Overheating assessment & ventilative cooling in national building codes regarding indoor environmental quality and energy performance

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ABSTRACT

The world meteorological organization (WMO) reported that the past 11 years (2015-2025) are now the warmest on record. This accelerating warming trend highlights a shift in building practice: from focusing on heating needs (in cold and moderate climates) to addressing cooling demand, overheating risks, and thermal resilience. Within this context, ventilative cooling is recognized as a key strategy to meet cooling demand and to enhance resilience during heatwaves. Designers typically rely on national building codes on indoor environmental quality (IEQ) and energy performance when assessing overheating risks. Therefore, we aimed to assess how these codes address overheating and ventilative cooling in buildings.

We conducted a cross-country survey in 2024-2025, targeting 19 countries/regions - Australia, Austria, Flanders (Belgium), Canada, Denmark, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, South Korea, Spain, Sweden, Switzerland and England & Wales (GB). This survey gathered detailed information on assessment methods, performance requirements, and the integration of passive cooling concepts in both residential and non-residential buildings in current regulations. All information provided reflects the interpretation of national experts based on their understanding of applicable regulations.

The analysis of the survey responses shows that approximately half of the surveyed countries/regions include an assessment method and/or requirements for overheating in buildings. Both simplified and detailed assessment approaches are applied. Among these, 50% of the building codes specifies a separate performance based indicator for overheating in residential buildings. Regarding ventilative cooling, fewer than 50% of the studied countries explicitly include ventilative cooling as a mitigating strategy. Where ventilative cooling is considered, building codes typically provide multiple options for design and control. A clear distinction exits between residential and non-residential buildings: overheating assessment methods as well as requirements are common in residential buildings. Finally, current building codes do not account for climate change impact. Future weather files are absent, with Germany being the only (known) country planning to incorporate mid-term future weather data in its upcoming standard update. Resilience to overheating is mentioned in only one-third of the reviewed buildings codes.

KEYWORDS

Overheating, ventilative cooling, thermal resilience, building codes