PlanSchmiede · Schmalbachstraße 27 · 74626 Bretzfeld-Schwabbach

Company
medifa hygienic rooms GmbH
Mr Stockmar
Heinrich-Hertz-Str. 4
76470 Ötigheim

Investigative report on the airtightness measurement of an operating room Date: 20.09.18

Preliminary remarks

PlanSchmiede GmbH, based in 74626 Bretzfeld, Germany, was commissioned by medifa hygienic rooms GmbH to check the airtightness of a medical room module (operating room) which is used in the company as a demonstration object ("showroom"). The airtightness measurement (so-called BlowerDoor Test) was conducted as a differential pressure measurement. Due to the lack of a standardization of the measuring method as well as airtightness limits to be adhered to for medically used rooms, the Energy Saving Ordinance (EnEV) in the latest version 2016, proven in the building industry, DIN 13829 (Thermal performance of buildings) and DIN 4108-7 with regard to limits to be adhered to, were used.

Applied documents, measuring equipment, software

The following was used for execution:

- Building plans M1:50 of the client company medifa hygienic rooms GmbH
- Minneapolis BlowerDoor Standard" measuring system from the company BlowerDoor GmbH
- Leak detection with FLIR Systems thermographic camera "B360
- Evaluation software "Tectite Express" from the company BlowerDoor GmbH

General information

Within the scope of the airtightness measurement on the object (showroom) commissioned by medifa hygienic rooms GmbH, the maximum air exchange rate of 1.5 * m³/h at 50 Pascal pressure difference, applicable to buildings with ventilation systems, defined in the above-mentioned DIN EN 13829 in conjunction with DIN 4108-7, was defined as the target value. As the only permissible method since the amendment of the Energy Saving Ordinance in 2014, the so-called method B (measurement of the building envelope) was chosen.

Test methods

For tests on completed buildings, the BlowerDoor measuring method is a recognised method for measuring the air permeability of the building envelope (here: showroom). This technique is performed as a differential pressure measurement (measurement after generation of a negative and positive pressure in the finished

object of measurement). For this purpose, a fan including a frame and tarpaulin is installed in the door opening of the object of measurement and by means of this fan, the pre-set differential pressures are generated in the object in a speed-controlled process.

In addition to the volume-related air exchange rate (the so-called n_{50} value), which is determined by the air volume conveyed at 50 Pascal pressure difference in relation to the enclosed air volume, the mean leakage flow (the so-called q_{50} value, indicated in the dimensioning $m^3/h*m^2$) at 50 Pascal pressure difference can also be ascertained via the reference value of the inner component surface (enveloping surface). This value was also determined by the performed air-tightness measurement.

Measuring environment

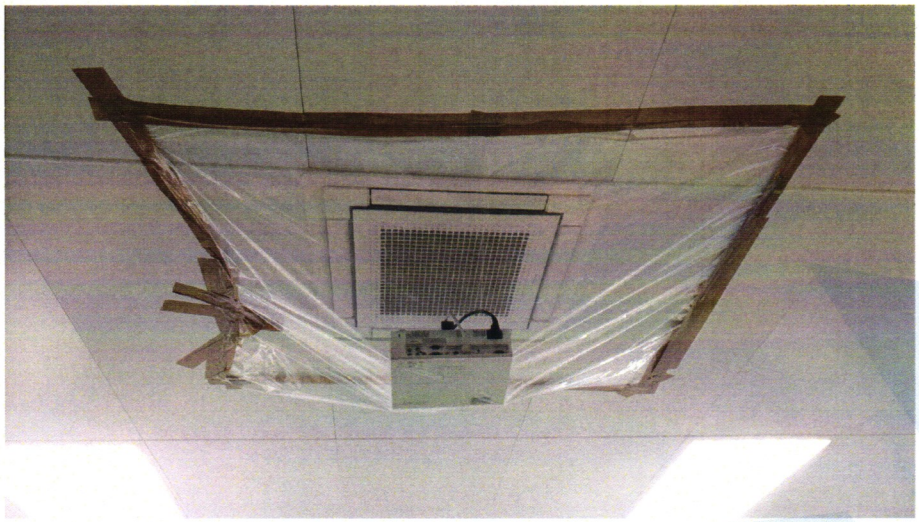
The measurements were taken during the day on 06/02/2018. The object of measurement (showroom) was located in the client's production building. During the measurements there was no wind, the average indoor air temperature was +22.5 °C, the average outdoor temperature was +19.5 °C.

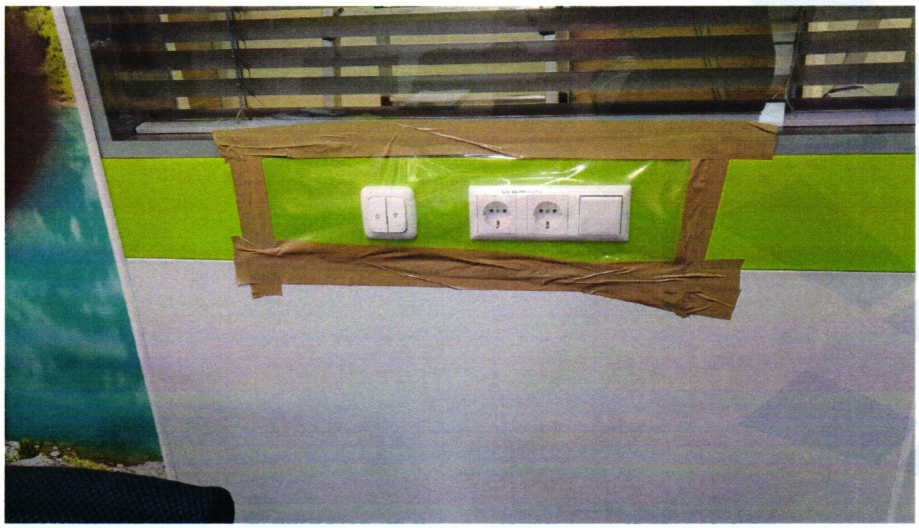
The values of the inner room volume and the inner structural surface (enveloping surface) were available from the client or were calculated on the basis of the building plans M1:50 prepared by the client.
The following value was found for the internal volume of the object of measurement: V=79.00 m^3
The following value was ascertained for the inner enveloping surface of the object of measurement: A=117.00 m^2

Preparation, implementation and results

The frame component required for the pressure test was installed in the provisionally reduced door opening of the object (showroom), into which the fan was inserted.

The air conditioning and ventilation module was then provisionally masked on the ceiling and the recessed sockets for the electrical supply and the push-buttons on the wall.



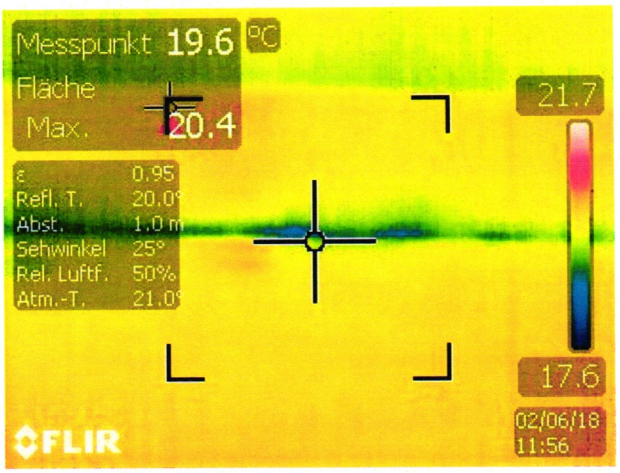


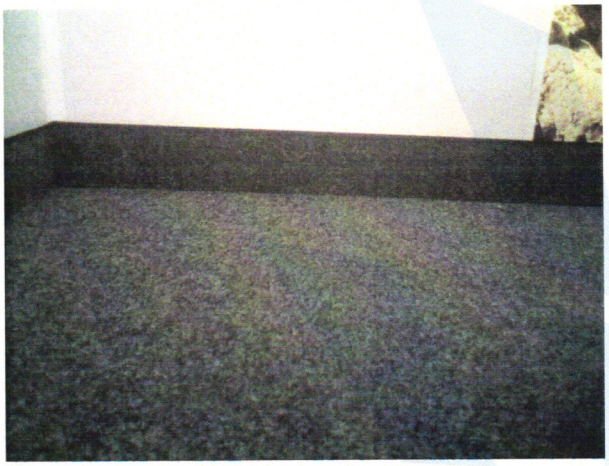
This was necessary in the case at hand as only the wall and ceiling elements and their connection joints were the subject of the airtightness measurement. The floor as another space-limiting component surface could be regarded as airtight due to the existing closed covering (without ducts).

Before the actual differential pressure measurements were performed, a preliminary room check (leakage location) was carried out at a stationary negative pressure of -50 Pa. The inner shell of the room was scanned and examined and thermographically examined. A thermographic camera from FLIR Systems, model B360 with a detector from Indigo was used.

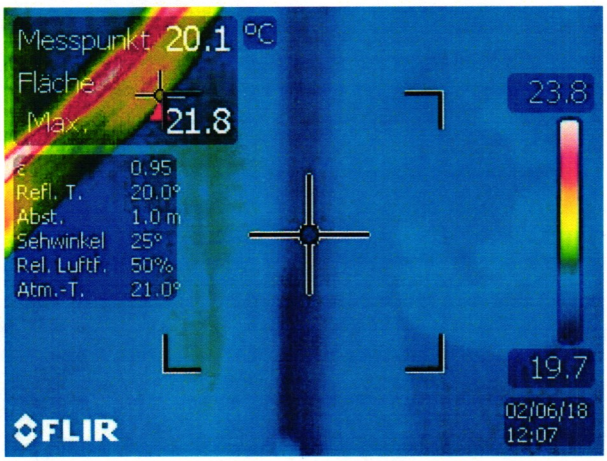
The following leaks were found while locating the leakage:

Connection area floor - wall element





Connection area wall element - wall element



The measurements were subsequently taken using the negative pressure method and then the positive pressure method.

For the vacuum measurement, 7 pressure stages in the range from -50 Pa to -18 Pa were triggered (see "Measurement data and results" in the enclosed test report). At each pressure stage 100 measurements were performed, from which the arithmetic mean was calculated.

For overpressure measurement, 7 pressure stages in the range from +50 Pa to +21 Pa were triggered (see "Measurement data and results" in the enclosed test report). At each pressure stage 100 measurements were performed, from which the arithmetic mean was calculated.

As can be seen from the test report attached on page 1, a volume-related air exchange rate of 1.0 / hour was achieved (so-called n_{50} value). The maximum permissible according to DIN EN 13829 in conjunction with DIN 4108-7 for buildings with ventilation systems is $n_{50} = 1.5 / h$.

In addition, as can be seen from the enclosed test report on page 7, an enveloping surface-related air exchange rate of 0.68 $m^3 / m^2 * h$ has been achieved (so-called q_{50} value). The maximum permissible for buildings with ventilation systems according to DIN EN 13829 in conjunction with DIN 4108-7 is $q_{50} = 2.5 m^3 / m^2 * h$. This limit value was thus clearly undershot...

PlanSchmiede GmbH

Michael Rossler

Attachment(s)
Test report with 6 pages of 13/03/2018 on the air tightness measurement of 06/02/2018