UV-FACTS
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EVOLUTION OF INDOOR AIR QUALITY IN BUILDINGS

From prescriptive ventilation to integrated pollutant control according to UNI EN 16798

Indoor air quality is now widely recognized as one of the key factors affecting occupants' health, environmental comfort, and the overall performance of buildings. However, this recognition is the result of a relatively recent regulatory and cultural evolution. For many years, HVAC system design was based almost exclusively on quantitative criteria, focusing on outdoor air flow rates as the primary means of ensuring acceptable hygienic conditions.

In recent years, this approach has gradually been replaced by a more articulated vision, which considers indoor air quality as a performance parameter to be defined, measured, and maintained over time. The UNI EN 16798-1 standard now represents the central reference for this change.

For a long time in Italy, the design of ventilation systems for non-residential buildings referred to **UNI 10339**, published in the 1990s. This standard defined minimum ventilation requirements based on air flow rate tables, according to room use and number of occupants.

The underlying assumption was that an adequate exchange of outdoor air was sufficient to guarantee acceptable hygienic conditions. In this context, indoor air quality was addressed indirectly, as a consequence of pollutant dilution.

There were no structured indications regarding microbial load control, the hygienic quality of system components, or the active contribution of HVAC systems to the healthiness of indoor environments.

This approach, although consistent with the technological and regulatory context of the time, gradually showed its limitations, especially in buildings characterized by high energy efficiency, higher occupant density, and extensive use of air recirculation.

THE INTRODUCTION OF UNI EN 16798-1: A NEW PARADIGM

The **UNI EN 16798-1** standard derives from **EN 16798-1:2019**, published at European level in 2019 as a replacement for the former EN 15251. In Italy, it was adopted as **UNI EN 16798-1:2019**, becoming the new technical reference for indoor environmental parameters, including air quality.

A key milestone was the publication of the **National Annex (NA)** in **November 2025**, which made the application criteria of the standard fully operative in the Italian context. With this step, the UNI 10339 approach is effectively superseded with regard to defining indoor air quality in non-residential buildings.

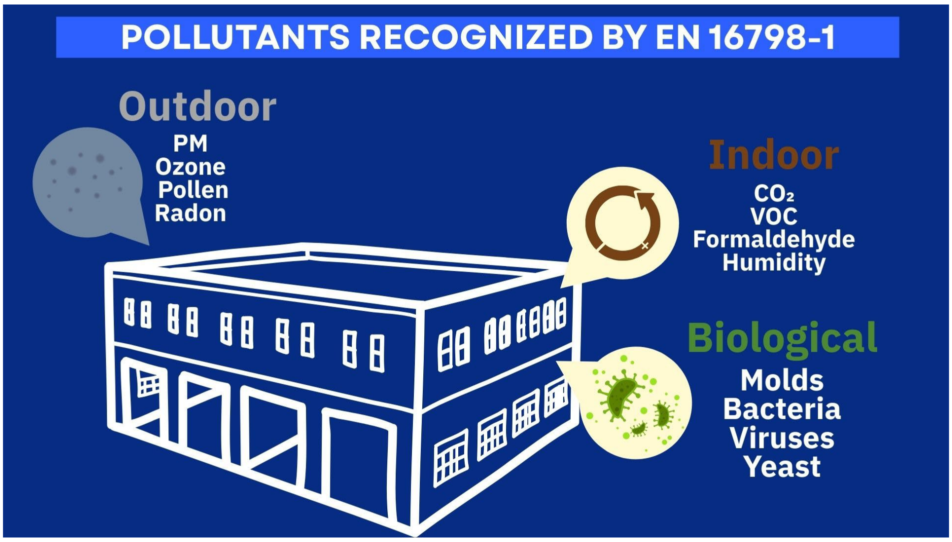
UNI EN 16798-1 introduces a fundamental change: **Indoor Air Quality (IAQ)** is no longer an implicit consequence of ventilation, but an **explicit design objective** that must be achieved and documented.

FROM AIR FLOW RATE TO AIR QUALITY

One of the central elements of the standard is the introduction of indoor **air quality classes (IDA 1, IDA 2, IDA 3, and IDA 4)**, which make it possible to assign buildings a clear and comparable performance level. The higher the IDA class, the higher the air quality guaranteed to occupants.

The standard clarifies that IAQ is the combined result of two factors:

- the supply of outdoor air;
- the management of pollutants generated indoors.



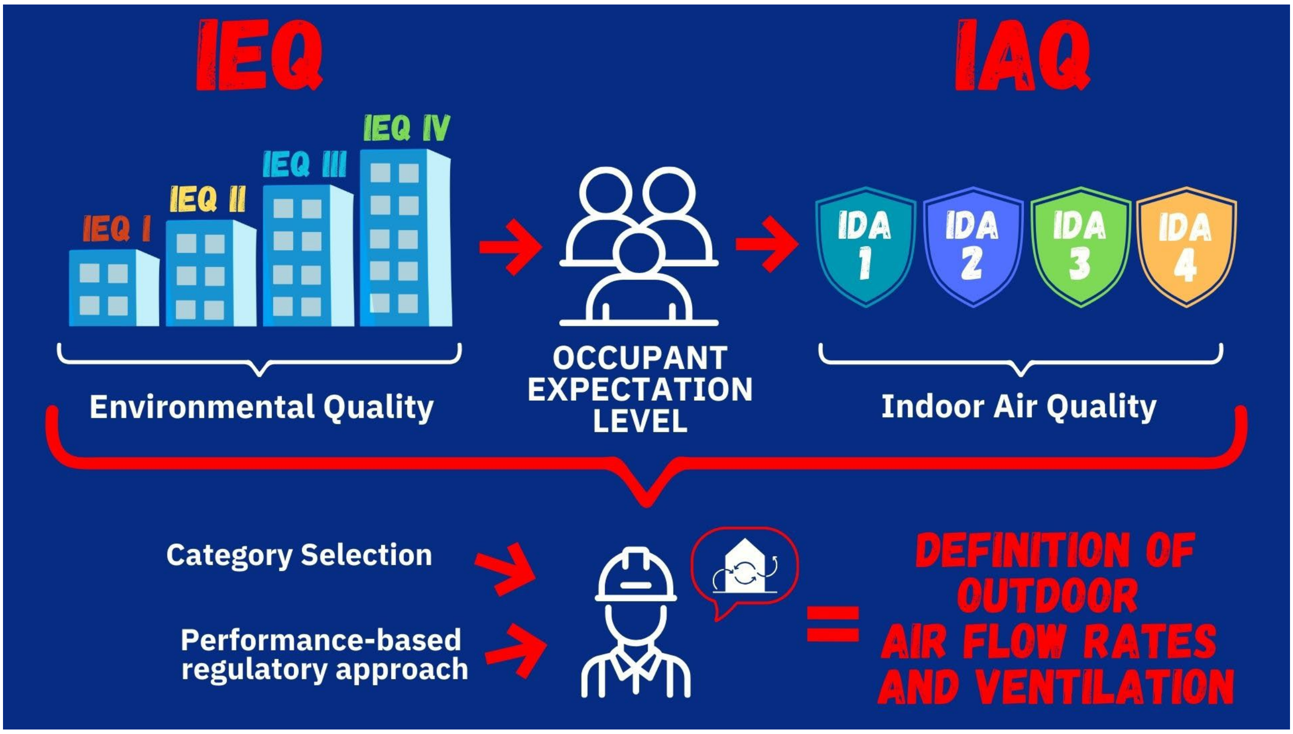
These pollutants explicitly include **chemical substances, particulate matter, and biological contaminants**, including those originating from occupants, surfaces, and the HVAC system components themselves.

This means that designers can no longer limit themselves to defining ventilation flow rates, but must evaluate the overall contribution of the HVAC system to indoor air quality.

THE ROLE OF UNI EN 16798-3 AND SYSTEM HYGIENE

UNI EN 16798-3, dedicated to non-residential buildings, further reinforces this approach by emphasizing the hygiene of ventilation systems. The standard highlights the need to avoid the recirculation of contaminants that may pose hygienic risks and to maintain adequate hygienic conditions of air handling units, ductwork, and internal components.

It is therefore recognized that air quality depends not only on the supplied air, but also on the hygienic condition of the system and its ability not to become a source of contamination itself.



AIR QUALITY AND ENERGY EFFICIENCY

Another key aspect of UNI EN 16798 is the balance between indoor air quality and energy efficiency. The indiscriminate increase of outdoor air flow rates, typical of purely quantitative approaches, is acknowledged as energetically inefficient and not always effective from an IAQ standpoint.

The standard therefore requires strategies that allow high levels of air quality to be maintained without compromising the building's energy performance, opening the way to air treatment solutions complementary to ventilation.

REGULATORY CONSISTENCY OF UV-C DISINFECTION TECHNOLOGIES

Within this regulatory framework, UV-C disinfection technologies find clear technical and design consistency. Although not explicitly mentioned in the standard, they directly address several requirements introduced by UNI EN 16798-1.

🎯 NEW GOALS for UNI EN 16798-1	Actions included in the Standard	✅UV-TECHNOLOGY CONTRIBUTION
Indoor Air Quality	Control of indoor pollutants and perceived comfort	**Proven reduction of biological contamination (viruses, bacteria, molds)**
Occupants Health	Reduction of exposure to harmful factors	**Inactivation of airborne pathogens**
System Performances Continuity	Stable indoor air quality over time	**Continuous operation independent of external conditions**
Energy Efficency	Indoor air quality with minimal energy consumption	**Contributes to maintaining system performance over time by reducing the degradation of operating conditions**
Performance Approach, Project Flexibility	Design flexibility for new and existing buildings	**Easily integrable with other systems, without pressure losses**

The ability of UV-C technologies to reduce microbial load in the air and on internal system surfaces addresses one of the aspects that the standard requires to be explicitly considered: the control of biological contaminants. Moreover, integrating UV-C systems into air handling units, heat exchange coils, or supply sections makes it possible to improve IAQ without increasing outdoor air flow rates, in line with energy efficiency objectives.

From a design perspective, UVGI solutions therefore represent a complementary tool to ventilation, useful for achieving higher IDA classes and for maintaining hygienic system conditions over time.

IMPLICATIONS FOR NEW SYSTEMS AND RETROFITS

UNI EN 16798 does not apply only to new buildings, but also opens significant opportunities for the existing building stock. Progressive compliance with the required air quality standards can be achieved without radically modifying systems, by integrating air treatment solutions into HVAC systems already in operation.

This approach is particularly relevant for offices, schools, healthcare facilities, and public and commercial buildings, where air quality directly affects comfort, well-being, and operational continuity.

CONCLUSION

The transition from UNI 10339 to UNI EN 16798-1 represents a profound evolution in the way indoor air quality is conceived.

The focus shifts from the mere quantity of supplied air to the real and integrated control of pollutants present in indoor environments, including those of microbiological nature.

In this new scenario, HVAC design requires a more informed and multidisciplinary approach, in which ventilation, air treatment, and system hygiene work together to achieve the required performance levels. UV-C technologies, although not prescribed by the standard, fit coherently into this framework, offering a concrete contribution to improving indoor air quality while respecting energy efficiency requirements.

Our team is at your disposal to offer you support on defining how UV-C technology can help you in the design of systems tailored to your needs.

Contact us on info@lightprogress.it or use our calculation software on www.lightprogress.it

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