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Ventilation and indoor air quality

Because very often we spend most of the day indoors, indoor air quality is very important. Indoor air quality worsens from the inflowing outdoor air pollution (car exhaust, emissions from industrial installations and boiler houses, dust, pollen, etc.) and also from the pollution we create ourselves (by smoking, using of household chemicals for cleaning, using of a fireplace or stove). In addition to that indoor air pollution is caused by substances emitted from furniture, construction and room finishing materials. The premises may also be contaminated with biological pollutants, for example, dust mites, mould, pet hair, infectious pathogens - viruses and bacteria.

Indoor air quality is affected by the indoor climate - air temperature, relative humidity and carbon dioxide (CO_2) content. It is assumed that the optimal indoor air comfort parameters are:

- 20-24^{o}C temperature;
- 40-60% relative humidity;
- CO_2 concentration does not exceed 1000ppm.

Whether the air quality in our home meets these parameters we can find out ourselves with the of special measuring devices (priced from 20 EUR).

It is estimated that in the European Union approximately 3% of diseases can be attributed to contaminated indoor air. Contaminated indoor air can cause increased fatigue, headache, allergic reactions and other health problems. For improving indoor air quality, important is to ensure air exchange – the fresh air inflow and outflow of contaminated air.

We can improve the air quality in the room by opening windows time to time. If we open the windows for a short time, then the effect is short-term, and soon the air quality is worsening again.

In turn, keeping the windows open for a long time, especially during the cold months is not the best option because it causes large amount of heat loss.

An adequate ventilation is the best way how to ensure a continuous air exchange and at the same time also taking care about the microclimate and saving of heat.

Ventilation shall ensure fresh air supply and removal of exhausted air!

So what are the necessary steps to ensure sufficient air exchange in multi-apartment buildings? In particular, this question becomes acute when wanting to save heat, we plan to replace old wooden windows with new well tight glass pane windows in a plastic or wooden frame. When closed these windows practically do not let the fresh outdoor air into the room. So what to do?

Windows with integrated fresh air inlet valves

There are modern windows with fresh air inlet valves integrated into the window frames. In addition they are equipped with, for example, sound insulation, heat recovery, fine dust and pollen filter and air quality sensors - valves open when indoor air quality is deteriorating. It is possible to put such equipment on already installed windows.

This equipment should be installed at least on one window frame in every room. Even when the windows are in a fully closed position, these valves ensure a small but a constant flow (up to 5 m^3/h) of fresh air at the same time keeping the room warm.

Air inflow through the openings in the external walls of the building

For additional inflow of fresh air into the rooms it is possible to install air vents in the external walls. These vents are equipped with a self-regulating valves. Depending on the outdoor temperature, the opening of the valve increases or decreases. Valves are equipped both with a dust filter and isolation system of outside noise. It is recommended to install such openings behind the radiators in order to heat up the air entering the room.

Air duct system for ventilation

Usually in multi apartment buildings vertical ventilation ducts are built in, which are designed for fast evacuation of vapours and odours from the kitchens, bathrooms and toilets. However, often they fail to fulfil their task. A specialist shall check out if the ventilation ducts are not bricked up, contaminated with debris, and whether they are properly constructed and have enough draft (can be tested with a special measuring device). If the air flow rate in ventilation ducts is not sufficient, it is necessary to clean it up or restore.

The constant air outflow is also hindered by the built-in household fans, such as kitchen, toilet ventilation hoods, because the air is extensively removed only during the time when the device is turned on.

In order to ensure air circulation throughout the house, the air must flow freely from the living rooms to the kitchen, bathroom and toilet. Therefore, all the rooms need to have doors with a gap of at least 0.5 cm up from the floor or a similar flow field wire rack.

Ventilation with heat recovery

If the above mentioned solutions however do not provide the desired ventilation in the apartment, an additional controlled mechanical ventilation system with heat recovery may be considered either for each apartment separately or jointly for the entire building. With the help of such a system the cold incoming air in winter is heated by means of outgoing warm air.

In such a way fresh air is ensured in the dwelling, and at the same time we do not have to worry about heat loss. Installation of such system throughout the whole building is not cheap, as it requires appropriate technical facilities and air-flow channels, thus it could be considered, for example, when implementing a complex renovation of the building.

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