BUILDING ENERGY CODES
WORKING GROUP

EBC
Energy in Buildings and Communities Programme

Meeting Recap: Fifth meeting of the Building Energy Codes Working Group – Focus on Overheating Part III

IEA-EBC Working Group on Building Energy Codes

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Meli Stylianou, Natural Resources Canada, Canada
Brodie Hobson, Natural Resources Canada, Canada

Table of content

1 Summary

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- **New Zealand Overheating Assessment Methodology:** Victoria Threadwell, supported by Richard London, presented the development and refinement of New Zealand's overheating assessment methodology, detailing its simulation, calculation, and pass-fail criteria, and discussed its application to residential archetypes and future regulatory integration.
    - **Methodology Structure:** Victoria explained that the overheating assessment methodology consists of three main parts: a simulation methodology based on CIBSE TM59, an effective temperature calculation (SET), and a pass-fail criterion using degree hours, with humidity as a key factor due to New Zealand's subtropical climate.
    - **Health and Wellbeing Focus:** The methodology prioritizes health and wellbeing by aiming to limit heat stress and heat strain for occupants, rather than focusing solely on comfort, and is being refined through application to 16 residential archetypes representing contemporary New Zealand housing.
    - **Technical Panel and Modelling:** A technical panel and engineering consultants are engaged to apply the methodology using IES and EnergyPlus software, with modelling results informing decisions on pass-fail criteria and weather file selection for future building code updates.
    - **Regulatory Pathways:** Victoria outlined plans for voluntary adoption of the methodology, followed by regulatory updates to include overheating performance requirements, with two compliance pathways: a detailed assessment and a simple rule-of-thumb approach involving measures like glazing limits and night purge ventilation.
    - **Collaboration and Research Questions:** Victoria emphasized ongoing collaboration with universities and research organizations, and invited feedback on key research questions such as defining heatwaves, weather file selection, modelling assumptions, and thresholds for heat stress and strain.
- **International Approaches to Overheating and Climate Risk:** Participants including Louis Bourru, Roberto Lamberts, Michael Dodd, and Michael Donn discussed international practices for defining heatwaves, reference weather files, and modelling approaches, comparing New Zealand's methodology with those used in France, Australia, and the UK.
    - **Heatwave Definitions:** Louis described France's use of a 15-day extreme weather file from 2003 for new buildings, while Victoria and Michael Donn questioned the suitability of such stringent files for New Zealand, noting potential for widespread building failures if applied locally.
    - **Reference Building Modelling:** Louis clarified that France uses reference building modelling for existing buildings, and stress tests new buildings against the extreme heatwave file, prompting Victoria to consider implications for New Zealand's methodology.
    - **Air Velocity and Window Operation:** Roberto asked about air velocity in the SET index; Victoria explained current assumptions from CIBSE TM59 and ongoing adaptation for New Zealand's climate, including window operation rules based on outdoor and indoor temperature differentials.
    - **Thresholds and Comfort Indices:** Victoria discussed the development of adaptive thermal comfort indices and thresholds for heat stress and strain, using data from Australia and ongoing research to refine these metrics for New Zealand.
    - **Future Climate Files:** Michael Dodd and Ryan Colker explored the use of forward-looking climate files in US and international codes, concluding that most jurisdictions rely on historic data, with limited adoption of future-focused risk assessments.

- **US Model Codes and Heat Mitigation Strategies:** Ryan Colker presented the US model code development process, highlighting the complexity of code adoption across states, existing heat mitigation strategies, and recent efforts to introduce cooling requirements and resilience measures, with input from Vincenzo Corrado and Michael Dodd.
    - **Code Development and Adoption:** Ryan explained that the International Code Council facilitates an open, consensus-based process for model code development, with adoption and amendments occurring at state and local levels, resulting in significant variability across jurisdictions.
    - **Heat Mitigation Measures:** Current codes focus on energy efficiency, insulation, solar heat gain, window-to-wall ratios, ventilation, duct sealing, cool roofs, and shading, but lack minimum cooling requirements and primarily address health and indoor air quality.
    - **Extreme Heat Working Group:** A working group was established to propose cooling requirements for the 2027 code editions, considering both active and passive measures, but these proposals were not adopted and will be revisited for the 2030 cycle.
    - **Climate Zone Updates:** The 2021 code update included revisions to the climate zone map, moving about 10% of US counties to warmer zones, reflecting observed temperature changes and influencing code requirements.
    - **Local Initiatives and Passive Survivability:** Ryan noted that some local jurisdictions have minimum cooling requirements, mainly in rental housing laws, and highlighted research on passive survivability, emphasizing the role of building codes in enhancing resilience during extreme weather and power outages.
- **Building Energy Resilience and Passive Survivability Codes:** Tristan Grant described New Buildings Institute's work on building energy resilience, including the development of the Connecticut Climate Resilient Energy Code, its technical measures, simulation methods, and ongoing efforts to adapt resilience frameworks for broader application.
    - **Energy Resilience Definition:** Tristan defined building energy resilience as the capacity to maintain critical functions during acute and chronic stressors, integrating passive survivability, grid-interactive technologies, and distributed energy systems such as solar and storage.
    - **Connecticut Code Development:** The Connecticut Climate Resilient Energy Code was developed for multifamily affordable housing, specifying improved envelope performance, critical load identification, emergency power requirements, and resilience measures for both residents and operators.
    - **Simulation and Performance Metrics:** Pacific Northwest National Laboratory supported analysis using standard effective temperature and cumulative degree hours, with simulations based on historical seven-day extreme events to evaluate passive and active system performance.
    - **Solar and Storage Sizing:** A microgrid consultant determined that solar and storage systems could achieve a minimum duration of 26 hours and typical duration of 59 hours during extreme events, with prescriptive requirements and performance paths included in the code.
    - **Adaptation and Incentive Programs:** Tristan discussed ongoing adaptation of the framework for ASHRAE standards and local incentive programs, noting flexibility in storage technology and incremental adoption for vulnerable populations and resilience hubs.
- **Technical Questions and Code Implementation Details:** Participants including Richard London, Michael Donn, and Michael Dodd engaged Tristan Grant in detailed questions about battery assumptions, storage sizing, passive survivability thresholds, and operational design for resilience hubs, clarifying technical aspects of code implementation.
    - **Battery Life and Central Storage:** Tristan clarified that the analysis assumed a central battery with a 10-year lifespan and payback at 8.2 years, reflecting typical ownership structures in affordable housing, but allowing flexibility for distributed or thermal storage.
    - **Resilience Hub Design:** Michael Dodd asked about designating public buildings as resilience hubs; Tristan explained ongoing work with ASHRAE 189.1 to define operational parameters and minimum storage requirements for such facilities, though no standard exists yet.
    - **Passive Survivability Thresholds:** Tristan described the use of a 216 degree hour threshold from a LEED pilot credit for passive survivability, acknowledging its arbitrary nature and supplementing it with maximum temperature exceedance limits in code language.

- **Plug Loads and Simulation:** Richard inquired about plug loads; Tristan confirmed that energy modelling accounted for internal loads and heat gain, using simulation software to calibrate passive and active performance during critical periods.

- **Parallel Building Code Updates in New Zealand:** Victoria Threadwell and Richard London highlighted ongoing projects in New Zealand addressing ventilation, internal moisture, and energy efficiency, noting opportunities to integrate lessons from overheating research into broader building code updates.
  - **Integrated Code Development:** Victoria explained that projects on ventilation, moisture, and energy efficiency are running in parallel with overheating work, enabling coordinated updates and new requirements across multiple building code clauses.
  - **Building as a System:** Richard emphasized the ministry's approach to viewing buildings as integrated systems, covering 30 of 38 technical code clauses, and leveraging cross-disciplinary expertise to address complex issues like overheating and moisture.

2 Action items

- **Overheating Assessment Methodology Feedback:** Provide feedback or thoughts on the research questions related to defining a heatwave for the built environment, weather file selection for assessments, and modelling assumptions for the New Zealand overheating assessment methodology. (All meeting participants)
- **Future Presentation on Compliance Pathways:** Present an update on the final compliance pathways for the overheating assessment methodology once developed in the next phase of work. (Victoria Threadwell)

3 Attendees

Name	Affiliation	Country
Louis Bourru	Cerema	France
Ryan Colker	International Code Council	USA
Vincenzo Corrado	Polytechnic University of Turin	Italy
Michael Dodd	Australia Capital Territorial Government	Australia
Michael Donn	Victoria University of Wellington	New Zealand
Tristan Grant	New Buildings Institute	USA
Roberto Lamberts	Federal University of Santa Catarina	Brazil
Richard London	Ministry of Business, Innovation & Employment	New Zealand
Rajan Rawal	CEPT University	India
Takao Sawachi	Building Research Institute	Japan
Meli Stylianou	Natural Resources Canada	Canada
Victoria Threadwell	Ministry of Business, Innovation & Employment	New Zealand
Shotaro Yagi	Building Research Institute	Japan