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Overheating Learning + Intervention

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Overheating risk in flats in UK

- 1 in 6 people in Europe live in a flat
- Flats are particularly vulnerable to overheating – surface to floor area is less than for homes
- High rise flats growing in number – tend to be urban
- We don't understand how people understand their homes



Empowering inhabitants

4 Learning modes:

1. Tacit knowledge
2. Sensory (trigger and feedback)
3. Individual cognitive learning
4. Social learning

In building performance evaluation, we tend only to focus on 2 and 3 for design purposes.

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Key research questions

- To what degree do inhabitants exploit thermal adaptation opportunities available to them from their homes?
- How can the adaptation of best practices for heat mitigation be enhanced?



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The retrofit block

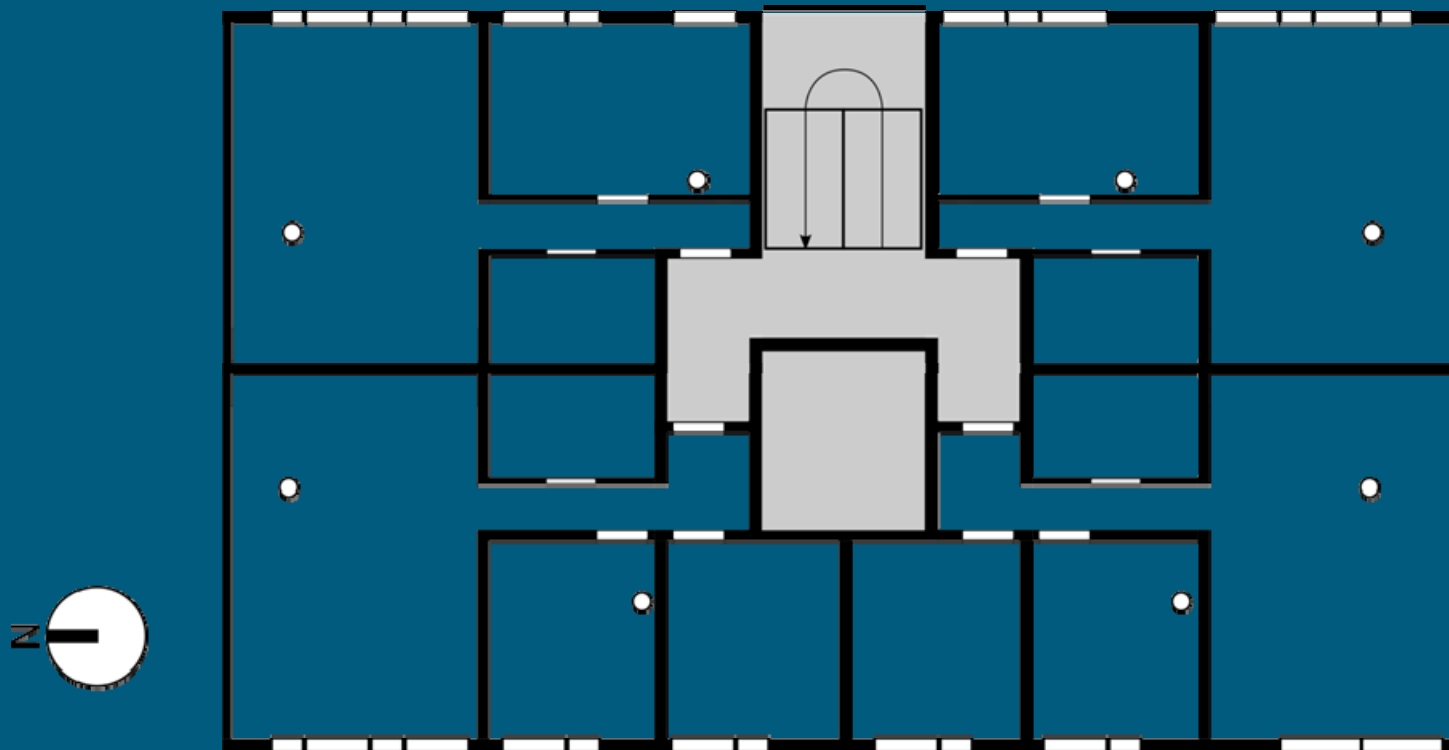
- 1960's block makeover in 2012
- 200 flats questionnaire
- 18 studied in depth
- 1 year BPE from 2013-14
- Deep ethnography
- Action research





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Four single aspect flats



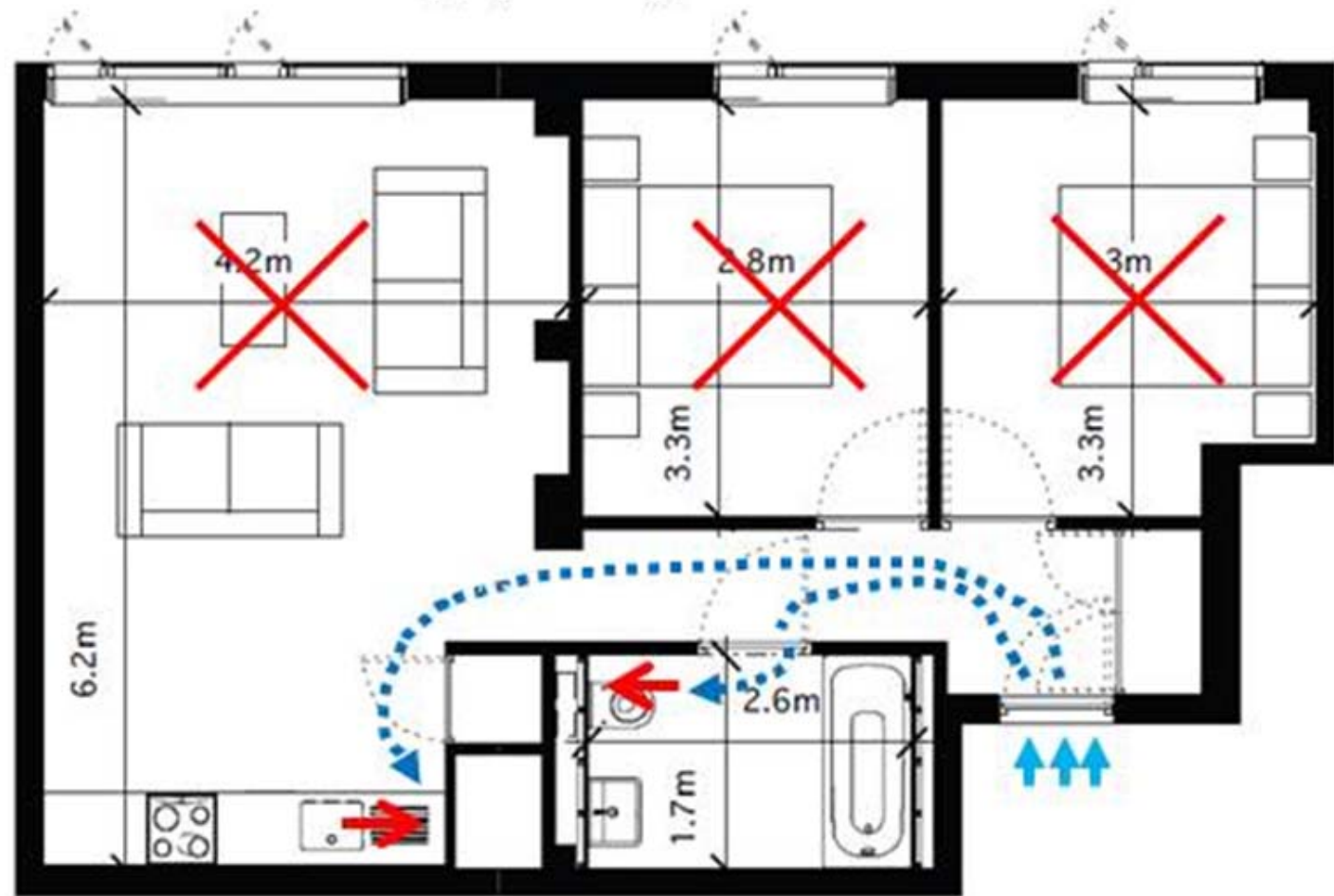


The 'controls' for overheating

- Floor to ceiling glazing with large openable area (20-50%)
- Openings only 100mm width for safety
- Trickle vents (ground floor only)
- Continuous mechanical extract ventilation (wet areas)
- Doors to the main stairwell
- No thermal mass (existing concrete covered with plasterboard)



Saxton MEV - air supply through entrance door undercut

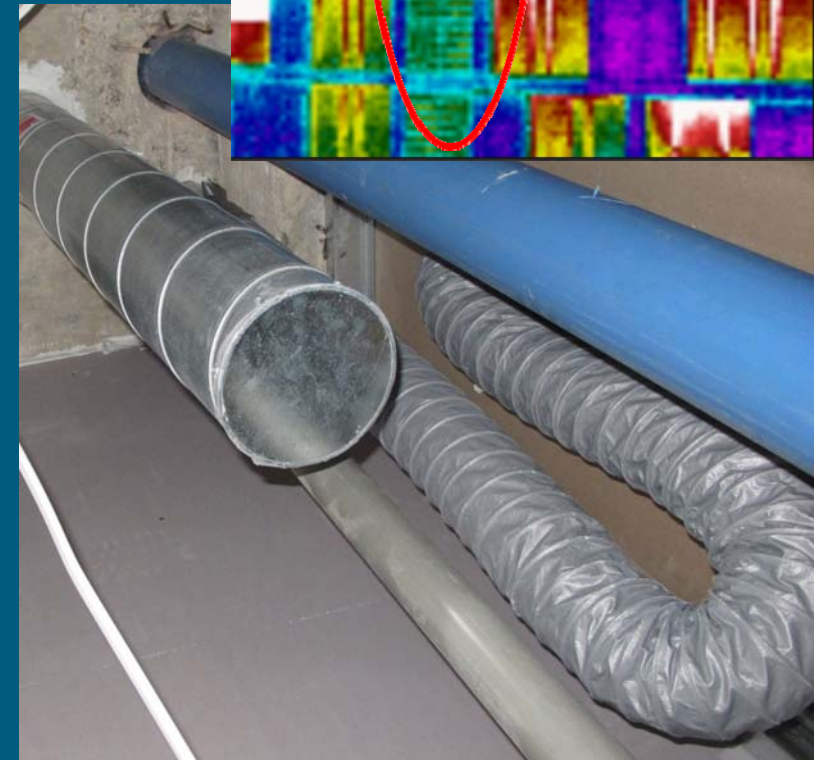
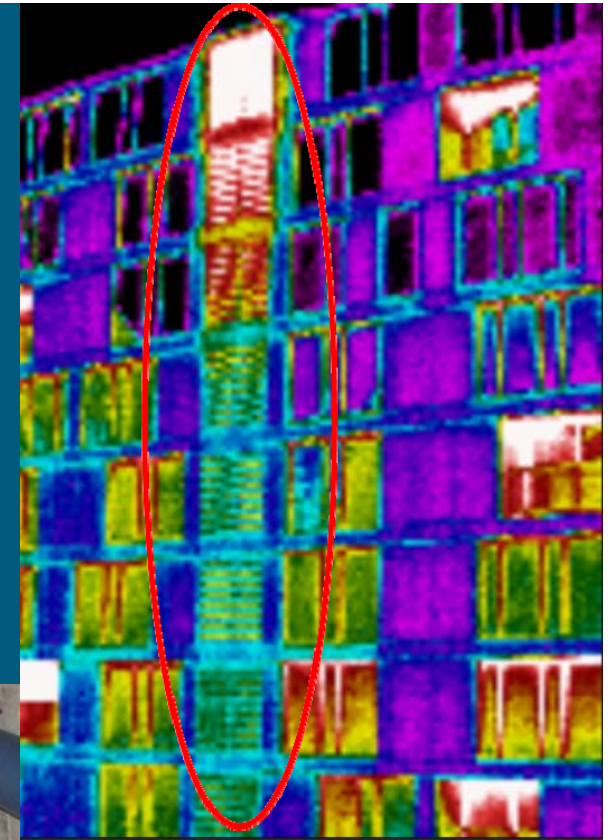


- Model of air movement from supply to extract point
- MEV air extract point
- Air supply through door undercut
- Air supply through trickle vents in windows
- No or little air exchange – so called 'dead zone'



Issues

- Poor MEV installation/noise
- Thermal stratification (4°C)
- Windows swing wildly
- MEV/doorstep draught excluder conflict
- Black asphalt car park on West side of block!
- Overheating in 44% bedrooms





Inhabitant learning in 3 phases

- Overheating experienced
 1. Trigger response = open windows etc
 2. Core learning = testing to get a positive practice
 3. Embedding = talking to others, disseminating, repeating

The guidance offered on 'controls' mitigated against this

Learning about...		Overheating prevention & mitigation practices							Understanding of related energy load
		Trickle vents open	Keeping MEV fans 'on' continuously	Opening windows		Blocking front doors open	Shading windows	Additional fans/air conditioning	
Learning through...				Wide	Trickle				
Tacit knowledge	Prior experience	Varies	No experience	'Yes'	Varies	No experience	Varies	'Yes' from commercial setting/ cars	Previous interest in electricity consumption
Sensory learning	Trigger and feedback	Low air flow not evident	Low air flow not evident; evident noise, condensation removal after shower	Air movement not always evident without cross-ventilation	In hot weather effect not evident	Immediate effect (strong draft – cross-ventilation activated)	Visual effect stronger than cutting off solar radiation	If installed immediate cooling effect	Bills based on: Assumptions – feedback delayed Meter readings – high load visible
Individual Cognitive learning	Home User's Guide	Described (installed on Floor 1)	Type specified; no explanation of impact/ need for	No mention					Specification enables finding manuals (online)
	Reading labels, manuals	Not available	Advice to keep 24/7	Prohibited by manufacturer's label; 10cm gap on latch allowed	Not available		Available	Energy load from manufacturer's label	
	Testing if practice effective, monitoring	Difficult + (installed on Floor 1 only)	Systematic trial & error would show effect			Immediate effect visible via air temp. measurement	Systematic trial & error would show effect	Immediate effect visible via air temp. measurement	Impossible without techn. knowledge & equipment
Social learning	Home Handover Demo. Tour	Varied testimonies		Not intended thus not covered	Varied testimonies	Not intended thus not covered		Not covered	
	Observing others	Practice hardly visible	Practice invisible	Practice visible	Practice invisible	Practice visible		Practice invisible	n/a
	Closed Facebook group	Repeated discussions on overheating mitigation – quality of peer feedback varies							
	Research feedback	Discussed (50% of the sample came to feedback meetings, 40% asked for advice during home visits)							
	Talking to neighbours	Never recalled							



Inhabitant practices

- 30% never used MEV at all – noise/lack of knowledge
- Most used it only for clearing condensation in bathroom
- 46% only opened windows when at home – security
- Home User Guide encouraged windows to stay closed leading to severe overheating in the afternoons
- Response = wedge front door open, throw windows open
- Variety of shading options – living and bedrooms



Inhabitants learning together

- Sensory learning depends on certainty – trumps cognitive advice from guidance
- Guidance on windows/trickle vents was wrong
- Action research intervention resulted in inhabitants starting to use the MEV properly – no trigger point
- Residents Facebook thread on overheating followed
- One resident successfully wedged doors, opened windows wide and MEV on 24/7!

Conclusion – it's all upstream...

- Don't blame the inhabitant – they respond to bad design
- For retrofit – internal shading is a pragmatic solution
- Only 9% used the MEV continuously – needs trigger point and better guidance- offered each time resident changes.
- Inhabitants are very good at learning together and also getting around 'control' issues, providing there are options to do so – good to empower them!
- Focus on design/feedback not inhabitant 'behaviour'



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