil-faced insulation to control air leakage.
2. Select an installation location with adequate structural support, space for service access and clearance for air return and supply duct connections.
3. A field supplied secondary drain pan must be installed where required by code.

D. Fan:

1. The fan shall be a direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz with a motor output range 0.2 to 0.5 HP.
3. The airflow rate shall be available in high setting.
4. The fan motor shall be thermally protected.

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5. Fan motor external static pressure for nominal airflow:

Model Number	Fan ESP (in. WG)
FXTQ09TAVJUA(D)	Up to 0.9
FXTQ12TAVJUA(D)	Up to 0.9
FXTQ18TAVJUA(D)	Up to 0.9
FXTQ24TAVJUA(D)	Up to 0.9
FXTQ30TAVJUA(D)	Up to 0.9
FXTQ36TAVJUA(D)	Up to 0.9
FXTQ42TAVJUA(D)	Up to 0.9
FXTQ48TAVJUA(D)	Up to 0.9
FXTQ54TAVJUA(D)	Up to 0.9
FXTQ60TAVJUA(D)	Up to 0.9

E. Filter:

1. The return air shall be filtered by means of a field supplied filter.

F. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 2-4 row cross fin copper evaporator coil with 14-16 fpi design completely factory tested.
4. The refrigerant connections shall be brazed connections and the condensate will be 3/4 inch outside diameter PVC.
5. A thermistor will be located on the liquid and gas line.

G. Electrical:

1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

H. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.
- 4.

I. Optional Accessories Available:

1. Field installed 3-25kW electric heaters
2. Air filter
3. Downflow kit
4. BRC4C84 wireless controller

4.17 INDOOR UNIT: OUTSIDE AIR PROCESSING UNIT (FXMQ_MF)

- A. General: Daikin indoor unit FXMQ_MF shall be a built-in ceiling concealed fan coil unit, operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation into the ceiling cavity. The unit shall be capable of introducing up to 100% outside air controlled to a fixed discharge air temperature. It is constructed of a galvanized steel

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casing. It shall be available in capacities from 48,000 Btu/h to 96,000 Btu/h. It shall be a horizontal discharge air with horizontal return air configuration. All models feature a low height cabinet making them applicable to ceiling pockets that tend to be shallow. Computerized PID control shall be used to control superheat to deliver a comfortable room temperature condition. The indoor units sound pressure shall range from 42 dB(A) to 47 dB(A) at low speed measured 5 feet below the ducted unit.

B. General Features:

1. The Daikin indoor unit FXMQ_MF shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, self-diagnostics, auto-restart function, 3-minute fused time delay and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Refrigerant lines shall be insulated from the outdoor unit.
4. The indoor units shall be equipped with a discharge air thermistor.
5. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.
6. The voltage range will be 253 volts maximum and 187 volts minimum.

C. Unit Cabinet:

1. The cabinet shall be located into the ceiling and ducted to the supply and return openings.
2. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan:

1. The fan shall be direct-drive Sirocco type fan, statically and dynamically balanced impeller with high and low fan speeds available.
2. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz, with a motor output of 0.51 HP.
3. The fan motor shall be thermally protected.
4. Fan motor external static pressure for nominal airflow:

Model Number	Fan ESP (in. WG)
FXMQ48MFVJU	0.88
FXMQ72MFVJU	0.96
FXMQ96MFVJU	1.03

E. Coil:

1. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
3. The coil shall be a 3 row cross fin copper evaporator coil with 13 fpi design completely factory tested.
4. The refrigerant connections shall be flare connections and the condensate will be 1-5/16 inch outside diameter PVC.
5. A thermistor will be located on the liquid and gas line.

F. Electrical:

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1. A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
2. Transmission (control) wiring between the indoor and outdoor unit shall be a maximum of 3,280 feet (total 6,560 feet).
3. Transmission (control) wiring between the indoor unit and remote controller shall be a maximum distance of 1,640 feet.

G. Control:

1. The unit shall have controls provided by Daikin to perform input functions necessary to operate the system.
2. The unit shall be compatible with interfacing with a BMS system via optional LonWorks or BACnet gateways.
3. The unit shall be compatible with a Daikin Intelligent Touch Manager advanced multi-zone controller.

4.18 Zone Controller: Navigation (NAV) Remote Controller (BRC1E73)

The NAV Remote Controller can provide control for all VRV indoor units. The remote controller wiring consist of a non-polar two-wire connection to the indoor unit at terminals P1/P2. The NAV Remote Controller is wall mounted and can be adjusted to maintain the optimal operation of the connected indoor unit(s). The NAV Remote Controller does not need to be addressed.

The NAV Remote Controller can be used in conjunction with another NAV Remote Controller to control the same indoor unit group. No more than 2 remote controllers can be placed in the same group.

1. Mounting:

The NAV Remote Controller shall be mounted into a standard 2" x 4" junction box.

2. Display Features:

- a. The NAV Remote Controller shall be approximately 4.75" x 4.75" in size with a 2.75" x 1.75" LCD display.
- b. Backlit LCD display with contrast adjustment and auto off after 30 seconds.
- c. Display language shall be selectable from English, French or Spanish.
- d. Selectable display – Detailed, Standard and Simple
 - 1) Detailed display
 - i. Shall display Operation Mode, Cool, Heat and Setback setpoints, Fan Speed, Louver position, Room Temperature, Time and Day of the Week
 - 2) Standard display
 - i. Shall display Operation Mode, Cool, Heat and Setback setpoints and Fan Speed
 - 3) Simple display
 - i. Shall display Operation Mode, Cool, Heat and Setback setpoints, Fan Speed and Room Temperature
 - ii. The room temperature shall be displayed with a large

11/16" font

- e. All displayed items configurable
 - 1) Configure "Off" to be displayed when unit is turned off (field setting required)
 - i. Prevents mode adjustment
 - 2) Setpoint can be removed from display when unit is turned Off (field setting required)
 - i. Prevents setpoint adjustment
 - 3) Fan speed display removable (field setting required)
 - i. Prevents fan speed adjustment
 - f. System Status icons.
 - g. The controller shall display temperature setpoint in one degree increments with a range of 60-90°F (16-32°C)
 - h. Detailed and Simple display will reflect room temperature (0-176°F/-18-80°C range in one degree increments).
 - 1) Display of temperature information shall be configurable for Fahrenheit or Celsius
 - i. On/Off status shall be displayed with an LED.
 - j. Error codes will be displayed with a two digit code in the event of system abnormality/error.
 - 1) A blinking LED will also signal system abnormality/error
 - k. The following system temperatures can be displayed to assist service personnel in troubleshooting:
 - 1) Return Air Temperature
 - 2) Liquid Line Temperature
 - 3) Gas Line Temperature
 - 4) Discharge Air Temperature (depending on unit),
 - 5) Remote Controller Sensor Temperature
 - 6) Temperature used for Indoor Unit Control
3. Basic Operation:
- a. Capable of controlling a group of up to 16 indoor units.
 - b. Controller shall control the following group operations:
 - 1) On/Off, Operation Mode (Cool, Heat, Fan, Dry and Auto* (*with VRV Heat Recovery & Heat Pump Systems))
 - i. Configure only the essential modes to be selectable – remove unnecessary mode selection(s) from display
 - 2) Independent Cooling and Heating setpoints in the occupied mode
 - i. Dual setpoints (individual Cool and Heat setpoints with minimum setpoint differential 0 – 7°F (0 – 4°C) default 2°F (1°C)) or Single setpoint
 - 3) Independent Cooling Setup and Heating Setback setpoints in the unoccupied mode
 - 4) Fan Speed
 - ii. Up to 5 speeds (dependent on indoor unit type)

- 5) Vane direction and oscillation (dependent on indoor unit type)
 - iii. Airflow direction
 1. Up to 5 louver positions and auto swing
 - iv. Individual airflow
 1. Provides individual control of up to four (4) louvers on an indoor unit
 - v. Dual airflow
 1. Provides control of both internal and external louver positions
 - vi. Automatic draft protection
 1. Automatically prevents air flow from blowing directly on occupants
 - b. The controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating in the occupied period
 - c. Function button lockout (On/Off, Mode, Fan Speed, Up/Down, Left, Right Arrows)
 - d. Optional Controller Face Decal (BRC1E72RM, BRC1E72RF, BRC1E72RMF, BRC1E72RM2, BRC1E72RF2, BRC1E72RMF2) to hide unnecessary (locked out) buttons
 - e. Indoor Unit group assignment
 - f. Filter indicator
 - 1) Filter service indicator shall be displayed after 100, 1250 or 2500 (default) hours of run time configurable via field setting
 - g. Clock (12/24 hour) and Day display
 - h. Automatic adjustment for Daylight Savings Time (DST)
 - 1) Set changeover period (second Sunday in March / first Sunday in November)
4. Programmability:
- a. Controller shall support schedule settings with selectable weekly pattern options.
 - 1) 7-day
 - 2) Weekday + Weekend
 - 3) Weekday + Saturday + Sunday
 - 4) Everyday
 - 5) The schedule shall support unit On/Off
 - 6) Independent settings for Cooling and/or Heating setpoints when unit is on (occupied)
 - 7) Independent Setup (Cooling) and Setback (Heating) setpoints when unit is off (unoccupied)
 - 8) A maximum of 5 operations can be schedulable per day
 - 9) Time setting in 1-minute increments
 - b. The Controller shall support Auto-changeover mode for both Heat Pump and Heat Recovery systems, therefore, allowing

the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat according to the room temperature and temperature setpoint.

- 1) Changeover to cooling mode shall occur at cooling setpoint + 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
 - i. Configurable from 1 – 4°F (0.5 – 2°C)
- 2) Changeover to cooling mode shall occur at the primary changeover deadband to cooling + 1°F (0.5°C) as the secondary changeover deadband.
 - i. Configurable from 1 – 4°F (0.5 – 2°C)
- 3) Changeover to heating mode shall occur at heating setpoint - 1°F (0.5°C) as the primary changeover deadband and takes the guard timer into consideration
 - i. Configurable from 1 – 4°F (0.5 – 2°C)
- 4) Changeover to heating mode shall occur at the primary changeover deadband to heating - 1°F (0.5°C) as the secondary changeover deadband.
 - i. Configurable from 1 – 4°F (0.5 – 2°C)
- 5) 1 hour guard timer
 - i. Upon changeover, guard timer will prevent another changeover during this period.
 - ii. Guard timer is ignored by a change of setpoint manually from either the Multi-zone Controller, Remote Controller, or by schedule.
 - iii. The Guard timer is also ignored if the space temperature reaches the secondary changeover deadband (configurable from 1 - 4°F (0.5 – 2°C)) from the primary changeover deadband, and the guard timer has been activated.
 - iv. 60 minutes as default, configurable to 15, 30, or 90 minutes
- c. The controller shall support the Auto-setback by sensor function (dependent on indoor unit type)
 - 1) The cooling and heating setpoints shall gradually relax (configurable) internally when the room is determined to be unoccupied.
 - i. The internal setpoint shall return to the original setpoint when room occupancy is detected.
- d. The controller shall support the Auto-off by sensor function (dependent on indoor unit type).
 - 1) The indoor unit shall turn off when it is determined that the room is unoccupied after a specified time has elapsed.
 - i. The indoor unit shall be turned on manually when occupancy is detected

- e. The controller shall support the Filter Auto Clean function to be performed once a day (dependent on indoor unit type)
 - 1) Eight (8) time periods (00:00-03:00, 03:00-06:00, 06:00-09:00, 09:00-12:00, 12:00-15:00, 15:00-18:00, 18:00-21:00, 21:00-00:00) shall be available to select from to enable the automatic filter cleaning function
 - i. Default time period (00:00 to 3:00) shall be used if the period for filter auto cleaning is not specified.
 - 2) The indoor unit shall be stopped during auto filter cleaning function operation.
- f. The Controller shall support an Auto Off Timer for temporarily enabling indoor unit operation during the unoccupied period.
 - 1) When the Off Timer is enabled and when the unit is manually turned on at the remote controller.
 - 2) The controller shall shut off the unit after a set time period.
 - 3) The time period shall be configurable in the controller menu with a range of 30-180 minutes in 10 minute increments.
- g. The room temperature shall be capable of being sensed at either the NAV Remote Controller, the Indoor Unit return air temperature sensor (default), or Remote Temperature Sensor (KRCS01-1B) configured through the field settings.

4.19 **Central Controller: Intelligent Touch Manager (iTM)**

The intelligent Touch Manager shall provide control for all VRV, and SkyAir units. It shall be capable of controlling indoor unit groups and indoor units. The intelligent Touch Manager shall support operations superseding that of the local remote controller, system configuration, daily/weekly scheduling, monitoring of operation status, and malfunction monitoring.

The intelligent Touch Manager can be used in conjunction with the Navigation Remote Controller, and Simplified Remote Controller. The remote controller shall require daisy chain wiring for grouping multiple indoor units together. Manual addressing shall be required of each remote controller group associated with the intelligent Touch Manager. The DIII-NET address can be set for one (1) indoor unit or each indoor unit in the remote controller group.

The intelligent Touch Manager shall be equipped with two RJ-45 Ethernet ports to support interconnection with a network PC via the Internet, Local Area Network (LAN), or connection with a non-networked PC after completed installation.

Web access functions shall be available so that facility staff can securely log into each Intelligent Touch Manager via the PC's web browser to support monitoring, scheduling, error email, and general user functions. Additional Energy Navigator software shall be available and will require advanced purchase and can only be activated upon receipt of a license activation key from Daikin AC.

1. Mounting:

The intelligent Touch Manager shall be mounted by the contractor in a 24" x 24" NEMA 1 control panel mounted on the wall as shown on the drawings.

2. Display Features:

- a. The intelligent Touch Manager shall be approximately 11.42" x 9.57" x 1.97' in size with a backlit 10.4" LCD display.
- b. Display information shall be in English.
- c. Featured backlit LCD with auto off after 30 minutes (default) is adjustable between 1 to 60 minutes, or the choice of 3 different screen savers.
- d. Area and Group configuration
 - 1) Area contains one (1) or more Area(s) or Group(s)
 - 2) A Group may be an indoor unit, Di, Dio point that has a DIII-NET address
 - 3) An Area is a tiered group where management points (indoor unit, digital input/output, and analog input groups) can be monitored and controlled by global settings. Up to 650 Areas can be created. Area hierarchy can have up to 10 tiered levels. Area configuration shall classify levels of monitoring and control for each management point.
 - 4) Areas and Groups may be assigned names
- e. The Controller shall display On/Off, Operation Mode, Setpoint, Space Temperature, Louver Position, Fan Speed for each Area or Group.
- f. The Controller shall display Date and day of the week along with the time of day.
- g. The Controller shall adjust for daylight savings time (DST) automatically.
- h. Display information shall be updated every 3 seconds to show the latest status of the indoor unit groups.
- i. System status icons shall display On/Off (color coded), Malfunction/Error (color coded), Forced Stop, Setback, Filter, Maintenance, and Screen Lock.
- j. The controller shall display the temperature setpoint in one degree increments with a range of 60°F - 90°F
 - 1) Display of temperature setpoint information shall be configurable for Fahrenheit
- k. Display shall reflect room temperature range in one degree increment.
 - 1) Display of room temperature information shall be configurable for Fahrenheit
- l. The Menu List shall be used to configure options and display information for each Area or Group.
- m. Error status shall be displayed in the event of system abnormality/error with one of three color coded icons placed over the indoor unit icon or lower task bar.
 - 1) System errors are generated when the Intelligent Touch Manager system with other VRV control systems combined, or power proportional distribution calculation errors occur. The intelligent Touch Manager shall display the error with a red triangle placed on the lower task bar
 - 2) Unit errors occurring at the VRV system shall be displayed with a yellow triangle placed over the indoor unit icon
 - 3) Limit errors are based upon preconfigured analog input upper and lower limit settings and are generated when the limits have been met. When limit error is generated a yellow triangle will be placed over the unit icon.

- 4) Communication errors between the intelligent Touch Manager and the indoor units shall be displayed with a blue triangle placed over the indoor unit icon
- 5) Error history shall be available for viewing for up to 1,000,000 errors/abnormality events
- n. Floor plan layout
 - 1) Capable of displaying site floor plan as the background for visual navigation. Indoor unit, DIII-NET Di and Dio, and External Di, DO, and Ai icons with operational status can be placed on the floor layout
 - i) Up to 4 status points can be assigned to the indoor unit icon (room name, room temperature, setpoint, and mode)
 - ii) Digital input and output icons will display On/Off status
 - iii) Analog input icons will display analog value
 - 2) Up to 60 floor layout sections can be created
3. Basic Operation:
 - a. Capable of controlling by Area(s) or Group(s)
 - b. Controller shall control the following group operations:
 - 1) On/Off
 - 2) Operation Mode (Cool, Heat, Fan, Dry, and Auto)
 - 3) Single setpoint for current mode in the occupied period
 - 4) Controller shall be able to limit the user adjustable setpoint ranges individually for cooling and heating based upon the Area or Group configurations.
 - 5) Relative Setup (Cooling) and Setback (Heating) setpoints in the unoccupied mode adjustable to 2 - 12^oF
 - i) The higher and lower relative setpoints
 - ii) Setup and Setback setpoints can be set inside or outside of the occupied setpoint range
 - iii) The recovery differential shall be 4^oF (default) and adjustable between 2 – 10^oF
 - iv) Settings shall be applied based upon the Area or Group configurations
 - 6) Fan Speed
 - i) Up to 3 speeds (dependent upon indoor unit type)
 - 7) Louver direction (dependent upon indoor unit type)
 - i) 5 fixed positions or swing position
 - 8) Remote controller permit/prohibit of On/Off, Mode, and Setpoint
 - 9) Lock out setting for Intelligent Touch Manager display
 - 10) Indoor unit Group/Area assignment
 - c. Capable of providing battery backup power for the clock at least 1 year when no AC power is applied.
 - 1) The battery can last at least 13 years when AC power is applied
 - 2) Settings stored in non-volatile memory
4. Programmability:
 - a. Controller shall support weekly schedule settings.
 - 1) 7 day weekly pattern
 - 2) The schedule shall have the capabilities of being enabled or disabled

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- 3) 100 independent schedules configurable with up to 20 events settable for each day schedule.
 - i) Each scheduled event shall specify time and target Area or Group
 - ii) Each scheduled event shall include On/Off, Operation Mode, Occupied Setpoint, Pre-Cool, Pre-Heat, Setback High, Setback Low, Remote Controller On/Off Prohibit, Remote Controller Mode Prohibit, Remote Controller Setpoint Prohibit, Timer Extension Setting, Fan Speed, and Setpoint Range Limit
 - Single Cooling or Heating setpoint when unit is On (occupied)
 - Configurable Relative Setup (Cooling) and Relative Setback (Heating) setpoints when unit is Off (unoccupied)
 - iii) Time setting in 1-minute increments
 - iv) Timer Extension shall be used for a timed override to allow indoor unit operation during the unoccupied period
 - 4) A maximum of 40 exception days can be schedule on the yearly schedule (repeats yearly)
 - i) Exception days shall be used to override specified days on the weekly schedule based upon irregular occupied/unoccupied conditions
 - ii) Exception days can be configured on a set date or a floating date
- b. Controller shall support auto-changeover.
- 1) Auto-change shall provide Fixed, Operating, and Averaging changeover methods for both Heat Pump and Heat Recovery systems based upon the changeover group configuration. This will allow for the optimal room temperature to be maintained by automatically switching the indoor unit's mode between Cool and Heat in accordance with the room temperature and setpoint.
 - i) When selecting the Auto-changeover method the Differential to also be set (default value 4°F, adjustable between 0 – 13°F). The (Thermal) Differential is the tolerance for the indoor unit's setpoint.
 - When the difference between the representative room temperature and the representative indoor unit setpoint exceed the thermal differential, the operation mode is changed
 - ii) When the mode is changed from Cool to Heat the setpoint will be decreased by the thermal differential set in the Auto Changeover configuration
 - iii) When the mode is changed from Heat to Cool the setpoint will be increased by the thermal differential set in the Auto Changeover configuration
 - 2) Fixed Method
 - i) Changeover evaluated by room temperature and setpoint of the representative indoor unit (first registered indoor unit in group) in the changeover group even when it is not operating (must be in Cool, Heat, or Auto mode)
 - 3) Operating Method
 - i) Changeover evaluated by searching for an indoor unit group that is operating in Cool, Heat, or Auto mode and uses the indoor unit room temperature and setpoint as the representative room temperature and setpoint

- ii) The order of the search is based upon the order of each indoor unit group is assigned to the intelligent Touch Manager within the changeover group
 - 4) Average Method
 - i) Changeover evaluated by the average of all indoor unit group's room temperatures and setpoints in the changeover group list
 - 5) Changeover shall change the operation mode of the indoor unit that is set as the Changeover Master. The Changeover Master indoor unit shall then change the operation mode of all indoor unit groups daisy chained to the same outdoor unit in the Heat Pump system or branch selector box in the Heat Recovery system.
 - 6) Changeover to cooling mode shall occur when the room temperature is great than or equal to the heating setpoint and the setting of the thermal difference (0 – 13°F) with some safety allowance if necessary is established
 - 7) Changeover to heating mode shall occur when room temperature is less than or equal to the cooling setpoint and the setting of the thermal difference (0 – 13°F) with some safety allowance if necessary is established
 - 8) 30 minute guard timer
 - ii) Upon changeover, guard timer will prevent another changeover during this period.
 - iii) Guard timer is ignored by a change of setpoint manually from either intelligent Touch Manger or Remote Controller or by schedule.
 - c. Controller shall support Interlock
 - 1) Interlock feature for use with 3rd party equipment (DOAS, dampers, occupancy sensing, etc...) to automatically control Groups or Areas corresponding to the change of the operation states or the On/Off states of any Group.
 - 2) WAGO I/O unit – Di, Do, Ai
 - i) On/Off based monitoring and control of equipment
 - ii) Manual or scheduled operation of equipment
 - iii) Operation based upon interlock with VRV indoor unit group(s)
 - iv) Monitor equipment error/alarm status
 - 3) Digital Input/Output unit or Digital Input unit
 - i) On/Off based monitoring and control of equipment
 - ii) Manual or scheduled operation of equipment
 - iii) Operation based upon interlock with VRV indoor unit group(s)
 - iv) Monitor equipment error/alarm status
 - d. Controller shall support force shutdown of associated indoor unit groups.
5. Web/Email Function
- a. Each intelligent Touch Manager shall be capable of monitoring, operating, and scheduling a maximum 512 indoor unit groups with the addition of the iTM Plus Adapter from a networked PC's web browser. It shall also be capable of creating general user access and sending detailed error emails to a customized distribution list (up to 10 email addresses).
 - b. All PCs shall be field supplied
6. Expandability
- Adapters shall be available to expand the system as needed.

Part 5 – Execution

5.1 Examination

- a) Examine substrates, areas and conditions with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of VRV-VRF system.
- b) Proceed with installation only after unsatisfactory conditions have been corrected.

5.2 Installation

- a) Install outdoor and indoor equipment according to project drawings and manufacturers specific guidelines.
- b) Install refrigerant piping according to project drawings and manufacturers specific guidelines.
- c) Install control wiring according to project drawings and manufacturers specific guidelines.
- d) Locate controllers according to project drawings and/or owner's preference.
- e) Refrigerant Charging: The contractor shall be responsible for the cost of the additional refrigerant required to charge the VRV-VRF system. Please note that the amount of additional refrigerant required is dependent on the actual installed piping lengths. Therefore the contractor must record exact measurements of every installed pipe length. This information will be used by the equipment supplier to calculate the amount of added refrigerant required.

5.3 Field Quality Control

- a) Installer Qualifications: The installation of the VRV-VRF system requires very specific procedures for control wiring as well as refrigerant pipe installation, pressure testing, evacuation, leak testing and charging. The installing contractor's lead installer on site must be trained and certified in the installation and commissioning of the VRV-VRF system prior to beginning the installation. To achieve this certification the individual must have attended a minimum of 3 days of installation-commissioning classes as taught by an instructor who has been qualified by the VRV-VRF manufacturer. Daikin training classes are available at three locations in the Carolinas.
- b) Manufacturer's Field Service: Equipment supplier technicians visiting the job must be fully trained by the VRV-VRF manufacturer in all aspects of the mechanics and controls associated with the VRV-VRF system including the use of the manufacturer's analytical-troubleshooting software. The equipment supplier shall have a technician living within 100 miles of the job.
- c) Manufacturer Site Visits: The equipment supplier shall include the following site visits by the manufacturer's trained and authorized technician:
 - * One pre-construction visit to review the job plans and installation procedures.
 - * One visit during the course of installation for each VRV-VRF system on

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the job.

- * One complete day start-up service for each VRV-VRF system on the job.
- * One day of controls programming-integration for each central controller and/or communications interface on the job.
- * One day owner demonstration and training.

5.4 Start-Up Service

- a) Engage a factory authorized and certified service representative to perform start-up service.
- b) Complete installation and start-up checks according to manufacturer's written instructions and do the following:
 1. Inspect for visible damage and proper installation of all system components, refrigerant pipe and control wire.
 2. Verify refrigerant pipe pressure test, evaluation and leak testing per manufacturer's specifications.
 3. Charge system with correct amount of refrigerant.
 4. Address all components within the control system.
 5. Energize and run all components per the manufacturer's detailed procedures.

5.5 Cleaning and Adjusting

- a) Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than normal occupancy hours for this purpose.
- b) After completing system installation and testing, adjusting, and balancing, clean and/or install new filters.

5.6 Demonstration

- a) Engage a factory-authorized and certified service representative to train Owner's maintenance personnel to adjust, operate and maintain the VRV-VRF system. A minimum of 8 hours will be required for demonstration.

5.7 Preventative Maintenance

- A. The equipment manufacturer (Daikin Applied Services) shall include a minimum of two (2) on site preventative maintenance visits per year for the full 10 year warranty period. This service is to be performed by the manufacturer and not a third-party representative, distributor or contractor. These inspections are to be performed in early spring for cooling, and early fall for heating. The servicing professional shall meet all the qualifications, and possess all diagnostic equipment required in providing the maintenance and repair services required by the manufacturer's parts and labor warranty.
- B. Inspections shall include all recommended items as described in the manufacturer's IOM, and include the following:
 - a. Record all operating data that is available by the manufacturer via direct access to the equipment communication network. Each device shall have data collected for a minimum of two (2) continuous hours.
 - b. Database for Central Controller, if equipped, shall be backed up and stored for safe keeping.

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- c. All sensors, (temperature and pressure), shall be checked for accuracy within 2% of its range.
 - d. Review zone setpoints and confirm proper operating range.
 - e. PID control of the fan coil/air handling units shall be checked to ensure close set point control without excessive swings in EEV control.
 - f. Fault or alarm history shall be checked and documented. Events investigated to find cause and a resolution shall be recommended.
 - g. Proper refrigerant level, and operating pressure control shall be confirmed.
- C. Service Records
- Each device shall have a service record maintained and available upon request by the owner. Each record shall include the following:
- 1. Model number
 - 2. Serial number

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Section 15M705 – Rooftop HVAC Unit (“RTU-1”)Systems & Accessories

PART 1: GENERAL

1.01 SECTION INCLUDES

- A. Packaged Rooftop air conditioners

1.02 REFERENCES

- A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- B. AMCA 99—Standards Handbook
- C. AMCA 210—Laboratory Methods of Testing Fans for Rating Purposes
- D. AMCA 500—Test Methods for Louver, Dampers, and Shutters.
- E. AHRI 340/360 - Unitary Large Equipment
- F. NEMA MG1—Motors and Generators
- G. National Electrical Code.
- H. NFPA 70—National Fire Protection Agency.
- I. SMACNA—HVAC Duct Construction Standards—Metal and Flexible.
- J. UL 900—Test Performance of Air Filter Units.

1.03 SUBMITTALS

- A. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, electrical characteristics and connection requirements.
- B. Product Data:
 - 1. Provide literature that indicates dimensions, weights, capacities, ratings, fan performance, and electrical characteristics and connection requirements.
 - 2. Provide computer generated fan curves with specified operating point clearly plotted.
 - 3. Manufacturer’s Installation Instructions.

1.04 OPERATION AND MAINTENANCE DATA

- A. Maintenance Data: Provide instructions for installation, maintenance and service

1.05 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience, who issues complete catalog data on total product.
- B. Startup must be done by trained personnel experienced with rooftop equipment.
- C. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters and remote controls are in place, bearings lubricated, and manufacturers’ installation instructions have been followed.

Section 15M705 Rooftop HVAC Unit
 (“RTU-1”)Systems & Accessories

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site.
- B. Accept products on site and inspect for damage.
- C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

PART 2: PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design: Daikin Applied
 1. No equal exists. [Deducts for alternative equipment will be considered.]

2.02 GENERAL DESCRIPTION

- A. Furnish as shown on plans, Daikin Applied Rebel Single zone Heating and Cooling Unit(s) model DPS. Unit performance and electrical characteristics shall be per the job schedule.
- B. Configuration: Fabricate as detailed on prints and drawings:
 1. Return plenum / economizer section
 2. Filter section
 3. Cooling coil section
 4. Supply fan section
 5. Gas heating section.
 6. Condensing unit section
- C. The complete unit shall be cETLus listed.
- D. The unit shall be ASHRAE 90.1-2016 compliant and labeled.
- E. Each unit shall be specifically designed for outdoor rooftop application and include a weatherproof cabinet. Each unit shall be completely factory assembled and shipped in one piece. Packaged units shall be shipped fully charged with R-410 Refrigerant and oil.
- F. The unit shall undergo a complete factory run test prior to shipment. The factory test shall include a refrigeration circuit run test, a unit control system operations checkout, a unit refrigerant leak test and a final unit inspection.
- G. All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit.
- H. Performance: All scheduled EER, IEER, capacities and face areas are minimum accepted values. All scheduled amps, kW, and HP are maximum accepted values that allow scheduled capacity to be met.
- I. Warranty: The manufacturer shall provide 12-month parts only warranty. Defective parts shall be repaired or replaced during the warranty period at no charge. The warranty period shall commence at startup or six months after shipment, whichever occurs first.

2.03 CABINET, CASING, AND FRAME

- A. Panel construction shall be double-wall construction for all panels. All floor panels shall have a solid galvanized steel inner liner on the air stream side of the unit to protect insulation during service and maintenance. Insulation shall be a minimum of 2" thick with an R-value of

13.0, and shall be 2 part injected foam. Panel design shall include no exposed insulation edges. Unit cabinet shall be designed to operate at total static pressures up to 5.0 inches w.g.

B. Panel construction shall be double-wall construction for all panels. All floor panels shall have a solid galvanized steel inner liner on the air stream side of the unit to protect insulation during service and maintenance. Insulation shall be a minimum of 1" thick with an R-value of 7.0, and shall be 2 part injected foam. Panel design shall include no exposed insulation edges. Unit cabinet shall be designed to operate at total static pressures up to 5.0 inches w.g.

C. Exterior surfaces shall be constructed of pre-painted galvanized steel for aesthetics and long term durability. Paint finish to include a base primer with a high quality, polyester resin topcoat of a neutral beige color. Finished panel surfaces to withstand a minimum 1000-hour salt spray test in accordance with ASTM B117 standard for salt spray resistance.

D. Service doors shall be provided on the fan section, filter section, control panel section, and heating vestibule in order to provide user access to unit components. All service access doors shall be mounted on multiple, stainless steel hinges and shall be secured by a latch system. Removable service panels secured by multiple mechanical fasteners are not acceptable.

E. The unit base shall overhang the roof curb for positive water runoff and shall seat on the roof curb gasket to provide a positive, weathertight seal. Lifting brackets shall be provided on the unit base to accept cable or chain hooks for rigging the equipment.

2.04 OUTDOOR/RETURN AIR SECTION

A. Unit shall be provided with a 100% outdoor air hood. The 100% outdoor air hood shall allow outdoor air to enter from the back of the unit, at the draw-through filter section. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include a bird screen to prevent infiltration of foreign materials and a rain lip to drain water away from the entering air stream.

B. Daikin Applied UltraSeal low leak dampers shall be provided. Damper blades shall be fully gasketed and side sealed and arranged vertically in the hood. Damper leakage shall be less than 1.5 CFM/Sq. Ft. of damper area at 1.0 inch static pressure differential. Leakage rate to be tested in accordance with AMCA Standard 500. Damper blades shall be operated from multiple sets of linkages mounted on the leaving face of the dampers. Control of the dampers shall be from a factory installed actuator.

C. Control of the outdoor dampers shall be by a factory installed actuator. Damper actuator shall be of the modulating type. Damper to open when when supply fan starts, and close when supply fan stops.

2.05 ENERGY RECOVERY

A. The rooftop unit shall be provided with an AHRI certified rotary wheel air-to-air heat exchanger in a cassette frame complete with seals, drive motor and drive belt. The energy recovery wheel shall be an integral part of the rooftop unit with unitary construction and does not require field assembly. Bolt-on energy recovery units that require field assembly and section to section gasketing and sealing are not acceptable.

- B. The wheel capacity, air pressure drop and effectiveness shall be AHRI certified per AHRI Standard 1060. Thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to-Air Heat Exchangers and AHRI Standard 1060, Rating Air-to-Air Heat Exchangers For Energy Recovery Ventilation Equipment.
- C. The rooftop unit shall be designed with a track so the entire energy recovery wheel cassette can slide out from the rooftop unit to facilitate cleaning.
- D. The unit shall have 2" Merv 7 filters for the outdoor air before the wheel to help keep the wheel clean and reduce maintenance. Filter access shall be by a hinged access door with ¼ turn latches.
- E. The matrix design shall have channels to reduce cross contamination between the outdoor air and the exhaust air. The layers shall be effectively captured in aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belt(s) of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.
- F. The total energy recovery wheel shall be coated with silica gel desiccant permanently bonded without the use of binders or adhesives, which may degrade desiccant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity.
- G. Wheels shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning.
- H. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel. Wheels shall be connected to the shaft by means of taper lock hubs.
- I. The exhaust air fan shall be a direct drive SWSI plenum fan. The exhaust fan shall be sized for the airflow requirements per the construction schedule. The unit controller shall control the exhaust fan to maintain building pressure. A VFD shall be provided for the exhaust fan motor or the exhaust fan motor shall be an ECM motor. The rooftop unit shall have single point electrical power connection and shall be ETL listed.
- J. The control of the energy recovery wheel shall be an integral part of the rooftop unit's DDC controller. The DDC controller shall have visibility of the outdoor air temperature, leaving wheel temperature, return air temperature, and exhaust air temperature. These temperatures shall be displayed at the rooftop units DDC controller LCD display. All of these temperatures shall be made available through the BACnet interface.
- K. The rooftop unit DDC controller shall provide frost control for the energy recovery wheel. When a frost condition is encountered the unit controller shall stop the wheel. When in the frost control mode the wheel shall be jogged periodically and not be allowed to stay in the stationary position.

2.06 EXHAUST FAN

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- A. Exhaust fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with aluminum fan blades that are continuously welded to the hub plate and end rim. The exhaust fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.
- B. The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.
- C. The unit DDC controller shall provide building static pressure control. The unit controller shall provide proportional control of the exhaust fans from 25% to 100% of the supply air fan designed airflow to maintain the adjustable building pressure setpoint. The field shall mount the required sensing tubing from the building to the factory mounted building static pressure sensor.

2.07 FILTERS

- A. Unit shall be provided with a draw-through filter section. The filter rack shall be designed to accept a 2" prefilter and a 4" final filter. The unit design shall have a hinged access door for the filter section. The manufacturer shall ship the rooftop unit with 2" MERV 8 construction filters. The contractor shall furnish and install, at building occupancy, the final set of filters per the contract documents.

2.08 COOLING COIL

- A. The indoor coil section shall be installed in a draw through configuration, upstream of the supply air fan. The coil section shall be complete with a factory piped cooling coil and an ASHRAE 62.1 compliant double sloped drain pan.
- B. The direct expansion (DX) cooling coils shall be fabricated of seamless high efficiency copper tubing that is mechanically expanded into high efficiency aluminum plate fins. Coils shall be a multi-row, staggered tube design with a minimum of 3 rows. All cooling coils shall have an interlaced coil circuiting that keeps the full coil face active at all load conditions. All coils shall be factory leak tested with high pressure air under water.
- C. The cooling coil shall have an electronic controlled expansion valve. The unit controller shall control the expansion valve to maintain liquid subcooling and the superheat of the refrigerant system.
- D. The refrigerant suction lines shall be fully insulated from the expansion valve to the compressors.
- E. The drain pan shall be stainless steel and positively sloped. The slope of the drain pan shall be in two directions and comply with ASHRAE Standard 62.1. The drain pan shall have a minimum slope of 1/8" per foot to provide positive draining. The drain pan shall extend beyond the leaving side of the coil. The drain pan shall have a threaded drain connection extending through the unit base.

2.09 HOT GAS REHEAT

- A. Unit shall be equipped with a fully modulating hot gas reheat coil with hot gas coming from the unit condenser

B. Hot gas reheat coil shall be a Micro Channel design. The aluminum tube shall be a micro channel design with high efficiency aluminum fins. Fins shall be brazed to the tubing for a direct bond. The capacity of the reheat coil shall allow for a 20°F temperature rise at all operating conditions.

C. The modulating hot gas reheat systems shall allow for independent control of the cooling coil leaving air temperature and the reheat coil leaving air temperature. The cooling coil and reheat coil leaving air temperature setpoints shall be adjustable through the unit controller. During the dehumidification cycle the unit shall be capable of 100% of the cooling capacity. The hot gas reheat coil shall provide discharge temperature control within +/- 2°F.

D. Each coil shall be factory leak tested with high-pressure air under water.

2.010 SUPPLY FAN

A. Supply fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with fan blades that are continuously welded to the hub plate and end rim. The supply fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.

B. All fan assemblies shall employ solid steel fan shafts. Heavy-duty pillow block type, self-aligning, grease lubricated ball bearings shall be used. Bearings shall be sized to provide a L-50 life at 250,000 hours. The entire fan assembly shall be isolated from the fan bulkhead with a flexible collar and mounted on 1" spring isolators.

C. All fan assemblies shall be statically and dynamically balanced at the factory, including a final trim balance, prior to shipment.

D. Supply fan and motor assembly combinations larger than 8 hp or 22" diameter shall be internally isolated on 1" deflection, spring isolators and include removable shipping tie downs.

E. The fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.

F. The motor shall be T Frame and open drip proof. Ovrload protection and speed control is provided by the factory installed VFD and rooftop unit controller. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.

G. The supply fan shall be capable of airflow modulation from 30% to 100% of the scheduled designed airflow. The fan shall not operate in a state of surge at any point within the modulation range.

2.011 HEATING SECTION

A. The rooftop unit shall include a natural gas heating section. The gas furnace design shall be one natural gas fired heating module factory installed downstream of the supply air fan in the heat section. The heating module shall be a tubular design with in-shot gas burners.

B. The module shall be complete with furnace controller and control valve capable of 12:1 modulating operation.

- C. The module shall be complete with furnace controller and control valve capable of 10:1 modulating operation.
- D. The heat exchanger tubes shall be constructed of stainless steel.
- E. The module shall have an induced draft fan that will maintain a negative pressure in the heat exchanger tubes for the removal of the flue gases.
- F. Each burner module shall have two flame roll-out safety protection switches and a high temperature limit switch that will shut the gas valve off upon detection of improper burner manifold operation. The induced draft fan shall have an airflow safety switch that will prevent the heating module from turning on in the event of no airflow in the flue chamber.
- G. The factory-installed DDC unit control system shall control the gas heat module. Field installed heating modules shall require a field ETL certification. The manufacturer's rooftop unit ETL certification shall cover the complete unit including the gas heating modules.

2.012 HEAT PUMP HEATING

- A. The evaporator coil, condenser coil, compressors and refrigerant circuit shall be designed for heatpump operation. The refrigerant circuit shall contain a 4 way reversing valve for the heatpump operation. The outdoor coil shall have an electronic expansion valve to control the refrigerant flow. The unit controller shall modulate the expansion valve to maintain compressor operation within the compressor operational envelope.
- B. The refrigerant system shall have a pump-down cycle.
- C. The unit shall have a natural gas furnace for hybrid heating. When the heatpump operation cannot maintain the discharge air temperature setpoint the natural gas furnace shall temper the airstream to the discharge air temperature setpoint.

2.013 CONDENSING SECTION

- A. Outdoor coils shall have seamless copper tubes, mechanically bonded into aluminum plate-type fins. The fins shall have full drawn collars to completely cover the tubes. A sub-cooling coil shall be an integral part of the main outdoor air coil. Each outdoor air coil shall be factory leak tested with high-pressure air under water.
- B. Fan motors shall be an ECM type motor for proportional control. The unit controller shall proportionally control the speed of the condenser fan motors to maintain the head pressure of the refrigerant circuit from ambient condition of 0~120°F. Mechanical cooling shall be provided to 0° F. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase.
- C. Fan motors shall be an ECM type motor for proportional control. The unit controller shall proportionally control the speed of the condenser fan motors to maintain the head pressure of the refrigerant circuit from ambient condition of 25~120°F. Mechanical cooling shall be provided to 25° F. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase.
- D. The condenser fan shall be low noise blade design. Fan blade design shall be a dynamic profile for low tip speed. Fan blade shall be of a composite materia
- E. The unit shall have scroll compressors. One of the compressors shall be an inverter compressor providing proportional control. The unit controller shall control the speed of the

compressor to maintain the discharge air temperature. The inverter compressor shall have a separate oil pump and low oil safety protection.

F. The unit shall have scroll compressors. One of the compressors shall be an inverter compressor providing proportional control. The unit controller shall control the speed of the compressor to maintain the discharge air temperature. The inverter compressor shall have a separate oil pump and an oil separator for each compressor that routes oil back to the compressor instead of through the discharge line.

G. Pressure transducers shall be provided for the suction pressure and head pressure. Temperature sensor shall be provided for the suction temperature and the refrigerant discharge temperature of the compressors. All of the above devices shall be an input to the unit controller and the values be displayed at the unit controller.

H. Refrigerant circuit shall have a bypass valve between the suction and discharge refrigerant lines for low head pressure compressor starting and increased compressor reliability. When there is a call for mechanical cooling the bypass valve shall open to equalizing the suction and discharge pressures. When pressures are equalized the bypass valve shall close and the compressor shall be allowed to start.

I. Each circuit shall be dehydrated and factory charged with R-410A Refrigerant and oil.

2.014 ELECTRICAL

A. Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with the unit shall be number and color-coded and labeled according to the electrical diagram provided for easy identification. The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a single point power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring. Branch short circuit protection, 115-volt control circuit transformer and fuse, system switches, and a high temperature sensor shall also be provided with the unit. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Supply fan motors shall have contactors and external overload protection. Knockouts shall be provided in the bottom of the main control panels for field wiring entrance.

B. A single non-fused disconnect switch shall be provided for disconnecting electrical power at the unit. Disconnect switches shall be mounted internally to the control panel and operated by an externally mounted handle.

2.015 CONTROLS

A. Provide a complete integrated microprocessor based Direct Digital Control (DDC) system to control all unit functions including temperature control, scheduling, monitoring, unit safety protection, including compressor minimum run and minimum off times, and diagnostics. This system shall consist of all required temperature sensors, pressure sensors, controller and keypad/display operator interface. All MCBs and sensors shall be factory mounted, wired and tested.

B. The stand-alone DDC controllers shall not be dependent on communications with any on-site or remote PC or master control panel for proper unit operation. The microprocessor shall maintain existing set points and operate stand alone if the unit loses either direct connect or

network communications. The microprocessor memory shall be protected from voltage fluctuations as well as any extended power failures. All factory and user set schedules and control points shall be maintained in nonvolatile memory. No settings shall be lost, even during extended power shutdowns.

c. The DDC control system shall permit starting and stopping of the unit locally or remotely. The control system shall be capable of providing a remote alarm indication. The unit control system shall provide for outside air damper actuation, emergency shutdown, remote heat enable/disable, remote cool enable/disable, heat indication, cool indication, and fan operation.

D. All digital inputs and outputs shall be protected against damage from transients or incorrect voltages. All field wiring shall be terminated at a separate, clearly marked terminal strip.

E. The DDC controller shall have a built-in time schedule. The schedule shall be programmable from the unit keypad interface. The schedule shall be maintained in nonvolatile memory to insure that it is not lost during a power failure. There shall be one start/stop per day and a separate holiday schedule. The controller shall accept up to sixteen holidays each with up to a 5-day duration. Each unit shall also have the ability to accept a time schedule via BAS network communications.

F. The keypad interface shall allow convenient navigation and access to all control functions. The unit keypad/display character format shall be 4 lines x 20 characters. All control settings shall be password protected against unauthorized changes. For ease of service, the display format shall be English language readout. Coded formats with look-up tables will not be accepted. The user interaction with the display shall provide the following information as a minimum:

1. Return air temperature.
2. Discharge air temperature.
3. Outdoor air temperature.
4. Space air temperature.
5. Outdoor enthalpy, high/low.
6. Compressor suction temperature and pressure
7. Compressor head pressure and temperature
8. Expansion valve position
9. Condenser fan speed
10. Inverter compressor speed
11. Dirty filter indication.
12. Airflow verification.
13. Cooling status.
14. Control temperature (Changeover).
15. VAV box output status.
16. Cooling status/capacity.
17. Unit status.
18. All time schedules.
19. Active alarms with time and date.
20. Previous alarms with time and date.
21. Optimal start

- 22. Supply fan and exhaust fan speed.
- 23. System operating hours.
 - a. Fan
 - b. Exhaust fan
 - c. Cooling
 - d. Individual compressor
 - e. Heating
 - f. Economizer
 - g. Tenant override
- G. The user interaction with the keypad shall provide the following:
 - 1. Controls mode
 - a. Off manual
 - b. Auto
 - c. Heat/Cool
 - d. Cool only
 - e. Heat only
 - f. Fan only
 - 2. Occupancy mode
 - a. Auto
 - b. Occupied
 - c. Unoccupied
 - d. Tenant override
 - 3. Unit operation changeover control
 - a. Return air temperature
 - b. Space temperature
 - c. Network signal
 - 4. Cooling and heating change-over temperature with deadband
 - 5. Cooling discharge air temperature (DAT)
 - 6. Supply reset options
 - a. Return air temperature
 - b. Outdoor air temperature
 - c. Space temperature
 - d. Airflow (VAV)
 - e. Network signal
 - f. External (0-10 vdc)
 - g. External (0-20 mA)
 - 7. Temperature alarm limits
 - a. High supply air temperature
 - b. Low supply air temperature
 - c. High return air temperature
 - 8. Lockout control for compressors.
 - 9. Compressor interstage timers
 - 10. Night setback and setup space temperature.
 - 11. Building static pressure.
 - 12. Economizer changeover

- a. Enthalpy
- b. Drybulb temperature
- 13. Currently time and date
- 14. Tenant override time
- 15. Occupied/unoccupied time schedule
- 16. One event schedule
- 17. Holiday dates and duration
- 18. Adjustable set points
- 19. Service mode
 - a. Timers normal (all time delays normal)
 - b. Timers fast (all time delays 20 sec)
- H. If the unit is to be programmed with a night setback or setup function, an optional space sensor shall be provided. Space sensors shall be available to support field selectable features. Sensor options shall include:
 - 1. Zone sensor with tenant override switch
 - 2. Zone sensor with tenant override switch plus heating and cooling set point adjustment. (Space Comfort Control systems only)
- I. To increase the efficiency of the cooling system the DDC controller shall include a discharge air temperature reset program for part load operating conditions. The discharge air temperature shall be controlled between a minimum and a maximum discharge air temperature (DAT) based on one of the following inputs:
 - 1. Airflow
 - 2. Outside air temperature
 - 3. Space temperature
 - 4. Return air temperature
 - 5. External signal of 1-5 vdc
 - 6. External signal of 0-20 mA
 - 7. Network signal
- J. DDC controller must be capable of complete communications with the central VRV/VRF system using the same language communications protocol as the VRV/VRF central controller.

2.016 ROOF CURB

- A. A prefabricated heavy gauge galvanized steel, mounting curb shall be provided for field assembly on the roof decking prior to unit shipment. The roof curb shall be a full perimeter type with complete perimeter support of the air handling section and condensing section. The curb shall be a minimum of 14" high and include a nominal 2" x 4" wood nailing strip. Gasket shall be provided for field mounting between the unit base and roof curb.

END OF SECTION 15M705

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Flat Rock & Rugby Middle Schools
Henderson County Schools
Hendersonville, North Carolina
DEI Job No. 19005

Section 15M706 – Inverter Driven DX Air-Cooled Cooling System

1.00 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

Part 1- GENERAL

SINGLE SPLIT AIR CONDITIONING SPECIFICATION – Cooling Only

1.01 SYSTEM DESCRIPTION

System Size Ranges: 0.75 to 2 TONS NOMINAL

The variable capacity, cooling only system shall be a Daikin Inverter Driven series (cooling only model) split system. The system shall consist of a wall mounted evaporator model FTK09NMVJU exclusively matched to outdoor model RK09NMVJU, FTK12NMVJU exclusively matched to outdoor model RK12NMVJU, FTK18NMVJU exclusively matched to outdoor model RK18NMVJU, and FTK24NMVJU exclusively matched to outdoor model RK24NMVJU direct expansion (DX), air-cooled, Daikin swing, variable speed, inverter driven compressor using R-410A refrigerant. The outdoor unit is a horizontal discharge, variable speed, single fan unit using a single phase power supply. The system shall have a self diagnostic function, 3-minute time delay mechanism and have a factory pre-charge of R-410A adequate for 33 feet of total line set length. The system shall have automatic restart capability after a power failure has occurred and a low voltage cut-off feature to prevent stalling during power supply issues.

Daikin AC Model Numbers:

ODU	IDU
RK09NMVJU	FTK09NMVJU
RK12NMVJU	FTK12NMVJU
RK18NMVJU	FTK18NMVJU
RK24NMVJU	FTK24NMVJU

1.02 QUALITY ASSURANCE

- A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL), in accordance with ANSI/UL 1995 / CSA C22.2 No. 236 – Heating and Cooling Equipment and bear the Listed Mark.
- B. All wiring shall be in accordance with the National Electric Code (NEC).
- C. Each combination shall be rated in accordance with Air Conditioning Refrigeration Institute's (AHRI) Standard 210/240 and bear the ARI label.

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- D. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- E. The outdoor unit will be factory charged for a line set length of 33 feet of refrigerant with R-410A refrigerant.
- F. A holding charge of dry nitrogen shall be provided in the evaporator.
- G. System Efficiency shall meet or exceed 18 SEER, 12.5 EER.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Unit shall be stored and handled according to the manufacturer's recommendations.

Part 2 – WARRANTY

2.01 LIMITED WARRANTY

This warranty is provided to you by Daikin North America LLC ("Daikin"), which warrants all parts of this heating or air conditioning unit, as described below.

- A. Commercial Installations: This warranty applies to heating and air conditioning units installed in buildings other than residences and covers defects in materials and workmanship that appear under normal use and maintenance. Warranty coverage begins on the "installation date". The installation date is one of two dates: (1) The installation date is the date that the unit is originally installed. (2) If the date the unit is originally installed cannot be verified, the installation date is three months after the manufacture date. The warranty lasts for a period up to 5 YEARS.

2.02 INSTALLATION REQUIREMENTS

Installation must comply with installation manual. It is recommended the system be installed by a contractor/dealer who has been through Daikin training programs.

Part 3 - PERFORMANCE

3.01 The system performance shall be in accordance with AHRI 210/240 test conditions as shown in the performance table below.

ODU	IDU	Cooling Capacity Rated (Min. ~ Max.)	SEER	EER
RK09NMVJU	FTK09NMVJU	9,000 (4,400 ~ 10,200)	19	12.5
RK12NMVJU	FTK12NMVJU	10,900 (4,400 ~ 13,300)	19	12.5
RK18NMVJU	FTK18NMVJU	18,000 (5,500 ~ 20,000)	18	12.5
RK24NMVJU	FTK24NMVJU	21,200 (5,500 ~ 24,000)	18	12.5

*values are measured approximately 3 feet away with JIS standard operating conditions.

The cooling performance is based on 80°F DB / 67°F WB for the indoor unit and 95°F DB / 75°F WB for the outdoor unit and 25 feet of piping.

3.02 The operating range in cooling will be 50°F DB ~ 115°F DB, and down to -4°F DB when optional wind baffle used and Jumper is cut on ODU.

3.03 The system shall be capable of maximum refrigerant piping as follows. For the 9k btu and 12k btu a max of 65-5/8 feet, with 49-1/4 feet vertical difference. For the 18k btu and the 24k btu a max of 98-1/2 feet, with 65-5/8 feet maximum vertical difference, without any oil traps or additional components.

Part 4 – PRODUCTS

4.01 INDOOR UNIT

General:

The indoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.

A. Unit Cabinet:

1. The indoor unit shall have a white, "wipe-clean" finish.
2. The drain and refrigerant piping shall be accessible from six (6) positions for flexible installation (right side, right back, and right bottom; and left side, left back, and left bottom).

3. The cabinet shall be supplied with a mounting plate to be installed onto a wall for securely mounting the cabinet.
 4. The cabinet includes:
 - i. Indoor unit ON/OFF switch, capable of being used when the remote controller is missing. When switch is used, the default setting is Cooling mode, 72°F temperature setting, and AUTO airflow rate.
 - ii. OPERATION lamp that turns green when activated
 - iii. TIMER lamp that turns orange when activated
 - iv. A Signal Receiver that receives signals from the remote controller at a maximum distance of 23 ft. When the unit receives a signal, you will hear the following: 2 beeps – operation start, 1 beep – Setting changed, 1 long beep – Operation stop.
- B. Fan:
1. The evaporator fan shall be an assembly consisting of a direct-driven fan by a single motor.
 2. The fan shall be statically and dynamically balanced and operate on a motor with permanent lubricated bearings.
 3. An auto-swing louver for adjustable air flow (vertically) is standard via the wireless remote control furnished with each system.
 4. The indoor fan shall offer a choice of five speeds, plus quiet and auto settings.
- C. Filter:
1. The return air filter provided will be a mildew resistant, removable and washable filter. Two titanium apatite photocatalytic air purifying filters are included for additional air filtration.
- D. Coil:
1. The evaporator coil shall be a nonferrous, aluminum fin on copper tube heat exchanger.
 2. All tube joints shall be brazed with silver alloy or phoscopper.
 3. All coils will be factory pressure tested.
 4. A condensate pan shall be provided under the coil with a drain connection.
- E. Electrical:
1. The outdoor unit shall be powered with 208-230 volts, 1 phase, and 60 hertz power. The indoor unit shall receive 208-230 volt, 1 phase, 60 hertz power from the outdoor unit.
 2. The allowable voltage range shall be 187 volts to 253 volts.
- F. Control:
1. The unit shall have a backlit, wireless remote infra-red controller capable to operate the system. It shall have Cooling Operation, Dry Operation and Fan Only Operation.

If associated with a VRV system the split system shall include the same wall mounted controller as that used on the VRV system and must

communicate with the central VRV system using the same language communications protocol as the VRV central controller.

G. Sound:

1. Indoor unit sound levels shall not exceed:

Indoor Daikin Model	Cooling Mode Sound Level (H/M/L/SL) dB(A)
FTK09NMVJU	43 / 36 / 30 / 19
FTK12NMVJU	45 / 37 / 30 / 19
FTK18NMVJU	49 / 44 / 38 / 33
FTK24NMVJU	53 / 45 / 39 / 34

*values are measured approximately 3 feet away with JIS standard operating conditions.

4.02 OUTDOOR UNIT

General:

The outdoor unit shall be specifically matched to the corresponding indoor unit size. The outdoor unit shall be complete factory assembled and pre-wired with all necessary electronic and refrigerant controls. The outdoor shall be controlled by a microprocessor and dedicated EEV's shall be provided for capacity control during part load of the indoor unit.

A. Unit Cabinet:

1. The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
2. The outdoor unit will come furnished with four (4) mounting feet, mounted across the base pan, to allow bolting to a cement pad or optionally supplied mounting bracket.
3. This assembly will be able to withstand a maximum rated wind pressure of 194psf Lateral, 94psf Uplift. See document TER-16-3088.

B. Fan:

1. The fan shall be a direct drive, propeller type fan.
2. The motor shall be inverter driven, permanently lubricated type bearings, inherent.
3. A fan guard is provided on the outdoor unit to prevent contact with fan operation.
4. Airflow shall be horizontal discharge.

C. Coil:

1. The outdoor coil shall be nonferrous construction with corrugated fin tube.
2. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1, rated for up to 1000 hours salt spray.
3. Refrigerant flow from the condenser will be controlled via a metering device.

D. Compressor:

1. The outdoor compressor shall be a patented, variable speed Daikin swing inverter-driven compressor. The one piece action reduces noise, extends life, boasts higher efficiency and reduces energy consumption.
2. The outdoor unit shall have an accumulator and four-way reversing valve.
3. PVE Refrigerant Oil shall be used to provide improved lubrication & better chemical stability, and no hydrolysis, leading to higher product reliability.
4. The compressor shall have an internal thermal overload.
5. The outdoor unit can operate with a maximum vertical height difference of 65-5/8 feet and overall maximum length of 98-1/2 feet without any oil traps or additional components.

E. Electrical:

1. The electrical power requirement is 208-230 volt, 1-phase, and 60 Hz power.
2. The voltage range limitations shall be a minimum of 187 volts and a maximum of 253 volts.

F. Sound:

1. Outdoor unit sound levels shall not exceed:

Outdoor Daikin Model	Cooling Mode Sound Level dB(A)
RK09NMVJU	46
RK12NMVJU	49
RK18NMVJU	54
RK24NMVJU	55

*values are measured approximately 3 feet away with JIS standard operating conditions.

4.03 SYSTEM DIAGNOSTICS

General:

The system shall be capable of producing 2-digit fault codes:

A. Controls

1. I/R controller
2. Wi-fi module

B. D-Checker software: The D-Checker software has the ability to display error codes and values for every sensor on the system through the outdoor unit.

The sensor data points shall be graphed or recorded for export to a spreadsheet. The spreadsheet can then be analyzed to troubleshoot operational issues or acknowledge proper operation.