

SUBMITTAL

Job Title: HANNAFORD FOREST AVE

Engineer: WBRC
Contractor: AIR TEMP
Elevation: (ft) 62
Date: 07/10/15
Submitted By: Jeff Berry

BUCKLEY ASSOCIATES INC
498B WOODFORD STREET
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SUBMITTAL NOTES:

MAKE UP AIR UNITS



P.O. Box 410 Schofield, WI 54476 (715) 359-6171 FAX (715) 355-2399 www.greenheck.com

DGK-112-H15-01

CONSTRUCTION FEATURES AND ACCESSORIES

Unit Overview

Model	Airflow (CFM)	Heating	Cooling	Electrical V/C/P
DGK-112-H15-01	3,150	Direct Gas	No Cooling	208/60/3

Features

- Exterior housing constructed of galvanized steel
- Removable access panels
- Painted or galvanized steel blower and bearing supports
- Forward curved steel blower and motor
- Fan assembly is mounted on vibration isolators
- Motor pulleys are adjustable through 15 hp and fixed for 20 hp and greater
- Fan shaft is mounted in permanently lubricated ball bearings (up through size 118) or ball bearing pillow blocks (size 120 and greater)
- Static free belts
- Corrosion resistant fasteners are standard
- Disconnect mounted by factory

Options and Accessories

- Air Flow Arrangement: Outdoor Air Only
- Weatherhood: Aluminum Mesh, 16x20x2(4)
- Damper: Inlet
- Outdoor Air Intake Position: End
- Discharge Position: Downblast
- Coating: Permator
- Insulation: Duct Liner - Heat Source On
- 1 Set(s) of Spare Belts (ships loose)
- Access Side: Right-Hand
- Control Center
- Heat Inlet Air Sensor
- Mounting: GPI-27.5/27.5-G20
- Curb Includes: 1.5 in. Insulation, Duct Adaptor
- Unit Warranty: 1 Yr (Standard)



NOTES:

Integral unit disconnect is supplied as a standard.

Inlet damper being supplied is a VCD-23. The VCD-23 series is a low leakage, motorized damper. The VCD-23 is IECC (International Energy Consumption Code) compliant with a leakage rating of 3 CFM/ft² at 1 in. wg or less.

DGK-112-H15-01

PERFORMANCE AND SPECIFICATIONS

Description/Arrangement

Model	Qty	Unit Weight (lb)	Discharge Position	Air Flow Arrangement	Unit Arrangement
DGK-112-H15-01	1	521	Downblast	Outdoor Air Only	Horizontal

Design Conditions

Elevation (ft)	Summer DB (F)	Summer WB (F)	Winter DB (F)
62	87	74	0

Air Performance

Type	Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor Size (hp)
Supply	3,150	0.5	1.401	1014	1.52	2

Electrical/Motor Specifications

V/C/P	Unit MCA (amps)	Unit MOP (amps)	Enclosure	Supply Motor RPM	Supply Efficiency
208/60/3	10.1	15	ODP	1725	Premium

Heating/Cooling Specifications

Heating Type	Gas Type	Input (MBH)	Output (MBH)	LAT (F)	Temp. Rise (F)
Direct Gas	Natural	260.0	239.2	70.0	70.0

Sound Performance in Accordance with AMCA

Fan	Sound Power by Octave Band								Lwa	dBA	Sones
	62.5	125	250	500	1000	2000	4000	8000			
Supply	92	85	75	74	71	68	65	58	78	67	14.4

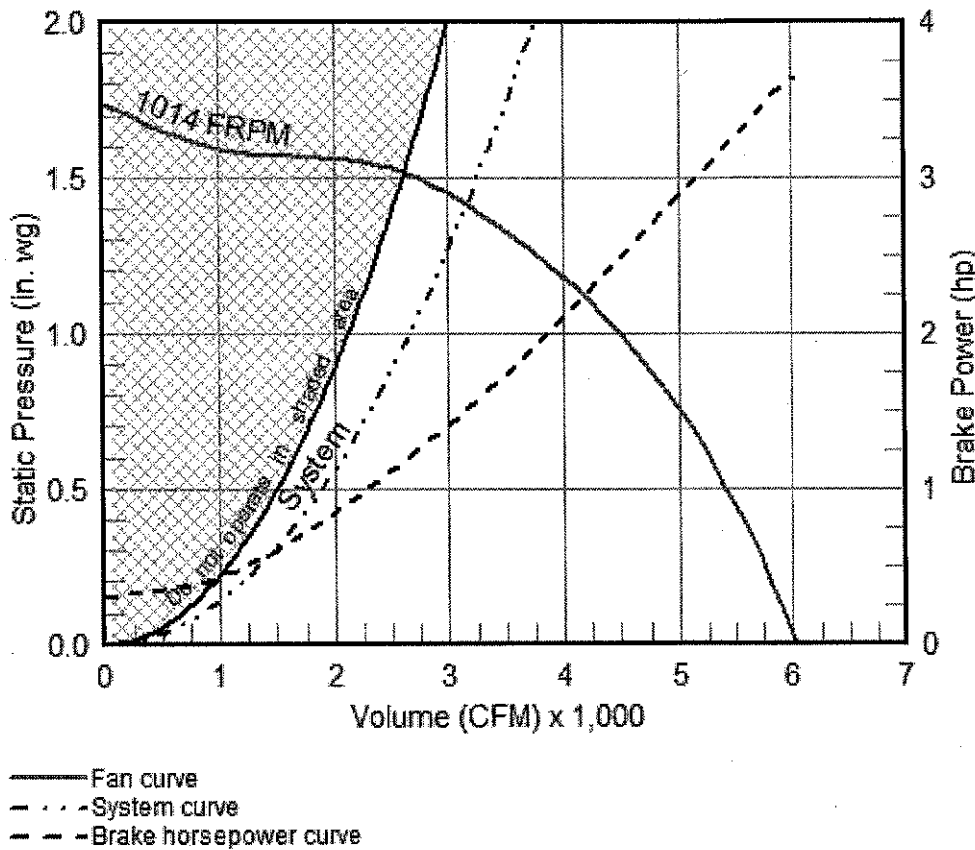
Unit Pressure Drop (in. wg)

Air Stream	Weatherhood	Damper Section	Filter Section	Cooling Section	Heating Section
Supply	0.101	0.175	0	0	0.625

DGK-112-H15-01 FAN CURVES

Supply Fan Performance

Volume (CFM)	Supply SP (in wg)	Total SP (in wg)	RPM	Operating Power (hp)	Motor Size (hp)	Fan Quantity
3150	0.5	1.401	1014	1.52	2	1



DGK-112-H15-01

HEATING PERFORMANCE

Direct Gas Heating

Heating Type	Gas Type	Input (MBH)	Output (MBH)	LAT (F)	Temp. Rise (F)
Direct Gas	Natural	260.0	239.2	70.0	70.0

Direct Gas Unit Details

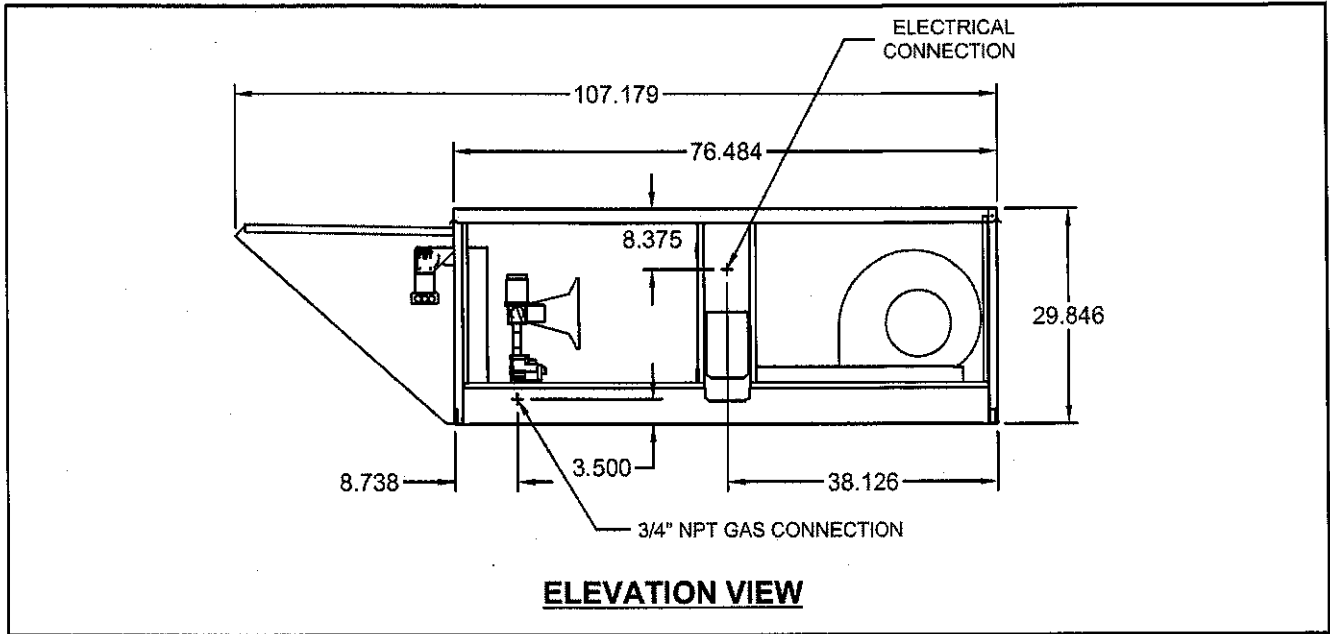
This unit will come equipped with the following:

- 92% Efficiency
- Direct Spark Ignition
- High quality cast aluminum burners with stainless steel mixing plates
- 25:1 Turndown Ratio
- Maxitrol electronic modulation burner control

Heating Details

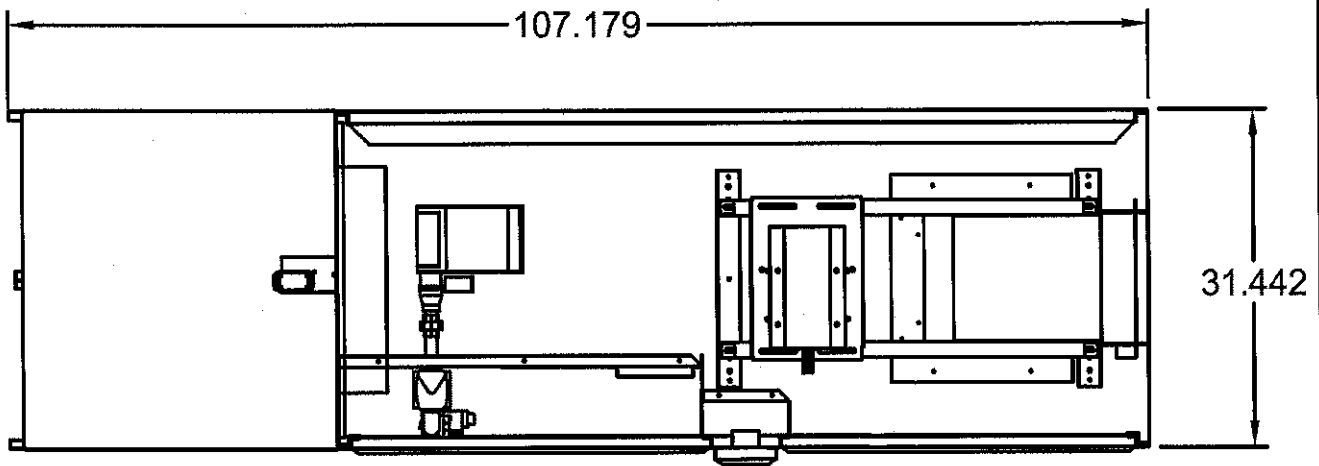
Agency Approval	ETL and IRI
Building Gas Pressure	1/2 PSI
Temperature Control	Discharge
Units Rated Gas Pressure	1/2 PSI
Ignition Control	Direct Spark
Flame Sensing	Flame Rod
Min Gas Pressure For Maximum Fire	9 (in. WC)

DGK-112-H15-01



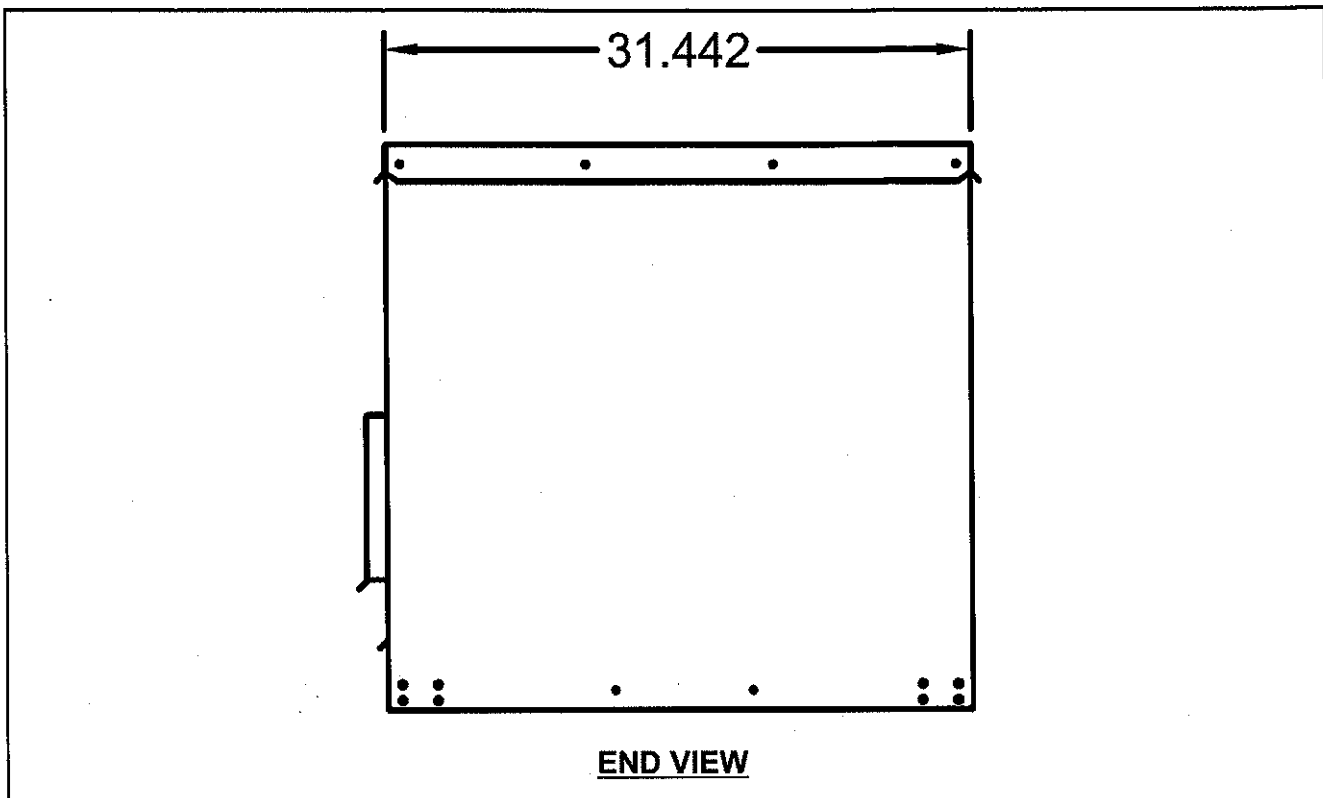
ELEVATION VIEW

*Standard configuration for unit access is on the right-hand side, when looking into the unit intake in the direction of airflow.
 *Note: Order of unit sections is from intake of unit to discharge of unit.
 *Sections included on this unit: Weatherhood Section, Heating Section
 *Insulation: DuctLiner, from Burner Section through end of unit.



PLAN VIEW

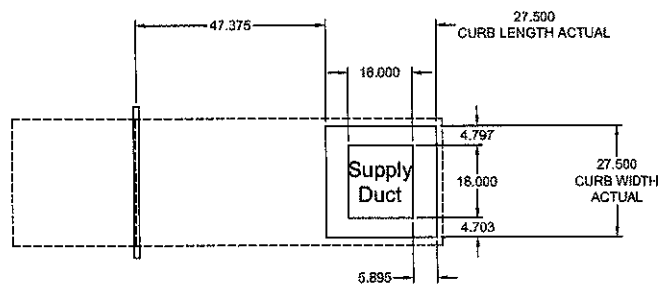
* Standard configuration for unit access is on the right-hand side, when looking into the unit intake in the direction of airflow.



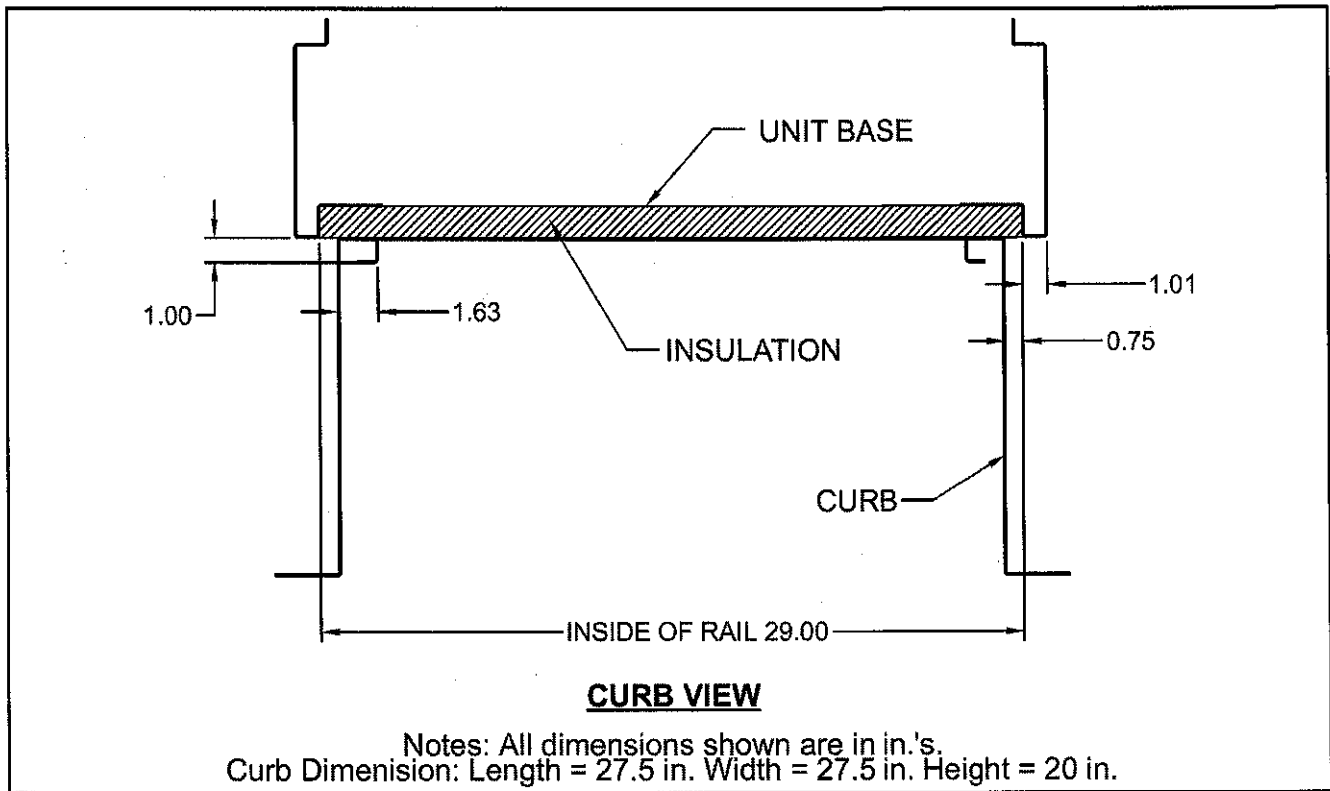
NOTE: Roof Opening Requirements:

Minimum Roof Opening: The minimum roof opening size is the illustrated duct diameter plus 0.25" on all sides.
For example: If the duct size is 14 x 14 inches square, the minimum roof opening size is 14.5 x 14.5 inches square.

Maximum Roof Opening: There must be a minimum perimeter of 1.75" between the roof opening and the roof curb.
For example: If the roof curb is 75 x 30 inches square, the maximum roof opening is 71.5 x 26.5 inches square.



NOTE: The weatherhood and filter sections of the make-up air unit are not supported by the curb. This is by design, in order to help alleviate water infiltration issues.



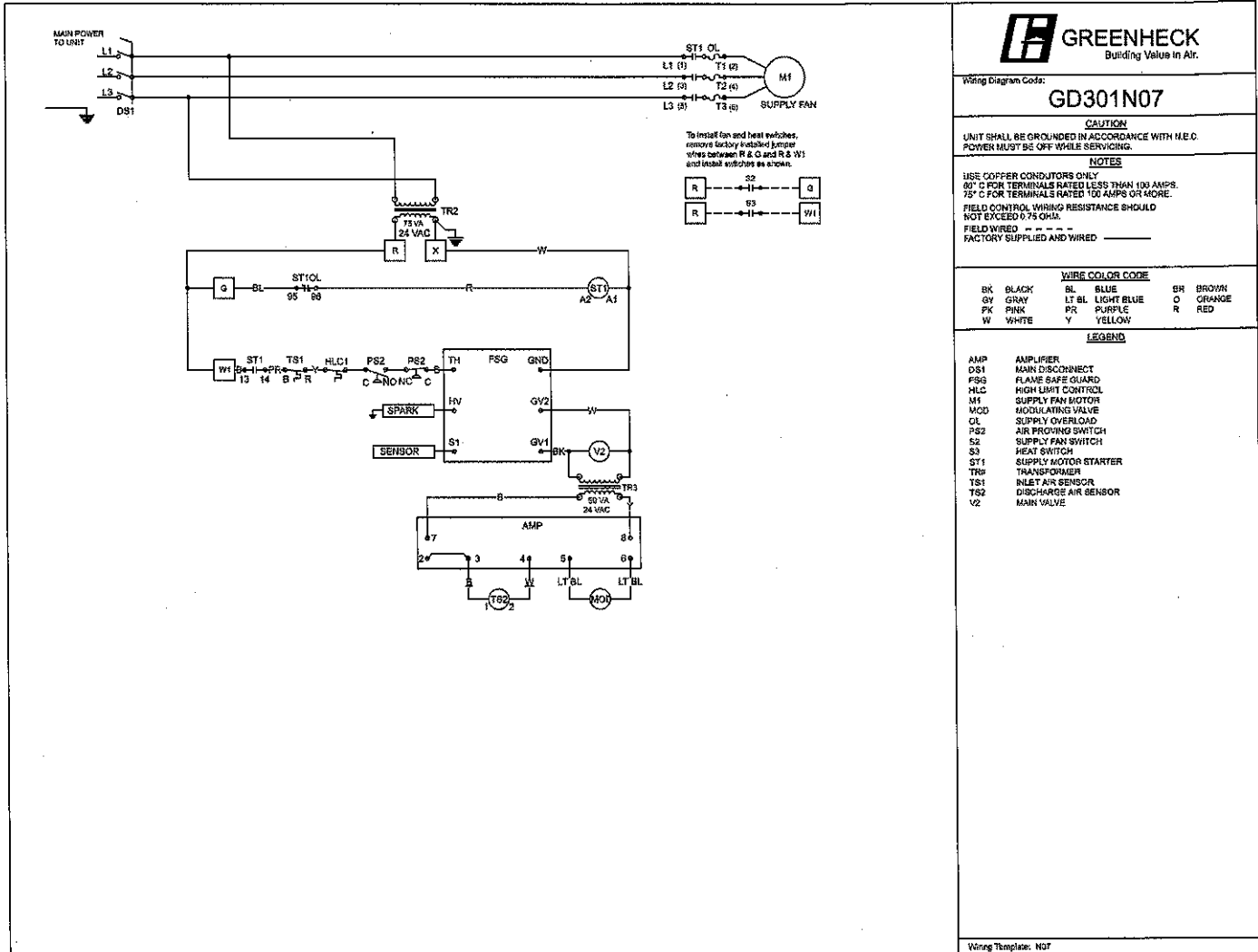
Recommended Minimum Combustible Clearances				
	Floor	Top	Sides	Ends
Insulated/Units	0 in.	0 in.	0 in.	0 in.
Non-Insulated/Units	0 in.	6 in.	6 in.	6 in.

Clearance to combustibles is defined as the minimum distance required between the heating source and the adjacent combustible surfaces to ensure the adjacent surface's temperature does not exceed 90 F above the ambient temperature.

Recommended Minimum Service Clearances	
Housing 32 and less	42 in. on the controls side of the unit
Housing 35 and higher	48 in. on the controls side of the unit

To ensure ample space for component removal (evaporative cooling media, coils, filters, etc.), service clearances should be 6 in. wider than the width of the module itself.

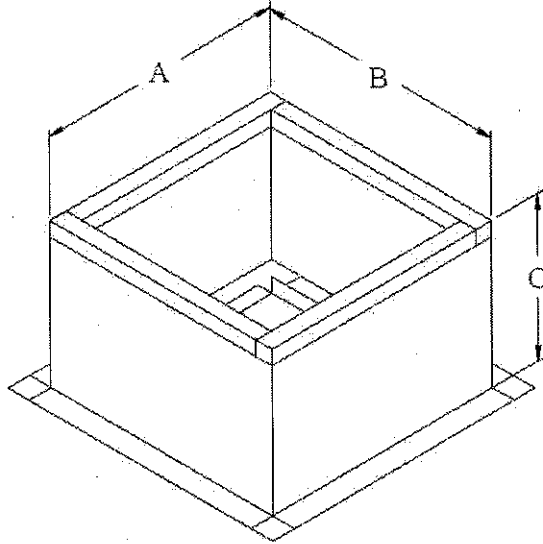
EQUIPMENT SCHEDULE													
Tempered Make-Up Air Unit											Mark: MUA-1		
Qty	Greenheck Model	Volume	External SP		FRPM	Operating Power	Weight	Motor Information					MCA
			Total SP					Size	V/C/P	Encl.	Motor RPM	Windings	
1	DGK-112-H15-01	3,150 CFM	0.5 in. wg	1.401 in. wg	1014 RPM	1.52 hp	521 lb	2 hp	208/60/3	ODP	1725	1	10.1
Heating													
Type	Gas Type	Temperature			Energy			Connection Gas	Building Gas Pressure	Control Access			
		Winter DB	Max Δ	Max LAT	Input	Output	Efficiency						
Direct Gas	Natural	0 F	70.0 F	70.0 F	260.0 MBH	239.2 MBH	92%	3/4"	1/2 PSI	Right Hand			
Outlet Sound Power By Octave Band								LwA	dBA	Sones			
62.5	125	250	500	1000	2000	4000	8000						
92.3	84.6	74.8	74.1	71.1	68.4	65.4	57.5	77.5	66.5	14.4			
<ul style="list-style-type: none"> • LwA - A weighted sound power level based on ANSI S1.4 • dBA - A weighted sound pressure level base on 11.1 dB attenuation per octave band at 5.0 ft. • Noise Criteria (NC) based on an average attenuation of 11.5 dB per octave band at 5.0 ft. 													
OPTIONS AND ACCESSORIES													
Air Flow Arrangement: Outdoor Air Only Weatherhood: Aluminum Mesh, 16x20x2(4) Damper: Inlet Outdoor Air Intake Position: End Discharge Position: Downblast Coating: Permatector Insulation: Duct Liner - Heat Source On 1 Set(s) of Spare Belts (ships loose) Access Side: Right-Hand Control Center Heat Inlet Air Sensor Direct Gas Options/Accessories Approvals: ETL and IRI Temperature Control: Discharge Flame Sensing: Flame Rod Ignition Control: Direct Spark Unit Rated Gas Pressure: 1/2 PSI Mounting: GPI-27.5/27.5-G20 Curb Includes: 1.5 in. Insulation, Duct Adaptor Unit Warranty: 1 Yr (Standard)													



Manufacturer reserves the right to change, modify, or improve this product at anytime

DGK-112-H15-01

Roof Curb - GPI



CONSTRUCTION FEATURES

- Welded aluminum (0.064 in.) or galvanized steel (18 ga.)
- Straight sided • 2 in. mounting flange • 1 in., 3 lb. density insulation • Wood nailer

Dimension	Description	Value (in.)
A	Length	27.5
B	Width	27.5
C	Height	20

* All dimensions are actual

ADDITIONAL NOTES

- The Roof Opening Dimension may NOT match the Structural Roof Support Dimension.
- Curbs with length > 143.5 will ship knocked-down
- Curbs with length > 119.5 may ship knocked-down, dependent on manufacturing location

DGK-112-H15-01

SEQUENCE OF OPERATIONS

MAKE-UP AIR UNIT CONTROLS: The Make-Up Air unit will be provided from the factory with an integral control center including: a single non-fused disconnect, 24VAC transformer, terminal strip, and fan starters (contactor and overload).

OCCUPIED MODE: Within the unit control center, a contact closure must be made in the terminal strip (connecting terminal points R and G) to control unit startup or shutdown.

Outdoor Air Only: The make-up air unit will be sized to handle a constant 100% outdoor air volume. Any adjustments to airflow performance will need to be done by adjusting or replacing sheaves and belts.

Startup (Contact Closes)

- Inlet damper actuator is energized and powers open
- Supply fan starter is enabled

Shutdown (Contact Opens)

- Supply blower is de-energized
- Inlet damper actuator is de-energized, damper closes (spring return)

HEATING CONTROL: Within the unit control center, a contact closure must be made in the terminal strip (connecting terminal points R and W1) to control the call for heating.

Direct Gas: This make-up air unit is controlled by:

Heating Inlet Air Sensor (Heating Lock-Out): The heating inlet air sensor will automatically turn the heating on and off based on a field-adjustable set point. (A contact closure must still be provided between R and W1).

Note: If outside air conditions are above set point, there will not be a call for heating.

Heat Enable Sequence of Operations

- If inlet air temperature is below set point, inlet air temperature sensor is energized.
- High limit control (160 F) contact remains closed if temperature remains below set point.
- Power passes through high and low gas pressure contacts if gas pressure is within set range.
- Power passes through airflow switches if there is proper airflow across the burner.
- Power passes to Flame Safeguard, which begins its sequence.
(See Direct Gas Burner Sequence)

Direct Gas Burner Sequence Direct Spark Ignition

- Flame Safeguard
 - o Checks for proper airflow
 - o Verifies no flame present at burner
 - o Initiates 15 second pre-purge
 - o Sends power to open gas valve and energizes the spark generator
 - o Spark Generator ignites for up to 10 seconds to ignite burner
 - o Once the burner is ignited (in low fire) the flame is confirmed
 - o Shuts down spark generator
 - o Continuously monitors the flame and airflow

CONTROLS

Temperature Control

Discharge Control: This unit's burner will modulate to maintain a field-set discharge temperature set point. The location of the controls is listed below.

- The discharge temperature is controlled from a dial located within the unit control center.

Warranty Information

Limited Warranty - Unit

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of 1 year(s) from the purchase date. 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.

The warranty does 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.

This warranty is exclusive, and is 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.

DGK-110-H15-01

CONSTRUCTION FEATURES AND ACCESSORIES

Unit Overview

Model	Airflow (CFM)	Heating	Cooling	Electrical V/C/P
DGK-110-H15-01	1,925	Direct Gas	No Cooling	208/60/3

Features

- Exterior housing constructed of galvanized steel
- Removable access panels
- Painted or galvanized steel blower and bearing supports
- Forward curved steel blower and motor
- Fan assembly is mounted on vibration isolators
- Motor pulleys are adjustable through 15 hp and fixed for 20 hp and greater
- Fan shaft is mounted in permanently lubricated ball bearings (up through size 118) or ball bearing pillow blocks (size 120 and greater)
- Static free belts
- Corrosion resistant fasteners are standard
- Disconnect mounted by factory

Options and Accessories

- Air Flow Arrangement: Outdoor Air Only
- Weatherhood: Aluminum Mesh, 16x20x2(4)
- Damper: Inlet
- Outdoor Air Intake Position: End
- Discharge Position: Downblast
- Coating: Permator
- Insulation: Duct Liner - Heat Source On
- Access Side: Right-Hand
- Control Center
- Heat Inlet Air Sensor
- Mounting: GPI-27.5/27.5-G20
- Curb Includes: 1.5 in. Insulation, Duct Adaptor
- Unit Warranty: 1 Yr (Standard)



NOTES:

Integral unit disconnect is supplied as a standard.

Inlet damper being supplied is a VCD-23. The VCD-23 series is a low leakage, motorized damper. The VCD-23 is IECC (International Energy Consumption Code) compliant with a leakage rating of 3 CFM/ft² at 1 in. wg or less.

DGK-110-H15-01

PERFORMANCE AND SPECIFICATIONS

Description/Arrangement

Model	Qty	Unit Weight (lb)	Discharge Position	Air Flow Arrangement	Unit Arrangement
DGK-110-H15-01	1	474	Downblast	Outdoor Air Only	Horizontal

Design Conditions

Elevation (ft)	Summer DB (F)	Summer WB (F)	Winter DB (F)
62	87	74	0

Air Performance

Type	Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor Size (hp)
Supply	1,925	0.5	1.228	1096	0.78	1

Electrical/Motor Specifications

V/C/P	Unit MCA (amps)	Unit MOP (amps)	Enclosure	Supply Motor RPM	Supply Efficiency
208/60/3	6.4	15	ODP	1725	Premium

Heating/Cooling Specifications

Heating Type	Gas Type	Input (MBH)	Output (MBH)	LAT (F)	Temp. Rise (F)
Direct Gas	Natural	158.9	146.2	70.0	70.0

Sound Performance in Accordance with AMCA

Fan	Sound Power by Octave Band								Lwa	dBA	Sones
	62.5	125	250	500	1000	2000	4000	8000			
Supply	89	91	79	72	69	67	65	59	79	68	15.8

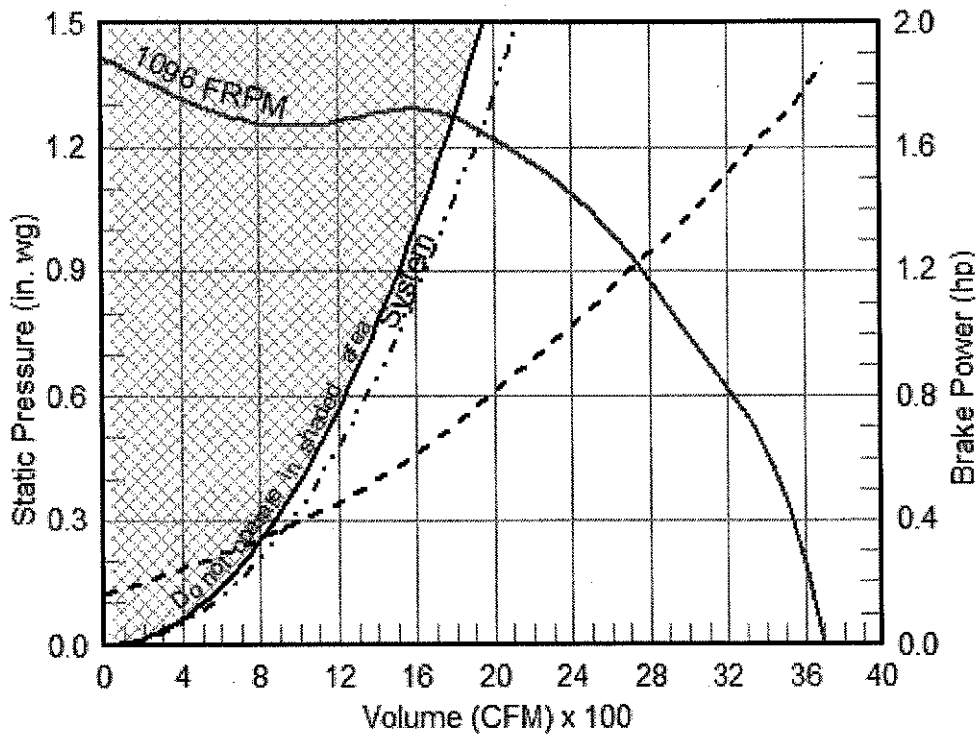
Unit Pressure Drop (in. wg)

Air Stream	Weatherhood	Damper Section	Filter Section	Cooling Section	Heating Section
Supply	0.038	0.065	0	0	0.625

DGK-110-H15-01 FAN CURVES

Supply Fan Performance

Volume (CFM)	Supply SP (in wg)	Total SP (in wg)	RPM	Operating Power (hp)	Motor Size (hp)	Fan Quantity
1925	0.5	1.228	1096	0.78	1	1



- Fan curve
- - - System curve
- . . . Brake horsepower curve

DGK-110-H15-01

HEATING PERFORMANCE

Direct Gas Heating

Heating Type	Gas Type	Input (MBH)	Output (MBH)	LAT (F)	Temp. Rise (F)
Direct Gas	Natural	158.9	146.2	70.0	70.0

Direct Gas Unit Details

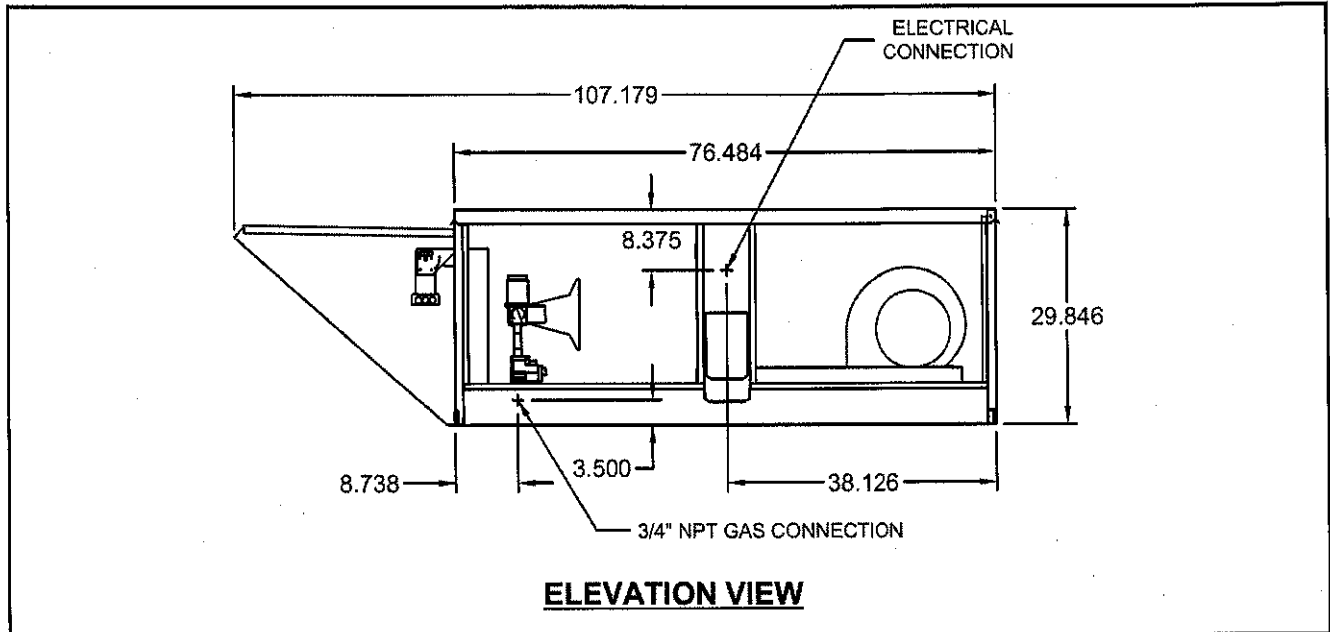
This unit will come equipped with the following:

- 92% Efficiency
- Direct Spark Ignition
- High quality cast aluminum burners with stainless steel mixing plates
- 25:1 Turndown Ratio
- Maxitrol electronic modulation burner control

Heating Details

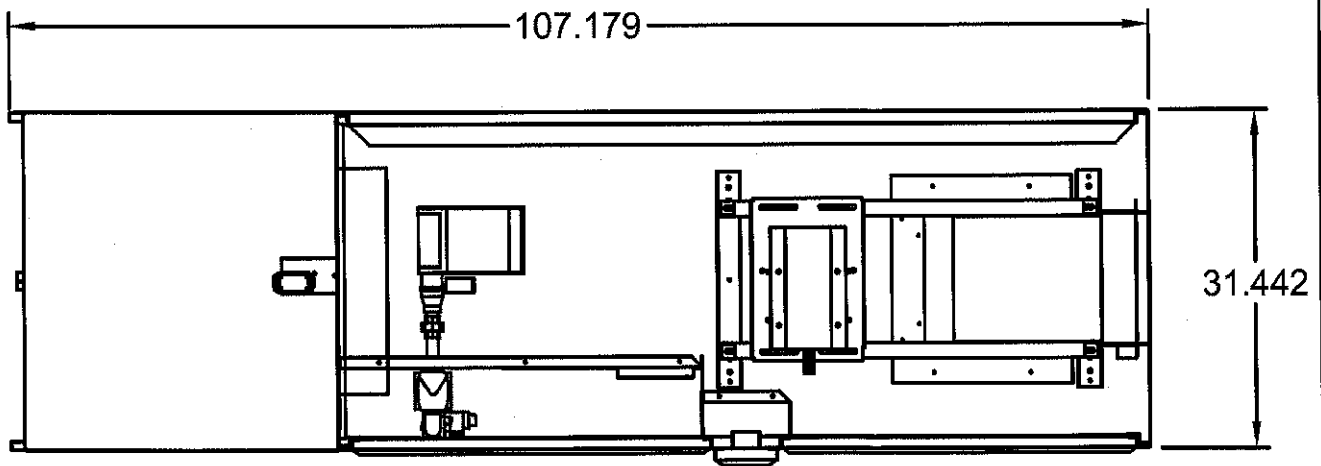
Agency Approval	ETL and IRI
Building Gas Pressure	1/2 PSI
Temperature Control	Discharge
Units Rated Gas Pressure	1/2 PSI
Ignition Control	Direct Spark
Flame Sensing	Flame Rod
Min Gas Pressure For Maximum Fire	7(in. WC)

DGK-110-H15-01



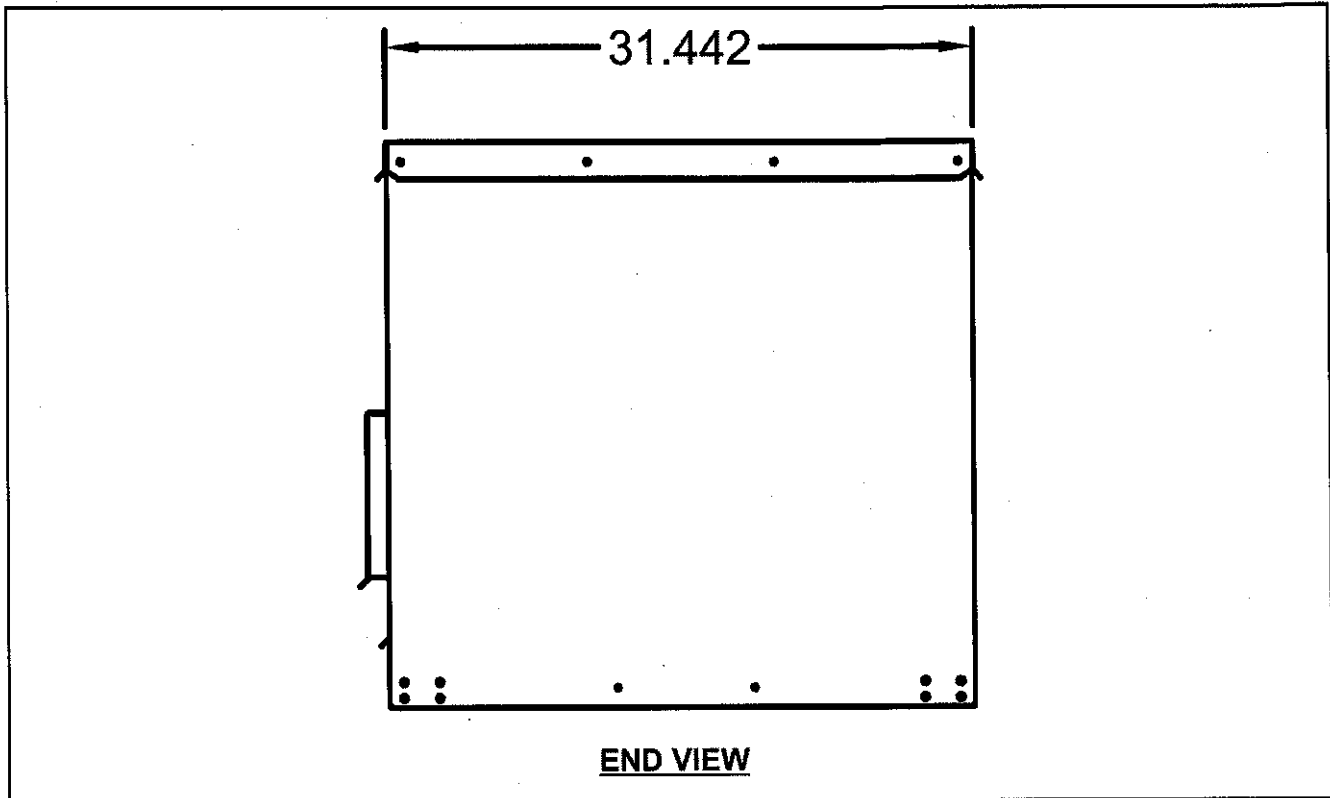
ELEVATION VIEW

*Standard configuration for unit access is on the right-hand side, when looking into the unit intake in the direction of airflow.
 *Note: Order of unit sections is from intake of unit to discharge of unit.
 *Sections included on this unit: Weatherhood Section, Heating Section
 *Insulation: DuctLiner, from Burner Section through end of unit.



PLAN VIEW

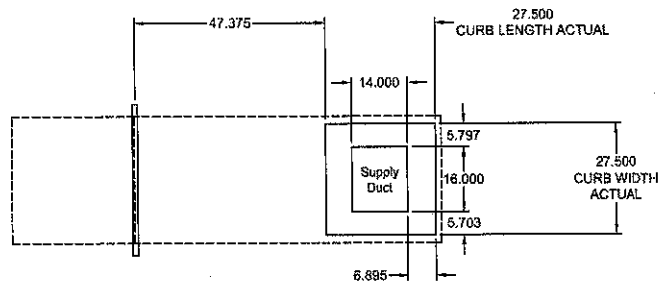
* Standard configuration for unit access is on the right-hand side, when looking into the unit intake in the direction of airflow.



NOTE: Roof Opening Requirements:

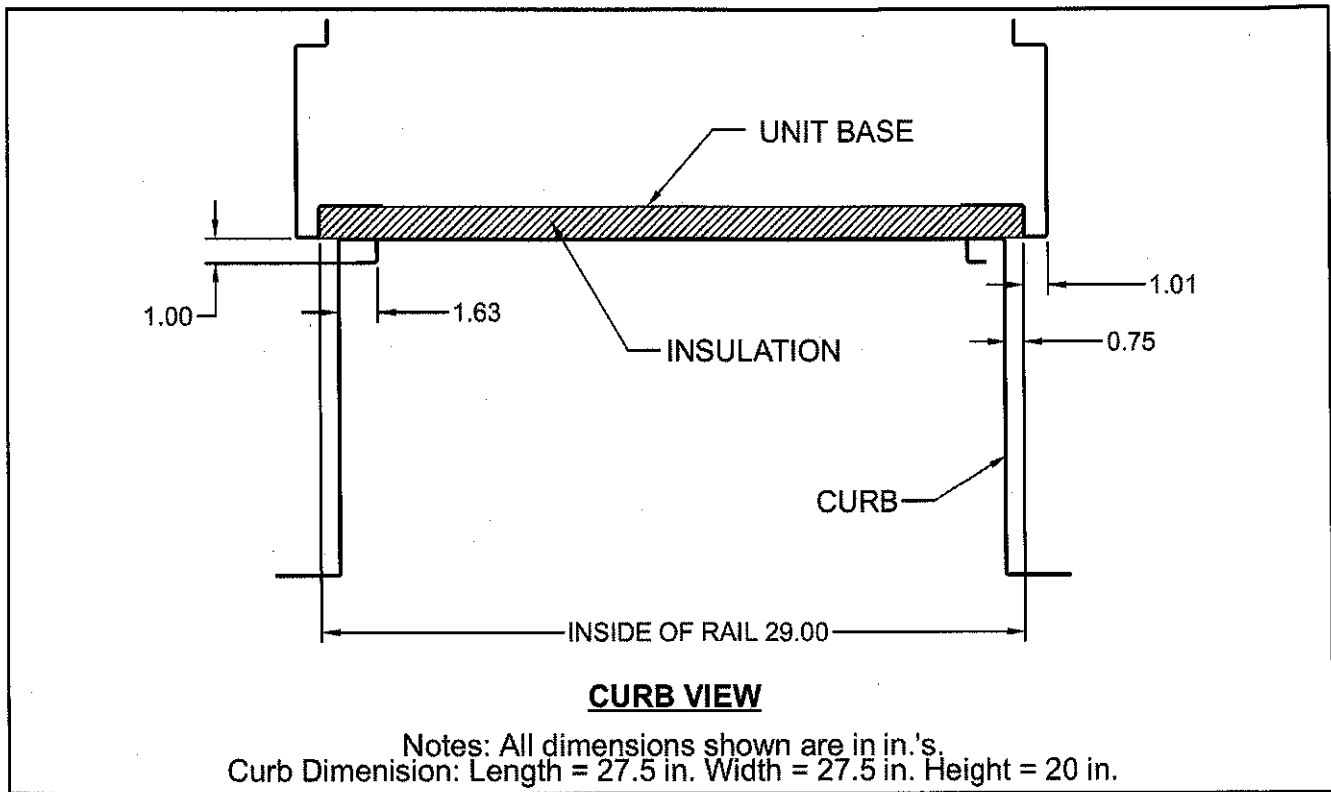
Minimum Roof Opening: The minimum roof opening size is the illustrated duct diameter plus 0.25" on all sides.
For example: If the duct size is 14 x 14 inches square, the minimum roof opening size is 14.5 x 14.5 inches square.

Maximum Roof Opening: There must be a minimum perimeter of 1.75" between the roof opening and the roof curb.
For example: If the roof curb is 75 x 30 inches square, the maximum roof opening is 71.5 x 26.5 inches square.



NOTE: The weatherhood and filter sections of the make-up air unit are not supported by the curb. This is by design, in order to help alleviate water infiltration issues.

FOOTPRINT VIEW



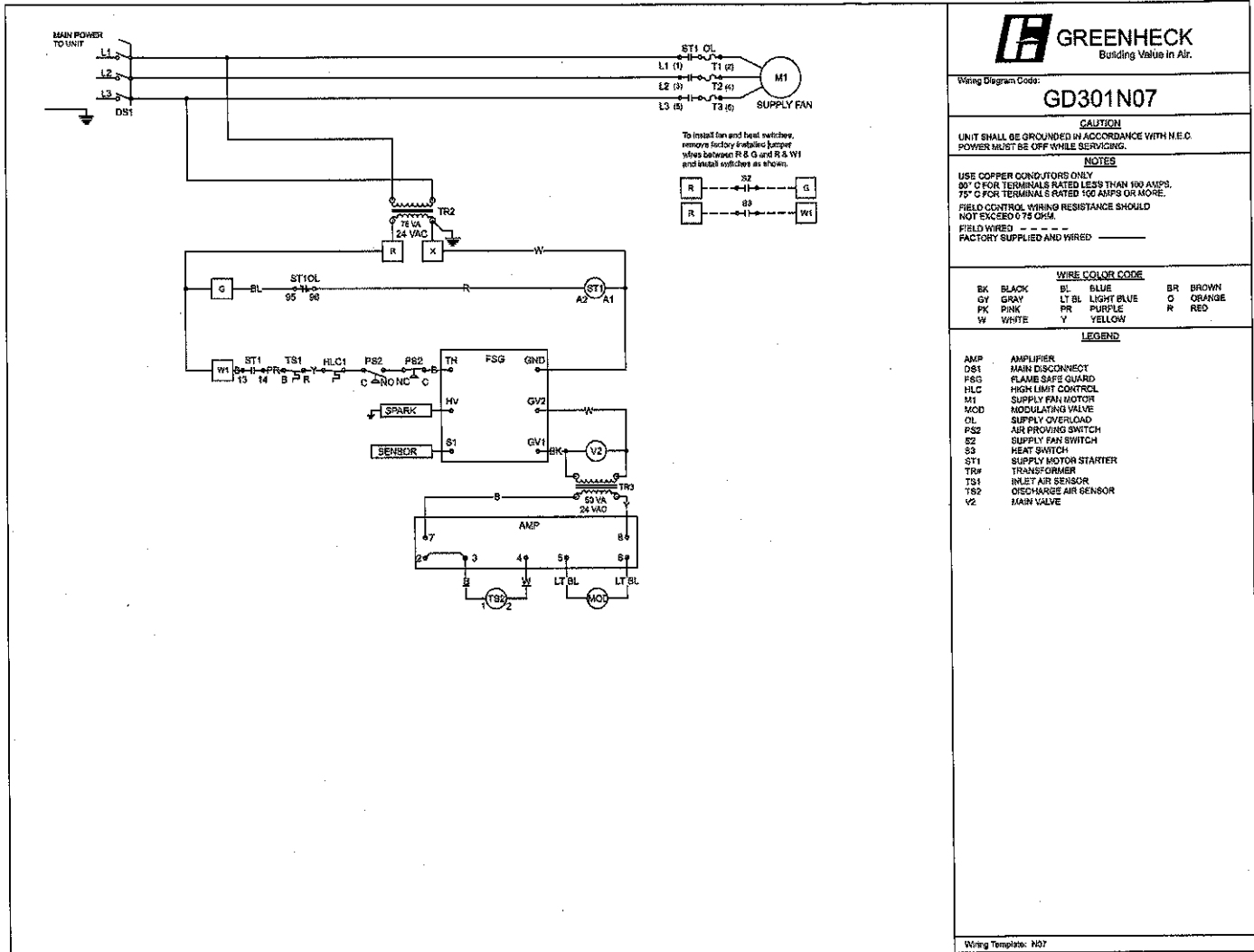
	Recommended Minimum Combustible Clearances			
	Floor	Top	Sides	Ends
Insulated/Units	0 in.	0 in.	0 in.	0 in.
Non-Insulated/Units	0 in.	6 in.	6 in.	6 in.

Clearance to combustibles is defined as the minimum distance required between the heating source and the adjacent combustible surfaces to ensure the adjacent surface's temperature does not exceed 90 F above the ambient temperature.

Recommended Minimum Service Clearances	
Housing 32 and less	42 in. on the controls side of the unit
Housing 35 and higher	48 in. on the controls side of the unit

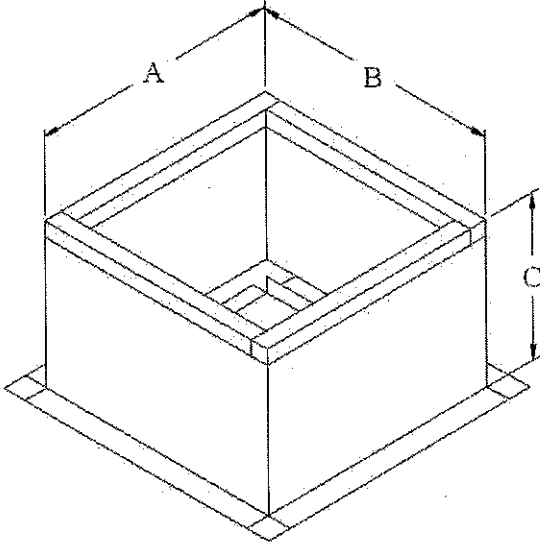
To ensure ample space for component removal (evaporative cooling media, coils, filters, etc.), service clearances should be 6 in. wider than the width of the module itself.

EQUIPMENT SCHEDULE													
Tempered Make-Up Air Unit											Mark: MUA-2		
Qty	Greenheck Model	Volume	External SP		FRPM	Operating Power	Weight	Motor Information					MCA
			Total SP					Size	V/C/P	Encl.	Motor RPM	Windings	
1	DGK-110-H15-01	1,925 CFM	0.5 in. wg	1.228 in. wg	1096 RPM	0.78 hp	474 lb	1 hp	208/60/3	ODP	1725	1	6.4
Heating													
Type	Gas Type	Temperature			Energy			Connection Gas	Building Gas Pressure	Control Access			
		Winter DB	Max Δ	Max LAT	Input	Output	Efficiency						
Direct Gas	Natural	0 F	70.0 F	70.0 F	158.9 MBH	146.2 MBH	92%	3/4"	1/2 PSI	Right Hand			
Outlet Sound Power By Octave Band								LwA	dBA	Sones			
62.5	125	250	500	1000	2000	4000	8000						
89.2	90.5	79.3	71.5	69.4	66.8	64.5	58.5	78.6	67.6	15.6			
<ul style="list-style-type: none"> • LwA - A weighted sound power level based on ANSI S1.4 • dBA - A weighted sound pressure level base on 11.1 dB attenuation per octave band at 5.0 ft. • Noise Criteria (NC) based on an average attenuation of 11.5 dB per octave band at 5.0 ft. 													
OPTIONS AND ACCESSORIES													
Air Flow Arrangement: Outdoor Air Only Weatherhood: Aluminum Mesh, 16x20x2(4) Damper: Inlet Outdoor Air Intake Position: End Discharge Position: Downblast Coating: Permatector Insulation: Duct Liner - Heat Source On Access Side: Right-Hand Control Center Heat Inlet Air Sensor Direct Gas Options/Accessories Approvals: ETL and IRI Temperature Control: Discharge Flame Sensing: Flame Rod Ignition Control: Direct Spark Unit Rated Gas Pressure: 1/2 PSI Mounting: GPI-27.5/27.5-G20 Curb Includes: 1.5 in. Insulation, Duct Adaptor Unit Warranty: 1 Yr (Standard)													



Manufacturer reserves the right to change, modify, or improve this product at anytime

DGK-110-H15-01



Roof Curb - GPI

CONSTRUCTION FEATURES

- Welded aluminum (0.064 in.) or galvanized steel (18 ga.)
- Straight sided • 2 in. mounting flange • 1 in., 3 lb. density insulation • Wood nailer

Dimension	Description	Value (in.)
A	Length	27.5
B	Width	27.5
C	Height	20

* All dimensions are actual

ADDITIONAL NOTES

- The Roof Opening Dimension may NOT match the Structural Roof Support Dimension.
- Curbs with length > 143.5 will ship knocked-down
- Curbs with length > 119.5 may ship knocked-down, dependent on manufacturing location

DGK-110-H15-01

SEQUENCE OF OPERATIONS

MAKE-UP AIR UNIT CONTROLS: The Make-Up Air unit will be provided from the factory with an integral control center including: a single non-fused disconnect, 24VAC transformer, terminal strip, and fan starters (contactor and overload).

OCCUPIED MODE: Within the unit control center, a contact closure must be made in the terminal strip (connecting terminal points R and G) to control unit startup or shutdown.

Outdoor Air Only: The make-up air unit will be sized to handle a constant 100% outdoor air volume. Any adjustments to airflow performance will need to be done by adjusting or replacing sheaves and belts.

Startup (Contact Closes)

- Inlet damper actuator is energized and powers open
- Supply fan starter is enabled

Shutdown (Contact Opens)

- Supply blower is de-energized
- Inlet damper actuator is de-energized, damper closes (spring return)

HEATING CONTROL: Within the unit control center, a contact closure must be made in the terminal strip (connecting terminal points R and W1) to control the call for heating.

Direct Gas: This make-up air unit is controlled by:

Heating Inlet Air Sensor (Heating Lock-Out): The heating inlet air sensor will automatically turn the heating on and off based on a field-adjustable set point. (A contact closure must still be provided between R and W1).

Note: If outside air conditions are above set point, there will not be a call for heating.

Heat Enable Sequence of Operations

- If inlet air temperature is below set point, inlet air temperature sensor is energized.
- High limit control (160 F) contact remains closed if temperature remains below set point.
- Power passes through high and low gas pressure contacts if gas pressure is within set range.
- Power passes through airflow switches if there is proper airflow across the burner.
- Power passes to Flame Safeguard, which begins its sequence.
(See Direct Gas Burner Sequence)

Direct Gas Burner Sequence Direct Spark Ignition

- Flame Safeguard
 - o Checks for proper airflow
 - o Verifies no flame present at burner
 - o Initiates 15 second pre-purge
 - o Sends power to open gas valve and energizes the spark generator
 - o Spark Generator ignites for up to 10 seconds to ignite burner
 - o Once the burner is ignited (in low fire) the flame is confirmed
 - o Shuts down spark generator
 - o Continuously monitors the flame and airflow

CONTROLS

Temperature Control

Discharge Control: This unit's burner will modulate to maintain a field-set discharge temperature set point. The location of the controls is listed below.

- The discharge temperature is controlled from a dial located within the unit control center.

Warranty Information

Limited Warranty - Unit

Greenheck warrants this equipment to be free from defects in material and workmanship for a period of 1 year(s) from the purchase date. 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.

The warranty does 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.

This warranty is exclusive, and is 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.