

Date

03/29/2023

Project Name

North Windham Elementary

Project Number

Client / Purchaser



F.W. WEBB COMPANY

Submittal Summary Page

Qty	Tag #	Model # / Material #	Description
1	RTU-1	AV18E3CP2U1AAB11B2	<p>17.5 Ton, York SunChoice Single Packaged R-410A Air Conditioner, Two Stage Compressor Operation, Standard Efficiency, Bottom Duct, Electric Heat, High Heat 75 kW, 208/230-3-60, 5 kA Standard SCCR, 5 HP Medium Static Belt Drive Blower</p> <ul style="list-style-type: none"> • IntelliSpeed control of the VFD based on stages of cooling. Provides Single Zone VAV Fan Operation as defined by ASHRAE 90.1 section 6.4.3.10. • Dual Enthalpy Economizer w/Barometric Relief and Power Exhaust with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511) • 2" Throwaway Filter • Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors. • Phase Monitor • Microchannel condenser coils • Copper tube/Aluminum fin evaporator coils • Hinged Access Panel • Polyester SMC Drain Pan
1	RTU-1	1RC0443	14" Roof Curb

Equipment start-up and commissioning by a factory trained technician is recommended. Contact your supplying distributor or sales representative for additional information & guidance.



WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

York Single Package R-410A Air Conditioner

Project Name: **North Windham Elementary**

Unit Model #: **AV18E3CP2U1AAB11B2**

Quantity: **1** Tag #: **RTU-1**

System: **AV18E3CP2U1AAB11B2**

Cooling Performance

Total gross capacity	209.6 MBH
Sensible gross capacity	155.4 MBH
Total net capacity	201.5 MBH
Sensible net capacity	147.3 MBH
Efficiency (at ARI)	11.00 EER
Integrated eff. (at ARI)	14.20 IEER
Ambient DB temp.	95.0 °F
Entering DB temp.	80.0 °F
Entering WB temp.	67.0 °F
Leaving DB temp.	56.8 °F
Leaving WB temp.	56.3 °F
Leaving air temp dew point	56.00 °F
Sound power	85 dB(A)

Refrigerant

Refrigerant type	R-410A
Sys1	10 lbs
Sys2	10 lbs 4 oz

Heating Performance

Entering DB temp.	60 °F
Heating output capacity (Max)	192.0 MBH
Nominal electric heat	75 kW
Applied electric heat	56.3 kW
Installed	Factory
Supply air	6200 CFM
Leaving DB temp.	88.7 °F
Air temp. rise	28.7 °F

Supply Air Blower Performance

Supply air	6200 CFM
Ext. static pressure	0.75 IWG
Addl. Unit Losses (Options/Accessories)	0.02 IWG
Blower speed	833 RPM
Max BHP of Motor (including service factor)	5.75 HP
Duct location	Bottom
Motor rating	5.00 HP
Actual required BHP	2.56 HP
Power input	2.38 kW
Elevation	0 ft.
Drive type	BELT

Exhaust Air Blower Performance

Supply Air	4093 CFM
Ext. static pressure	0.10 IWG
Blower speed	1044 HP
Speed tap	Hi
Motor rating	1.5 HP
Power input	1.70 kW
Drive type	DIRECT
Unit static resistance	.02 IWG
Duct location	Bottom

Outside/Mixed Air

Outside Air CFM	700 CFM
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Electrical Data

Power supply	208-3-60
Unit min circuit ampacity	194.3 Amps
Unit max over-current protection	200 Amps

Dimensions & Weight

Hgt 49 in.	Len 130 in.	Wth 89 in.
Weight with factory installed options 2140 lbs		

Clearances

Right	42 in.	Front	80 in.	Rear	36 in.
Top	120 in.	Bottom	0 in.	Left	96 in.

Note: Please refer to the tech guide for listed maximum static pressures



17.5 Ton

- Manufactured at an ISO 9001 Registered Facility and Each Rooftop is Completely Computer-Run Tested Prior to Shipment.

Unit Features

- Two Stage Compressor Operation
- Two independent refrigerant circuits
- Full Perimeter Base Rails with Built in Rigging Capabilities
- Dual Enthalpy Economizer w/Barometric Relief and Power Exhaust with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511)
- 5 HP Medium Static Belt Drive Blower
- 2" Throwaway Filter
- Replacement Filters: 6 (20" x 25" x 2" or 4"). Unit accepts 2" or 4" wide filters.
- Units are provided with the selected 2-inch or 4-inch filter and can easily be converted in the field to accept either size in the standard filter rack
- Utility Connections - Gas and electrical utility locations are supplied in the unit underside as well as the side of the unit. Utility connections can be made quickly and with a minimum amount of field labor
- Copper tube/Aluminum fin evaporator coils
- Microchannel condenser coils

BAS Controller

- Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors.

Standard Unit Controller: Smart Equipment Control Board

- An Integrated Low-Ambient Control, Anti-Short Cycle Protection, Lead-Lag, Fan On and Fan off Delays, Low Voltage Protection, On-Board Diagnostic and Fault Code Display. Allows all units to operate in the cooling mode down to 0 °F outdoor ambient without additional components or intervention.
- Safety Monitoring - Monitors the High and Low-Pressure Switches, the Freezestats, the Gas Valve, if Applicable, and the Temperature Limit Switch on Gas and Electric Heat Units. The Unit Control Board will Alarm on Ignition Failures, Safety Lockouts and Repeated Limit Switch Trips.

Warranty

- One (1) Year Limited Warranty on the Complete Unit
- Five (5) Year Warranty - Compressors and Electric Heater Elements





Sun Choice 15-27.5 Ton Package

York Single Package R-410A Air Conditioner

Project Name: North Windham Elementary

Unit Model #: AV18E3CP2U1AAB11B2

Quantity: 1 Tag #: RTU-1

System: AV18E3CP2U1AAB11B2

Additional Electrical Data

Power supply	208-3-60
Unit min circuit ampacity	194.3 Amps
Unit max over-current protection	200 Amps
Min Voltage	180 V
Max Voltage	254 V
Comp #1 RLA	27.6
Comp #1 LRA	191
Comp #2 RLA	28.2
Comp #2 LRA	240
Indoor Mtr Voltage	208-3-60
Indoor Mtr FLA	20.4
Outdoor Mtr Qty	2
Outdoor Fan Voltage	208-1-60
OD Fan Mtr FLA (ea.)	2.1
Power Ex Mtr Qty	2
Powered Ex Voltage	208-1-60
Power Ex Mtr FLA (ea)	5



Sun Choice 15-27.5 Ton Package

York Single Package R-410A Air Conditioner

Project Name: North Windham Elementary

Unit Model #: AV18E3CP2U1AAB11B2

Quantity: 1 Tag #: RTU-1

System: AV18E3CP2U1AAB11B2

Factory Installed Options

AV18E3CP2U1AAB11B2

Equipment Options	Option(s) Selected
Product Category:	A York SunChoice Single Packaged R-410A Air Conditioner
Efficiency:	V Standard Efficiency, Bottom Duct
Nominal Cooling Capacity:	18 17.5 Ton
Heat Type:	E Electric Heat
Heat Size:	3 High Heat 75 kW
Blower Option:	C 5 HP Medium Static Belt Drive Blower
Air Volume:	P Two Stage Compressor Operation IntelliSpeed control of the VFD based on stages of cooling. Provides Single Zone VAV Fan Operation as defined by ASHRAE 90.1 section 6.4.3.10.
Voltage:	2 208/230-3-60 5 kA Standard SCCR
Outside Air Option:	U Dual Enthalpy Economizer w/Barometric Relief and Power Exhaust with Economizer Fault Detection & Diagnostic (Meets ASHRAE 90.1-2013, IECC 2015, California Title 24, AMCA 511)
Coil Options:	1 Microchannel condenser coils Copper tube/Aluminum fin evaporator coils
Controls:	A Smart Equipment Controller including Discharge Air, Return Air, and Outdoor Air Temperature Sensors.
Sensor Options:	A
Service Options:	B Phase Monitor
Refrigeration:	1
Additional Options:	1 2" Throwaway Filter
Cabinet Options:	B Hinged Access Panel Polyester SMC Drain Pan
Product Generation:	2

Field Installed Accessories

- | | | |
|--|--|---|
| <input type="radio"/> 1BD0411 - Burglar Bars | <input type="radio"/> 1CV0416 - Concentric Diffuser,Side Discharge,24X48 | <input type="radio"/> 1CV0423 - Concentric Diffuser,Specialty,36X36 |
| <input type="radio"/> 1CV0407 - Concentric Diffuser,Flush Mount,24X28 | <input type="radio"/> 1CV0421 - Concentric Diffuser,Specialty,28X28 | <input type="radio"/> 1CV0427 - Concentric Diffuser,Specialty,28X28 |
| <input type="radio"/> 1CV0415 - Concentric Diffuser,Side Discharge,18X36 | <input type="radio"/> 1CV0422 - Concentric Diffuser,Specialty,30X30 | <input type="radio"/> 1CV0428 - Concentric Diffuser,Specialty,30X30 |

York Single Package R-410A Air Conditioner

Project Name: **North Windham Elementary**

Unit Model #: **AV18E3CP2U1AAB11B2**

Quantity: **1** Tag #: **RTU-1**

System: **AV18E3CP2U1AAB11B2**

- | | | |
|--|---|--|
| <ul style="list-style-type: none"> <input type="radio"/> 1HG0437 - Louvered Hail Guard, 15 and 17.5 ton models (75.0 lbs) <input checked="" type="radio"/> 1RC0443 - 14" Roof Curb (171.0 lbs) <input type="radio"/> 1RC0446 - 24" Roof Curb (237.0 lbs) <input type="radio"/> 2AP0402 - Air Proving Switch (1.0 lbs) <input type="radio"/> 2AQ04700524 - CO² Space Sensor - Wall Mount Accessory (5.0 lbs) <input type="radio"/> 2AQ04700624 - CO² Unit Mount Accessory (4.6 lbs) <input type="radio"/> 2DF0403 - Dirty Filter Switch (1.0 lbs) <input type="radio"/> 2ET077001124 - Honeywell T7350, 2 Heat / 4 Cool, Auto/Man Changeover, Electronic 7 Day Programmable (2.0 lbs) <input type="radio"/> 2FS0401 - Condensate Overflow Switch (2.0 lbs) <input type="radio"/> 2LA04700625 - Low Ambient Controller for 208/230V (12.0 lbs) <input type="radio"/> 2NC0401 - Non-powered Convenience Outlet (5.0 lbs) <input type="radio"/> 2SD04702024 - Supply Air Smoke Detector (8.0 lbs) <input type="radio"/> 2SD04703024 - Return Air Smoke Detector (8.0 lbs) <input type="radio"/> 2SD04703124 - Supply & Return Air Smoke Detector (12.0 lbs) <input type="radio"/> S1-03102529000 - Non-Networking Wall Sensor – Allows remote sensing and control from single or multiple zones. (0.2 lbs) <input type="radio"/> S1-03102529004 - Non-Networking Wall Sensor with Over-ride button – Allows remote sensing and control from single or multiple zones. Override allows setpoint to be overridden for 2 hour time period. (0.2 lbs) <input type="radio"/> S1-03102529006 - Non-Networking Wall Sensor with Setpoint Adjustment and Over-ride Button – Allows remote sensing and control from single or multiple zones. Allows setpoint to be adjusted ± 5° F. Override allows setpoint to be overridden for 2 hour time period. (0.2 lbs) <input type="radio"/> S1-03103489000 - Temp sensor, 80mm x 80mm, LCD display, screw terminals, adjustable setpoint, JCI logo (0.1 lbs) | <ul style="list-style-type: none"> <input type="radio"/> S1-03103490000 - Temp sensor w/Economizer FDD, 120mm x 80mm, LCD display, screw terminals, adjustable setpoint, no logo (0.0 lbs) <input type="radio"/> S1-03103516000 - Temp & humidity sensor, 120mm x 80mm, LCD display, screw terminals, warmer/cooler dial, JCI logo (0.4 lbs) <input type="radio"/> S1-03103517000 - Temp sensor, 120mm x 80mm, no display, no dial, screw terminals, no logo (0.4 lbs) <input type="radio"/> S1-03103518000 - Temp & humidity sensor, 120mm x 80mm, no display, modular jack, warmer/cooler dial, JCI logo (0.4 lbs) <input type="radio"/> S1-03103519000 - Network Sensor ,CO₂, No Display (0.2 lbs) <input type="radio"/> S1-MP-PRTKIT-0P - MAP (Multiple Access Portal) Gateway Kit- Replacement MAP gateway protective case, lanyard and communication cable. Use only to replace worn or damaged components. (0.3 lbs) <input type="radio"/> S1-NSB8BHN041-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, No Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BHN043-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, No Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BHN141-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Warmer/Cooler Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BHN143-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Warmer/Cooler Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BHN240-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs) | <ul style="list-style-type: none"> <input type="radio"/> S1-NSB8BHN241-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BHN243-0 - Wall Temperature and 3% Relative Humidity Combined Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BPN240-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BPN241-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BPN243-0 - Wall Temperature and 2% Relative Humidity Combined Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BTN041-0 - Wall Temperature Sensor, No Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BTN043-0 - Wall Temperature Sensor, No Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BTN141-0 - Wall Temperature Sensor, Warmer/Cooler Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BTN143-0 - Wall Temperature Sensor, Warmer/Cooler Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BTN240-0 - Wall Temperature Sensor, Full Display, WHITE, JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BTN241-0 - Wall Temperature Sensor, Full Display, WHITE, NO JCI LOGO, NS8000 Series (0.4 lbs) <input type="radio"/> S1-NSB8BTN243-0 - Wall Temperature Sensor, Full Display, BLACK, NO JCI LOGO, NS8000 Series (0.4 lbs) |
|--|---|--|



Sun Choice 15-27.5 Ton Package

York Single Package R-410A Air Conditioner

Project Name: North Windham Elementary

Unit Model #: AV18E3CP2U1AAB11B2

Quantity: 1 Tag #: RTU-1

System: AV18E3CP2U1AAB11B2

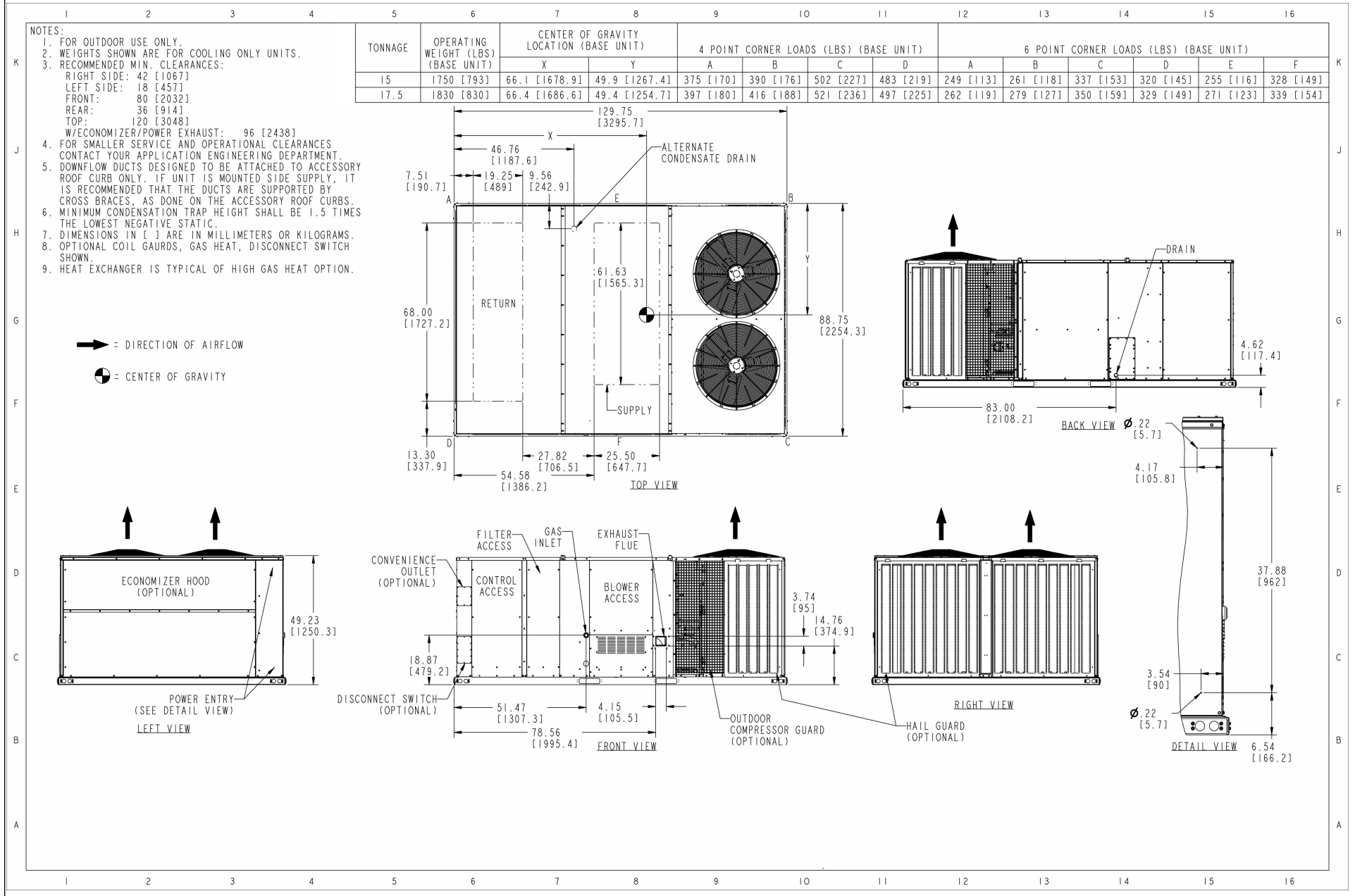
- S1-SE-COM1001-0 - Field Installed Communication Card for Simplicity SE control. Can be field configurable for BACnet, N2 or ModBUS MSTP (0.0 lbs)
- S1-TEC3030-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON,FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- S1-TEC3030-16-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON, AND FULL COLOR, WHITE, NO LOGO (0.8 lbs)
- S1-TEC3031-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- S1-TEC3031-16-000 - 7 DAY PROGRAMMABLE THERMOSTAT, ZIGBEE PRO WIRELESS COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, NO LOGO (0.8 lbs)
- S1-TEC3630-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, OPTIONAL MSTP OR N2 COMMUNICATION, RTU/HEAT PUMP WITH ECON,FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- S1-TEC3631-14-000 - 7 DAY PROGRAMMABLE THERMOSTAT, OPTIONAL MSTP OR N2 COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, JCI LOGO (0.8 lbs)
- S1-TEC3631-16-000 - 7 DAY PROGRAMMABLE THERMOSTAT, OPTIONAL MSTP OR N2 COMMUNICATION, RTU/HEAT PUMP WITH ECON, OCC SENSOR, FULL COLOR, WHITE, NO LOGO (0.8 lbs)
- S1-YK-MAP1810-0P - MAP (Multiple Access Portal) Gateway- For use with SimplicitySE Control. (0.2 lbs)
- S1-YK-MAP1810-0S - Stationary MAP Gateway (Includes MAP Gateway, Field Bus Adapter, Mounting Bracket and 100 to 240 VAC Power Supply). US-compatible counties. (1.9 lbs)

Project Name: **North Windham Elementary**

 Unit Model #: **AV18E3CP2U1AAB11B2**

 Quantity: **1** Tag #: **RTU-1**

15 - 17.5 Ton Consolidated Drawing



Project Name: North Windham Elementary

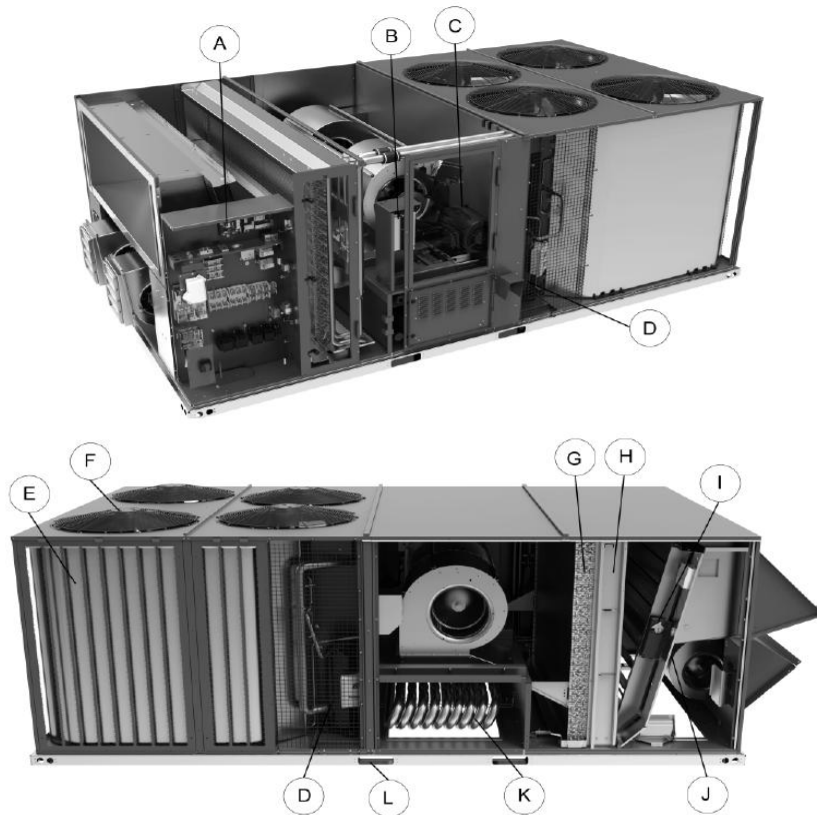
Unit Model #: AV18E3CP2U1AAB11B2

Quantity: 1 Tag #: RTU-1

Component Location

Unit components

Figure 1: Component location



The previous figure shows the AVXX model. The following table lists the components of the unit.

Table 1: Component location table

Item	Description	Item	Description
A	Smart Equipment™ controls	G	Copper tube/aluminum fin evaporator coil
B	Optional variable frequency drive	H	Filter access, 2-inch or 4-inch filter options
C	Belt drive blower motor with dual centrifugal fan design	I	Optional economizer. Optional manual or motorized outside air dampers not shown.
D	Scroll compressors in various arrangements to produce 2 or 4 stages of cooling depending on the selected model	J	Optional powered exhaust. Optional barometric relief not shown.
E	MicroChannel condenser coils	K	Optional staged or modulating gas heat with aluminized or stainless steel heat exchanger
F	Condenser fans	L	Full perimeter base rails with holes for overhead rigging

Project Name: **North Windham
Elementary**

Unit Model #: **AV18E3CP2U1AAB11B2**

Quantity: **1** Tag #: **RTU-1**

Typical Installation

Typical installation

The following figures show the typical installations for the unit.

Figure 14: Roofjack installation

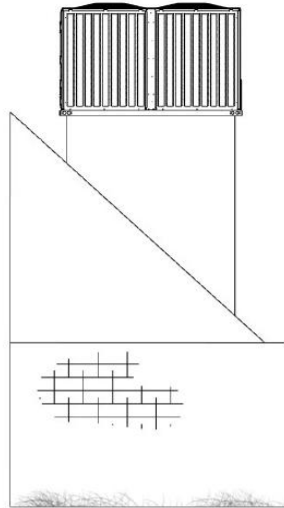
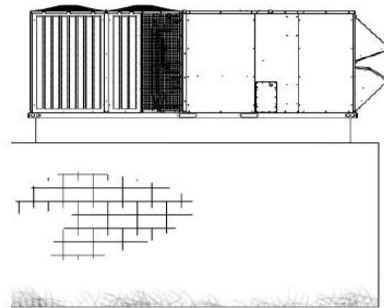


Figure 15: Roof curb installation



Project Name: **North Windham Elementary**

Unit Model #: **AV18E3CP2U1AAB11B2**

Quantity: 1 Tag #: **RTU-1**

Economizer Drawing

Economizer options

Figure 13: Economizer options

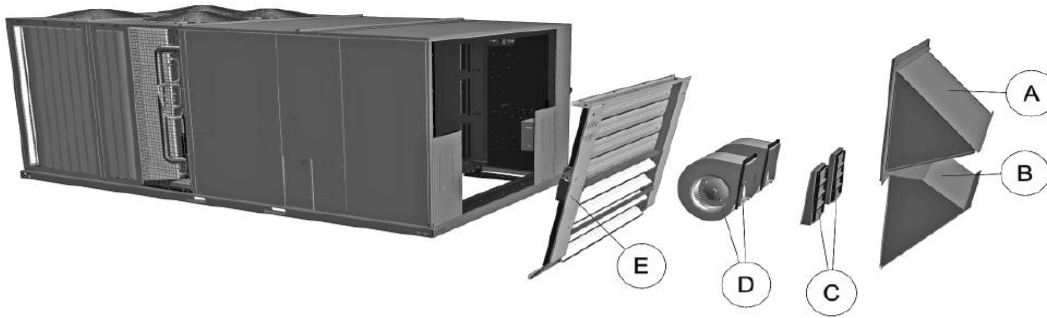


Table 38: Economizer components

Item	Description
A	Fresh air hood
B	Power exhaust hood
C	Power exhaust damper
D	Power exhaust
E	Low leak economizer

Project Name: **North Windham Elementary**

Unit Model #: **AV18E3CP2U1AAB11B2**

Quantity: **1** Tag #: **RTU-1**

Rainhood Drawing

Rain hood dimensions

Figure 8: Rain hood dimensions

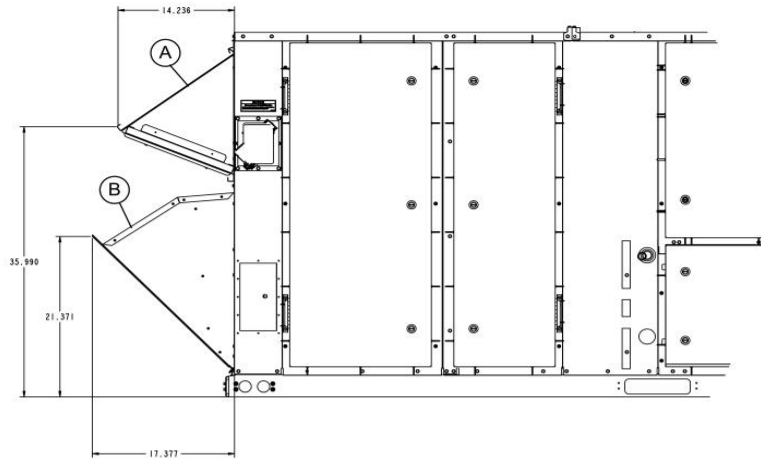


Table 32: Rain hood components

Item	Description
A	Economizer/motorized damper and power exhaust rain hood
B	Air intake hood

Project Name: North Windham Elementary

Unit Model #: AV18E3CP2U1AAB11B2

Quantity: 1 Tag #: RTU-1

Roof Curb Drawings 0443,0446

Roof curbs

The following figures show the roof curbs for the units. All dimensions are in inches.



Figure 9: 1RC0443 and 1RC0446 roof curb dimensions

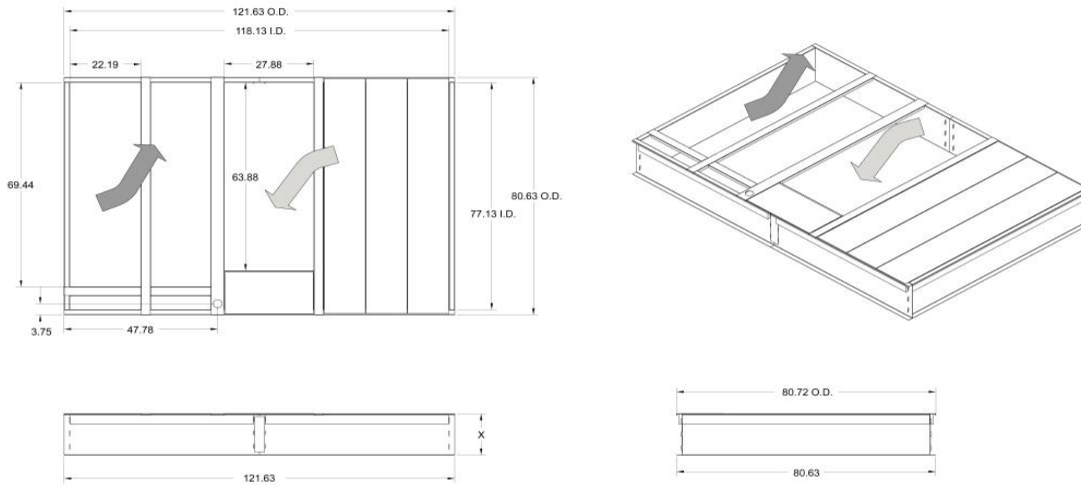


Table 34: 1RC0443 and 1RC0446 dimensions

Roof curb	X measurement (in.)
1RC0443	14
1RC0446	24

Project Name: **North Windham Elementary**

Unit Model #: **AV18E3CP2U1AAB11B2**

Quantity: **1** Tag #: **RTU-1**

Roof Curb Cutaway

Figure 12: Roof curb cutaway

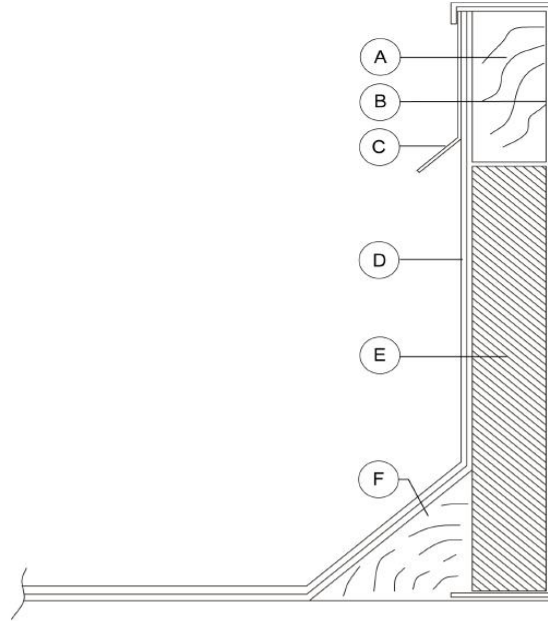


Table 37: Roof curb cutaway components

Item	Description	Item	Description
A	Wood nailer	D	Roof felt (field supplied)
B	Curb frame	E	Rigid insulation (field supplied)
C	Counter flashing (field supplied)	F	Cant strip (field supplied)

Date

03/29/2023

Project Name

North Windham Elementary

Project Number

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F.W. WEBB COMPANY

Guide Specification Summary Page

Product Series	Models and Unit Tags	
Sun Choice 15-27.5 Ton Package	AV18E3CP2U1AAB11B2	RTU-1

**15 to 27.5 Tons Nominal Cooling
178,000 to 324,000 BTUH Nominal Gas Heating Output
25 to 75 kW Electric Heating**

23 06 80 Schedules for Decentralized HVAC Equipment

- 23 06 80. 13 Decentralized Unitary HVAC Equipment Schedule
- 23 06 80. 13.A. Rooftop unit schedule
 - 1. Schedule is per the project specification requirements.

23 07 16. HVAC Equipment Insulation

- 23 07 16. 13 Decentralized, Rooftop Units:
 - 23 07 16. 13.A. Evaporator fan compartment:
 - 1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
 - 2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
 - 23 07 16. 13.B. Gas heat compartment:
 - 1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
 - 2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
 - 23 07 16. 13.C. Economizer and Control compartment:
 - 1. Shall be Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
 - 2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
 - 23 07 16. 13.D. Partition and Duct Panel:
 - 1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
 - 2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
 - 23 07 16. 13.E. Base Pan and Blower Back:
 - 1. Interior cabinet surfaces shall be insulated with a minimum 0.5 in. thick, foil faced fiber glass insulation with thermal conductivity of 0.23 or better, adhered with water based adhesive.
 - 2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

23 09 13 Instrumentation and Control Devices for HVAC

- 23 09 13. 23 Sensors and Transmitters
- 23 09 13. 23.A. Thermostats
 - 1. Thermostat must
 - a. Energize "Y" when calling for cooling and "W" when calling for heating.
 - b. Shall have capability to energize 2 different stages of cooling, and 2 different stages of heating.
 - c. Shall include capability for occupancy scheduling.

23 09 23 Direct- digital Control system for HVAC

- 23 09 23. 13 Decentralized, Rooftop Units:
 - 23 09 23. 13.A. Simplicity SMART Equipment Control
 - 1. Shall be ASHRAE 62 compliant.
 - 2. Shall accept 20-30 VAC input power, 50/60Hz. 24 VAC nominal.
 - 3. Shall have an operating temperature range from -40°F to 158°F; 10-90% RH (non-condensing UI), and -4°F to 158°F; 10-90% RH (non-condensing), with a storage temperature range from -40°F to 194°F; 5-95% RH (non-condensing).
 - 4. Shall include an option of an Economizer microprocessor controller which communicates directly with the Unit Control Board and has 8 Analog outputs, 2 Analog inputs, 2 Binary outputs, 3 Binary inputs.
 - 5. Controller shall accept the following inputs: space temperature, return air temperature sensor, set point adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock- out, fire/smoke

shutdown, single and dual enthalpy, fan status, remote time clock, Sensor Actuator (SA) Bus communicated temperature/humidity/CO2 values from Network sensors, Field Controller (FC) Bus Network Overrides for space temperature, outdoor air temperature, space humidity, outdoor air quality, Indoor air quality, System purge.

6. Shall accept a CO2 sensor or multiple CO2 sensors networked together in the conditioned space, and be Demand Control Ventilation (DCV) ready.
7. Shall provide compressor short-cycle protection with minimum compressor runtime set at 3 minutes standard and adjustable from 2 to 7 minutes.
8. Unit shall provide surge protection for the controller through a circuit breaker.
9. Shall have open communication protocols with all required points exposed. Protocols supported include: BACnet®, MS/TP, Modbus®, and N2 communication.
10. Shall have an LCD display on the Unit Control Board to display fault messages as well as navigate the menu structure to review and change set points.
11. Shall utilize a USB connection to allow for uploading and downloading of data.
 - a. USB shall allow for downloading of “trending data” for analysis of inputs and values on other device such as a PC.
 - b. USB shall allow for uploading of new firmware to the UCB.
 - c. USB shall allow for backing up controller set points and parameters and for uploading of these same parameters to the UCB.
12. Shall include an RJ-12 port to be used with a Wi-Fi signal transmitting device and allow unit(s) access via any non-proprietary smart device.
 - a. Unit access shall include ability to view and change all adjustable parameters and set points using the same characteristics and values available directly through the UCB joystick and LCD display.
 - b. Unit access shall be configurable at 3 different levels to allow control over parameter and set point changes.
 - c. Wi-Fi transmitting device can be connected by 3 means.
 - 1) RJ-12 port connected directly to UCB.
 - 2) Optional connection port mounted in operating space.
 - 3) Optional connection to building network allowing unit access from any internet browser worldwide.
13. Shall have the capability to integrate with Verasys zoning controls system.
14. Shall not require any proprietary software or contractor tool to start-up, commission and troubleshoot unit operation.
15. Software upgrades will be accomplished by local download via USB port on main Unit Control Board.
16. Shall be UL Recognized, File E107041, UL 916, Energy management Equipment, UL 60335-2-40, Heating and Cooling Equipment; FCC Compliant to CFR47, Part 15, Subpart B, Class B, CSA 22.2 No. 236, Signal Equipment Industry Canada, ICES-003 Recognized, and BTL certified.

23 09 33 Electric and Electronic Control System for HVAC

23 09 33. 13 Decentralized, Rooftop Units:

23 09 33. 13.A. General

1. Shall be complete with self- contained low- voltage control circuit protected by a resettable circuit breaker on the 24- v transformer side. Transformer shall have minimum 75VA capability.
2. Shall utilize color- coded wiring.
3. Shall include a central control terminal board to conveniently and safely provide connection points for vital control functions such as: smoke detectors, phase monitor, gas controller, economizer, thermostat, DDC control options, and low and high pressure switches.
4. The gas furnace shall be controlled by an integrated gas controller (IGC) microprocessor. See heat exchanger section of this specification.

23 09 33. 23.B. Safeties:

1. Compressor over- temperature and over- current.
2. Low pressure switch and high pressure switch.
 - a. Low pressure switch shall use different color wire than the high pressure switch. The purpose is to assist the installer and service technician to correctly wire and or troubleshoot the rooftop unit.
3. Automatic reset, motor thermal overload protector.
4. Gas heating section shall be provided with the following minimum protections.
 - a. Primary and auxiliary high temperature limit switches

- b. Induced draft pressure sensor
- c. Flame rollout switch
- d. Flame proving controls
- 5. Electric heat section shall be provided with the following minimum protections:
 - a. Primary, backup and auxiliary high temperature limit switches

23 40 13 Panel Air Filters

23 40 13 13. Decentralized, Rooftop Units:

23 40 13. 13.A. Standard filter section

- 1. Shall consist of factory installed, low velocity, disposable 2- in. thick fiberglass filters of commercially available sizes.
- 2. Units can accept 2" or 4" filters and have a field convertible transition.
- 3. Filters shall be accessible through an access panel; hinged panel with toolless access is available as described in the Special Features Options and Special Features Options and Accessories section of this specification.

23 81 19 Self- Contained Air Conditioners

23 81 19 13. Small- Capacity Self- Contained Air Conditioners

23 81 19. 13.A. General

- 1. Outdoor, rooftop mounted, electrically controlled, heating and cooling unit utilizing a fully hermetic, suction gas cooled, direct drive compressor(s) for cooling duty and gas combustion or nickel chromium elements for heating duty.
- 2. Factory assembled, single- piece heating and cooling rooftop unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, and special features required prior to field start- up.
- 3. Unit shall use environmentally sound, R-410A refrigerant.
- 4. Unit shall be installed in accordance with the manufacturer's instructions.
- 5. Unit must be selected and installed in compliance with local, state, and federal codes.

23 81 19. 13.B. Quality Assurance

- 1. Unit meets ASHRAE 90.1 minimum efficiency requirements.
- 2. Unit shall be rated in accordance with AHRI Standards 210/240 or 340/360.
- 3. Unit shall be designed to conform to ASHRAE 15.
- 4. Unit shall be CSA tested and certified in accordance with ANSI Z21.47 -2016/CSA 2.3-2016, and CSA C22.2 No. 60335-2-40.
- 5. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- 6. Unit casing shall be capable of withstanding 750- hour salt spray exposure per ASTM B117 (scribed specimen).
- 7. Roof curb shall be designed to conform to NRCA Standards.
- 8. Unit shall be subjected to a completely automated run test on the assembly line. The data for each unit will be stored at the factory, and must be available upon request.
- 9. Unit shall be designed in accordance with CSA C.22.2 NO.60335-2-40, including tested to withstand rain.
- 10. Unit shall be constructed to prevent intrusion of snow into the control box.
- 11. 15 – 25 ton units shall be shake tested to Truck 2, ASTM D4169 to ensure shipping reliability.

23 81 19. 13.C. Delivery, Storage, and Handling

- 1. Unit shall be stored and handled per manufacturer's recommendations.
- 2. Overhead crane can be used to place the units on a roof using rigging holes built into the unit base rails without any additions to the unit.
- 3. Unit shall only be stored or positioned in the upright position.

23 81 19. 13.D. Project Conditions

- 1. As specified in the contract.

23 81 19. 13.E. Operating Characteristics

- 1. Unit shall be capable of starting and running at 115°F (52°C) ambient outdoor temperature, meeting maximum load criteria of AHRI Standard 210/240 or 340/360 at ±10% voltage.
- 2. Compressor with standard controls shall be capable of operation down to 45°F (7°C), ambient outdoor temperatures. Intermittent cooling shall be operational down 0° F (-17° C). Low ambient kit is necessary if mechanically cooling at ambient temperatures below 40°F (4°C).

3. Unit shall be factory configured for vertical supply & return configurations.
- 23 81 19. 13.F. Electrical Requirements
 1. Main power supply voltage, phase, and frequency must match those required by the manufacturer.
- 23 81 19. 13.G. Unit Cabinet
 1. Unit cabinet shall be constructed of galvanized steel with exterior surfaces coated with a non-chalking, powder paint finish, certified at 750 hour salt spray test per ASTM-B117 standards.
 2. Unit cabinet exterior paint shall be: film thickness, (dry) 3.0 MILS minimum, gloss (per ASTM D523, 60°F / 16°C): 80+/- 5, Hardness: H- 2H Pencil hardness.
 3. Unit cabinet shall have gas utility entry holes in the side of the unit and in the unit underside. Entry holes shall not require field setup and shall be capped from the factory to prevent water intrusion when not in use.
 4. Unit cabinet shall have electric utility entry locations marked from the factory with a dimple for accuracy of field drilling. Entry locations shall be available for entry through the side of the unit or from the unit underside.
5. Base Rail
 - a. Unit shall have base rails on all 4 sides.
 - b. Holes shall be provided in the base rails for rigging shackles to facilitate maneuvering and overhead rigging.
 - c. Holes shall be provided in the base rail for moving the unit by fork truck.
 - d. Base rail shall be a minimum of 15 gauge thickness.
6. Condensate pan and connections:
 - a. Shall be a multidirectional internally sloped condensate drain pan made of a non- corrosive material.
 - b. Shall comply with ASHRAE Standard 62.
 - c. Shall use a 1" NPT female drain connection through the side of the drain pan. Connection shall be made per manufacturer's recommendations.
 - d. Shall include intentional "overflow notch" and water containment path to guide flow of water where desired in the event of a drain pan overflow.
7. Top panel:
 - a. Shall be a multi piece top panel.
8. Electrical Connections
 - a. All unit power wiring shall enter unit cabinet through a field drilled hole located by a factory provided dimple.
 - b. Through- the- base capability.
 - 1) Standard unit shall have a through- the- base electrical location(s) using a raised, embossed portion of the unit base-pan.
 - 2) No base-pan penetration, other than those authorized by the manufacturer, is permitted.
- 23 81 19. 13.H. Electric Heating
 1. Use nickel chromium elements for heating.
 2. Shall have a single stage of capacity on 25 kW heaters and two stages of capacity for other heater capacities.
 3. Shall have a primary limit control with automatic reset to prevent the heating element system from operating at an excessive temperature.
 4. Shall have a non-resetting backup limit control to prevent the heating element system from operating at an excessive temperature in the event a primary limit control fails.
 5. Shall be wired for single point power supply with branch circuit fusing (where required).
- 23 81 19. 13.I. Coils
 1. Evaporator Coils, Aluminum Fin - Copper Tube:
 - a. Standard evaporator coils shall have aluminum plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
 - b. Shall be leak tested to 150 psig, pressure tested to 250 psig, and burst qualified to CSA C22.2 No. 60335-2-40.th edition burst test at 1775 psig.
 - c. Assembled unit shall be pressure tested to 450 psig.
 2. Condenser Coils, All Aluminum Microchannel:

- a. Condenser coils shall have all aluminum microchannel design consisting of aluminum multiport flat tube design and aluminum fin. Coils shall be a furnace brazed design and contain epoxy lined shrink wrap on all aluminum to copper connections.
 - b. Microchannel condenser coils shall be leak tested to 150 psig, pressure tested by supplier to 600 psig, and burst qualified to CSA C22.2 No. 60335-2-40.
 - c. Assembled unit shall be pressure tested to 450 psig.
- 23 81 19. 13.J. Refrigerant Circuits
- 1. 2 stage IntelliSpeed airflow options shall have 2 refrigerant circuits with 2 stages of cooling.
 - 2. Refrigerant circuit shall include the following control, safety, and maintenance features:
 - a. Thermostatic Expansion Valve (TXV) shall help provide optimum performance across the entire operating range.
 - b. Refrigerant filter drier - Solid core design.
 - c. Service gauge connections on suction and discharge lines.
 - 3. Compressors
 - a. Unit shall use fully hermetic scroll compressors for each independent refrigeration circuit.
 - b. Two stage models shall use a single stage compressor on each refrigeration circuit.
 - c. Compressor motors shall be cooled by refrigerant gas passing through motor windings.
 - d. Compressors shall be internally protected from high discharge temperature conditions.
 - e. Compressors shall be protected from an over- temperature and over- amperage conditions by an internal, motor overload device.
 - f. Compressor shall be factory mounted on rubber grommets.
 - g. Crankcase heaters shall be installed in the factory as needed on tandem compressor sets.
- 23 81 19. 13.K. Filter Section
- 1. Filters access is specified in the unit cabinet section of this specification.
- 23 81 19. 13.L. Evaporator Fan and Motor
- 1. Evaporator fan motor:
 - a. Shall have permanently lubricated ball-bearings.
 - b. Shall have inherent automatic- reset thermal overload protection.
 - c. The job site selected brake horsepower shall be required to not exceed the motor's nameplate horsepower rating plus the service factor.
 - 2. Evaporator Fan:
 - a. Fan shall be a belt drive assembly with an adjustable pitch motor pulley.
 - b. Blower bearings shall have an L10 life of 100,000 hrs
 - c. Shall use sealed, permanently lubricated ball-bearing type.
 - d. Shall use dual blower design consisting of two balanced blower fans on a single shaft.
 - e. Blower fan shall be double- inlet type with forward- curved blades.
 - f. Shall be constructed from steel with a corrosion resistant finish and dynamically balanced.
- 23 81 19. 13.M. Condenser Fans and Motors
- 1. Condenser fan motors:
 - a. Shall be a totally enclosed motor.
 - b. Shall use permanently lubricated ball-bearings.
 - c. Shall have inherent thermal overload protection with an automatic reset feature.
 - d. Shall use a shaft- down design.
 - 2. Condenser Fans:
 - a. Shall be a direct- driven propeller type fan.
- 23 81 19. 13.N. Special Features Options and Accessories
- 1. IntelliSpeed staged air volume system:
 - a. Evaporator fan motor:
 - 1) Shall have permanently lubricated bearings.

- 2) Shall have a maximum continuous bhp rating for continuous duty operation; no safety factors above that rating.
- 3) Shall be Variable Frequency duty and multi-speed control.
2. Variable Frequency Drive (VFD). Available on multi-speed (IntelliSpeed) and VAV indoor fan motor options:
 - a. Shall be installed inside the unit cabinet, mounted, wired and tested.
 - b. Shall contain Electromagnetic Interference (EMI) frequency protection.
 - c. Insulated Gate Bi- Polar Transistors (IGBT) used to produce the output pulse width modulated (PWM) waveform.
 - d. Built in LED display and controls. Does not require additional kit or options.
 - e. RS485 capability standard.
 - f. Electronic thermal overload protection.
 - g. All printed circuit boards shall be conformal coated.
3. Low Leak Economizer:
 - a. Integrated, tie-bar driven parallel modulating blade design type capable of simultaneous economizer and compressor operation.
 - b. Damper blades shall be galvanized steel with tie-bar metal linkages. Plastic or composite blades on intake or return shall not be acceptable.
 - c. Damper blades shall be class 1A dampers.
 - d. Shall include all hardware and controls to provide free cooling with outdoor air when temperature and/or humidity are below set points.
 - e. Shall be equipped with tie-bar driven dampers for both the outdoor ventilation air and the return air for positive air stream control.
 - f. Economizer shall comply with, and be certified to, the AMCA 511 standard.
 - g. Standard leak rate shall be equipped with dampers not to exceed 3 cfm/ft² leakage at 1 in. wg pressure differential.
 - h. Economizer controller shall be the Johnson Controls SE Economizer Controller
 - 1) On- board Fault Detection and Diagnostics (FDD) that senses and alerts when the economizer is not operating properly, meets the requirements for California Title 24, IECC 2015, and ASHRAE 90.1.
 - 2) Display alarms if the following occur
 - i. Economizer is economizing when conditions do not support
 - ii. Economizer is not economizing when conditions do support
 - iii. Damper Stuck
 - iv. Excess Outdoor Air
 - v. Failed Sensor
 - 3) Automatic sensor detection
 - 4) Capabilities for use with multiple-speed indoor fan systems
 - 5) Utilize digital sensors: Dry bulb and Enthalpy
 - 6) UL, CSA, and ICES-003 recognized and FCC compliant to CFR47
 - i. Shall be capable of introducing up to 100% outdoor air.
 - j. Shall be equipped with a barometric relief damper capable of relieving up to 100% return air and contain seals that meet ASHRAE 90.1 requirements. Barometric relief can be replaced by optional power exhaust.
 - k. Shall be designed to close damper(s) during loss- of- power situations with spring return built into motor.
 - l. Dry bulb outdoor air temperature sensor shall be provided as standard. Single or dual enthalpy sensing is available as a factory or field installed sensing option. Outdoor air sensor set point shall be adjustable and shall range from 40° to 80°F / 4° to 27°C. Additional sensor options shall be available as accessories.
 - m. The economizer controller shall also provide control of an accessory power exhaust unit function. Factory set at 100%, with a range of 0% to 100%.
 - n. The economizer shall maintain minimum airflow into the building during occupied period and provide design ventilation rate for full occupancy.
 - o. Dampers shall be completely closed when the unit is in the unoccupied mode.

- p. Economizer controller shall accept a 2- 10 Vdc CO2 sensor input for IAQ/DCV control. In this mode, dampers shall modulate the outdoor air damper to provide ventilation based on the sensor input.
- q. Economizer controller shall provide indications when in free cooling mode, in the DCV mode, or the exhaust fan contact is closed.
- 4. Phase Monitor:
 - a. Shall provide protection against phase reversal, phase loss, and phase unbalance.
 - b. Switch shall automatically shut off unit control circuit if any of the above conditions is detected.
 - c. Shall have visual LED indication of operational status.
- 5. Hinged and tool less access panels:
 - a. Cabinet panels shall be hinged.
 - b. Shall provide easy access with toolless latching mechanism.
 - c. Shall be on major panels of: filter, control box, fan motor, and gas or electric heat controls.
- 6. Constant Volume Power Exhaust:
 - a. Power exhaust shall be used in conjunction with an integrated economizer.
 - b. Exhaust fans shall be of centrifugal blower design with dual exhaust fans.
 - c. Shall be controlled by economizer controller operation. Exhaust fans shall be energized when dampers open past the 0- 100% adjustable set point on the economizer control.
 - d. Factory installed exhaust and field installed fold out exhaust shall have built in fold out rain hood design to reduce installation time.
 - e. Bolt on field installed exhaust shall be either of same design as factory installed exhaust described above or of bolt on design, per customer selection.
- 7. Roof Curbs:
 - a. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
 - b. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.
- 8. Dual Enthalpy Sensor:
 - a. The dual enthalpy sensor option or kit shall provide 2 relative humidity sensors to be mounted in the return and outdoor air streams to provide dual enthalpy economizer control.
 - b. This kit contains all components required for dual enthalpy control and does not need to be used in conjunction with the Single Enthalpy Sensor Kit.

Date

03/29/2023

Project Name

North Windham Elementary

Project Number

Client / Purchaser



F.W. WEBB COMPANY

Control Summary Page

Control	Models and Unit Tags
Stand Alone Simplicity	AV18E3CP2U1AAB11B2 RTU-1

23 09 23 Direct- digital Control system for HVAC23 09 23. 13 Decentralized, Rooftop Units:23 09 23. 13.A. Unit Control Board

1. ASHRAE 62- 2001 compliant. BTL certified.
2. Shall accept 20-30 VAC input power, 50/60Hz. 24 VAC nominal.
3. Operating temperature range from -40F to 158F; 10-90% RH (non-condensing UI), and -4F to 158F; 10-90% Rh (non-condensing), with a storage temperature range from -40F to 194F; 5-95% RH (non-condensing).
4. Shall include an option of and Economizer microprocessor controller which communicates directly with the Unit Control Board and has 8 Analog outputs, 2 Analog inputs, 2 Binary outputs, 3 Binary outputs.
5. Controller shall accept the following inputs: space temperature, return air temperature sensor, setpoint adjustment, outdoor air temperature, indoor air quality, outdoor air quality, indoor relative humidity, compressor lock- out, fire/smoke shutdown, single and dual enthalpy, fan status, remote time clock, SA Bus communicated temperature/humidity/CO2 values from Network sensors, FC Bus Network Overrides for space temperature, outdoor air temperature, space humidity, outdoor air quality, Indoor air quality, System purge.
6. Shall accept a single CO2 sensor or multiple CO2 sensors networked together via communication bus in the conditioned space, and be Demand Control Ventilation (DCV) ready.
7. Shall provide the following outputs: economizer, fan, cooling stage 1, cooling stage 2, heat stage 1, heat stage 2, heat stage 3/ exhaust/ reversing valve/ dehumidify/occupied.
8. Unit shall provide surge protection for the controller through a circuit breaker.
9. Shall be Internet capable, and communicate at a Baud rate of 38.4K or faster.
10. Shall have an LED display independently showing the status of activity on the communication bus, and processor operation.
11. Unit shall incorporate a lockout circuit which provides reset capability at the space thermostat or base unit should any of the following standard safety devices trip and shut off compressor. If any of these safety devices trip, the LCD screen will display alarm message indicating the specific safety device that caused the lockout.
 - a. Loss of charge/Low-pressure switch.
 - b. High-pressure switch.
 - c. Freeze condition sensor on evaporator coil.
12. Unit control board must support each usage case:
 - a. Conventional thermostat with low voltage input terminals for easy installation
 - b. Communicating network sensors in the occupied space to provide feedback on space conditions for unit control board to compare with associated setpoints
 - c. Communication via BACnet MS/TP, Modbus RTU, N2 protocols for integration into a building automation/management system
13. Anti-short cycle and low voltage protection features included.
14. Internal occupied/unoccupied scheduling
15. Unit control board shall permit cooling operation down to a selectable value as low as 0 degrees F.
16. Shall allow for start-up, commissioning, troubleshooting, parameter adjustment, setpoint adjustment via onboard display and navigable menu with no additional interface tool or controls technician required.
17. The unit control board shall run a self-test diagnostics algorithm at startup that operated the cooling cycle, heating cycle, fan operation. A status report shall be provided upon completion of the diagnostic self-test.
18. Utilize any wi-fi enabled smart device to access the HVAC or multiple HVAC units if communication wiring between them is present (FC Bus or SA Bus). Remote access shall allow complete ability to perform start-up, commissioning, troubleshooting, parameter adjustment, setpoint adjustment.
19. Local embedded trending and scheduling. Trending data and occupancy scheduling predefined from the factory. Occupancy schedule to be modified via control board joystick menu navigation and remotely using a smart device (cellular phone, laptop, tablet)
20. A menu on the onboard screen shall display the unit status and allow changing parameters where applicable. These include but are not limited to:
 - a. Demand Ventilation Mode – enable or disable
 - b. Operational Setpoint – display current value
 - c. Supply Air Temperature (SAT) – display current value
 - d. Return Air Temperature (RAT) – display current value

- e. Operational Supply Humidity (OprSH) – display current value as provided by a 0-10VDS input, SA Bus Network Sensor, or FC Bus communicated value
 - f. Return Air Humidity (RAH) – display current value
 - g. Operational outdoor Air Temperature (OprOAT) – enthalpy calculated from OAH 0-10VDC input to Economizer board and OprOAT only if economizer is present
 - h. Operational Outdoor Air Humidity (OprOAH) – the buffered outdoor air humidity. May be from economizer boards OAH 0-10VDC input or FC Bus communicated value
 - i. Operational outdoor Air Quality (OprOAQ) – the buffered outdoor air quality in use. May be from economizer boards OAQ 0-10VDC input or FC Bus communicated value
 - j. Operational Indoor Air Quality (OprIAQ) – the buffered indoor air quality in use. May be from economizer board IAQ 0-10VDC input, SA Bus Network Sensor, or FC Bus communicated value
21. A menu shall display and allow modification to the following operations and settings:
- a. HVAC Zone Fan
 - b. Cooling
 - c. Heating
 - d. Economizer
 - e. Demand Ventilation
 - f. Power Exhaust
 - g. Sensors
 - h. Network
22. A menu shall display and allow modification to the following operations and settings:
- a. HVAC Zone – Occupied status
 - b. Indoor Fan status
 - c. Cooling status
 - d. Heating status
 - e. Economizer indication whether free-cooling is available or not
 - f. Enabling or disabling of Demand Ventilation
 - g. Power Exhaust
 - 1) Enable/disable hot-gas reheat if available
 - 2) Warmup/Cooldown
 - 3) Title 24 Load Shed
 - 4) Defrost
23. A menu shall display and allow modification to the following operations and settings:
- a. Firmware version (of UCB, Economizer, other peripheral boards)
 - b. Setting time zone
 - c. Network information
 - 1) Device name that will appear on the FC Bus
 - 2) Selection of communication protocol
 - 3) Operational Baud Rate
 - 4) Device ID
24. A menu shall display and allow modification to the following operations and settings:
- a. Version of firmware
 - b. Ability to Load new firmware
 - c. Create a backup file of the firmware and parameter setting via USB port
 - d. Restore factory default parameter values and setup
 - e. Full and Partial Cloning of parameter setpoints from or to other units
 - f. Data trend exporting
25. A menu shall display and allow modification to the following operations and settings:

- a. Unit serial number, model number and name
- b. Ability to reset Lockouts
- c. Controller name
- d. Displays the current values of all setpoints in use
- e. Displays all current values for the indoor and outdoor zones
- f. Displays current values related to:
 - 1) Indoor Fan
 - 2) Cooling
 - 3) Heating
 - 4) Heat Pump operation
 - 5) Economizer operation
 - 6) Power Exhaust
 - 7) Demand Ventilation
 - 8) Air monitoring station
 - 9) Hot Gas Reheat
 - 10) Smoke Control
- g. Current information for inputs; including
 - 1) Sensors
 - 2) Coil Sensors
 - 3) Thermostat
 - 4) Binary Inputs
 - 5) Unit Protection
 - 6) Network Inputs
 - 7) All outputs (relay and binary)
- h. Self-Test
 - 1) A patented self-test system that runs through a series of algorithms to provide a report of all functioning characteristics of the system at time of startup and commissioning.

23 09 23. 13.B. Auxiliary Control Boards

1. ASHRAE 62- 2001 compliant. BTL certified.
2. Economizer controller CEC Title 24 Compliant
 - a. Display alarms if the following occur
 - 1) Economizer is economizing when conditions do not support
 - 2) Economizer is not economizing when conditions do support
 - 3) Damper Stuck
 - 4) Excess Outdoor Air
 - 5) Failed Sensor
3. Refrigeration Fault Detection & Diagnostics
 - a. There is insufficient refrigerant in any circuit
 - b. There is excessive refrigerant in any circuit
 - c. There is excessive refrigerant flow
 - d. There is insufficient refrigerant flow (restriction)
 - e. Inefficient compressor
 - f. Insufficient High-side heat transfer
 - g. Excessive High-side heat transfer (low ambient control problem, low ΔP)
 - h. Insufficient Low-side heat transfer
 - i. Excessive Low-side heat transfer

- j. Sensor fault- The liquid temperature is greater than the condenser temperature (Could also be triggered if refrigerant level is very low in the system)
- k. Sensor fault- Sensor data is not available
- l. The unit is off
- m. The ambient temperature is too low
- n. The ambient temperature is too high
- o. The return air wet-bulb temperature is too low
- p. The return air wet-bulb temperature is too high
- q. Sensor fault- The condensing temperature is lower than the ambient temperature (Could also be triggered when the condenser is wet)
- r. The suction line temperature is less than the evaporator temperature
- s. The evaporator temperature is greater than the ambient temperature
- t. The liquid temperature is lower than the ambient temperature
- u. Sensor fault- Suction temperature or ambient temperature is invalid
- v. Sensor fault- The return air dry-bulb or wet-bulb temperature is invalid
- w. Sensor fault- The liquid pressure or suction pressure is invalid
- x. Sensor fault- The suction line temperature is invalid
- y. The return air dry-bulb temperature is too low
- z. The return air dry-bulb temperature is too high
- aa. The Efficiency Index is below 75% of ideal
- bb. The Capacity Index is below 75% of ideal

23 09 23. 13.C Remote Accessibility:

1. ASHRAE 62- 2001 compliant. BTL certified.
2. Provide the ability to adjust parameter values, setpoints, limits remotely
3. Connectivity to an Ethernet network via static IP address or Dynamic Name Server (DNS)
4. Allow a maximum of 100 devices on the same FC bus trunk and accessed by one remote device

OPERATING MEASUREMENTS - COOLING

Stage	Discharge Pressure	Discharge Temp.	Liquid Line Temp. ¹	Subcooling ²	Suction Pressure	Suction Temp.	Superheat
First	#	°	°	°	#	°	°
Second (if equipped)	#	°	°	°	#	°	°
Third (if equipped)	#	°	°	°	#	°	°
Fourth (if equipped)	#	°	°	°	#	°	°
Reheat 1st Stage	#	°	°	°	#	°	°

1. Liquid temperature should be taken before filter/drier.
2. Subtract 10 psi from discharge pressure for estimated liquid line pressure

Outside air temperature _____ °F db _____ °F wb _____ %RH
 Return Air Temperature _____ °F db _____ °F wb _____ %RH
 Mixed Air Temperature _____ °F db _____ °F wb _____ %RH
 Supply Air Temperature _____ °F db _____ °F wb _____ %RH

REFRIGERANT SAFETIES

Action	Completed	See Notes
Prove Compressor Rotation (3 phase only) by gauge pressure	<input type="checkbox"/>	<input type="checkbox"/>
Prove High Pressure Safety, All Systems	<input type="checkbox"/>	<input type="checkbox"/>
Prove Low Pressure Safety, All Systems	<input type="checkbox"/>	<input type="checkbox"/>

OPERATING MEASUREMENTS - GAS HEATING

Fuel Type: Natural Gas LP Gas

Action	Completed	See Notes
Check for gas leaks	<input type="checkbox"/>	<input type="checkbox"/>
Prove Ventor Motor Operation	<input type="checkbox"/>	<input type="checkbox"/>
Prove Primary Safety Operation	<input type="checkbox"/>	<input type="checkbox"/>
Prove Auxiliary Safety Operation	<input type="checkbox"/>	<input type="checkbox"/>
Prove Rollout Switch Operation	<input type="checkbox"/>	<input type="checkbox"/>
Prove Smoke Detector Operation	<input type="checkbox"/>	<input type="checkbox"/>
Manifold Pressure	Stage 1	IWC
	Stage 2 (If Equipped)	IWC
	Stage 3 (If Equipped)	IWC
Supply gas pressure at full fire	IWC	<input type="checkbox"/>
Check temperature rise ¹	<input type="checkbox"/> measured at full fire	°F

1. Input X Eff. (BTU output)
1.08 X Temp. Rise