Design procedures for ventilative cooling integrated in new standards

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SUMMARY

Low energy buildings are highly insulated and airtight and therefore subject to overheating risks, where Ventilative Cooling (VC) could be a relevant solution in both existing and new buildings - being both a sustainable and energy efficient solution to improve indoor well-being, hereunder thermal comfort (*State-of-the-art-review*, Kolokotroni et al., 2015).
VC is widely used as a key element when designing buildings to cope with overheating to assist improving thermal comfort, but can also improve the Indoor Air Quality due to higher ventilation rates in the cooling season.

VC technologies have the potential to be an effective measure to reduce the energy use in buildings, by meeting some or all of the cooling requirement of a building without the need for an active cooling system (e.g. mechanical cooling). The design of a VC system plays a significant role in the success and here fair and proper implementation of VC methods in standards, guidelines and legislation are becoming more important to enhance a proper design with a corresponding good performance.

In terms of building design, the responsiveness of a building not only includes good thermal comfort, but also resiliency and an ability to cope with the environmental impact of a certain technical solution. Amongst other things, the resilience aspect is important to include in future standards and legislation on this topic, e.g. evaluating what happens to the thermal comfort if there is a power outage.

There has generally been lacking proper ventilative cooling design integration in existing European standards and legislation and therefore New projects have started up under international standardization committees, CEN and ISO namely; CEN/TC 156 and ISO/TC 205.

KEYWORDS

Ventilative cooling, standards, legislation, compliance tools, recommendations for implementation of VC

1 EUROPEAN TECHNICAL SPECIFICATION ON VENTILATIVE COOLING IN CEN

1.1 General

There has generally been missing good ventilative cooling design integration for "system design" and "performance" aspects in existing European standards and legislation and therefore New projects have started up in New working groups under CEN/TC 156 and ISO/TC 205.

In CEN a new European Technical specification (CEN/TS) named "Ventilative cooling systems – Design" under CEN/TC 156/WG21 has started up with the goal to be the go-to European technical document for how to design ventilative cooling systems, while also ensuring a reference for ventilative cooling in the upcoming revision of EN 16798-1 named EN 16798-1-3 (for thermal comfort).

1.2 Content of CEN/TS

The purpose of the CEN/TS is to set criteria and give guidance to the design of ventilative cooling systems with main focus on thermal comfort in order to reduce cooling loads and prevent/reduce overheating in buildings. Ventilative cooling can be achieved through natural, mechanical and hybrid means.

With reference to the "VC design guide" from IEA Annex 62 inspiration has come up for input to the CEN and ISO technical documents on ventilative cooling (*Ventilative cooling design guide, IEA Annex 62,* Heiselberg et al., 2018).

In the CEN/TS, the general design procedure will consist of 3 design stages:

- Conceptual design
  - Aim: To embed VC principles and find VC potential
- Basic design
  - Aim: To determine opening areas/duct sizing and to investigate if the needed air change rate is achievable
- Detailed design
  - Aim: To investigate if the chosen ventilative cooling system actually complies with the set criteria

In the conceptual design phase will be included a method estimating the "ventilative cooling potential" early on to find when VC applications can be used throughout the year for a given climate. If VC is not sufficient, there will informatively be given information on supplementary cooling and mechanical cooling to ensure full thermal comfort in the building. The aim is to include early design evaluations with illustrated "architypes" e.g. in terms of climate type to help the designer make valid choices early on based on simulations for VC strategies (e.g. single sided or cross ventilation).

In all design stages will be included resilience checks, ranging from simple (conceptual and basic) to possibly more detailed resilience indicators (detailed design). This resilience check will investigate if the building e.g can withstand power cuts, in order to still achieve a good thermal comfort.

2 CONCLUSION

Generally, new aspects are highlighted included in the upcoming European Technical specification on "Ventilative cooling systems - Design" in CEN/TC 156/WG21 in order for the audience to understand the need to have this information available in a new technical document and that a reference should be made to the current revision of EN 16798-1-3 (thermal comfort).

There can generally be different ways of cooling a building and here VC technologies have the potential to reduce the energy use in buildings, by meeting some or all of the cooling requirement of a building without the need for an active mechanical cooling system. The design of a VC system plays a significant role in the success of this and to this are needed fair and proper implementation of VC methods in standards, guidelines and legislation.

3 ACKNOWLEDGEMENTS

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Table 1 - Research participants helping with input to IEA Annex 62 report

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