Fan Coil Units Statement on Air Volume Flow Rate Commissioning

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1. Measurements

Air volume flow rate measurements should be taken of the air discharging from ceiling discharge diffusers for ceiling void units, or the discharge grilles on casing/vertical units. This will normally be done at the design fan speed as given in the fan coil unit manufacturer's quotation.

Switch on the fan coil unit air distribution system including any central plant air handling units and/or any separate extract system(s). After the system has been operating for at least 20 minutes, air flow measurements are taken at each discharge diffuser/grille using a suitable instrument such as balometer measuring hood (see Figure 1) or custom-made hood with vane anemometer. All instruments must have current calibration certification traceable to a national calibration standards body.

Figure 1 - Balometer Airflow Measuring Hood

If there is more than one supply duct from a fan coil unit, such as with ceiling void installations, volume control dampers, if fitted, are adjusted to produce a balanced air flow from the separate diffusers in the proportion as required by the design. Accurate measurements of air volume flow rates are then taken at each diffuser. Settings on dampers should be marked.

For airside control fan coil units the air volume flow rates are checked with the cooling damper in the open position.

A long, slim balometer hood should be used for continuous slot diffusers measuring at the active sections only. Beware of placing the measuring hood over segments of slot diffusers that have return air sections adjacent to discharge sections.

2. Results, Adjustments and Problems

It is responsibility of the designer to specify flow rate tolerances and to ensure that these are appropriate to the particular design, installation and application. From BS EN ISO 5801:2017 *Fans. Performance testing using standardizes airways*[1], the allowable tolerance for air volume flow rate from each fan coil unit should be +10% / -5%. CIBSE Commissioning Code A; *Air distribution systems*[2] specifies +10% / 0%. It should be understood that a 5% drop in air volume flow rate from a fan coil unit is equivalent to a drop of approximately 3% in the design day cooling output and that commissioning measurements are to verify design day performance that may only occur a few days each year.

If results are outside of the stated tolerance band it is likely that duct static resistances are excessive or the fans in the fan coil unit are under performing.

Duct static resistances should be checked using the static tapping from a pitot static tube inserted into the ducting from the fan coil unit. Great care must be taken to find tapping positions that are representative of the static pressure that the ductwork system is imposing across the fan coil unit. The static pressure reading taken will be for the air volume flow rate as measured, not necessarily the design air volume flow rate required.

If air volume flow rate measurements are different from the design air volume flow rate required it will be necessary to refer to the air flow performance curves for each fan coil unit. These give the relationship between air volume flow rate and external static pressure for the particular fan coil unit. From these laboratory derived curves it is possible to 'normalise' the measured air volume flow rate to what it would be at the specified external static pressure, i.e. 30Pa.

As an example, in Figure 2 the air volume flow rate for a fan coil unit operating on Speed 4 is measured as 265 l/s (solid lines) but the specification calls for 325 l/s at 30Pa external static resistance (broken lines). Measurements of duct static resistance at 265 l/s air volume flow rate, indicate the fan coil unit is operating against 50Pa external static pressure. From the air flow performance curves shown in Figure 2, if the external static pressure of the system (the system line) were reduced from 'System Line Measured' (solid line) to 'System Line Specified' (broken line) it can be seen that the fan coil unit can now provide just over the specified air volume flow rate.

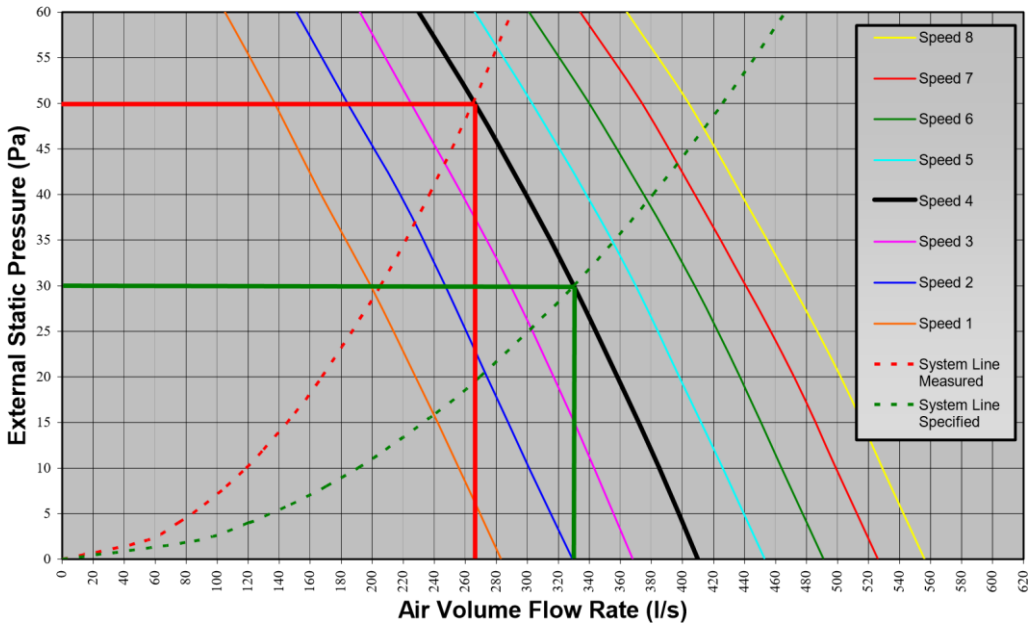

Figure 2 - Fan Coil Unit Air Flow Performance Curves

What is happening in this example is that the actual system resistance is higher than that specified and it is this high system resistance that pulls the air volume flow rate down below the design air volume flow rate.

However, if after checking duct resistances it is suspected that the fans in the fan coil units are underperforming the manufacturer should be invited to attend to this problem and rectify it if necessary.

1. BS EN ISO 5801:2017: *Fans. Performance testing using standardized airways* (London: British Standards Institution) (2017)

2. *Air distribution systems* CIBSE Commissioning Code A (London: Chartered Institution of Building Services Engineers) (1996/2006)