

Indoor air quality: It's important!

Fresh air for healthy living!

We need good, 'fresh' air to breathe. At the same time, breathing produces carbon dioxide (CO₂), which accumulates in living spaces over time and leads to 'bad' air if we do not ventilate properly. In conventional buildings, we have to open the windows to get fresh air from the outside. In winter, however, this causes very high ventilation heat losses and thus considerably increases the required heating for a flat or house while also negatively affecting the comfort in living spaces.

Controlled mechanical ventilation

Ventilation with heat recovery (HR) should always be in the plans for new buildings. If existing buildings are to be refurbished anyway, retrofitting with a controlled ventilation system is recommended and viable, both technically and economically.

Ventilation systems with heat recovery are generally a sustainable solution for good air – not only against the background of the COVID19 pandemic. The advantages lie both in the area of health (removal of indoor air pollutants, reduction of the risk of infection) and in the area of climate protection (higher energy efficiency, lower ventilation heat losses), while at the same time providing a high level of comfort (draught-free air due to pre-heated outside air).

Outside Air — filters are necessary

Fresh air fundamentally means air with a low CO₂ content of around 400 ppm. In this sense, outdoor air is generally 'fresh air', unless it is contaminated with pollutants and dust. In order to remove the dust, suitable filters must be installed in the intake valves for outdoor air. These must be changed regularly, depending on the dust load. All the dust that is collected in the filters is kept from the indoor air the occupants breathe!

Indoor air quality

Indoor air quality is best assessed by measuring the concentration of CO₂. The CO₂ content of the air is therefore used as a guide value for undesirable substances in the air. For school rooms, for example, it is required that the CO₂ content does not permanently exceed 1500 ppm.

Air humidity and the air exchange rate

The air exchange rate, i.e. the exchange of indoor air with outdoor air, should be about 30 m³ per person per hour in living rooms. This helps to achieve

permanent CO₂ concentrations of less than 1000 ppm.

For health reasons, the relative humidity should be within a range of at least 35% relative humidity (RH) to a maximum of 65% RH. This can be controlled by changing the outdoor air exchange rate: If it is too humid indoors, the air exchange rate is increased. If it is too dry, e.g. in winter when the outside air is very dry, then the air change rate can be adjusted accordingly.

Comfortable supply air temperature

The supply air flowing into the interior should never be too cold ($T_{\text{supply air}} \geq 17 \text{ °C}$). This is ensured by the heat recovery system (HR). The air should also not flow in too quickly from the supply air valves, as the occupants could feel a draught.

Ventilation without noise

In addition, air that flows too quickly can produce hissing flow noises in the valves. Also, the fans in the ventilation unit produce a noise during operation that is too loud for living rooms. Therefore sound absorbers must be installed in the ventilation ducts between the unit and the extract air and supply air valves. In the living room, the sound level from the ventilation unit must not exceed 25 dB(A). This value is lower than the hearing threshold, i.e. the ventilation is not audible in the living room.

Ventilation with fresh air is hygienic!

The concentration of aerosols, which can carry infectious COVID19 virions, for example, is correlated with the CO₂ concentration, just like the other air pollutants mentioned. Recent research shows that at CO₂ levels of less than 1000 ppm, the risk of infection via aerosols is very low.

Controlled ventilation with heat recovery is therefore advantageous because it continuously exchanges the indoor air, thus keeping the aerosol concentration permanently below the critical threshold.

Ventilation systems are part of the building services

Therefore, just as much care should be taken for their planning and quality assurance as for all other parts of the building. Certified ventilation systems of good quality can be found in the Passive House Institute's component database at www.passiv.de.

Further information and sources:

<https://www.passipedia.org> | ©iPHA / Passive House Institute | author: Dr. Berthold Kaufmann