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**Date:** 8/25/2023
**Return Request:** 9/5/2023
**Project:** ASU Mid-South RC & UC Chiller Replacement
**Supplier:** Airetech
**Manufacturer:** Greenheck
**Submittal:** Commercial Kitchen Ventilation System
**Submittal Number:** 23 38 13-01
**Drawing # and Installation:** Mechanical Drawings

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# Installation, Operation and Maintenance Manual

**EQUIPMENT:** Greenheck Exhaust Fan

**PROJECT:** ASU Mid-South Chiller Replacement

**LOCATION:** West Memphis, AR

**MECHANICAL CONTRACTOR:** Comfort Systems, USA

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GREENHECK
Building Value in Air.

**Document 471560**
**Model CUE Direct Drive**
**Model CUBE Belt Drive**
**Upblast Centrifugal Roof Exhaust**

# Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.

### Direct Drive Upblast Centrifugal Exhaust Fan

These fans are specifically designed for roof and wall mounted applications. The maximum continuous operating temperature for fan sizes 099-300 is 400°F *(204°C)* and for fan sizes 060-095 is 130°F *(54°C)*. Direct drive fans are available with nominal wheel diameters ranging from 9 to 30 inches *(229 to 762 mm)* (060-300 unit sizes). Each fan shall bear a permanently affixed manufacturer's embossed metal nameplate containing the model number and individual serial number.

### Belt Drive Upblast Centrifugal Exhaust Fan

These fans are specifically designed for roof and wall mounted applications. The maximum continuous operating temperature is 400°F *(204°C)*. Belt drive fans are available with nominal wheel diameters ranging from 10 to 48 inches *(254 to 1219 mm*) (099-480 unit sizes). Each fan shall bear a permanently affixed manufacturer's embossed metal nameplate containing the model number and individual serial number.

**NOTE**: Both direct and belt drive units are capable for roof or wall mounting without selecting it up to size 130. Sizes 140-300 will need to be selected for sidewall mount. *Your accessories will change when you select sidewall mount.*

## General Safety Information

Only qualified personnel should install this fan. Personnel should have a clear understanding of these instructions and should be aware of general safety precautions. Improper installation can result in electric shock, possible injury due to coming in contact with moving parts, as well as other potential hazards. Other considerations may be required if high winds or seismic activity is present. If more information is needed, contact a licensed professional engineer before moving forward.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electrical Code (CEC) in Canada.
2. The rotation of the wheel is critical. It must be free to rotate without striking or rubbing any stationary objects.
3. Motor must be securely and adequately grounded.
4. Do not spin fan wheel faster than max cataloged fan RPM. Adjustments to fan speed significantly affects motor load. If the fan RPM is changed, the motor current should be checked to make sure it is not exceeding the motor nameplate amps.
5. Do not allow the power cable to kink or come in contact with oil, grease, hot surfaces or chemicals. Replace cord immediately if damaged.
6. Verify that the power source is compatible with the equipment.
7. Never open access doors to a duct while the fan is running.

| **DANGER** |
| --- |
| Always disconnect, lock and tag power source before installing or servicing. Failure to disconnect power source can result in fire, shock or serious injury. |
| **CAUTION** |
| When servicing the fan, motor may be hot enough to cause pain or injury. Allow motor to cool before servicing. |
| **CAUTION** |
| Precaution should be taken in explosive atmospheres. |
| **DANGER** |
| Pour écarter les risques d'incendie, de choc électrique ou de blessure grave, veiller à toujours débrancher, verrouiller et étiqueter la source de courant avant l'installation ou l'entretien. |
| **ATTENTION** |
| Lors de toute intervention sur la soufflante, le moteur peut être suffisamment chaud pour provoquer une douleur voire une blessure. Laisser le moteur refroidir avant toute maintenance. |
| **ATTENTION** |
| Faire preuve de précaution dans les atmosphères explosives. |

## Receiving

Upon receiving the product, check to ensure all items are accounted for by referencing the delivery receipt or packing list. Inspect each crate or carton for shipping damage before accepting delivery. Alert the carrier of any damage detected. The customer will make notation of damage (or shortage of items) on the delivery receipt and all copies of the bill of lading which is countersigned by the delivering carrier. If damaged, immediately contact your representative. Any physical damage to the unit after acceptance is not the responsibility of the manufacturer.

## Unpacking

Verify that all required parts and the correct quantity of each item have been received. If any items are missing, report shortages to your local representative to arrange for obtaining missing parts. Sometimes it is not possible that all items for the unit be shipped together due to availability of transportation and truck space. Confirmation of shipment(s) must be limited to only items on the bill of lading.

**IMPORTANT**

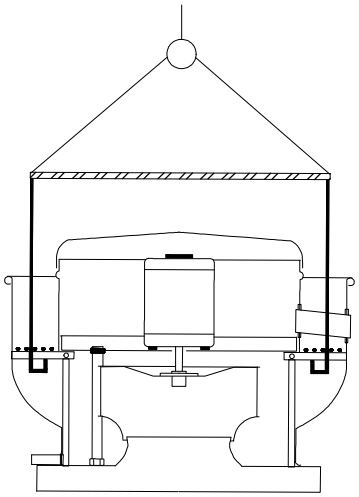
Do not lift by the fan hood. Avoid lifting fans in a way that will bend or distort fan parts. Never pass slings or timbers through the venturi of fan. Fans with special coatings or paints must be protected in handling to prevent damage.

## Handling

### Direct and Belt Drive Units

Lift Direct Drive unit on to the roof utilizing hooks under the horizontal supports. Evenly space the hooks using a minimum of four lifting straps. Use a spreader bar to ensure the straps do not come in contact with the unit, see Figure 1.

**Figure 1**



When lifting a Belt Drive unit onto the roof, use either the four lifting points on the drive frame or the two lifting points on the bearing plate if present, see Figure 2 for lifting points. Access to the drive frame is accomplished by removing the screws pointed out in Figure 3. The cover can then be removed and placed on a flat surface in an area protected from strong winds.

**Figure 2**

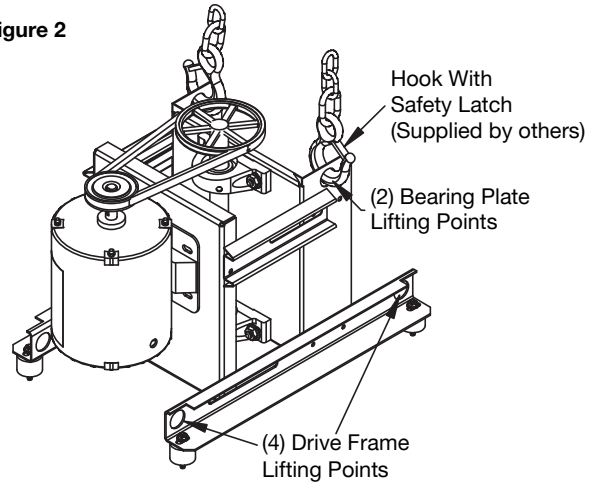
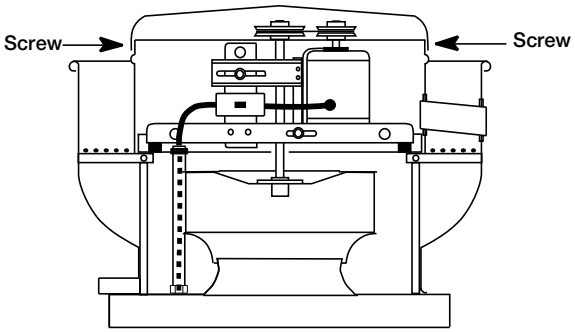



**Figure 3**




When the Direct and/or Belt Drive unit is on the roof, move fan to desired location using lifting points and fasten securely through mounting holes in base. Shims may be necessary depending upon roofing material thickness.

The motor amperage and voltage ratings must be checked for compatibility to supply voltage prior to final electrical connection. For Direct and/or Belt Drive installations, the electrical supply should be routed through the conduit chase located between the curb cap and the bottom of the motor compartment or through the breather tube. Wiring must conform to local and national codes.

## Storage

Fans are protected against damage during shipment. If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the fan and accessories while in storage. The manufacturer will not be responsible for damage during storage. These suggestions are provided solely as a convenience to the user.

### Indoor

The ideal environment for the storage of fans and accessories is indoors, above grade, in a low humidity atmosphere which is sealed to prevent the entry of blowing dust, rain or snow. Temperatures should be evenly maintained between 30° to 110°F *(-1° to 43°C)* (wide temperature swings may cause condensation and "sweating" of metal parts). All accessories must be stored indoors in a clean, dry atmosphere. Remove any accumulations of dirt, water, ice or snow and wipe dry before moving to indoor storage. To avoid "sweating" of metal parts, allow cold parts to reach room temperature. To dry parts and packages, use a portable electric heater to get rid of any moisture buildup. Leave coverings loose to permit air circulation and to allow for periodic inspection.

The unit should be stored at least 3-1/2 inches *(89 mm)* off the floor on wooden blocks covered with moisture proof paper or polyethylene sheathing. Aisles between parts and along all walls should be provided to permit air circulation and space for inspection.

### Outdoor

Fans designed for outdoor applications may be stored outdoors, if absolutely necessary. Roads or aisles for portable cranes and hauling equipment are needed.

The fan should be placed on a level surface to prevent water from leaking into the fan. The fan should be elevated on an adequate number of wooden blocks so that it is above water and snow levels and has enough blocking to prevent it from settling into soft ground. Locate parts far enough apart to permit air circulation, sunlight and space for periodic inspection. To minimize water accumulation, place all fan parts on blocking supports so that rain water will run off.

Do not cover parts with plastic film or tarps as these cause condensation of moisture from the air passing through heating and cooling cycles.

Fan wheels should be blocked to prevent spinning caused by strong winds.

## Inspection and Maintenance During Storage

While in storage, inspect fans once per month. Keep a record of inspection and maintenance performed.

If moisture or dirt accumulations are found on parts, the source should be located and eliminated. At each inspection, rotate the wheel by hand ten to fifteen revolutions to distribute lubricant in motor. If paint deterioration begins, consideration should be given to touch-up or repainting. Fans with special coatings may require special techniques for touch-up or repair.

Machined parts coated with rust preventive should be restored to good condition promptly if signs of rust occur. Immediately remove the original rust preventive coating with petroleum solvent and clean with lint-free cloths. Polish any remaining rust from surface with crocus cloth or fine emery paper and oil. Do not destroy the continuity of the surfaces. Thoroughly wipe clean with Tectyl® 506 (Ashland Inc.) or the equivalent. For hard to reach internal surfaces or for occasional use, consider using Tectyl® 511M Rust Preventive, WD-40® or the equivalent.

## Removing From Storage

As fans are removed from storage to be installed in their final location, they should be protected and maintained in a similar fashion until the fan equipment goes into operation.

**IMPORTANT**

Installation, troubleshooting and parts replacement are to be performed only by qualified personnel. Consult and follow all applicable national, state and local codes. They will supersede this document.

# Dimensional Data

Direct Drive

| Model Size | Curb Cap | Damper | Roof/Wall Opening | Wall Opening with a curb | **Approx. Weight |
|---|---|---|---|---|---|
| 060, 070 | 17 *(432)* | 8 *(203)* | 13½ *(343)* | 17 *(432)* | 29 *(13)* |
| 080, 090, 095 | 19 *(483)* | 10 *(254)* | 15½ *(393)* | 19 *(483)* | 40 *(18)* |
| 099, 100, 101*, 120, 121*, 130, 131* | 19 *(483)* | 12 *(305)* | 15½ *(393)* | 19 *(483)* | 67 *(30)* |
| 140, 141*, 160, 161* | 22 *(559)* | 16 *(406)* | 18½ *(470)* | 22 *(559)* | 90 *(41)* |
| 180, 200, 200HP | 30 *(762)* | 24 *(610)* | 26½ *(673)* | 30 *(762)* | 142 *(64)* |
| 240, 240HP | 34 *(864)* | 24 *(610)* | 30½ *(775)* | N/A | 175 *(79)* |
| 300, 300HP | 40 *(1016)* | 34 *(864)* | 36½ *(927)* | N/A | 313 *(142)* |

Belt Drive

| Model Size | Curb Cap | Shaft Bearings | Damper | Roof/Wall Opening | Wall Opening with a curb | **Approx. Weight |
|---|---|---|---|---|---|---|
| 099, 100, 101*, 100HP, 101HP*, 120, 121*, 130, 131* | 19 *(483)* | ¾ *(19)* | 12 *(305)* | 15½ *(393)* | 19 *(483)* | 66 *(30)* |
| 140, 141*, 140HP, 141HP*, 160, 161*, 160HP, 161HP* | 22 *(559)* | ¾ *(19)* | 16 *(406)* | 18½ *(470)* | 22 *(559)* | 87 *(39)* |
| 160XP, 161XP* | 22 *(559)* | 1 *(25)* | 16 *(406)* | 18½ *(470)* | 22 *(559)* | 87 *(39)* |
| 180 | 30 *(762)* | ¾ *(19)* | 24 *(610)* | 26½ *(673)* | 30 *(762)* | 126 *(57)* |
| 180HP | 30 *(762)* | 1 *(25)* | 24 *(610)* | 26½ *(673)* | 30 *(762)* | 126 *(57)* |
| 200 | 30 *(762)* | ¾ *(19)* | 24 *(610)* | 26½ *(673)* | 30 *(762)* | 142 *(64)* |
| 200HP | 30 *(762)* | 1 *(25)* | 24 *(610)* | 26½ *(673)* | 30 *(762)* | 142 *(64)* |
| 220, 220HP, 240, 240HP, 240XP | 34 *(864)* | 1 *(25)* | 24 *(610)* | 30½ *(775)* | 34 *(864)* | 175 *(79)* |
| 300, 300HP, 300XP | 40 *(1016)* | 1 *(25)* | 34 *(864)* | 36½ *(927)* | 40 *(1016)* | 313 *(142)* |
| 360, 360HP, 360XP | 46 *(1168)* | 1¼ *(32)* | 40 *(1016)* | 42½ *(1080)* | N/A | 440 *(200)* |
| 420 | 52 *(1321)* | 1¼ *(32)* | 46 *(1168)* | 48½ *(1232)* | N/A | 578 *(262)* |
| 480 | 58 *(1473)* | 1½ *(38)* | 52 *(1321)* | 54½ *(1384)* | N/A | 675 *(306)* |

- All dimensions are in inches *(millimeters)*.

* Previous size, no physical product change with new size

** Approximate weight shown in lbs. *(kg.)* is the largest cataloged open drip proof motor.

- "Curb Cap" is the inside dimension of the curb cap
- The roof curb should be 1½ in. *(38 mm)* less than the curb cap to allow for roofing and flashing.
- Roof/wall opening is a square dimension

# Installation

## General Ventilation Installation

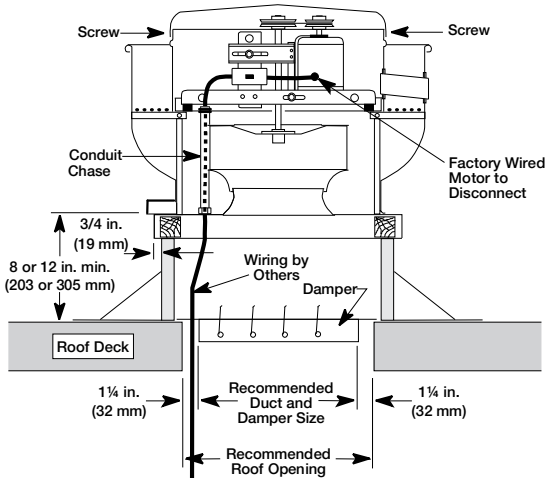



**Figure 4 - Typical Roof Mounting Installation**

1. On the roof surface, cut an appropriate sized hole and follow manufacturer's instructions on curb installation. Caulk and flash the curb to ensure a water tight seal.
2. If unit is equipped with a backdraft damper, it should be installed now.
3. Remove motor cover. Access to the motor compartment is accomplished by removing the screws as shown in Figure 3, page 2.

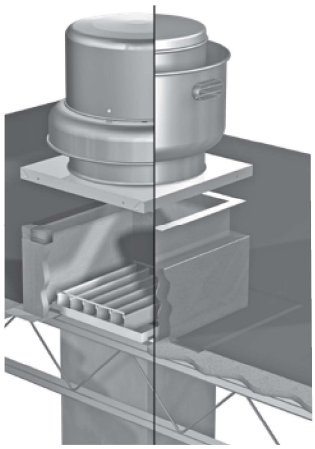


**Figure 5 - Roof Curb Installation**

4a. On **belt drive** fans, use the lifting lugs on the drive frame or bearing plate to lift and place the unit on top of roof curb. Refer to Figure 2, page 2.

4b. On **direct drive** fans, lift and place the unit on top of roof curb using hooks under the horizontal supports. Refer to Figure 1, page 2.

5. Secure fan to curb using a minimum of eight lag screws, metal screws or other suitable fasteners. Shims may be required depending upon curb installation and roofing material.
6. Verify power line wiring is de-energized before connecting fan motor to power source.
7. For commercial kitchen and UL Listed emergency smoke control applications, the electrical supply must enter the motor compartment through the breather tube. For other non-flammable applications, the electrical supply can be routed through the conduit chase between the curb cap and the bottom of the motor compartment.
8. Connect power supply wiring to the motor as indicated on the motor nameplate or terminal box cover. Check the power source for compatibility with the requirements of your equipment.
9. Check fan wheel for free rotation, recenter if necessary. Check setscrew(s) for tightness.
10. Check all fasteners for tightness.
11. Mount and wire safety disconnect switch under motor cover. Wire control switches at ground level, refer to Figure 6.
12. Replace motor cover.

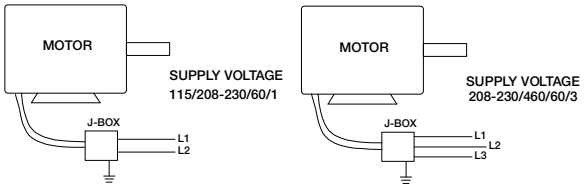
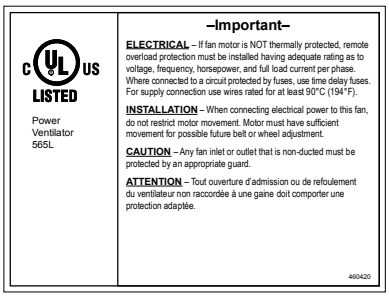



**Figure 6 - Typical Wiring Diagram**

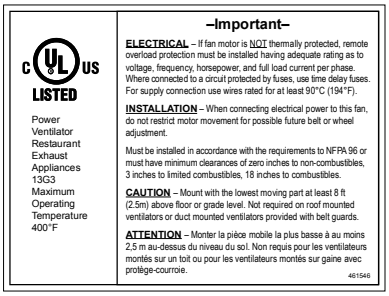
## Vari-Green® Wiring

For Vari-Green wiring refer to the Vari-Green Motor and Controls Installation, Operation and Maintenance Manual for complete wiring and operation instructions.

*Representation of UL Listed Power Ventilator label*




*Representation of UL Listed Power Ventilator Restaurant Exhaust Appliances label*




## Sidewall Mounting Installation

| IMPORTANT | | |
|---|---|---|
| Sidewall Mount Availability | | |
| *Fan Size* | *060-130* | *140-300* |
| CUE | Yes | Yes (if configured) |
| CUBE | Yes | Yes (if configured) |
| *Your accessories will change when you select sidewall mount.* | | |

1a. **Curb**: Cut an appropriate sized hole in the wall for either through wall (recommended) or exterior face mount and follow the manufacturer's instructions on curb installation.

1b. **Wall bracket**: Cut an appropriate sized hole in the wall for exterior face mounting. If unit is equipped with a backdraft damper, it should be installed in the ductwork/wall opening now.

2. Mount the curb or wall bracket to the wall with a minimum of eight 3/8 inch fasteners around the flange. Caulk and flash the curb or wall bracket to ensure a watertight seal.

3. **Curb only**: If unit is equipped with a backdraft damper, it should be installed now.

4. Lift the fan into place. Do NOT support the unit by the hoodband during installation.

5a. **Curb**: Orient fan so the grease trough is downward and secure fan to curb using a minimum of eight lag screws, metal screws or other suitable fasteners.

5b. **Wall bracket**: Orient fan so the grease trough is downward and secure fan to bracket using the fasteners provided.

6. Follow steps 6 through 12 of General Ventilation Installation instructions on page 4.

NOTE: If using any type of hinging, your fan must be a minimum of 8 inches away from the wall.

NOTE: Do not install your fan more than 12 inches away from the wall.

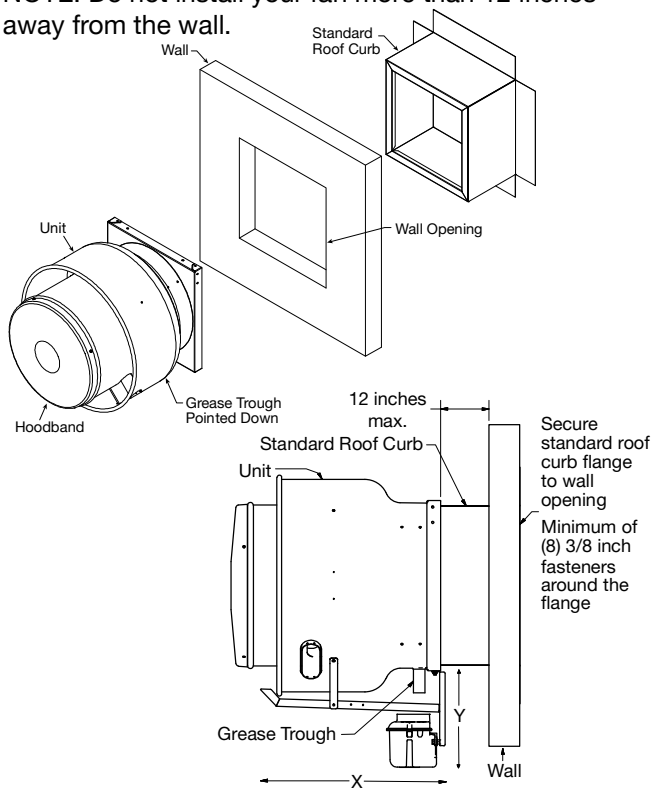



**Figure 7 - Typical Sidewall Mounting Installation (Through Wall)**

| Grease Pan Kit Dimensions | | |
|---|---|---|
| Fan Size | X (in.) | Y (in.) |
| 99-130 | 21.5 | 13.5 |
| 140-160 | 23.5 | 13.3 |
| 180-200 | 29.5 | 17.5 |
| 220-240 | 32.5 | 18.5 |
| 300 | 33.0 | 19.5 |

## Commercial Kitchen Installation

Commercial kitchen installations must comply with NFPA 96. Check local and national codes for these installations and consult local code authorities for other specific requirements.

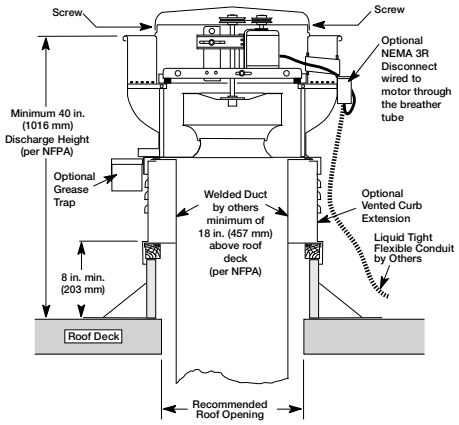



**Figure 8**
**Typical Roof Mounting Installation**

1. On the roof surface, cut an appropriate sized hole and follow manufacturer's instructions on curb installation. Caulk and flash the curb to ensure a watertight seal.
2. If unit is equipped with a backdraft damper. DO NOT install it.

Perform steps 3 - 12 of General Ventilation Installation.

| IMPORTANT |
|---|
| The size of the duct must be equal to or larger than the inlet opening of the fan. |
| To comply with NFPA 96, the fan discharge must be a minimum of 40 in. *(1016 mm)* above the roof surface and a minimum of 10 ft. *(3048 mm)* from any building air intake. |
| Per NFPA 96, ductwork to an upblast discharge exhaust fan must be constructed of and supported by carbon steel not less than No. 6 MSG *(1.52 mm)* or stainless steel not less than No. 18 MSG *(1.21 mm)* in thickness. Duct must also extend a minimum of 18 in. *(457 mm)* above the roof surface. |
| Ensure that a minimum of 500 ft/min of air velocity through the duct is maintained per NFPA 96, clause 8.2.1.1, 2014 edition and UL 762, Issue #7, clause 6.2, October 14, 2013. |
| The following accessories may be required by NFPA 96 depending upon installation: Grease Trap, Hinge Kit or Hinged Base, Clean-Out Port, and Vented Curb. |
| Minimum duct velocities must be maintained in kitchen exhaust applications. If a speed controller is used, ensure compliance with all applicable codes. |

## Grease Trap Installation

The polypropylene grease trap is designed to collect grease residue and avoid drainage onto roof surface. Follow all local codes, as well as the National Fire Protection Agency (NFPA) where applicable.

**NFPA 96:** Upblast fans shall have a drain directed to a readily accessible and visible grease receptacle not to exceed 1 gal. *(3.8L)*

**Refer to Document 476370** - Grease Trap Installation, Operation and Maintenance Manual for parts list and specific installation instructions.

### Grease Trap Maintenance

Regular inspection of grease trap is recommended. Depending on the amount of grease discharged through the fan, the grease trap should be cleaned regularly to ensure proper operation.

- Check grease absorber (if included) every month. Replace grease absorber after every cleaning and/ or as needed between cleanings.
- Replacement grease absorbers (P/N 476084) can be ordered from your local representative.

## Hinge Installation

**NFPA 96:** Upblast exhaust fans shall be supplied with a hinge.

**Refer to listed Installation, Operation and Maintenance Manuals** for parts list and specific installation instructions:

**Document 481937 -** Sidewall Mount Hinge Kit
**Document 481366 -** Bracket Hinge Kit
**Document 462865/462866 -** Hinge Kit

## UL Listed Emergency Smoke Control Installation

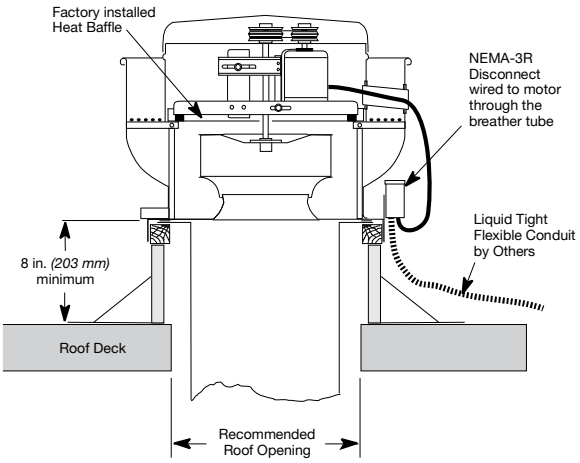


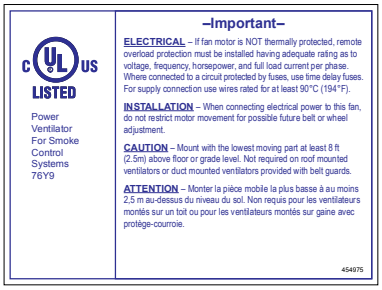

**Figure 9 - Typical Roof Mounting Installation**

### Electrical Connection

For **belt drive** units in emergency smoke removal installations, the motor's amperage and voltage rating must be checked for compatibility to the supply voltage prior to final electrical connection. Also, the motor itself cannot have thermal overload protection.

The electrical supply must enter the motor compartment through the breather tube and the disconnect must be mounted outside the fan's motor compartment. Emergency smoke removal fans may also require an isolated power supply so that if power is cut to the building in the event of a fire, the fan will continue to operate.

Check the local and national electrical codes for emergency smoke removal fans. Consult local code authorities for your specific requirements.




*Representation of UL Listed Power Ventilator for Smoke Control Systems label*

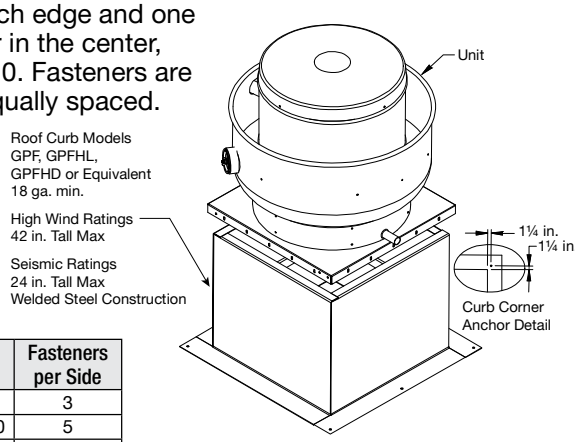
## Mounting for Severe Duty Installation

**IMPORTANT**

**Only qualified installers should perform this work. Manufacturer assumes no liability for damages resulting from installation.**

Installation instructions for seismic ratings are only recommendations. Final design must be determined by Structural Engineer of Record (SEOR) including requirements for curb construction, mounting of unit to curb and mounting of curb to structure.

**Fan to Curb Mounting:** 5/16 inch *(7.9 mm)* self-drilling fasteners are to be installed on each side of fan with one fastener 4 inches *(102 mm)* from each edge and one fastener in the center, Figure 10. Fasteners are to be equally spaced.




| Fan Size | Fasteners per Side |
|---|---|
| ≤ 161 | 3 |
| 180 to 240 | 5 |
| ≥ 300 | 9 |

**Figure 10 - Fan to Curb Mounting**

**Optional Hinged Base Mounting:** For installations that include the optional hinged base accessory, the fan must be secured to the hinged base and curb using the correct number of fasteners as shown in the "Fan to Curb Mounting" section. All fasteners must be installed through the curb cap of the fan, the hinged base, and the curb. All fasteners must be reinstalled after each time the fan is hinged open, see Figure 11.

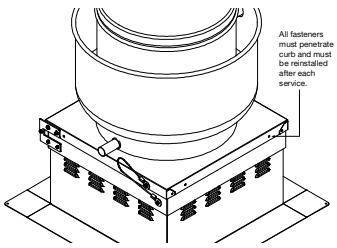



**Figure 11 - Fasteners**

**Curb to Deck Mounting:** Fasteners need to be located on all four sides of the curb, Figures 12a and 12b.

**Figure 12a**

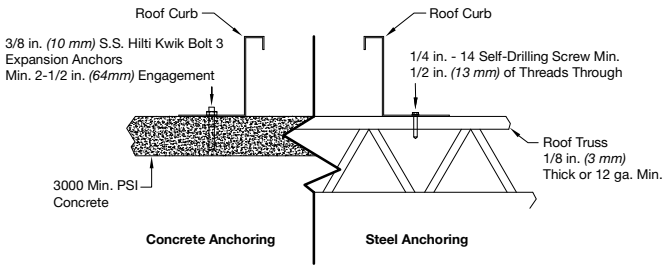
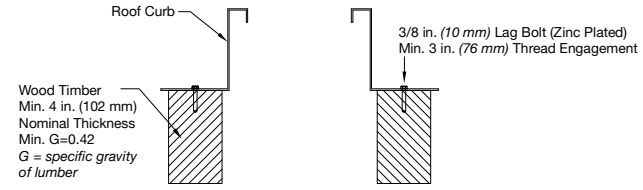



**Figure 12b**




**Timber Anchoring**

| | High Wind Ratings | | | | Seismic Ratings | | |
|---|---|---|---|---|---|---|---|
| | | | Fasteners | | | Fasteners | |
| | Fan Size | Curb Cap Size inches *(millimeters)* | Per Side | Total | Fan Size | Per Side | Total |
| Steel | ≤ 161 | 17x17 to 22x22 *(432x432 to 559x559 mm)* | 3 | 12 | 060-240 | 2 | 8 |
| | > 161 | 26x26 to 40x40 *(660x660 to 1016x1016 mm)* | 4 | 16 | 300-360 | 3 | 12 |
| | | | | | 420-480 | 5 | 20 |
| Concrete | ≤ 161 | 17x17 to 22x22 *(432x432 to 559x559 mm)* | 3 | 12 | 060-240 | 2 | 8 |
| | > 161 | 26x26 to 40x40 *(660x660 to 1016x1016 mm)* | 3 | 12 | 300-360 | 3 | 12 |
| | | | | | 420-480 | 5 | 20 |
| Wood | ≤ 161 | 17x17 to 22x22 *(432x432 to 559x559 mm)* | 3 | 12 | 060-240 | 2 | 8 |
| | > 161 | 26x26 to 40x40 *(660x660 to 1016x1016 mm)* | 4 | 16 | 300-360 | 3 | 12 |
| | | | | | 420-480 | 5 | 20 |

All dimensions are in inches *(millimeters)*.

## Pre-Starting Checks

1. Check all fasteners and setscrews for tightness. The wheel should rotate freely and be aligned as shown in Figure 13.

| Model Type | | Model Size | G - Overlap inch *(mm)* | H - Gap inch *(mm)* |
|---|---|---|---|---|
| Direct | Belt | | | |
| X | – | 060-095 | – | 3/32 *(2)* |
| X | X | 099-161 | 1/4 *(6)* | – |
| X | X | 180-300 | 1/2 *(13)* | – |
| – | X | 360-480 | 3/4 *(19)* | – |

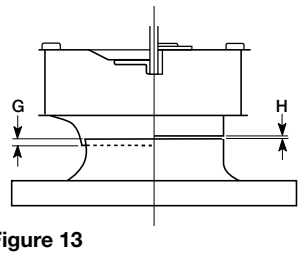



**Figure 13**
**Wheel Overlap and Gap Dimension**

2. Wheel position is preset and the unit is test run at the factory. Movement may occur during shipment and realignment may be necessary.

   Centering the wheel can be accomplished by loosening the bolts on the support pan and moving support pan until wheel is properly aligned. For units with drive frame mounting, loosen the bolts holding the drive frame to the vibration isolators and reposition the drive frame if additional movement is needed for wheel alignment.

   Wheel and inlet cone overlap can be adjusted by loosening the setscrews in the wheel hub and moving the wheel to the desired position. For direct and belt drive models with wheel hubs and shaft pulleys utilizing tapered bushing interface, reference page 9 for tapered bushing removal and move the wheel to the desired position.

3. Check wheel rotation (viewing from the shaft side) by momentarily energizing the unit. Rotation should be clockwise as shown in Figure 14 and correspond to the rotation decal on the unit. If wheel rotation is incorrect, reverse two of the wiring leads or check motor wiring for single phase. Fan RPM should be checked and verified with a tachometer.

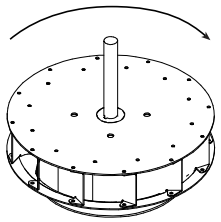


**Figure 14**

**WARNING**

Correct direction of wheel rotation is critical. Reversed rotation will result in poor air performance, motor overloading and possible motor burnout.

**AVERTISSEMENT**

La turbine doit impérativement tourner dans le bon sens. Une rotation en sens inverse entraînerait de mauvaises performances de soufflage, une surcharge du moteur voire un grillage du moteur.

**Belt Drive Pre-Starting Belt Tension Checks**

4. Always loosen tension enough to install belts without stretching. Do not force belt(s) *see* Figure 15. Forcing belts will break the cords and cause belt failure.

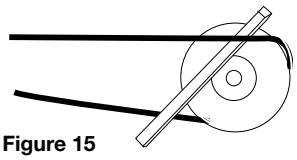


**Figure 15**

5. For units with two groove pulleys, adjust so the tension is equal in both belts.
6. If adjustments are made, it is very important to check the pulleys for proper alignment. Misaligned pulleys lead to excessive belt wear, vibration, noise and power loss, see Figure 16.

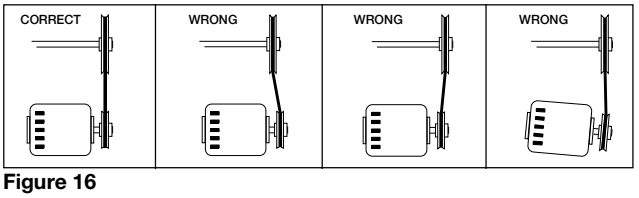



**Figure 16**

# Installation, Operation and Maintenance Manual

**EQUIPMENT:** Greenheck Makeup Air Unit

**PROJECT:** ASU Mid-South Chiller Replacement

**LOCATION:** West Memphis, AR

**MECHANICAL CONTRACTOR:** Comfort Systems, USA

**SUBMITTED BY:** Forrest Moseley
forrest@airetechcorp.com
(501) 280-0404

---

**Job # 74382**

7631 NORTHSHORE PLACE
NORTH LITTLE ROCK, ARKANSAS 72118
Voice (501)280-0404 ● Fax (501)280-9200

GREENHECK
Building Value in Air.

**Document 470658**
**Model MSX**
**Modular Make-Up Air**

# Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage!

C ETL LISTED US
Intertek

## General Safety Information

**DANGER**

Always disconnect power before working on or near a unit. Lock and tag the disconnect switch or breaker to prevent accidental power up.

**CAUTION**

When servicing the unit, motor may be hot enough to cause pain or injury. Allow motor to cool before servicing.

**IMPORTANT**

All factory provided lifting lugs must be used when lifting any unit. Failure to comply with this safety precaution could result in property damage, serious injury or death.

**WARNING**

Disconnect all electrical power to the fan and secure to the “OFF” position prior to inspection or servicing. Failure to comply with this safety precaution could result in serious injury or death.

**WARNING**

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

**FOR YOUR SAFETY**

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

**FOR YOUR SAFETY**

MAXIMUM ALTITUDE: 11154 FT OR 3400 M

## General Safety Information

Only qualified personnel should install this unit. Personnel should have a clear understanding of these instructions and should be aware of general safety precautions. Improper installation can result in electric shock, possible injury due to coming in contact with moving parts, as well as other potential hazards. Other considerations may be required if high winds or seismic activity are present. If more information is needed, contact a licensed professional engineer before moving forward.

1. Follow all local electrical and safety codes, as well as the National Electrical Code (NEC), the National Fire Protection Agency (NFPA), where applicable. Follow the Canadian Electrical Code (CEC) in Canada.
2. The rotation of the wheel is critical. It must be free to rotate without striking or rubbing any stationary objects.
3. Motor must be securely and adequately grounded.
4. Do not spin fan wheel faster than maximum cataloged fan rpm. Adjustments to fan speed significantly effects motor load. If the fan RPM is changed, the motor current should be checked to make sure it is not exceeding the motor nameplate amps.
5. Do not allow the power cable to kink or come in contact with oil, grease, hot surfaces, or chemicals. Replace cord immediately if damaged.
6. Verify that the power source is compatible with the equipment.
7. Never open blower access doors while the fan is running.

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## Receiving

Upon receiving the product check to ensure all items are accounted for by referencing the delivery receipt or packing list. Inspect each crate or carton for shipping damage before accepting delivery. Alert the carrier of any damage detected. The customer will make notification of damage (or shortage of items) on the delivery receipt and all copies of the bill of lading which is countersigned by the delivering carrier. If damaged, immediately contact your Greenheck Representative. Any physical damage to the unit after acceptance is not the responsibility of Greenheck Fan Corporation.

## Unpacking

Verify that all required parts and the correct quantity of each item have been received. If any items are missing, report shortages to your local representative to arrange for obtaining missing parts. Sometimes it is not possible that all items for the unit be shipped together due to availability of transportation and truck space. Confirmation of shipment(s) must be limited to only items on the bill of lading.

## Handling

Units are to be rigged and moved by the lifting brackets provided or by the skid when a forklift is used. Location of brackets varies by model and size. Handle in such a manner as to keep from scratching or chipping the coating. Damaged finish may reduce ability of unit to resist corrosion.

## Storage

Units are protected against damage during shipment. If the unit cannot be installed and operated immediately, precautions need to be taken to prevent deterioration of the unit during storage. The user assumes responsibility of the unit and accessories while in storage. The manufacturer will not be responsible for damage during storage. These suggestions are provided solely as a convenience to the user.

**INDOOR** — The ideal environment for the storage of units and accessories is indoors, above grade, in a low humidity atmosphere which is sealed to prevent the entry of blowing dust, rain, or snow. Temperatures should be evenly maintained between 30°F (-1°C) and 110°F (43°C) (wide temperature swings may cause condensation and “sweating” of metal parts). All accessories must be stored indoors in a clean, dry atmosphere.

Remove any accumulations of dirt, water, ice, or snow and wipe dry before moving to indoor storage. To avoid “sweating” of metal parts allow cold parts to reach room temperature. To dry parts and packages, use a portable electric heater to get rid of any moisture build up. Leave coverings loose to permit air circulation and to allow for periodic inspection.

The unit should be stored at least 3½ in. (89 mm) off the floor on wooden blocks covered with moisture proof paper or polyethylene sheathing. Aisles between parts and along all walls should be provided to permit air circulation and space for inspection.

**OUTDOOR** — Units designed for outdoor applications may be stored outdoors, if absolutely necessary. Roads or aisles for portable cranes and hauling equipment are needed.

The fan should be placed on a level surface to prevent water from leaking into the unit. The unit should be elevated on an adequate number of wooden blocks so that it is above water and snow levels and has enough blocking to prevent it from settling into soft ground. Locate parts far enough apart to permit air circulation, sunlight, and space for periodic inspection. To minimize water accumulation, place all unit parts on blocking supports so that rain water will run off.

Do not cover parts with plastic film or tarps as these cause condensation of moisture from the air passing through heating and cooling cycles.

## Inspection and Maintenance during Storage

While in storage, inspect fans once per month. Keep a record of inspection and maintenance performed.

If moisture or dirt accumulations are found on parts, the source should be located and eliminated. At each inspection, rotate the fan wheel by hand ten to fifteen revolutions to distribute lubricant on motor. Every three months, the fan motor should be energized. If paint deterioration begins, consideration should be given to touch-up or repainting. Fans with special coatings may require special techniques for touch-up or repair.

Machined parts coated with rust preventive should be restored to good condition promptly if signs of rust occur. Immediately remove the original rust preventive coating with petroleum solvent and clean with lint-free cloths. Polish any remaining rust from surface with crocus cloth or fine emery paper and oil. Do not destroy the continuity of the surfaces. Wipe thoroughly clean with Tectyl® 506 (Ashland Inc.) or the equivalent. For hard to reach internal surfaces or for occasional use, consider using Tectyl® 511M Rust Preventive or WD-40® or the equivalent.

**REMOVING FROM STORAGE** — As units are removed from storage to be installed in their final location, they should be protected and maintained in a similar fashion, until the equipment goes into operation.

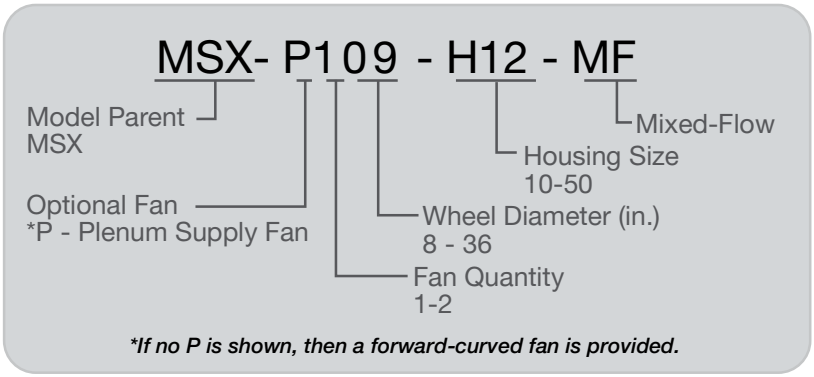
Prior to installing the unit and system components, inspect the unit assembly to make sure it is in working order.

1. Check all fasteners, set screws on the fan, wheel, bearings, drive, motor base, and accessories for tightness.
2. Rotate the fan wheel(s) by hand and assure no parts are rubbing.

# General

## Model Number Code

The model number code provides basic identification of the unit. The serial number can be used by the manufacturer's representative or the factory to identify the specific unit configuration. The serial number of the unit must be provided when consulting the manufacturer's representative or the factory.




RANGE OF EXTERNAL STATIC PRESSURES: 0.00 - 4.00 IN.W.C. OR 0.000 - 0.995 KPA

# Installation

## Combustible and Service Clearances

| | Floor | Top | Sides | Ends |
|---|---|---|---|---|
| **Insulated Units** | 0 inches *(0 mm)* | 0 inches *(0 mm)* | 0 inches *(0 mm)* | 0 inches *(0 mm)* |
| **Non Insulated Units** | 0 inches *(0 mm)* | 6 inches *(152.4 mm)* | 6 inches *(152.4 mm)* | 6 inches *(152.4 mm)* |

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

| Recommended Minimum Service Clearances | |
|---|---|
| **Housing 32 and less** | 42 inches *(1066.8 mm)* on the controls side of the unit |
| **Housing 35 and higher** | 48 inches *(1219.2 mm)* on the controls side of the unit |

Clearances for component removal (such as evaporative cooler media) may be greater than the service clearances listed.

## Installation of Indoor Unit

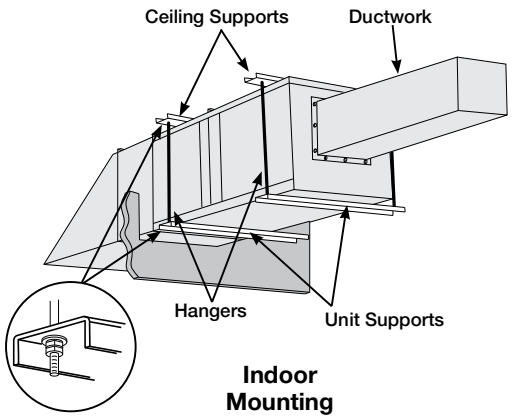
1. **Install Hangers.** Install threaded hangers from ceiling supports. When locating hangers, allow enough room to open access panel(s). Two nuts must be used on the end of each threaded hanger. Ceiling supports are supplied by others.
2. **Install Unit.** Using sheet metal screws, attach the weatherhood/thru-wall/filter section to the blower/burner section. The flange on the weatherhood/thru-wall/filter section should overlap the flange on the blower/burner section.

   Raise the assembled unit into place.

   Using two nuts per hanger, fasten the unit supports to the hangers under the unit. Appropriate unit supports, such as the optional hanging bracket kit or c-channel and angle iron (supplied by others) should be used.

   Using self tapping screws, attach ductwork to unit.

   In order to prevent the unit from swinging and to provide a safe environment for service and maintenance, additional measures must be taken to secure the unit in all directions.




**Indoor Mounting**

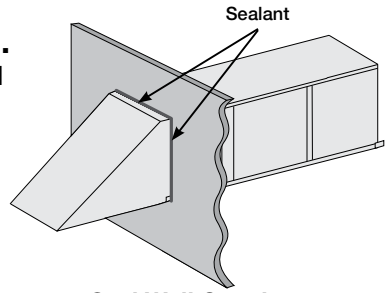
**NOTE**

Two nuts must be used on each end of each threaded hanging rod for proper support.

**NOTE**

Good duct practices should be followed for all ductwork. Ductwork should be installed in accordance with SMACNA and AMCA guidelines, NFPA 96 and any local codes. Reference the CAPS submittal for duct sizes.

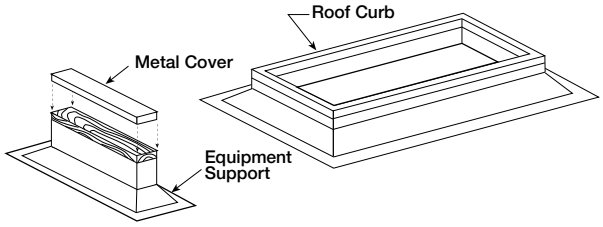
3. **Seal Wall Opening.** Apply sealant around the perimeter of the weatherhood to prevent water penetration and drafts into the building.




**Seal Wall Opening**

## Installation of Arrangement DB/HZ/UB

1. **Install Curb and/or Equipment Support(s).** Position curb/equipment support(s) on the roof (reference the CAPS submittal for placement of curb/equipment support(s) in relation to the unit). Verify that unit supports are level, shim if necessary. Attach curb to roof and flash into place. Attach the equipment support(s) to the roof, remove metal cover, flash to wooden nailer and reinstall cover.



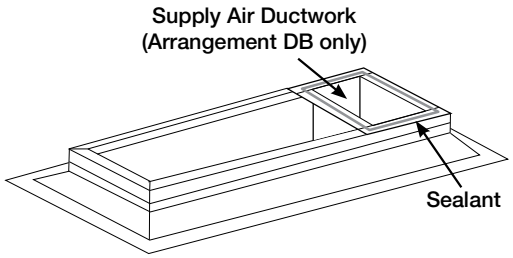

**Roof Curb and Equipment Support**

2. **Install Ductwork.** Good duct practices should be followed for all ductwork. All ductwork should be installed in accordance with SMACNA and AMCA guidelines, NFPA 96 and all local codes. Reference the CAPS submittal for ductwork sizes.

**NOTE**

The use of a duct adapter is recommended on a downblast (DB) arrangement to align the ductwork with the supply unit. The duct adapter is only a guide and is not to be used as a support for the ductwork.

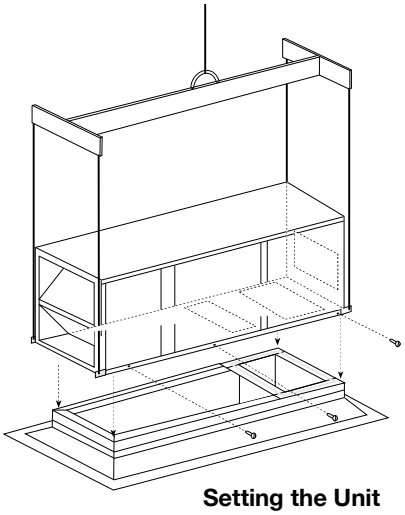
3. **Apply Sealant.** Apply an appropriate sealant around the perimeter of the curb and duct adapter(s) to isolate fan vibration and prevent water penetration.




**Ductwork and Sealant**

4. **Install Unit.** Use a crane and a set of spreader bars hooked to the factory lifting lugs to lift and center the unit on the curb/equipment support(s).

   Use self-tapping sheet metal screws to fasten the unit to the curb/equipment support(s).



**Setting the Unit**

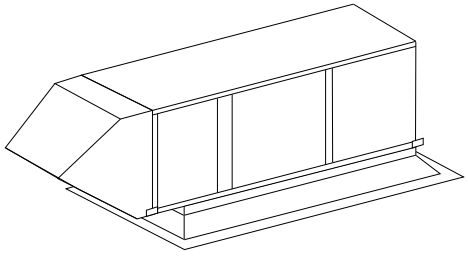
**NOTE**

The use of all lifting lugs and a set of spreader bars is mandatory when lifting the unit.

**NOTE**

Some units come with the weatherhood attached and Step 5 may not apply.

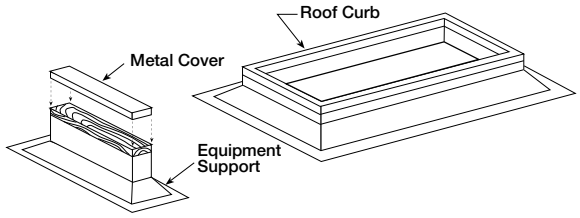
5. **Assemble and Attach Weatherhood.** The weatherhood can now be assembled and attached to the unit. Detailed assembly instructions can be found with the weatherhood. If the optional evaporative cooling module was selected, this step does not apply, refer to the Installation of the Optional Evaporative Cooling Module section.
6. **Seal Weatherhood Seam.** Using an appropriate sealant, seal the seam between the weatherhood and the unit.



**Complete Rooftop Installation**

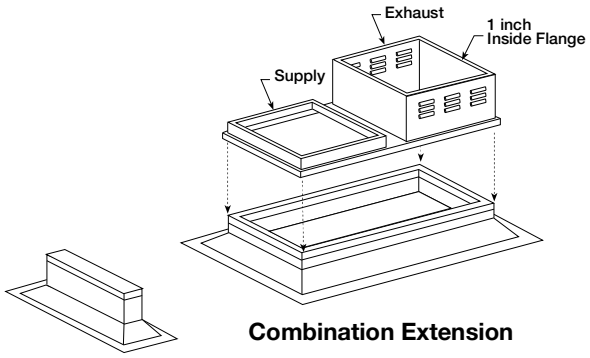
## Installation of Roof Mounted Unit Arrangement DBC

1. **Install Curb/Equipment Support(s).** Position curb/equipment support(s) on the roof (reference the CAPS submittal for placement of curb/equipment support(s) in relation to the unit). Verify that all unit supports are level, shim if necessary. Attach curb to roof and flash into place. Attach the equipment support(s) to the roof, remove metal cover, flash to wooden nailer and reinstall cover.



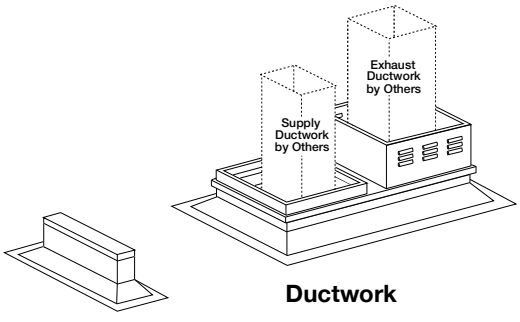

**Roof Curb and Equipment Support**

2. **Install Combination Extension.** Install combination extension over curb. Lag into place using wood screws. Locate the extension so the tall vented side is over the exhaust opening.




**Combination Extension**

3. **Install Ductwork.** Good duct practices should be followed for all ductwork. All ductwork should be installed in accordance with SMACNA and AMCA guidelines, NFPA 96 and any local codes. Reference the CAPS submittal for ductwork size and location.



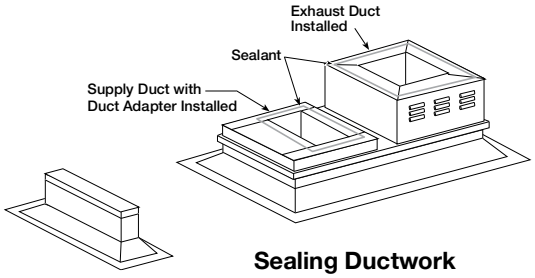

**Ductwork**

**NOTE**

The use of a duct adapter is recommended on a downblast (DBC) arrangement to align the ductwork with the supply unit. The duct adapter is only a guide and is not to be used as a support for the ductwork.

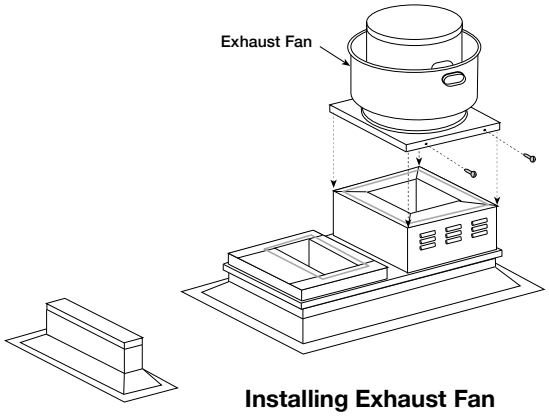
## Installation of Roof Mounted Unit Arrangement DBC, *continued*

4. **Apply Sealant.** Apply an appropriate sealant around the perimeter of the curb and duct adapter(s) to isolate fan vibration and prevent water penetration.




**Sealing Ductwork**

5. **Install Exhaust Fan.** Fasten exhaust fan to curb extension with self-tapping sheet metal screws. **Installing the exhaust fan prior to the supply unit will allow for easier installation of options.**




**Installing Exhaust Fan**

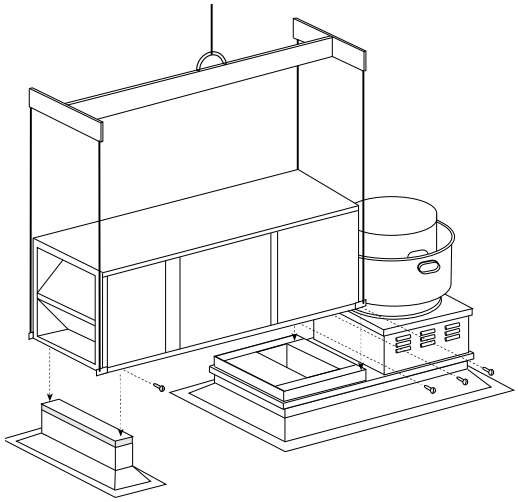
**NOTE**

NFPA 96 requires the exhaust fan to be hinged.

6. **Install Exhaust Options.** Install optional hinge kit with restraining cables and grease trap with drain connection.

7. **Install Supply Unit.** Use a crane and a set of spreader bars hooked to the factory lifting lugs to lift and center the unit on the extension/equipment support(s).

   Use self-tapping sheet metal screws to fasten the unit to the extension/equipment support(s).



**Installing Supply Unit**

**NOTE**

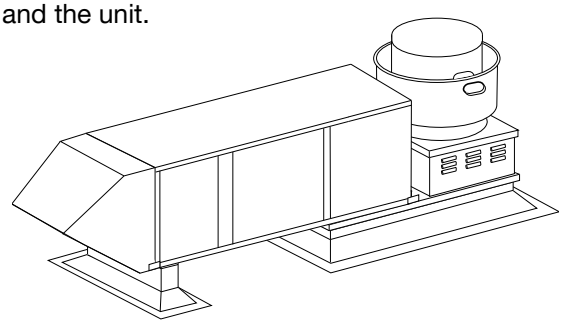
The use of all lifting lugs and a set of spreader bars is mandatory when lifting unit.

**NOTE**

Some units come with the weatherhood attached and Step 8 may not apply.

8. **Assemble and Attach Weatherhood.** The weatherhood can now be assembled and/or attached to the unit. Detailed assembly instructions can be found with the weatherhood. If the optional evaporative cooling module was selected, this step does not apply, refer to the next section, Installation of the Optional Evaporative Cooling Module.

9. **Seal Weatherhood Seam**. Using an appropriate sealant, seal the seam between the weatherhood and the unit.



**Complete Combination Installation**

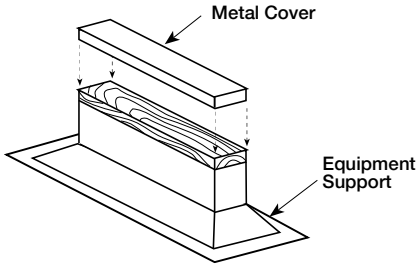
# Installation

## Installation of Evaporative Cooling Module *(optional)*

**NOTE**

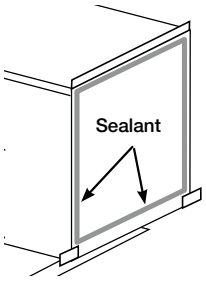
Small evaporative coolers ship attached to the base unit and require no additional mounting.

1. **Locate Equipment Support(s).** Position equipment support(s) on the roof (reference the CAPS submittal for placement of equipment support(s) in relation to the unit). Verify that all unit supports are level, shim if necessary. Attach equipment support to the roof, remove metal cover, flash to wooden nailer and reinstall cover.

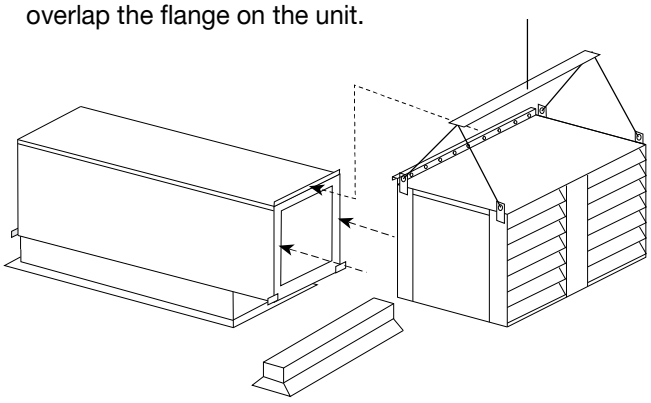



**Equipment Support**

2. **Apply Sealant.** Apply an appropriate sealant around the airstream opening to create an air tight seal.




3. **Set Evaporative Cooling Module.** Use a crane and a set of spreader bars hooked to the factory lifting lugs to lift and center the module on the equipment support(s). The flange on the evaporative cooler should overlap the flange on the unit.

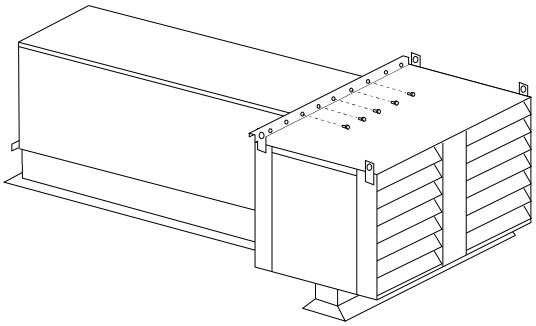


**Placing Evaporative Module**

**NOTE**

The use of all lifting lugs and a set of spreader bars is mandatory when lifting the evaporative cooling module.

4. **Secure Cooling Module to Unit.** Use self-tapping screws to fasten the cooling module to the base unit along the top and down both sides. Fasten at the top through the flanges. To fasten the sides, the media must be removed. To remove the media, first remove the access panel on the evaporative module and disconnect the evaporative pump(s). The media will now slide out. With the media removed, you can access the side fastening points inside the evaporative module. With all the screws in place, reinstall the media, reconnect the pumps and reinstall the access panel.



**Securing Evaporative Module**

**NOTE**

When mounting the evaporative cooler, it is important that it is level to ensure proper operation and water drainage.

## Installation of Electrical Wiring

**IMPORTANT**

Before connecting power to the unit, read and understand the following instructions and wiring diagrams. Complete wiring diagrams are attached on the inside of the control center door(s).

**IMPORTANT**

All wiring should be done in accordance with the latest edition of the National Electric Code ANSI/ NFPA 70 and any local codes that may apply. In Canada, wiring should be done in accordance with the Canadian Electrical Code.

**IMPORTANT**

The equipment must be properly grounded. Any wiring running through the unit in the airstream must be protected by metal conduit, metal clad cable or raceways.

**CAUTION**

If replacement wire is required, it must have a temperature rating of at least 105°C, except for an energy cut-off or sensor lead wire which must be rated to 150°C.

**DANGER**

High voltage electrical input is needed for this equipment. This work should be performed by a qualified electrician.

**CAUTION**

Any wiring deviations may result in personal injury or property damage. Manufacturer is not responsible for any damage to, or failure of the unit caused by incorrect final wiring.

**IMPORTANT**

Manufacturer's standard control voltage is 24 VAC. Control wire resistance should not exceed 0.75 ohms (approximately 285 feet total length for 14 gauge wire; 455 feet total length for 12 gauge wire). If the resistance exceeds 0.75 ohms, an industrial-style plug-in relay should be wired in place of the remote switch. The relay must be rated for at least 5 amps and have a 24 VAC coil. Failure to comply with these guidelines may cause motor starters to chatter or not pull in, resulting in contactor failures and/or motor failures.

1. **Determine the Size of the Main Power Lines.** The unit's nameplate states the voltage and the unit's MCA. The main power lines to the unit should be sized accordingly. The nameplate is located on the outside of the unit on the control panel side.
2. **Provide the Opening(s) for the Electrical Connection.** Electrical openings vary by unit size and arrangement and are field-supplied.
3. **Connect the Main Power.** Connect the main power lines to the disconnect switch and main grounding lug(s). Torque field connections to 20 in.-lbs.
4. **Wire the Optional Convenience Outlet.** The convenience outlet requires a separate 115 volt power supply circuit. The circuit must include short circuit protection which may need to be supplied by others.
5. **Wire the Optional Accessories**. Reference the Ladder Diagram on the inside of the control center door for correct wiring of the following accessories:
   - Blower Switch
   - Heat Switch
   - Indicating Lights
   - Dirty Filter Indicator
   - TSCP
   - KSCP

**NOTE**

TSCP has number-to-number wiring.

6. **Wire the Optional Evaporative Cooler.** Reference the Ladder Diagram on the inside of the control center door for correct wiring of the pump and the optional auto-drain and flush.

**NOTE**

Large evaporative coolers may require a separate power supply.

## Installation of Electric Heater *(optional)*

**WARNING**

Electrical Shock Hazard! Disconnect all power sources before doing any work on the unit.

The requirements and practices described below are based on the National Electrical Code (NEC) and The Space Heating Standard of Underwriters Laboratories Inc. (UL). Although UL requirements are uniform throughout the country, local electrical codes may deviate from the National Electrical Code. Therefore, local inspection authorities should be consulted regarding local requirements.

### Electrical Wiring Instructions

1. Use the wiring diagram supplied with the heater as a guide in correlating field wiring with the heater internal wiring.
2. All field wiring to the heater must meet the requirements of the National Electrical Code and any other applicable local or state codes.
3. Wiring to the heater must be rated for 75°C *(167°F)* minimum.
4. The fan is interlocked by the factory to the control circuit so the electric heater will not operate unless the fan is on.
5. If heater does not have a built-in disconnect switch or main circuit breaker, install a remote disconnect (furnished by others) in accordance with the National Electrical Code, Article 424-65.

## Effect of Low Voltage on Wattage and British Thermal Unit (BTU)

The heating elements may be used on voltages lower than the design voltage of the heater, however, the wattage and BTU output will be reduced to the percentages listed in the table below.

**Derated Wattage For Low Voltage**

| Heater Voltage | Line Voltage | % of Heater Wattage and BTU | Heater Voltage | Line Voltage | % of Heater Wattage and BTU |
|---|---|---|---|---|---|
| 480 | 460 | 92 | 208 | 200 | 92 |
| | 440 | 84 | | 190 | 83 |
| 277 | 265 | 92 | 120 | 115 | 92 |
| | 254 | 84 | | 110 | 84 |
| 240 | 230 | 92 | | | |
| | 220 | 84 | | | |
| | 208 | 75 | | | |
| | 200 | 69 | | | |

## Installation Evaporative Cooling Piping *(optional)*

### Recirculating Evaporative Piping

**IMPORTANT**

All supply solenoids, valves and all traps must be below the roof line or be otherwise protected from freezing.

**IMPORTANT**

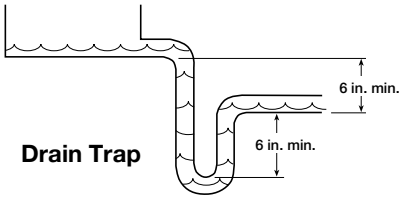
The supply line should be of adequate size and pressure to resupply the amount of water lost due to bleed-off and evaporation. The drain line should be the same size or larger than the supply line.

**CAUTION**

Provisions must be taken to prevent damage to the evaporative cooling section during freezing conditions. The sump, drain lines and supply lines must be drained prior to freezing conditions or an alternate method must be used to protect the lines and media.

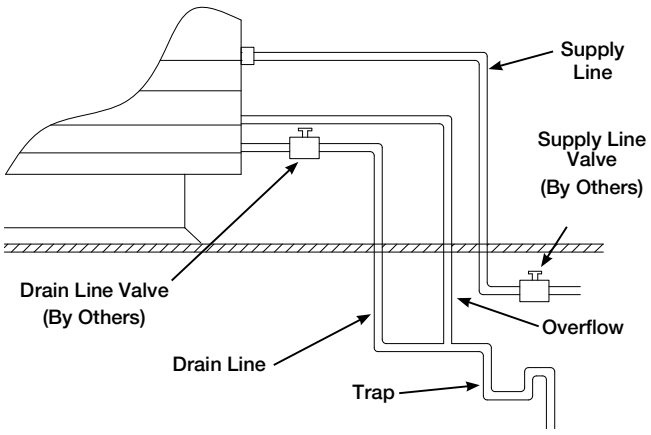
1. **Install the Water Supply Line.** Supply line opening requirements vary by unit size and arrangement and are field-supplied. Connect the water supply line to the float valve through the supply line opening in the evaporative cooling unit. Install a manual shutoff valve in the supply line as shown.
2. **Install the Drain Line.** Connect an unobstructed drain line to the drain and overflow connections on the evaporative cooler. A manual shut off valve (by others) is required for the evaporative cooler drain line.

   A trap should be used to prevent sewer gas from being drawn into the unit.



Drain Trap

3. **Check/Adjust Water Level.** Check the water level in the sump tank. The water level should be above the pump intake and below the overflow. Adjust the float as needed to achieve the proper water level.



**Evaporative Cooling with Recirculating Pump**

### Auto Drain & Fill Evaporative Piping

**IMPORTANT**

The supply line should be of adequate size and pressure to resupply the amount of water lost due to bleed-off and evaporation. The drain line should be the same size or larger than the supply line.

**CAUTION**

All solenoids valves and traps must be installed below the roof to protect the supply water line from freezing. If they cannot be installed below the roof, an alternative method must be used to protect the lines from freezing.

**IMPORTANT**

The supply solenoid (Valve A) is NOT the same as the drain solenoids (Valve B and Valve C). Make sure to use the proper solenoid for each location. Check your local code requirements for proper installation of this type of system.

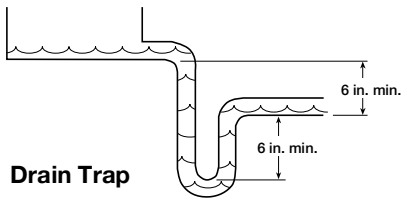
**Auto Drain & Flush Valves**
(when provided by manufacturer)

| Assembly Number | Mfg. Part Number | ASCO Part No. | Solenoid Type | De-Energized Position | Diameter | Qty. |
|---|---|---|---|---|---|---|
| 852178 | 461262 | 8210G2 | Supply | Closed | 1/2 inch *(12.7 mm)* | 1 |
| | 461263 | 8262G262 | Supply Line Drain | Open | 1/4 inch *(6.35 mm)* | 1 |
| | 461264 | 8210G35 | Sump Drain | Open | 3/4 inch *(19.05 mm)* | 1 |

*Part numbers subject to change.*

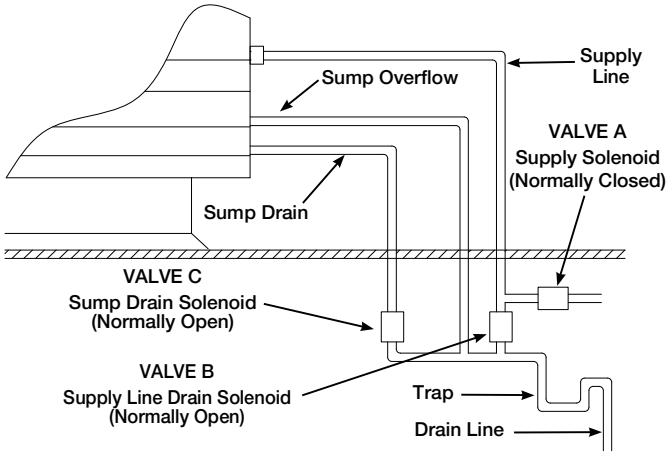
1. **Install the Water Supply Line.** Supply line opening requirements vary by unit size and arrangement and are field-supplied. Connect the water supply line to the float valve through the supply line opening in the evaporative cooling unit. Install the 1/2 in. normally closed solenoid (Valve A) in the supply line. Install the 1/4 in. normally open solenoid (Valve B) between the supply line and the drain line. Refer to Evaporative Cooling with Auto Drain & Fill drawing.
2. **Install the Drain Line.** Connect an unobstructed drain line to the sump drain overflow connection. Install the 3/4 in. normally open solenoid (Valve C) between the sump drain connection and the drain line.

   A trap should be used to prevent sewer gas from being drawn into the unit.



Drain Trap

3. **Check/Adjust Water Level.** Check the water level in the sump tank. The water level should be above the pump intake and below the overflow. Adjust the float as needed to achieve the proper water level.




**Evaporative Cooling with Auto Drain and Fill**

## Installation of Water Wizard™ *(optional)*

### Evaporative Cooling with the Water Wizard™

**NOTE**

The following instructions are provided for evaporative coolers equipped with the Water Wizard™ only. Additional instructions are provided for evaporative coolers equipped with the auto-drain and fill or bleed-off.

**WARNING**

Disconnect and lock-out all power and gas before performing any maintenance or service to the unit. Failure to do so could result in serious injury or death and damage to equipment.

**Water Wizard™ Valves**
(when provided by manufacturer)

| Unit Model | Assm. No. | Mfg. Part No. | ASCO Part No. | Solenoid Type | De-Energized Position | Diameter | Qty. |
|---|---|---|---|---|---|---|---|
| MSX-H12, H22 | 852370 | 461262 | 8210G2 | Supply | Closed | 1/2 inch *(12.7 mm)* | 1 |
| MSX-H32 (<9000 cfm) | | 383086 | 8210G34 | Supply Line Drain | Open | 1/2 inch *(12.7 mm)* | 1 |
| MSX-H32 (≥9000 cfm) | 852371 | 383088 | 8210G9 | Supply | Closed | 3/4 inch *(19.05 mm)* | 1 |
| MSX-H35, H38, H42 | | 383086 | 8210G34 | Supply Line Drain | Open | 1/2 inch *(12.7 mm)* | 1 |

*Part numbers subject to change.*

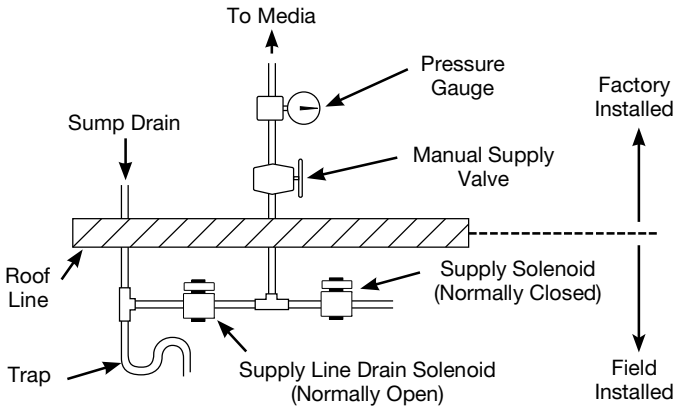
1. **Install Normally Closed Supply Line/Solenoid.** Connect the water supply line to the manual supply valve in the unit. Install the supply solenoid in the supply line, upstream of the manual supply valve and below the roof line.
2. **Install Normally Open Drain Line/Solenoid.** Connect the drain line to the supply line between the manual supply valve and the supply solenoid. Install a drain solenoid in the drain line, below the roof line. A trap should be installed in the drain line.

**NOTE**

Solenoid(s) may be provided by Manufacturer (if ordered) or by others.

**CAUTION**

Any wiring deviations may result in personal injury or property damage. Manufacturer is not responsible for any damage to or failure of the unit caused by incorrect final wiring.




**Water Wizard™ Installation**

3. **Wire the Solenoid(s).** Wire the supply line solenoid and drain solenoid as shown on the unit's wiring diagram in the control center.
4. **Wire the Temperature Sensor.** If the evaporative cooler shipped separate from the unit, the temperature sensor must be wired. The sensor wire is bundled inside the discharge end of the evaporative cooler. Wire the sensor wire to terminals as shown on the unit's wiring diagram.

**NOTE**

The Water Wizard™ start-up must be completed for proper performance.

## Installation of Direct Expansion (DX) Coil Piping *(optional)*

**IMPORTANT**

Guidelines for the installation of direct expansion cooling coils have been provided to ensure proper performance and longevity of the coils. These are general guidelines that may have to be tailored to meet the specific requirements of any one job. As always, a qualified party or individual should perform the installation and maintenance of any coil. Protective equipment such as safety glasses, steel toe boots and gloves are recommended during the installation and maintenance of the coil.

**IMPORTANT**

All field brazing and welding should be performed using high quality materials and an inert gas purge (such as nitrogen) to reduce oxidation of the internal surface of the coil.

**IMPORTANT**

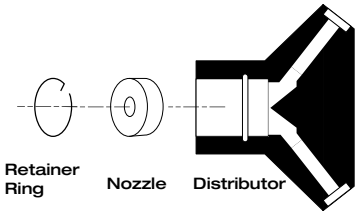
All field piping must be self-supporting and flexible enough to allow for the thermal expansion of the coil.

1. **Locate the Distributor(s) by Removing the Distributor Access Panel**

**Distributor Access Panel**

**Distributor Location**

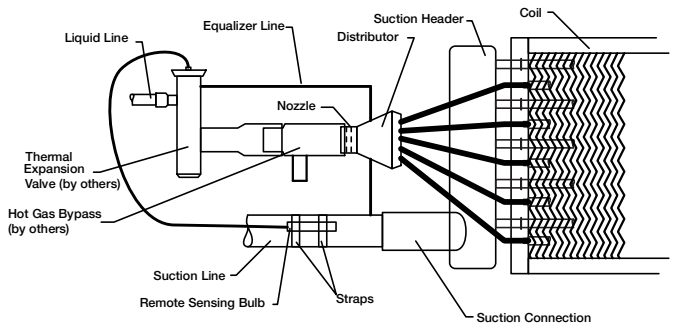
2. **Verify Nozzle Placement.** Inspect the refrigerant distributor and verify that the nozzle is in place. The nozzle is generally held in place by a retaining ring or is an integral part of the distributor itself.




**Nozzle Placement**

3. **Install Suction Line**. Install suction line(s) from the compressor to the suction connection(s) which are stubbed through the side of the cabinet.

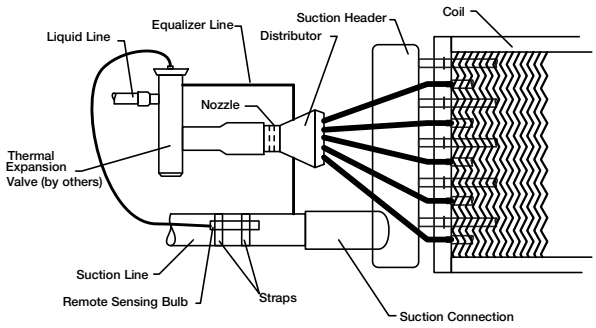
4. **Install the Liquid Line and Thermal Expansion Valve (TEV) (by others).** Liquid line openings vary by coil size and circuiting and are field-supplied. Follow the TEV recommendations for installation to avoid damaging the valve.




**Installation with Hot Gas Bypass**

**NOTE**

If a hot gas bypass kit was provided by others, refer to the manufacturer's instructions.



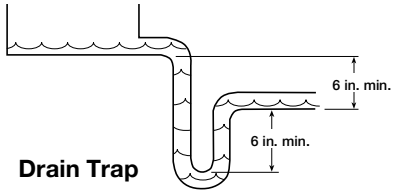

**General Installation**

5. **Mount the Remote Sensing Bulb (by others)**. The expansion valve's remote sensing bulb should be securely strapped to the horizontal run of the suction line at the 3 or 9 o'clock position and insulated.

6. **Check Coil Piping for Leaks.** Pressurize the coil to 100 psig with dry nitrogen or other suitable gas. The coil should be left pressurized for a minimum of 10 minutes. If the coil holds the pressure, the hook-up can be considered leak free. If the pressure drops by 5 psig or less, re-pressurize the coil and wait another 10 minutes. If the pressure drops again, there is likely one or more small leaks which should be located and repaired. Pressure losses greater than 5 psig indicate a large leak that should be isolated and repaired.

## Installation of Direct Expansion (DX) Coil Piping *(optional) - continued*

7. **Evacuate and Charge the Coil.** Use a vacuum pump to evacuate the coil and any interconnecting piping that has been open to the atmosphere. Measure the vacuum in the piping using a micron gauge located as far from the pump as possible. Evacuate the coil to 500 microns or less, and then close the valve between the pump and the system. If the vacuum holds to 500 microns or less for one minute, the system is ready to be charged or refrigerant in another portion of the system can be opened to the coil. A steady rise in microns would indicate that moisture is still present and that the coil should be further vacuumed until the moisture has been removed.
8. **Install the Drain Line.** Connect an unobstructed drain line to the drain pan. A trap should be used to prevent sewer gas from being drawn into the unit.



Drain Trap

**IMPORTANT**

All traps must be installed below the roof line or be otherwise protected from freezing.

**NOTE**

Failure to obtain a high vacuum indicates a great deal of moisture or a small leak. Break the vacuum with a charge of dry nitrogen or other suitable gas and recheck for leaks. If no leaks are found, continue vacuuming the coil until the desired vacuum is reached.

# Installation

## Installation of Chilled Water Coil Piping *(optional)*

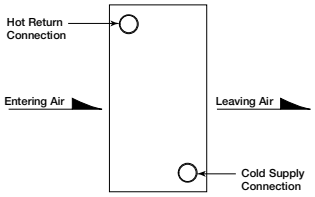
**IMPORTANT**

Guidelines for the installation of the cooling coil have been provided to ensure proper performance of the coils and their longevity. These are general guidelines that may have to be tailored to meet the specific requirements of any one job. As always, a qualified party or individual should perform the installation and maintenance of the coil. Protective equipment such as safety glasses, steel toe boots and gloves are recommended during the installation and maintenance of the coil.

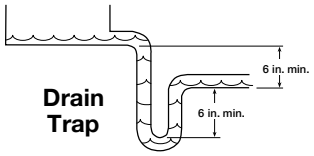
When installing couplings, do not apply undue stress to the connection. Use a backup pipe wrench to avoid breaking the weld between the coil connection and the header.

All field piping must be self-supporting. System piping should be flexible enough to allow for the thermal expansion and contraction of the coil.

1. **Verify Coil Hand Designation.** Check the coil hand designation to ensure that it matches the system. Coils are generally plumbed with the supply connection located on the bottom of the leaving air-side of the coil and the return connection at the top of the entering air-side of the coil. This arrangement provides a counter flow heat exchanger and positive coil drainage.




2. **Check the Coil for Leaks.** Pressurize the coil to 100 psig with dry nitrogen or other suitable gas. The coil should be left pressurized for a minimum of 10 minutes. If the coil holds the pressure, the hook-up can be considered leak free. If the pressure drops by 5 psig or less, re-pressurize the coil and wait another 10 minutes. If the pressure drops again there is likely one or more small leaks which should be located and repaired. Pressure losses greater than 5 psig indicate a large leak that should be isolated and repaired.
3. **Connect the Supply and Return Lines.** Connect the supply and return lines as shown above.
4. **Install the Drain Line.** Connect an unobstructed drain line to the drain pan. A trap should be installed to prevent sewer gas from being drawn into the unit.



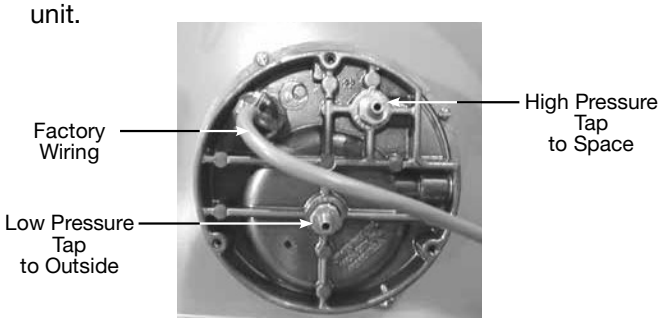

**IMPORTANT**

All traps must be installed below the roof line or be otherwise protected from freezing.

## Installation of Building Pressure Control *(optional)*

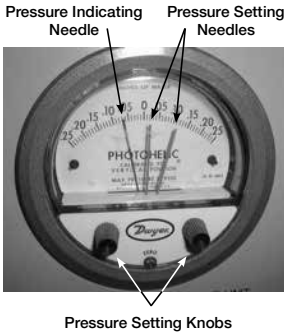
1. **Mount Pressure Tap.** Using the factory-provided bracket, mount the pressure tap to the outside of the unit. Choose a location out of the prevailing winds and away from supply or exhaust fans to assure accurate readings.

2. **Run Pressure Tap Lines.** Run a pressure tap line from the pressure tap on the outside of the unit to the low pressure tap on the back of the photohelic gauge. Run a second pressure tap line from the high pressure tap on the back of the photohelic gauge to the space. Fifty feet of tubing is supplied with the unit.




**Connections for Photohelic Gauge**

3. **Set the Building Pressure.** The pressure gauge is used to set the desired building pressure. The pressure is set by adjusting the knobs for the upper and lower pressure limits. Typical settings are 0.0 inch wc for the lower and 0.10 inch wc for the upper pressure setting.




**Typical Photohelic Gauge Settings**

# Start-Up Checklist

| SPECIAL TOOLS REQUIRED |
|---|
| • Voltage Meter (with wire probes)<br>• Amperage Meter<br>• Micro Amp Meter<br>• Tachometer<br>• Thermometer<br>• Incline manometer or equivalent |

## Start-Up Checklist

Unit Model Number _____
(e.g. MSX-120-H32-DB)

Unit Serial Number _____
(e.g. 10111000)

Start-Up Date _____

Start-Up Personnel Name _____

Start-Up Company _____

Phone Number _____

### Pre Start-Up Checklist – check boxes as items are completed.

- ☐ Check tightness of all factory wiring connections
- ☐ Verify control wiring wire gauge
- ☐ Hand-rotate blower to verify free rotation
- ☐ Verify supply voltage to the main disconnect
- ☐ Verify remote controls wiring

### Start-Up Blower Checklist – refer to Blower Start-Up section for further detail.

- ☐ Check line voltage L1-L2 _____
  L2-L3 _____
  L1-L3 _____
- ☐ Check blower rotation
- ☐ Check for vibration
- ☐ Supply fan RPM _____ RPM
- ☐ Motor nameplate amps _____ Amps
- ☐ Actual motor L1 _____ Amps
  L2 _____ Amps
  L3 _____ Amps
- ☐ Actual CFM delivered _____ CFM

### Optional Accessories – refer to Blower Start-Up section, Step #6 for further detail.

- ☐ Heating Inlet Air Sensor
  _____ Actual Setting
  • *Typical setting 60-70ºF (15º-21ºC)*
- ☐ Cooling Inlet Air Sensor
  _____ Actual Setting
  • *Typical setting 75ºF (24ºC)*
- ☐ Building Freeze Protection
  _____ Actual Setting
  • *Typical setting 5 minutes; 45ºF (7ºC)*
- ☐ Dirty Filter Gauge
  _____ Actual Setting
  • *Typical setting varies*

### Start-Up Electric Heater (optional) – refer to Electric Heater Start-Up section for further detail.

- ☐ Check line voltage L1-L2 _____
  L2-L3 _____
  L1-L3 _____
- ☐ Set the unit's operating temperature
  _____ °F / °C

### Start-Up Evaporative Cooler (optional) – refer to Evaporative Cooler Start-Up section for further detail.

- ☐ Check media orientation
- ☐ Check for proper water flow to distribution headers
- ☐ Check for distribution header orientation to prevent water spillage

# Start-Up - Blower

**NOTE**

Units with a direct drive backward-curved plenum supply fan must always be supplied with a VFD due to the direct drive arrangement on the supply fan. Before proceeding further, identify if this is a constant volume or VAV unit.

## Pre Start-Up Check

Rotate the fan wheel by hand and make sure no parts are rubbing. Check the V-belt drive for proper alignment and tension (a guide for proper belt tension and alignment is provided in the Belt Maintenance section). Check fasteners, set screws and locking collars on the fan, bearings, drive, motor base, and accessories for tightness.

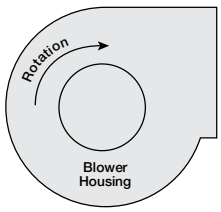
**WARNING**

Disconnect and lock-out all power and gas before performing any maintenance or service to the unit. Failure to do so could result in serious injury or death and damage to equipment.

**WARNING**

Check the housing, blower, and ductwork for any foreign objects before running the blower.

1. **Check the Voltage.** Before starting the unit, compare the supplied voltage, hertz, and phase with the unit and motor's nameplate information.
2. **Check the Blower Rotation**. Open the blower access door and run the blower momentarily to determine the rotation. Arrows are placed on the blower scroll to indicate the proper direction or reference the example shown.




**Blower Rotation**

**NOTE**

To reverse the rotation on three phase units, disconnect and lock-out the power, then interchange any two power leads.

**NOTE**

To reverse the rotation on single phase units, disconnect and lock-out the power, then rewire the motor per the manufacturer's instructions.

**IMPORTANT**

If the blower is rotating in the wrong direction, the unit will move some air, but will not perform as designed. Be sure to perform a visual inspection to guarantee the correct blower rotation.

3. **Check for Vibration.** Check for unusual noise, vibration or overheating of the bearings. Reference the Troubleshooting section for corrective actions.

**IMPORTANT**

Excessive vibration may be experienced during the initial start-up. Left unchecked, it can cause a multitude of problems including structural and/or component failure.

**IMPORTANT**

Generally, fan vibration and noise is transmitted to other parts of the building by the ductwork. To minimize this undesirable effect, the use of heavy canvas duct connectors is recommended.

4. **Motor Check.** Measure the motor's voltage, amps and RPM. Compare to the specifications. Motor amps can be reduced by lowering the motor RPM or increasing system static pressure.

**IMPORTANT**

Additional starters and overloads may be provided in the make-up air control center for optional exhaust blowers. Any additional overloads must be checked for proper voltage, amps and RPMs.

5. **Air Volume Measurement & Check**. Measure the unit's air volume (cfm) and compare it with it's rated air volume. If the measured air volume is off, adjust the fan's RPM by changing/adjusting the drive.

**NOTE**

The most accurate way to measure the air volume is by using a pitot traverse method downstream of the blower. Other methods can be used but should be proven and accurate.

**IMPORTANT**

Changing the air volume can significantly increase the motor's amps. If the air volume is changed, the motor's amps must be checked to prevent overloading the motor.

**NOTE**

To ensure accuracy, the dampers are to be open when measuring the air volume.

6. **Set-Up Optional Components**. Adjust the settings on the optional components. See the Control Center Layout in the Reference section for location of optional components.
   - Heating Inlet Air Sensor
     Typical setting: 60-70°F (15-21°C)
   - Cooling Inlet Air Sensor
     Typical setting: 75°F (24°C)
   - Building Freeze Protection
     Typical setting: 5 minutes; 45°F (7°C)
   - Dirty Filter Gauge
     Typical setting: Settings vary greatly for each unit.

## Start-Up - Electric Heater *(optional)*

### Pre Start-Up Check

Check all electrical connections. Tighten any loose connection to all components including contactors, heating elements and main power lugs.

**WARNING**

Disconnect and lock-out all power before performing any maintenance or service to the unit. Failure to due so could result in serious injury or death and damage to equipment.

1. **Check the Voltage.** Before starting the heater, compare the supplied voltage, hertz, and phase with the heater's nameplate information.
2. **Airflow Interlock**. With the supply fan on, verify the electric heater's airflow interlock (DDS) is made.
3. **Set the Unit's Operating Temperature.** Set the operating temperature by adjusting the discharge temperature selector. Typical settings are 65-70°F *(18-21°C)*.

**NOTE**

If the heater is equipped with an optional inlet air sensor the heater will not energize unless the outdoor air temperature is less than the inlet air sensor's set point.

# Economizer *(optional)*

The following economizer sequences will function to modulate the outdoor and return air dampers to determine and maximize the availability of free cooling. Although the Honeywell economizer controller contains numerous set points, the adjustment of only a few is necessary to ensure optimal performance.

## Sequences

### EC-1 Outdoor Air Temperature Reference

This mode compares the outdoor air temperature to the dry bulb temperature set point (DRYBLB SET). Once the outdoor air temperature is less than DRYBLB SET, the unit will modulate the position of the dampers to maintain a predetermined mixed air temperature (MAT SET).

### EC-2 Outdoor Air Enthalpy Reference

This mode compares the outdoor air enthalpy to a preset enthalpy curve. When the outdoor air conditions are within this curve, the dampers will modulate to maintain a mixed air temperature (MAT SET).

### EC-3 Differential Temperature Reference

This mode compares the outdoor air temperature and the return air temperatures. If the outdoor air is cooler than the return, the dampers will modulate to maintain a preset mixed air temperature (MAT SET).

### EC-4 Differential Enthalpy Reference

This mode compares the outdoor air enthalpy and the return air enthalpy. If the outdoor air enthalpy

## Relevant Set Points

1. **MAT SET** - The mixed air temperature set point. The control will modulate the damper to maintain temperature as best as it can (Set point menu, Default 53°F)
2. **LOW T LOCK** - The set point for the low temperature mechanical cooling lockout. (Set point menu, Default 32°F)
3. **DRYBLB SET** - The outdoor air set point to call for economizer. (Set point menu, Default 63°F)
4. **MIN POS** - The minimum signal voltage sent to the dampers. This must be set to 2 VDC. (Set point menu, Default 2.8 VDC)
5. **AUX1 O** – The controllers operating sequence structure. (Set point menu, Default 'None')
6. **ERV OAT SP** - The set point for low temperature economizer lockout. This is the low temperature set point when AUX1 O is set to ERV. (Set point menu, Default 32°F)
7. **STG3 DLY** - Time delay after second cooling stage is enabled (Advanced setup menu, Default 2 hrs.)

## Using the Keypad with Settings and Parameters

To use the keypad when working with Set points, System and Advanced Settings, Checkout tests, and Alarms:

1. Navigate to the desired menu.
2. Press ↵ (enter) to display the first item in the currently displayed menu.
3. Use the ▲ and ▼ buttons to scroll to the desired parameter.
4. Press ↵ (enter) to display the value of the currently displayed item.
5. Press the ▲ button to increase (change) the displayed parameter value.[a]
6. Press the ▼ button to increase (change) the displayed parameter value.[a]
7. Press ↵ (enter) to accept the displayed value and store it in non-volatile RAM.
8. CHANGE STORED displays.
9. Press ↵ (enter) to return the current menu parameter.
10. Press ⓘ (escape) to return to the current menu parameter.

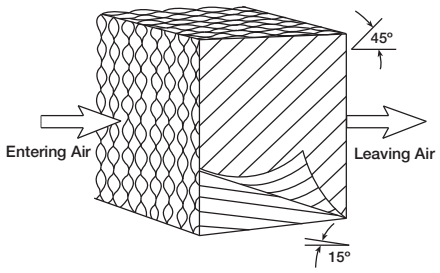
[a] When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

## Modulate Dampers

1. Navigate to the Checkout menu and press (Enter).
2. The cooling should turn off.
3. Navigate to Damper Open and press (enter) twice to run the test.
4. Voltage between terminals ACT 2-10 and ACT COM should be 10 VDC. This will open the outdoor air damper and close the return air damper
5. Press (escape), navigate to Damper Close and press (enter) twice to run the test.
6. Voltage between terminal ACT 2-10 and ACT COM should be 2 VDC. This will close the outdoor air damper and open the return air damper.

## Start-Up - Evaporative Cooling Recirculating *(optional)*

1. **Check the Installation.** The media may have been removed during installation, so its orientation should be double checked. The media should be installed with the steeper flute angle sloping down towards the entering air side.



**Media Orientation**

   Verify that the stainless steel caps and distribution headers are in place. The headers should be located over the media towards the entering air side. The caps should be placed over the headers.

2. **Check the Pump Filter.** Check that the pump filter is around the pump inlet.
3. **Fill the Sump and Adjust the Float**. Turn on the water supply and allow the sump tank to fill. Adjust the float valve to shut-off the water supply when the sump is filled to within 1 inch of the bottom of the overflow.
4. **Break-In the Media**. Open the bleed-off valve completely and saturate the media with the blower(s) off for no less than 20 minutes.

**NOTE**

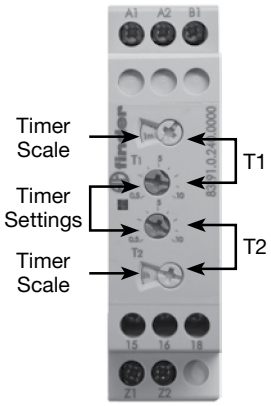
A jumper will need to be installed in the control center to power the evaporative pumps with the blower(s) off. Reference the unit's ladder diagram to determine proper terminals.

5. **Check the Flow Rate.** The pumps should provide enough water to saturate the media in 45 to 60 seconds. Consult the factory if adequate flow is not achieved.
6. **Adjust the Water Bleed-Off Rate**. The water bleed-off rate is dependent on the water's mineral content. The bleed-off should be adjusted based on the media's mineral deposits after two weeks of service.
7. **Set the Optional Auto Drain and Fill.** This system will automatically drain the sump tank and fill it with fresh water at the field adjustable intervals, typically once every 24 hours. This flushes mineral build-up and debris from the tank to promote low maintenance and increase media pad life.

   In addition, the system will protect the evaporative cooler from freezing by draining the sump tank and supply line when the outside temperatures fall below the set point of the outside air sensor. Typically, this is set at 45 to 50ºF. The auto drain and fill outdoor air sensor should be installed in an area that is shaded from direct sunlight so the outside air sensor probe will detect an accurate air temperature.

   **Set the Timer Scale and Settings dials:**

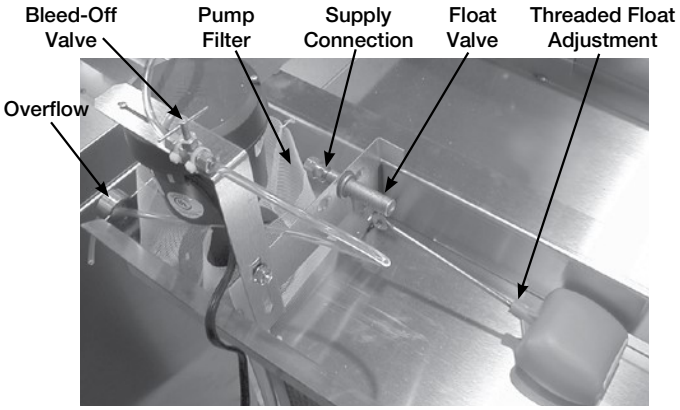
   - **T1** timer setting set to **10** and timer scale set to **1d** for 1 day of operation
   - **T2** timer setting set to **10** and the timer scale set to **10m** for 10 minutes of drain time




8. **Put the Unit into Service.** Remove the jumper, and energize the blower(s). Verify proper operation.

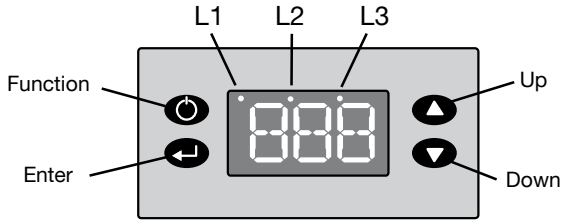
**IMPORTANT**

Check the media for minerals after two weeks of service and adjust the bleed-off rate accordingly.



**Evaporative Cooler Set-Up**

## Start-Up - Water Wizard™ *(optional)*




**Water Wizard™ User Interface Key Function Description**

1. **Open the Solenoid**. Confirm that the manual water supply valve is closed. Press and hold the Function key for one second. L3 will begin blinking (short on, long off), indicating that Flow Test Mode is active and the supply solenoid is open.
2. **Set the Water Pressure.** With the solenoid open, set the supply water pressure to the correct setting (see table below). Use the manual supply valve to adjust the supply pressure. A pressure gauge is provided between the manual supply valve and the media.

**WARNING**

Opening the manual supply valve will allow water to pass to the media. Be sure the sump is safely draining before opening the manual supply valve.

**NOTE**

The manual supply valve ships closed and must be adjusted for proper performance.

| Recommended Water Pressure Chart | | |
|---|---|---|
| Housing Size | Media Width (inches) | Water Pressure (in. wc) |
| MSX-H12 | 30 | 20 |
| MSX-H22 | 43¾ | 36 |
| | 60 | 61 |
| MSX-H32 | 66 | 72 |
| | 96* | 42 |
| MSX-H35 | 120* | 61 |
| MSX-H38 | 180* | 37 |
| MSX-H42 | 216* | 51 |

*Multiple media sections. Values represent total media width.

**NOTE**

The recommended water pressure is based on media width. Refer to the table provided for proper water pressure settings.

3. **Break-in Media.** Leave the supply solenoid open to saturate and break-in media for 20 minutes with the blower off.
4. **Close Solenoid.** With the pressure set, press the Function key for one second to deactivate Flow Test Mode and allow the supply solenoid to close.
5. **Check Media.** Start the cooling cycle and check the media after one hour of operation. If the media is continuously dry or if too much water is draining from the sump tank, refer to Troubleshooting, Water Wizard™.

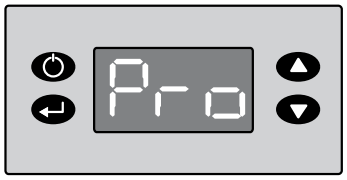
**NOTE**

Steps 6 through 8 are provided to adjust the minimum cooling temperature. The minimum cooling is preset to the factory recommended 75°F (24°C). Only adjust if needed.

**NOTE**

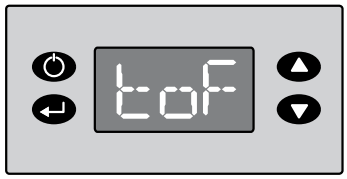
The inlet air sensor function overrides and shuts down the evaporative cooler if the outside temperature falls below the minimum cooling temperature.

6. **Enter Program Mode**. Press and hold the Enter key for three seconds. The display will read "Pro" when Program Mode is active.




**Program Display**

7. **Adjust the Minimum Cooling Temperature.** While in the Program Menu, use the Up and Down keys to navigate the Menu Options until "toF" is displayed. Press the Enter key to access the selected Menu Option setting.




**Minimum Cooling Temperature Display**

Use the Up and Down keys to adjust the Minimum Cooling Temperature as needed. Press the Enter key to save the Minimum Cooling Temperature setting and return to the Program Menu.

**NOTE**

The Enter key must be pressed to save the new minimum cooling temperature.

8. **Exit Program Mode.** After 15 seconds of idle time the controller will exit Program Mode.

## **Microprocessor** *(optional)*

If the optional microprocessor is mounted in the control center of the unit, it may be configured to control the VFD.

pettitpettit
CONSULTING ENGINEERS, INC

# REVIEW OF MECHANICAL SUBMITTALS

**Project:** ASU Mid South Chiller Replacement
**Location:** West Memphis, Arkansas
**Date of Receipt:** Thursday, September 7, 2023
**Date of Review:** Friday, September 8, 2023
**Reviewed by:** Mark Eakin
**Email:** meakin@pettitinc.com

**P&P Job No. 23-008**

Signed: _____

Checking is for conformance with the design concept of the Project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site; for information that pertains solely to the fabrication processes or to techniques of construction; and for coordination of the work of all trades.

| Item | Approval Status | | Comments |
|---|---|---|---|
| Section 23 38 13 – Commercial Kitchen Ventilation Systems | Approved as Corrected. | o | - Note top of exhaust fan is 47.5" above roof with curb extension for both KEF-1 and KEF-2.<br>- Verify exact locations for hoods at the site. Coordinate installations with general contractor.<br>- Verify natural gas shut-off valve location at the site.<br>- Closely coordinate electrical requirements and connections with electrical contractor.<br>- Coordinate airflow requirements closely with Test and Balance Contractor. |
| | | | |

✓ ✗ o ✱

Note:

**Section 23 3813 COMMERCIAL KITCHEN VENTILATION**

**APPROVED AS NOTED**

**Product Data & Manufacturer:**
Manufacturer and product data reviewed and approved. See additional Pettit & Pettit comments above.

**Verification:**
*- Existing structure to be reviewed by Structural Engineer and determined if existing structure can support additional equipment load as built. Final location to be verified in field and coordinated with existing structure and additional steel bracing as required prior to install.*

JSw (WER) 09/12/2023

# SUBMITTAL DATA

EQUIPMENT: Greenheck Kitchen Hood Systems

TAGS: KH-1 & 2, KEF-1 & 2, KMAU-1 & 2

PROJECT: ASU Mid-South Chiller Replacement

LOCATION: West Memphis, AR

ENGINEER:

CONTRACTOR:

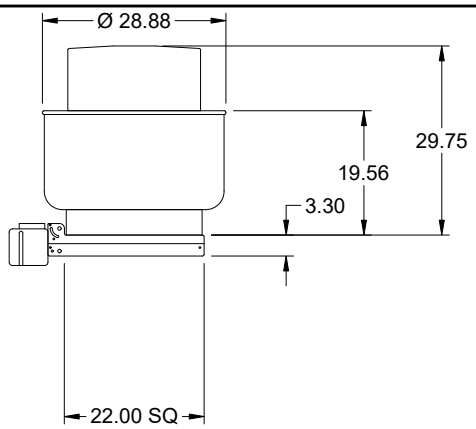
DATE: 8/21/2023

SUBMITTED BY: Forrest Moseley
forrest@airetechcorp.com

# Model: CUBE-140-7

Belt Drive Upblast Centrifugal Roof Exhaust Fan

***Previously: CUBE-141-7***



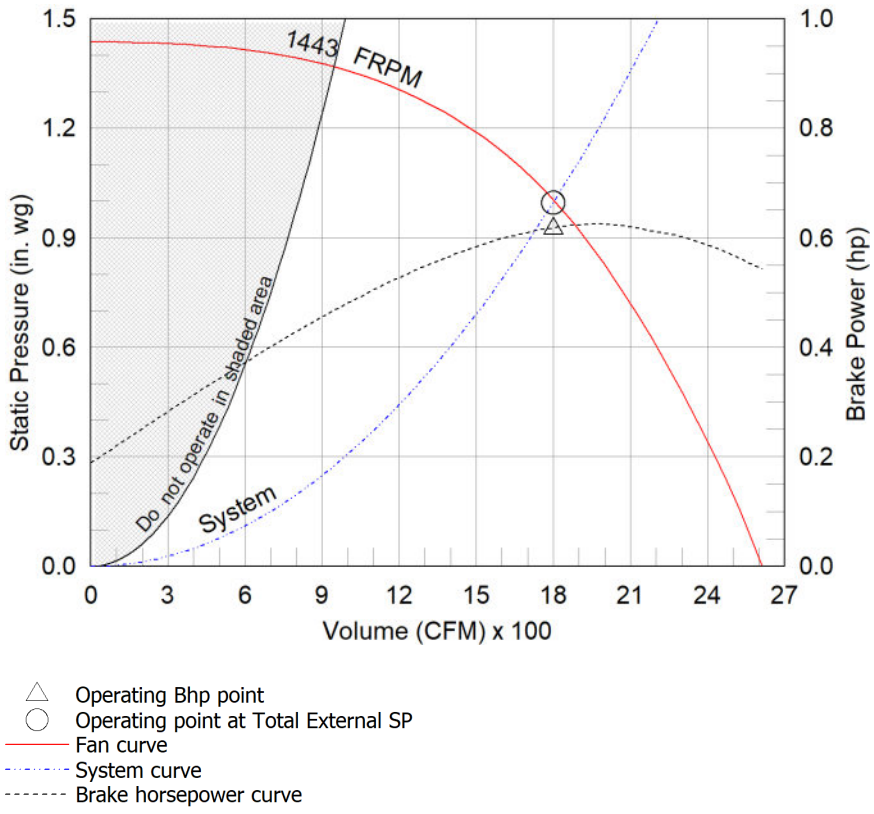

OVERALL HEIGHT MAY BE GREATER DEPENDING ON MOTOR, ADAPTER, AND/OR HINGE BASE.

| Dimensional | |
|---|---|
| Quantity | 1 |
| Weight w/o Acc's (lb) | 74 |
| Weight w/ Acc's (lb) | 108 |
| Max T Motor Frame Size | 145 |
| Standard Curb Cap Size (in.) | 22 x 22 |
| Roof Opening (in.) | 18.5 x 18.5 |

| Performance | |
|---|---|
| Requested Volume (CFM) | 1,800 |
| Actual Volume (CFM) | 1,800 |
| Total External SP (in. wg) | 0.996 |
| Fan RPM | 1443 |
| Operating Power (hp) | 0.62 |
| Elevation (ft) | 338 |
| Airstream Temp.(F) | 70 |
| Air Density (lb/ft3) | 0.074 |
| Drive Loss (%) | 7.6 |
| Tip Speed (ft/min) | 5,524 |
| Static Eff. (%) | 50 |

| Misc Fan Data | |
|---|---|
| Fan Eff. Index (FEI) | - |
| Outlet Velocity (ft/min) | 1,047 |

| Motor | |
|---|---|
| Motor Included | Yes |
| Size (hp) | 3/4 |
| Voltage/Cycle/Phase | 115/60/1 |
| Enclosure | ODP |
| Motor RPM | 1725 |
| Efficiency Rating | Standard |
| Windings | 1 |
| NEC FLA* (Amps) | 13.8 |
| Min. Circuit Ampacity (MCA) | 17.25 |
| Max. Overcurrent Protection (MOP) | 35 |
| Short Circuit Current Rtg (SCCR) | 5 kA |




Sound Power by Octave Band

| Sound Data | 62.5 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | LwA | dBA | Sones |
|---|---|---|---|---|---|---|---|---|---|---|---|

**Notes:**

All dimensions shown are in units of in.
*NEC FLA, MCA and MOP are for reference only – based on tables 430.248 or 430.25 of National Electric Code 2020. Actual motor FLA may vary, for sizing thermal overload, consult factory. MCA and MOP values shown only account for the motor, not accessories (damper actuator, field supplied VFD, etc).
LwA - A weighted sound power level, based on ANSI S1.4
dBA - A weighted sound pressure level, based on 11.5 dB attenuation per Octave band at 5 ft - dBA levels are not licensed by AMCA International
Sones - calculated using ANSI/AMCA 301 at 5 ft

# Model: CUBE-140-7

## Belt Drive Upblast Centrifugal Roof Exhaust Fan

### Standard Construction Features:

- Aluminum housing - Backward inclined aluminum wheel - Curb cap with prepunched mounting holes - Motor and drives isolated on shock mounts - Drain trough - Ball bearing motors - Adjustable motor pulley - Adjustable motor plate - Fan shaft mounted in ball bearing pillow blocks - Bearings meet or exceed temperature rating of fan - Static resistant belts - Corrosion resistant fasteners - Internal lifting lugs

### Selected Options & Accessories:

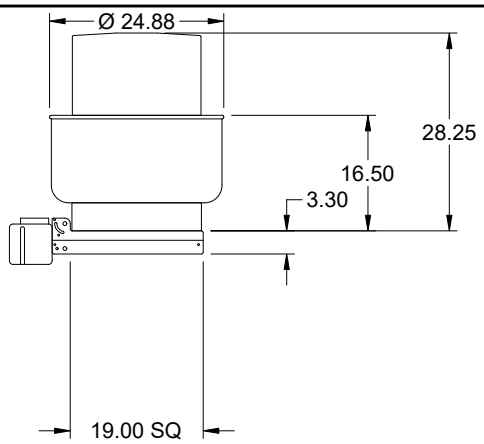
Standard Curb Cap Size - 22 Square
UL/cUL 705 Listed - Supplement SC - "Power Ventilators for Restaurant Exh. Appliances" (Formerly UL 762)
Switch, NEMA-1, Toggle,
Junction Box Mounted & Wired
Curb Extension-Galv., VCE-22-G15.25, Shipped Loose From Factory
Hinge, Factory Installed
High Temp Curb Seal Rated for Continuous Duty at 1500 F (Factory Attached)
Grease Trap (PN 475538)
Heat Baffle (Attached)
Conduit Chase Qty 1
Unit Warranty: 1 Yr (Standard)

# Model: CUBE-120-5

Belt Drive Upblast Centrifugal Roof Exhaust Fan

***Previously: CUBE-121-5***

| Dimensional | |
|---|---|
| Quantity | 1 |
| Weight w/o Acc's (lb) | 68 |
| Weight w/ Acc's (lb) | 100 |
| Max T Motor Frame Size | 56 |
| Standard Curb Cap Size (in.) | 19 x 19 |
| Roof Opening (in.) | 15.5 x 15.5 |

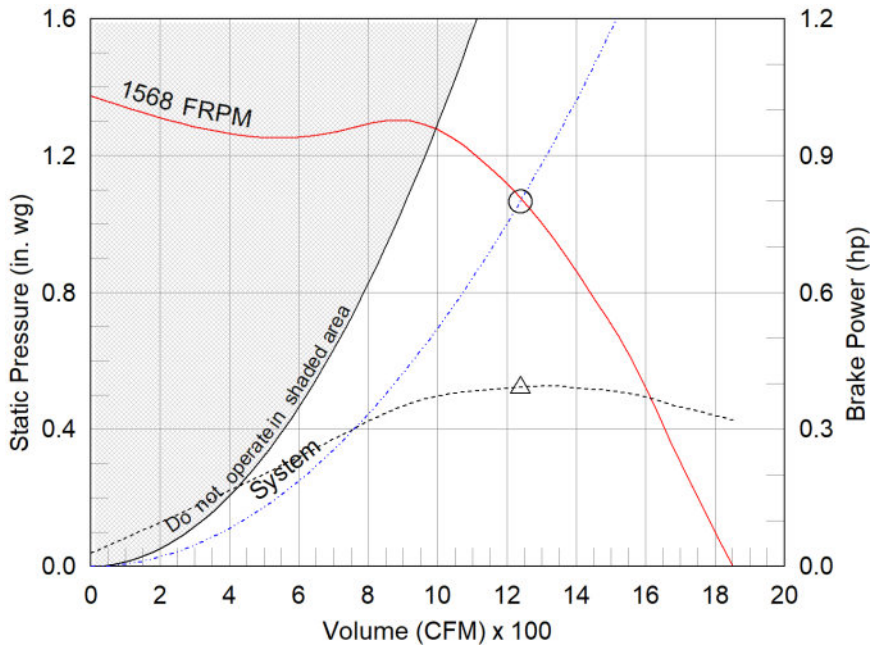



OVERALL HEIGHT MAY BE GREATER DEPENDING ON MOTOR, ADAPTER, AND/OR HINGE BASE.

| Performance | |
|---|---|
| Requested Volume (CFM) | 1,238 |
| Actual Volume (CFM) | 1,238 |
| Total External SP (in. wg) | 1.066 |
| Fan RPM | 1568 |
| Operating Power (hp) | 0.39 |
| Elevation (ft) | 338 |
| Airstream Temp.(F) | 70 |
| Air Density (lb/ft3) | 0.074 |
| Drive Loss (%) | 9.5 |
| Tip Speed (ft/min) | 5,363 |
| Static Eff. (%) | 59 |

| Misc Fan Data | |
|---|---|
| Fan Eff. Index (FEI) | - |
| Outlet Velocity (ft/min) | 967 |

| Motor | |
|---|---|
| Motor Included | Yes |
| Size (hp) | 1/2 |
| Voltage/Cycle/Phase | 115/60/1 |
| Enclosure | ODP |
| Motor RPM | 1725 |
| Efficiency Rating | Standard |
| Windings | 1 |
| NEC FLA* (Amps) | 9.8 |
| Min. Circuit Ampacity (MCA) | 12.25 |
| Max. Overcurrent Protection (MOP) | 25 |
| Short Circuit Current Rtg (SCCR) | 5 kA |




△ Operating Bhp point
◯ Operating point at Total External SP
Fan curve
System curve
Brake horsepower curve

Sound Power by Octave Band

| Sound Data | 62.5 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | LwA | dBA | Sones |
|---|---|---|---|---|---|---|---|---|---|---|---|

**Notes:**

All dimensions shown are in units of in.
*NEC FLA, MCA and MOP are for reference only – based on tables 430.248 or 430.25 of National Electric Code 2020. Actual motor FLA may vary, for sizing thermal overload, consult factory. MCA and MOP values shown only account for the motor, not accessories (damper actuator, field supplied VFD, etc).
LwA - A weighted sound power level, based on ANSI S1.4
dBA - A weighted sound pressure level, based on 11.5 dB attenuation per Octave band at 5 ft - dBA levels are not licensed by AMCA International
Sones - calculated using ANSI/AMCA 301 at 5 ft

# Model: CUBE-120-5

## Belt Drive Upblast Centrifugal Roof Exhaust Fan

### Standard Construction Features:

- Aluminum housing - Backward inclined aluminum wheel - Curb cap with prepunched mounting holes - Motor and drives isolated on shock mounts - Drain trough - Ball bearing motors - Adjustable motor pulley - Adjustable motor plate - Fan shaft mounted in ball bearing pillow blocks - Bearings meet or exceed temperature rating of fan - Static resistant belts - Corrosion resistant fasteners - Internal lifting lugs

### Selected Options & Accessories:

Standard Curb Cap Size - 19 Square
UL/cUL 705 Listed - Supplement SC - "Power Ventilators for Restaurant Exh. Appliances" (Formerly UL 762)
Switch, NEMA-1, Toggle,
Junction Box Mounted & Wired
Curb Extension-Galv., VCE-19-G15.25, Shipped Loose From Factory
Hinge, Factory Installed
High Temp Curb Seal Rated for Continuous Duty at 1500 F (Factory Attached)
Grease Trap (PN 475538)
Heat Baffle (Attached)
Conduit Chase Qty 1
Unit Warranty: 1 Yr (Standard)

## GXEW

**Type 1, X-Tractor (Spark Arrestor Incl.) Filter Single Wall - Exhaust Only Wall Canopy**

| Model | Hood Length (in.) | Width (in.) | Bottom Width (in.) | Height (in.) | | Exhaust Volume (CFM) | Exhaust SP (in. w.g.) | Double Island |
|---|---|---|---|---|---|---|---|---|
| | | | | Front | Back | | | |
| GXEW | 98 | 48 | 48 | 24 | 24 | 1800 | 0.682 | No |

### Selected Options & Accessories:

| Option or Accessory | Description |
|---|---|
| Mounting Height | 80 in. off Finished Floor. |
| Integral Air Space | Factory Mounted on Back - 3" wide 28 lbs |
| Ceiling Enclosures | 16 in. High on Left Front Right |
| Filter Type | Stainless Steel X-Tractor (Spark Arrestor Incl.) Filters 54 lbs |
| Left Full End Skirt | 45 in High 42.5 in Top Width 36.5 in Bottom Width 10 lbs |
| Right Full End Skirt | 45 in High 42.5 in Top Width 36.5 in Bottom Width 10 lbs |

**Material:** 430 SS Where Exposed
**UL Listing:** UL 710 w/out Exhaust Fire Damper

**Features:**
Performance Enhancing Lip (PEL)
Standing Seam Construction for Superior Strength
Stainless Steel Finish for Higher Corrosion Resistance

**Hood End Conditions:**
Back Wall - Limited Combustible

### Section Data:

| Length (in.) | Volume (CFM) | Exhaust Rate (CFM/FT) | SP (in. wg) | Filter Qty | | Filter Ht. (in.) | Cooking Load | Light Qty | Light Type | Foot Candles | Drain Location | Hood Weight (LBS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 16" W | 20" W | | | | | | | |
| 98 | 1800 | 220 | 0.682 | 6 | 0 | 20 | Heavy | 5 | Incandescent / CFL | 48.61 | Left/Right | 262.2 |

### Exhaust Collar Data:

| Collar Num. | Collar Size (LxW) in. or Diameter (in.) | | Pos. Off Left (in.) | Pos Off Back (in.) | Velocity (fpm) | Mounting Option |
|---|---|---|---|---|---|---|
| 1 | | 14 | 34 | 9 | 1684 | Shipped Loose Exhaust Collar(s) |

### External Supply Plenum Data:

**Supply: 1944 CFM** **MUA: 1440 CFM** **AC: 504 CFM**

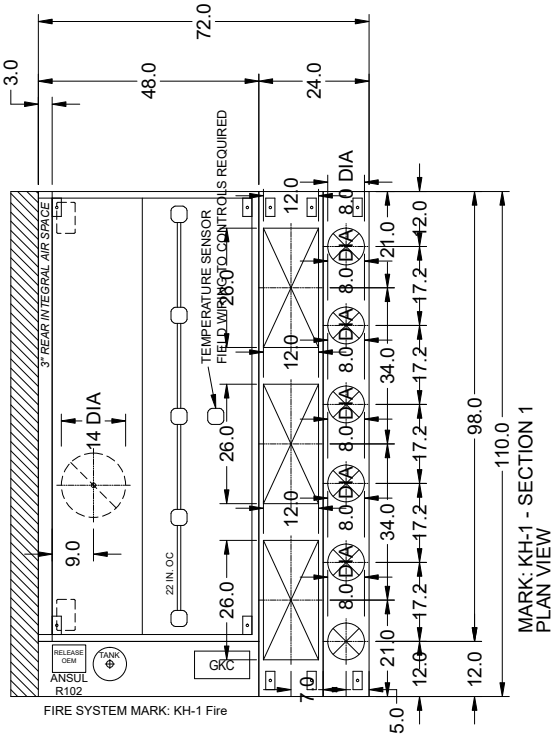
| Plenum Num. | Side | Type | Length (in.) | Width (in.) | Height (in.) | Volume (CFM) | Weight (lbs) | SP (in. wg) | Insulated | MBD | LED Lights |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Front | Split Air Curtain Supply (SSP) - MUA | 110 | 14 | 4 | 1440 | 65 | 0.01 | No | Yes | No |
| 1 | Front | Split Air Curtain Supply (SSP) - AC | 110 | 10 | 4 | 504 | 54 | 0.01 | Yes | Yes | No |

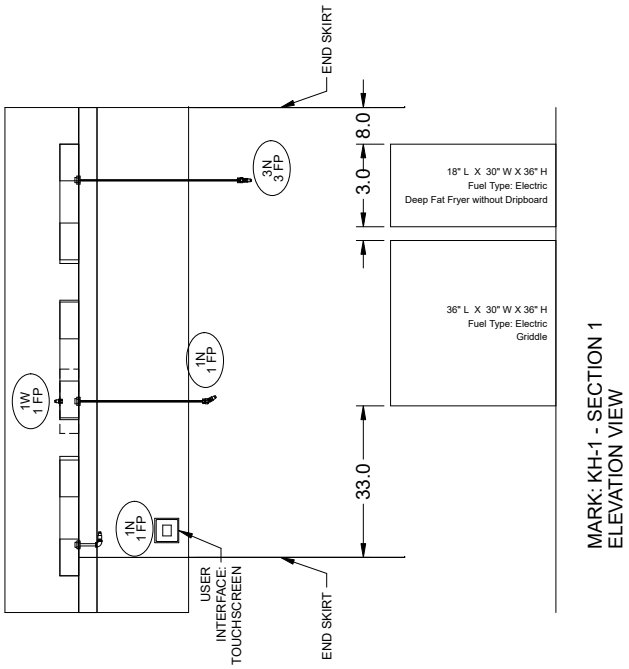
### External Supply Collar Data:

| Section Num. | Plenum Num. | Side | Collar Num. | Collar Shape | Collar Size (LxW) in. or Diameter (in.) | Pos. Off Left (in.) | Pos. Off Front (in.) | Velocity (fpm) | Mounting Option |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Front | 1 | rectangular | 26 x 12 | 21 | 7 | 222 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 2 | rectangular | 26 x 12 | 55 | 7 | 222 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 3 | rectangular | 26 x 12 | 89 | 7 | 222 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 1 | round | 8 | 12 | 5 | 241 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 2 | round | 8 | 29.2 | 5 | 241 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 3 | round | 8 | 46.4 | 5 | 241 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 4 | round | 8 | 63.6 | 5 | 241 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 5 | round | 8 | 80.8 | 5 | 241 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 6 | round | 8 | 98 | 5 | 241 | Factory Mounted Supply Collar(s) |

### Utility Cabinet Data:

| Descripiton | Length (in.) | Width (in.) | Height (in.) | Weight (lbs) |
|---|---|---|---|---|
| Left Utility Cabinet | 48 | 12 | 24 | 134 |

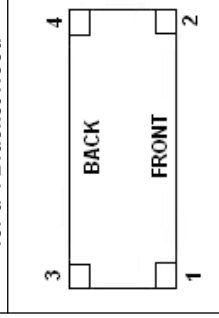


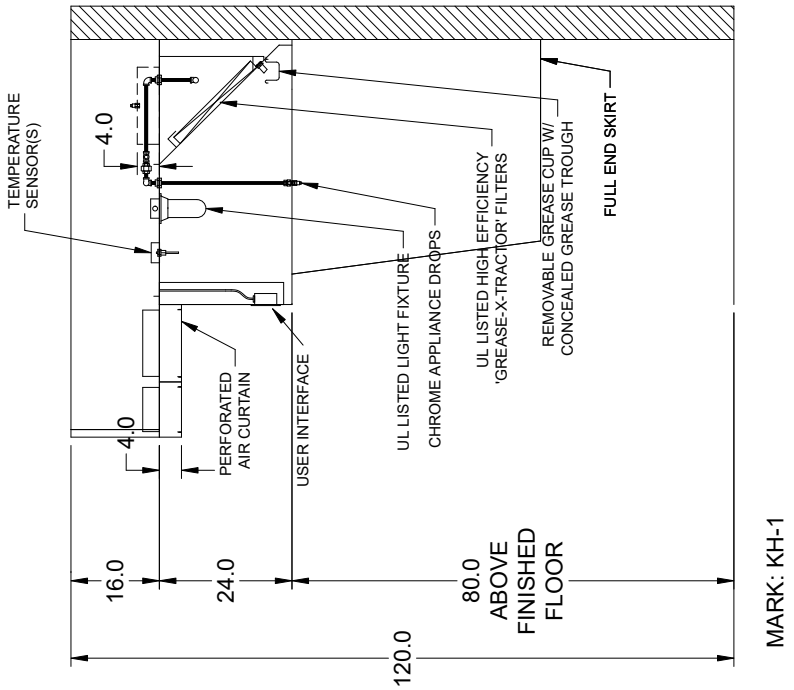




NOTE: All dimensions are in units of in.

| Hanger Bracket Locations | | | |
|---|---|---|---|
| Sec # | Brkt # | Distance Off Left (in) | Distance Off Front (in) |
| 1 | 1 | 3.50 | 2.50 |
| 1 | 2 | 94.50 | 2.50 |
| 1 | 3 | 3.50 | 44.00 |
| 1 | 4 | 94.50 | 44.00 |

**Bracket Mounting Position for a 4 Bracket Hood**




NOTE: All dimensions are in units of in.

# Constant Volume

Greenheck Kitchen Controls

### Standard Construction Features:

Includes control system, Fan Starters (unless otherwise stated), Temperature Sensors, Touchscreen. IMC 507.2.1.1 compliant. UL/ULC Listed.

### Options & Accessories:

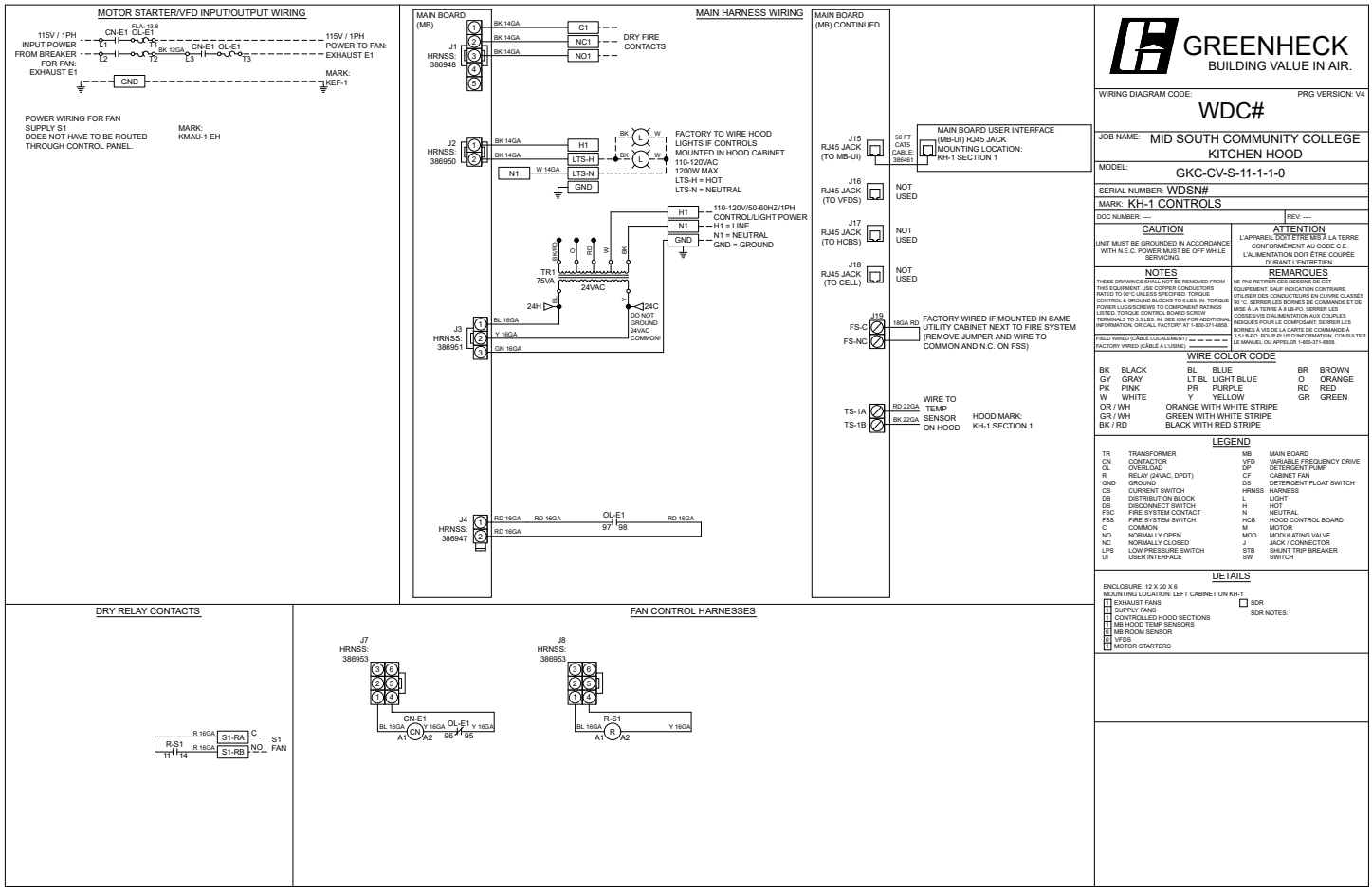
| | |
|---|---|
| Mounting Option | Left Cabinet on KH-1 |
| Exhaust Fan Quantity | 1 |
| Supply Fan Quantity | 1 |
| Hood Light Control | Yes |
| User Interface | Full Color Touchscreen |
| Touchscreen Mounting Location | Face Mount Left Side of Hood - KH-1 Section 1 |
| Exhaust During Fire | Exhaust fans will run at max speed when in fire mode |

### Controlled Fans:

| Fan Mark | Fan Type | Supplied By | Phase | HP | Voltage | NEC FLA | Starter/VFD Required | Starter/VFD Provided |
|---|---|---|---|---|---|---|---|---|
| KEF-1 | Exhaust | Manufacturer | 1 | 0.75 | 115 | 13.8 | Yes | Yes |
| KMAU-1 EH | Supply | Manufacturer | 3 | 0.5 | 208 | 2.4 | No | No |

### Controlled Hood Sections and Fan Relationships:

| | |
|---|---|
| KH-1 Section - Number of Sensors = 1 | |
| | Exhaust Fan Name - KEF-1 |
| | Supply Fan Name - KMAU-1 EH |




GREENHECK
BUILDING VALUE IN AIR.

WIRING DIAGRAM CODE: WDC#
PRG VERSION: V4

JOB NAME: MID SOUTH COMMUNITY COLLEGE KITCHEN HOOD

MODEL: GKC-CV-S-11-1-1-0

SERIAL NUMBER: WDSN#

MARK: KH-1 CONTROLS

DOC NUMBER: ----

REV: ----

**CAUTION**

UNIT MUST BE GROUNDED IN ACCORDANCE WITH N.E.C. POWER MUST BE OFF WHILE SERVICING.

**ATTENTION**

L'APPAREIL DOIT ÊTRE MIS À LA TERRE CONFORMÉMENT AU CODE C.E. L'ALIMENTATION DOIT ÊTRE COUPÉE DURANT L'ENTRETIEN.

**NOTES**

THESE DRAWINGS SHALL NOT BE REMOVED FROM THIS EQUIPMENT. USE COPPER CONDUCTORS RATED TO 90°C UNLESS SPECIFIED. TORQUE CONTROL & GROUND BLOCKS TO 4 LBS. IN. TORQUE POWER LUGS/SCREWS TO COMPONENT RATINGS LISTED. TORQUE CONTROL BOARD SCREW TERMINALS TO 3.5 LBS. IN. SEE IOM FOR ADDITIONAL INFORMATION, OR CALL FACTORY AT 1-800-371-6828.

FIELD WIRED (CÂBLE LOCALEMENT) ———
FACTORY WIRED (CÂBLE À L'USINE) - - - -

**REMARQUES**

NE PAS RETIRER CES DESSINS DE CET ÉQUIPEMENT. SAUF INDICATION CONTRAIRE, UTILISER DES CONDUCTEURS EN CUIVRE CLASSÉS 90 °C. SERRER LES BORNES DE COMMANDE ET DE MISE À LA TERRE À 0 LB-PO. SERRER LES COSSES/VIS D'ALIMENTATION AUX COUPLES INDIQUÉS POUR LE COMPOSANT. SERRER LES BORNES À VIS DE LA CARTE DE COMMANDE À 3.5 LB-PO. POUR PLUS D'INFORMATION, CONSULTER LE MANUEL OU APPELER 1-800-371-6828.

**WIRE COLOR CODE**

| | | | | | |
|---|---|---|---|---|---|
| BK | BLACK | BL | BLUE | BR | BROWN |
| GY | GRAY | LT BL | LIGHT BLUE | O | ORANGE |
| PK | PINK | PR | PURPLE | RD | RED |
| W | WHITE | Y | YELLOW | GR | GREEN |
| OR / WH | ORANGE WITH WHITE STRIPE | | | | |
| GR / WH | GREEN WITH WHITE STRIPE | | | | |
| BK / RD | BLACK WITH RED STRIPE | | | | |

**LEGEND**

| | | | |
|---|---|---|---|
| TR | TRANSFORMER | MB | MAIN BOARD |
| CN | CONTACTOR | VFD | VARIABLE FREQUENCY DRIVE |
| OL | OVERLOAD | DP | DETERGENT PUMP |
| R | RELAY (24VAC, DPDT) | CF | CABINET FAN |
| GND | GROUND | DS | DETERGENT FLOAT SWITCH |
| CS | CURRENT SWITCH | HRNSS | HARNESS |
| DB | DISTRIBUTION BLOCK | L | LIGHT |
| DS | DISCONNECT SWITCH | H | HOT |
| FSC | FIRE SYSTEM CONTACT | N | NEUTRAL |
| FSS | FIRE SYSTEM SWITCH | HCB | HOOD CONTROL BOARD |
| C | COMMON | M | MOTOR |
| NO | NORMALLY OPEN | MOD | MODULATING VALVE |
| NC | NORMALLY CLOSED | J | JACK / CONNECTOR |
| LPS | LOW PRESSURE SWITCH | STB | SHUNT TRIP BREAKER |
| UI | USER INTERFACE | SW | SWITCH |

**DETAILS**

ENCLOSURE: 12 X 20 X 6
MOUNTING LOCATION: LEFT CABINET ON KH-1

- [1] EXHAUST FANS
- [1] SUPPLY FANS
- [1] CONTROLLED HOOD SECTIONS
- [1] MB HOOD TEMP SENSORS
- [1] MB ROOM SENSOR
- [1] VFDS
- [1] MOTOR STARTERS
- [ ] SDR

SDR NOTES:

GREENHECK
BUILDING VALUE IN AIR.

DOC NUMBER: ----
REV: ----

CAUTION
UNIT MUST BE GROUNDED IN ACCORDANCE WITH N.E.C. POWER MUST BE OFF WHILE SERVICING.

ATTENTION
L'APPAREIL DOIT ÊTRE MIS À LA TERRE CONFORMÉMENT AU CODE C.E. L'ALIMENTATION DOIT ÊTRE COUPÉE DURANT L'ENTRETIEN.

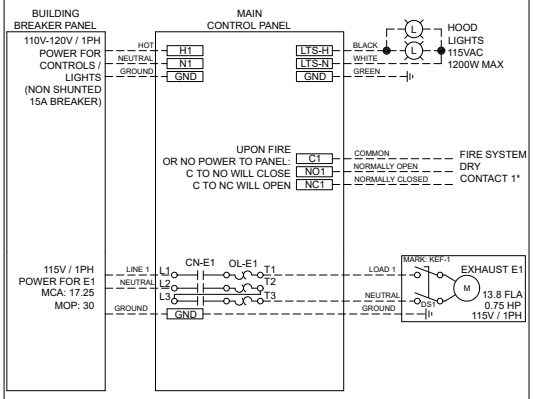
43BM
COMMERCIAL APPLIANCE OUTLET CENTER
ELECTRICAL RATINGS: 110-240V,1PHASE, 50 -60HZ,15A
BASE FILE #E200616, ML FILE #E313951

THESE DRAWINGS SHALL NOT BE REMOVED FROM THIS EQUIPMENT. USE COPPER CONDUCTORS RATED TO 90°C UNLESS SPECIFIED. TORQUE CONTROL & GROUND BLOCKS TO 8 LBS. IN. TORQUE POWER LUGS/SCREWS TO COMPONENT RATINGS LISTED. TORQUE CONTROL BOARD SCREW TERMINALS TO 3.5 LBS. IN. FIELD CONTROL WIRING RESISTANCE SHOULD NOT EXCEED 0.75 OHM. SEE IOM FOR ADDITIONAL INFORMATION, OR CALL FACTORY AT 1-800-371-6858.
PRG VERSION: V4
FIELD WIRED (CÂBLÉ LOCALEMENT)
FACTORY WIRED (CÂBLÉ À L'USINE)

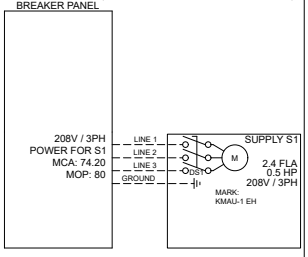
NE PAS RETIRER CES DESSINS DE CET ÉQUIPEMENT. SAUF INDICATION CONTRAIRE, UTILISER DES CONDUCTEURS EN CUIVRE CLASSÉS 90 °C. SERRER LES BORNES DE COMMANDE ET DE MISE À LA TERRE À 8 LB-PO. SERRER LES COSSES/VIS D'ALIMENTATION AUX COUPLES INDIQUÉS POUR LE COMPOSANT. SERRER LES BORNES À VIS DE LA CARTE DE COMMANDE À 3,5 LB-PO. LA RÉSISTANCE DU CÂBLAGE DE COMMANDE LOCAL NE DOIT PAS DÉPASSER 0,75 OHM. POUR PLUS D'INFORMATION, CONSULTER LE MANUEL OU APPELER 1-800-371-6858

WIRING DIAGRAM CODE: WDC#
JOB NAME: MID SOUTH COMMUNITY COLLEGE KITCHEN HOOD
MODEL: GKC-CV-S-11-1-1-0
SERIAL NUMBER: WDSN#
MARK: KH-1 CONTROLS

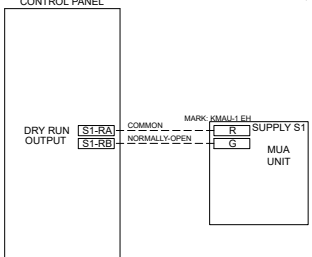
## POWER WIRING FOR KITCHEN CONTROLS
(WIRING TO BE DONE BY ELECTRICIAN)

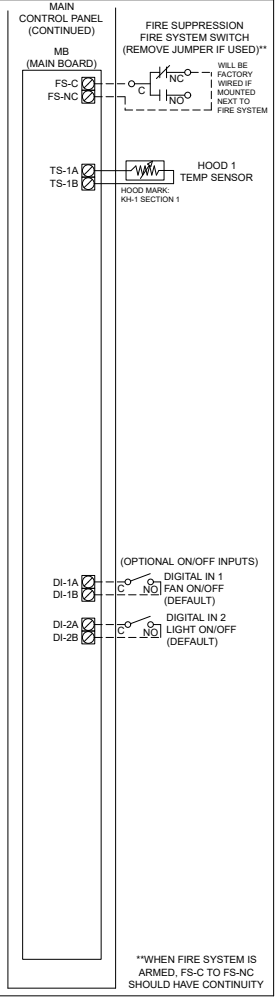



## POWER WIRING FROM BREAKER PANEL DIRECT TO FANS
(WIRING TO BE DONE BY ELECTRICIAN)

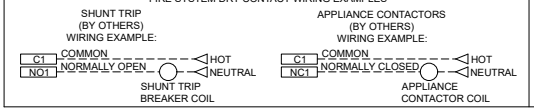



## CONTROL WIRING FOR KITCHEN CONTROLS
(WIRING TO BE DONE BY ELECTRICIAN, IF NO CONTROLS CONTRACTOR. USE 18-22GA WIRE UNLESS SPECIFIED.)




*FIRE SYSTEM DRY CONTACT WIRING EXAMPLES



# Ansul R-102 Wet Chemical Fire Suppression System

**Scope:**
Pre-Pipe With Parts and Factory Coordinated Installation

**Hood Fire Suppression System**

| | |
|---|---|
| Detection Type | Mechanical |
| Coverage | Appliance Specific |
| Hood Mark(s) Connected | KH-1 |
| Mounting Location | Utility cabinet on hood (see hood submittal for more visual detail) |
| System Size | 3 Gallon |
| Flow Points | Maximum of 11 and 6 are utilized. |

**Options and Accessories for Hood Fire System Provided from Factory**

| | |
|---|---|
| OEM Regulated Release Assembly | QTY of 1 |
| 3 Gallon Tank Assembly | QTY of 1 |
| Gas Valve | 2", mechanical |
| Manual Pull Stations | QTY of 1 |
| Microswitch | QTY of 1 |
| Alarm Initiating Switch | QTY of 1 |
| Metal Blow Off Caps | Included |

**Important Notes**

- The manner in which the parts included in the scope of this fire system are supplied may vary. They could be shipped from the fire suppression manufacturer, shipped loose with the hood, connected directly to the hood, or supplied directly to the installing distributor.
- Must maintain 8 inch clearance between top of hood and pipe connections for installation (includes piping and workspace clearance).
- The amount of supply pipe that should not be exceeded per system is 32 ft., which includes all pipe used along the length the hood, between hoods, and the pipe needed to connect to the tanks where they are mounted.
- Pull station locations must be a minimum of 10 ft. and a maximum of 20 ft. from the hoods and in the path of egress. They also must be 40-48 in. from the finished floor.
- Systems are pre-piped for a specific appliance line-up. If appliance types and sizes differ from what is shown on the hood submittal, this may result in a field re-pipe which is outside the scope defined here.
- If the collars on the hood are shipped loose, the detection line will not be installed on the hood and the parts will ship loose.

## Gas Valve

Quantity: 1
Ansul
Mechanical
2 in.

### Labor Information:

Hook-up of detection line and supply line is included.

Surface mounting of the manual pull station in a pre-determined location is included.

Charging and arming of the system is included.

Permit Included

Hood Puff Test Fee Included

### Items which may be supplied by the factory, but are not installed or hooked-up by the factory OR the installing distributor:

Gas valve (not applicable for PCU)

Microswitch(es)

Remote mounted cabinets, enclosures, or tank brackets

### Not included unless explicitly stated elsewhere in the quote as included:

Special, signed, or sealed drawings required to satisfy a state or local code

Parts or labor required to correct piping due to cooking equipment changes or deviation from approved drawings

More than two trips to the jobsite, special transportation, or overnight lodging requirement in remote areas. Typical travel distance is defined as the first 50 miles from the distributor’s office

A shut-off device (e.g. shunt-trip breaker) for electric cooking equipment

All electrical connections required to shut down fan(s), electric cooking equipment, activate an alarm system, etc. aside from what is explicitly stated as “factory-wired” in the Accurex control’s scope (if provided)

Installation of the gas shut-off valve

Pre-test

Full dump test or any other system test requirement outside of a standard puff test

Special classes or additional labor for access to security sensitive areas

Union labor, government labor, or prevailing wages required for field hook-up

Any dismantling or reassembly required where access to the fire suppression piping has been blocked

Plan examination fees

Rough-in conduit for remote pull station (for flush mounted pull station) or gas valve

Additional remote pull stations beyond the quantity specified in the submittals

# GXEW

**Type 1, X-Tractor Filter Single Wall - Exhaust Only Wall Canopy**

| Model | Hood Length (in.) | Width (in.) | Bottom Width (in.) | Height (in.) | | Exhaust Volume (CFM) | Exhaust SP (in. w.g.) | Double Island |
|---|---|---|---|---|---|---|---|---|
| | | | | Front | Back | | | |
| GXEW | 66 | 48 | 48 | 24 | 24 | 1238 | 0.662 | No |

## Selected Options & Accessories:

| Option or Accessory | Description |
|---|---|
| Mounting Height | 80 in. off Finished Floor. |
| Integral Air Space | Factory Mounted on Back - 3" wide 20 lbs |
| Ceiling Enclosures | 16 in. High on Left Front Right |
| Filter Type | Stainless Steel X-Tractor Filters 36 lbs |
| Left Full End Skirt | 45 in High 42.5 in Top Width 36.5 in Bottom Width 10 lbs |
| Right Full End Skirt | 45 in High 42.5 in Top Width 36.5 in Bottom Width 10 lbs |

**Material:** 430 SS Where Exposed
**UL Listing:** UL 710 w/out Exhaust Fire Damper

**Features:**
Performance Enhancing Lip (PEL)
Standing Seam Construction for Superior Strength
Stainless Steel Finish for Higher Corrosion Resistance

**Hood End Conditions:**
Back Wall - Limited Combustible

## Section Data:

| Length (in.) | Volume (CFM) | Exhaust Rate (CFM/FT) | SP (in. wg) | Filter Qty | | Filter Ht. (in.) | Cooking Load | Light Qty | Light Type | Foot Candles | Drain Location | Hood Weight (LBS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 16" W | 20" W | | | | | | | |
| 66 | 1238 | 225 | 0.662 | 4 | 0 | 20 | Heavy | 3 | Incandescent / CFL | 43.04 | Left/Right | 190.04 |

## Exhaust Collar Data:

| Collar Num. | Collar Size (LxW) in. or Diameter (in.) | | Pos. Off Left (in.) | Pos Off Back (in.) | Velocity (fpm) | Mounting Option |
|---|---|---|---|---|---|---|
| 1 | | 12 | 33 | 8 | 1576 | Shipped Loose Exhaust Collar(s) |

## External Supply Plenum Data:

**Supply: 1390 CFM** **MUA: 990 CFM** **AC: 400 CFM**

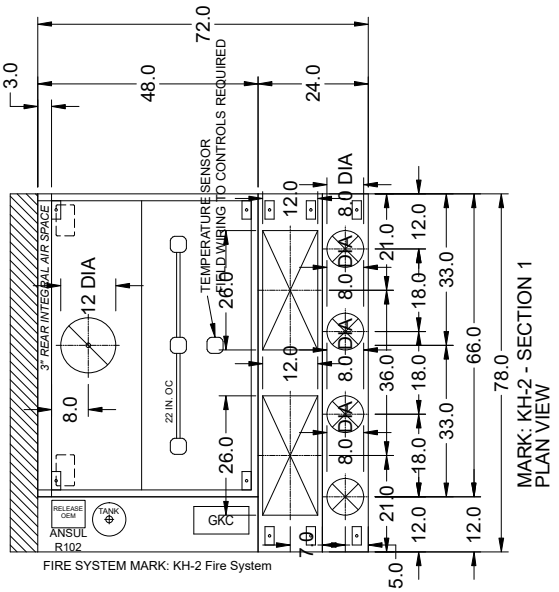
| Plenum Num. | Side | Type | Length (in.) | Width (in.) | Height (in.) | Volume (CFM) | Weight (lbs) | SP (in. wg) | Insulated | MBD | LED Lights |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Front | Split Air Curtain Supply (SSP) - MUA | 78 | 14 | 4 | 990 | 46 | 0.01 | No | Yes | No |
| 1 | Front | Split Air Curtain Supply (SSP) - AC | 78 | 10 | 4 | 400 | 38 | 0.02 | Yes | Yes | No |

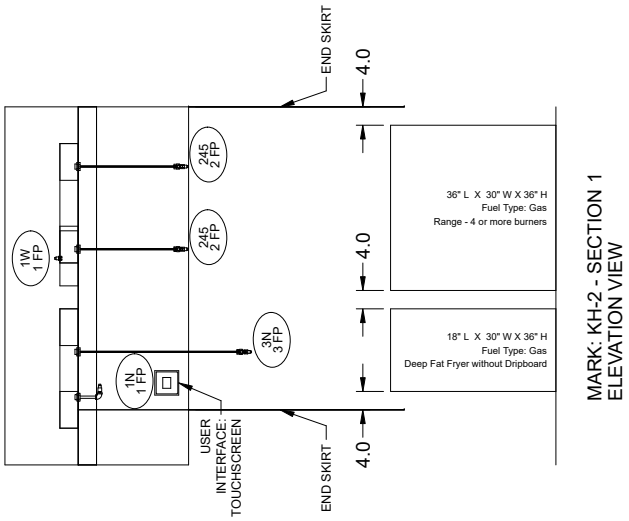
## External Supply Collar Data:

| Section Num. | Plenum Num. | Side | Collar Num. | Collar Shape | Collar Size (LxW) in. or Diameter (in.) | Pos. Off Left (in.) | Pos. Off Front (in.) | Velocity (fpm) | Mounting Option |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Front | 1 | rectangular | 26 x 12 | 21 | 7 | 228 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 2 | rectangular | 26 x 12 | 57 | 7 | 228 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 1 | round | 8 | 12 | 5 | 286 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 2 | round | 8 | 30 | 5 | 286 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 3 | round | 8 | 48 | 5 | 286 | Factory Mounted Supply Collar(s) |
| 1 | 1 | Front | 4 | round | 8 | 66 | 5 | 286 | Factory Mounted Supply Collar(s) |

## Utility Cabinet Data:

| Descripiton | Length (in.) | Width (in.) | Height (in.) | Weight (lbs) |
|---|---|---|---|---|
| Left Utility Cabinet | 48 | 12 | 24 | 134 |

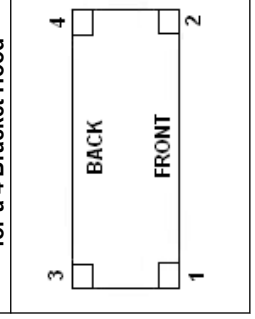


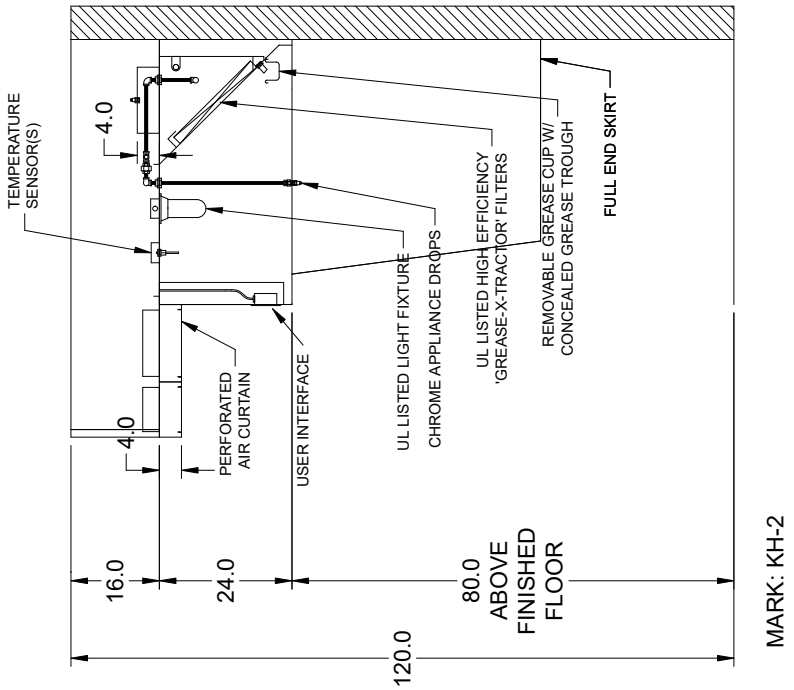




NOTE: All dimensions are in units of in.

| Hanger Bracket Locations | | | |
|---|---|---|---|
| Sec # | Brkt # | Distance Off Left (in) | Distance Off Front (in) |
| 1 | 1 | 3.50 | 2.50 |
| 1 | 2 | 62.50 | 2.50 |
| 1 | 3 | 3.50 | 44.00 |
| 1 | 4 | 62.50 | 44.00 |

**Bracket Mounting Position for a 4 Bracket Hood**




NOTE: All dimensions are in units of in.

# Constant Volume

Greenheck Kitchen Controls

### Standard Construction Features:

Includes control system, Fan Starters (unless otherwise stated), Temperature Sensors, Touchscreen. IMC 507.2.1.1 compliant. UL/ULC Listed.

### Options & Accessories:

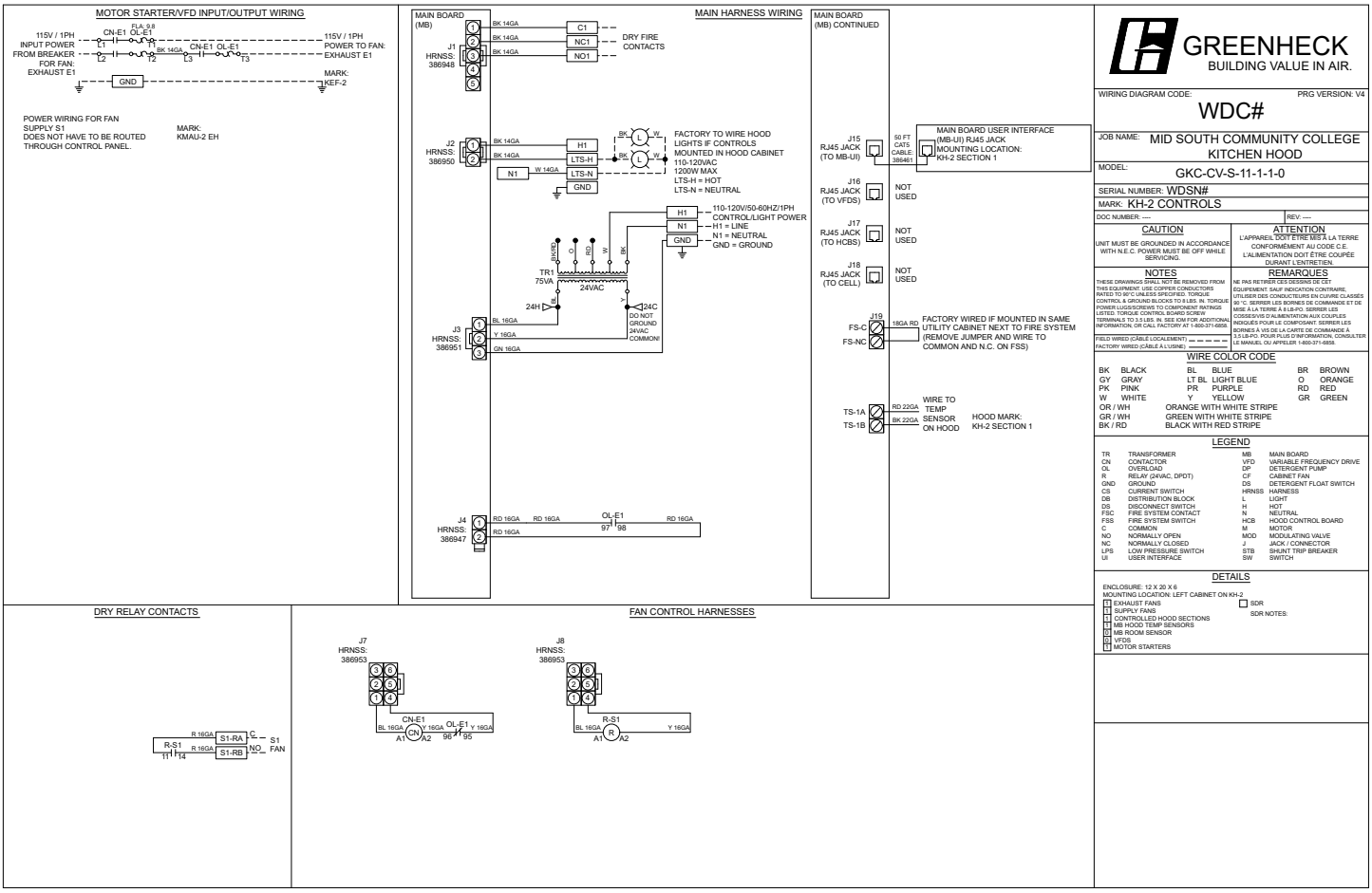
| | |
|---|---|
| Mounting Option | Left Cabinet on KH-2 |
| Exhaust Fan Quantity | 1 |
| Supply Fan Quantity | 1 |
| Hood Light Control | Yes |
| User Interface | Full Color Touchscreen |
| Touchscreen Mounting Location | Face Mount Left Side of Hood - KH-2 Section 1 |
| Exhaust During Fire | Exhaust fans will run at max speed when in fire mode |

### Controlled Fans:

| Fan Mark | Fan Type | Supplied By | Phase | HP | Voltage | NEC FLA | Starter/VFD Required | Starter/VFD Provided |
|---|---|---|---|---|---|---|---|---|
| KEF-2 | Exhaust | Manufacturer | 1 | 0.5 | 115 | 9.8 | Yes | Yes |
| KMAU-2 EH | Supply | Manufacturer | 3 | 0.25 | 208 | 1.4 | No | No |

### Controlled Hood Sections and Fan Relationships:

| | |
|---|---|
| KH-2 Section - Number of Sensors = 1 | |
| | Exhaust Fan Name - KEF-2 |
| | Supply Fan Name - KMAU-2 EH |




GREENHECK
BUILDING VALUE IN AIR.

WIRING DIAGRAM CODE: PRG VERSION: V4

WDC#

JOB NAME: MID SOUTH COMMUNITY COLLEGE KITCHEN HOOD

MODEL: GKC-CV-S-11-1-1-0

SERIAL NUMBER: WDSN#

MARK: KH-2 CONTROLS

DOC NUMBER: ---- REV: ----

**CAUTION**

UNIT MUST BE GROUNDED IN ACCORDANCE WITH N.E.C. POWER MUST BE OFF WHILE SERVICING.

**ATTENTION**

L'APPAREIL DOIT ÊTRE MIS À LA TERRE CONFORMÉMENT AU CODE C.E. L'ALIMENTATION DOIT ÊTRE COUPÉE DURANT L'ENTRETIEN.

**NOTES**

THESE DRAWINGS SHALL NOT BE REMOVED FROM THIS EQUIPMENT. USE COPPER CONDUCTORS RATED TO 90°C UNLESS SPECIFIED. TORQUE CONTROL & GROUND BLOCKS TO 4 LBS. IN. TORQUE POWER LUGS/SCREWS TO COMPONENT RATINGS LISTED. TORQUE CONTROL BOARD SCREW TERMINALS TO 3.5 LBS. IN. SEE IOM FOR ADDITIONAL INFORMATION, OR CALL FACTORY AT 1-800-371-6828.

FIELD WIRED (CÂBLE LOCALEMENT) ———
FACTORY WIRED (CÂBLE À L'USINE) - - - -

**REMARQUES**

NE PAS RETIRER CES DESSINS DE CET ÉQUIPEMENT. SAUF INDICATION CONTRAIRE, UTILISER DES CONDUCTEURS EN CUIVRE CLASSÉS 90 °C. SERRER LES BORNES DE COMMANDE ET DE MISE À LA TERRE À 0 LB-PO. SERRER LES COSSES/VIS D'ALIMENTATION AUX COUPLES INDIQUÉS POUR LE COMPOSANT. SERRER LES BORNES À VIS DE LA CARTE DE COMMANDE À 3.5 LB-PO. POUR PLUS D'INFORMATION, CONSULTER LE MANUEL OU APPELER 1-800-371-6828.

**WIRE COLOR CODE**

| | | | | | |
|---|---|---|---|---|---|
| BK | BLACK | BL | BLUE | BR | BROWN |
| GY | GRAY | LT BL | LIGHT BLUE | O | ORANGE |
| PK | PINK | PR | PURPLE | RD | RED |
| W | WHITE | Y | YELLOW | GR | GREEN |
| OR / WH | ORANGE WITH WHITE STRIPE | | | | |
| GR / WH | GREEN WITH WHITE STRIPE | | | | |
| BK / RD | BLACK WITH RED STRIPE | | | | |

**LEGEND**

| | | | |
|---|---|---|---|
| TR | TRANSFORMER | MB | MAIN BOARD |
| CN | CONTACTOR | VFD | VARIABLE FREQUENCY DRIVE |
| OL | OVERLOAD | DP | DETERGENT PUMP |
| R | RELAY (24VAC, DPDT) | CF | CABINET FAN |
| GND | GROUND | DS | DETERGENT FLOAT SWITCH |
| CS | CURRENT SWITCH | HRNSS | HARNESS |
| DB | DISTRIBUTION BLOCK | L | LIGHT |
| DS | DISCONNECT SWITCH | H | HOT |
| FSC | FIRE SYSTEM CONTACT | N | NEUTRAL |
| FSS | FIRE SYSTEM SWITCH | HCB | HOOD CONTROL BOARD |
| C | COMMON | M | MOTOR |
| NO | NORMALLY OPEN | MOD | MODULATING VALVE |
| NC | NORMALLY CLOSED | J | JACK / CONNECTOR |
| LPS | LOW PRESSURE SWITCH | STB | SHUNT TRIP BREAKER |
| UI | USER INTERFACE | SW | SWITCH |

**DETAILS**

ENCLOSURE: 12 X 20 X 6
MOUNTING LOCATION: LEFT CABINET ON KH-2

- [1] EXHAUST FANS
- [1] SUPPLY FANS
- [1] CONTROLLED HOOD SECTIONS
- [1] MB HOOD TEMP SENSORS
- [1] MB ROOM SENSOR
- [0] VFDS
- [1] MOTOR STARTERS
- [ ] SDR

SDR NOTES:

GREENHECK
BUILDING VALUE IN AIR.

DOC NUMBER: ----
REV: ----

CAUTION
UNIT MUST BE GROUNDED IN ACCORDANCE WITH N.E.C. POWER MUST BE OFF WHILE SERVICING.

ATTENTION
L'APPAREIL DOIT ÊTRE MIS À LA TERRE CONFORMÉMENT AU CODE C.E. L'ALIMENTATION DOIT ÊTRE COUPÉE DURANT L'ENTRETIEN.

43BM
COMMERCIAL APPLIANCE OUTLET CENTER
ELECTRICAL RATINGS: 110-240V,1PHASE, 50 -60HZ,15A
BASE FILE #E200616, ML FILE #E313951

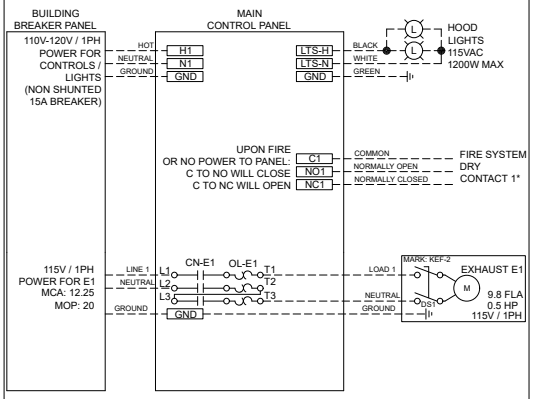
THESE DRAWINGS SHALL NOT BE REMOVED FROM THIS EQUIPMENT. USE COPPER CONDUCTORS RATED TO 90°C UNLESS SPECIFIED. TORQUE CONTROL & GROUND BLOCKS TO 8 LBS. IN. TORQUE POWER LUGS/SCREWS TO COMPONENT RATINGS LISTED. TORQUE CONTROL BOARD SCREW TERMINALS TO 3.5 LBS. IN. FIELD CONTROL WIRING RESISTANCE SHOULD NOT EXCEED 0.75 OHM. SEE IOM FOR ADDITIONAL INFORMATION, OR CALL FACTORY AT 1-800-371-6858.

PRG VERSION: V4
FIELD WIRED (CÂBLÉ LOCALEMENT)
FACTORY WIRED (CÂBLÉ À L'USINE)

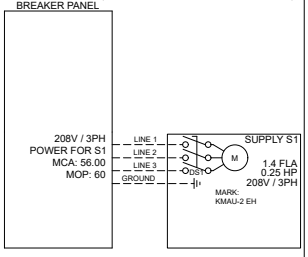
NE PAS RETIRER CES DESSINS DE CET ÉQUIPEMENT. SAUF INDICATION CONTRAIRE, UTILISER DES CONDUCTEURS EN CUIVRE CLASSÉS 90 °C. SERRER LES BORNES DE COMMANDE ET DE MISE À LA TERRE À 8 LB-PO. SERRER LES COSSES/VIS D'ALIMENTATION AUX COUPLES INDIQUÉS POUR LE COMPOSANT. SERRER LES BORNES À VIS DE LA CARTE DE COMMANDE À 3,5 LB-PO. LA RÉSISTANCE DU CÂBLAGE DE COMMANDE LOCAL NE DOIT PAS DÉPASSER 0,75 OHM. POUR PLUS D'INFORMATION, CONSULTER LE MANUEL OU APPELER 1-800-371-6858

WIRING DIAGRAM CODE: WDC#
JOB NAME: MID SOUTH COMMUNITY COLLEGE KITCHEN HOOD
MODEL: GKC-CV-S-11-1-1-0
SERIAL NUMBER: WDSN#
MARK: KH-2 CONTROLS

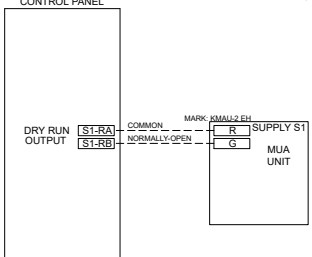
## POWER WIRING FOR KITCHEN CONTROLS
(WIRING TO BE DONE BY ELECTRICIAN)

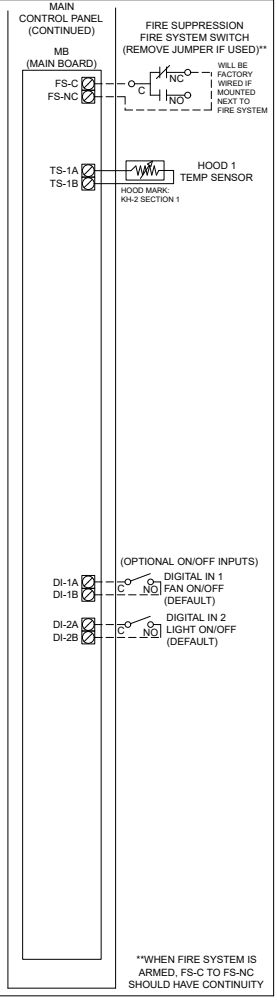



## POWER WIRING FROM BREAKER PANEL DIRECT TO FANS
(WIRING TO BE DONE BY ELECTRICIAN)

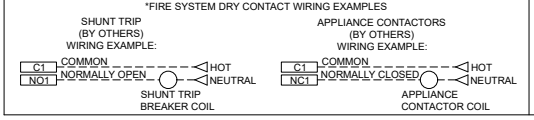



## CONTROL WIRING FOR KITCHEN CONTROLS
(WIRING TO BE DONE BY ELECTRICIAN, IF NO CONTROLS CONTRACTOR. USE 18-22GA WIRE UNLESS SPECIFIED.)




*FIRE SYSTEM DRY CONTACT WIRING EXAMPLES



# Ansul R-102 Wet Chemical Fire Suppression System

**Scope:**
Pre-Pipe With Parts and Factory Coordinated Installation

**Hood Fire Suppression System**

| | |
|---|---|
| Detection Type | Mechanical |
| Coverage | Appliance Specific |
| Hood Mark(s) Connected | KH-2 |
| Mounting Location | Utility cabinet on hood (see hood submittal for more visual detail) |
| System Size | 3 Gallon |
| Flow Points | Maximum of 11 and 9 are utilized. |

**Options and Accessories for Hood Fire System Provided from Factory**

| | |
|---|---|
| OEM Regulated Release Assembly | QTY of 1 |
| 3 Gallon Tank Assembly | QTY of 1 |
| Gas Valve | 2", mechanical |
| Manual Pull Stations | QTY of 1 |
| Microswitch | QTY of 1 |
| Alarm Initiating Switch | QTY of 1 |
| Metal Blow Off Caps | Included |

**Important Notes**

- The manner in which the parts included in the scope of this fire system are supplied may vary. They could be shipped from the fire suppression manufacturer, shipped loose with the hood, connected directly to the hood, or supplied directly to the installing distributor.
- Must maintain 8 inch clearance between top of hood and pipe connections for installation (includes piping and workspace clearance).
- The amount of supply pipe that should not be exceeded per system is 32 ft., which includes all pipe used along the length the hood, between hoods, and the pipe needed to connect to the tanks where they are mounted.
- Pull station locations must be a minimum of 10 ft. and a maximum of 20 ft. from the hoods and in the path of egress. They also must be 40-48 in. from the finished floor.
- Systems are pre-piped for a specific appliance line-up. If appliance types and sizes differ from what is shown on the hood submittal, this may result in a field re-pipe which is outside the scope defined here.
- If the collars on the hood are shipped loose, the detection line will not be installed on the hood and the parts will ship loose.

## Gas Valve

Quantity: 1
Ansul
Mechanical
2 in.

### Labor Information:

Hook-up of detection line and supply line is included.

Surface mounting of the manual pull station in a pre-determined location is included.

Charging and arming of the system is included.

Permit Included

Hood Puff Test Fee Included

### Items which may be supplied by the factory, but are not installed or hooked-up by the factory OR the installing distributor:

Gas valve (not applicable for PCU)

Microswitch(es)

Remote mounted cabinets, enclosures, or tank brackets

### Not included unless explicitly stated elsewhere in the quote as included:

Special, signed, or sealed drawings required to satisfy a state or local code

Parts or labor required to correct piping due to cooking equipment changes or deviation from approved drawings

More than two trips to the jobsite, special transportation, or overnight lodging requirement in remote areas. Typical travel distance is defined as the first 50 miles from the distributor’s office

A shut-off device (e.g. shunt-trip breaker) for electric cooking equipment

All electrical connections required to shut down fan(s), electric cooking equipment, activate an alarm system, etc. aside from what is explicitly stated as “factory-wired” in the Accurex control’s scope (if provided)

Installation of the gas shut-off valve

Pre-test

Full dump test or any other system test requirement outside of a standard puff test

Special classes or additional labor for access to security sensitive areas

Union labor, government labor, or prevailing wages required for field hook-up

Any dismantling or reassembly required where access to the fire suppression piping has been blocked

Plan examination fees

Rough-in conduit for remote pull station (for flush mounted pull station) or gas valve

Additional remote pull stations beyond the quantity specified in the submittals

# MSX-P112-H12-MF

## Unit Performance

| Design Conditions | | | | | |
|---|---|---|---|---|---|
| Elevation (ft) | Summer | | Winter (°F) | Supply (CFM) | Outdoor Air (CFM) |
| | DB (°F) | WB (°F) | | | |
| 338 | 99.3 | 81.1 | 15.3 | 1,440 | 1,440 |

| Unit Specifications | | | | | |
|---|---|---|---|---|---|
| Qty | Weight (lb) | Cooling Type | Heating Type | Unit Installation | Unit ETL Listing |
| 1 | 1,069 (+/- 5%) | None | Electric | Outdoor/Indoor | UL / cUL 1995 |

| Configuration | | | | |
|---|---|---|---|---|
| Unit Orientation | Unit Configuration | Outdoor Air Intake | Return Air Intake | Supply Air Discharge |
| Horizontal | Constant Volume 100% OA | End | - | Bottom |

| Heating Specifications | | | | | |
|---|---|---|---|---|---|
| Type | Capacity (kW) | Temperature Rise (°F) | Capacity Control | Performance | |
| | | | | EAT (°F) | LAT (°F) |
| Electric | 20.4 | 44.8 | Modulating (SCR) | 15.3 | 60.1 |

| Air Performance | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Type | Total Volume (CFM) | External SP (in. wg) | Total SP (in. wg) | RPM | Operating Power (hp) | Fan | | | |
| | | | | | | Qty | Type | Size (in.) | Drive-Type |
| Supply | 1,440 | 0.39 | 0.558 | 1475 | 0.24 | 1 | Mixed Flow | 15 | Direct-Drive |

| Motor Specifications | | | | | |
|---|---|---|---|---|---|
| Motor | Qty | Size (HP) | Enclosure | Efficiency | RPM |
| Supply Fan Motor | 1 | 1/2 | ODP | Standard | 1725 |

| Electrical Specifications | | | | |
|---|---|---|---|---|
| Power Supply | Rating (V/C/P) | MCA (A) | MOP (A) | SCCR |
| Unit | 208/60/3 | 74.2 | 80 | 5kA |

## CONSTRUCTION FEATURES AND ACCESSORIES

| Unit | |
|---|---|
| Unit Installation - Indoor or Outdoor | Std |
| Unit Construction - Double Wall | X |
| Wall Insulation - 1in. fiberglass - Tempering on | X |
| Base Insulation - 1in. fiberglass - entire unit base pan | Std |
| Paneled Bottom - Sheet metal liner for base insulation | |
| Corrosion Resistant Fasteners | Std |
| Access and Connections - Right side when facing intake | X |
| Service Access - Hinged access doors | X |
| Unit Finish - G90 Galvanized | X |
| Finish Color | |
| Supply Fan - Direct-drive, mixed flow plenum | X |
| Supply Fan and Motor Vibration isolation - Neoprene | X |
| **Controls** | |
| Unit Controls - Terminal strip | X |
| Remote Panel | |
| BMS Communication | |
| BMS Protocol | |
| Temperature Control - Discharge control | X |
| Supply Fan VFD - VFD by factory | X |
| Supply Fan Control - Constant Volume | X |
| Unoccupied Mode (Night Setback) | |
| Recirculation Control | |
| **Control Accessories** | |
| Remote display | |
| Heating Inlet Air Sensor | X |
| Cooling Inlet Air Sensor | |
| Dirty Filter Switch | |
| Fire Stat Type III (Ships loose) | |
| 120V/24V Smoke Detector (Ships loose) | |
| Inlet Damper End Switch | |
| External Cooling Lockout Relay | |
| Freeze Protection (Supply Air Low Limit) | |
| Auxiliary Supply Starter Contacts | |
| Auxiliary Exhaust Starter Contacts | |
| Heating Coil Freeze Protection | |
| Airflow Proving Monitoring Contact | |

| Accessories | |
|---|---|
| Factory Installed, Lockable, NEMA 3R Disconnect | Std |
| Weatherhood - Aluminum Mesh filtered | X |
| Supply Air Filters | |
| Outdoor Air Inlet Damper - Low leakage | X |
| Supply Air Outlet Damper | |
| Return Air Damper | |
| Diffuser | |
| Roof Curb - GPI | X |
| Combination Curb - 140 | X |
| Electrofin Coil Coating | |
| Fan Bearing Extended Lube Lines | |
| Inlet Damper Module | X |
| Spare Belts | |
| Spare Filters | |
| Motor with Shaft Grounding | |
| Service Outlet | |
| Service Lights | |
| **Warranty Options** | |
| Unit Warranty - 18 months (std.) | X |
| 5 Year Compressor Warranty | |

| | |
|---|---|
| **Standard Option** | Std |
| **Not Included** | |
| **Included** | X |

| Notes |
|---|
| Damper(s) supplied are low leakage, motorized VCD-23 (leakage rate of 3 CFM/ft^2 @ 1 in.wg), Class 1A |

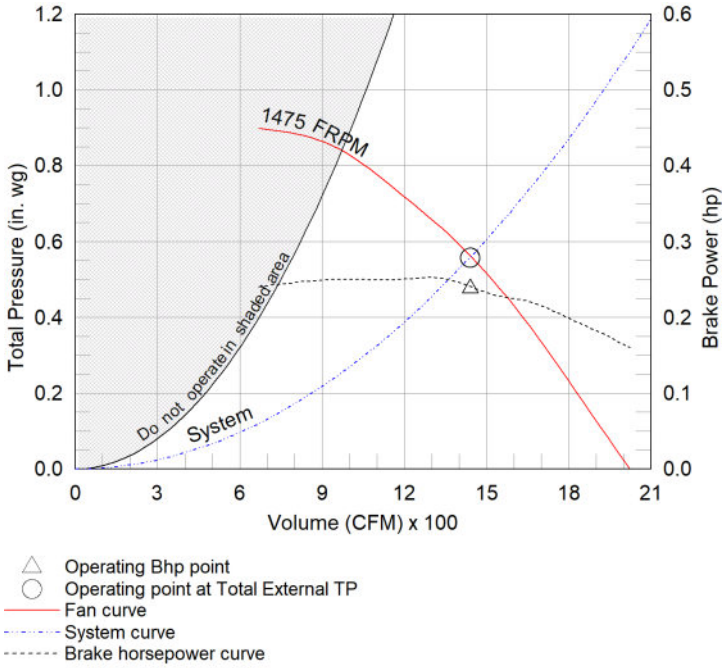
## Fan Charts And Performance

| 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 |
| 1,440 | 0.39 | 0.558 | 1475 | 0.24 | 1 | 1/2 | 1 | Mixed Flow | Direct |

| Pressure Drop (in. wg) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Diffuser | Weatherhood | Filter | Damper | Cooling | Heating | External | Total |
| - | 0.026 | - | 0.017 | - | 0.125 | 0.39 | 0.558 |

| Sound Performance in Accordance with AMCA | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sound Power by Octave Band | | | | | | | | Lwa | dBA | Sones |
| 62.5 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | | | |
| 64 | 66 | 62 | 61 | 70 | 69 | 65 | 67 | 75 | 64 | 12.2 |

Supply Fan



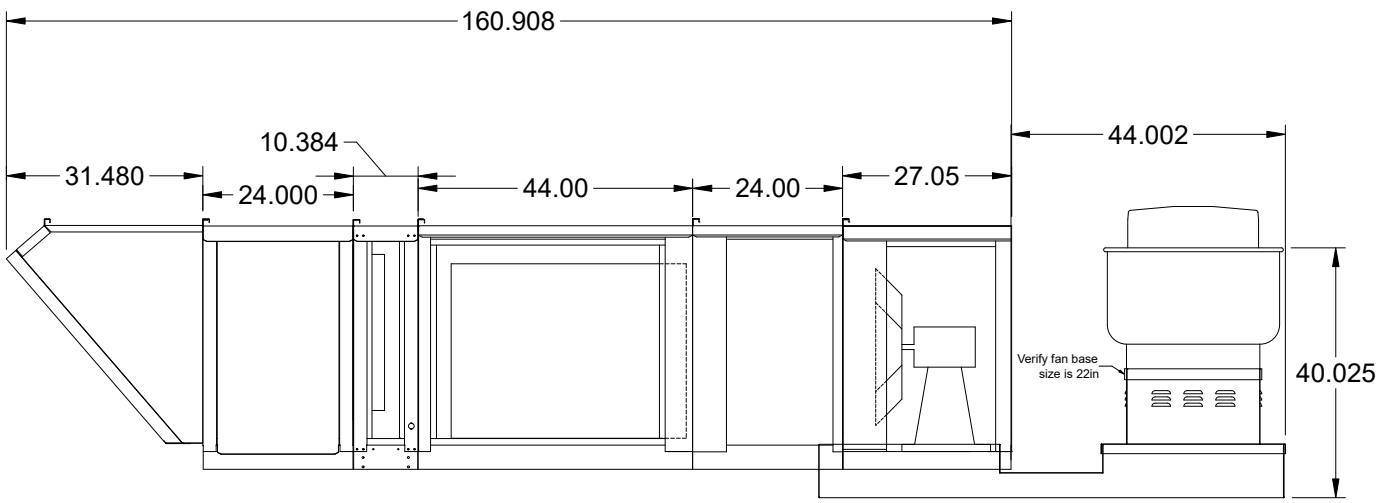
## Heating Specifications

| Heating Performance | | | | | |
|---|---|---|---|---|---|
| Type | Capacity (kW) | Temperature Rise (°F) | Capacity Control | Performance | |
| | | | | EAT (°F) | LAT (°F) |
| Electric | 20.4 | 44.8 | Modulating (SCR) | 15.3 | 60.1 |

| Unit Details |
|---|
| Open coil heating elements |
| High grade Nickel-Chrome alloy coils |

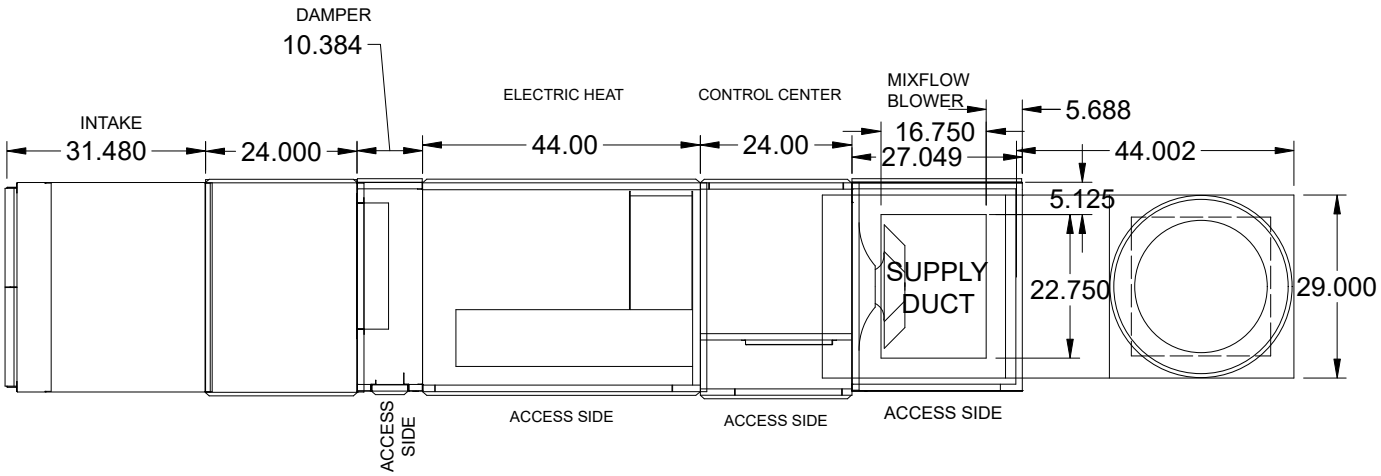
| |
|---|
| SCR controller |

## ELEVATION VIEW



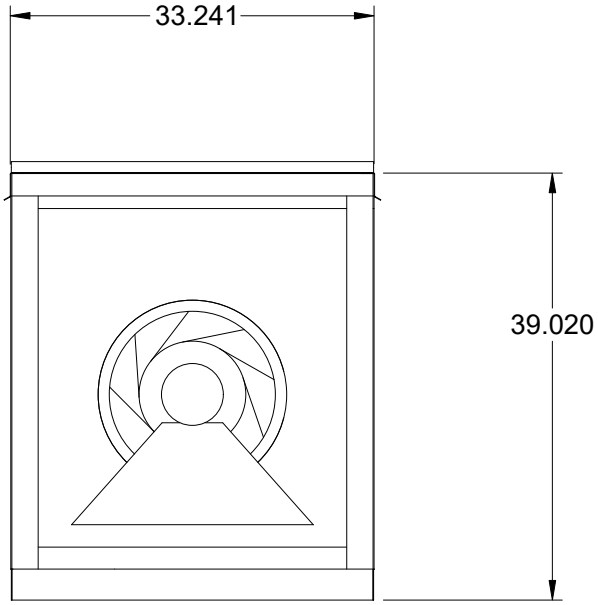

| Notes - Elevation View |
|---|
| Standard configuration for unit access is on the right-hand side, when looking into the unit intake in the direction of airflow. |
| Order of unit sections is from intake of unit to discharge of unit. |
| Sections included on this unit: Weatherhood Section, Spacer Section, Damper Section, Heating Section, Control Center Module Section, Blower Section |
| Insulation: Double Wall, from the Electric Heater through end of unit. |

## PLAN VIEW

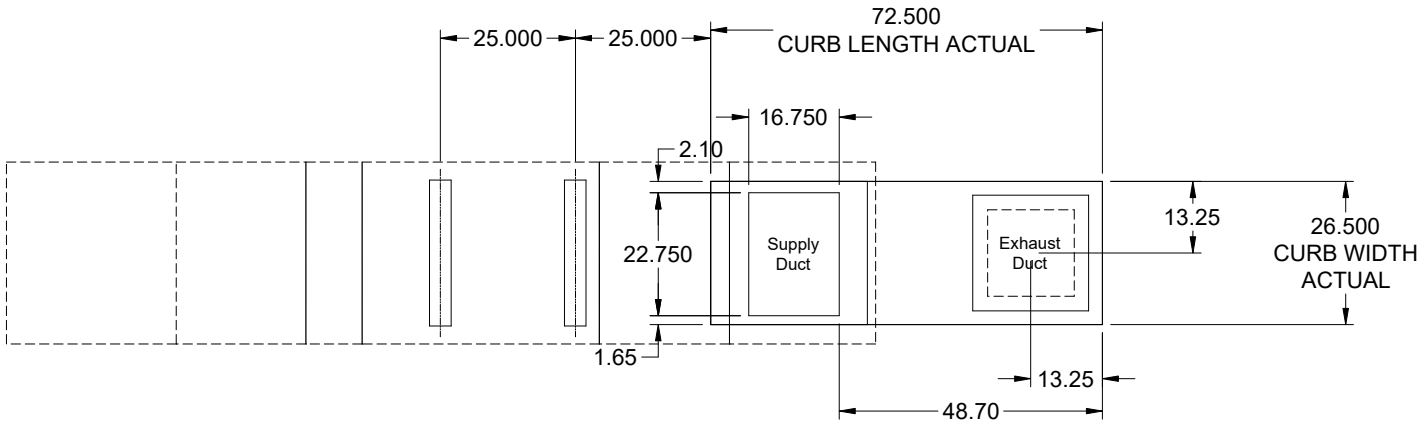



| Notes - Plan View |
|---|
| Standard configuration for unit access is on the right-hand side, when looking into the unit intake in the direction of airflow. |

## END VIEW

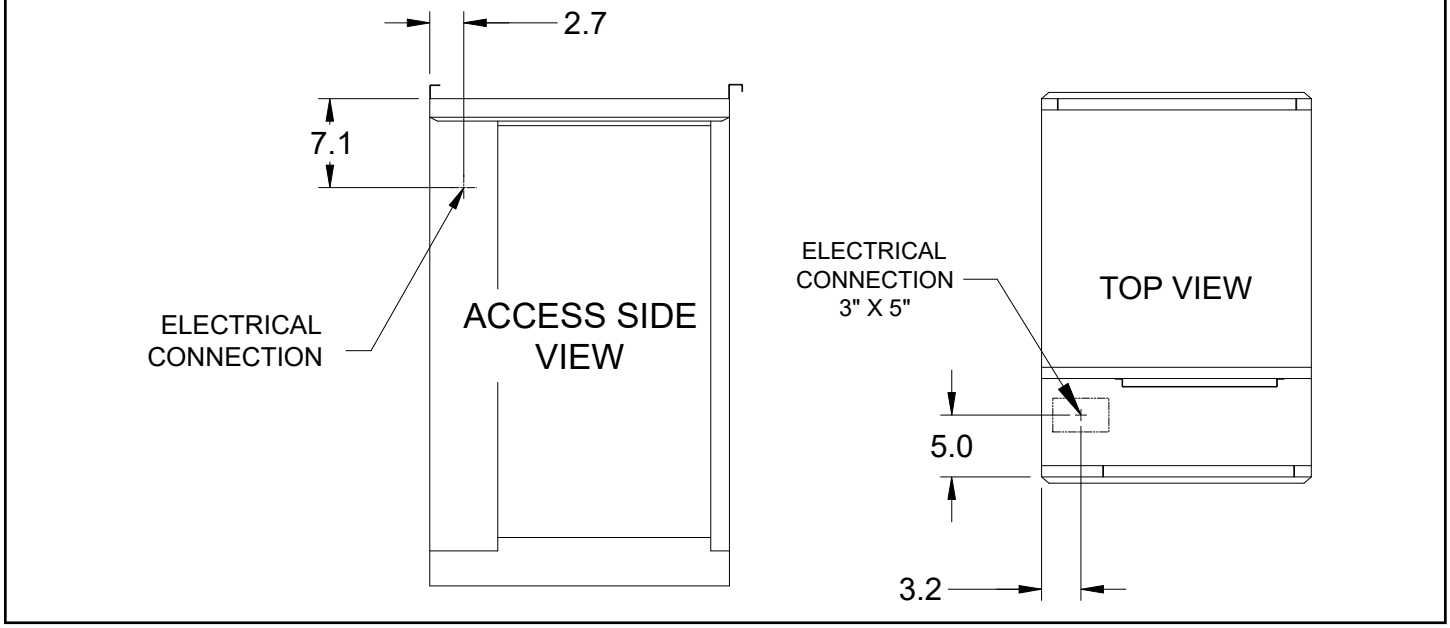



## FOOTPRINT VIEW




| Notes - Footprint View |
|---|
| Minimum Roof Opening: The minimum roof opening size is the illustrated duct diameter plus 0.25 in. on all sides. For example: If the duct size is 14 x 14 in. square, the minimum roof opening size is 14.5 x 14.5 in. square. |
| Maximum Roof Opening: There must be a minimum perimeter of 1.75 in. between the roof opening and the roof curb. For example: If the roof curb is 75 x 30 in. square, the maximum roof opening is 71.5 x 26.5 in. inches square. |
| The weatherhood and filter sections of the make-up air unit extend beyond the curb. This is by design, to prevent water infiltration. |

## Electrical Connections



## Clearance Specifications

| Recommended Minimum Combustible Clearances | | | | |
|---|---|---|---|---|
| | **Floor (in.)** | **Top (in.)** | **Sides (in.)** | **Ends (in.)** |
| Insulated Units | 0 | 0 | 0 | 0 |
| Non-Insulated Units | 0 | 6 | 6 | 6 |

**Notes - Combustible Clearances**

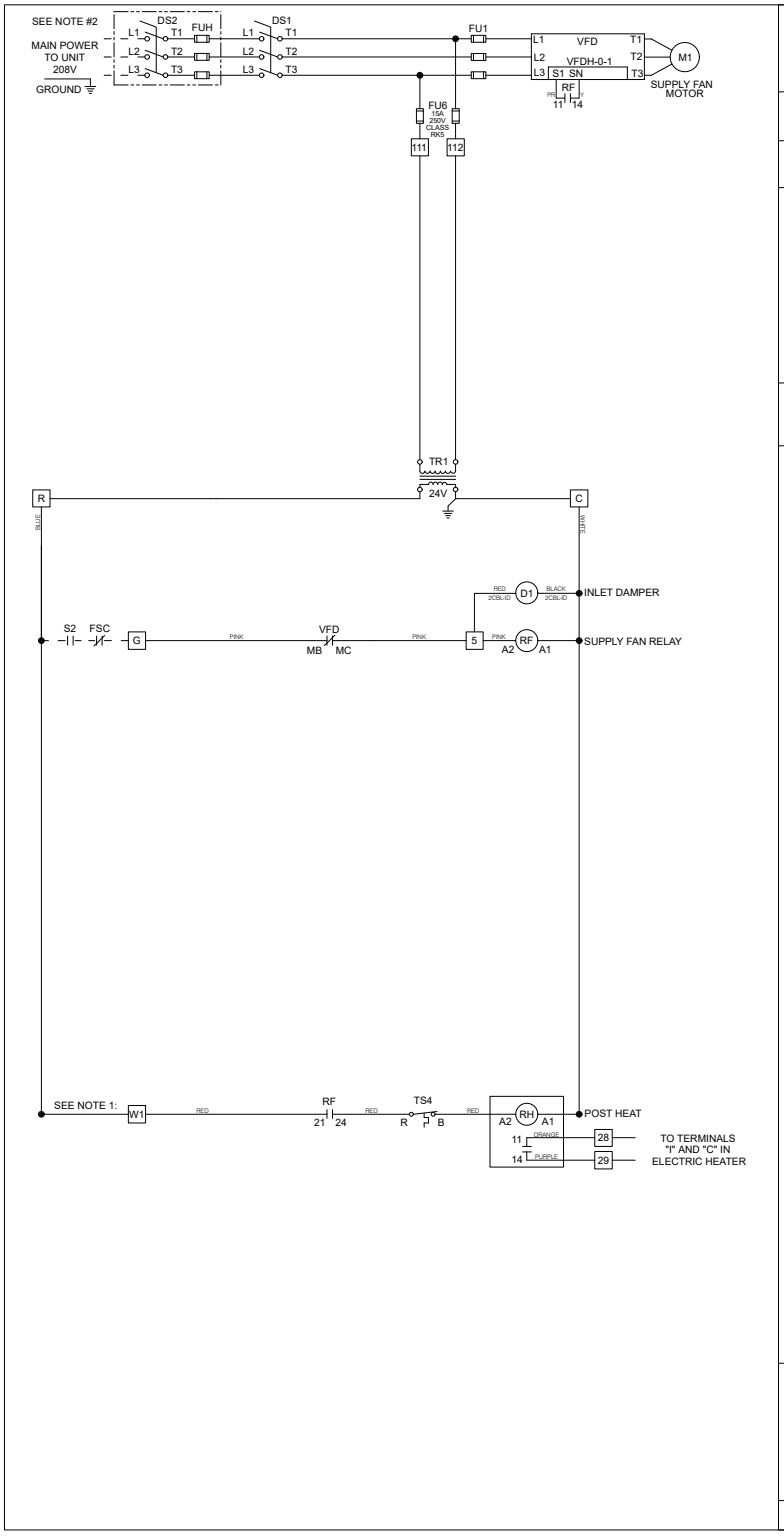
Clearance to combustibles is defined as the minimum distance required between the heating source and the adjacent combustible surfaces to ensure the adjacent surface's temperature does not exceed 90 F above the ambient temperature.

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

**Notes - Service Clearances**

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.

## Wiring Diagram




GREENHECK
Building Value in Air.

Wiring Diagram Code:

GE20N40CZ010N10NU17

CAUTION

UNIT SHALL BE GROUNDED IN ACCORDANCE WITH N.E.C.
POWER MUST BE OFF WHILE SERVICING.

NOTES

USE COPPER CONDUCTORS ONLY
60° C FOR TERMINALS RATED LESS THAN 100 AMPS.
75° C FOR TERMINALS RATED 100 AMPS OR MORE.

FIELD CONTROL WIRING RESISTANCE SHOULD NOT EXCEED 0.75 OHM.

FIELD WIRED – – – – –
FACTORY SUPPLIED AND WIRED ————

NOTE: #1
FOR EXTERNAL HEAT ENABLE - REMOVE R TO W1 JUMPER AND INSTALL EXTERNAL CONTACT.

NOTE: #2
FIELD POWER TO UNIT WIRE TO ELECTRIC HEATER DISCONNECT (DS2)
DS2 AND FUH LOCATED IN ELECTRIC HEATER
SEE ELECTRIC HEATER FOR SPECIFIC HEATER DIAGRAM

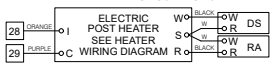
WIRE COLOR CODE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BK | BLACK | BL | BLUE | BR | BROWN | GY | GRAY |
| LT BL | LIGHT BLUE | O | ORANGE | PK | PINK | PR | PURPLE |
| R | RED | W | WHITE | Y | YELLOW | | |

LEGEND

| | |
|---|---|
| D1 | INLET DAMPER |
| DS | DISCHARGE TEMP SENSOR |
| DS1 | MAIN DISCONNECT SWITCH |
| DS2 | ELECTRIC HEATER DISCONNECT SWITCH LOCATED IN ELECTRIC HEATER SUPPLIED BY HEATER MANUFACTOR |
| FSC | FIRE SYSTEM CONTACT |
| FU# | FUSE |
| FUH | FUSE - LOCATED IN ELECTRIC HEATER SUPPLIED BY HEATER MANUFACTOR |
| M# | MOTOR |
| OL# | MOTOR OVERLOAD |
| RA | REMOTE ADJUSTER LOCATED IN MAIN UNIT CONTROL CENTER |
| RF | SUPPLY FAN RELAY |
| RF1 | FAN ENABLE RELAY |
| RH | HEAT RELAY |
| S2 | FAN SWITCH |
| S4 | HEAT AND COOL SWITCH |
| TR# | TRANSFORMER |
| TS4 | INLET AIR SENSOR - HEAT |
| VFD | VARIABLE FREQUENCY DRIVE |

ELECTRIC HEATER FACTORY/FIELD WIRED INTERFACE CONNECTIONS

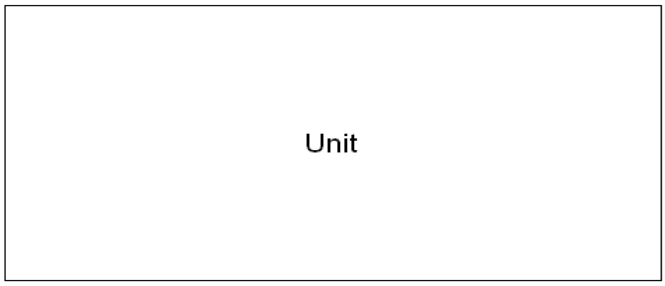



Template Drawing: U17 DOC NUMBER: ---- REV: ----

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

## Corner Weights

249 lb 250 lb




285 lb 286 lb

# SEQUENCE OF OPERATIONS

**Unit Controls**
The unit shall be provided from the factory with:

- 24VAC Transformer
- Terminal Strip
- Supply fan VFD
- Factory mounted and wired outdoor air inlet damper with actuator

**Field Provided Control Requirements**
The following field provided control signals must be provided for proper operation of the unit (Reference the unit wiring diagram for additional information):

- Supply fan enable – Contact closure between R and G (24VAC)

**Unit Start-Up Sequence**

- Supply Fan Enable Is Received
- Outdoor air inlet damper actuator is energized
- Supply Fan Is Enabled

**Supply Fan Sequence**
The unit has been provided with a factory mounted variable frequency drive (VFD). The variable frequency drive shall control the supply fan speed as indicated by the following sequence:

**Constant Volume**
The VFD shall be programmed from the factory for a constant supply fan speed. This is to be adjusted for air balancing only and is not to be modulated.

**Heating Control**
A heating enable signal must be present and the supply fan must enabled before the unit will enable heating.

**Heating Inlet Air Sensor (Heating Lockout)**
The heating will be locked out when the outside air temperature is above the heating inlet air sensor set point (typical 65 F, adj.)

**Electric Heating (Discharge Control)**
The electric heater shall include fully modulating controls. The controls shall allow the heater to maintain a supply temperature set point. The supply temperature set point is controlled by a dial in the unit control center.

# Warranty Statement for Make-Up Air

## 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.

## 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.

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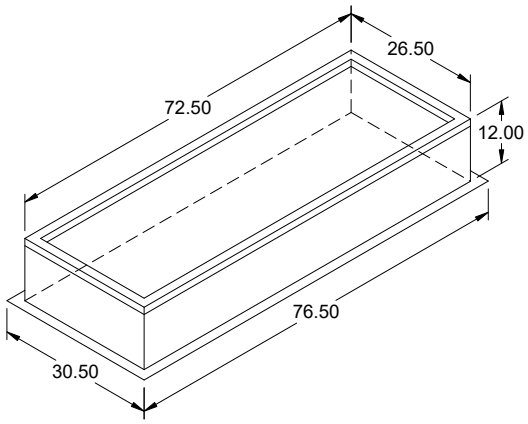



# Model: GPI

## Roof Curb

### Standard Construction Features:

- Roof Curb fits between the building roof and the fan mounted directly to the roof support structure - Constructed of either 18 ga galvanized steel or 0.064 in. aluminum - Straight Sided without a cant - 2 in. mounting flange - 3 lb density insulation - Height - Available from 12 in. to 42 in. as specified in 0.5 in. increments. Notes: - The maximum roof opening dimension should not be greater than the "Actual" top outside dimension minus 2 in.. - The minimum roof opening dimension should be at least 2.5 in. more than the damper dimension or recommended duct size. - The Roof Opening Dimension may or may not be the same as the Structural Opening Dimension. - Damper Tray is optional and must be specified. Tray size is same as damper size. - Security bars are optional and must be specified. Frames and gridwork are all 12 ga steel. Gridwork is welded to the frame and the frame is welded to the curb.

**General**

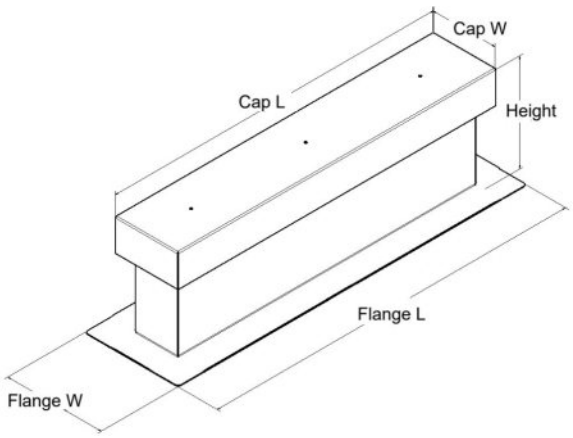
| Tag | Qty | Model | Sizing Method | Undersizing (in.) | Weight (lb) | Shipped Assembled | Union Label |
|---|---|---|---|---|---|---|---|
| | 1 | GPI-28 x 74 | Nominal | 1.5 | 57 | Yes | No Preference |

**Dimensions**

| Curb Height (in.) | Nominal Outside Width (in.) | Nominal Outside Length (in.) | Actual Outside Width (in.) | Actual Outside Length (in.) | Flange Width (in.) | Flange Length (in.) |
|---|---|---|---|---|---|---|
| 12 | 28 | 74 | 26.5 | 72.5 | 30.5 | 76.5 |

**Accessories**

| Material | Security Bars | Liner | Insulation (in.) | Insulation R Value |
|---|---|---|---|---|
| Galvanized | No | No | 1 | R4.3 |




# Model: GESI

## Flat or Pitched Roof Equipment Support

### Standard Construction Features:

- Welded construction (see Material Note) - Wood nailer - Flashing cap. NOTES: - MAXIMUM design load of 400 lb per isolator. MATERIAL NOTE: - If Length <= 44 OR Height <= 12: Galvanized is 18 ga and Aluminum is 0.064 in. - If Length > 44 OR Height > 12: Galvanized is 16 ga and Aluminum is 0.080 in.

**Dimensions**

| ID# | Tag | Qty | Length (in.) | Flange Width (in.) | Flange Length (in.) | Base Width (in.) | Base Length (in.) | Cap Width (in.) | Cap Length (in.) |
|---|---|---|---|---|---|---|---|---|---|
| Unit | | 2 | 27 | 7.5 | 4 | 4 | 0 | 5 | 1.5 |

**Accessories**

| ID# | Material | Width (in.) | Height (in.) | Sizing |
|---|---|---|---|---|
| Unit | Galvanized | 4 | 20 | Nominal |

# MSX-P109-H12-MF

## Unit Performance

| Design Conditions | | | | | |
|---|---|---|---|---|---|
| Elevation (ft) | Summer | | Winter (°F) | Supply (CFM) | Outdoor Air (CFM) |
| | DB (°F) | WB (°F) | | | |
| 338 | 99.3 | 81.1 | 15.3 | 990 | 990 |

| Unit Specifications | | | | | |
|---|---|---|---|---|---|
| Qty | Weight (lb) | Cooling Type | Heating Type | Unit Installation | Unit ETL Listing |
| 1 | 1,052 (+/- 5%) | None | Electric | Outdoor/Indoor | UL / cUL 1995 |

| Configuration | | | | |
|---|---|---|---|---|
| Unit Orientation | Unit Configuration | Outdoor Air Intake | Return Air Intake | Supply Air Discharge |
| Horizontal | Constant Volume 100% OA | End | - | Bottom |

| Heating Specifications | | | | | |
|---|---|---|---|---|---|
| Type | Capacity (kW) | Temperature Rise (°F) | Capacity Control | Performance | |
| | | | | EAT (°F) | LAT (°F) |
| Electric | 15.5 | 49.5 | Modulating (SCR) | 15.3 | 64.8 |

| Air Performance | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Type | Total Volume (CFM) | External SP (in. wg) | Total SP (in. wg) | RPM | Operating Power (hp) | Fan | | | |
| | | | | | | Qty | Type | Size (in.) | Drive-Type |
| Supply | 990 | 0.39 | 0.535 | 1899 | 0.17 | 1 | Mixed Flow | 11 | Direct-Drive |

| Motor Specifications | | | | | |
|---|---|---|---|---|---|
| Motor | Qty | Size (HP) | Enclosure | Efficiency | RPM |
| Supply Fan Motor | 1 | 1/4 | ODP | Standard | 1725 |

| Electrical Specifications | | | | |
|---|---|---|---|---|
| Power Supply | Rating (V/C/P) | MCA (A) | MOP (A) | SCCR |
| Unit | 208/60/3 | 56 | 60 | 5kA |

## CONSTRUCTION FEATURES AND ACCESSORIES

| Unit | |
|---|---|
| Unit Installation - Indoor or Outdoor | Std |
| Unit Construction - Double Wall | X |
| Wall Insulation - 1in. fiberglass - Tempering on | X |
| Base Insulation - 1in. fiberglass - entire unit base pan | Std |
| Paneled Bottom - Sheet metal liner for base insulation | |
| Corrosion Resistant Fasteners | Std |
| Access and Connections - Right side when facing intake | X |
| Service Access - Hinged access doors | X |
| Unit Finish - G90 Galvanized | X |
| Finish Color | |
| Supply Fan - Direct-drive, mixed flow plenum | X |
| Supply Fan and Motor Vibration isolation - Neoprene | X |
| **Controls** | |
| Unit Controls - Terminal strip | X |
| Remote Panel | |
| BMS Communication | |
| BMS Protocol | |
| Temperature Control - Discharge control | X |
| Supply Fan VFD - VFD by factory | X |
| Supply Fan Control - Constant Volume | X |
| Unoccupied Mode (Night Setback) | |
| Recirculation Control | |
| **Control Accessories** | |
| Remote display | |
| Heating Inlet Air Sensor | X |
| Cooling Inlet Air Sensor | |
| Dirty Filter Switch | |
| Fire Stat Type III (Ships loose) | |
| 120V/24V Smoke Detector (Ships loose) | |
| Inlet Damper End Switch | |
| External Cooling Lockout Relay | |
| Freeze Protection (Supply Air Low Limit) | |
| Auxiliary Supply Starter Contacts | |
| Auxiliary Exhaust Starter Contacts | |
| Heating Coil Freeze Protection | |
| Airflow Proving Monitoring Contact | |

| Accessories | |
|---|---|
| Factory Installed, Lockable, NEMA 3R Disconnect | Std |
| Weatherhood - Aluminum Mesh filtered | X |
| Supply Air Filters | |
| Outdoor Air Inlet Damper - Low leakage | X |
| Supply Air Outlet Damper | |
| Return Air Damper | |
| Diffuser | |
| Roof Curb - GPI | X |
| Combination Curb - 120 | X |
| Electrofin Coil Coating | |
| Fan Bearing Extended Lube Lines | |
| Inlet Damper Module | X |
| Spare Belts | |
| Spare Filters | |
| Motor with Shaft Grounding | |
| Service Outlet | |
| Service Lights | |
| **Warranty Options** | |
| Unit Warranty - 18 months (std.) | X |
| 5 Year Compressor Warranty | |

| | |
|---|---|
| **Standard Option** | Std |
| **Not Included** | |
| **Included** | X |

| Notes |
|---|
| Damper(s) supplied are low leakage, motorized VCD-23 (leakage rate of 3 CFM/ft^2 @ 1 in.wg), Class 1A |

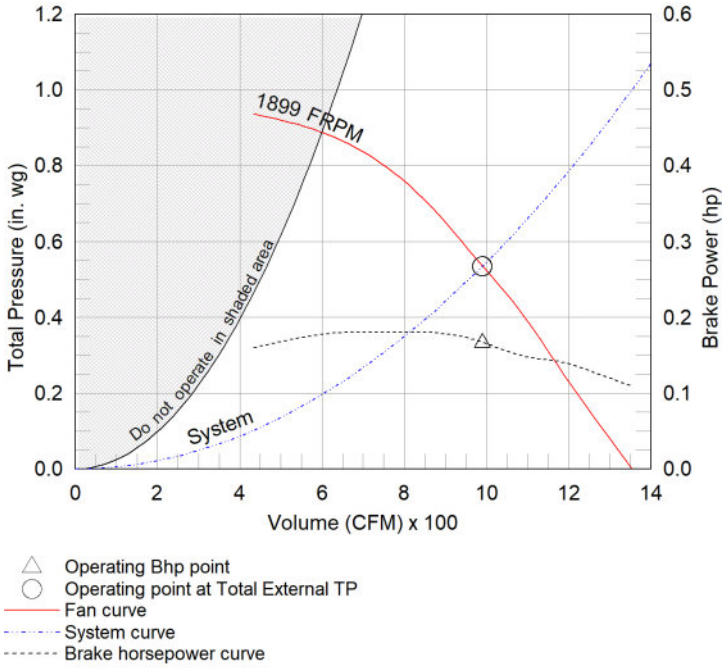
## Fan Charts And Performance

| 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 |
| 990 | 0.39 | 0.535 | 1899 | 0.17 | 1 | 1/4 | 1 | Mixed Flow | Direct |

| Pressure Drop (in. wg) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Diffuser | Weatherhood | Filter | Damper | Cooling | Heating | External | Total |
| - | 0.012 | - | 0.008 | - | 0.125 | 0.39 | 0.535 |

| Sound Performance in Accordance with AMCA | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sound Power by Octave Band | | | | | | | | Lwa | dBA | Sones |
| 62.5 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | | | |
| 63 | 65 | 64 | 64 | 73 | 70 | 70 | 60 | 77 | 66 | 12.6 |

Supply Fan



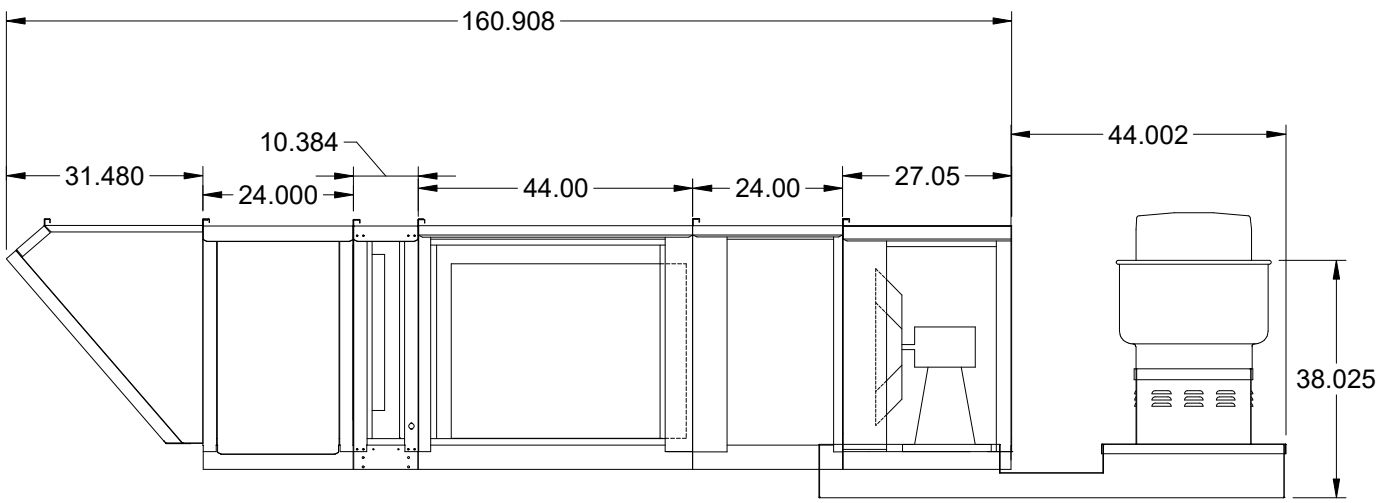
## Heating Specifications

| Heating Performance | | | | | |
|---|---|---|---|---|---|
| Type | Capacity (kW) | Temperature Rise (°F) | Capacity Control | Performance | |
| | | | | EAT (°F) | LAT (°F) |
| Electric | 15.5 | 49.5 | Modulating (SCR) | 15.3 | 64.8 |

| Unit Details |
|---|
| Open coil heating elements |
| High grade Nickel-Chrome alloy coils |

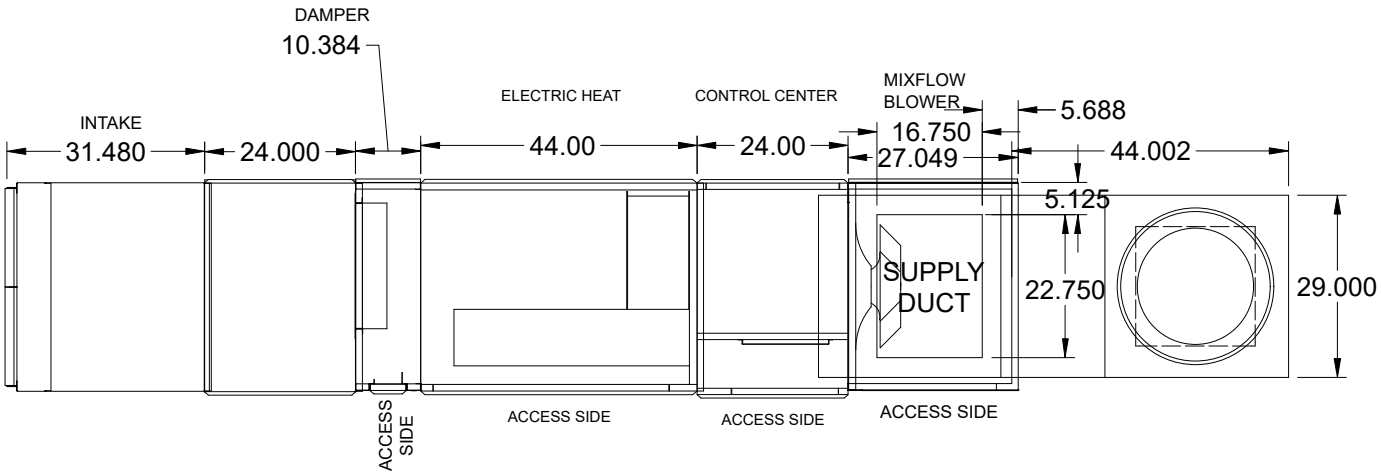
| |
|---|
| SCR controller |

## ELEVATION VIEW



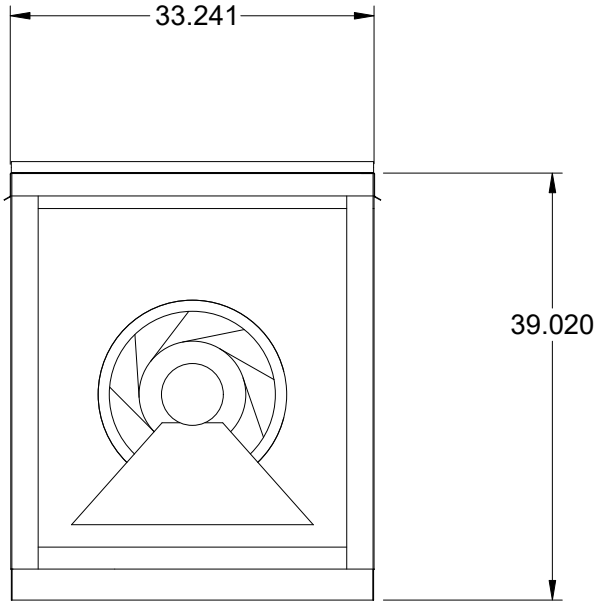

| Notes - Elevation View |
|---|
| Standard configuration for unit access is on the right-hand side, when looking into the unit intake in the direction of airflow. |
| Order of unit sections is from intake of unit to discharge of unit. |
| Sections included on this unit: Weatherhood Section, Spacer Section, Damper Section, Heating Section, Control Center Module Section, Blower Section |
| Insulation: Double Wall, from the Electric Heater through end of unit. |

## PLAN VIEW

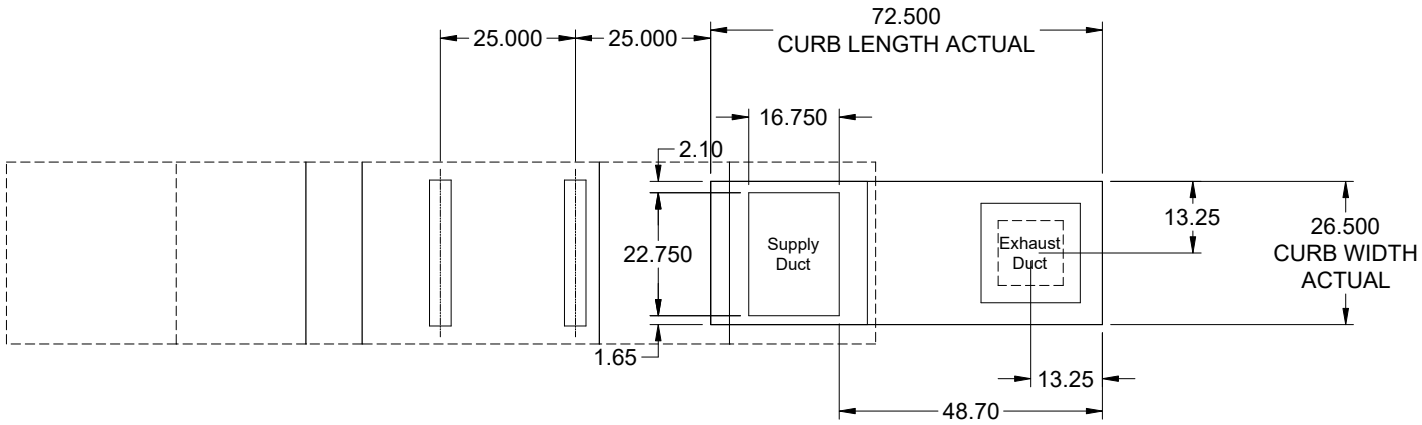



| Notes - Plan View |
|---|
| Standard configuration for unit access is on the right-hand side, when looking into the unit intake in the direction of airflow. |

## END VIEW

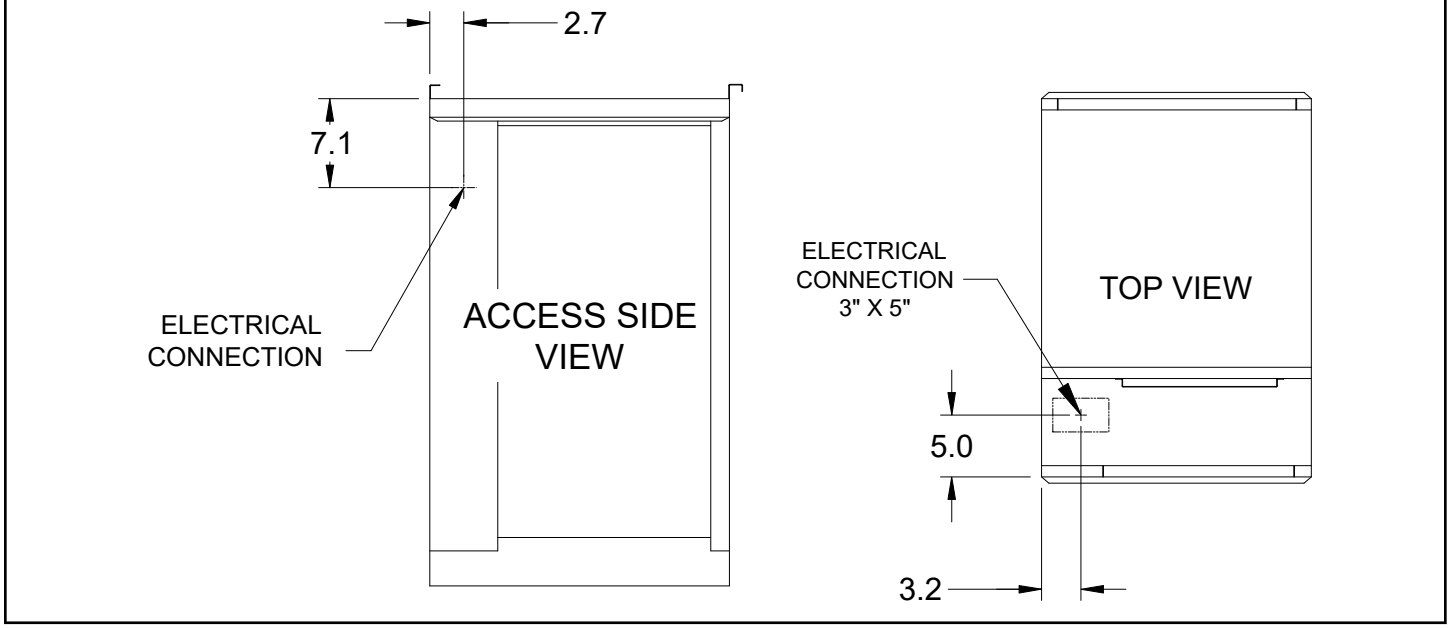



## FOOTPRINT VIEW




| Notes - Footprint View |
|---|
| Minimum Roof Opening: The minimum roof opening size is the illustrated duct diameter plus 0.25 in. on all sides. For example: If the duct size is 14 x 14 in. square, the minimum roof opening size is 14.5 x 14.5 in. square. |
| Maximum Roof Opening: There must be a minimum perimeter of 1.75 in. between the roof opening and the roof curb. For example: If the roof curb is 75 x 30 in. square, the maximum roof opening is 71.5 x 26.5 in. inches square. |
| The weatherhood and filter sections of the make-up air unit extend beyond the curb. This is by design, to prevent water infiltration. |

## Electrical Connections



## Clearance Specifications

| Recommended Minimum Combustible Clearances | | | | |
|---|---|---|---|---|
| | **Floor (in.)** | **Top (in.)** | **Sides (in.)** | **Ends (in.)** |
| Insulated Units | 0 | 0 | 0 | 0 |
| Non-Insulated Units | 0 | 6 | 6 | 6 |

**Notes - Combustible Clearances**

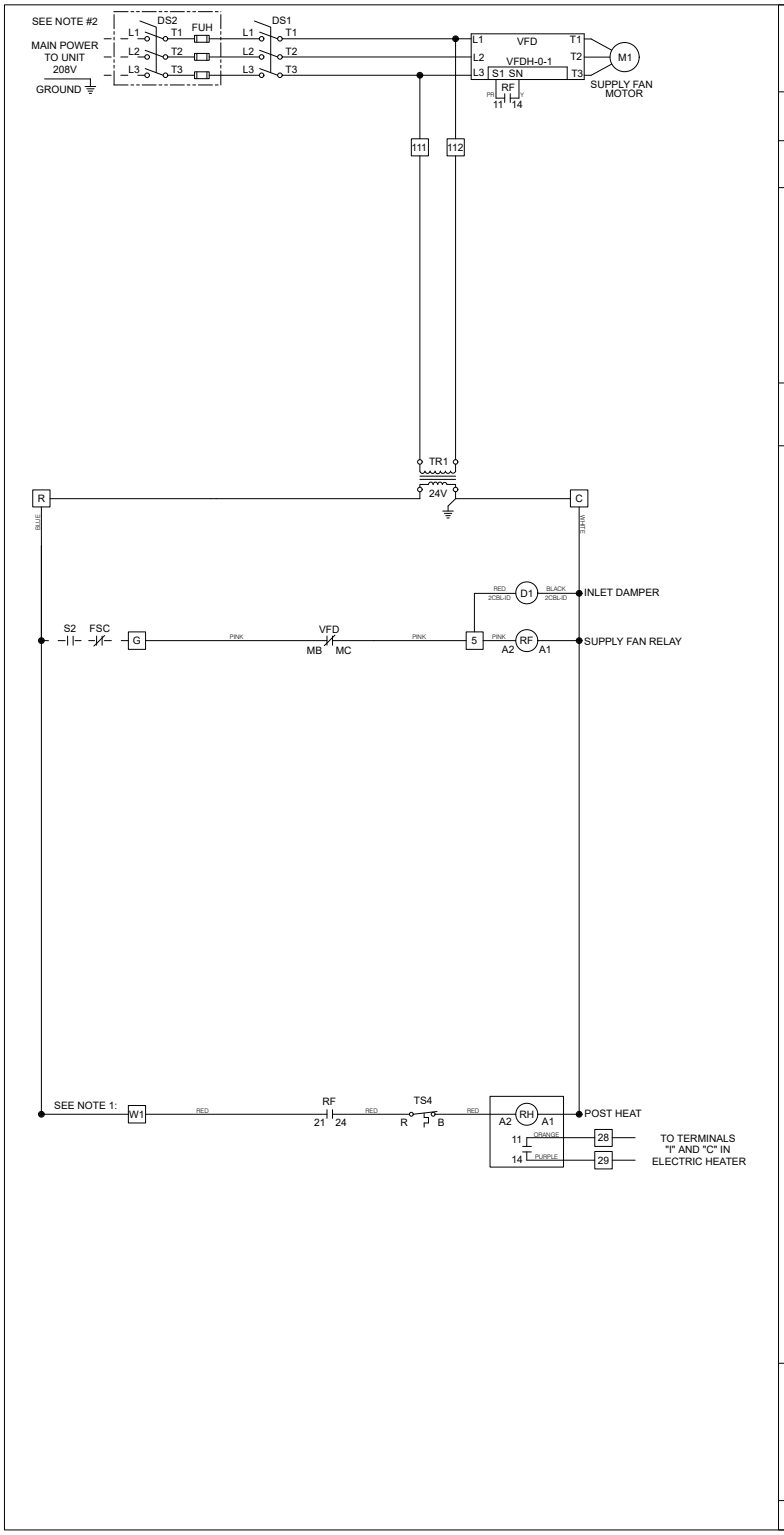
Clearance to combustibles is defined as the minimum distance required between the heating source and the adjacent combustible surfaces to ensure the adjacent surface's temperature does not exceed 90 F above the ambient temperature.

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

**Notes - Service Clearances**

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.

## Wiring Diagram




GREENHECK
Building Value in Air.

Wiring Diagram Code:

GE20N40BZ010N10NU17

CAUTION

UNIT SHALL BE GROUNDED IN ACCORDANCE WITH N.E.C.
POWER MUST BE OFF WHILE SERVICING.

NOTES

USE COPPER CONDUCTORS ONLY
60° C FOR TERMINALS RATED LESS THAN 100 AMPS.
75° C FOR TERMINALS RATED 100 AMPS OR MORE.

FIELD CONTROL WIRING RESISTANCE SHOULD NOT EXCEED 0.75 OHM.

FIELD WIRED – – – – –
FACTORY SUPPLIED AND WIRED ————

NOTE: #1
FOR EXTERNAL HEAT ENABLE - REMOVE R TO W1 JUMPER AND INSTALL EXTERNAL CONTACT.

NOTE: #2
FIELD POWER TO UNIT WIRE TO ELECTRIC HEATER DISCONNECT (DS2)
DS2 AND FUH LOCATED IN ELECTRIC HEATER
SEE ELECTRIC HEATER FOR SPECIFIC HEATER DIAGRAM

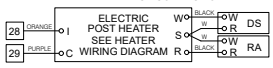
WIRE COLOR CODE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| BK | BLACK | BL | BLUE | BR | BROWN | GY | GRAY |
| LT BL | LIGHT BLUE | O | ORANGE | PK | PINK | PR | PURPLE |
| R | RED | W | WHITE | Y | YELLOW | | |

LEGEND

| | |
|---|---|
| D1 | INLET DAMPER |
| DS | DISCHARGE TEMP SENSOR |
| DS1 | MAIN DISCONNECT SWITCH |
| DS2 | ELECTRIC HEATER DISCONNECT SWITCH LOCATED IN ELECTRIC HEATER SUPPLIED BY HEATER MANUFACTOR |
| FSC | FIRE SYSTEM CONTACT |
| FU# | FUSE |
| FUH | FUSE - LOCATED IN ELECTRIC HEATER SUPPLIED BY HEATER MANUFACTOR |
| M# | MOTOR |
| OL# | MOTOR OVERLOAD |
| RA | REMOTE ADJUSTER LOCATED IN MAIN UNIT CONTROL CENTER |
| RF | SUPPLY FAN RELAY |
| RF1 | FAN ENABLE RELAY |
| RH | HEAT RELAY |
| S2 | FAN SWITCH |
| S4 | HEAT AND COOL SWITCH |
| TR# | TRANSFORMER |
| TS4 | INLET AIR SENSOR - HEAT |
| VFD | VARIABLE FREQUENCY DRIVE |

ELECTRIC HEATER FACTORY/FIELD WIRED INTERFACE CONNECTIONS

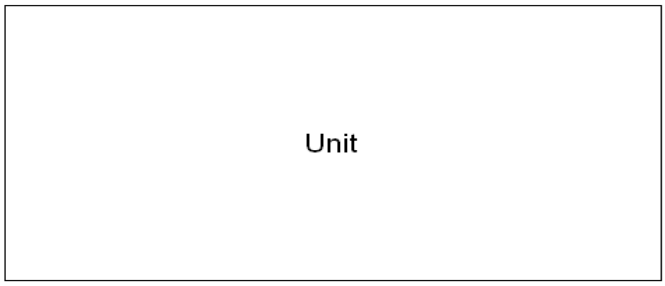



Template Drawing: U17 DOC NUMBER: ---- REV: ----

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

## Corner Weights

248 lb 242 lb




284 lb 278 lb

# SEQUENCE OF OPERATIONS

**Unit Controls**
The unit shall be provided from the factory with:

- 24VAC Transformer
- Terminal Strip
- Supply fan VFD
- Factory mounted and wired outdoor air inlet damper with actuator

**Field Provided Control Requirements**
The following field provided control signals must be provided for proper operation of the unit (Reference the unit wiring diagram for additional information):

- Supply fan enable – Contact closure between R and G (24VAC)

**Unit Start-Up Sequence**

- Supply Fan Enable Is Received
- Outdoor air inlet damper actuator is energized
- Supply Fan Is Enabled

**Supply Fan Sequence**
The unit has been provided with a factory mounted variable frequency drive (VFD). The variable frequency drive shall control the supply fan speed as indicated by the following sequence:

**Constant Volume**
The VFD shall be programmed from the factory for a constant supply fan speed. This is to be adjusted for air balancing only and is not to be modulated.

**Heating Control**
A heating enable signal must be present and the supply fan must enabled before the unit will enable heating.

**Heating Inlet Air Sensor (Heating Lockout)**
The heating will be locked out when the outside air temperature is above the heating inlet air sensor set point (typical 65 F, adj.)

**Electric Heating (Discharge Control)**
The electric heater shall include fully modulating controls. The controls shall allow the heater to maintain a supply temperature set point. The supply temperature set point is controlled by a dial in the unit control center.

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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.

## 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.

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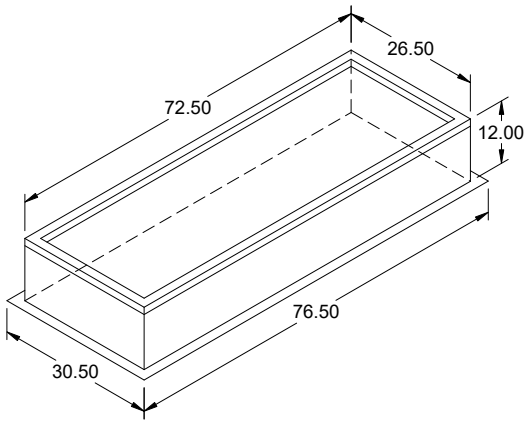



# Model: GPI

## Roof Curb

### Standard Construction Features:

- Roof Curb fits between the building roof and the fan mounted directly to the roof support structure - Constructed of either 18 ga galvanized steel or 0.064 in. aluminum - Straight Sided without a cant - 2 in. mounting flange - 3 lb density insulation - Height - Available from 12 in. to 42 in. as specified in 0.5 in. increments. Notes: - The maximum roof opening dimension should not be greater than the "Actual" top outside dimension minus 2 in.. - The minimum roof opening dimension should be at least 2.5 in. more than the damper dimension or recommended duct size. - The Roof Opening Dimension may or may not be the same as the Structural Opening Dimension. - Damper Tray is optional and must be specified. Tray size is same as damper size. - Security bars are optional and must be specified. Frames and gridwork are all 12 ga steel. Gridwork is welded to the frame and the frame is welded to the curb.

**General**

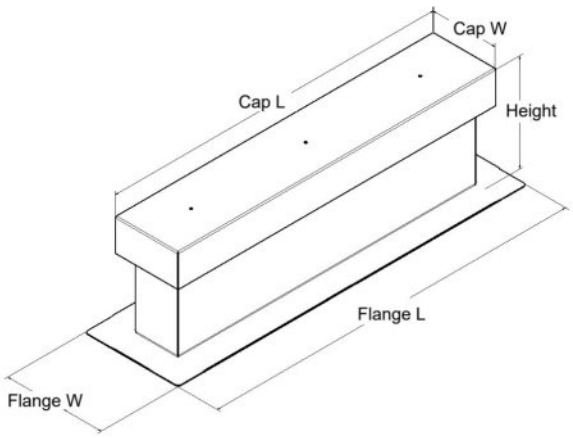
| Tag | Qty | Model | Sizing Method | Undersizing (in.) | Weight (lb) | Shipped Assembled | Union Label |
|---|---|---|---|---|---|---|---|
| | 1 | GPI-28 x 74 | Nominal | 1.5 | 57 | Yes | No Preference |

**Dimensions**

| Curb Height (in.) | Nominal Outside Width (in.) | Nominal Outside Length (in.) | Actual Outside Width (in.) | Actual Outside Length (in.) | Flange Width (in.) | Flange Length (in.) |
|---|---|---|---|---|---|---|
| 12 | 28 | 74 | 26.5 | 72.5 | 30.5 | 76.5 |

**Accessories**

| Material | Security Bars | Liner | Insulation (in.) | Insulation R Value |
|---|---|---|---|---|
| Galvanized | No | No | 1 | R4.3 |




# Model: GESI

## Flat or Pitched Roof Equipment Support

### Standard Construction Features:

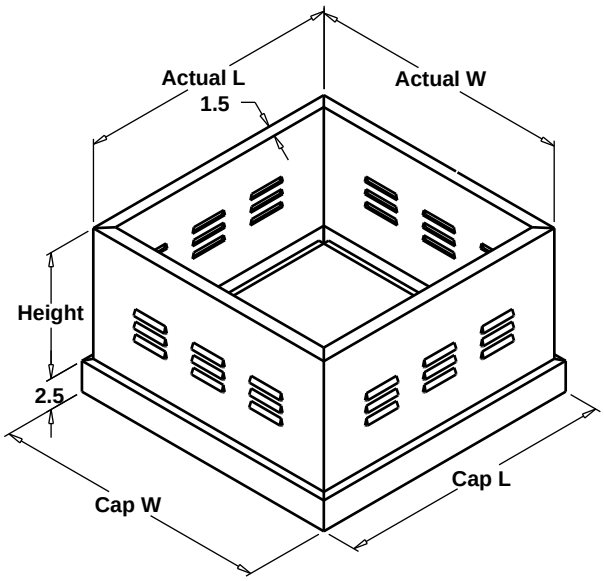
- Welded construction (see Material Note) - Wood nailer - Flashing cap. NOTES: - MAXIMUM design load of 400 lb per isolator. MATERIAL NOTE: - If Length <= 44 OR Height <= 12: Galvanized is 18 ga and Aluminum is 0.064 in. - If Length > 44 OR Height > 12: Galvanized is 16 ga and Aluminum is 0.080 in.

**Dimensions**

| ID# | Tag | Qty | Length (in.) | Flange Width (in.) | Flange Length (in.) | Base Width (in.) | Base Length (in.) | Cap Width (in.) | Cap Length (in.) |
|---|---|---|---|---|---|---|---|---|---|
| Unit | | 2 | 27 | 7.5 | 4 | 4 | 0 | 5 | 1.5 |

**Accessories**

| ID# | Material | Width (in.) | Height (in.) | Sizing |
|---|---|---|---|---|
| Unit | Galvanized | 4 | 20 | Nominal |




NOTES: All dimensions shown are in units of inches

| Mark | Qty. | Cap W x L | Actual W x L | Height |
|---|---|---|---|---|
| KEF-1 | 1 | 22 x 22 | 21 x 21 | 15.25 |
| KEF-2 | 1 | 19 x 19 | 18 x 18 | 15.25 |

# VCE Vented Curb Extension

## STANDARD CONSTRUCTION FEATURES

• Welded Aluminum (0.064 in.) or galvanized (18 ga) construction • Louvered vents to vent heat • Designed to provide required 40 in. minimum discharge height above roof line when used with an 8 in. high roof curb and Greenheck model CUBE fan per NFPA 96.
NOTE: Damper Trays are not available.