

### PLEASE READ BEFORE INSTALL

This instruction is a summary of the basic rules and applies to most applications. For applications outside the scope of this guide refer to the detailed design rules in the installation and design bulletins.

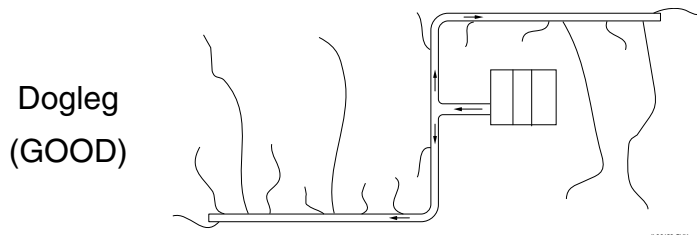
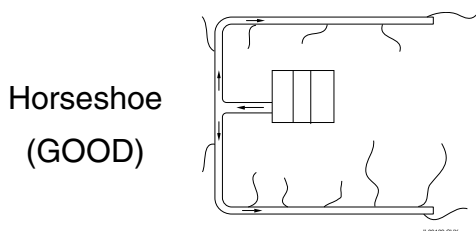
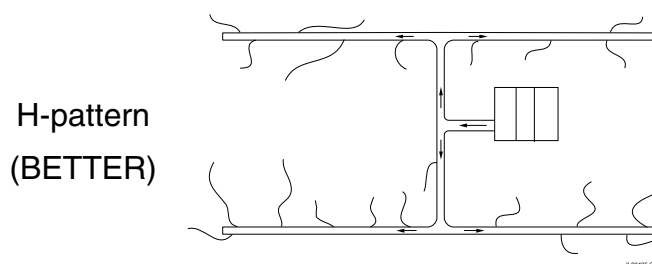
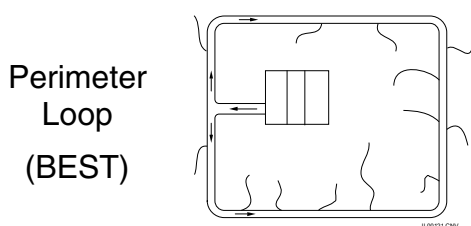
### Duct Design

#### Outlets

- ☐ **6 Per Ton (1.7 per kW).** The number of outlets depends on amount of air required and the desired sound level (based on the maximum outlet airflow). Most projects use 7-8 per ton. The minimum number of 2-inch (50 mm) outlets is six outlets per nominal ton.
- ☐ **250 CFM per nominal ton.** The Unico System is rated with 250 CFM per nominal ton (33 L/s per kW) for air conditioning applications and 275 CFM per ton (36 L/s per kW) for heat pumps. Chilled and hot water coils are not rated at a specific airflow; refer to Bulletins 20-20.3 and 20-20.4.
- ☐ **20% Rule for 2.5 inch (63 mm) Duct.** A 2.5 inch (63 mm) outlet delivers 20% more air or is 20% quieter. Your choice.
- ☐ **10% Rule for Branch Ducts.** For supply ducts longer than 10 feet (3 meter), the air is reduced in that run by 10% for every 5 feet over 10 (every 1.5 meter over 3 meters). *For example, a 30 foot (9 meter)) run is 60% of an outlet that is 10 foot (3 m) yielding a reduction of 40% (30-10=20, 20÷5=4, 4×10=40%).* Refer to Bulletin 20-54 for more information.
- ☐ **Consider Traffic Pattern.** Place outlets out of traffic pattern. A corner, 5-inch (127 mm) from each wall, is a good location, or along walls, or in soffits blowing horizontally. Consider floor outlets (with screens) for units located in basement. Slotted outlets can be used for high wall locations or in ceilings where there is insufficient room for bending tubing.
- ☐ **Allow for Aspiration.** Locate outlets so the air stream does not impinge on any objects or people — at least 3 feet (1 m) away. Use outlet deflectors and outlet balancing orifices sparingly as they disrupt the aspiration.
- ☐ **Minimize Length, Minimize Restriction.** Keep the supply tubing length as close to 10 feet (3 m) as possible and never less than 6 feet (1.8 meters). Use the fewest number of bends as possible. Maximize the radius of any bends making sure the bend in the sound attenuator tubing near the outlet is at least 6-inch (152 mm) inside radius.

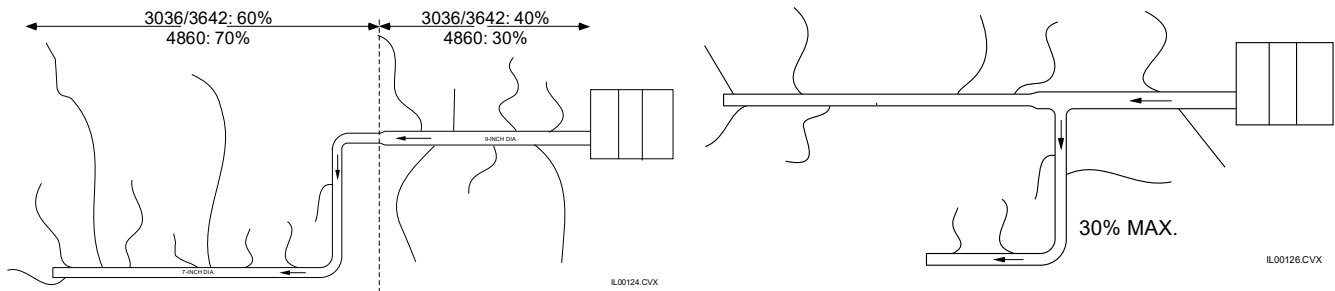
#### Plenum

- ☐ **Maximize Length, Minimize Restriction.** Run main trunk (plenum) as long as possible; it is better to lengthen the plenum if you can shorten even two supply tubing runs. Use full flow tees with turning vanes (when applicable) and full flow elbows. The maximum total plenum length is 150 ft (45 m); consider the first tee equal to 30 ft (9 m) and elbows equal to 15 ft (4.6 m). Refer to Bulletin 40-40 for more detail.
- ☐ **Use a Plenum Tee.** (Best Method). Use a plenum tee at least 24 inches (610 mm) off unit. For the 4860 unit, use 10-inch (254 mm) diameter with a reducer tee; then use 9-inch (229 mm) both directions. For the 3036 and 3642 unit, use 9-inch (229 mm) then 7-inch (178 mm) both directions. For the 1218 and 2430, use 7-inch (178 mm) throughout.



- ☐ **60/40 Rule.** When using a tee split the flow as close to 50/50 as possible — no more than 60/40. Always use a turning vane.

- ❑ **Shotgun Pattern.** For the 4860 unit, use 10-inch (254 mm) duct for the first 30 percent; then reduce to 9-inch (229 mm). For the 3036 and 3642 unit, use 9-inch (229 mm) for the first 40 percent; then reduce to 7-inch (178 mm). For the 1218 and 2430 unit, use 7-inch (178 mm) throughout. Do not reduce the duct size if plenum is longer than 100 ft (30 m).



- ❑ **70/30 Rule.** Turn the tee 90° to make a side branch with no more than 30 percent of the air. Do not use a turning vane
- ❑ **24-inch (610 mm) Rule.** Use at least 24-inch (610 mm) of straight plenum before any fitting, such as an elbow, tee, or takeoff. Avoid elbows directly off units.
- ❑ **Space Takeoffs Evenly.** Maintain distance between takeoffs as evenly as possible. Space the takeoffs at least 6-inch (152 mm) from each other and 12-inch (305 mm) from end cap.

### Sound

- ❑ **Sound Attenuators.** Always use at least 3 feet (1 m) of the Unico supplied sound attenuator supply tubing (UPC-26C) at the end of each run. For runs up to 12 feet (3658 mm), you may use the sound attenuator for the entire run. For greater lengths, use the aluminum core supply tubing (UPC-25) with a 3-foot (1 m) sound attenuator at the end.
- ❑ **35 CFM per outlet.** Outlet sound is based on the amount of air from the outlet. The recommended airflow for good noise attenuation from a 2-inch (50 mm) outlet is a maximum of 35 CFM (16.5 L/s). Use this number, adjusted for duct length, plenum static pressure, duct size, and balancing orifices, to fine-tune number of outlets. Refer to Bulletin 20-54 for more detail.
- ❑ **Return Air Duct Attenuation.** Use the Unico acoustical Return Air Duct (UPC-04), fiberglass duct-board, or sheet metal with acoustical duct liner.
- ❑ **Isolation.** Isolate the air handler with foam rubber strips under the unit. Either hang the unit from the structure using angle iron framework under unit (do not hang directly with hooks in the cabinet) or set on a platform.

### Piping

- ❑ **Secondary Drain Pan.** Always use a secondary drain pan wherever overflow of condensate can cause water damage. Do not trap secondary drain line or connect to primary drainpipe. Place secondary drain line exit so that it is apparent when being used. For example, pipe the drain line so it drips on an outdoor windowsill and causes splashing to be noticed.
- ❑ **Primary Drain.** Always trap primary drain line and run drain line per local plumbing codes.
- ❑ **Refrigerant Lines.** Follow outdoor section manufacturer's instructions for running refrigerant lines. Size and trap per their instructions.

### **STARTUP — DO THIS BEFORE BOXING-IN THE DUCT WORK.**

- ❑ **Check for Full Flow.** Inspect each outlet for full flow (except where balancing orifices are used or for long branch ducts); it should be approx. 35 CFM (17 L/s) per outlet. Investigate for blockage or kinks if flow is insufficient.
- ❑ **Check Outlet Airflow and Sound Levels.** Check the airflow at each outlet with a Turbometer<sup>1</sup> centered over the outlet. Add up the airflow for all outlets – it should not differ by +/- 5% from the design airflow. To make outlets quieter, use more outlets, switch to the 2.5 inch (63 mm) outlets, or reduce the airflow (but never below 200 CFM per nominal ton (27 L/s per kW)).
- ❑ **Check Blower Airflow.** It is easy to check the airflow. For single speed motors, measure current (amperage) and voltage, then look up the airflow shown on the airflow label (or in specification bulletin). For variable speed ECM, count the blinks on the control board or use the ECMconfig software with a connected Windows PC. Compare the blower airflow and the outlet airflow. If the outlet airflow is significantly less than the blower airflow, check for system air leaks.
- ❑ **Check Static Pressure (optional).** If the airflow is less than required, checking static pressure will help troubleshoot the problem. Measure the external static pressure in plenum 2 feet (610 mm) from unit and before any fitting. Static pressure above 1.5 inches of water (0.37 kPa) may indicate restrictive plenum or not enough outlets. Correct as necessary.
- ❑ **Check Refrigerant Charge.** Charge unit per outdoor manufacturer's instructions and Unico's Installation instructions. For best results use the subcooling method during the cooling cycle. Heat pumps should be checked in both heating and cooling.

<sup>1</sup> TurboMeter® is a registered trademark of Davis Instruments