Phase Change Material Thermal Stores

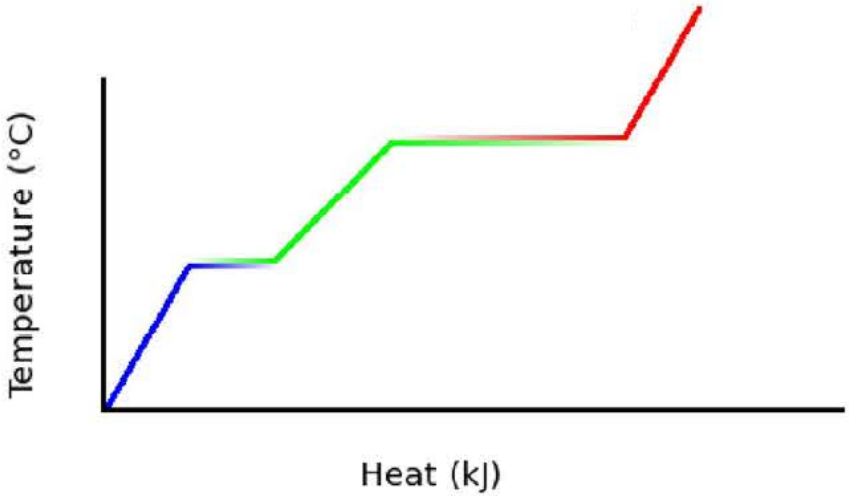
The application of inorganic Phase Change Material thermal stores in sustainable building design in Europe – an on-going research project.

Oliver Wilton – Lecturer in Environmental Design at The Bartlett School of Architecture, UCL and practicing architect.

Jake Hacker – Visiting Professor in Building Engineering Physics, UCL Energy Institute and building physicist at Arup.

Nick Hopper – Technical Director, Monodraught Ltd.

What are Phase Change Materials?



All materials are phase change materials – they change phase depending on temperature and pressure. Our focus is on PCMs that can help in keeping building interiors at comfortably cool temperatures in summer. These PCMs typically have a freezing point of around 22 degrees centigrade.

Inorganic Phase Change Materials (PCMs)

PCMs are either organic or inorganic.

Organic PCMs:

- Typically paraffin
- Relatively costly
- Flammable

Inorganic PCMs (our focus):

-Typically salt hydrates
- Relatively low cost
- Non-flammable
- Typically require a thickening agent

PCM thermal stores

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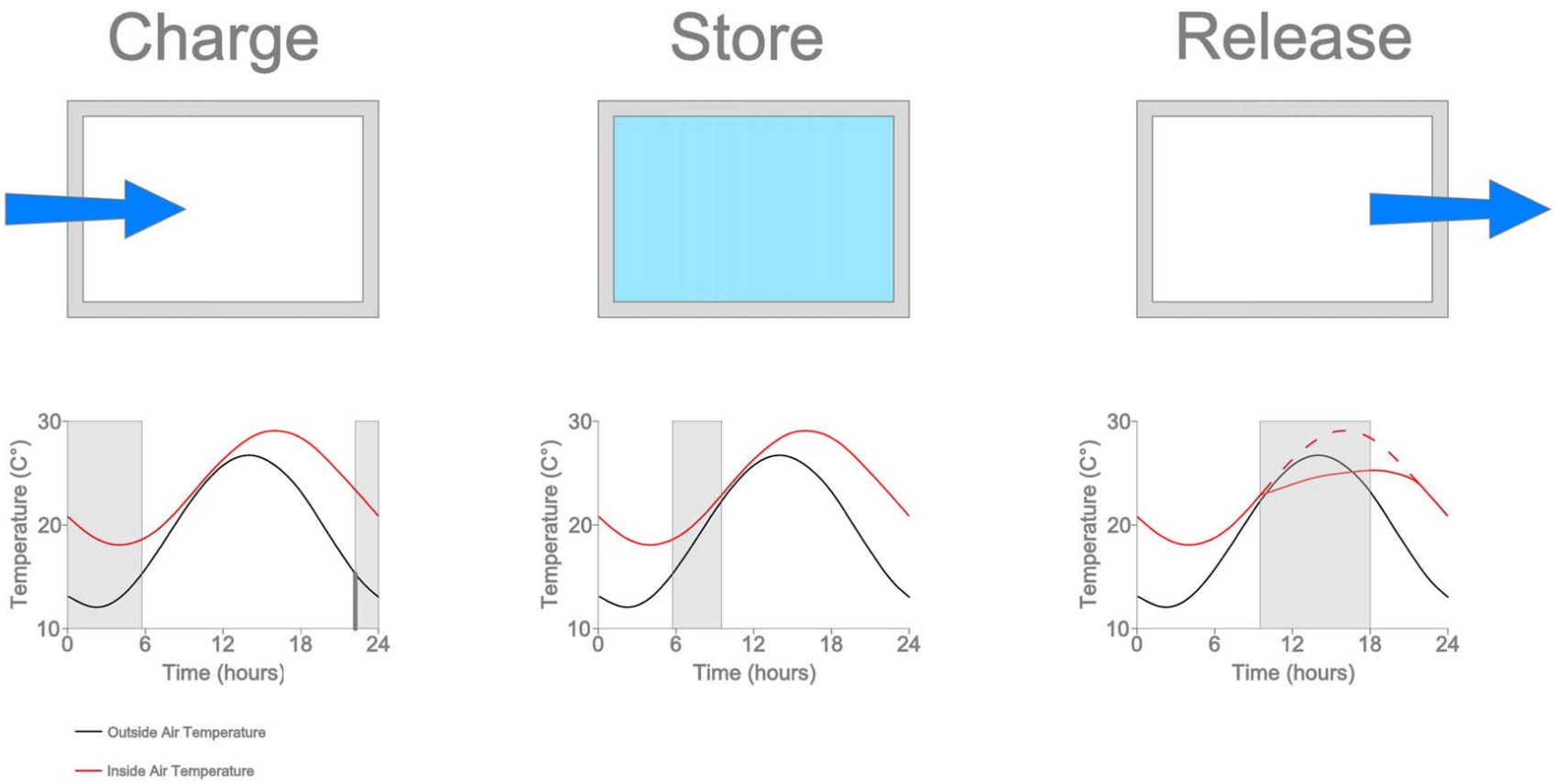
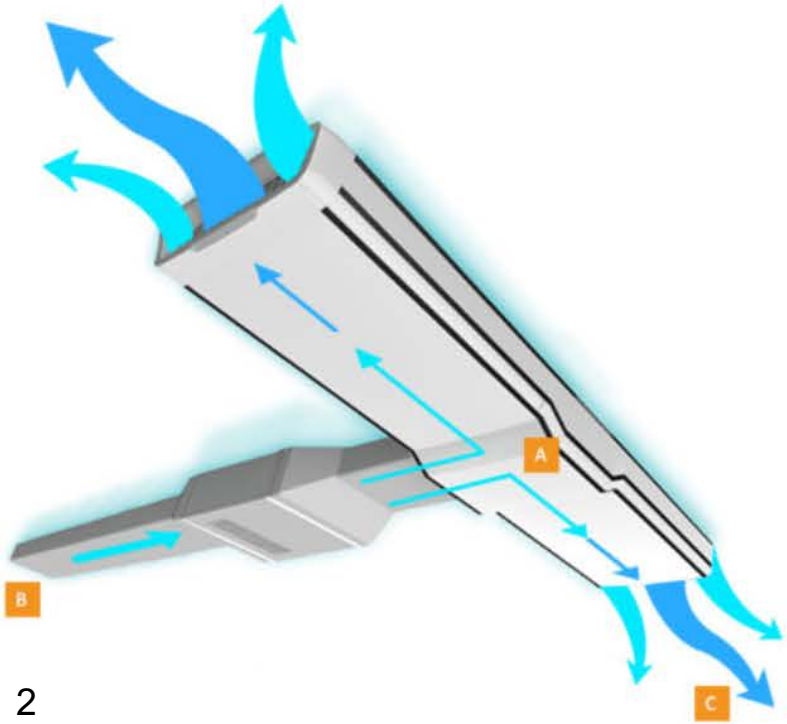


Monodraught Cool-Phase®



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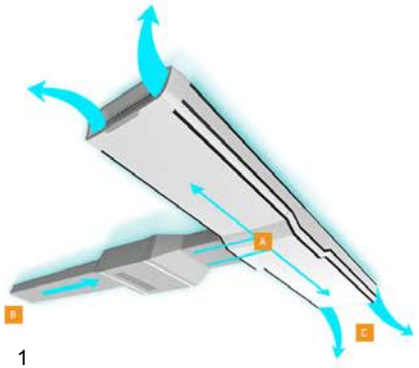
Ventilation, Cooling & Heat Recovery

Click the links to find out more

1. Ventilation
2. **Outside Air Ventilation & Cooling**
3. Re-circulation & Cooling
4. Heat Recovery

A.) Operation: This is used when the temperature differential between inside and outside air is insufficient to cool the space but the outside temperature is still lower than the temperature within the room.



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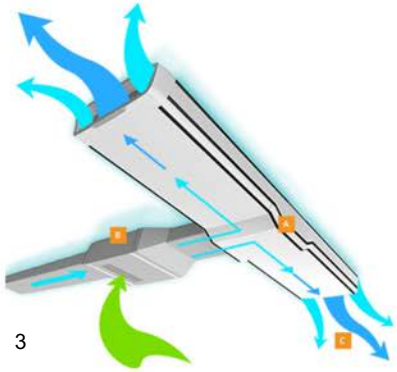

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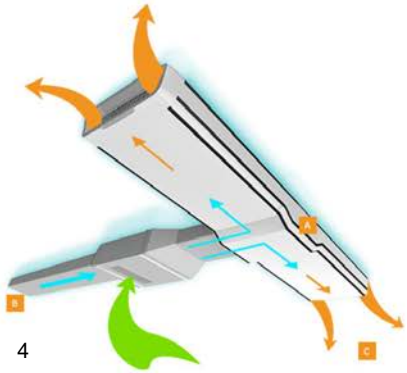

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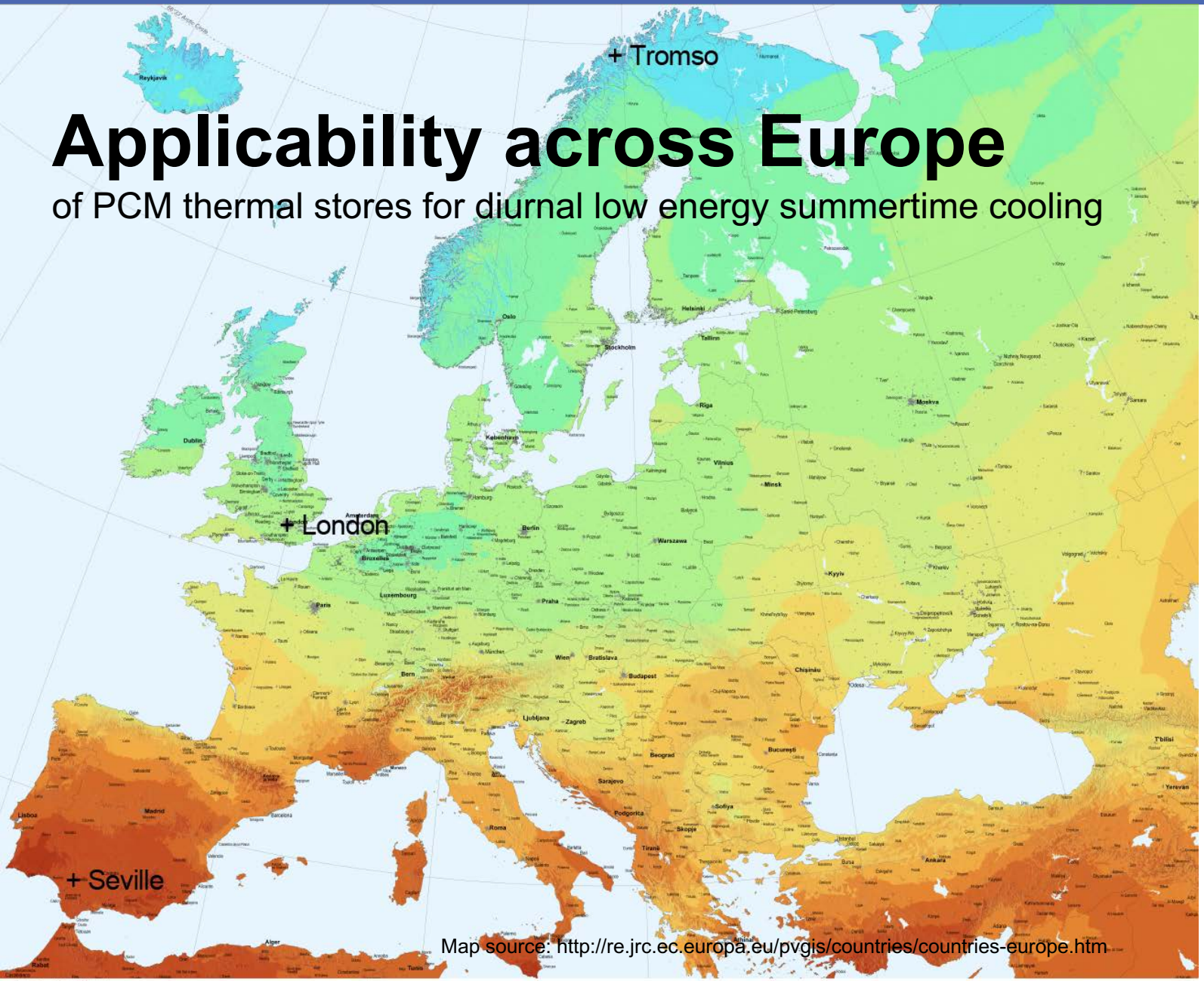
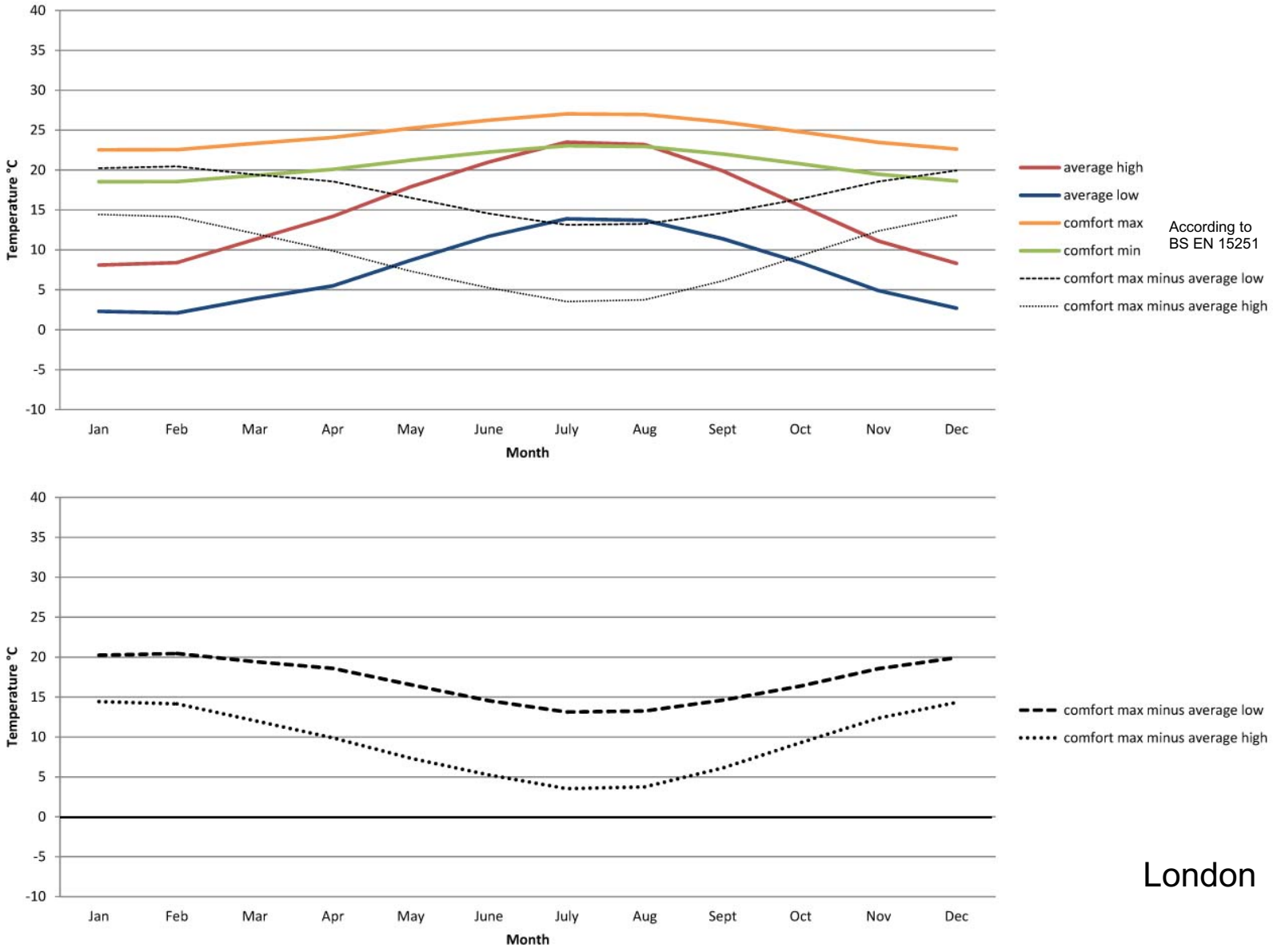
Applicability across Europe

of PCM thermal stores for diurnal low energy summertime cooling



Map source: http://re.jrc.ec.europa.eu/pvgis/countries/countries-europe.htm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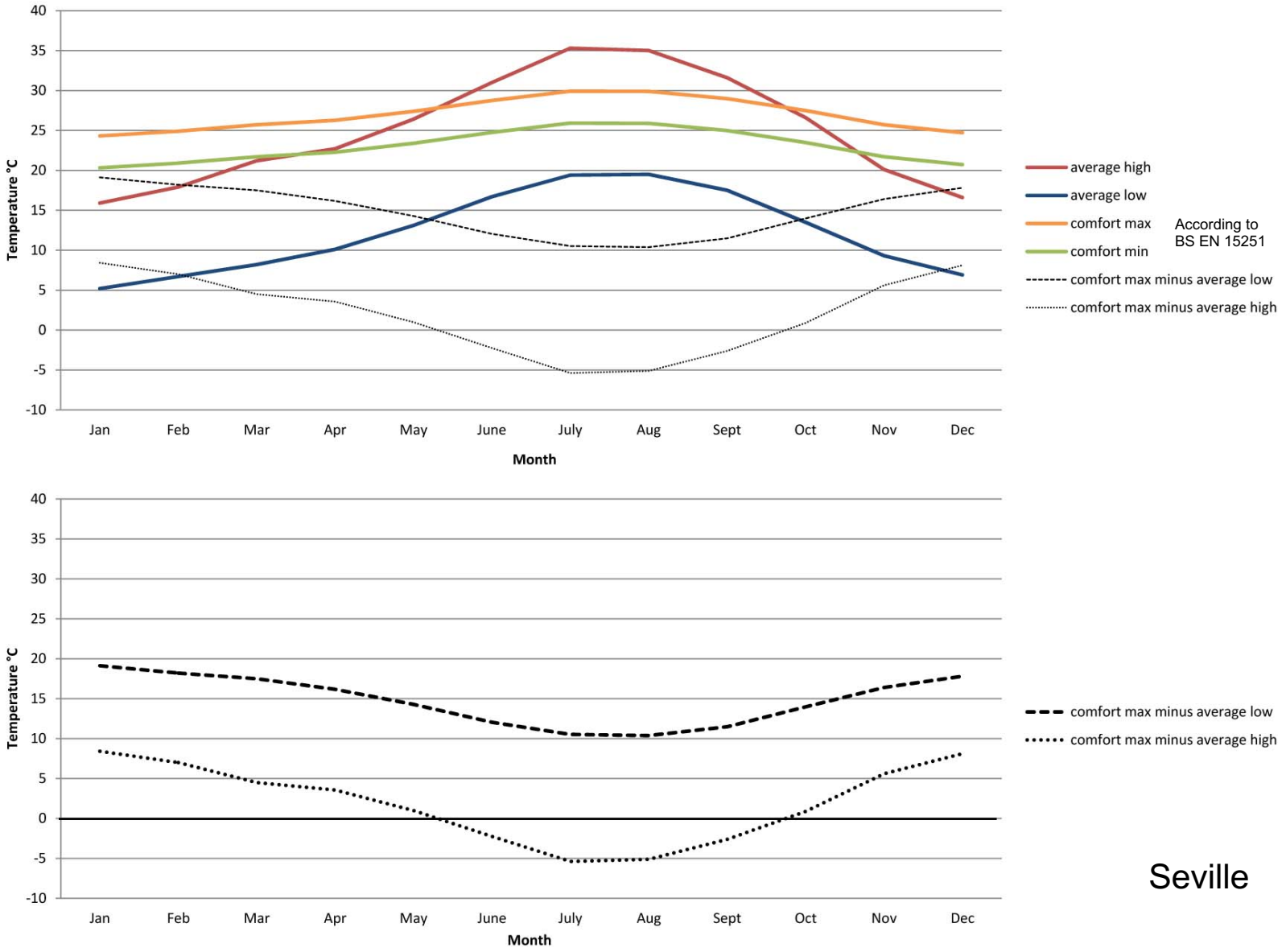
Sept
Oct
Nov
Dec
Month
average high
average low
comfort max
comfort min
comfort max minus average low
comfort max minus average high
According to
BS EN 15251
comfort max minus average low
comfort max minus average high

London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According to BS EN 15251
comfort max minus average low
comfort max minus average high
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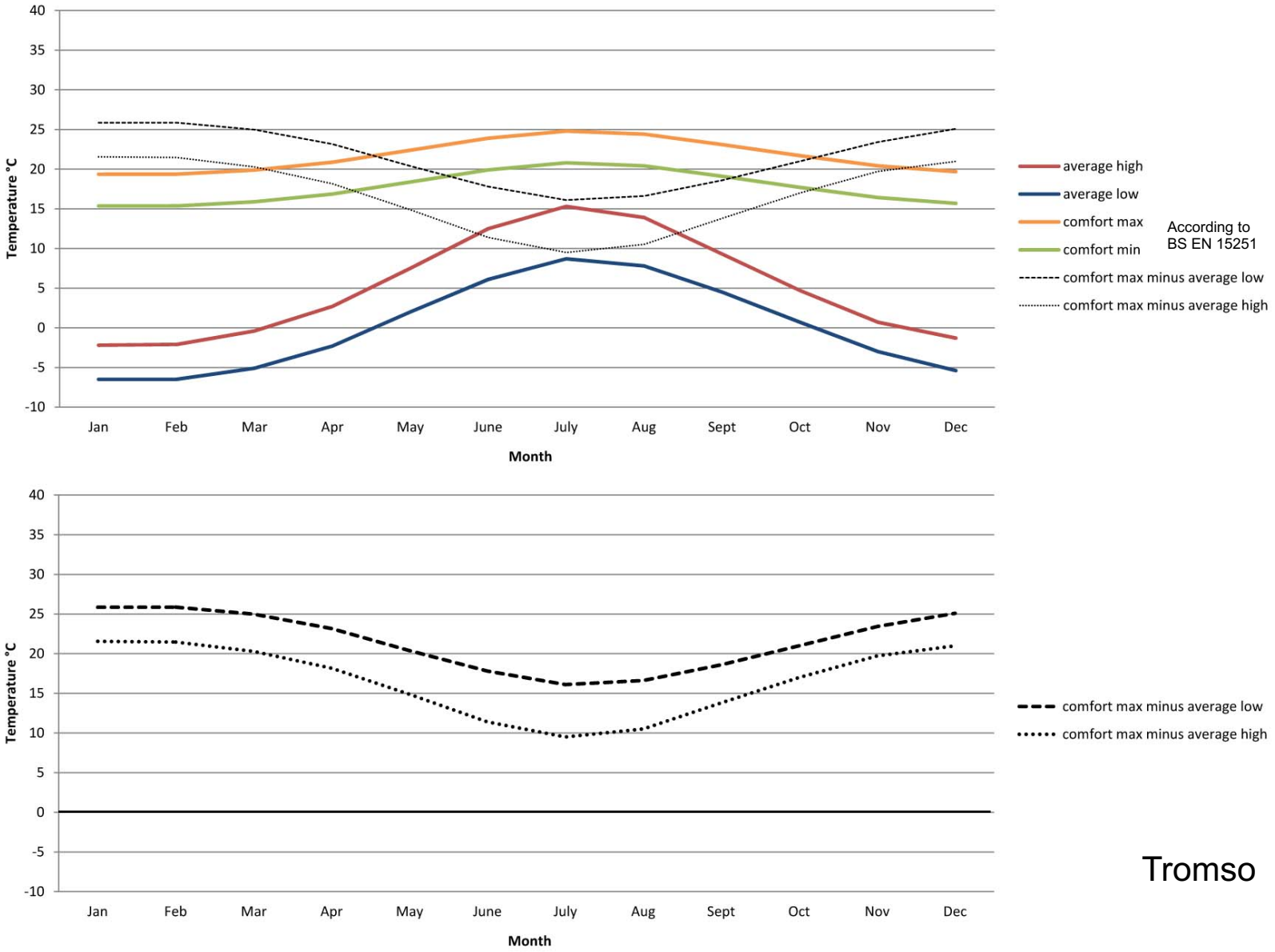
comfort max minus average high

Seville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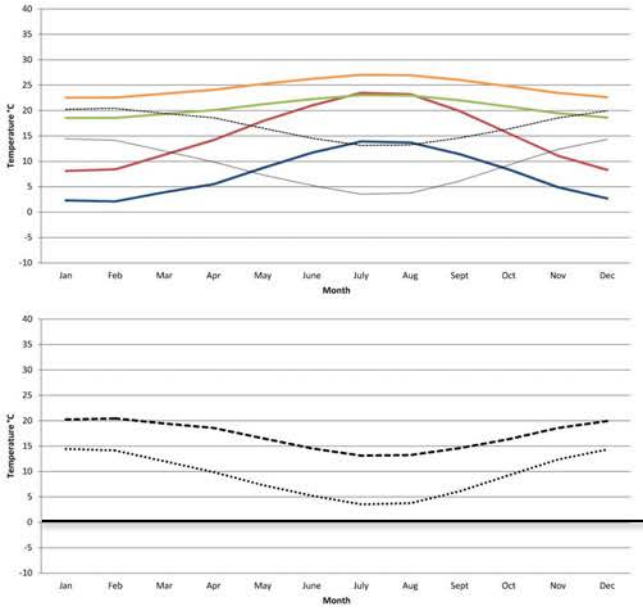
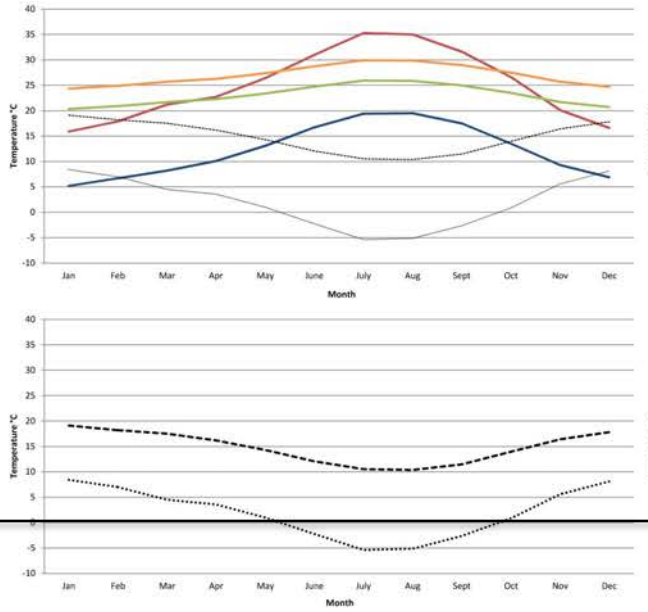
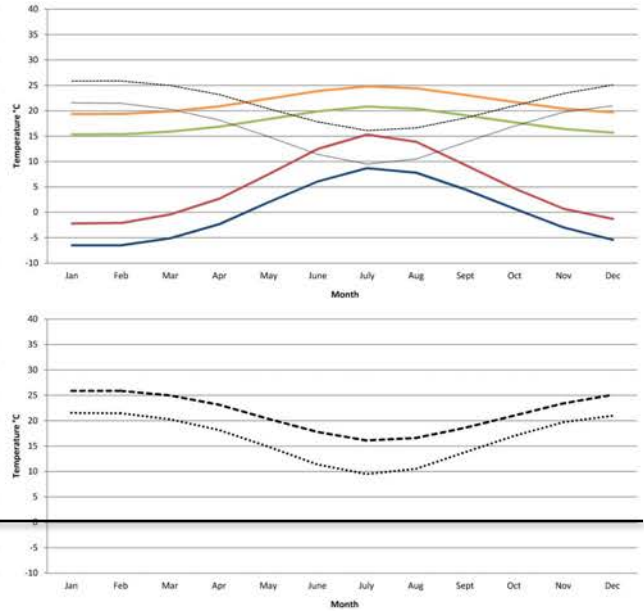
Tromso



London

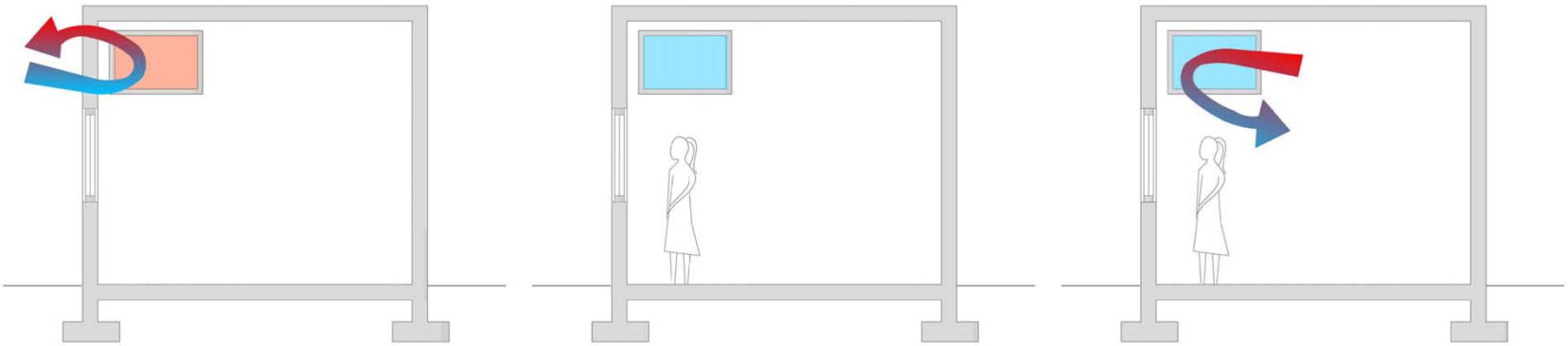


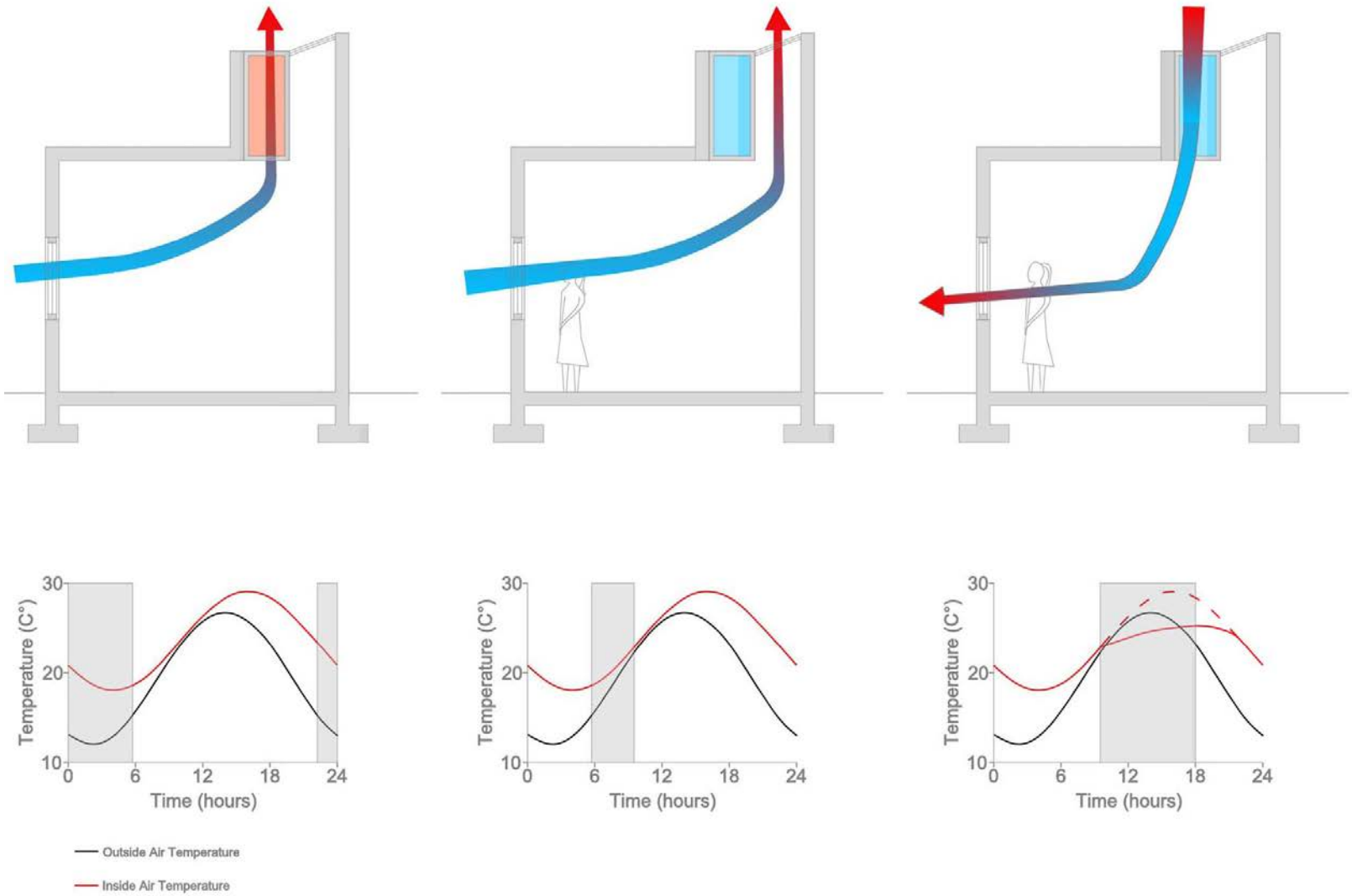
Seville



Tromso

Design approaches




30
20
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Temperature (C°)
0
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12
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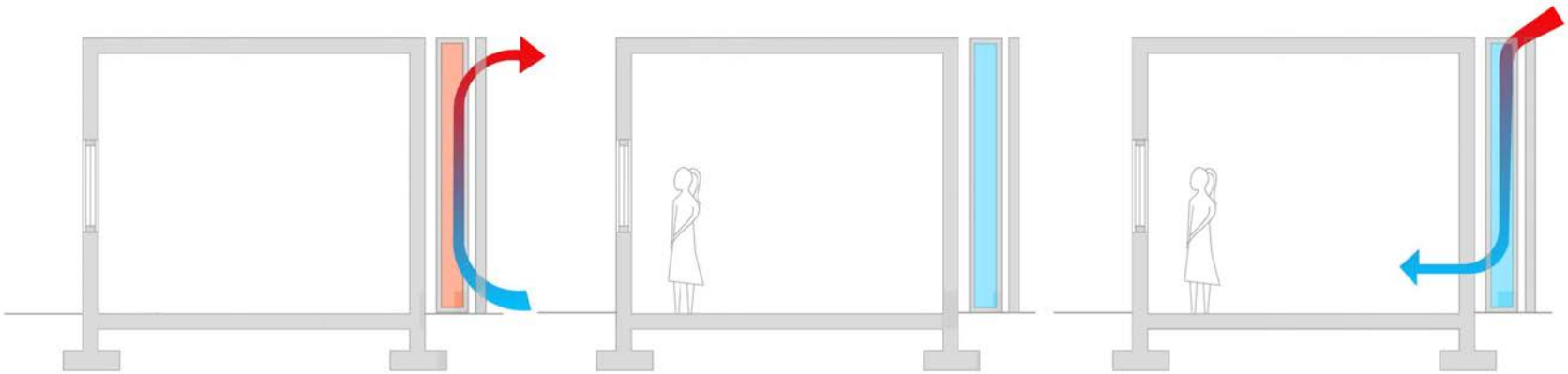
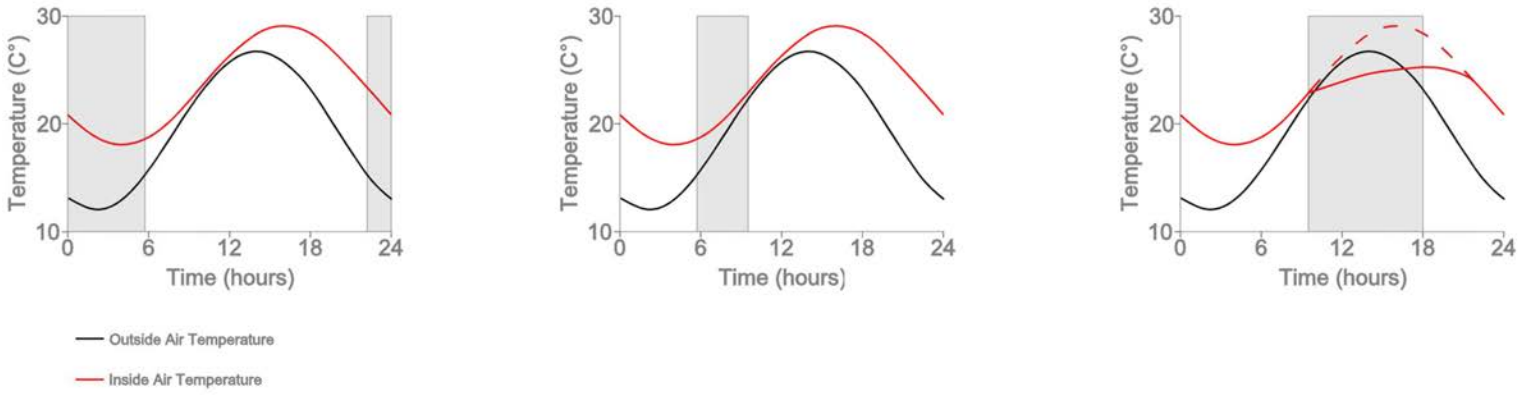
24
Time (hours)
Outside Air Temperature
Inside Air Temperature

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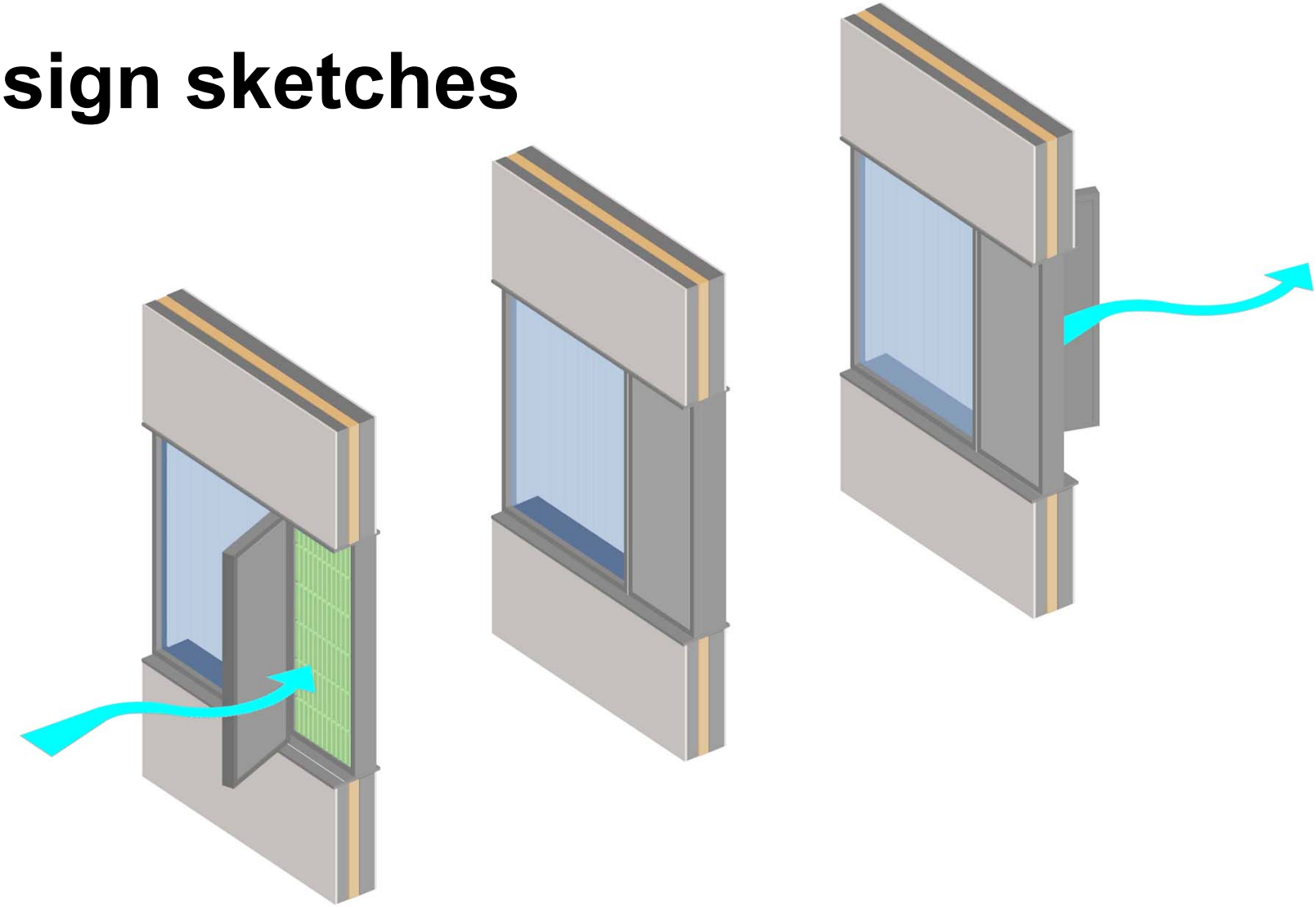
Design sketches



Next steps

- Case study building investigating potential performance of a range of PCM thermal store approaches and elements, using dynamic thermal modelling software to ascertain potential energy-saving benefits.

- Construction and testing of a physical prototype of one of the products developed under the previous points. The prototype will then be installed and tested in a live building.