Policy Brief:

Codifying Cool Surfaces to Protect People and the Grid During Heatwaves

Heatwaves are among the most lethal of natural hazards globally. They are exacerbated in population centres, such as Western Sydney, due to the urban heat island effect. Improving the performance of our building stock to provide appropriate shelter is an urgent public health challenge.

Current active cooling systems are vulnerable to rising frequency of extreme weather events like heatwaves and power outages. These challenges, compounded by climate change, are putting unprecedented pressure on building cooling systems and, in turn, the power grid.

Resilient cooling approaches, such as cool surfaces, provide energy efficient and affordable solutions that strengthen the ability of individuals and communities to prevent and withstand extreme heat gain. (Figure 2).

There is an opportunity to further integrate requirements for cool surfaces, such as evaporative envelopes or reflective surfaces, into the National Construction Code (NCC) as has been done in California. Incorporating requirements into the building code provides certainty for builders, comfortable and safer homes for citizens, and reduced emissions and peak electricity demand.

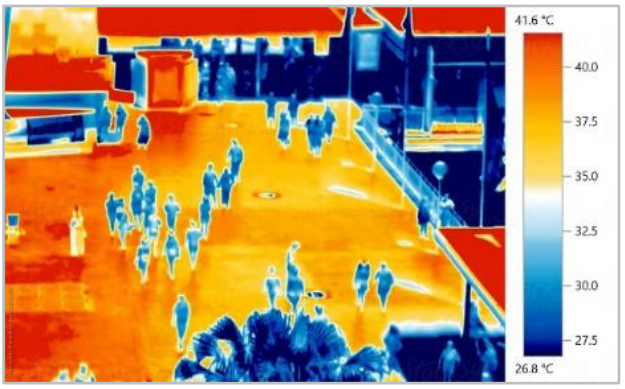

Figure 1: Thermal image of a Sydney mall.

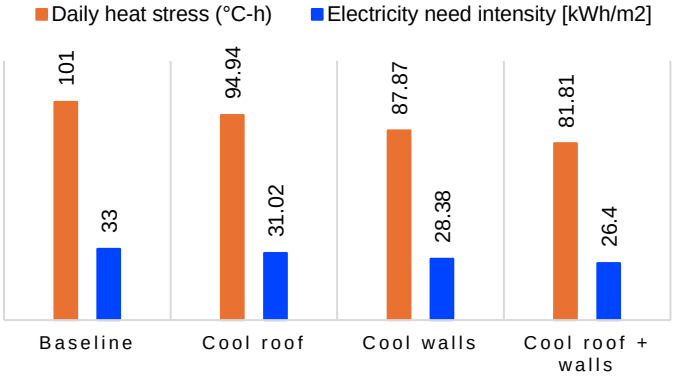

Figure 2: Table showing reduced stress and HVAC electricity needs from cool envelopes in a single-storey house in Los Angeles, California circa 2050 from *Resilient Cooling of Buildings Technology Profiles Report*

Recommendations for policymakers

The IEA EBC Annex 80: Resilient Cooling of Buildings has considered wide ranging opportunities to address the need for resilient cooling, with significant benefits identified by adopting the following cool envelope approaches:

- **Expand cool-roof policies to include cool walls, accounting for roof-wall differences in materials and physics.** Every building energy standard, green building program, product rating program, and product certification program that already incorporates cool roofs should be expanded to include cool walls**.**
- **Expand existing requirements in the National Construction Code for cool roofs and walls.** Provide appropriate pathways (J1V2 and NatHERS) to credit the use of solar reflective and thermal radiative (sky cooling) roofs and walls to reduce the interior heat gain of buildings. International building energy codes such as International Energy Efficiency Code [IECC] and California Title 24 Part 6 feature these approaches.
- **Offer rebates for manufacturers or homeowners to offset initial cool surface product premiums.**
- **Create a training and certification program for roof and wall contractors to (a) understand cool surface benefits and (b) locate and apply/install products.** This will help them understand the benefits of cool roofs and walls, communicate these benefits to their customers, and apply/install cool surface products.

Background and context

The challenges of cooling in a warming world

The global stock of air conditioners in buildings will grow to 5.6 billion by 2050, up from 1.6 billion in 2018, according to the International Energy Agency (IEA) *Future of Cooling* report, becoming a top driver of global electricity demand.

The increasing demand is driven by climate change, urbanisation, rising comfort expectations, and economic growth, particularly in hot and densely populated regions.

In Australia, 1.2 to 1.3 million small and medium stationary air conditioning units are sold annually, which would not be required in a warming climate if resilient cooling approaches are used. (Figure 3).

Figure 3: Cool wall use at One Central Park, Sydney (left) compared with maladaptive retrofitted air conditioning (right).

A *cool roof* or *cool wall* is a building surface designed to reflect more sunlight and absorb less heat than standard materials, helping to reduce the building's overall temperature. They can vary in detail from reflective painting through to green or water roofs/walls. The selection will depend on the design and whether it is a new building or retrofit. This reduces the need for air conditioning and, consequently, the costs for householders and businesses and the strain on the electricity grid.

Broader policy support for resilient cooling

IEA EBC Annex 80's main objective is to support a rapid transition to an environment where resilient low energy and low carbon cooling systems are the mainstream and preferred solutions for cooling and overheating issues in buildings.

It encompasses research into both active and passive cooling technologies categorised into four aims:

- Reduce externally induced heat gains to indoor environments
- Enhance personal comfort apart from cooling whole spaces
- Remove sensible heat (measurable heat) from indoor environments
- Control latent heat (humidity) of indoor environments.

Further reading

Annex 80 Publications https://annex80.iea-ebc.org/publications

The publication *International Energy Agency Resilient Cooling of Buildings – Policy Recommendations (Annex 80)* has a suite of other recommendations for policymakers working on the built environment, climate change adaptation, and public health. This includes practical information about envelope materials, ventilation and cooling systems, micro-cooling and personal comfort control, and whole building approaches.

About the author

This work was made possible by Annex 80: Resilient Cooling of Buildings of the International Energy Agency (IEA) Energy in Buildings and Communities (EBC) Technology Collaboration Programme.

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