

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

IEA-EBC Working Group on Building Energy Codes

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1 Summary

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- **Canadian Overheating Measures and Code Development:** Sébastien Brideau presented an overview of overheating considerations in the National Energy Code of Canada (NECB), discussing current measures, ongoing research, and future directions, with contributions from Aeric Siu, Roberto Lamberts, Michael Donn, Karine Jan, and Meli Stylianou regarding international comparisons and technical details.
 - **Current Code Measures:** Sébastien explained that the NECB currently addresses overheating primarily in small residential buildings through measures such as maximum solar heat gain coefficients (SHGCs) for windows and performance-based cooling load limits. These measures are limited in scope and only indirectly address overheating, focusing mainly on energy consumption rather than direct overheating indicators.
 - **Future Code Directions:** Sébastien described ongoing committee work to introduce requirements for active cooling in residential buildings unable to maintain 26°C passively, with research underway to determine prescriptive rules based on climate data and the possibility for builders to demonstrate compliance through simulation. No final decisions have been made, and the process is ongoing.
 - **Technical Factors in Overheating:** Sébastien highlighted that climate, window properties (SHGC, area, operability), thermal mass, and building shape are key factors influencing overheating in Canadian residential buildings. The team is also assessing the energy impacts of low solar heat gain coefficient windows and developing surrogate modelling tools for code compliance.
 - **International Comparisons and Research Review:** In response to Meli's question, Sébastien and Aeric confirmed that they have reviewed international work on overheating, referencing a paper linked to IEA annex research on resilient cooling, and are preparing an updated global overview for the Canada's codes committees.
 - **Discussion on Window Measures and Heating Penalty:** Roberto questioned the trade-off between low solar heat gain coefficients and winter heating penalties. Sébastien clarified that while simulations have limitations, the heating penalty is generally small, especially with heat pumps, and Aeric is conducting further research on this topic.
- **Italian Overheating Policies and Code Requirements:** Vincenzo Corrado presented Italian policies on overheating, detailing two main codes—one for minimum energy performance requirements and another for minimum environmental criteria—while addressing technical aspects such as solar gain control, thermal inertia, and adaptive comfort, with follow-up questions from Meli, Michael, Takao Sawachi, and Karine.
 - **Minimum Requirements Code:** Vincenzo explained that the Italian minimum requirements code applies to all buildings and addresses overheating indirectly through envelope prescriptions, solar gain control, and cooling energy demand limits. Requirements vary by climate zone and intervention type, with specific parameters for solar transmittance and thermal inertia.
 - **Minimum Environmental Criteria Code:** The minimum environmental criteria code, applicable to public buildings, directly addresses overheating through mandatory shading, passive strategies (including natural ventilation and thermal mass), and operative temperature limits. It distinguishes between buildings with and without cooling systems, applying adaptive comfort theory in the latter case.
 - **Technical Prescriptions and Metrics:** Vincenzo described technical prescriptions such as the calculation of summer effective solar area, requirements for dynamic thermal properties of opaque elements, and the use of technologies like cool roofs, ventilated roofs, and phase change materials (PCMs), though PCMs are not widely used in practice.
 - **Adaptive Comfort and Overheating Definition:** In response to Michael, Vincenzo clarified that the Italian code uses adaptive comfort theory for buildings without cooling, requiring that at least 85% of occupied hours

- remain within 4°C above the running mean outdoor temperature, which differs from the fixed 26°C threshold used in Canada.
- **Evaluation of Vented Roofs:** Takao asked about evaluating vented roofs; Vincenzo responded that Italian legislation requires designers to demonstrate equivalent performance to traditional solutions, typically through dynamic simulation, as no simplified standard parameters exist.
 - **Japanese Approach to Overheating Evaluation:** Takao Sawachi presented Japan's approach to evaluating building performance against overheating, covering climatic diversity, key factors influencing overheating, and the technical evaluation of natural ventilation and cooling equipment, with questions from Vincenzo and comments from Meli and Michael.
 - **Climatic Diversity and Overheating Factors:** Takao described Japan's wide climatic range and identified five main factors affecting overheating in residential buildings: solar heat gain, thermal mass, internal heat gain, natural ventilation, and cooling equipment, emphasizing the importance of internal gains from appliances and lighting.
 - **Natural Ventilation Evaluation:** Takao detailed the technical challenges in evaluating natural ventilation, including the variability of discharge coefficients based on airflow direction and the use of wind tunnel experiments to determine wind pressure coefficients for different building densities and window configurations.
 - **Cooling Equipment Performance:** Takao presented research on the actual energy efficiency of room air conditioners, noting that part-load operation is common due to conservative sizing guidance, and that coefficient of performance (COP) drops at low part-load ratios, a trend observed across heat pumps.
 - **Impact of Natural Ventilation on Cooling Energy:** Takao reported that utilizing natural ventilation can reduce annual cooling energy use by approximately 12–13%, but its effectiveness is limited to periods when outdoor air is cooler than indoor air, typically at night.
 - **Wind and Temperature Data for Design:** In response to Vincenzo, Takao explained that Japan maintains a database of wind speed, direction, and outdoor temperature for over 800 weather stations, which designers can use to optimize natural ventilation strategies, though location-specific differences have not been fully analyzed.
 - **Discussion on International Overheating Thresholds and Cultural Factors:** Participants including Sébastien, Vincenzo, Karine, and Meli discussed differences in overheating thresholds, the influence of health studies, adaptation, and cultural practices on comfort standards, and the importance of tailoring code requirements to local contexts.
 - **Basis for Overheating Thresholds:** Sébastien clarified that Canada's 26°C threshold is based on health studies, particularly for vulnerable populations, while Italian and other European codes use adaptive comfort models that allow higher temperatures, reflecting local adaptation and cultural practices.
 - **Cultural and Regional Variations:** Vincenzo and Karine noted that comfort expectations and code requirements vary by country and even within countries, influenced by climate, building practices, and cultural norms such as dress codes and use of fans or air conditioning.
 - **Implications for Code Development:** Participants agreed that overheating thresholds and code requirements should be tailored to specific populations and climates, rather than adopting a universal standard, to ensure both health protection and practical applicability.
 - **Planning Future Meeting Topics:** Meli facilitated a discussion with Richard London, Ryan Colker, Vincenzo, Tristan Grant, Michael Donn, and others to prioritize future meeting topics, with consensus emerging around focusing on cost-benefit analysis, affordability, and existing buildings for the next series of presentations.
 - **Prioritization of Topics:** Participants reviewed a list of potential topics and expressed strong interest in cost-benefit analysis, affordability, and the treatment of existing buildings in building codes, noting their relevance to current policy debates and regulatory requirements.
 - **Compliance and Performance-Based Codes:** Richard and Michael discussed the interplay between prescriptive and performance-based codes, the challenges of demonstrating compliance, and the need for clarity in compliance methodologies across different jurisdictions.

- International Perspectives and Incentives: Vincenzo and Richard highlighted differences in regulatory approaches, including the use of financial incentives in Europe versus limited incentives in New Zealand, and the importance of understanding how various countries address existing building stock.

2 Action items

- **Next Steps and Meeting Planning:** Meli confirmed that the next series of meetings, likely starting in September, will focus on cost-benefit and affordability, with a Doodle poll to be sent out in late August to coordinate participation (Meli, Brodie).
- **Publication and Sharing of Meeting Materials:** Vincenzo, Takao Sawachi, and Meli discussed the publication of presentations, confirming that materials will be posted on the Building Energy Codes Working Group website without the need for additional formatting, and that a summary presentation will be prepared (Meli, Sébastien, Aeric).
- **Presentation Sharing:** Meli confirmed that all presentations from the meeting series will be posted on the Building Energy Codes Working Group website as submitted, and presenters were asked to send their files directly for upload (Sébastien, Vincenzo, Takao, Meli, Brodie).
- **Summary Preparation:** Meli stated that a summary presentation covering the main discussion points and organizational priorities will be prepared, with the possibility of a journal special issue being considered (Meli, Sébastien, Aeric).

3 Attendees

Name	Affiliation	Country
Sébastien Brideau	Natural Resources Canada	Canada
Ryan Colker	International Code Council	USA
Vincenzo Corrado	Polytechnic University of Turin	Italy
Michael Donn	Victoria University of Wellington	New Zealand
Meredydd Evans	Pacific Northwest National Laboratory	USA
Tristan Grant	New Buildings Institute	USA
Brodie Hobson	Natural Resources Canada	Canada
Karine Jan	Cerema	France
Danielle Krauel	Natural Resources Canada	Canada
Roberto Lamberts	Federal University of Santa Catarina	Brazil
Richard London	Ministry of Business, Innovation & Employment	New Zealand
Mahsan Sadeghi	CSIRO	Australia
Takao Sawachi	Building Research Institute	Japan
Aeric Siu	Natural Resources Canada	Canada
Meli Stylianou	Natural Resources Canada	Canada