Resilient cooling in office buildings: case study in Belgium

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1 INTRODUCTION

To achieve future-proof buildings, it is crucial to design buildings and systems that can withstand to shocks (like heat waves and power outages) and reduce the impact of shocks on thermal comfort in a building. This is known as resilience to overheating.

However, shocks are not included in daily building design practice. Practitioners still have the question: "how to design a building that is resilient to overheating?". To answer this question, IEA EBC Annex 80: Resilient Cooling of Buildings translated its results into Resilient Cooling Guidelines (Corrado et al., 2023). The case study from these guidelines is the subject of this summary/presentation.

2 CASE STUDY DESCRIPTION

The case study is a new low-tech office building with a floor area of 1019m² on 2 floors in the city of Leuven (Belgium) designed by and for archipelago architects (see Figure 1).

Figure 1: Parkside view of the office building © archipelago architects

3 (PRE-)DESIGN PROCESS

Figure 2 presents the step-by-step design process that is applied to reach a resilient building with focus on passive design strategies and in particular the combination of solar shading, natural ventilative cooling (NVC) and exposed thermal mass. For more details about the whole design process is referred to Declercq et al. (2021).

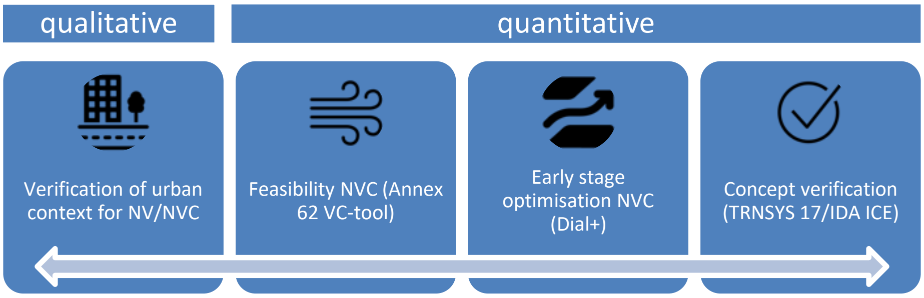

Figure 2 Step-by-step design process (including used tools) © archipelago architects

4 RESILIENCE ASSESSMENT

A building simulation model including 10 zones is built in IDA ICE v4.9.9. Thermal resilience is assessed for two open plan offices (with 32 occupants each) and one reception area by the following performance indicators: overheating escalation factor (OEF) and degree hours above a standard effective temperature (SET) of 28 and 30°C. The concerned shocks are heat waves in current and future weather conditions (mid-term and long-term projections) and a 48h power outage on the hottest day of the heat wave. Simulated scenarios include a combination of automated shading (yes/no), natural/mechanical ventilative cooling (yes/no), thermal mass (light/heavy), mechanical radiant cooling device.

5 ACKNOWLEDGEMENTS

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6 REFERENCES

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