

Editorial

Sanela Klarić

Today, our architectural profession faces even more challenging requirements, problems and opportunities because as part of our creations and activities, we are directly responsible for the protection of the natural environment and people. However, our obligations are much more complex, comprehensive and demanding. Our focus is not only on the aesthetics and function; we also need to consider energy conservation, life cycle of materials, waste management, use of renewable energy sources, rainwater recovery and maximum use of biodegradable local natural materials, while also paying special attention to comfort and health, and much more. That is why we must work comprehensively in interdisciplinary teams.

I am going to focus on just one of the range of factors that we must respect when designing, building and maintaining facilities, and that is the indoor air quality (IAQ). As people spend most of their lives (80-90%) indoors, it is very important to ensure high indoor air quality. This has gained additional importance because it is known today that some pollutants can reach concentrations that are several times higher indoors than outdoors. In addition to the level of outdoor air pollution, the quality of indoor air is greatly affected by additional pollutants originating from the interior of buildings, namely formaldehyde, volatile organic compounds (benzene, trichloroethane, toluene, ethylbenzene, and xylene), CO, CO₂ and other chemical and biological compounds, hence indoor air can be 10 times more polluted than outdoor air.

Nowadays, we also know that prolonged exposure to indoor air pollution, even at low concentrations of pollutants, can result in adverse biological effects. According to the WHO, indoor air pollution is the eighth most important risk factor for human health and it is responsible for 2.7% of the global disease burden. The World Health Organization (WHO) defines indoor and outdoor air pollution as air contamination by any chemical, physical or biological agent that modifies the normal characteristics of the atmosphere.

Indoor and outdoor air pollution is a globally recognized threat to human health, ecosystems in general, the environment and the climate. According to the WHO, 12.6 million deaths worldwide annually are attributable to unhealthy environments, constituting 23% of total global mortality and 26% of infant mortality. The WHO data also show that 9 out of 10 people breathe air in which the concentrations of pollutants exceed the limits stated in the WHO guidelines, and low and middle income countries suffer from the greatest exposure. That is why the WHO Regional Office for Europe recently developed AIRQ + software to assess the effects of air pollution on public health. School-age children (usually 4-12 years old) spend more time (about 80%) indoors (e.g. in schools and their homes) than outdoors. After home, a school or classroom is the second most important environment for a child in which, mostly indoors, they spend about 25-30% of their lives (up to 10 hours a day).

Therefore, adequate air quality in schools is an important determinant of a healthy life and well-being of school children. Indoor air quality affects around 64 million students and 4.5 million teachers across Europe. The number of studies on the potential effects of indoor air pollution on the health of school children, their academic productivity and well-being, especially those involving younger school children, has been growing. To date, it has been confirmed repeatedly that poor indoor air quality is associated with various adverse health effects that have recently been classified into two categories - syndromes, namely the sick object syndrome and the object-related syndrome.

The health effects of poor indoor air quality on the school population are primarily related to respiratory problems, including the worsening of asthma, cardiovascular system diseases, cancer, and other environmental illnesses. However, poor indoor quality also has an impact on the attention and academic achievement of school children. Academic success can be impaired either directly or through the negative health effects of pollutants and the consequent absence of a child from school. Moreover, data suggest that early exposure to polluted air during intrauterine development and childhood may play an important role in the development of chronic diseases in adulthood.

With the COVID-19 pandemic, the issue of air pollution has become even more relevant because people have been forced to spend even more time indoors, with new dangers of infection and disease development in polluted, humid and stuffy unventilated areas. Furthermore, it has been even more difficult to isolate children in schools with the existing classroom facilities and schedules.

Recent research conducted in schools in Bosnia and Herzegovina (BaH) has shown worrying results where the pollutant levels measured were as much as 5-6 times the limits allowed by the World Health Organization. One of the reasons this could be attributed to is inadequate urban planning and investment architecture in BaH. There is also a lack of green spaces in cities, which further affects the increased pollution of outdoor and indoor air.

In addition, inadequate inspections of school locations further contribute to the negative impact of the outside air on the indoor air quality due to its transmission into the buildings. Energy efficiency projects have additionally led to an increase in indoor air quality problems, as the focus has been mostly on the renewal of envelopes and possible replacement of energy sources, which has resulted in even more hermetically closed premises, without regard to natural ventilation. No public building that has been renovated with energy-efficiency as the priority has any built-in ventilation or air recuperation systems. Research indicates that even with the implementation of energy efficient projects, the minimum required energy characteristics are not achieved, although they are so extensive in the EU standards that since June 2020 all facilities can only be built as nearly-zero energy buildings (nZEB). The renovated buildings do not even comply with the minimum requirements required by local regulations and violate the law.

Green certification is a comprehensive approach to the construction and renovation of facilities in accordance with environmental protection, circular economy and sustainability, which should be the goal and standard our country strives to achieve in the construction sector. In addition, the choice of materials is very important for construction or renovation, energy efficiency and interior design because many studies have shown that improperly selected materials have a very strong negative impact on air quality. Natural materials are recommended for the insulation materials or windows, but also for interior decoration. In addition, the philosophy of circular economy and green certification of facilities supports local production and the local economy and reduces transport costs. Green public procurement is one of the mechanisms to support the best and healthiest practices in BaH.

When maintaining facilities, it is also very important to follow the recommendations that the premises be maintained every day using natural hygiene products, and tools with adequate filters to retain particles and the like. Since we have a large number of different indoor air purification systems on the market, the next step is to compare the results of air purification in classrooms with different purification systems installed, such as recuperation systems, ionization systems, green wall systems, etc. The most important thing is to raise awareness of the importance of solving the problem of indoor air quality in order to ensure that our facilities and cities provide comfort and healthy conditions for all users in the future.