

# MET 466 – Thermal Processes Lab

## LAB #7 Duct Balance Lab

Assigned: 4/15/09

Due: 4/22/09

### Introduction

The goal of the lab is to introduce the student to the art of duct balancing. Much effort is put into the design and installation of a proper heating, air conditioning, and ventilation (HVAC) system. The result of a well designed HVAC system is a comfortable controlled environment that will enhance the productivity and comfort of its inhabitants. The comfort level and efficiency of the installed system can be reduced dramatically if proper duct balancing is not performed. Excessive or lacking flow rates to a controlled environment will degrade the comfort level attainable therefore reducing the overall effectiveness of the HVAC system. The technique of attaining flow rates within a multiple duct scenario will be explored.

### Technical background

The system to be used for this analysis will be a basic mixed air plenum system maintaining conditions for one room using one return duct, and 4 supply ducts. A duct balancing tool will be used to measure the flow exiting each supply duct individually through square diffusers. The sum of the supply ducts should be the capacity of the fan minus frictional losses in the ductwork. Figure 1 depicts the layout of the ducting, located above the ceiling of the indoor chamber.

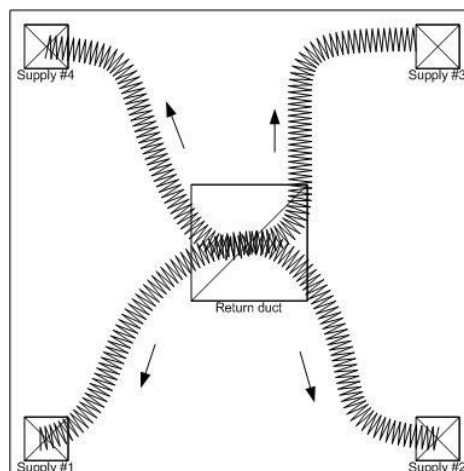


Figure 1 Duct routing

## Equipment

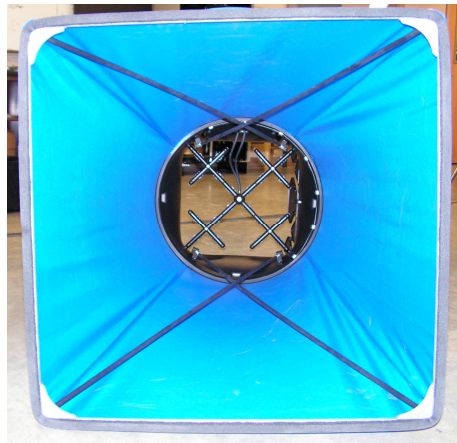
The experiment will be performed in the HVAC lab in EPS 008E. The following equipment will be used:

1. electronic balancing tool – Alnor EBT 721
2. screwdrivers:
  - a. .25 inch wide regular

## Procedure

Warning: Do not close all supply ducts at once when fan is running. Fan and duct damage can occur if the HVAC system is placed in this condition.

1. The professor will have the circulation fan running prior to the students starting the experiment.
2. Setup the duct balancing tool as follows:
  - a. Ensure velocity matrix is installed in hood base (+ and – tubes should be connected to the electronic module support).
  - b. Install hood as follows:
    - i. Place hood base on the floor.
    - ii. Lift top of fabric and insert one end of a support pole into its pole mount in the base. There is a cup in each corner of the frame to accept the other end of each support pole.
    - iii. Grasp the support pole and slightly bend the pole to insert the top end of the pole into the support pole cup located in the opposite corner of the fabric frame. The support poles should be installed in a crisscross fashion as displayed in figure 2.



**Figure 2 Fully assembled hood**

- c. Install electronic module into hood base.
- d. Connect temperature probe cable and back pressure flap switch cable to the right side of the electronic module as seen in figure 3.
- e. Thread foam handgrip into hole above electronics section.



**Figure 3 Electronic connections**

- f. Power on electronic module and ensure batteries have sufficient charge according to LCD display.
- g. Using the enter key and the arrow buttons, navigate through the menu and go to “SETUP/DS.MODE” and select RUNAVG.
- h. Press “READ” (a clicking sound will emanate when unit is sampling).
3. Locate instrument so the hood top is surrounding the supply diffuser to be measured (look up through instrument to ensure a good seal is made with the surface surrounding the duct). Ensure no air can bypass the hood entrance due to misalignment. Make certain you are not hindering exit flow when taking reading.
4. Record flow in units of CFM.
5. Repeat for all supply ducts. The sum of all supply ducts will be the maximum flow supplied by the fan. Observe and note physical conditions within the room (sounds, high air speed areas, etc.)
6. Now adjust the diffusers to achieve equal flow through all supply ducts.
7. Record the following after each adjustment:
  - Flows in cfm
  - Adjustment specifics (1/4 turn right, 1/2 turn left, etc.)
  - Conditions observed in the room (sounds, air movement, etc.)
8. After ducts are balanced at maximum flow, close supply duct #2 diffuser (as much as possible).
9. Adjust the remaining three diffusers to achieve equal flow in each.
10. Record the following after each adjustment:
  - Flows in cfm
  - Adjustment specifics (1/4 turn right, 1/2 turn left, etc.)
  - Conditions observed in the room (sounds, air movement, etc.)
11. Using a .25 inch regular screwdriver, adjust all supply ducts to fully open (slats should be completely vertical).

## **Results**

- Create tables displaying the measurements and adjustments made to achieve a balanced room at maximum flow and after diffuser #2 is closed.
- Discuss the conditions sensed by the participants at each flow condition.
- Comment on the sensitivity of the duct adjustment at various positions.
- Discuss the effect of adjustment on the air supply system.