U.S. Army Corps of Engineers (USACE)

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE

For use of this form, see ER 415-1-0; the proponent agency is CECW-CE

DATE	TRANSMITTAL NO.
3/20/2023	23 30 00-2.3

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (This section will be initiated by the contractor)

TO:	FROM:	CONTRACT NO.	CHECK ONE:
81st RSC Geographic District ROs 69A Hagood Avenue Charleston, SC 29403-5107	TEAM CONSTRUCTION 825 Gum Branch Rd. STE 128 JACKSONVILLE NC 28540-6312 USA	W912HP21D6006 W912HP22F1176	☐ THIS IS A NEW TRANSMITTAL ☑ THIS IS A RESUBMITTAL OF TRANSMITTAL 23 30 00-2

SPECIFICATION SEC. NO. (Covers only one section with each transmittal)	PROJECT TITLE AND LOCATION	THIS TRANSMITTAL IS FOR: (Check one)
23 30 00-HVAC Air Distribution	01 FY22 81st NC026 HEP Reset; W'ville, NC,Winterville, NC	☒ FIO ☐ GA ☐ DA ☐ CR ☐ DA/CR ☐ DA/GA

ITEM NO. (See Note 3) a.	DESCRIPTION OF SUBMITTAL ITEM (Type size, model number/etc) b.	SUBMITTAL TYPE CODE (See Note 8) c.	NO. OF COPIES d.	CONTRACT DOCUMENT REFERENCE		CONTRACTOR REVIEW CODE g.	VARIATION Enter "Y" if requesting a variation (See Note 6) h.	USACE ACTION CODE (Note 9) i.
				SPEC. PARA. NO. e.	DRAWING SHEET NO. f.			
8	Sound Attenuation Equipment	03 - PRODUCT	1	2.8.8		A	No	
11	Air Vents, Penthouses, and Goosenecks	03 - PRODUCT	1	2.8.10		A	No	

REMARKS

This is a resubmittal.

I certify that the above submitted items had been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.

NAME OF CONTRACTOR	SIGNATURE OF CONTRACTOR
	Donald Shingleton

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED (List by Item No.)	NAME AND TITLE OF APPROVING AUTHORITY	SIGNATURE OF APPROVING AUTHORITY	DATE

CROMWELL

SUBMITTAL REVIEW FORM

1300 EAST 6TH STREET
LITTLE ROCK, AR 72202
PHONE: 501-372-2900
FAX: 501-372-0482

Reviewing is only for conformance with the design concepts of the Project and compliance with the information given in the contract documents. The Contractor is responsible for dimensions to be confirmed or correlated at the site; for information that pertains solely to the fabrication process, or to the means, methods, techniques, sequences, and procedures of construction; and for coordination of the work of all other trades

JOB TITLE: 81st RSC Reset NC026 Winterville NC

JOB NO: 2020-147

SUBMITTAL NO: 233000-2.3 REV Air Vents

BY: CRB

DATE: 04/11/2023

Item No.	Description (See contractor transmittal for corresponding description)	No Exception Taken	Make Corrections Noted	Revise and Resubmit	Not Accepted	Comments
						Review of Transmittal No. 233000-2.3 from Team Construction dated 3/20/2023.
1	Submittal Comments (pg. 3/45)					• *-Please select Supply and Exhaust Fan control option.* **Make Corrections Noted: See Review Below** • *-OA Weatherhood has been deducted, we are providing flanges for duct connection.* **No Exception Taken** • *-Verify Flat 14" Roof curbs are acceptable.* See **Review Below** • *-Horizontal curb by MGM now included in submittal.* **See Review Below**
2	ERV-01	**X**	**X**			• Coordinate supply and exhaust fan control requirements with the Controls Contractor. Refer to detail 3/M-708 for control diagram and sequence of operation.
3	ERV-02	**X**	**X**			• Coordinate supply and exhaust fan control requirements with the Controls Contractor. Refer to detail 3/M-708 for control diagram and sequence of operation.
4	Curb: ERV-01	**X**				
5	Curb: ERV-02	**X**				

EASTBOUND MECHANICAL

SUBMITTAL DATA SHEET

To:	Gary Pate Team Construction	**Project:**	81st Readiness NCO26 Reset 3000 Mill Street Winterville NC 28590
Architect:	Cromwell 1300 East 6th Street Little Rock AR 72202	**Engineer:**	
Product:	Air Handling Units / Coils	**Supplier:**	Hoffman & Hoffman
Spec Section:	23 30 00 2.12	**Drawing:**	M601

Submittal Notes: see notes added to address initial submittal review comments

APPROVAL STAMPS

East Bound Mechanical 3195-B Airport Blvd. Wilson, NC 27896	General Contractor	Architect/Engineer
☐ Reviewed - Furnish Pending A/E Approval/Review ☐ Notes Indicated ☑ Resubmittal - See Comments Reviewed By: Jay Gunter Date: 03/13/2023 Review of this drawing and or data does not indicate approval of variations to the contract documents or coordination with other trades as may be required.		

DATE: *3.6.23*

SALESMAN: *Cory Adcroft* ***ORDER*** *#620.628.11138*

PROJECT: *NC 026 Reset 81st*
Winterville, NC

ENGINEER: *US Army Corps of Engineers*

CONTRACTOR: *Eastbound Mechanical*
Winterville, NC

MANUFACTURER(S): *Greenheck*
Energy Recovery Ventilators

-Please select Supply and Exhaust Fan control option.
-OA Weatherhood has been deducted, we are providing flanges for duct connection.
-Verify Flat 14" Roof curbs are acceptable.
-Horizontal curb by MGM now included in submittal.

APPROVAL REQUIRED

SUBMITTAL DATA

HOFFMAN HOFFMAN, INC.

HVAC Manufacturers Representative
Website: www.hoffman-hoffman.com

Asheville, NC	(828) 296-0111	Charleston, SC	(843) 884-3201
Charlotte, NC	(704) 364-4700	Columbia, SC	(803) 765-9360
Raleigh, NC	(919) 781-8011	Greenville, SC	(864) 676-1888
Wilmington, NC	(910) 791-4775	Chesapeake, VA	(757) 548-1700
Chattanooga, TN	(423) 693-2890	Richmond, VA	(804) 272-1500
Knoxville, TN	(865) 540-9770	Roanoke, VA	(540) 725-8701

Corporate: Greensboro, NC (336) 292-8777

ECV-30-P-L

Unit Performance

Design Conditions

Elevation (ft)	Summer		Winter DB (F)	Outdoor Air (CFM)	Exhaust Air (CFM)
	DB (F)	WB (F)			
436	94.0	74.0	21.0	1,800	2,000

Unit Specifications

Qty	Weight (lb)	Unit Installation	Unit ETL Listing
1	1,024 (+/- 5%)	Outdoor	UL 1812

Configuration

Outdoor Air		Exhaust Air	
Intake	Discharge	Intake	Discharge
End	Bottom	Bottom	End

Energy Recovery Performance

Design Condition	Temperature (F)								Capacity Reduction (BTU/h)
	Outdoor Air		Supply Air		Return Air		Exhaust Air		
	DB	WB	DB	WB	DB	WB/RH	DB	WB	
Summer	94.0	74.0	83.3	69.0	78.0	64.9/50	87.5	69.9	35,640.0
Winter	21.0	17.5	52.6	41.5	72.0	55.8/35	42.3	38.3	61,942.0

Air Performance

Type	Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	FRPM	Fan		
					Qty	Type	Drive-Type
Supply	1,800	1	1.984	1789	2	Plenum	Direct
Exhaust	2,000	0.5	1.567	1656	2	Plenum	Direct

Motor Specifications

Motor	Qty	Operating Power (hp)	Size (hp)	Enclosure	Efficiency	RPM
Supply	2	0.62	1	ODP	PE	1750
Exhaust	2	0.49	3/4	ODP	SE	1750

Electrical Specifications

Power Supply	Rating (V/C/P)	MCA (A)	MOP (A)	Fan Power (W/CFM)*
Unit	208/60/3	12.9	15.0	0.924

*Fan Power (W/CFM) = (Supply BHP + Exhaust BHP) / Supply CFM

Construction Features And Accessories

Unit	
UL-1812	Std
Unit Installation - Outdoor	Std
Outdoor Air Filters - 2" MERV 13, 3-20x20	X
Exhaust Air Filters - 2" MERV 13, 3-20x20	X
Energy Recovery Device - Polymer Membrane Energy Recovery Core	Std
Unit Construction - Double Wall	X
Insulation - 1 inch R4 Fiberglass	Std
Corrosion Resistant Fasteners	Std
Access - Hinged	X
Factory Wired Non-Fused Disconnect Switch	Std
Unit Finish - Permatector, Concrete Gray (RAL 7023)	X
Single Point Power	Std
Supply Weatherhood: Downturn	Std
Exhaust Weatherhood: Downturn	Std
Fan VFDs - Modulating	X
Fan Vibration Isolation - Neoprene	Std
Controls	
Unit Controls - Microprocessor	X
Sensors - OAI, OAD	Std
Unit On/Off Control - Microprocessor	X
Sensor Monitoring Package	
Heating Enable - None	
Cooling Enable - None	
Supply Fan Control - Constant Volume (on/off)	X
Exhaust Fan Control - Constant Volume (on/off)	X
Network Protocol - BACNetMSTP	X
Exhaust Only Operation	
Economizer Control - Bypass Damper - Temperature	X
Control Accessories	
Remote Display	
CO2 Sensor	
Dirty Filter Sensor(s) - Both	X
Airflow Monitoring - None	

Accessories	
Frost Control	
Spare Filters - Both, Qty: 1 set(s)	X
Shipped Loose Smoke Detectors	
Duct Flange	
Outdoor Air Damper - Low Leakage	X
Return Air Damper - Low Leakage	X
Service Outlet - 120 VAC GFCI Service Outlet, Shipped Loose	
Damper End Switch	
Roof Curb	
Spare Fan Belts	
Warranty Options	
Unit Warranty - 18 Months (Std.)	Std
Energy Core Warranty - 5 Yrs	Std

Standard Option	Std
Not Included	
Included	X

Notes
Outdoor Air Damper supplied is low leakage, motorized VCD-23 (leakage rate of 3 CFM / ft^2 @ 1 in. wg), Class 1A
Return Air Damper supplied is low leakage, motorized VCD-23 (leakage rate of 3 CFM / ft^2 @ 1 in. wg), Class 1A

Special Design Requests

Special Design Number
Special Design Request for "OA deduct and flanges", (E2300122)

Supply Fan Charts And Performance

Supply Fan Performance

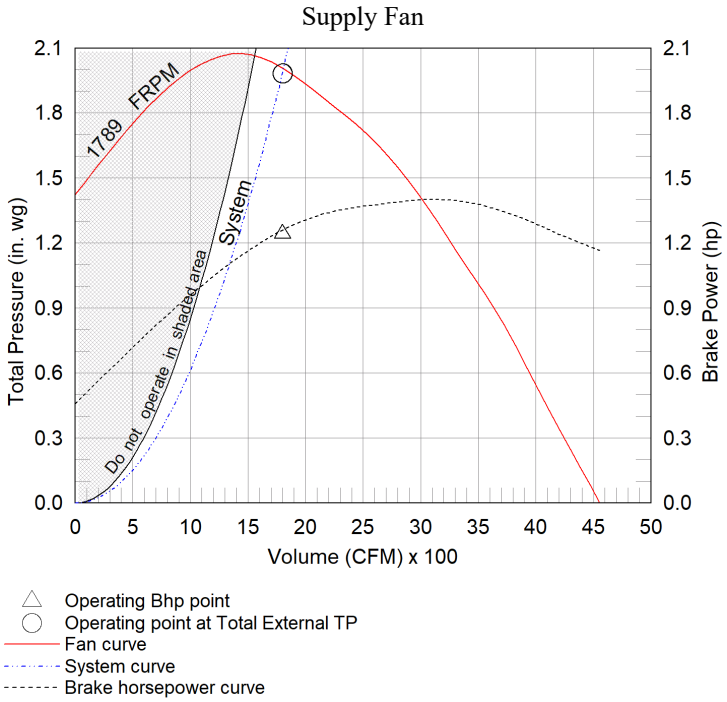
Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor		Fan		
					Qty	Size (hp)	Qty	Type	Drive-Type
1,800	1	1.984	1789	0.62	2	1	2	Plenum	Direct

Pressure Drop (in. wg)

Weatherhood	Filter	Damper	External	Total
0.076	0.105	0.01	1	1.984

Sound Performance in Accordance with AMCA

Sound Power by Octave Band								Lwa	dBA	Sones
62.5	125	250	500	1000	2000	4000	8000			
83.7	84.2	84	78.9	74.6	70	67	70.3	81.4	69.9	19.1



Exhaust Fan Charts And Performance

Exhaust Fan Performance

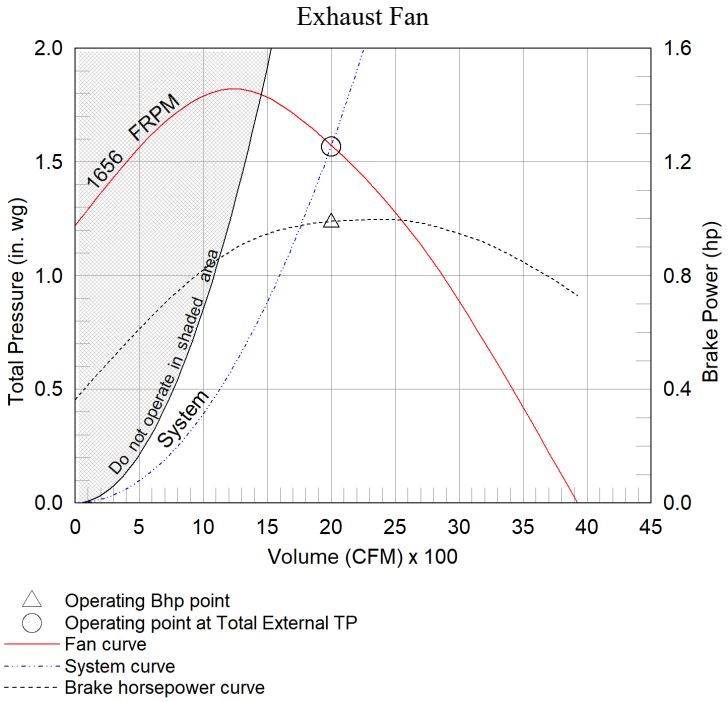
Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor		Fan		
					Qty	Size (hp)	Qty	Type	Drive-Type
2,000	0.5	1.567	1656	0.49	2	3/4	2	Plenum	Direct

Pressure Drop (in. wg)

Weatherhood	Filter	Damper	External	Total
0.041	0.13	0.008	0.5	1.567

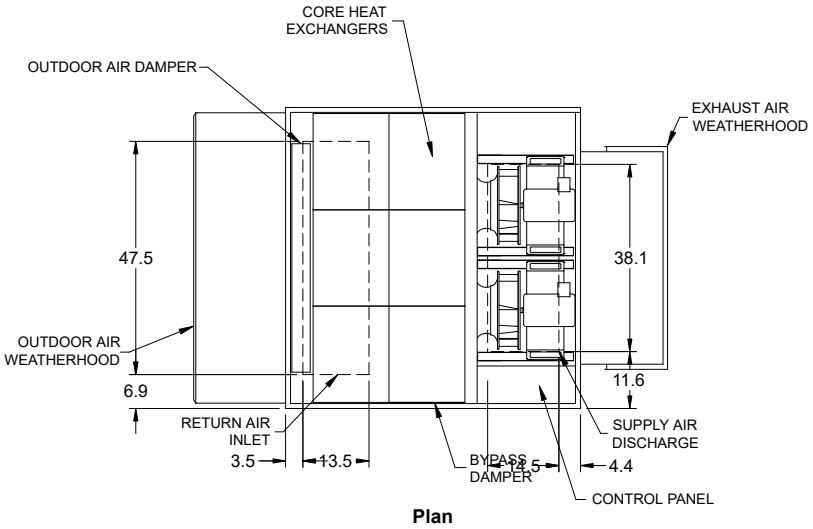
Sound Performance in Accordance with AMCA

Sound Power by Octave Band								Lwa	dBA	Sones
62.5	125	250	500	1000	2000	4000	8000			
77.5	74.9	72.6	70.8	58.3	57.9	53.2	56.7	70.7	59.2	9.5



Radiated Sound

Position A



Plan

Position D

Position B

Position C

"E" is the Top Plane

Radiated Sound Levels										
Plane	Octave Bands (Lw)								Plane Lw	Plane LwA
	1	2	3	4	5	6	7	8		
A	80	76	77	73	75	72	70	65	84	79
B	80	77	77	75	79	77	74	70	86	83
C	80	76	78	73	74	72	69	65	84	79
D	79	76	76	68	65	65	62	58	82	73
E	78	72	76	71	72	70	68	63	82	77
Total	86	83	84	79	82	80	77	73	91	86

AMCA 320-07 - Laboratory Methods of Sound Testing of Fans Using Sound Intensity
Tests conducted in accordance with this standard.
Free field measurement plane created 1 foot from unit on all sides and top.
Sound Intensity measured in Watts/m^2.
Sound data converted to Sound Power (Lw) for the chart above.
A-Weighted Sound Power was determined using AMCA Standard 301-90 Clause 9.1.
Plane E sound data was measured above the top plane of the unit.

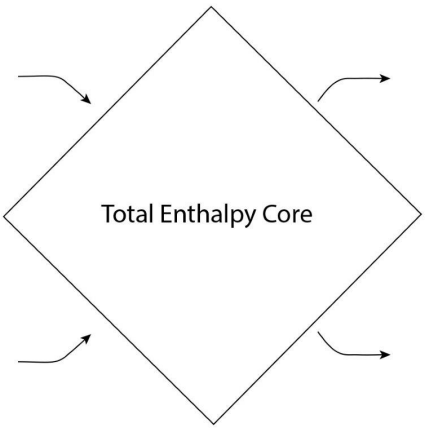
Energy Recovery Summer Performance

Design Air Flow Conditions			
OA Volume (CFM)	ASHRAE 90.1 OA Enthalpy Recovery Ratio	EA Volume (CFM)	EA Core Effectiveness
1,800	57.6	2,000	56.8

Outdoor Air Cooling Reduction				
OA Load w/o Energy Recovery		OA Load with Energy Recovery		Equipment Reduction (tons)
(BTU/h)	(tons)	(BTU/h)	(tons)	
62,370.0	5.20	26,730.0	2.23	2.97

Outdoor Air Entering	
Dry Bulb (F)	94.0
Wet Bulb (F)	74.0
Specific Humidity (gr/lb)	97
Enthalpy (BTU/lb)	37.8

Indoor Air Entering	
Dry Bulb (F)	78.0
Rel. Humidity (%)	50
Specific Humidity (gr/lb)	73
Enthalpy (BTU/lb)	30.1



Exhaust Air Leaving	
Dry Bulb (F)	87.5
Wet Bulb (F)	69.9
Specific Humidity (gr/lb)	82
Enthalpy (BTU/lb)	33.9

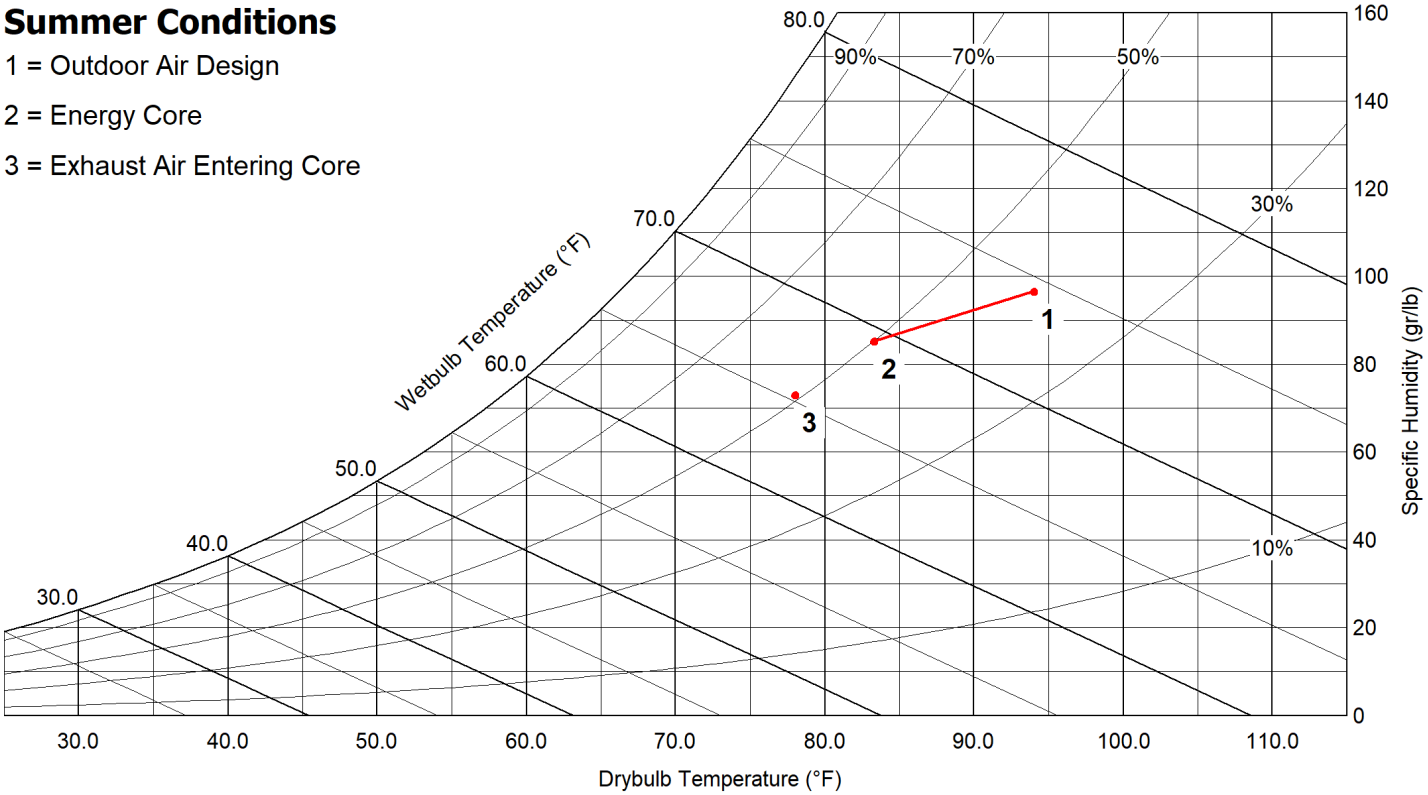
Supply Air Leaving	
Dry Bulb (F)	83.3
Wet Bulb (F)	69.0
Specific Humidity (gr/lb)	85
Enthalpy (BTU/lb)	33.4

Summer Conditions

1 = Outdoor Air Design

2 = Energy Core

3 = Exhaust Air Entering Core



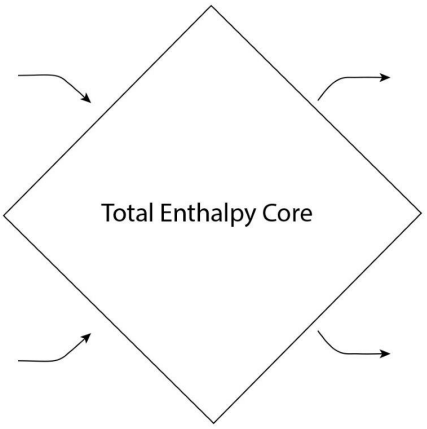
Energy Recovery Winter Performance

Design Air Flow Conditions			
OA Volume (CFM)	ASHRAE 90.1 OA Enthalpy Recovery Ratio	EA Volume (CFM)	EA Core Effectiveness
1,800	55.7	2,000	55.8

Outdoor Air Heating Reduction			
OA Load w/o Energy Recovery (BTU/h)	OA Load with Energy Recovery (BTU/h)	Equipment Reduction (BTU/h)	Sensible Effectiveness (%)
99,970.0	38,028.0	61,942.0	61.8

Outdoor Air Entering	
Dry Bulb (F)	21.0
Wet Bulb (F)	17.5
Specific Humidity (gr/lb)	8
Enthalpy (BTU/lb)	6.3

Indoor Air Entering	
Dry Bulb (F)	72.0
Rel. Humidity (%)	35
Specific Humidity (gr/lb)	42
Enthalpy (BTU/lb)	23.7



Exhaust Air Leaving	
Dry Bulb (F)	42.3
Wet Bulb (F)	38.3
Specific Humidity (gr/lb)	28
Enthalpy (BTU/lb)	14.5

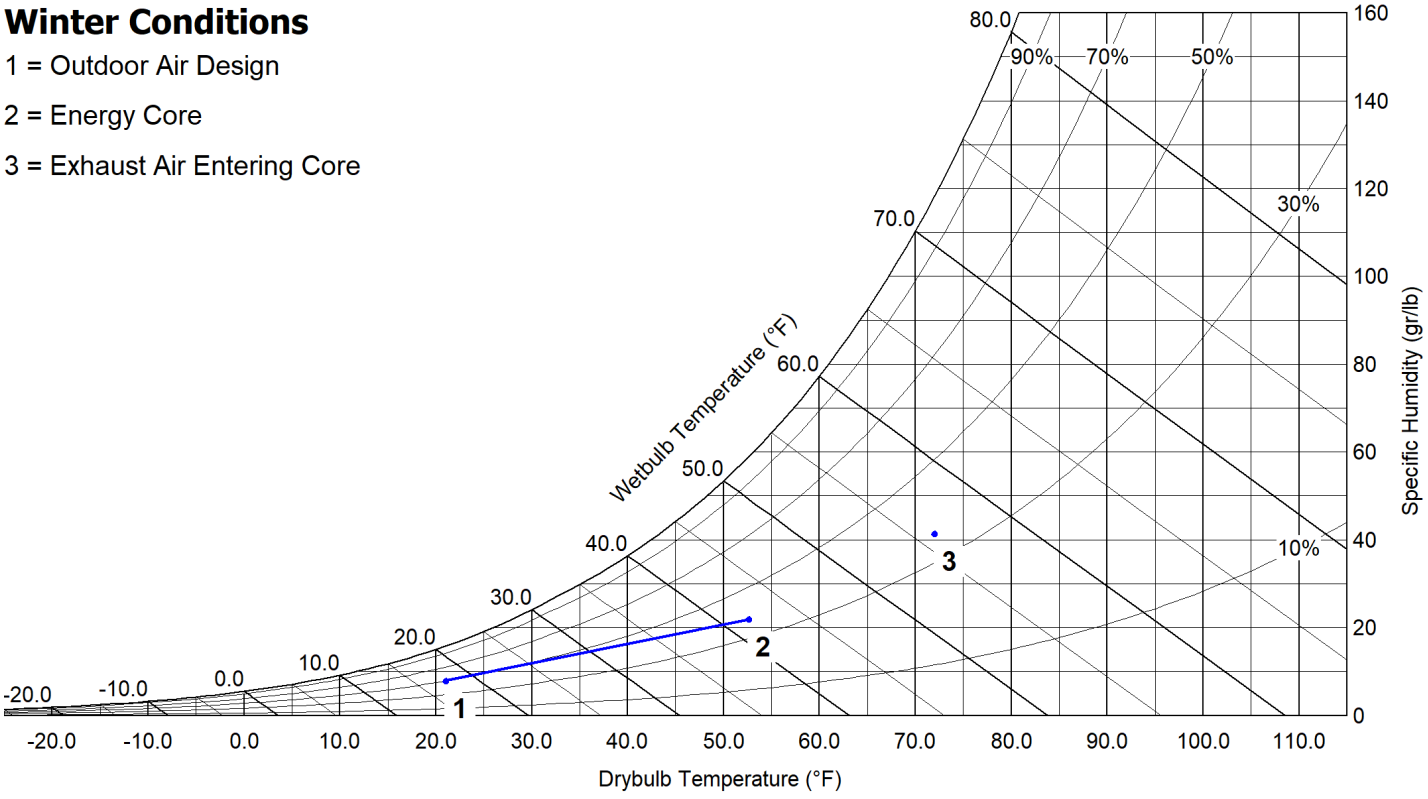
Supply Air Leaving	
Dry Bulb (F)	52.6
Wet Bulb (F)	41.5
Specific Humidity (gr/lb)	22
Enthalpy (BTU/lb)	16.0

Winter Conditions

1 = Outdoor Air Design

2 = Energy Core

3 = Exhaust Air Entering Core



AHRI Performance Ratings

Energy Recovery Performance Rating in accordance with AHRI Standard 1060 (I-P)						
Rated Airflow (SCFM)		Net Supply Airflow (SCFM)	EATR (%)	OACF	Pressure Drop (in. wg)	
Leaving Supply	Entering Exhaust				Supply	Exhaust
1806	2006	1800	0.4	1.04	0.80	0.89

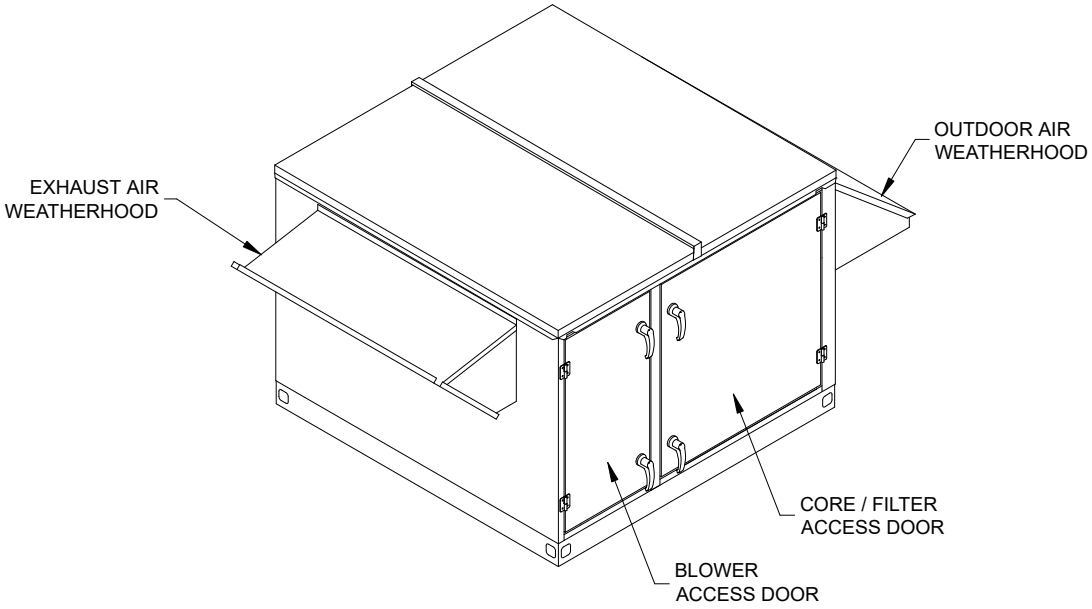
Thermal Effectiveness Ratings							
Enthalpy Recovery Ratio (%)		Sensible Effectiveness (%)		Latent Effectiveness (%)		Total Effectiveness (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
57.6	55.7	66.5	61.8	46	41.6	56.8	55.8

Note(s)

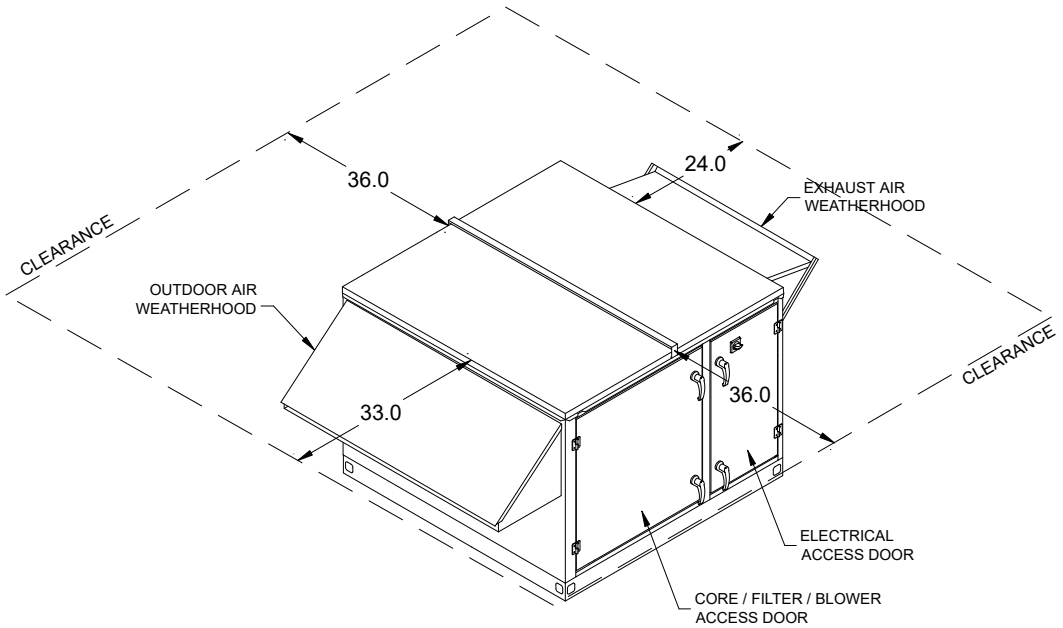
Summer Design Conditions:
Certified in accordance with the AHRI ERV Certification Program, which is based on AHRI Standard 1060. Certified units may be found in the AHRI Directory at www.ahridirectory.org.

Winter Design Conditions:
Please consult factory regarding AHRI Certification

Isometric Drawings



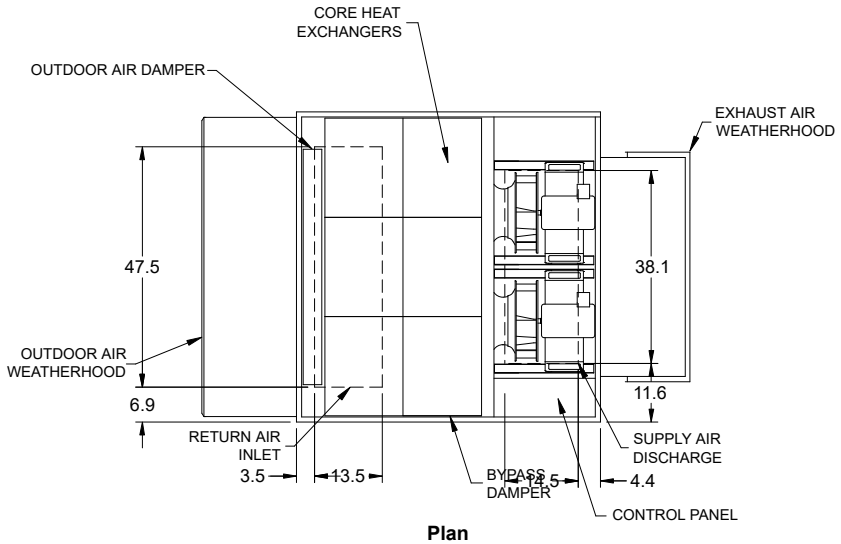
Back Right Isometric



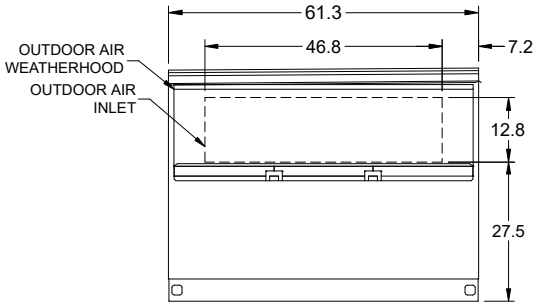
THE NON-ELECTRICAL SIDE CAN BE PLACED AGAINST A WALL. CLEARANCE TO THE ELECTRICAL SIDE IS ESSENTIAL TO PROVIDE ACCESS TO THE CONTROL CENTER AND COMPONENT MAINTENANCE.

Front Left Isometric

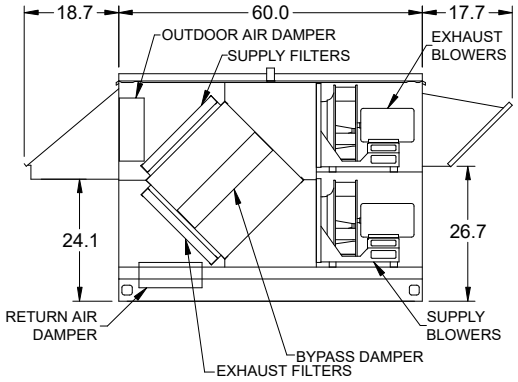
Overview Drawings



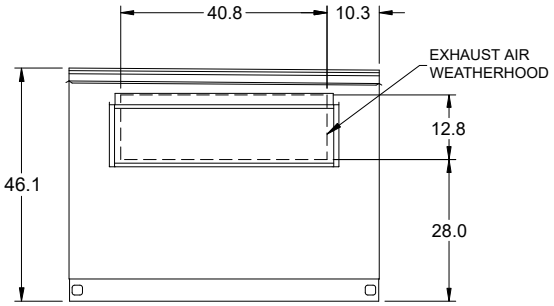
Plan



Left End



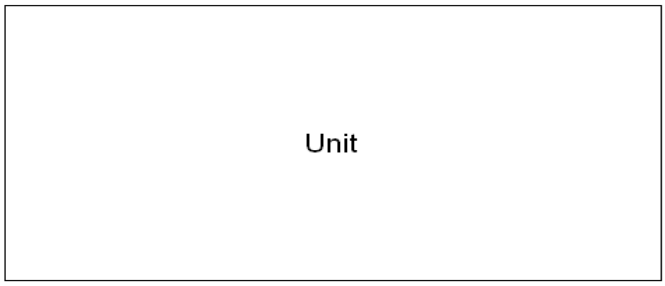
Elevation



Right End

Corner Weights

278 lb 246 lb



265 lb 235 lb

Note

Estimated corner weights are shown looking down on unit and the outside air intake will be on the left. Weights are applied at the base of the unit. Images not drawn to scale.

Microprocessor Controller Sequence of Operation

MICROPROCESSOR CONTROLLER

Controller shall be provided with the required sensors and programming for the preconditioner. Controller shall be factory programmed, mounted, and tested. Controller shall have an LCD readout for changing set points and monitoring unit operation.

UNIT START COMMAND (Unit will be enabled to start once a jumper is placed between R and G)

- Factory mounted and wired outdoor air damper actuator is powered.
- Exhaust blower starts after a delay (adj.).
- Supply blower starts after a delay (adj.).

UNIT STOP COMMAND (OR DE-ENERGIZED)

- Supply blower and exhaust blower de-energized.
- Outdoor air damper actuator is spring return closed.

SUPPLY BLOWER SEQUENCE

The supply blower speed will be controlled with the following sequence:

Constant Volume with VFD (on/off)

The supply blower is provided with a factory mounted and wired VFD and is intended to operate at a constant speed (adjustable set point in controller) during operation. This speed needs to be set during the test and balance of the unit.

EXHAUST BLOWER SEQUENCE

The exhaust blower speed will be controlled with the following sequence:

Constant Volume (on/off)

The exhaust blower is provided with a factory mounted and wired VFD and is intended to operate at a constant speed during operation. This speed needs to be set during the test and balance of the unit.

Constant Volume with VFD (on/off)

The exhaust blower is provided with a factory mounted and wired VFD and is intended to operate at a constant speed (adjustable set point in controller) during operation. This speed needs to be set during the test and balance of the unit.

ECONOMIZER SEQUENCE

The core is provided with a factory mounted bypass damper. When economizer is enabled, the bypass damper will cycle into a bypass condition, allowing cool air to flow past the energy recovery core rather than flow through it.

Temperature

The economizer will be locked out when the outdoor air is less than 50 F (adj.) or greater than 65 F (adj.).

ALARMS

The controller will display alarms and have one digital output for remote indication of an alarm condition. Possible alarms include:

AIRFLOW ALARM

The controller monitors the airflow proving switch on each blower. The controller will send an alarm if either of the airflow proving switches are not engaged.

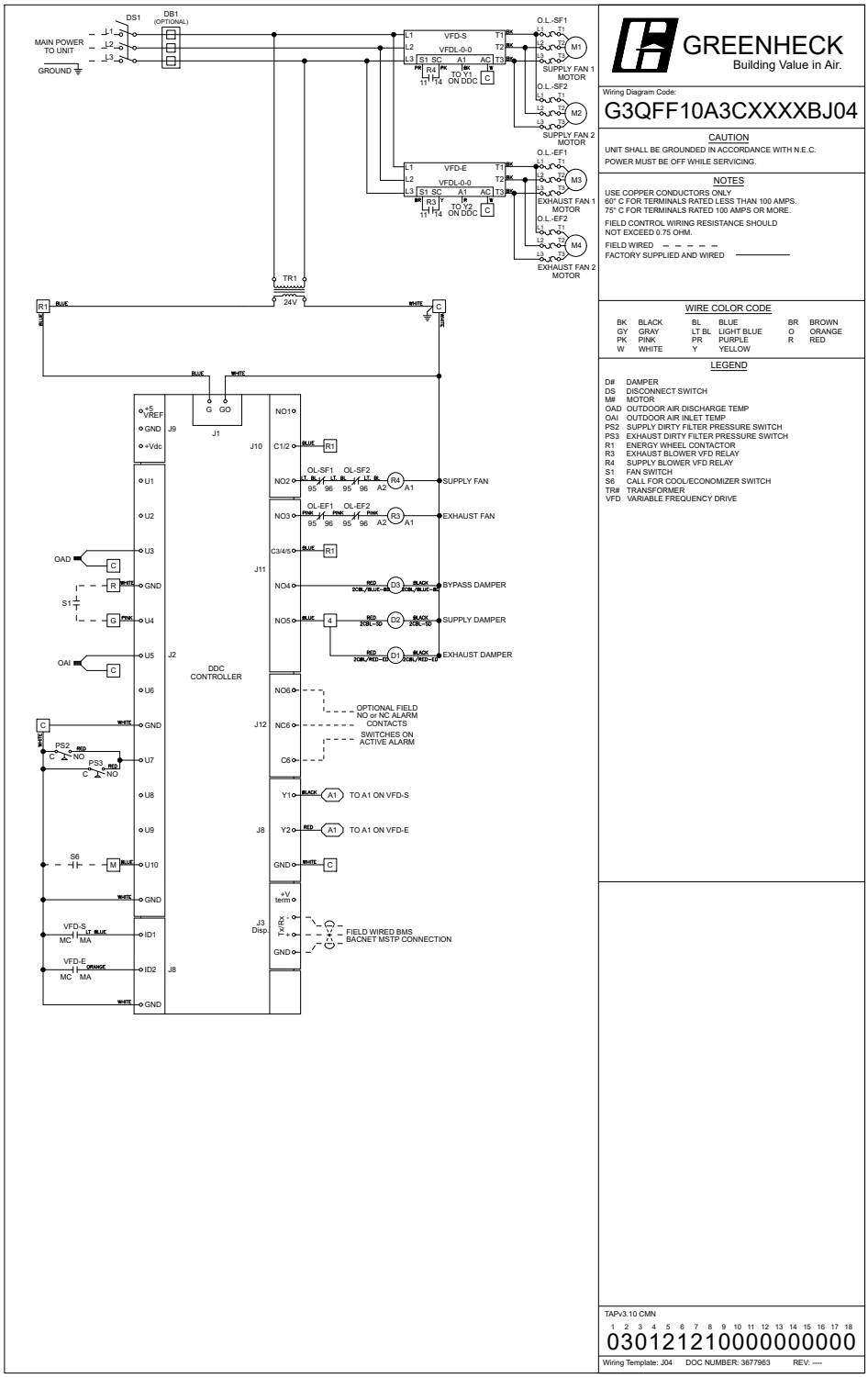
TEMPERATURE SENSOR ALARM

The controller sends an alarm if the temperature sensor fails.

DIRTY FILTER ALARM

A digital signal is sent to the controller indicating an increased pressure drop across the outdoor, exhaust, or supply air filters which must be adjusted in the field during start up. The controller will then provide a dirty filter alarm.

Wiring Diagram



Analog Inputs - Read Only

Variable	Description	BACNET (Object Type-AI, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Input, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Supply_Temp_Analog_Input	Supply Temperature	1	0.1	30031	X
Outside_Air_Temp_Analog_Input	Outside Air Temperature	2	0.1	30033	X
Exhaust_Temp_Analog_Input	Exhaust Temperature	3	0.1	30035	
Outside_RH_Analog_Input	Outside Relative Humidity %	4	0.1	30037	
Space_Static_Pressure_Analog_Input	Space Static Pressure	5	0.1	30039	
Supply_Duct_Static_Pressure_Analog_Input	Supply Duct Static Pressure	6	0.1	30041	
Space_CO2_1_Analog_Input	Space 1 CO2 ppm	7	10	30043	
Exhaust_Fan_Speed_Analog_Input	Exhaust Fan Speed Remote Command Input value (0-10 by others)	8	1	30045	
Supply_Fan_Speed_Analog_Input	Supply Fan Speed Remote Command Input value (0-10 by others)	9	0.1	30047	
Space_VOC_1_Analog_Input	Space 1 VOC ppm	10	10	30049	
Aux_In_Customer_1	Customer defined auxiliary input	31	0.1	30051	
Aux_In_Customer_2	Customer defined auxiliary input	32	0.1	30053	
Aux_In_Customer_3	Customer defined auxiliary input	33	0.1	30055	
Aux_In_Customer_4	Customer defined auxiliary input	34	0.1	30057	
Aux_In_Customer_5	Customer defined auxiliary input	35	0.1	30059	
Aux_In_Customer_6	Customer defined auxiliary input	36	0.1	30061	

Analog Values - Read/Write

Variable	Description	BACNET (Object Type-AV, Access-ReadCOV_Commandable)		MODBUS (Register Type-Holding, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Temperature_Setpoint	Temperature Set point	1	0	40001	X
Economizer_Temp_Enable_Setpoint	Economizer Ambient Temp Enable Setpoint. Allow Econ when OAT < Spt	2	0	40003	X
Economizer_Enthalpy_Enable_Setpoint	Economizer Enthalpy Enable Setpoint. Allow Econ when OA Enthalpy < Spt	3	0	40005	
Space_Static_Pressure_Setpoint	Space Static Pressure Setpoint	4	0.1	40007	
Supply_Duct_Static_Pressure_Setpoint	Supply Duct Static Pressure Setpoint	5	0.1	40009	
Space_CO2_Setpoint	Space CO2 Setpoint	6	0.1	40011	
Space_VOC_Setpoint	Space VOC Setpoint	7	0.1	40013	
SF_Control_Signal_BMS	BMS to control signal for supply fan speed	8	0.1	40015	
EF_Control_Signal_BMS	BMS to control signal for exhaust fan speed	9	0.1	40017	
Outside_RH_from_BMS	Outside RH from BMS. Used when source selection is set to BMS	10	0.1	40019	
Outside_Temp_from_BMS	Outside Temp from BMS. Used when source selection is set to BMS	11	0.1	40021	X
Space_1_CO2_from_BMS	Space 1 CO2 from BMS. Used when source selection is set to BMS	12	0.1	40023	
Space_Static_from_BMS	Space Static from BMS. Used when source selection is set to BMS	13	0.1	40025	
Space_VOC_from_BMS	SpaceVOC from BMS. Used when source selection is set to BMS	14	0.1	40027	
ER_Control_Signal_from_BMS	ER control signal from BMS. Used when source selection is set to BMS.	15	0.1	40029	
Aux_BMS_Analog_Output_1	BMS Commanded auxilary analog output	101	0.1	40101	
Aux_BMS_Analog_Output_2	BMS Commanded auxilary analog output	102	0.1	40103	
Aux_BMS_Analog_Output_3	BMS Commanded auxilary analog output	103	0.1	40105	
Aux_BMS_Analog_Output_4	BMS Commanded auxilary analog output	104	0.1	40107	

Analog Values - Read Only					
Variable	Description	BACNET (Object Type-AV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Input, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Unit_Status_Mode	0: Off/Standby 1: Occupied Start 2: Opening Dampers3: Dampers Open 4: Fan Start Delay 5: Exhaust Fan Starting 6: Supply Fan Starting 7: System On 8: System Disabled 9: Remote Off 10: Shutdown Alarm 19: Fans and Energy Recovery 20: Economizing 21: Defrost Active 22: Overrides Active 23: Expansion Offline	45	0	30001	X
Supply_Temperature_Calculated_Setpoint	Active Supply Temperature Setpoint	46	0.1	30003	X
Defrost_Ramp	Defrost Ramp	47	1	30005	
Economizer_Ramp	Economizer Ramp	48	1	30007	X
Exhaust_Fan_Space_Static_Pressure_Ramp	Exhaust Fan Space Static Pressure Ramp	49	1	30009	
Exhaust_Fan_Supply_Tracking_Ramp	Exhaust Fan Supply Tracking Ramp	50	1	30011	
Space_CO2_Control_Ramp	Space CO2 Control Ramp	51	1	30013	
Supply_Duct_Static_Pressure_Ramp	Supply Duct Static Pressure Ramp	52	1	30015	
Supply_Fan_Space_Static_Pressure_Ramp	Supply Fan Space Static Pressure Ramp	53	1	30017	
Outside_Dewpoint	Outside Dewpoint	54	0.1	30019	
Outside_Enthalpy	Outside Enthalpy	55	0.1	30021	
Energy_Recovery_Analog_Output	Energy Recovery Analog Output	56	0.1	30023	
Exhaust_Fan_Speed_Analog_Output	Exhaust Fan Speed Analog Output	57	0.1	30025	X
Supply_Fan_Speed_Analog_Output	Supply Fan Speed Analog Output	58	0.1	30027	X

Integer Values - Read Only					
Variable	Description	BACNET (Object Type-IV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Holding, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
LatestAlm	Most recent alarm. See alarm table	1	1	30101	X

Binary Inputs - Read Only

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BI, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Discrete)	Included
				OBJECT INSTANCE	HYST	INDEX	
Supply_Fan_1_Status_Digital_Input	Supply Fan 1 Status	Active	Inactive	10	0	10101	X
Exhaust_Fan_1_Status_Digital_Input	Exhaust Fan 1 Status	Active	Inactive	11	0	10102	X
Unit_Enable_Digital_Input	Remote Unit Enable Digital Input Status	Active	Inactive	12	0	10103	X

Binary Values - Read/Write

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-Read_Commandable)		MODBUS (Register Type-Coil)	Included
				OBJECT INSTANCE	HYST	INDEX	
BMS_Watchdog	BMS Watchdog command. Used to determine comm status. Must heartbeat within the watchdog timeout delay to detect comm status	Active	Inactive	1	0	2	X
System_Enable	Master system enable/disable point	Enable	Disable	2	0	3	X
Reset_All_Alarms	Alarm Reset Command	Reset	Normal	3	0	4	X
Outside_RH_Source_BMS	Outside RH Source Selection. True = BMS. False = Local	BMS	Local	4	0	5	
Outside_Temp_Source_BMS	Outside Temp Source Selection. True = BMS. False = Local	BMS	Local	5	0	6	X
Space_1_CO2_Source_BMS	Space 1 CO2 Source Selection. True = BMS. False = Local	BMS	Local	6	0	7	
Space_Static_Source_BMS	Space Static Source Selection. True = BMS. False = Local	BMS	Local	7	0	8	
SF_Control_Source_BMS	Allows the BMS to control supply fan speed. True = BMS. False = Local	BMS	Local	8	0	9	
EF_Control_Source_BMS	Allows the BMS to control exhaust fan speed. True = BMS. False = Local	BMS	Local	9	0	10	
Space_VOC_Source_BMS	Space VOC Source Selection. True = BMS. False = Local	BMS	Local	10	0	11	
Econ_Enable_Source_BMS	Economizer Enable Source Selection. True = BMS. False = Local	BMS	Local	11	0	12	X
Econ_Enable_from_BMS	Economizer Enable from BMS. Used when source selection is set to BMS	Enable	Disable	12	0	13	X
ER_Control_Source_BMS	ER Economizer Control Signal from BMS True = BMS False = Local	BMS	Local	13	0	15	

Binary Values - Read Only

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Discrete)	Included
				OBJECT INSTANCE	HYST	INDEX	
Global_Alarm	General alarm point. Optionally set to indicate any alarm is active, or a shutdown alarm is active	Alarm	Normal	30	0	10002	X
System_Shutdown_Alarm	Shutdown alarm status. When true, System Enable will be set to false and the unit will remain off	Shutdown	Normal	31	0	10003	X
Manual_Override_Active	Indicates that manual overrides are active	Override	Normal	32	0	10004	X
Heat_Wheel_Enable_Digital_Output	Heat Wheel Enable Digital Output	Active	Inactive	33	0	10005	
BMS_Offline_Alarm.Active	BMS Offline Alarm (0=Normal 1=Alarm)	Alarm	Normal	34	0	10006	X
Exhaust_Fan_1_Alarm.Active	Exhaust Fan 1 Alarm (0=Normal 1=Alarm)	Alarm	Normal	35	0	10007	X
Outside_Air_Temperature_Sensor_Alarm.Active	Outside Air Temperature Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	36	0	10008	X
Filter_Alarm.Active	Outside Filter Alarm (0=Normal 1=Alarm)	Alarm	Normal	37	0	10009	X
Outside_RH_Sensor_Alarm.Active	Outside RH Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	38	0	10010	
Space_CO2_1_Analog_Input_Alarm.Active	Space CO2 1 Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	39	0	10011	
Space_High_Static_Alarm.Active	Space High Static Alarm (0=Normal 1=Alarm)	Alarm	Normal	40	0	10012	
Space_Static_Pressure_Analog_Input_Alarm.Active	Space Static Pressure Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	41	0	10013	
Supply_Air_Temp_Low_Limit.Active	Supply Air Temp Low Limit Alarm (0=Normal 1=Alarm)	Alarm	Normal	42	0	10014	X
Supply_Air_Temperature_Sensor_Alarm.Active	Supply Air Temperature Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	43	0	10015	X
Supply_Duct_Static_Pressure_Analog_Input_Alarm.Active	Supply Duct Static Pressure Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	44	0	10016	
Supply_Fan_1_Alarm.Active	Supply Fan 1 Alarm (0=Normal 1=Alarm)	Alarm	Normal	45	0	10017	X
Supply_High_Duct_Static_Alarm.Active	Supply High Duct Static Alarm (0=Normal 1=Alarm)	Alarm	Normal	46	0	10018	
Wheel_Rotation_Alarm.Active	Wheel Rotation Alarm (0=Normal 1=Alarm)	Alarm	Normal	47	0	10019	
ER_Wheel_High_DP.Active	Energy Recovery Wheel high differential pressure (0=Normal 1=Alarm)	Alarm	Normal	48	0	10020	
Greentrol_1_Alarm.Active	Greentrol Device Alarm	Alarm	Normal	49	0	10021	
Greentrol_2_Alarm.Active	Greentrol Device Alarm	Alarm	Normal	50	0	10022	

Binary Values - Commandable

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-ReadCOV_Commandable)		MODBUS (Register Type-Coil)	Included
				OBJECT INSTANCE	HYST	INDEX	
Aux_BMS_Digital_Output_1	BMS Commanded auxilary digital output	Active	Inactive	101	0	21	
Aux_BMS_Digital_Output_2	BMS Commanded auxilary digital output	Active	Inactive	102	0	22	
Aux_BMS_Digital_Output_3	BMS Commanded auxilary digital output	Active	Inactive	103	0	23	
Aux_BMS_Digital_Output_4	BMS Commanded auxilary digital output	Active	Inactive	104	0	24	
Aux_BMS_Digital_Output_5	BMS Commanded auxilary digital output	Active	Inactive	105	0	25	
Aux_BMS_Digital_Output_6	BMS Commanded auxilary digital output	Active	Inactive	106	0	26	

Warranty Statement for ERV Preconditioners

Unit Warranty

Greenheck warrants the equipment to be free from defects in material and workmanship for a period of 18 months from the date of shipment. Initial startup must be completed within six months of the shipment date, and a startup report must be submitted to Greenheck.

Total Energy Core Warranty

The enthalpy core is warranted to be free from defects in material and workmanship for a period of 5 years from the shipment date.

Warranty Notes

Any component which proves defective during the warranty period will be repaired or replaced at Greenheck's sole option when returned to our factory, transportation prepaid. All warranties do not include labor costs associated with troubleshooting, removal, or installation. Greenheck will not be liable for any consequential, punitive, or incidental damages resulting from use, repair, or operation of any Greenheck product. These warranties are exclusive and are in lieu of all other warranties, whether written, oral, or implied, including the warranty of merchantability and the warranty of fitness for a particular purpose. No person (including any agent or salesperson) has authority to expand Seller's obligation beyond the terms of this warranty, or to state that the performance of the product is other than that published by Seller.

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

ECV-20-P-L

Unit Performance

Design Conditions

Elevation (ft)	Summer		Winter DB (F)	Outdoor Air (CFM)	Exhaust Air (CFM)
	DB (F)	WB (F)			
436	94.0	74.0	21.0	1,100	1,345

Unit Specifications

Qty	Weight (lb)	Unit Installation	Unit ETL Listing
1	709 (+/- 5%)	Outdoor	UL 1812

Configuration

Outdoor Air		Exhaust Air	
Intake	Discharge	Intake	Discharge
End	Bottom	Bottom	End

Energy Recovery Performance

Design Condition	Temperature (F)								Capacity Reduction (BTU/h)
	Outdoor Air		Supply Air		Return Air		Exhaust Air		
	DB	WB	DB	WB	DB	WB/RH	DB	WB	
Summer	94.0	74.0	81.8	68.2	78.0	64.9/50	87.9	70.2	25,245.0
Winter	21.0	17.5	58.6	45.4	72.0	55.8/35	40.3	36.7	45,041.0

Air Performance

Type	Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	FRPM	Fan		
					Qty	Type	Drive-Type
Supply	1,100	1	1.714	1654	1	Plenum	Direct
Exhaust	1,345	0.5	1.354	1732	1	Plenum	Direct

Motor Specifications

Motor	Qty	Operating Power (hp)	Size (hp)	Enclosure	Efficiency	RPM
Supply	1	0.53	3/4	ODP	SE	1750
Exhaust	1	0.59	3/4	ODP	SE	1750

Electrical Specifications

Power Supply	Rating (V/C/P)	MCA (A)	MOP (A)	Fan Power (W/CFM)*
Unit	208/60/3	5.7	15.0	0.754

*Fan Power (W/CFM) = (Supply BHP + Exhaust BHP) / Supply CFM

Construction Features And Accessories

Unit	
UL-1812	Std
Unit Installation - Outdoor	Std
Outdoor Air Filters - 2" MERV 13, 2-20x20	X
Exhaust Air Filters - 2" MERV 13, 2-20X20	X
Energy Recovery Device - Polymer Membrane Energy Recovery Core	Std
Unit Construction - Double Wall	X
Insulation - 1 inch R4 Fiberglass	Std
Corrosion Resistant Fasteners	Std
Access - Hinged	X
Factory Wired Non-Fused Disconnect Switch	Std
Unit Finish - Permatector, Concrete Gray (RAL 7023)	X
Single Point Power	Std
Supply Weatherhood: Downturn	Std
Exhaust Weatherhood: Downturn	Std
Fan VFDs - Modulating	X
Fan Vibration Isolation - Neoprene	Std
Controls	
Unit Controls - Microprocessor	X
Sensors - OAI, OAD	Std
Unit On/Off Control - Microprocessor	X
Sensor Monitoring Package	
Heating Enable - None	
Cooling Enable - None	
Supply Fan Control - Constant Volume (on/off)	X
Exhaust Fan Control - Constant Volume (on/off)	X
Network Protocol - BACNetMSTP	X
Exhaust Only Operation	
Economizer Control - Bypass Damper - Temperature	X
Control Accessories	
Remote Display	
CO2 Sensor	
Dirty Filter Sensor(s) - Both	X
Airflow Monitoring - None	

Accessories	
Frost Control	
Spare Filters - Both, Qty: 1 set(s)	X
Shipped Loose Smoke Detectors	
Duct Flange	
Outdoor Air Damper - Low Leakage	X
Return Air Damper - Low Leakage	X
Service Outlet - 120 VAC GFCI Service Outlet, Shipped Loose	
Damper End Switch	
Roof Curb	
Spare Fan Belts	
Warranty Options	
Unit Warranty - 18 Months (Std.)	Std
Energy Core Warranty - 5 Yrs	Std

Standard Option	Std
Not Included	
Included	X

Notes
Outdoor Air Damper supplied is low leakage, motorized VCD-23 (leakage rate of 3 CFM / ft^2 @ 1 in. wg), Class 1A
Return Air Damper supplied is low leakage, motorized VCD-23 (leakage rate of 3 CFM / ft^2 @ 1 in. wg), Class 1A

Special Design Requests

Special Design Number
Special Design Request for "OA deduct and flanges", (E2300122)

Supply Fan Charts And Performance

Supply Fan Performance

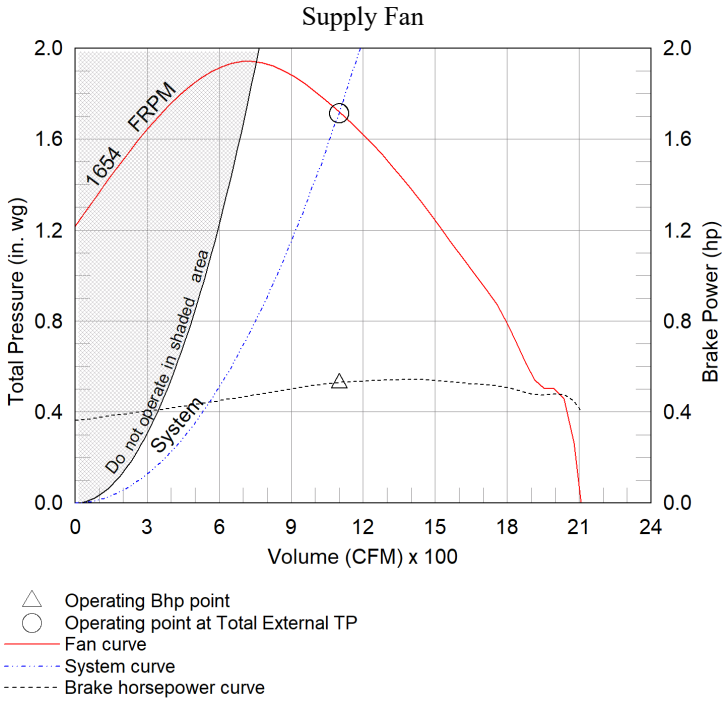
Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor		Fan		
					Qty	Size (hp)	Qty	Type	Drive-Type
1,100	1	1.714	1654	0.53	1	3/4	1	Plenum	Direct

Pressure Drop (in. wg)

Weatherhood	Filter	Damper	External	Total
0.058	0.088	0.01	1	1.714

Sound Performance in Accordance with AMCA

Sound Power by Octave Band								Lwa	dBA	Sones
62.5	125	250	500	1000	2000	4000	8000			
79.3	80	83	71.9	67.1	65	64.1	67.6	77.5	66	15.4



Exhaust Fan Charts And Performance

Exhaust Fan Performance

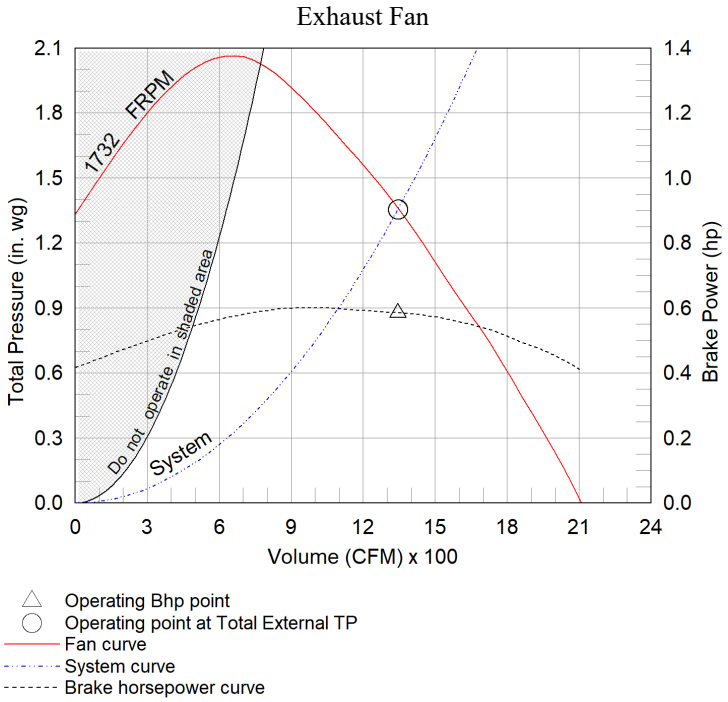
Total Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor		Fan		
					Qty	Size (hp)	Qty	Type	Drive-Type
1,345	0.5	1.354	1732	0.59	1	3/4	1	Plenum	Direct

Pressure Drop (in. wg)

Weatherhood	Filter	Damper	External	Total
0.018	0.132	0.013	0.5	1.354

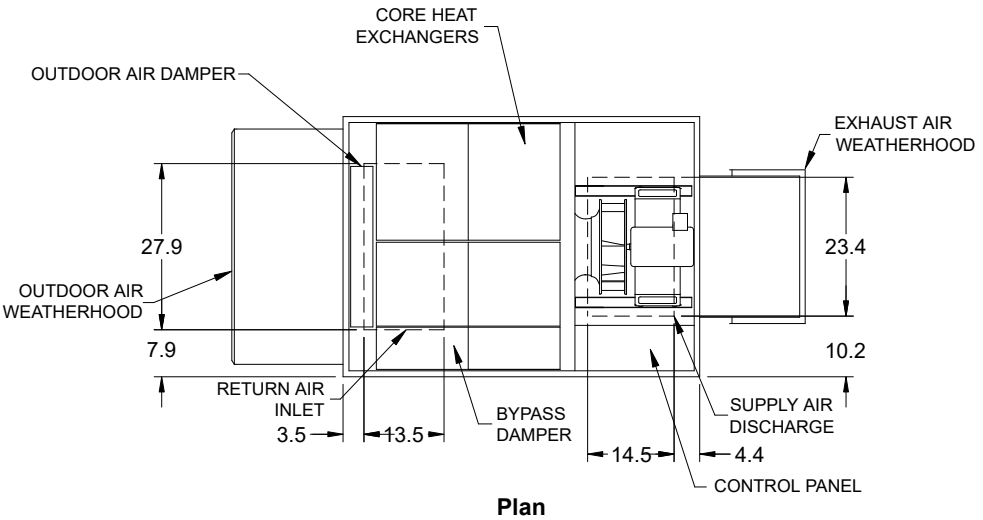
Sound Performance in Accordance with AMCA

Sound Power by Octave Band								Lwa	dBA	Sones
62.5	125	250	500	1000	2000	4000	8000			
68.7	68.9	61.5	62.4	55.5	53.5	50.4	46.9	63.3	51.8	6



Radiated Sound

Position A



Plan

Position D

Position B

Position C

"E" is the Top Plane

Radiated Sound Levels										
Plane	Octave Bands (Lw)								Plane Lw	Plane LwA
	1	2	3	4	5	6	7	8		
A	78	75	71	70	70	70	68	64	82	76
B	79	76	73	72	76	75	73	69	84	81
C	78	75	70	70	70	69	68	64	81	76
D	75	70	67	64	61	60	56	50	77	67
E	76	70	71	69	68	68	67	63	80	75
Total	85	81	78	76	78	77	76	72	88	84

AMCA 320-07 - Laboratory Methods of Sound Testing of Fans Using Sound Intensity
Tests conducted in accordance with this standard.
Free field measurement plane created 1 foot from unit on all sides and top.
Sound Intensity measured in Watts/m^2.
Sound data converted to Sound Power (Lw) for the chart above.
A-Weighted Sound Power was determined using AMCA Standard 301-90 Clause 9.1.
Plane E sound data was measured above the top plane of the unit.

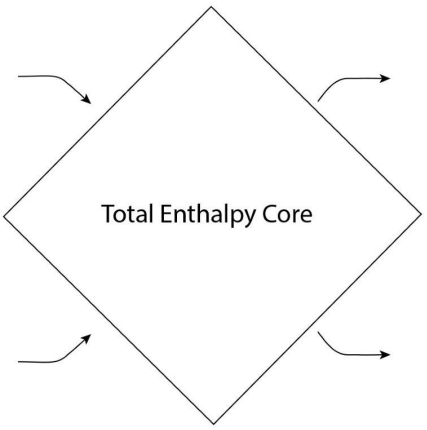
Energy Recovery Summer Performance

Design Air Flow Conditions			
OA Volume (CFM)	ASHRAE 90.1 OA Enthalpy Recovery Ratio	EA Volume (CFM)	EA Core Effectiveness
1,100	66.2	1,345	65.5

Outdoor Air Cooling Reduction				
OA Load w/o Energy Recovery		OA Load with Energy Recovery		Equipment Reduction (tons)
(BTU/h)	(tons)	(BTU/h)	(tons)	
38,115.0	3.18	12,870.0	1.07	2.10

Outdoor Air Entering	
Dry Bulb (F)	94.0
Wet Bulb (F)	74.0
Specific Humidity (gr/lb)	97
Enthalpy (BTU/lb)	37.8

Indoor Air Entering	
Dry Bulb (F)	78.0
Rel. Humidity (%)	50
Specific Humidity (gr/lb)	73
Enthalpy (BTU/lb)	30.1



Exhaust Air Leaving	
Dry Bulb (F)	87.9
Wet Bulb (F)	70.2
Specific Humidity (gr/lb)	83
Enthalpy (BTU/lb)	34.1

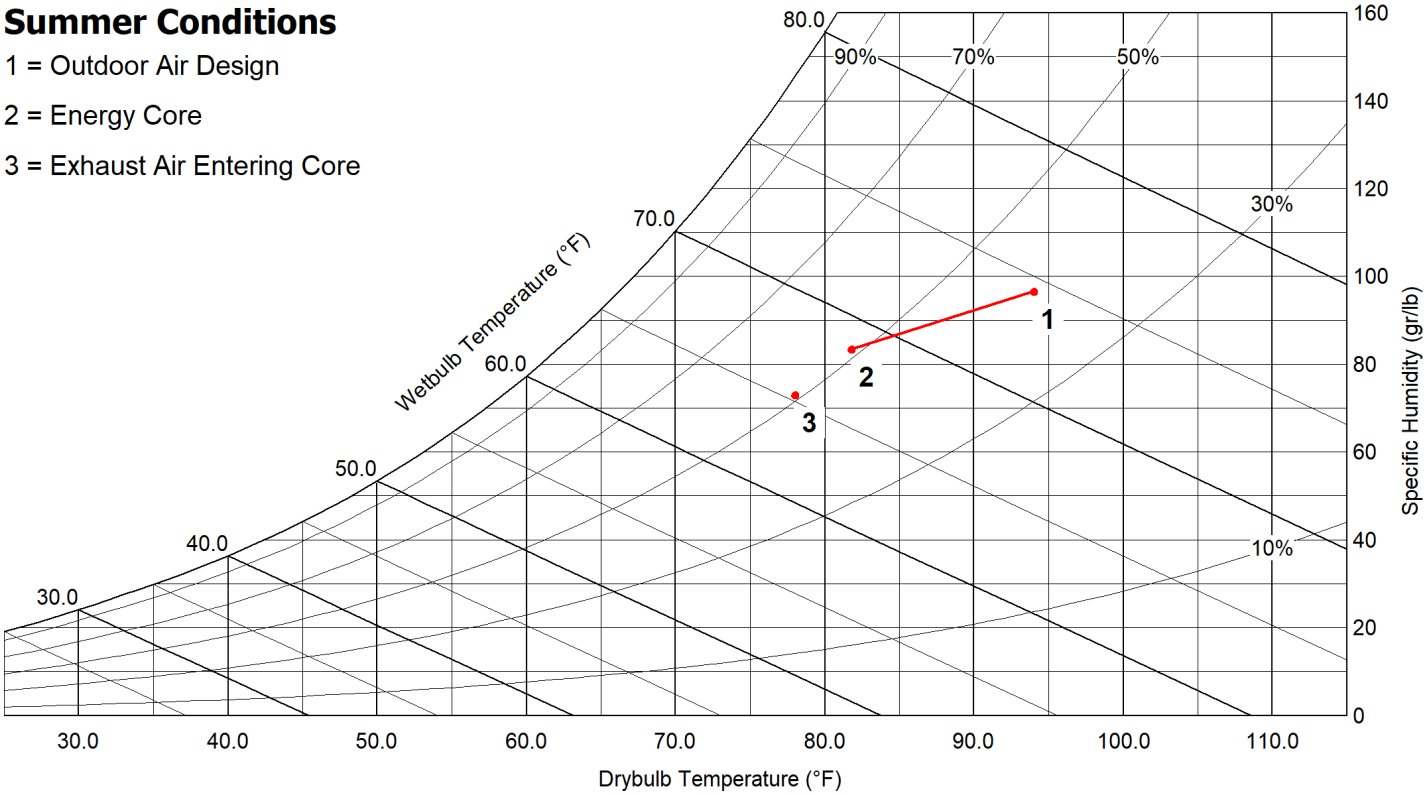
Supply Air Leaving	
Dry Bulb (F)	81.8
Wet Bulb (F)	68.2
Specific Humidity (gr/lb)	84
Enthalpy (BTU/lb)	32.7

Summer Conditions

1 = Outdoor Air Design

2 = Energy Core

3 = Exhaust Air Entering Core



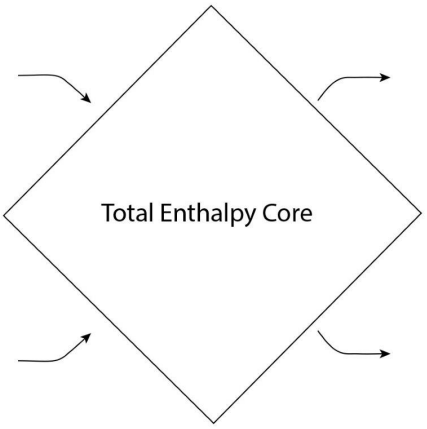
Energy Recovery Winter Performance

Design Air Flow Conditions			
OA Volume (CFM)	ASHRAE 90.1 OA Enthalpy Recovery Ratio	EA Volume (CFM)	EA Core Effectiveness
1,100	66.7	1,345	66.7

Outdoor Air Heating Reduction			
OA Load w/o Energy Recovery (BTU/h)	OA Load with Energy Recovery (BTU/h)	Equipment Reduction (BTU/h)	Sensible Effectiveness (%)
61,093.0	16,052.0	45,041.0	73.6

Outdoor Air Entering	
Dry Bulb (F)	21.0
Wet Bulb (F)	17.5
Specific Humidity (gr/lb)	8
Enthalpy (BTU/lb)	6.3

Indoor Air Entering	
Dry Bulb (F)	72.0
Rel. Humidity (%)	35
Specific Humidity (gr/lb)	42
Enthalpy (BTU/lb)	23.7



Exhaust Air Leaving	
Dry Bulb (F)	40.3
Wet Bulb (F)	36.7
Specific Humidity (gr/lb)	27
Enthalpy (BTU/lb)	13.8

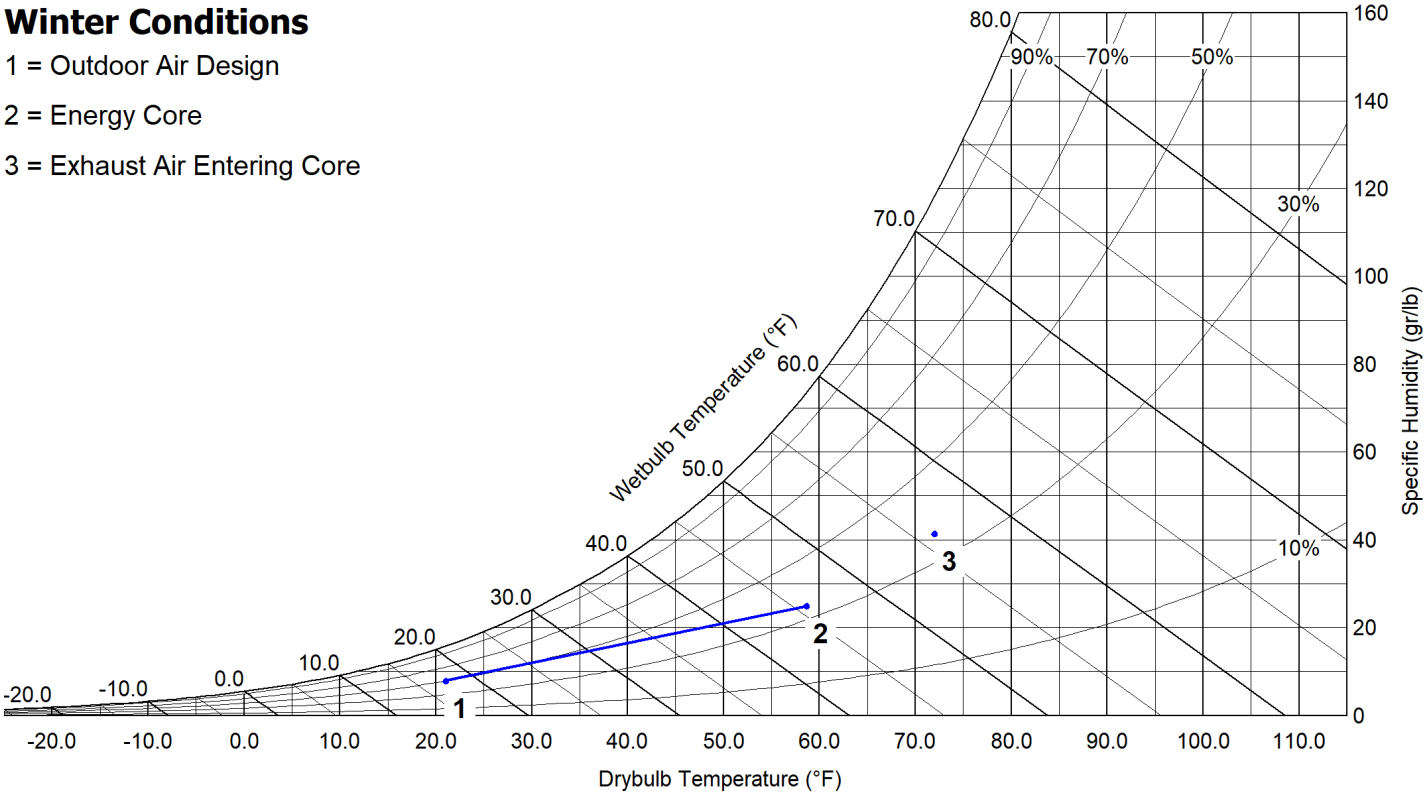
Supply Air Leaving	
Dry Bulb (F)	58.6
Wet Bulb (F)	45.4
Specific Humidity (gr/lb)	25
Enthalpy (BTU/lb)	17.9

Winter Conditions

1 = Outdoor Air Design

2 = Energy Core

3 = Exhaust Air Entering Core



AHRI Performance Ratings

Energy Recovery Performance Rating in accordance with AHRI Standard 1060 (I-P)						
Rated Airflow (SCFM)		Net Supply Airflow (SCFM)	EATR (%)	OACF	Pressure Drop (in. wg)	
Leaving Supply	Entering Exhaust				Supply	Exhaust
639	781	1100	0.2	1.05	0.56	0.69

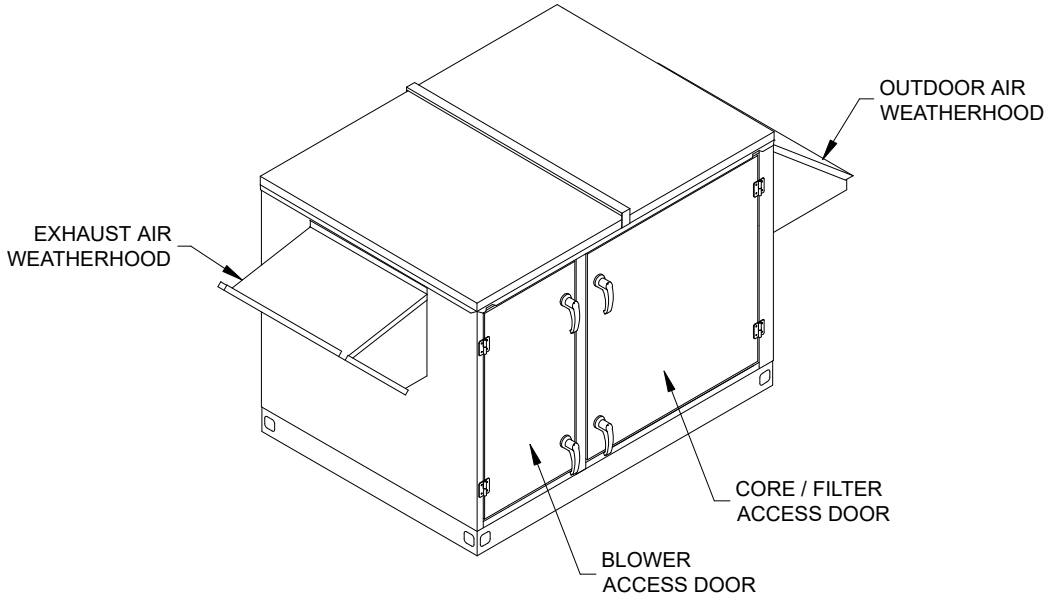
Thermal Effectiveness Ratings							
Enthalpy Recovery Ratio (%)		Sensible Effectiveness (%)		Latent Effectiveness (%)		Total Effectiveness (%)	
Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
66.2	66.7	76.4	73.6	53.5	50.7	65.5	66.7

Note(s)

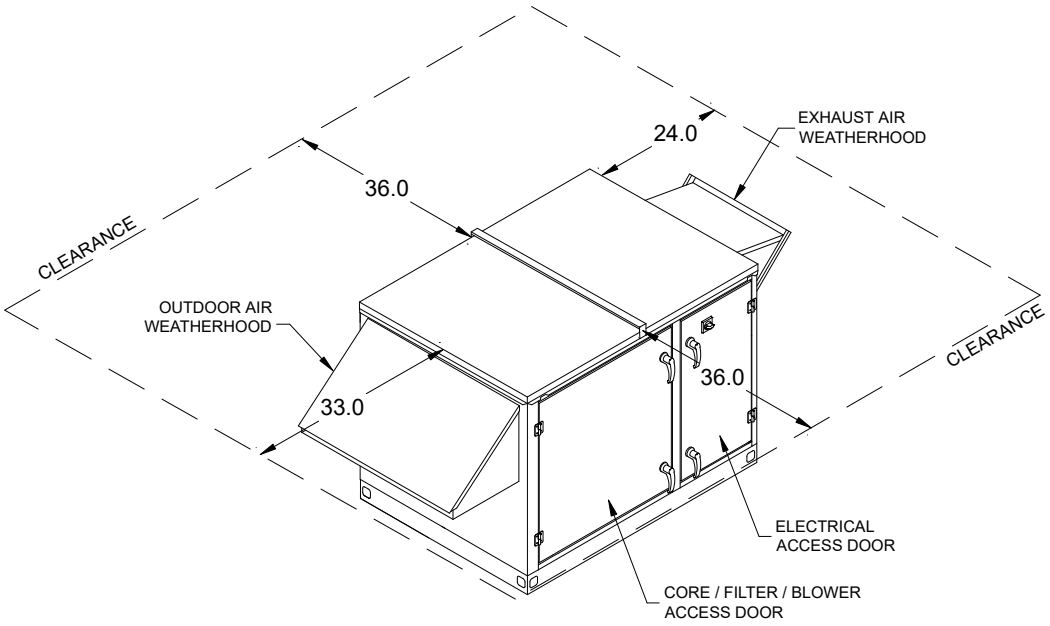
Summer Design Conditions:
Certified in accordance with the AHRI ERV Certification Program, which is based on AHRI Standard 1060. Certified units may be found in the AHRI Directory at www.ahridirectory.org.

Winter Design Conditions:
Please consult factory regarding AHRI Certification

Isometric Drawings



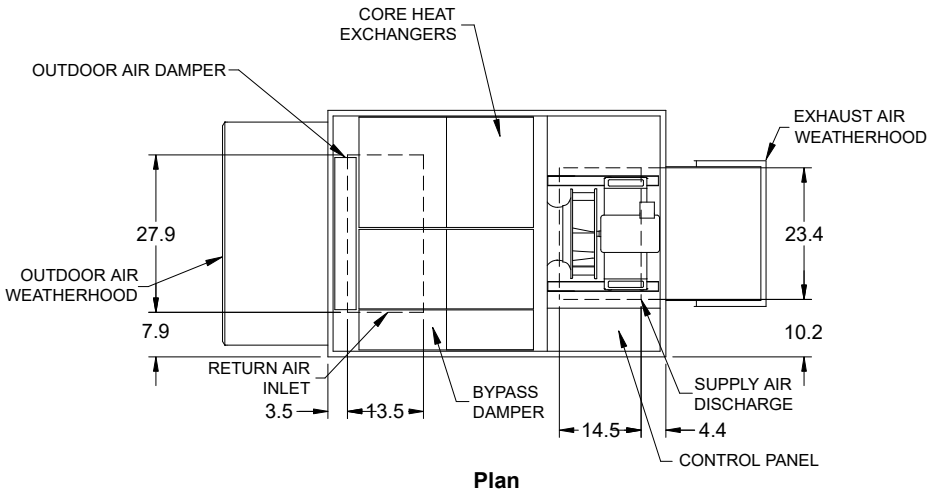
Back Right Isometric



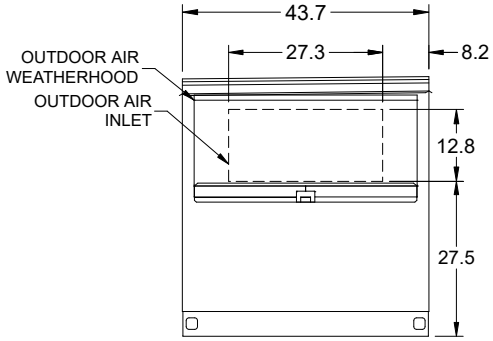
THE NON-ELECTRICAL SIDE CAN BE PLACED AGAINST A WALL. CLEARANCE TO THE ELECTRICAL SIDE IS ESSENTIAL TO PROVIDE ACCESS TO THE CONTROL CENTER AND COMPONENT MAINTENANCE.

Front Left Isometric

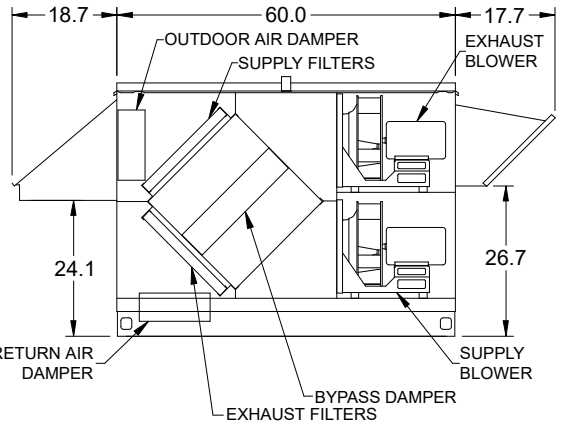
Overview Drawings



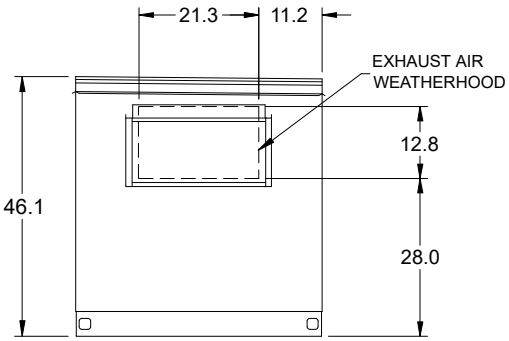
Plan



Left End



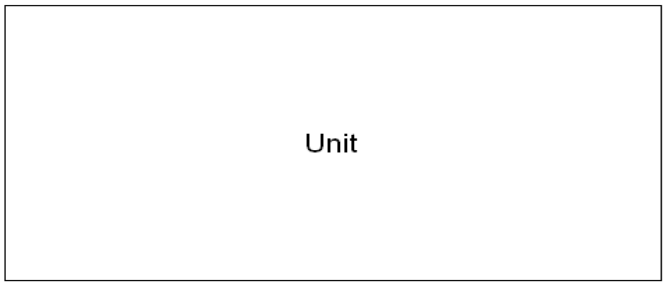
Elevation



Right End

Corner Weights

191 lb 168 lb



186 lb 164 lb

Note

Estimated corner weights are shown looking down on unit and the outside air intake will be on the left. Weights are applied at the base of the unit. Images not drawn to scale.

Microprocessor Controller Sequence of Operation

MICROPROCESSOR CONTROLLER

Controller shall be provided with the required sensors and programming for the preconditioner. Controller shall be factory programmed, mounted, and tested. Controller shall have an LCD readout for changing set points and monitoring unit operation.

UNIT START COMMAND (Unit will be enabled to start once a jumper is placed between R and G)

- Factory mounted and wired outdoor air damper actuator is powered.
- Exhaust blower starts after a delay (adj.).
- Supply blower starts after a delay (adj.).

UNIT STOP COMMAND (OR DE-ENERGIZED)

- Supply blower and exhaust blower de-energized.
- Outdoor air damper actuator is spring return closed.

SUPPLY BLOWER SEQUENCE

The supply blower speed will be controlled with the following sequence:

Constant Volume with VFD (on/off)

The supply blower is provided with a factory mounted and wired VFD and is intended to operate at a constant speed (adjustable set point in controller) during operation. This speed needs to be set during the test and balance of the unit.

EXHAUST BLOWER SEQUENCE

The exhaust blower speed will be controlled with the following sequence:

Constant Volume (on/off)

The exhaust blower is provided with a factory mounted and wired VFD and is intended to operate at a constant speed during operation. This speed needs to be set during the test and balance of the unit.

Constant Volume with VFD (on/off)

The exhaust blower is provided with a factory mounted and wired VFD and is intended to operate at a constant speed (adjustable set point in controller) during operation. This speed needs to be set during the test and balance of the unit.

ECONOMIZER SEQUENCE

The core is provided with a factory mounted bypass damper. When economizer is enabled, the bypass damper will cycle into a bypass condition, allowing cool air to flow past the energy recovery core rather than flow through it.

Temperature

The economizer will be locked out when the outdoor air is less than 50 F (adj.) or greater than 65 F (adj.).

ALARMS

The controller will display alarms and have one digital output for remote indication of an alarm condition. Possible alarms include:

AIRFLOW ALARM

The controller monitors the airflow proving switch on each blower. The controller will send an alarm if either of the airflow proving switches are not engaged.

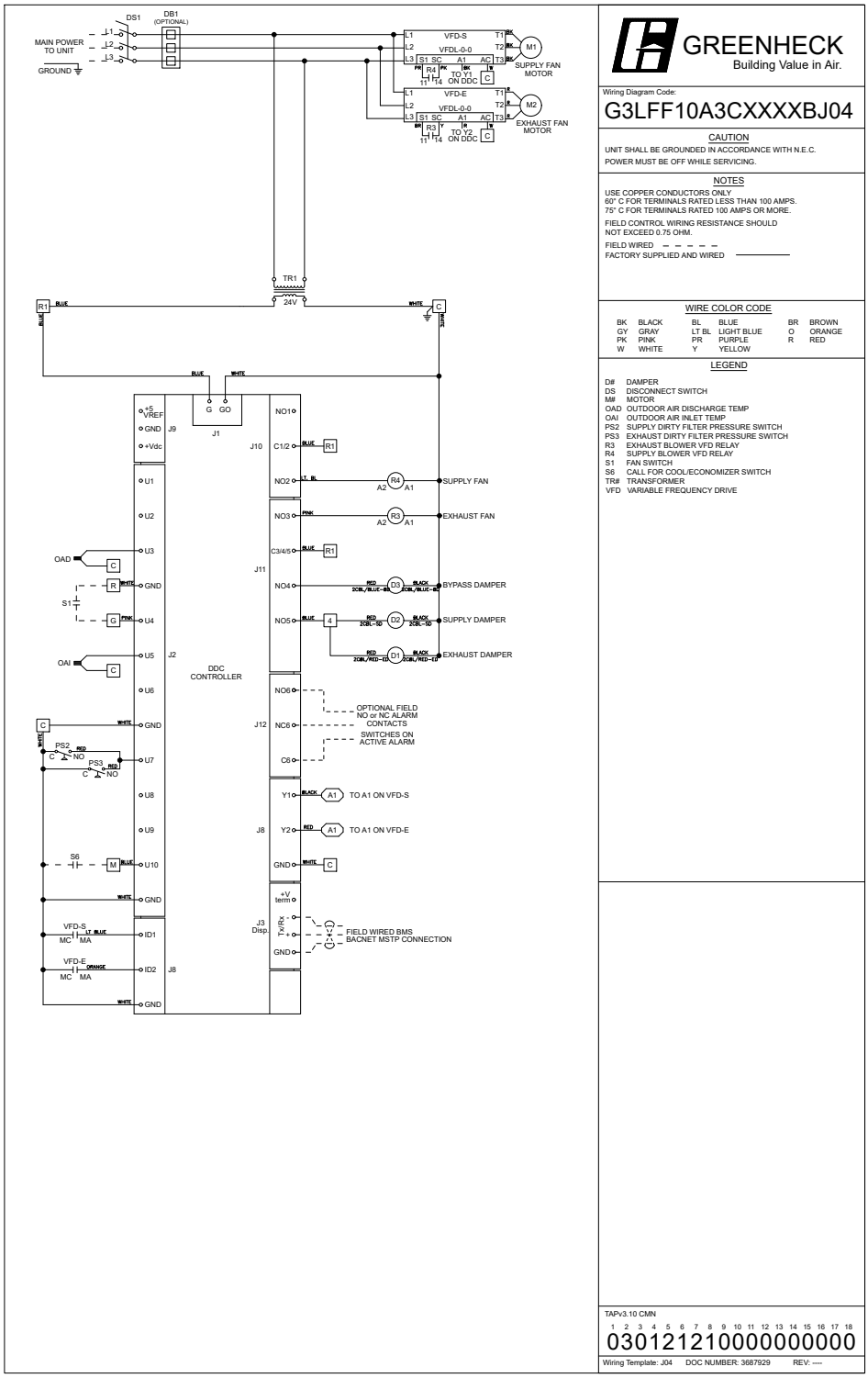
TEMPERATURE SENSOR ALARM

The controller sends an alarm if the temperature sensor fails.

DIRTY FILTER ALARM

A digital signal is sent to the controller indicating an increased pressure drop across the outdoor, exhaust, or supply air filters which must be adjusted in the field during start up. The controller will then provide a dirty filter alarm.

Wiring Diagram



Analog Inputs - Read Only

Variable	Description	BACNET (Object Type-AI, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Input, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Supply_Temp_Analog_Input	Supply Temperature	1	0.1	30031	X
Outside_Air_Temp_Analog_Input	Outside Air Temperature	2	0.1	30033	X
Exhaust_Temp_Analog_Input	Exhaust Temperature	3	0.1	30035	
Outside_RH_Analog_Input	Outside Relative Humidity %	4	0.1	30037	
Space_Static_Pressure_Analog_Input	Space Static Pressure	5	0.1	30039	
Supply_Duct_Static_Pressure_Analog_Input	Supply Duct Static Pressure	6	0.1	30041	
Space_CO2_1_Analog_Input	Space 1 CO2 ppm	7	10	30043	
Exhaust_Fan_Speed_Analog_Input	Exhaust Fan Speed Remote Command Input value (0-10 by others)	8	1	30045	
Supply_Fan_Speed_Analog_Input	Supply Fan Speed Remote Command Input value (0-10 by others)	9	0.1	30047	
Space_VOC_1_Analog_Input	Space 1 VOC ppm	10	10	30049	
Aux_In_Customer_1	Customer defined auxiliary input	31	0.1	30051	
Aux_In_Customer_2	Customer defined auxiliary input	32	0.1	30053	
Aux_In_Customer_3	Customer defined auxiliary input	33	0.1	30055	
Aux_In_Customer_4	Customer defined auxiliary input	34	0.1	30057	
Aux_In_Customer_5	Customer defined auxiliary input	35	0.1	30059	
Aux_In_Customer_6	Customer defined auxiliary input	36	0.1	30061	

Analog Values - Read/Write

Variable	Description	BACNET (Object Type-AV, Access-ReadCOV_Commandable)		MODBUS (Register Type-Holding, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Temperature_Setpoint	Temperature Set point	1	0	40001	X
Economizer_Temp_Enable_Setpoint	Economizer Ambient Temp Enable Setpoint. Allow Econ when OAT < Spt	2	0	40003	X
Economizer_Enthalpy_Enable_Setpoint	Economizer Enthalpy Enable Setpoint. Allow Econ when OA Enthalpy < Spt	3	0	40005	
Space_Static_Pressure_Setpoint	Space Static Pressure Setpoint	4	0.1	40007	
Supply_Duct_Static_Pressure_Setpoint	Supply Duct Static Pressure Setpoint	5	0.1	40009	
Space_CO2_Setpoint	Space CO2 Setpoint	6	0.1	40011	
Space_VOC_Setpoint	Space VOC Setpoint	7	0.1	40013	
SF_Control_Signal_BMS	BMS to control signal for supply fan speed	8	0.1	40015	
EF_Control_Signal_BMS	BMS to control signal for exhaust fan speed	9	0.1	40017	
Outside_RH_from_BMS	Outside RH from BMS. Used when source selection is set to BMS	10	0.1	40019	
Outside_Temp_from_BMS	Outside Temp from BMS. Used when source selection is set to BMS	11	0.1	40021	X
Space_1_CO2_from_BMS	Space 1 CO2 from BMS. Used when source selection is set to BMS	12	0.1	40023	
Space_Static_from_BMS	Space Static from BMS. Used when source selection is set to BMS	13	0.1	40025	
Space_VOC_from_BMS	SpaceVOC from BMS. Used when source selection is set to BMS	14	0.1	40027	
ER_Control_Signal_from_BMS	ER control signal from BMS. Used when source selection is set to BMS.	15	0.1	40029	
Aux_BMS_Analog_Output_1	BMS Commanded auxilary analog output	101	0.1	40101	
Aux_BMS_Analog_Output_2	BMS Commanded auxilary analog output	102	0.1	40103	
Aux_BMS_Analog_Output_3	BMS Commanded auxilary analog output	103	0.1	40105	
Aux_BMS_Analog_Output_4	BMS Commanded auxilary analog output	104	0.1	40107	

Analog Values - Read Only					
Variable	Description	BACNET (Object Type-AV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Input, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
Unit_Status_Mode	0: Off/Standby 1: Occupied Start 2: Opening Dampers3: Dampers Open 4: Fan Start Delay 5: Exhaust Fan Starting 6: Supply Fan Starting 7: System On 8: System Disabled 9: Remote Off 10: Shutdown Alarm 19: Fans and Energy Recovery 20: Economizing 21: Defrost Active 22: Overrides Active 23: Expansion Offline	45	0	30001	X
Supply_Temperature_Calculated_Setpoint	Active Supply Temperature Setpoint	46	0.1	30003	X
Defrost_Ramp	Defrost Ramp	47	1	30005	
Economizer_Ramp	Economizer Ramp	48	1	30007	X
Exhaust_Fan_Space_Static_Pressure_Ramp	Exhaust Fan Space Static Pressure Ramp	49	1	30009	
Exhaust_Fan_Supply_Tracking_Ramp	Exhaust Fan Supply Tracking Ramp	50	1	30011	
Space_CO2_Control_Ramp	Space CO2 Control Ramp	51	1	30013	
Supply_Duct_Static_Pressure_Ramp	Supply Duct Static Pressure Ramp	52	1	30015	
Supply_Fan_Space_Static_Pressure_Ramp	Supply Fan Space Static Pressure Ramp	53	1	30017	
Outside_Dewpoint	Outside Dewpoint	54	0.1	30019	
Outside_Enthalpy	Outside Enthalpy	55	0.1	30021	
Energy_Recovery_Analog_Output	Energy Recovery Analog Output	56	0.1	30023	
Exhaust_Fan_Speed_Analog_Output	Exhaust Fan Speed Analog Output	57	0.1	30025	X
Supply_Fan_Speed_Analog_Output	Supply Fan Speed Analog Output	58	0.1	30027	X

Integer Values - Read Only					
Variable	Description	BACNET (Object Type-IV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Holding, Size-2)	Included
		OBJECT INSTANCE	HYST	INDEX	
LatestAlm	Most recent alarm. See alarm table	1	1	30101	X

Binary Inputs - Read Only

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BI, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Discrete)	Included
				OBJECT INSTANCE	HYST	INDEX	
Supply_Fan_1_Status_Digital_Input	Supply Fan 1 Status	Active	Inactive	10	0	10101	X
Exhaust_Fan_1_Status_Digital_Input	Exhaust Fan 1 Status	Active	Inactive	11	0	10102	X
Unit_Enable_Digital_Input	Remote Unit Enable Digital Input Status	Active	Inactive	12	0	10103	X

Binary Values - Read/Write

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-Read_Commandable)		MODBUS (Register Type-Coil)	Included
				OBJECT INSTANCE	HYST	INDEX	
BMS_Watchdog	BMS Watchdog command. Used to determine comm status. Must heartbeat within the watchdog timeout delay to detect comm status	Active	Inactive	1	0	2	X
System_Enable	Master system enable/disable point	Enable	Disable	2	0	3	X
Reset_All_Alarms	Alarm Reset Command	Reset	Normal	3	0	4	X
Outside_RH_Source_BMS	Outside RH Source Selection. True = BMS. False = Local	BMS	Local	4	0	5	
Outside_Temp_Source_BMS	Outside Temp Source Selection. True = BMS. False = Local	BMS	Local	5	0	6	X
Space_1_CO2_Source_BMS	Space 1 CO2 Source Selection. True = BMS. False = Local	BMS	Local	6	0	7	
Space_Static_Source_BMS	Space Static Source Selection. True = BMS. False = Local	BMS	Local	7	0	8	
SF_Control_Source_BMS	Allows the BMS to control supply fan speed. True = BMS. False = Local	BMS	Local	8	0	9	
EF_Control_Source_BMS	Allows the BMS to control exhaust fan speed. True = BMS. False = Local	BMS	Local	9	0	10	
Space_VOC_Source_BMS	Space VOC Source Selection. True = BMS. False = Local	BMS	Local	10	0	11	
Econ_Enable_Source_BMS	Economizer Enable Source Selection. True = BMS. False = Local	BMS	Local	11	0	12	X
Econ_Enable_from_BMS	Economizer Enable from BMS. Used when source selection is set to BMS	Enable	Disable	12	0	13	X
ER_Control_Source_BMS	ER Economizer Control Signal from BMS True = BMS False = Local	BMS	Local	13	0	15	

Binary Values - Read Only

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-ReadCOV_NoWrite)		MODBUS (Register Type-Discrete)	Included
				OBJECT INSTANCE	HYST	INDEX	
Global_Alarm	General alarm point. Optionally set to indicate any alarm is active, or a shutdown alarm is active	Alarm	Normal	30	0	10002	X
System_Shutdown_Alarm	Shutdown alarm status. When true, System Enable will be set to false and the unit will remain off	Shutdown	Normal	31	0	10003	X
Manual_Override_Active	Indicates that manual overrides are active	Override	Normal	32	0	10004	X
Heat_Wheel_Enable_Digital_Output	Heat Wheel Enable Digital Output	Active	Inactive	33	0	10005	
BMS_Offline_Alarm.Active	BMS Offline Alarm (0=Normal 1=Alarm)	Alarm	Normal	34	0	10006	X
Exhaust_Fan_1_Alarm.Active	Exhaust Fan 1 Alarm (0=Normal 1=Alarm)	Alarm	Normal	35	0	10007	X
Outside_Air_Temperature_Sensor_Alarm.Active	Outside Air Temperature Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	36	0	10008	X
Filter_Alarm.Active	Outside Filter Alarm (0=Normal 1=Alarm)	Alarm	Normal	37	0	10009	X
Outside_RH_Sensor_Alarm.Active	Outside RH Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	38	0	10010	
Space_CO2_1_Analog_Input_Alarm.Active	Space CO2 1 Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	39	0	10011	
Space_High_Static_Alarm.Active	Space High Static Alarm (0=Normal 1=Alarm)	Alarm	Normal	40	0	10012	
Space_Static_Pressure_Analog_Input_Alarm.Active	Space Static Pressure Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	41	0	10013	
Supply_Air_Temp_Low_Limit.Active	Supply Air Temp Low Limit Alarm (0=Normal 1=Alarm)	Alarm	Normal	42	0	10014	X
Supply_Air_Temperature_Sensor_Alarm.Active	Supply Air Temperature Sensor Alarm (0=Normal 1=Alarm)	Alarm	Normal	43	0	10015	X
Supply_Duct_Static_Pressure_Analog_Input_Alarm.Active	Supply Duct Static Pressure Analog Input Alarm (0=Normal 1=Alarm)	Alarm	Normal	44	0	10016	
Supply_Fan_1_Alarm.Active	Supply Fan 1 Alarm (0=Normal 1=Alarm)	Alarm	Normal	45	0	10017	X
Supply_High_Duct_Static_Alarm.Active	Supply High Duct Static Alarm (0=Normal 1=Alarm)	Alarm	Normal	46	0	10018	
Wheel_Rotation_Alarm.Active	Wheel Rotation Alarm (0=Normal 1=Alarm)	Alarm	Normal	47	0	10019	
ER_Wheel_High_DP.Active	Energy Recovery Wheel high differential pressure (0=Normal 1=Alarm)	Alarm	Normal	48	0	10020	
Greentrol_1_Alarm.Active	Greentrol Device Alarm	Alarm	Normal	49	0	10021	
Greentrol_2_Alarm.Active	Greentrol Device Alarm	Alarm	Normal	50	0	10022	

Binary Values - Commandable

Variable	Description	ACTIVE TEXT	INACTIVE TEXT	BACNET (Object Type-BV, Access-ReadCOV_Commandable)		MODBUS (Register Type-Coil)	Included
				OBJECT INSTANCE	HYST	INDEX	
Aux_BMS_Digital_Output_1	BMS Commanded auxilary digital output	Active	Inactive	101	0	21	
Aux_BMS_Digital_Output_2	BMS Commanded auxilary digital output	Active	Inactive	102	0	22	
Aux_BMS_Digital_Output_3	BMS Commanded auxilary digital output	Active	Inactive	103	0	23	
Aux_BMS_Digital_Output_4	BMS Commanded auxilary digital output	Active	Inactive	104	0	24	
Aux_BMS_Digital_Output_5	BMS Commanded auxilary digital output	Active	Inactive	105	0	25	
Aux_BMS_Digital_Output_6	BMS Commanded auxilary digital output	Active	Inactive	106	0	26	

Warranty Statement for ERV Preconditioners

Unit Warranty

Greenheck warrants the equipment to be free from defects in material and workmanship for a period of 18 months from the date of shipment. Initial startup must be completed within six months of the shipment date, and a startup report must be submitted to Greenheck.

Total Energy Core Warranty

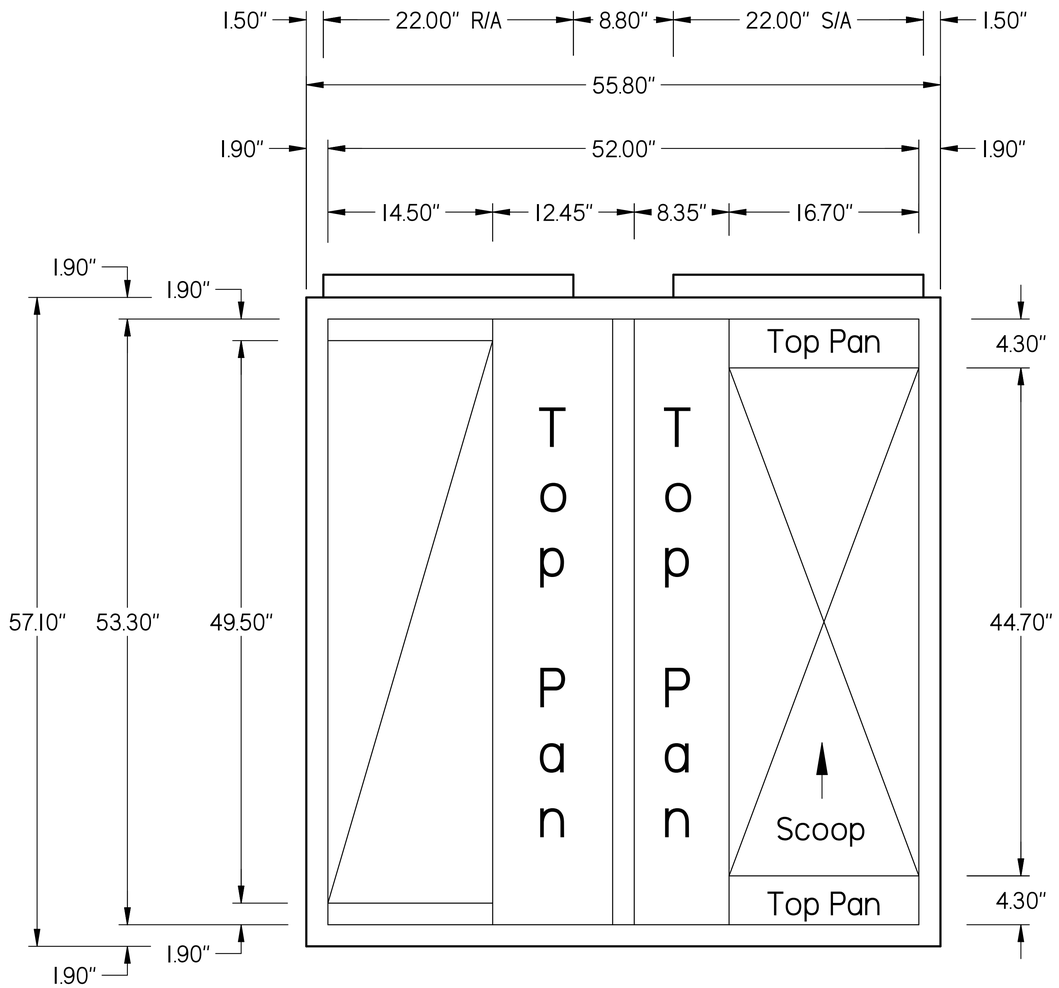
The enthalpy core is warranted to be free from defects in material and workmanship for a period of 5 years from the shipment date.

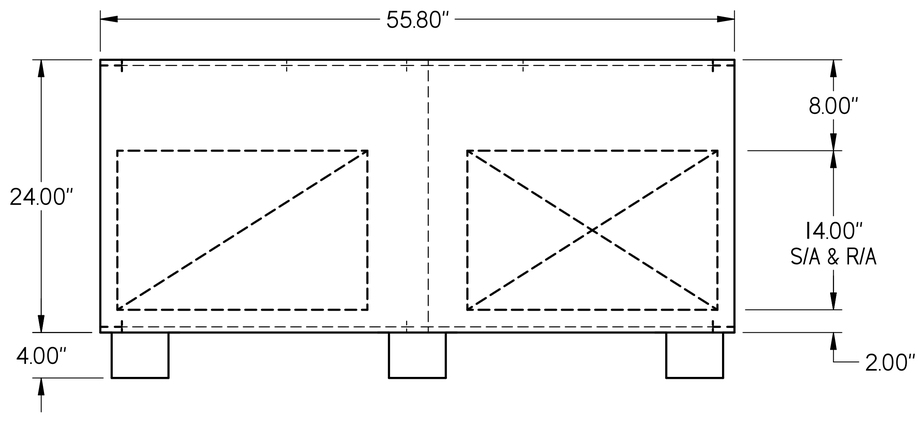
Warranty Notes

Any component which proves defective during the warranty period will be repaired or replaced at Greenheck's sole option when returned to our factory, transportation prepaid. All warranties do not include labor costs associated with troubleshooting, removal, or installation. Greenheck will not be liable for any consequential, punitive, or incidental damages resulting from use, repair, or operation of any Greenheck product. These warranties are exclusive and are in lieu of all other warranties, whether written, oral, or implied, including the warranty of merchantability and the warranty of fitness for a particular purpose. No person (including any agent or salesperson) has authority to expand Seller's obligation beyond the terms of this warranty, or to state that the performance of the product is other than that published by Seller.

As a result of our commitment to continuous improvement, Greenheck reserves the right to change specifications without notice.

REVISION HISTORY			
REV	DESCRIPTION	DATE	ENGINEER
1	INITIAL DRAWING	2/28/23	TK





"IN THE ABSENCE OF A SIGNED DRAWING, MGM PRODUCTS ACCEPTS THE P.O AS CONFIRMATION OF WHAT IS TO BE BUILT"

APPROVED BY: DATE:

MGM PRODUCTS, INC.

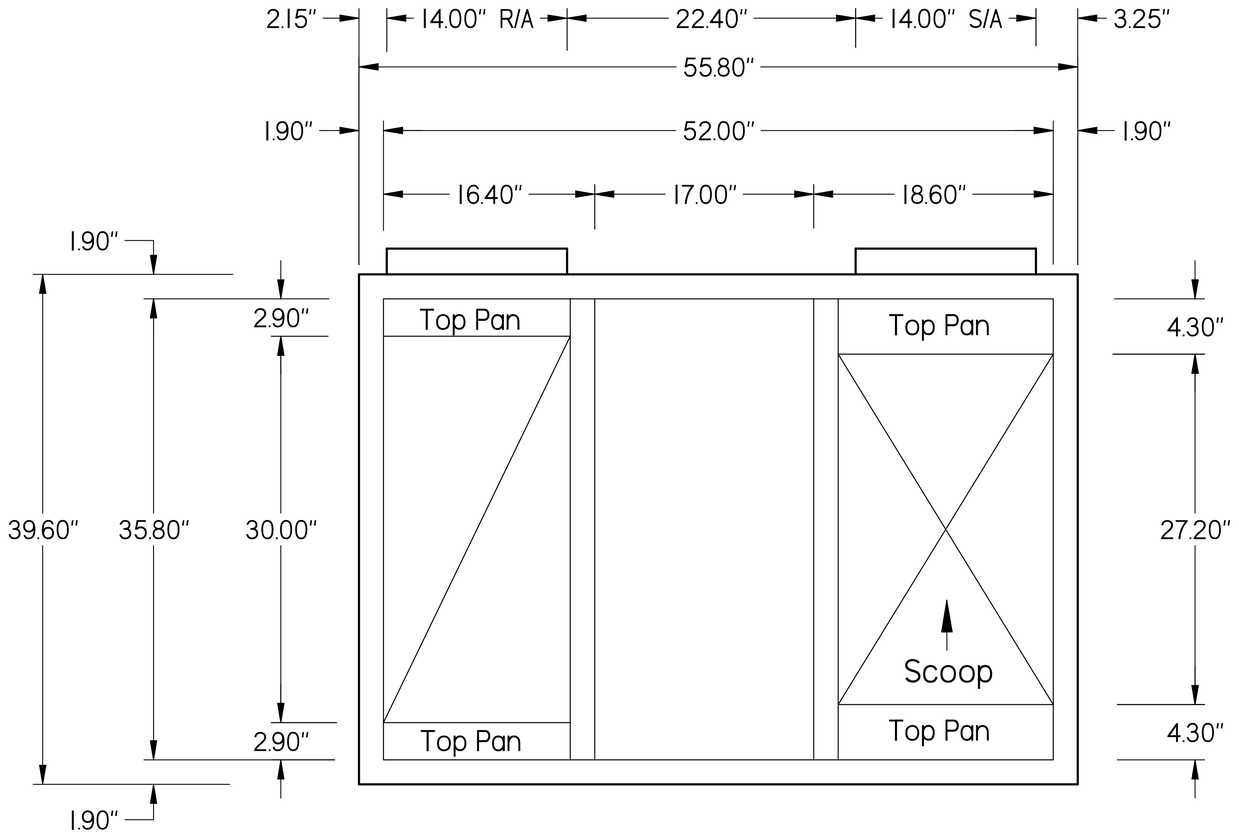
1080 CULPEPPER DRIVE CONYERS, GA 30094
PHONE: (770) 483-0055; (800) 341-3536 FAX: (770) 483-0130
WWW.MGMPRODUCTS.COM

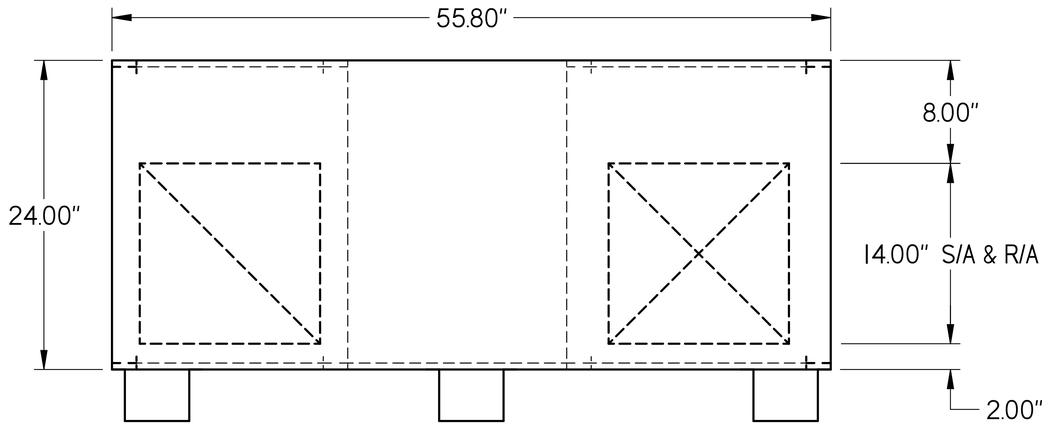
NOTES:

1. 18Ga Galvanized
2. 1" FSK Insulation
3. Gasketing & Lifting Eyes

TITLE	ECV-30-P-L [24" Tall Horiz. Pad Mount]		
	NAME	DATE	US Army NC026 Q# 54555 ERV-1
DRAWN	TK	2/28/2023	
WEIGHT			
SHEET	SHEET 1 OF 1		
FILE NAME	ECV-30-P-L (24" TALL HORIZ. PAD MOUNT)-(Q# 54555)-(ERV-1).DFT		

REVISION HISTORY			
REV	DESCRIPTION	DATE	ENGINEER
1	INITIAL DRAWING	2/28/23	TK





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TITLE	ECV-20-P-L [24" Tall Horiz. Pad Mount]		
	NAME	DATE	US Army NC026 Q# 54555 ERV-2
DRAWN	TK	2/28/2023	
WEIGHT			
SHEET	SHEET 1 OF 1		
FILE NAME	ECV-20-P-L (24" TALL HORIZ. PAD MOUNT)-(Q# 45555)-(ERV-2).DFT		