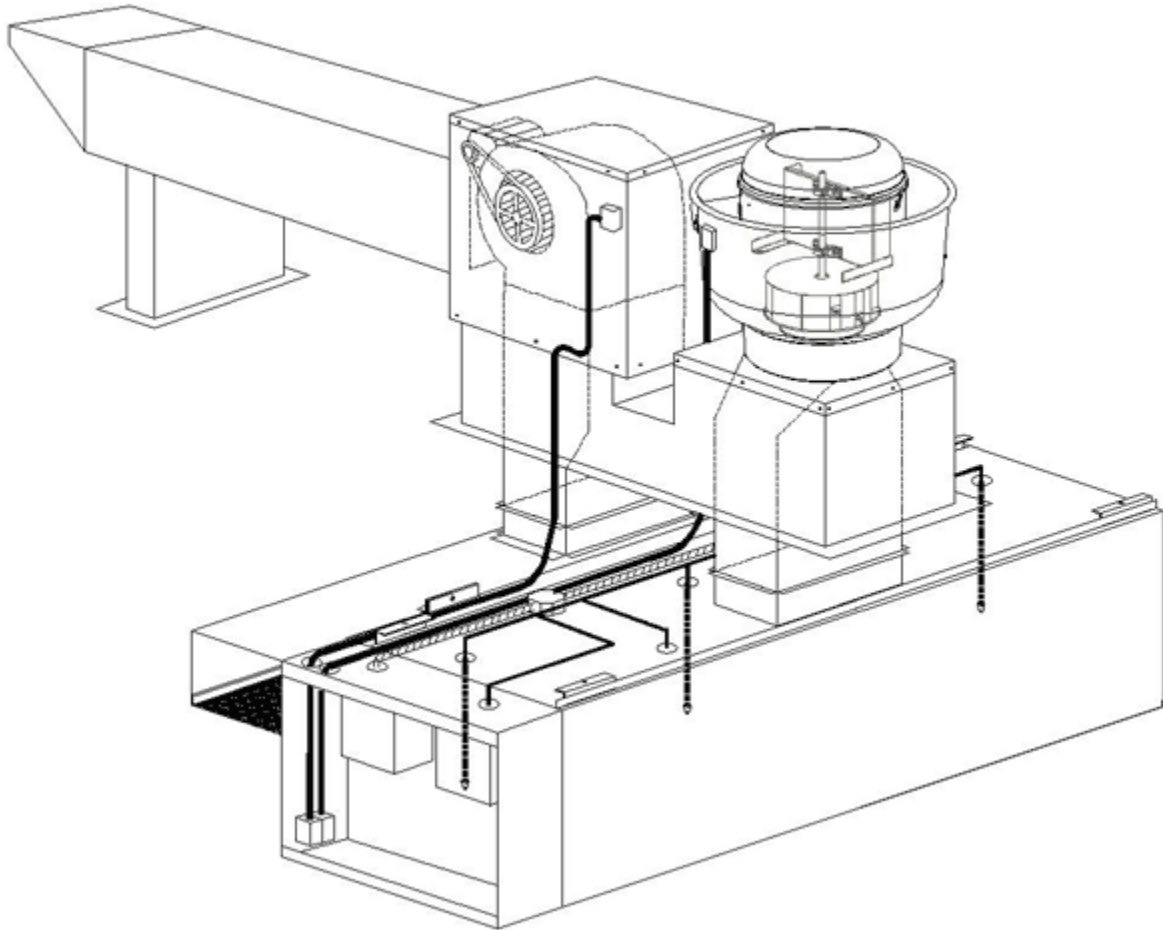


## Installation, Operation, and Maintenance of Commercial Kitchen Hoods



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- INSTALLING THE ROOF TOP PACKAGE UNIT (Combined exhaust and make-up air)
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- LIMITED WARRANTY

**The manufacturer reserves the right to modify the design, materials and/or specifications as a result of code requirements or product enhancements resulting from the Company's ongoing research and development.**

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### **General Information**

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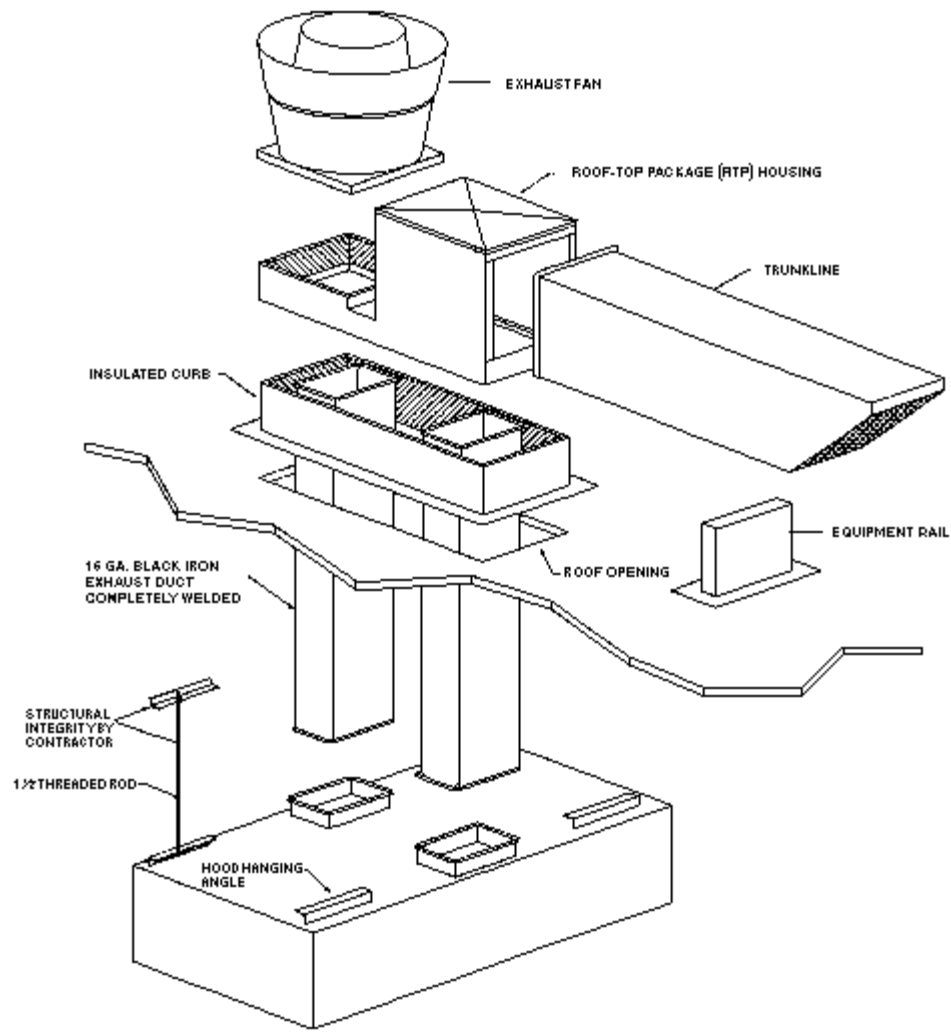
Prior to installing the stainless steel ventilation hood, the installing contractor should thoroughly review the plans and specifications of the project. The contractor should determine the exact location of the cooking hood and it should be determined if adequate room is available to install all ductwork with proper clearances from combustible material.

It is also imperative that the roof top package or curbs be installed in such a way as to minimize any offsetting in the exhaust duct system. All overhead beams or angles must be structurally strong enough to support the weight of the hood system. It is often necessary to strengthen existing structural beams, as they are not designed to carry the weight of a stainless steel hood.

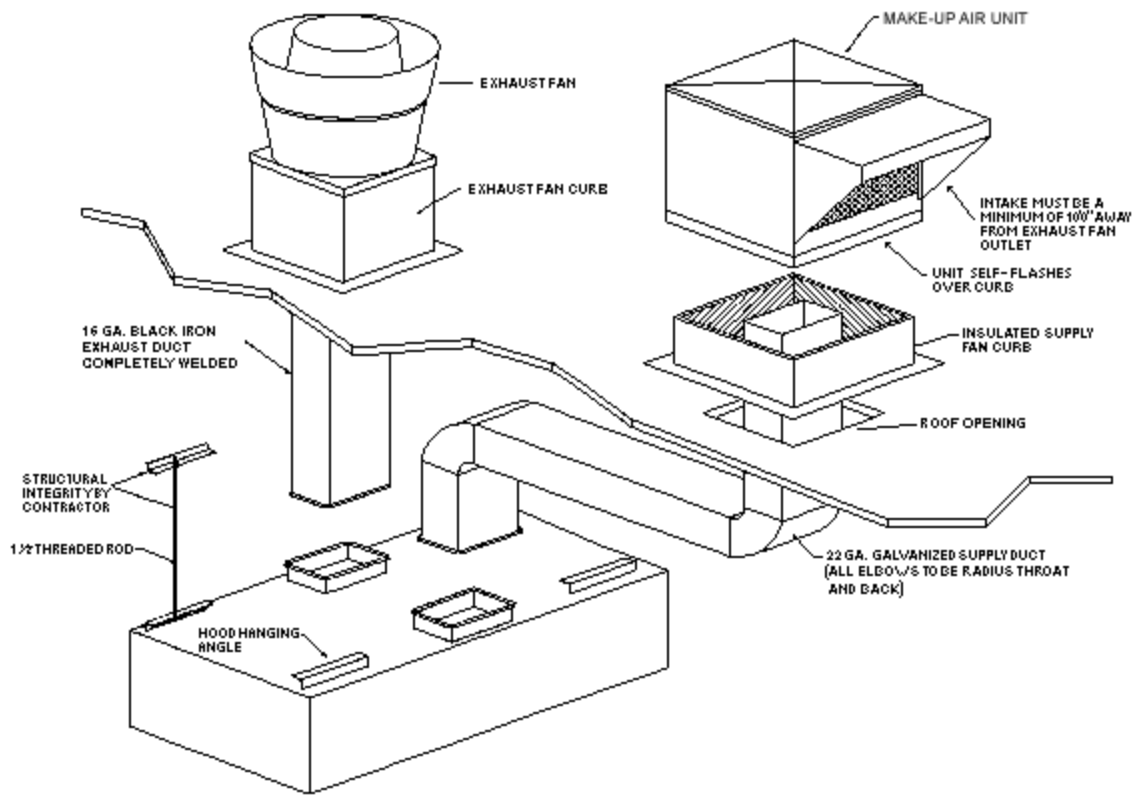
NFPA 96, BOCA, the Southern Building Code and local authorities having jurisdiction call for minimum clearances between the cooking hood, exhaust ducts and building materials which are combustible. The normal requirement between the hood, duct and combustible materials is an 18" clearance. However, this clearance can be lowered based on NFPA 96 Appendix A, BOCA or UMC Codes. It is important that you check with local authorities having jurisdiction to make sure the method of installation is suitable and satisfactory with their requirements.

A minimum of four 8" long mounting angles or two 8" long and full length mounting angle, depending on hood type, are provided with each hood. Larger hoods will have additional brackets. (The submittal drawings indicate the location of these brackets to enable the contractor to make preliminary plans for hanging the hoods.) All hoods are to be hung with 1/2" all-thread rod. Refer to the following pages for recommended hanging heights.

It is extremely important that the hood be hung level, with the supply and exhaust risers on the hood located directly beneath the openings in the roof. It is advisable to finalize the location using a plumb-bob. The following pages show exploded views of the hood with a Roof Top Package unit and the hood with separate fans.



**The Hood With Roof Top Package Unit**



**The Hood With Separate Fans**

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## Canopy Hood - Installing the Hood

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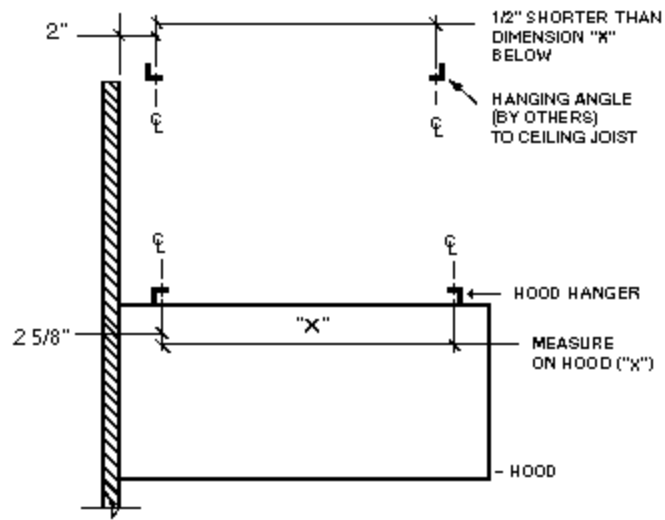
The following is a step-by-step procedure for installation of the ventilation hood.

1. Uncrate the hood, being very careful not to dent or scratch the outer surface. Report any damage to the delivering freight carrier and file a claim if appropriate. Check the nameplate on the equipment to make certain it meets the specifications provided by the architect/engineer. (If discrepancies occur, notify manufacturer immediately.) Refer to the installation drawing for typical details of the ventilation system prior to hanging hood.
2. Position hood on floor in its approximate final position.
3. Determine if modification to roof structure is necessary to accommodate both the hood weight and hood hanging system.

To approximate hood weights, use the guidelines outlined in the:

### Hood Weight Index

4. Use 1/2" threaded rod to hang hoods. Drill 9/16" holes in the supporting structure to line up with the welded-on angle mounting brackets on the hood. (The structural integrity of the structural support system is the responsibility of the contractor and the structural engineer.) The hole spacing in the angle should line up with the angle on top of the hood. Refer to the sketch "Side View".
5. If hood has a back plenum, install it now. See the INSTALLING DROP DOWN PLENUM section and refer to Drop Down Plenum Installation instructions attached to the product.
6. The hood should be hung so that the bottom of the hood is 6'6" from the finished floor, unless otherwise specified by local authorities having jurisdiction. At this point, proceed to weld exhaust duct to hood while on floor, if possible. With the hood well protected against possible scratching, lift the hood into position using high lifts or equipment jacks. When the hood is elevated to the proper height, install 1/2" threaded rod between each mounting bracket on the hood and the modified support. Secure rods with heavy duty nuts and appropriately sized fender washers. Refer to sketch "Side View".
7. If hood has enclosure panels, install them now. See the INSTALLING THE ENCLOSURE PANELS (WRAPPER) section for Installation Instructions and refer to instructions attached to product.
8. The entire exhaust duct system must be continuously welded, liquid tight. The duct must be welded to the hood exhaust collar and the roof curb cap must be welded to the exhaust duct. (Ductwork installation 'By Others.')
9. Threaded rods should be 1/2" closer to the back wall at the top hanger so as to pull the hood against the wall. Make sure the hood is level.
10. Install light bulbs (supplied by others), light globes, and grease filters in the hood.
11. Install grease cups in the studs provided.
12. Use a stainless steel polish such as "Sheila Shine" to clean the hood of dust or dirt acquired in transit.
13. It is recommended that a protective plastic coating be placed over the hood until construction is complete, so as to avoid any damage to this equipment.
14. IF HOODS ARE TO BE HUNG BACK TO BACK IN AN ISLAND CONFIGURATION, REFER TO THE SECTION "INSTALLING CONNECTING HOODS".

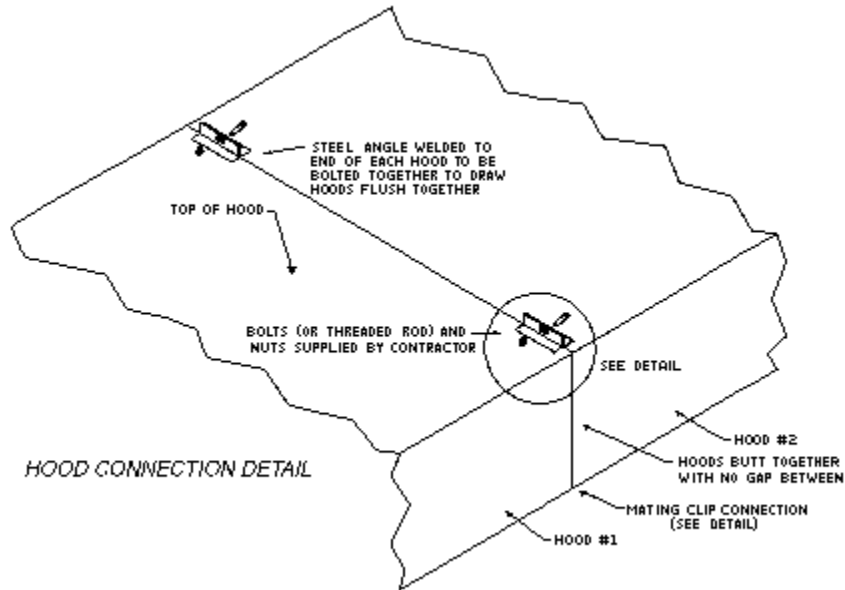


SIDE VIEW

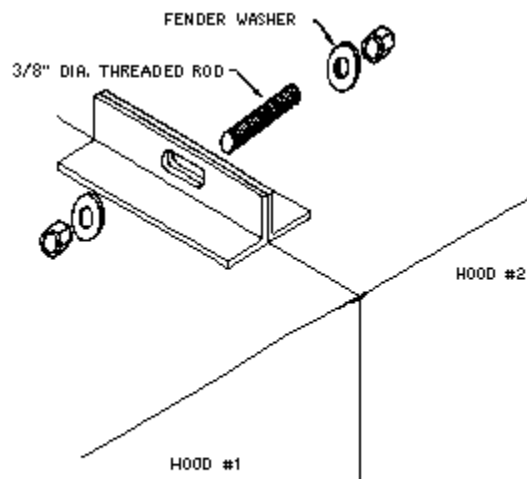
**INSTRUCTIONS**

- A. Hang hoods, adjusting tension on hanging rods to position hoods so they fit flush with each other (see figure 5).
- B. Bolt the tops of the hoods together by sliding a threaded rod through the mounting angle slots and holes and fastening it into position by using nuts and washers as shown in figure 2.
- C. Install end to end mating clips and back to back mating clips. Run a bead of caulk along the seam to be covered and slip the mating clip into position as shown in figures 3 & 4.
- D. The end product should resemble figure 1.

**Figure 1. End to End or Back to Back Hood Connection Detail**



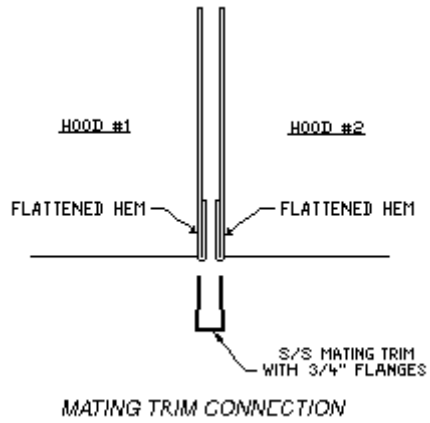
**2. Exploded View of Connecting Angles on Top of Hood**



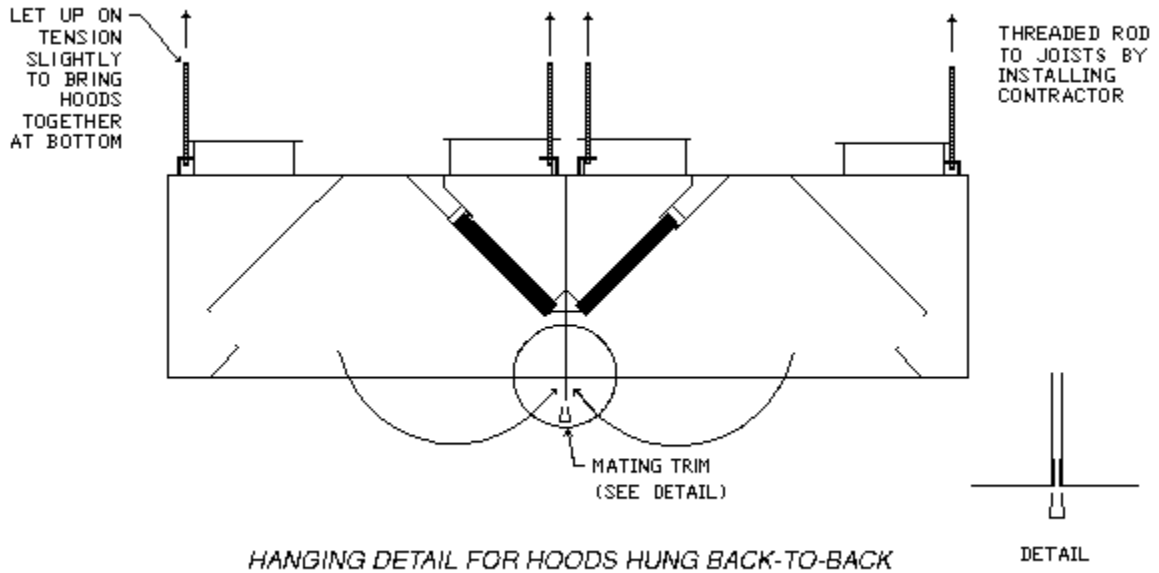
*CONNECTION BRACKET DETAIL*



**3. End to End Connecting Hoods: Mating Trim Detail**

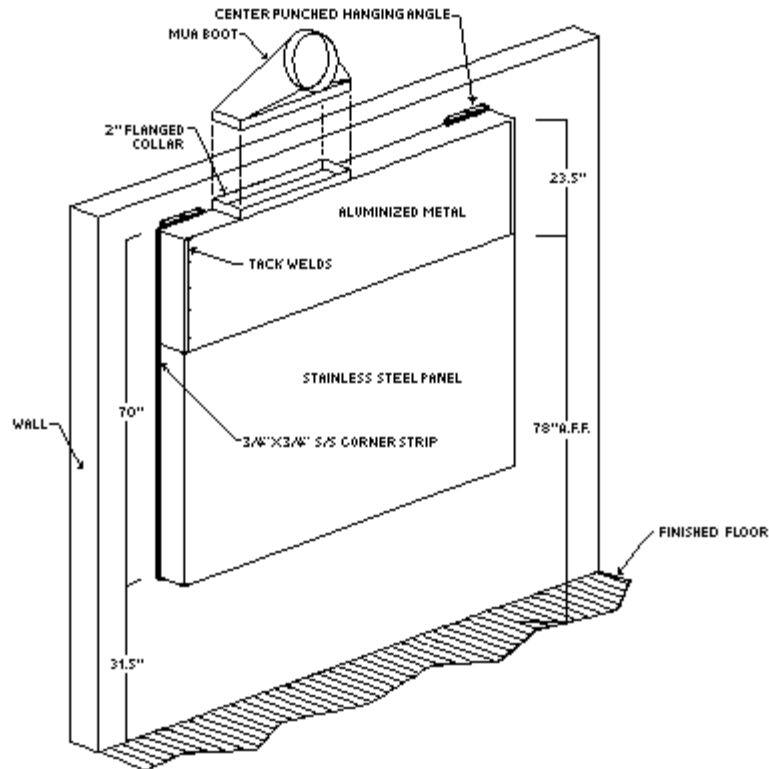


**4. Back to Back Connecting Hoods: Mating Trim Detail**



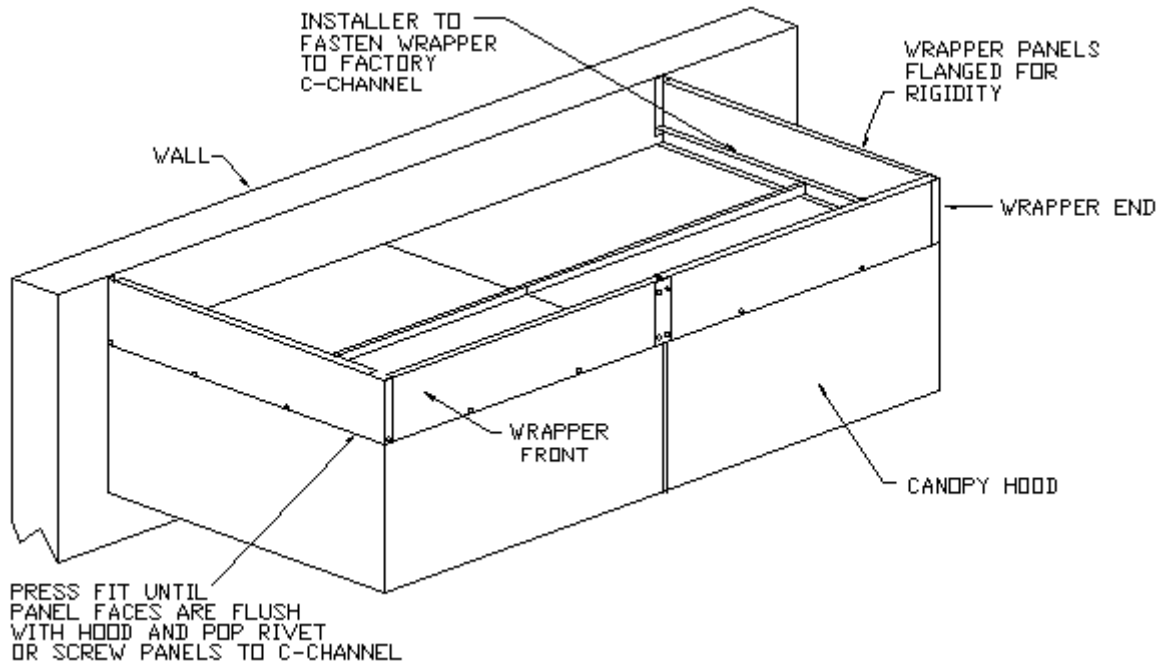
## Drop Down Plenum Installation Instructions

1. Locate the assembly and unpack from the crate.
2. If the MUA risers are to be field cut, cut the risers in as desired. (Note: The manufacturer installs a 2" flange for a MUA riser. This flange is intended to slip inside a MUA boot that is supplied by the installer.)
3. Locate the wall and ceiling joists that will support the assembly.
4. Install the threaded rod and angle that will be used to hang the assembly from the ceiling joists.
5. Move the assembly into position as indicated by the markings on the product. Note the location of the 78" A.F.F. critical hanging height marking. This point should be level with the bottom back edge of the hood when it is hung later.
6. Install the threaded rod into the hood hanging angles and use heavy-duty nuts to secure the connection.
7. Caulk the seams between the wall and the drop down plenum assembly.



## Installing the Enclosure Panels (Wrappers) On Canopy-Type Hoods

1. Unwrap the wrapper panels from the shipping container.
2. Locate "L" brackets if supplied. Position and fasten brackets parallel to corner of hood on the wall. Brackets should be offset at least 1/16" in from edge of hood in order for wrapper face to mount flush with the hood (Fig. 1,2)
3. Locate one of the side wrapper panels and position it on the hood so that the 3/8" flange on the bottom of panel slips underneath the C-channel on top of the hood. (Fig. 1)  
**Note:** A notch will have to be cut on the wrapper flange using shears (tin snips) where interference occurs. (Fig. 3)
4. Press fit panel into place until wrapper face is flush with hood face. Screw or pop-rivet wrapper to the C-channel and "L" bracket. (Fig. 1)
5. Locate front wrapper panel. Position its' lower 3/8" flange under C-channel of hood and slide panel into position so that the end of front panel is behind the 90 degree bend of side panel. (Fig. 4) Once into place, press fit the lower flange of the front panel into C-channel in order to have wrapper face flush with front of hood. Screw or pop-rivet bottom of front panel to the C-channel.
6. Drill appropriate holes and rivet front to end panel. (Fig. 5)
7. If multiple panels are used (i.e. hood is side to side or back to back to another), a stainless trim will be provided to attach multiple panels together. Attach the panels by slipping them behind the stainless trim and fastening with screws or rivets. (Fig. 5)  
**Note:** Trim length will have to be cut to fit. In most instances, trim should extend from bottom of hood to top of wrapper panel. (Fig. 6)
8. Locate the other side panel. Repeat steps 2,3,4. Pop rivet as previously done in step 5. Note: In most instances where hood is located against a side wall, fasten the front wrapper panel to the "L" bracket. A second side panel will not be shipped. Pop rivet or screw front wrapper panel to bracket. (Fig. 7)
9. Caulk all gaps and seams.



COMPLETED WRAPPER ASSEMBLY

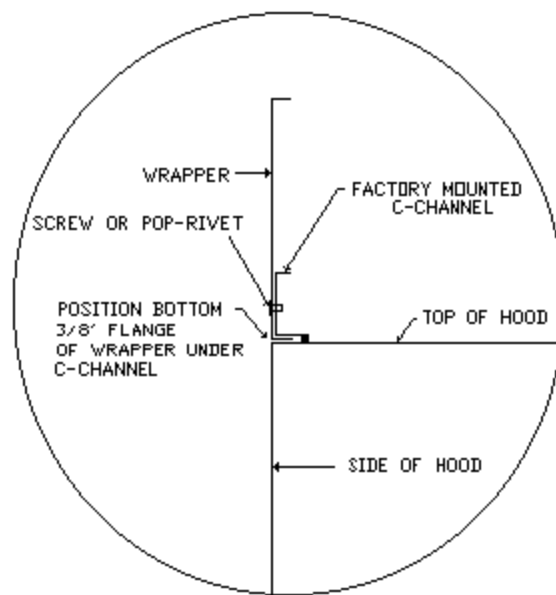


FIG. 1 WRAPPER DETAIL

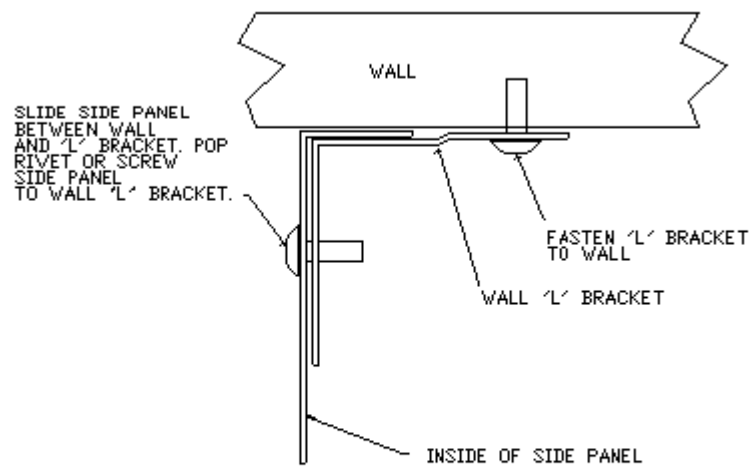


FIG. 2 WALL ANGLE

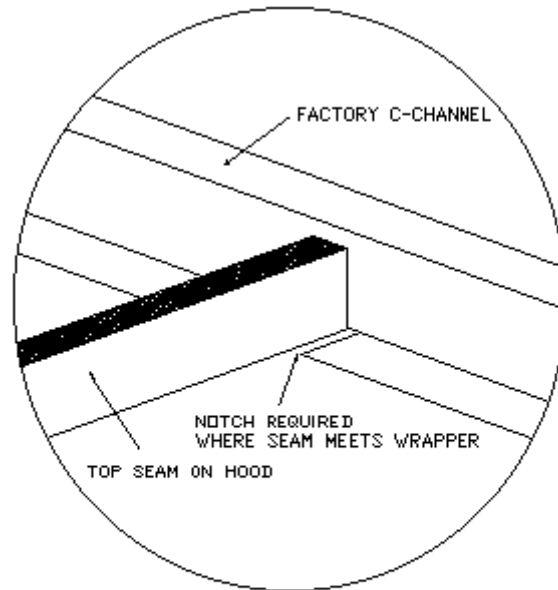


FIG. 3 TOP HOOD SEAM DETAIL

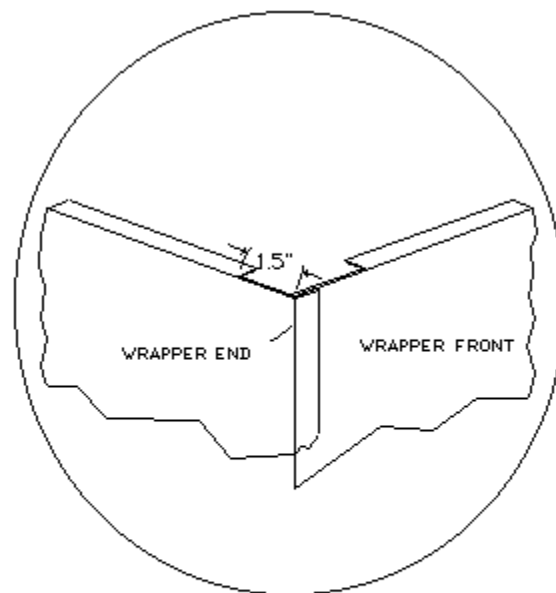


FIG. 4 CORNER DETAIL

PLACE FRONT PANEL  
UNDER 90 DEGREE BEND  
OF SIDE PANEL AND SCREW OR  
POP-RIVET INTO POSITION

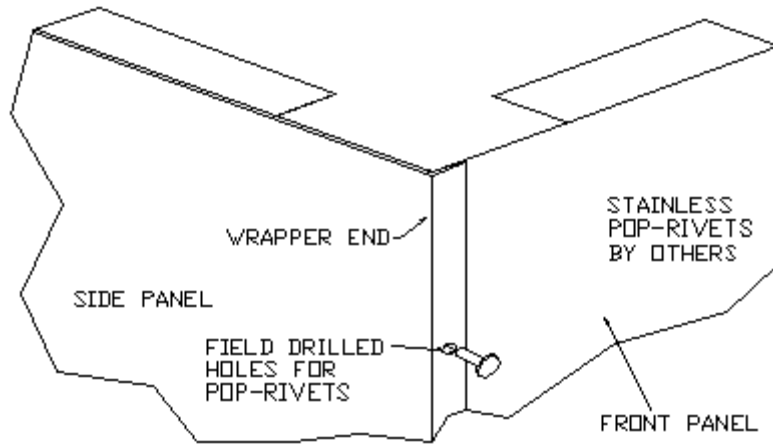


FIG.5 FRONT CORNER ASSEMBLY

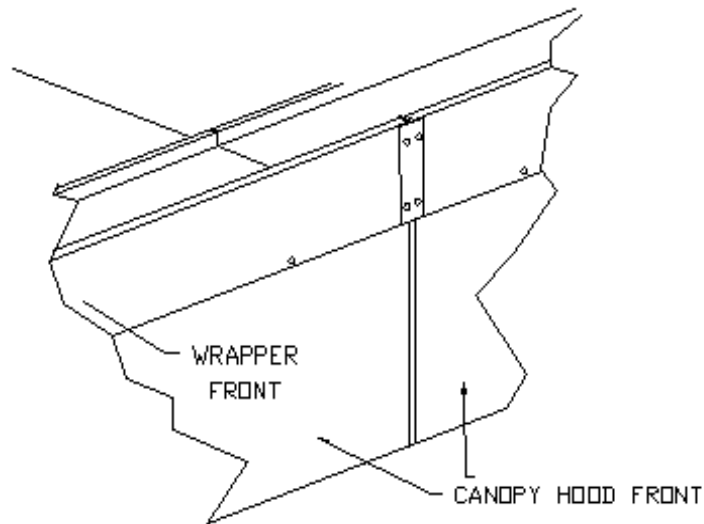
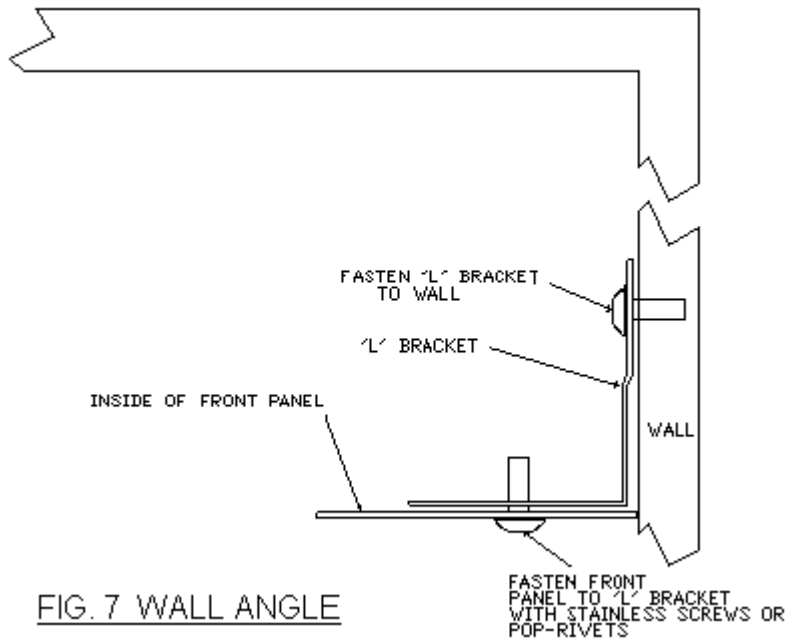


FIG.6 FRONT WRAPPER JOINT ASSEMBLY



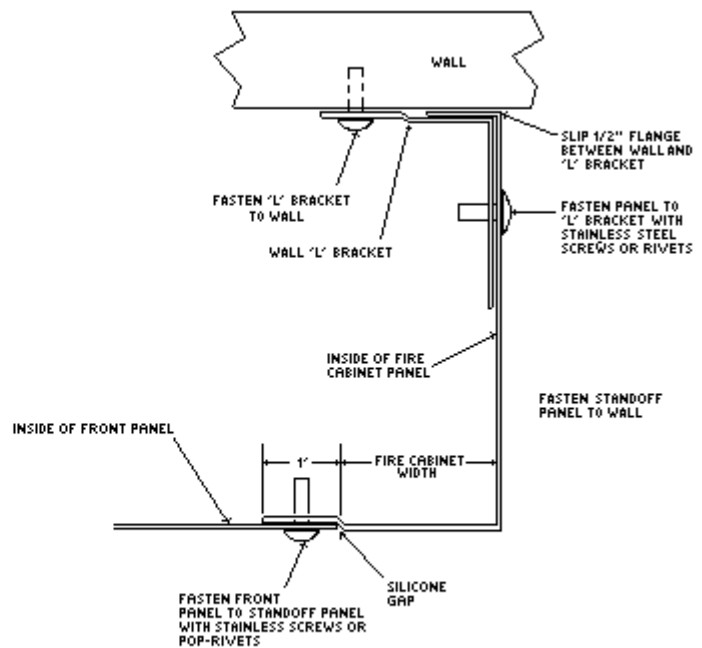
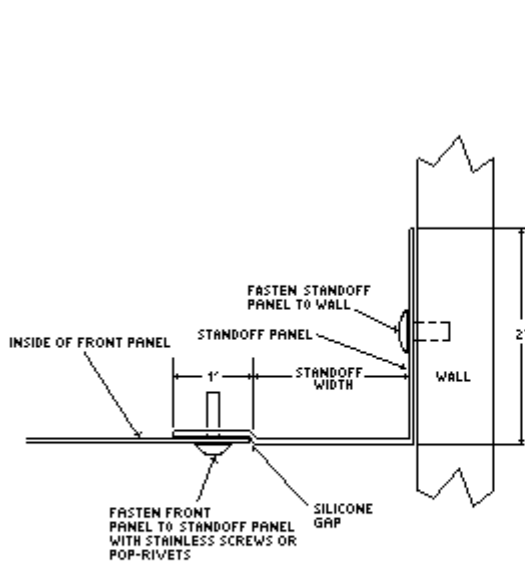
**FOR SINGLE HOODS EXCEEDING 16 FEET**

**FOR HOODS WITH SIDE WALL AND STANDOFF OPTION:**

1. Complete steps 1 through 4 of the standard instructions.
2. Locate standoff panel. Slip its' lower 3/8" flange under factory C-channel. Front face of panel should be even with front of hood. Fasten panel to wall and C-channel.
3. Locate front panel of wrapper assembly. Slip its' lower 3/8" flange under factory C-channel. Slide panel end behind the 90 degree bend of side panel. (Fig. 4) Once in position, make sure wrapper face and hood face are flush. Screw or rivet front panel to C-channel and standoff panel (Fig. 8)
4. Locate a corner gusset and install under top corner of the wrapper where 90 degree bend meets the front panel. (Fig. 5)
5. Caulk all gaps and seams.

**FOR 16 FOOT HOODS WITH ATTACHED FIRE CABINET:**

1. Complete steps 1 through 7 of standard instructions.
2. Locate fire cabinet wrapper panel. Repeat steps 2,3,4 for this panel. Make sure that 1 inch offset flange of fire cabinet slides behind front panel. A corner gusset will not be necessary for this application. Pop rivet or screw fire cabinet panel to front panel, C-channel, and "L" bracket. (Fig. 9)
3. Caulk all gaps and seams.

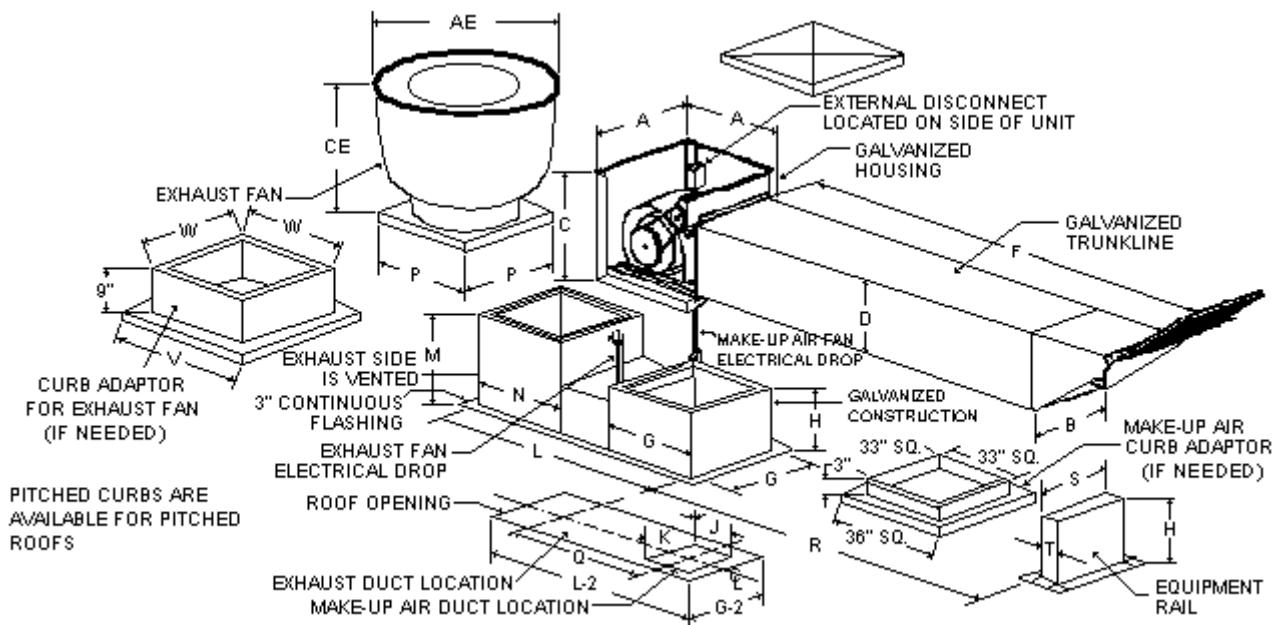


## Installing the Roof Top Package Unit (Combined Exhaust/Supply Air Unit)

If a combined exhaust/make-up air unit (RTP) is supplied with the job, proceed as follows:

1. Refer to components drawing in the "General Information" section.
2. Determine the location of the hood in the building from the plans and job specs.
3. Draw an outline of the hood on the floor exactly where it will be positioned.
4. Determine and mark the center line of the main exhaust duct where it will penetrate the roof deck. (This point may or may not be the same as the exhaust riser on the hood since a pantleg duct or offset duct may have to be used.)
5. Extend the exact center of the exhaust duct straight up to the roof, using a plumb bob. Punch a hole through the roof deck at this point. This is the exhaust center.
6. Re-check your measurements to be sure the hole will be cut properly.
7. Locate the punched hole on the roof. Draw center lines on the roof the same as the center lines of the main exhaust duct and determine the proper roof opening size from the model specific documentation at the job site.
8. Mark the opening on the roof and be sure that the exhaust center line drawn on the roof lines up with the exhaust center line of the curb. Cut the roof opening.
9. Place the curb over the opening and flash it onto the roof deck.
10. Place the unit onto the curb, being sure that the exhaust fan section is over the exhaust duct center line.
11. Place the equipment rail on the roof at a distance of 57-1/2" from the edge of the curb to the make-up air intake side of the unit.
12. Flash the rail onto the roof deck.
13. Secure the intake air trunkline (with the filter) to the unit with screws. Caulk the joint.
14. Bring power to the unit from the switches through the flex drop. (Refer to "Wiring the System" section.)

The drawing below shows a typical rooftop package installation.



For specific dimensional information, please refer to the model specific documentation at the job site.



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## Installing the Make-Up Air Unit

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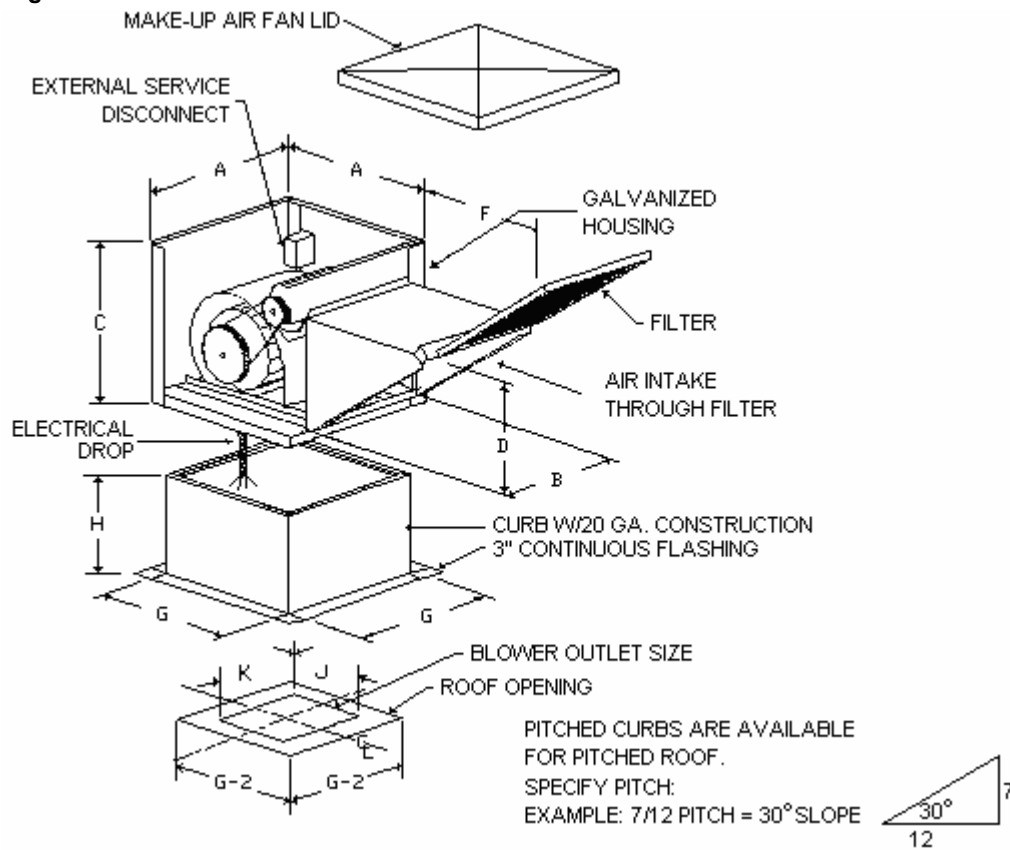
If a Make-Up Air Unit is supplied with the job, proceed as follows:

1. Refer to components drawing in the "General Information" section.
2. Determine the location of the hood in the building from the plans and job specs.
3. Draw an outline of the hood on the floor exactly where it will be positioned.
4. Determine and mark the center line of the main supply duct where it will penetrate the roof deck. (This point may or may not be the same as the supply riser on the hood since code requires the make-up air intake to be positioned at least 10' from the exhaust outlet.)
5. Extend the exact center of the supply duct straight up to the roof, using a plumb bob. Punch a hole through the roof deck at this point. This is the make-up air center.
6. Re-check your measurements to be sure the hole will be cut properly.
7. Locate the punched hole on the roof. Draw center lines on the roof the same as the center lines of the main make-up air duct and determine the proper roof opening size from the model specific documentation at the job site.
8. Mark the opening on the roof and be sure that the make-up air center line drawn on the roof lines up with the make-up air center line of the curb. Cut the roof opening.
9. Place the curb over the opening and flash it onto the roof deck.
10. Place the unit onto the curb and secure with self-tapping screws.
11. Bring power to the unit.

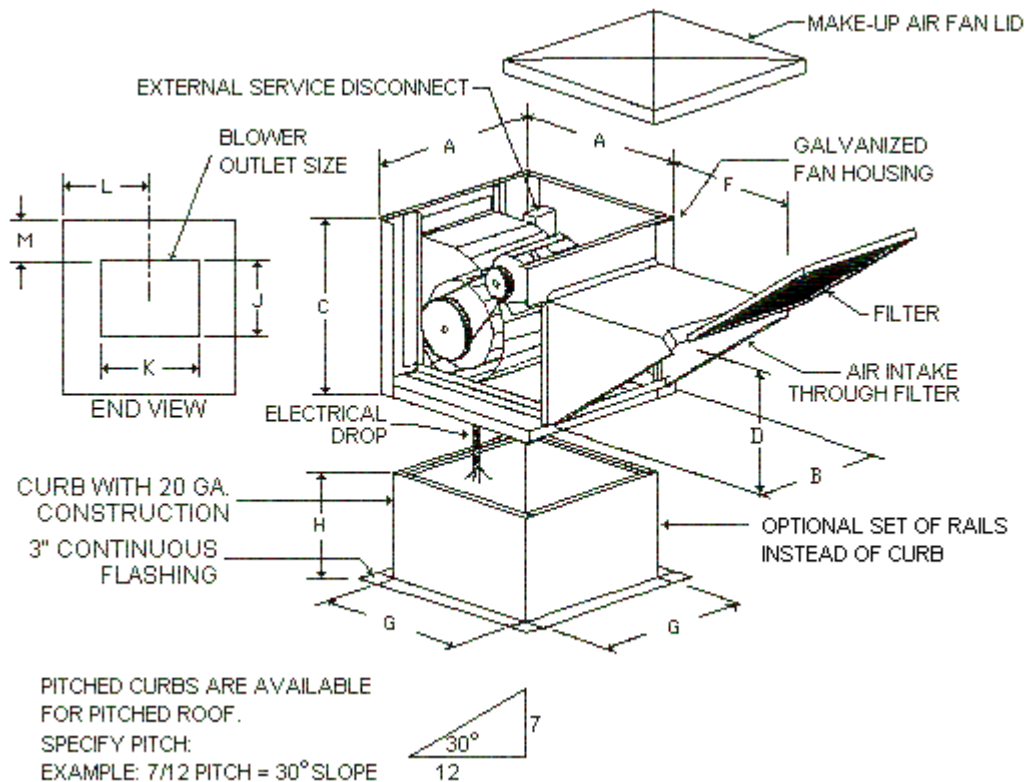
Below are exploded drawings which show typical installations of a make-up air unit.

For specific dimensional information, please refer to the model specific documentation at the job site.

### Down Discharge Installation



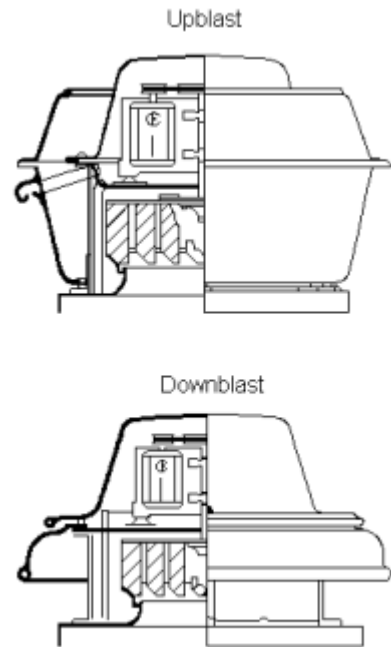
### Side Discharge Installation



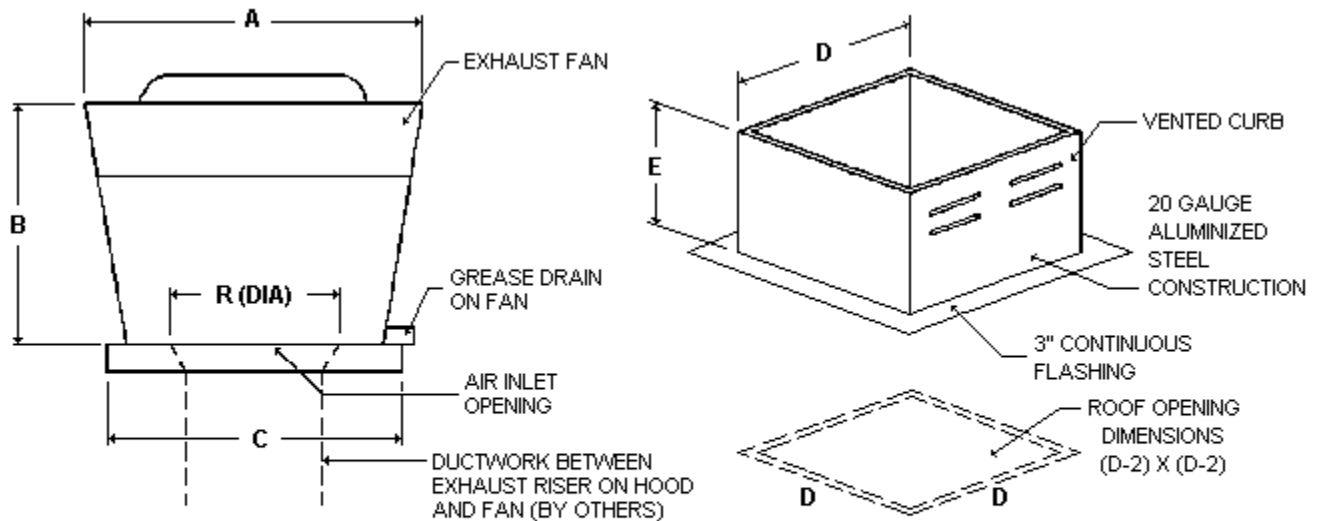
## Installing the Exhaust Fan

If an Exhaust Fan is supplied with the job, proceed as follows:

1. Refer to drawing in the "General Information" section.
2. Determine the location of the hood in the building from the plans and job specs.
3. Draw an outline of the hood on the floor exactly where it will be positioned.
4. Determine and mark the center line of the main exhaust duct where it will penetrate the roof deck.
5. Extend the exact center of the exhaust duct straight up to the roof, using a plumb bob. Punch a hole through the roof deck at this point. This is the exhaust center.
6. Re-check your measurements to be sure the hole will be cut properly.
7. Locate the punched hole on the roof. Draw center lines on the roof the same as the center lines of the exhaust duct and determine the proper roof opening size from the model specific documentation at the job site.
8. Mark the opening on the roof and be sure that the exhaust center line drawn on the roof lines up with the center line of the curb. Cut the roof opening.
9. Place the curb over the opening and flash it onto the roof deck.
10. Place the unit onto the curb and secure with self-tapping screws.
11. Bring power to the unit.



The drawing below shows a typical exhaust fan installation.



PITCHED CURBS ARE AVAILABLE FOR PITCHED ROOF.  
 SPECIFY PITCH:  
 EXAMPLE: 7/12 PITCH = 30° SLOPE  
 IN ORDER TO COMPLY WITH NFPA 96,  
 THE MINIMUM CURB HEIGHT MUST BE 15 INCHES.

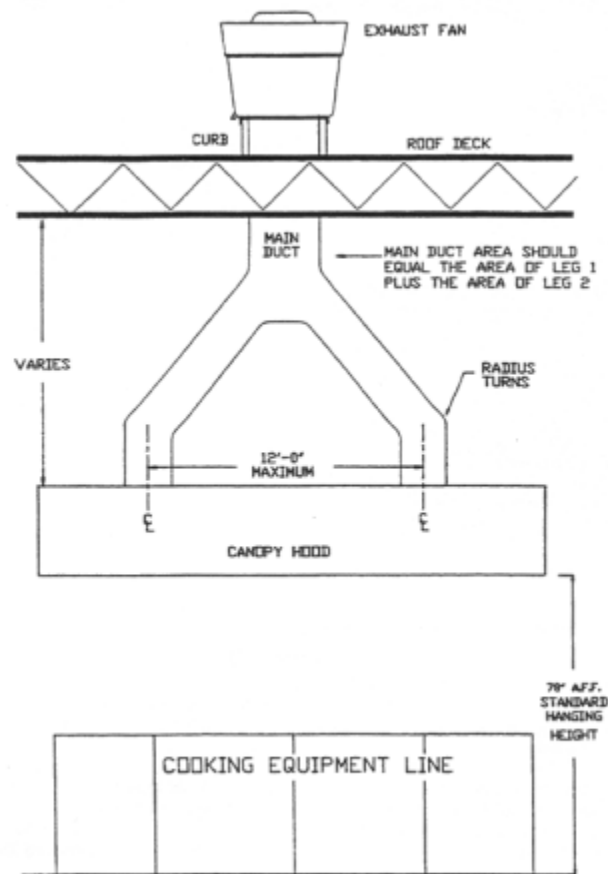
For specific dimensional information, please refer to the model specific documentation at the job site.

### Installing Ductwork: Guidelines

The following information serves as a guideline only. Ductwork should be installed in accordance with local codes and restrictions. IT IS THE RESPONSIBILITY OF THE INSTALLER TO CHECK LOCAL CODES BEFORE RUNNING DUCT.

1. All exhaust ductwork must be installed in the most direct manner possible.
2. Exhaust duct must be made of 16 gauge steel or 18 gauge stainless steel.
3. Per NFPA-96-Chapter 3, all exhaust duct seams and joints must have a continuous liquid tight external weld.
4. EXHAUST RISERS on the hood have been sized to achieve the velocity of 1500-2200 FPM (NFPA-96) based on the CFM required for the hood. Please be sure to maintain the area of each riser when connecting duct, offsets or transitions to it.
5. Branches should enter at gradual expansions and at an angle of 30 degrees or less (preferred) to 45 degrees if necessary. Avoid "T" intersections.
6. When a "PANTLEG DUCT" is required to bring two ducts into one exhaust fan, please observe the following:
  - a. Use ONLY radius back and radius throat elbows. (2 to 2.5 diameter center line radius is recommended)
  - b. Maintain the distance between the center line of exhaust ducts at a maximum of 12' apart.
  - c. The main duct going to the exhaust fan must be the sum of the area of the separate legs.
7. MAKE-UP AIR RISERS are sized around 800-1200 FPM. Maintain this area when installing ducts.
8. DO NOT use "flexible" type duct for make-up air duct, as it has higher pressure losses caused by the friction of the irregular inside duct surface. Only the rigid type duct installed in accordance with SMACNA/HVAC Duct Construction Standards will be acceptable.
9. IMPORTANT: When a fusible link is installed in the make-up air damper at the hood collar, an access door must be cut into the make-up air duct by the installer.

### Installing the Pantleg Ductwork



**Clearances**

The normal requirement states that a hood and associated ductwork must have an 18" clearance from combustible materials. Since this is too great in most installations, BOCA, NFPA and the Uniform Mechanical Code have produced approved methods of protecting exhaust ducts from surrounding combustibles to reduce this clearance to 3". Please observe the method approved by local authorities governing your area.

**BOCA**

**SECTION M-1101.0 - REDUCED CLEARANCES**

**M-1101.1 Labeled reduction:** The required clearance to combustibles may be reduced by methods that have been tested and bear the label of an approved agency.

**M-1101.2 Reduction table:** The required clearance to combustibles may be reduced when protected in accordance with one of the methods specified in Table M-1101.2. The reduced clearance distances in the table shall be measured from the device to the face of the protection.

Table M-1 101.2 - REDUCED CLEARANCE TO COMBUSTIBLES

Reduced clearance protection*	Reduced clearance based on required clearance to combustibles (inches)**			
	36	18	9	6
1/8-inch unpainted aluminum plate spaced 1 inch off the wall	3	3	3	3
1/8-inch painted aluminum plate spaced 1 inch off the wall	28	9	3	3
Unpainted galvanized sheet metal Manufacturer's Standard Gage No. 28 mounted on 1/2-inch inorganic insulating board attached directly to the wall	3	3	3	3
Painted galvanized sheet metal Manufacturer's Standard Gage No.28 spaced 1 inch off the wall	24	6	3	3
2 layers of painted galvanized sheet metal Manufacturer's Standard Gage No. 28 having a 1-inch air space between layer, spaced 1 inch off the wall	3	3	3	3
1/4-inch inorganic insulating board having painted galvanized sheet metal Manufacturer's Standard Gage No. 28 attached on both sides spaced 1 inch off the wall	3	3	3	3
1/4-inch inorganic insulating board spaced 1 inch off the wall	30	9	3	3
2 layers of painted galvanized sheet metal Manufacturer's Standard Gage No. 24 having 1 inch of fiberglass insulation between layers spaced 1 inch off the wall 3-1/2-inch thick wall space 1 inch off the wall	3 18	3 5	3 3	3 0

Note: \* The spacers shall be noncombustible

Note: \*\* 1 inch - 25.4mm

**Uniform Mechanical Code**

TABLE NO. 5-B - CLEARANCES, INCHES, WITH SPECIFIED FORMS OF PROTECTION\*,\*\*

<b>TYPE OF PROTECTION Applied to the Combustible Material Unless Otherwise Specified and Covering All Surfaces Within the Distance Specified as the Required Clearance With No Protection (Thicknesses Are Minimum)</b>	<b>WHERE THE STANDARD CLEARANCE IN TABLE NO. 5-A WITH NO PROTECTION IS:</b>											
	36 inches			18 inches			9 inches			6 inches		
	Above	Sides & Rear	Chimney or Vent Connector	Above	Sides & Rear	Chimney or Vent Connector	Above	Sides & Rear	Chimney or Vent Connector	Above	Sides & Rear	Chimney or Vent Connector
	a) 1/4" insulating millboard spaced out 1"****	30	18	30	15	9	12	9	6	6	3	2
b) 0.013" (No. 28 manufacturer's standard gage) steel sheet on 1/4" insulating millboard	24	18	24	23	9	12	9	6	4	3	2	2
c) 0.013" (No. 28 manufacturer's standard gage) steel sheet spaced out 1"****	18	12	18	9	6	9	6	4	4	2	2	2
d) 0.013" (No. 28 manufacturer's standard gage) steel sheet on 1/8" insulating millboard spaced out 1"****	18	12	18	9	6	9	6	4	4	2	2	2
e) 1/2" insulating cement covering on heating appliance	18	12	36	9	6	18	6	4	9	2	1	6
f) 1/4" insulating millboard on 1" mineral fiber bats reinforced with wire mesh or equivalent	18	12	18	6	6	6	4	4	4	2	2	2
g) 0.027 (No. 22 manufacturer's standard gage) steel sheet on 1" mineral fiber bats reinforced with wire or equivalent	18	12	12	4	3	3	2	2	2	2	2	2

\*For appliances complying with Section 504(b) and (c)

\*\*Except for the protection described in (3), all clearances shall be measured from the outer surface of the appliance to the combustible material, disregarding any intervening protection applied to the combustible material

\*\*\*Spaces shall be on noncombustible material

NOTE: Insulating millboard is a factory made product formed of noncombustible materials, normally fibers, and having a thermal conductivity of 1 Btu-inch per square foot per degree F, or less

#### NFPA 96

**Appendix A:** *This Appendix is not a part of the requirements of this NFPA document, but it is included for information purposes only.*

**A-1** Where 18 in. (457.2 mm) clearance is required to unprotected combustible material, the clearance may be reduced if the combustible material is protected by an engineered construction system acceptable to the authority having jurisdiction, or by the use of materials or products listed for protection purposes, or by the use of materials listed below:

**Type of Protection**

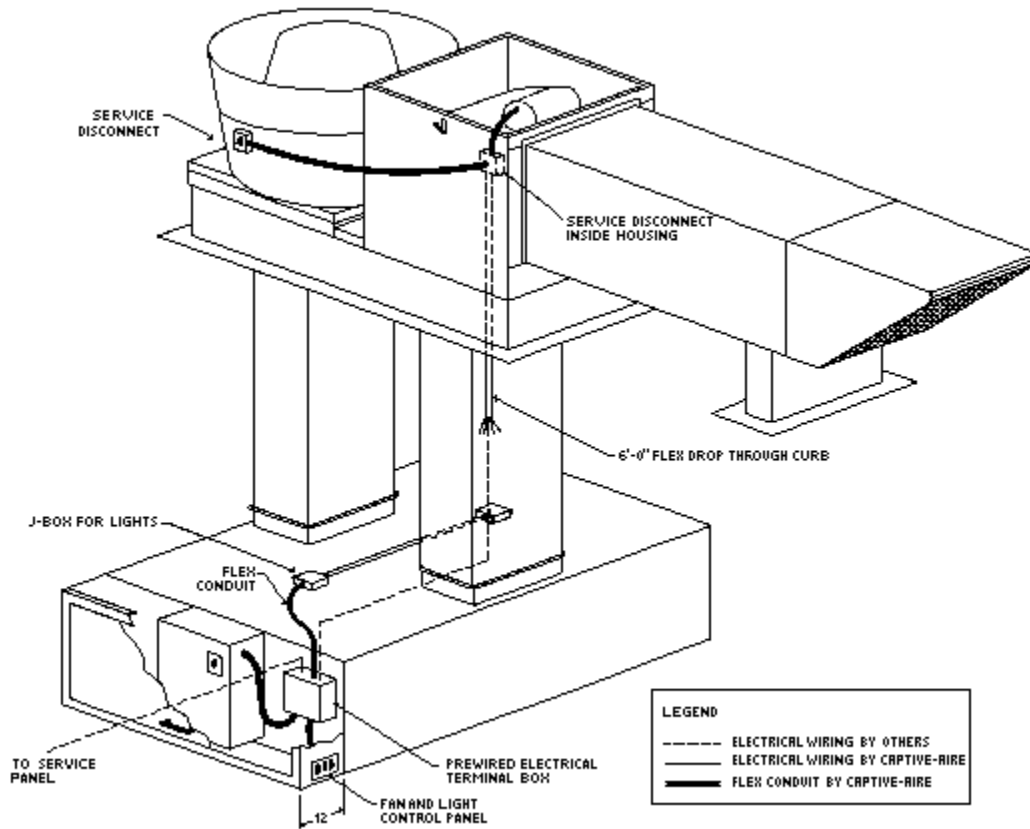
1. 0.013-in. (.33mm) (28 gage) sheet metal spaced out 1 in. (25.4 mm) on noncombustible spacers. **Clearance:** 9 inches (228.6 mm)
2. 0.027 (.69 mm) (22 gage) sheet metal on 1 in. (25.4 mm) mineral wool bats reinforced with wire mesh or equivalent spaced out 1 in. (25.4 mm) on noncombustible spacers **Clearance:** 3 inches (76.2 mm)

**A-2** Materials and products listed for the purpose of reducing clearance to combustibles shall be installed in accordance with the condition of the listing and the manufacturer's instruction.

## Wiring the System

### Field Completion of Wiring:

1. If a CONTROL PANEL is furnished:  
Follow the field wiring instructions included with the package.
2. If a CONTROL PANEL is not furnished:  
Complete the wiring in accordance with the project specifications and the national and local electrical codes.
3. If power and/or control wiring is furnished with the ROOF TOP UNIT:  
Extend to the junction box on top of the hood and connect to like numbers or power supply as indicated in the field wiring instructions.
4. When sizing main breakers: Refer to the nominal full load amps listed on the motor plates.





### GUIDELINES BEFORE YOU BEGIN:

The testing and balancing of a system is necessary to insure proper and efficient operation of that system as it was designed. In any building where effluent and hot air is removed, that mass of air must be replaced to maintain a constant pressure in the space. Any change in the pressure differential between inside and outside air will in some way affect the operation of a system, most commonly that affect is a negative one.

A test and balance, as well as the simple performance test in International Mechanical Code section 507.16.1 should be included in all jobs, as code inspectors are increasingly enforcing these requirements. Requirement in the 2003 IMC, which is currently effective in most parts of the U.S., are as follows:

*"507.16 Performance test. A performance test shall be conducted upon completion and before final approval of the installation of a ventilation system serving commercial cooking appliances. The test shall verify the rate of exhaust airflow required by Section 507.13, makeup airflow required by Section 508, and proper operation as specified in this chapter. The permit holder shall furnish the necessary test equipment and devices required to perform the tests.*

*507.16.1 Capture and containment test. The permit holder shall verify capture and containment performance of the exhaust system. This field test shall be conducted with all appliances under the hood at operating temperatures. Capture and containment shall be verified visually by observing smoke or steam produced by actual or simulated cooking, such as with smoke candles, smoke puffers, etc."*

The simplest means of doing the performance test is using a T-T Puffer from [www.evhill.com](http://www.evhill.com). Activate the puffer and use it to trace effluent around the entire perimeter of the hood, emitting smoke a few inches under the lower edges of the hood. If the smoke goes into the hood, it passes the test. If smoke goes out of the hood, adjustment is needed.

1. A hood with multiple make-up air risers should be balanced according to the cooking load beneath it. For example, if a hood with multiple make-up air risers has a charbroiler in the center and several ovens on the ends, the risers should be evenly balanced. This will achieve the most efficient contaminant capture.
  - a. Perforated supply plenums discharging air around the hood should be set to the designed discharge velocity.
2. When fan pulleys are adjusted, belts should then be re-checked for correct tension and an amperage reading should be taken on the motor to make certain it is not overloaded.
3. The prime objective of balancing is to insure that each hood will capture all the contaminants produced by the equipment it covers without causing undesirable conditions in the kitchen (i.e., excessive negative pressure, excessive quantities of hot or cold air in the kitchen, etc.).
4. A performance evaluation of the system can be performed only if all the following items have been completed:
  - a. All fans operational and rotations visually verified by observation of the arrows stamped on them.
  - b. All filters in place.
  - c. Equipment under the hood in place and operational.
  - d. HVAC units in place and operational.
  - e. Exhaust hood performance can be seriously deteriorated by high velocity supply or makeup air sources near hoods. If there are problems with a hood performance test, ensure there are no 4-way or slot diffusers near hood. 2' x2' 4-way supply diffusers near hoods should be replaced with 2' x 2' perforated return registers (used as supply diffusers); these include no vanes, louvers, or other internal components to increase velocity.

If problems occur, refer to the [Troubleshooting Section](#) of this manual.

### EXTERNAL FACTORS WHICH MAY AFFECT YOUR HOOD PERFORMANCE:

1. HVAC units are generally specified to supply 25% outside air (OA) to the room ventilation. If RTU's are not supplying the proper amount of OA to the building, negative pressure will exist.
2. HVAC return grilles located close to a hood can cause performance problems. The return grille competes with the hood to capture the air in the room. For example, a return grille for a 10-ton HVAC unit can draw anywhere from 3000 to 4000 CFM. This is equivalent to the exhaust of a 10' to 13' canopy hood. As a result, a return air grille located within 6' of a hood can have a serious effect on that hood's capture ability.
3. HVAC diffusers located near a hood can create flows in the room that detract from the hood's ability to capture. If the HVAC diffuser bounces air off the front of the hood or directs air along the hood and past the end, the air flow created can draw smoke and contaminants out of the hood.

### **USING A SHORTRIDGE INSTRUMENT:**

The **Shortridge** is a sophisticated instrument that, with its built-in features, is basically a self contained test and balance kit. It has a "velocity grid" for filter face readings, it has a "velocity probe" for ductwork readings, it has a "differential pressure" function to check room pressure and static pressure, as well as a temperature probe so it can calculate accurate values based on varying temperatures (most equipment assumes standard temperature and pressure), and many other useful features for helping in a test and balance.

### **Hood Information:**

To Calculate the CFM, the following information must first be acquired:

1. Hood size and length
2. Filter size and position
3. PSP width and length

### **Measuring Hood Static and Room Pressure:**

#### **Static Pressure:**

- a. Measure hood static pressure at exhaust collar using the Shortridge instrument.

**Static Pressure = \_\_\_\_\_**

#### **Room Pressure:**

For an exhaust hood to work properly, the kitchen should be at a slight negative pressure (caused by its air removal), and the building slightly positive. The dining room should be a slight positive to the outdoors and the kitchen (+.02" w.c.) or about 300 cfm's positive. This will keep dust and bugs outside and doors will be easy to open. The kitchen should be a slight negative to the dining room to keep odors in the kitchen. The kitchen should be balanced to slightly negative to the outdoors (0" to -.02" w.c.). Generally, if there is not enough negative, or if there is positive pressure there will be smoke roll out from the hood that occurs due to the wind currents from people moving around in the area, while if there is too much negative, there becomes a pressure problem on the building (opening doors, drafts, hot water heaters, etc.)

- a. Measure room static pressure using the Shortridge instrument. Adjust the supply fan to set room to 0.02" negative.

**Room Pressure = \_\_\_\_\_**

### **CALCULATING MAKE-UP AIR CFM WITH A SHORTRIDGE INSTRUMENT AND AVAILABLE EXCEL SPREADSHEET.**

1. Use the Velgrid mode to measure the supply air velocity, making sure to take measurements every twelve inches along the length of the PSP.
2. Locate the appropriate Excel spreadsheet for the PSP/Supply velocity and record all necessary data. This spreadsheet will calculate the total supply CFM for the hood.

### **CALCULATING MAKE-UP AIR CFM WITHOUT A SHORTRIDGE INSTRUMENT**

1. Compute the open area of the supply plenum of the hood. This area must be calculated at the same plane that velocity readings are taken. Area can be calculated using the following formula:

$$\text{Area (ft}^2\text{)} = \text{Length (ft)} \times \text{Width (ft)}$$

If both the length and width are measured in inches, use the following formula:

$$\text{Area (ft}^2\text{)} = \text{Length (in)} \times \text{Width (in)} / 144$$

2. Record velocity of air through supply openings from left to right on raw data sheet.
3. Compute and record average velocity through supply openings.
4. Compute and record CFM through supply openings.  $\text{CFM} = \text{Free area} \times \text{average velocity}$ .
5. Compute total CFM through all supply openings for each hood.

### **CALCULATING EXHAUST AIR CFM WITH A SHORTRIDGE INSTRUMENT AND AVAILABLE EXCEL SPREADSHEET.**

1. Use the Velgrid mode to measure the velocity at each filter.
2. Locate the appropriate Excel spreadsheet for the exhaust velocity and record all necessary data. This spreadsheet will calculate the total exhaust CFM for the hood.

### **CALCULATING EXHAUST AIR CFM WITHOUT A SHORTRIDGE INSTRUMENT**

1. Record filter sizes of each hood on raw data sheet.
2. Compute free area of filters.  
Example:  
 $16 \times 16 = 14 \times 14 = 1.36 \text{ ft}^2$   
 $10 \times 20 = 8 \times 18 = 1.00 \text{ ft}^2$   
 $12 \times 16 = 10 \times 14 = 0.97 \text{ ft}^2$
3. Record velocity of exhaust gases through filters starting top left to right (5 reading/filter).
4. Find average velocity through each filter.
5. Compute CFM through each filter.  $\text{CFM} = \text{Free area} \times \text{average velocity}$ .
6. Total exhaust CFM for each hood.
7. Multiply total exhaust CFM x 0.78. (This is the K Factor necessary when using the EDRA velometer.)

### **CONCLUSION:**

1. Compare specified data to the data recorded. Adjust exhaust as necessary using adjustable pulley on fan. Adjust supply as necessary using dampers on supply risers and adjustable pulley on supply fan.
2. After setting hoods to specified data, the room parameters should be checked.
3. If room parameters are not acceptable yet, the hood can be modified to improve them without decreasing hood performance. This is an acceptable condition.
4. Use a smoke bomb to verify that the hood captures adequately. This can be your final verification.

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### Complete Equipment List for Performance Evaluations

- Closed End Wrenches (9/16, 1/2, 7/16, 3/8, 5/16, 1/4)
- Socket Set & Ratchet (9/16, 1/2, 7/16, 3/8, 5/16, 1/4)
- Extension for Ratchet
- Cheater Bar
- Screwdrivers (Phillips & Standard, Short & Long)
- Adjustable Wrenches (Large & Small)
- 5/32" 9" Long Allen Wrench
- Multi-key Hex Set (Standard Assortment)
- Tape Measure, Hammers (Hard & Soft)
- 2-Channel Locks
- Vise-Grip Pliers (Medium Size)
- Velometer (or similar unit) (Edra 5LV or Davis LCA6000 recommended)
- Manometer (or similar unit) (Dwyer Magnehelic Model #2000-00 recommended)
- Work Gloves
- 6' Step Ladder
- 20' Extension Ladder
- Tachometer (Mechanical)
- Amprobe (Volt & Amp Meter)

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### Optional Equipment

- Wire Cutters
- Wire Strippers
- Wire Crimper
- Needle-Nose Pliers (Curved & Straight)
- Hacksaw & Blades
- Drill & Bits (1/8, 5/32, 3/16, 3/8, etc.)
- Rivet Gun & Rivets (1/8, 5/32, 3/16, Long & Short)
- Pulley Puller
- Metal Shears
- Duct Tape
- Caulk Gun & Silicone (Hi-Temp)
- Wire Connections
- Wire Nuts (Assorted)
- Wire (Red, White, Blue, Black, Green)
- Flex Conduit (Standard & Liquidtight)
- 90' Liquid - Tite Conduit Connectors
- Nuts & Bolts (For Motors, Switchboxes, Sheetmetal)
- Insulation
- 3-Wire SJ Cord
- 4-Wire SJ Cord
- Starter
- Spare Motor & Belt
  - Example: 115/230, 1 Phase (1/2, 1, 1 1/2 hp)
  - 220/440, 3 Phase (1/2, 1, 1 1/2, 2 hp)
  - 4L230-4L320 (Every 10)
  - 4L320-4L720 (Every 20)
- Knockouts (1/2", 3/4", 1")
- Unishear
- Grinder & Redwheel
- Sheila-Shine

### ROOF TOP PACKAGE SYSTEM, MAKE-UP AIR AND EXHAUST FANS

1. Air intake filters should be cleaned monthly or more often if conditions dictate.
2. Check all belts for slippage and tighten if necessary.
3. Perform cleaning on the exhaust fan interior and wheel as required to prevent accumulation of grease that could lead to a fire hazard.
4. At least every six months, all electrical connections should be inspected and checked for tightness.
5. Oil and/or grease all motors and bearings every six months or as conditions dictate.
6. If supplied with job, check and empty grease collection cup on outside of exhaust fan.

### CLEANING AND MAINTENANCE OF STAINLESS STEEL HOODS

1. Carefully wipe away gritty substances clinging to stainless steel surfaces to avoid scratching.
2. Dilute 1/2 cup of laundry detergent (E.G. Tide, Surf) with 1 gallon warm water.
3. Soak a cloth in the water detergent solution. Wring out excess.
4. Rub the cloth in the direction of the grain.
5. Wipe stainless steel with cloth soaked in warm water to remove all traces of the cleansing agent.
6. Wipe stainless steel dry with a clean cloth.
7. Reapply stainless steel polish (E.G. Sheilia Shine).
8. Empty and clean grease drain and cups.
9. Filters should be cleaned in a dishwasher or soak sink periodically.

#### CAUTION

**DO NOT** use iron wool (Brillo Pads), scrappers, or spatulas to clean hood!

**DO NOT** use the following substances on or around the hood!

1. Chlorine or chlorine based substances.
2. Acids (E.G. acetic, hydrochloric, sulfuric).
3. Chloride based substances (E.G. mercuric chloride, ferric chloride).

Vapors of the above substances can corrode stainless steel!

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### Operation of Hood

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- Before turning on cooking equipment, make sure that the make-up air and exhaust fans are on. Leave fans on at least 30 minutes after cooking equipment is shut off. Clean hood daily with non-abrasive cleaners. Remove filters and run through dishwasher daily.
- **Semi-Annually:** Fire system must be inspected by local, qualified fire system distributor.

## Troubleshooting

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### NO MAKE-UP AIR

1. Are the make-up air dampers open?
  - a. Will the damper blade move freely?
  - b. Does the ductwork block the blade?
2. Is the make-up air fan running?
  - a. 208/3 phase fans have reset switches on their starters.
  - b. Check the circuit breaker panel.
  - c. Check the disconnect switch on the fan.
  - d. Check belt on fan.
3. Check the ductwork for:
  - a. Flex duct in make-up air ductwork.
  - b. Excessive number of elbows.
  - c. Leaks.
4. Check make-up air fan unit filters for cleanliness.
5. Is the fan running in the right direction?
  - a. Check the rotation arrow on the fan.
  - b. 3 phase motors reverse direction by interchanging any 2 leads.
  - c. 1 phase motors have wiring instructions printed on the motor.
6. Fire system - If the fire system has not been armed, the microswitch may be keeping the make-up air fan "off". A Fire System Distributor must arm the unit before the fan will work.

### NO EXHAUST

1. Is the exhaust fan running?
  - a. 208/3 phase fans have reset switches on their starters.
  - b. Check the circuit breaker panel.
  - c. Check the disconnect switch on the fan.
  - d. Check belt on fan.
2. Is the fan running backwards?
  - a. Check the rotation arrow stamped on the fan.
  - b. 3 phase motors reverse direction by interchanging 2 leads.
  - c. 1 phase motors have wiring instructions printed on the motor.
3. Is the correct fan over the correct hood?
4. Check the ductwork for:
  - a. Squared elbows.
  - b. Excessive number of elbows.
  - c. Leaks.
5. Are the filters damaged?
  - a. Dirty.
  - b. Bent.
  - c. Missing.

### MOTOR CYCLES ON AND OFF

1. Check amperage, make sure it is below the FLA rating.
2. Flue gas equipment under backshelf hoods with short exhaust ducts can cause exhaust fans to cycle due to automatic thermally protected motors. Change to manual reset switch motor with class B insulation.
3. If fan is near a heat source on the roof, i.e., refrigerator compressor, motor may cycle.
4. Motor may be wired for 115V/1 phase instead of 208V/1 phase and vice versa. This will also cause the fan to cycle.
5. Circuit breaker may be undersized and tripping out.

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### Limited Warranty

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This equipment is warranted to be free from defects in materials and workmanship, under normal use and service, for a period of 12 months from date of shipment. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the MANUFACTURER'S installation instructions shipped with the product,
2. The equipment is not installed in accordance with federal, state and local codes and regulations,
3. The equipment is misused or neglected,
4. The equipment is not operated within its published capacity,
5. The invoice is not paid within the terms of the sales agreement.

The MANUFACTURER shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 12-month warranty period, upon examination by the MANUFACTURER, such part will be repaired or replaced by MANUFACTURER at no charge. The BUYER shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without MANUFACTURER'S prior authorization and all returned equipment shall be shipped by the BUYER, freight prepaid to a destination determined by the MANUFACTURER.