

SAP PCDB: Test method for central exhaust ventilation system packages used in a single dwelling

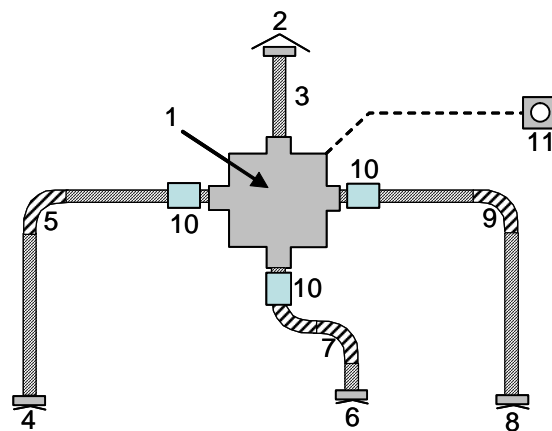
1 Introduction

This test method is based closely on the European Standard BS EN 13141-6:2004 and must be read alongside this standard. Central exhaust ventilation system packages tested by a UKAS accredited third-party to this standard can be recognised within the SAP Product Characteristics Database (PCDB) for use in single dwellings.

2 Scope

This test method specifies laboratory methods for measuring the aerodynamic performance of assembled exhaust ventilation packages for a single dwelling.

The object of this test method is to assess the ability of a ventilation package to provide the continuous extract (trickle) air flow rates required by the Building Regulations Approved Document F (Ventilation). The method also allows the effective power input to the fan to be determined at this flow rate at each operating point when the system is installed in accordance with the manufacturer's instructions.



- | | | | |
|---|----------------------------------|----|--------------------------------|
| 1 | Fan unit | 7 | Duct to bathroom |
| 2 | Roof / wall outlet terminal | 8 | Toilet exhaust terminal device |
| 3 | Duct from fan to outlet terminal | 9 | Duct to toilet |
| 4 | Kitchen exhaust terminal device | 10 | Sound attenuators |
| 5 | Duct to kitchen | 11 | System controller |
| 6 | Bathroom exhaust terminal device | | |

Figure 1 - Typical components that may form part of an exhaust ventilation system package

3 Terms and definitions

The terms and definitions used in this test method are the same as those in European Standard BS EN 13141-6.

4 Performance testing of aerodynamic characteristics

4.1 General

The following aerodynamic characteristic shall be determined for each configuration of exhaust terminals specified as being suitable by the manufacturer:

- Total air volume flow rate measured downstream of the fan

4.2 Test installation and conditions

4.2.1 Test installation

The test shall be carried out with all components supplied by the manufacturer directly linked in accordance with the manufacturer's instructions. The test configurations shall include all combinations of room exhaust air terminal devices specified as being suitable by the manufacturer.

- The minimum number of room exhaust terminal devices shall be two; representing one kitchen and one additional wet room.
- The maximum number of room exhaust terminal devices shall be specified by the manufacturer, but include one kitchen and additional wet rooms.

4.2.2 Installation of duct connecting roof/wall outlet terminal to the fan unit

The fan exhaust shall be connected to the wall/roof outlet terminal by the following ducting:

- Straight duct 0.5m long
- 90° elbow
- Straight duct 2.0m long

The exhaust duct size shall be based on the exhaust duct spigot of the fan as detailed in Table 1.

Fan exhaust spigot diameter	Test duct size
150mm or greater diameter	150mm diameter rigid duct
125mm diameter	125mm diameter rigid duct
204 x 60mm rectangular	204 x 60mm rectangular duct
100mm or smaller diameter	Same diameter as fan spigot
100 x 50mm rectangular	100 x 50mm rectangular duct

Table 1 - Exhaust duct sizes to be used for testing

4.2.3 Installation of the fan unit

Where a fan unit has many spigots, the spigots not in use must be capped off using the device supplied by the manufacturer for this purpose.

4.2.4 Installation of ducts connecting room exhaust air terminal devices and the fan unit

All room exhaust air terminal devices shall be connected to the fan unit using long or long branched ducts in accordance with Figure 2.

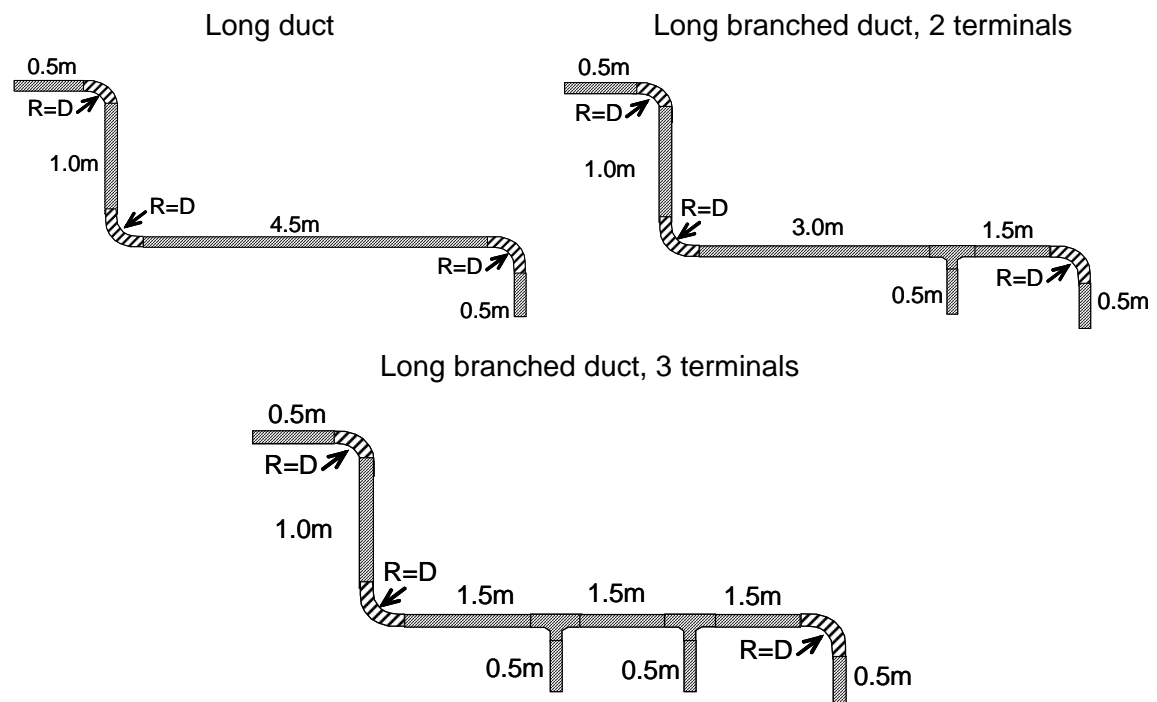


Figure 2 - Examples of duct connections

In a long branched duct configuration, the kitchen will always be assumed to be the furthest exhaust terminal from the fan.

The test duct sizes shall be based on the duct sizes specified by the manufacturer for installation of the fan as detailed in Table 2.

Manufacturer's specified duct size for installation	Test duct size
125mm or greater diameter rigid duct or, 204 x 60mm rectangular duct.	204 x 60mm rectangular duct
100mm or smaller diameter rigid duct or, 100 x 50mm rectangular duct.	100 x 50mm rectangular duct
All sizes of flexible duct	100mm diameter flexible duct

Table 2 - Ducts connecting room exhaust air terminal devices and the fan unit - sizes to be used for testing

When flexible ducts are provided or specified, they shall be extended to 90% of their maximum length and shall be supported to prevent sagging and to maintain the specified elbow radius.

4.2.5 Test conditions

4.2.5.1 Exhaust air flow rates

If the air flow rate through each terminal device is set after installation, the continuous extract air flow rate shall be with the air flow rate through each terminal device configured to meet the following:

Kitchen	13l/s
Additional wet rooms	8 l/s

Air flow rates are at 20°C and 101.325KPa

If the system is configured to self-regulate air flow rates by the manufacturer, the air flow rates through each terminal device shall be balanced proportionally to the air flow rates defined above, through the kitchen and additional wet rooms.

Balancing of the air flow rate through terminal devices shall be undertaken using standard commissioning instrumentation, i.e. rotating vane anemometer.

Total exhaust air flow rate shall be determined in accordance with the requirements of BS EN 13141-6 Clause 4.3.1.

A terminal device shall be deemed to be fully open in the following configuration:

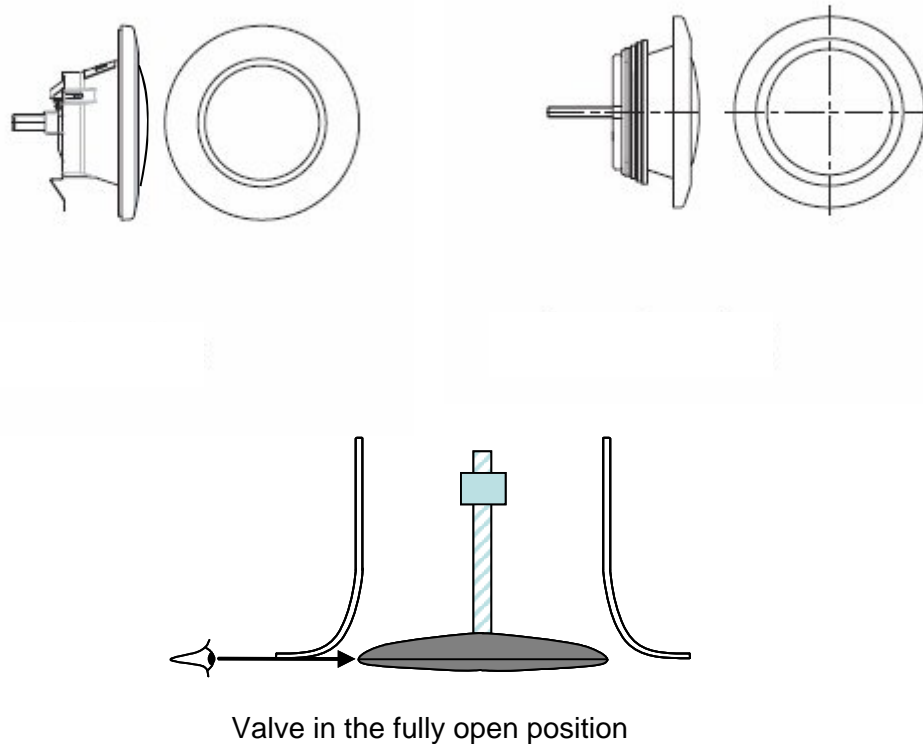


Figure 3 - Examples of terminal devices fully open

4.2.5.2 Exhaust conditions

4.2.5.2.1 Normal conditions

The system shall be tested under the following exhaust condition:

The pressure difference between the pressure upstream of the exhaust and the pressure downstream of the outlet shall be 0 ± 0.5 Pa.

4.2.5.2.2 Wind conditions

To test the wind effect, a counter pressure at the exhaust of +5Pa shall be applied to the normal conditions for the connection to outlet.

The total exhaust air flow rate at the fan shall be measured.

4.2.5.3 Temperature

The temperature of the test room shall be in accordance with BS EN 13141-6 Clause 4.2.5.2.

4.2.5.4 Electrical conditions

The electrical conditions for the test shall be in accordance with BS EN 13141-6 Clause 4.2.5.3.

4.3 Test procedure

4.3.1 Air flow measurements

The air flow measurements shall be in accordance with BS EN 13141-6 Clause 4.3.1.

5 Electrical power

5.1 Method

The electrical power of the whole ventilation system package shall be determined according to ISO 5801 for all fan speed / exhaust terminal configurations assessed in 4.1.

5.2 Analysis of results

The electrical power input shall be used to calculate the 'specific fan power', the energy consumption per unit of total air flow rate at the air flow rates specified in 4.2.5.1.

6 Presentation of results

The test configurations and flow rate conditions shall be clearly described.

Aerodynamic and wind condition data shall be presented in accordance with Table 3 for each exhaust terminal configuration and fan speed setting specified by the manufacturer.

Exhaust terminal configuration	Fan speed setting	Total flow rate (l/s)	Total flow rate – wind condition (l/s)	% reduction of total flow rate
Kitchen + 1 additional wet room				
Kitchen + 2 additional wet rooms				
Kitchen + .. additional wet rooms				

Table 3 - Presentation of wind condition test results - example

Aerodynamic and specific fan power data shall be presented in accordance with Table 4, for each exhaust terminal configuration and fan speed setting specified by the manufacturer.

Exhaust terminal configuration	Fan speed setting	Total flow rate (l/s)	Specific fan power (W/l/s)
Kitchen + 1 additional wet room			
Kitchen + 2 additional wet rooms			
Kitchen + .. additional wet rooms			

Table 4 - Presentation of aerodynamic and specific fan power test results - example

7 Application of results

7.1 Building Regulations ADF

Assessment of the performance of a MEV system for compliance with the requirements of Building Regulations ADF requires determination of the aerodynamic characteristics at each fan speed / exhaust terminal configuration specified as being suitable by the manufacturer.

The effect of wind on the performance of a MEV system shall not reduce the air flow rate by more than 10%. If the reduction in flow rate is greater than 10%, the system is considered as unsuitable for application as an exhaust ventilation system for a single dwelling

7.2 Building Regulations ADL – Standard Assessment Procedure

Results that are to be used for assessing compliance with the requirements of Building Regulations ADL through SAP require that the aerodynamic and electrical power characteristics are determined for each fan speed / exhaust terminal configuration specified as being suitable by the manufacturer.

If the air flow rate is not pre-set by the manufacturer, one of the following must be provided to ensure effective commissioning can be undertaken on site:

- a fan speed readout or indicator that will allow the fan speed to be set in increments not exceeding 5%, or;
- a means of determining the air flow rate to within $\pm 10\%$.

If neither of these is provided, the fan is considered as unsuitable for SAP Product Characteristics Database listing.