# Procedure for Air Balancing of HVAC Ducting System

The purpose of this procedure is to define the step by step method to implement the correct practices for the "Air Balancing "through the guidelines contained herein so as to ensure that the job execution complies with the project requirements and serves the intended function to satisfactory level.

**Checks prior to start of Air Balancing**

- Ensure that the HVAC ductwork installation is complete and mechanical completion is approved with leakage test of all ductwork.
- Ensure that no damage occurs between mechanical completion & air balancing. Repair all damages to the HVAC ductwork system.
- Ensure that the pre-commissioning & commissioning of AHUs have been carried out in line with procedure for AHU.
- Ensure that the pre-commissioning & commissioning of FCUs have been carried out in line with procedure for FCU. Ensure that the pre-commissioning & commissioning of Extract Fans have been carried out in line with procedure for FCU.
- Ensure adequate space is provided to access equipment & system components as required.
- Ensure that the insulation & cladding of the HVAC ductwork system is complete in all locations of the ducting network.
- Ensure that the instruments & sensors are fixed asper approved drawings.
- Ensure test holes are drilled as required in the locations of measurement in the ductwork system.
- Ensure all damper, VAVs, Fire dampers, sound attenuators etc., are open & all air handling equipment (AHUs, FCUs, Fans) are operating.
- Ensure that all redundant openings are closed
- All air terminals are fixed.
- Ensure return air openings are provided wherever required as per the approved shop drawings.
- Ensure all doors, windows & suspended ceilings are fitted.
- Ensure access is available to all testing areas.
- Ensure that the building is air tight.

**Air Balancing Procedure**


- Ensure that all the preliminary checks are carried out successfully.
- Depending upon location and access to air terminals, VAVs, etc., various types of airflow measuring instruments will be utilized to record the actual airflow at terminals.
- Assuming adequate access provided, a direct reading balometer would be used which gives a direct reading of volume rather than velocity, which cancels out the need for effective grille areas, terminal configuration consideration and velocity corrections.
- If access is restricted then a rotating vane **anemometer** shall be used and the velocity reading obtained would be converted to volume (velocity x free area = volume) and a comparison between the pitot traverse reading would be to obtain a correction factor which would be incorporated to give a true velocity reading.
- Alternatively, the effective area will be provided by the register / grille manufacturer and these will be incorporated in the design velocity calculations.

- Air quantities shall be measured according to CIBSE Application Guide 3/89 Standards (related pages enclosed). Ensure the fan speed (RPM) is within the limits specified by the manufacturer to avoid over loading. For AHUs with VFDs, check if the fan speed varies asper the pressure sensor in the supply air duct.
- Any main branch may be chosen to start with but given a free choice, and having carried out a rough balance of main and sub-branches, start with the most remote branch and then sub-branch.
- Locate the terminal which is discharging the lowest percentage of its design flow rate. This is generally the last terminal in the run. If it is not, adjust the damper in the last terminal unit until it is working with the same percentage as the lowest one previously measured.
- Measure the flow from the terminal next to the index and work out the percentage flow as close as possible to that of the index. Fix the damper in position.
- Repeat the procedure for the next terminal, again comparing it with the index.
- As the dampers are closed along the run, more air will be driven towards the downstream terminals and the volume of air discharged at the terminal index will rise. This does not affect the balancing procedure since each terminal being adjusted is related in turn with the index.
- When all the terminals have been balanced on a sub-branch, each terminal will be running with an equal percentage of the design rate, within the allowable tolerances.
- The flow rates at each terminals must be measured and recorded. Once again a summation should be made to check that the total is in reasonable agreement with the measured sub-branch flow. Test results shall be recorded in the approved test sheets and documents. Terminal balancing shall be carried out & the values shall be recorded in approved form.

**Air Balancing Data Recording**

Upon completion of air balancing, the following values shall be measured & recorded for relevant equipment &area:

1. Fan RPM
2. Motor Voltage, current
3. Entering & leaving static pressure
4. Supply, return, fresh & extract air flow
5. Air Temperature, ON/OFF coil readings
6. Relative Humidity, Room Temperature
7. Noise Level (all areas)

The above values shall be recorded in approved forms only as applicable.