

Hazardous Substances Policy Schedule 3.8 Supplement 1

Testing of Fume Cupboards Under BS EN 14175

Where fume cupboards have been installed since the publication of BS EN 14175-4:2004, the procedures in UHSP/15/HS/07 Schedule 3.8 will need to be supplemented/amended with the following additional tests.

For Fume Cupboards Supplied, Installed and Commissioned in accordance with BS EN 14175

That is, for a fume cupboard which has been:

- type tested in accordance with EN 14175-3 before installation; and
- commissioning tested after installation according to BS EN 14175-4:2004 Clause 5 and that a full commissioning test report according to BS EN 14175-4:2004 clause 9.1 is available.

Additional/amended tests

Face velocity
Extract volume flow rate
Pressure drop
Air flow visualization

For Fume Cupboards NOT Fully Compliant with BS EN 14175

That is, for a fume cupboard which:

- has NOT been type tested in accordance with EN 14175-3 before installation; and/or
- has NOT been fully commissioning tested after installation according to BS EN 14175-4:2004 Clause 5 and/or a full commissioning test report according to BS EN 14175-4:2004 clause 9.1 is NOT available.

Additional/amended tests

Face velocity
Extract volume flow rate
Pressure drop
Air flow visualization
Containment
Robustness of containment
Air exchange efficiency

Face velocity test

Objectives

The aim of the face velocity test (BS EN 14175-4:2004 clause 6) in the routine testing is to determine any variation from the type test and/or commissioning test results. No position mean should vary by more than 10% from the design value.

Test equipment and test procedure

An anemometer with a measuring range suitable for the fume cupboard under test and capable of measuring air velocities with an accuracy of 10 % shall be used. The fume cupboard shall be operating under actual working conditions.

The probe positions shall be as in EN 14175-3:2003, Clause 5.2.2. For vertical sashes the measurements shall be performed in all points in the horizontal middle row in the inner measurement plane (if the number of rows are even, the one above the centre). For horizontal sashes the measurements shall be performed at all points in the vertical middle row in the inner measurement plane (if the number of rows is even, choose one and report the position).

Measurements shall be made at each probe position for at least 30 s.

Test report

Calculate the average velocity in m/s and round the result to the second decimal place.

Extract volume flow rate test

Objectives

The aim of the extract volume flow rate test (BS EN 14175-4:2004 Clause 5.5) as part of the routine test is to verify whether the extract volume flow rate is maintained compared with the commissioning value, using one of the methods described. The sealing of the fume cupboard's leakages (see Clause 5.5.2.2) is not necessary, provided a correlation factor for the sealed and non-sealed face velocity has been established for the methods and conditions used.

The extract volume flow discharged from a fume cupboard can generally be measured according to ISO 5221. When the requirements for the use of this method are not fulfilled, one of the following methods can be applied.

Average face velocity method for Extract volume flow rate

Principle, test equipment and probe positions

This method determines the extract volume flow by measuring the face volume flow in the sash opening by making sure that all the extract air is flowing through the sash opening. Test equipment and probe positions in accordance with EN 14175-3:2003, 5.2.1 and 5.2.2.

Preparation

Any significant leakage, slit or opening of the fume cupboard, except of the test sash opening, shall be sealed by adhesive tape or appropriate air tight material. The sealing material shall be removed after the face velocity measurement. The test shall be carried out with the fume cupboard's sash(es) set at one of the type test sash opening(s) (see EN 14175-3:2003, 4.4.2).

Test procedure and test results

According to EN 14175-3:2003, 5.2.3 and 5.2.4.

Expression of results

Multiply the average face velocity at the sash opening with the area of the sash opening and report the resulting volume flow rate in m³/h together with the average face velocity, the sash area and the chosen sash opening. If the face velocity test according to 5.4 has been performed, a correlation factor for the face velocity of the sealed and non-sealed fume cupboard can be calculated and documented in the commissioning test report as reference value for subsequent routine testing (see 6.3).

Calibrated pressure difference method for Extract volume flow rate

Principle and test equipment

This method depends on the availability of manufacturer specified reference points. The method determines the extract volume flow by measuring the pressure difference between two reference points specified by the fume cupboard's manufacturer. Test equipment in accordance with EN 14175-3:2003, 5.6.2.

Positioning of pressure tap(s) and test procedure

The test shall be carried out with the fume cupboard's sash(es) set at one of the type test sash opening(s) (see EN 14175-3:2003, 4.4.2). The pressure tap(s) shall be fitted to the reference point(s) specified and marked by the fume cupboard's manufacturer. Test procedure according to EN 14175-3:2003, 5.6.5.

Expression of results

Take the extract volume flow corresponding to the measured pressure difference from the table or diagram supplied in the manufacturer's documentation. Report the measured pressure difference and the evaluated extract volume flow in m³/h together with the manufacturer's documentation identification and the reference measuring point(s).

Sequential average face velocity test for Extract volume flow rate

Principle, test equipment and probe positions

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This method determines the extract volume flow rate by measuring the face velocity in the sash opening of a fume cupboard using an anemometer. The anemometer shall be of an integrating type and shall be capable of measuring unidirectional air velocities down to 0.3 m/s or better. The accuracy of an individual reading shall be better than 0.02 m/s + 5 % of the reading. The anemometer should also be able to calculate the results in terms of air volume flow rates.

Test procedure and test results

The test should be carried out with the fume cupboard's sash set to a sash opening of 100 mm.

The test is to be carried out within the resulting area of opening. The anemometer shall be continuously oriented so that the velocity component perpendicular to the plane of opening is measured. Move the anemometer using a constant speed to scan the length of the opening. The time for scanning and integrating should be 60 s.

Test report

Note the measurement value in metres per second. Multiply the average face velocity at the opening plane with the area of the opening plane and report the resulting volume flow rate in cubic meter per hour together with the average face velocity and the opening plane's area.

Pressure drop test

To be performed according to BS EN 14175-4:2004 Clause 5.6. The cause of any variation from the commissioning value should be investigated

Air flow visualization

To be performed according to BS EN 14175-4:2004 Clause 5.7. The aim of the air flow visualisation is to obtain qualitative information regarding present room air flow and the interaction of the fume cupboard's air flow with the room air flow. Based on the test result, it should be decided whether the following room air velocity test is necessary.

Test procedure

Air flows around the installed fume cupboard and in the sash opening area should be visualized to check if there are any disturbances, e. g. by the room make-up air, that could affect the performance of the fume cupboard. Visualization shall be performed with generation of visible tracers, such as smoke, about 400 mm in front of the fume cupboard with release upwards to the ceiling. The density of the tracer shall be close to the room air density. The tracer shall be distributed with low impulse and not faster than 0.2 m/s.

Expression of results

Air movements around the working aperture shall be visualized and if there is any kind of disturbance it shall be documented and the following test performed.

Room air velocity test

Objectives

The aim of the room air inspection is to quantify the air flow in the surroundings of the fume cupboard. Room air flows exceeding 0.2 m/s can cause reduced containment of the fume cupboard. This test should be carried out if indicated by the result of the Airflow Visualisation test.

Test equipment

According EN 14175-3:2003, 5.2.1, with the exception that the anemometer shall be able to measure omnidirectional air speed.

Probe positions

The measurements shall be performed in a vertical plane about 400 mm in front of the fume cupboard's plane of sash (see EN 14175-3:2003, 3.1). The anemometer probe shall be positioned at points formed by the intersection of lines on this measurement plane as follows:

- (a) Two horizontal lines approx. 900 mm and 1400 mm above floor level.

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- (b) Five vertical lines, two of them aligned with the side walls of the fume cupboard, a third one in the middle between this two lines (aligned with the centre of the fume cupboard) and another two ones approx. 250 mm to the left and to the right of the side wall aligned lines.

Test procedure and test results

The sash of the fume cupboard shall be set to one of the test sash openings (see EN 14175-3:2003, 4.4.2.). The mean speed in metres per second at each measurement point shall be calculated and the result rounded to the second decimal place. Room air velocities of 0.2 m/s and greater are unacceptable and require corrective action.

Containment test

Objectives

The aim of a containment test is the quantification of the containment under the prevailing working conditions.

Test equipment, test procedure and data analysis

According to EN 14175-3:2003, 5.3. The containment test can either be performed in the inner measurement plane, or in the outer measurement plane or in both planes (see EN 14175-3:2003, 5.3.3 and 5.3.4). The test equipment shall be according to EN 14175-3, 5.3.1 with the following exception: detection level of the gas analyser may be $\leq 2.5 \times 10^{-8}$ instead of $\leq 10^{-8}$.

Test report

The calculated test results shall be reported (see 9.1). Containment should be < 0.005 ppm. Values greater than this must be investigated, the cause rectified and the correction verified by re-test.

Robustness of containment

According to EN 14175-3:2003, 5.4 Robustness of Containment should be < 0.1 ppm. Values greater than this must be investigated, the cause rectified and the correction verified by re-test.

Air exchange efficiency

According to EN 14175-3:2003, 5.5. Air Exchange Efficiency should be < 10 seconds. Values greater than this must be investigated, the cause rectified and the correction verified by re-test.