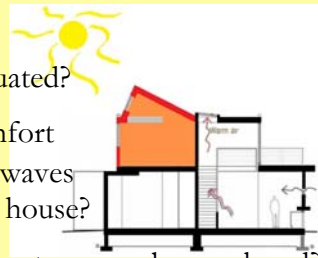


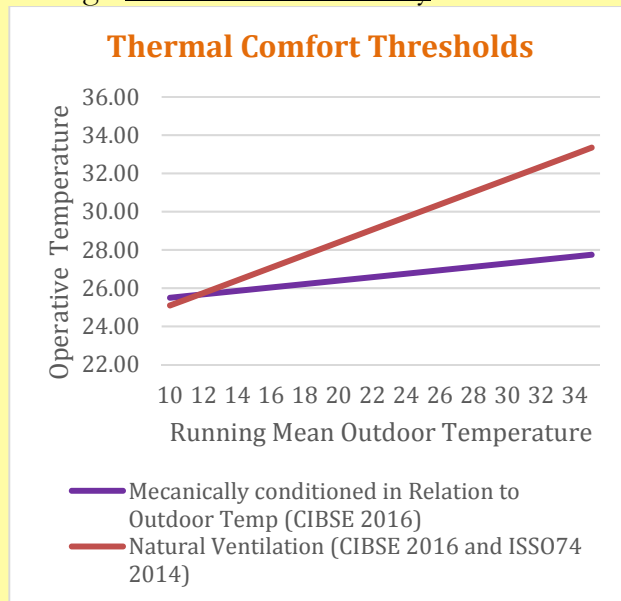
Research Questions

- How can the level of thermal comfort be evaluated?
- How can thermal comfort be improved during heatwaves in overheated zones of a house?
- What passive/hybrid systems can be employed?



Methodology

- Identify overheating in the top-floor of multi-level dwellings built after 2010 through survey and five years monitored indoor temperature.
- Analyse the data of four summer's top-floor temperature for Lochiel Park eight houses.
- Develop a parameter to evaluate dwellings thermal comfort based on Mechanically Conditioned Buildings in Relation to Outdoor Temperature and Adaptive Thermal Comfort through AccuRateSustainability



Results and Conclusions

Analysing the 170 questionnaires shows that:

- At least 50% of surveyed multi-level houses and apartments in Adelaide built after 2010, have overheating in top-floors which makes these zones unusable for residents.

Surveyed Dwelling Types	Total Number	With Overheating		Without Overheating	
		Number	%	Number	%
Multi-level	149	91	61.1	58	38.9
Apartment	19	10	52.6	9	47.4

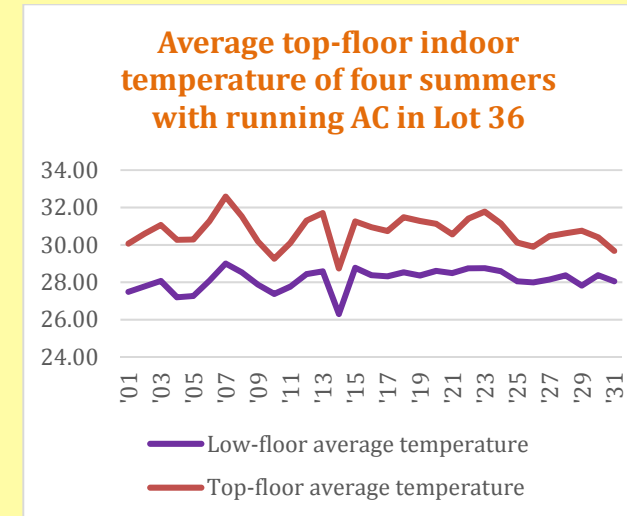
- Increasing star rating from 6 to 7.5 for Adelaide dwellings has significantly developed thermal comfort in low-floors, but not in top-floors.
- 10-point rating scale can accurately show the actual satisfactory level of thermal comfort (1 shows the worst thermal comfort and 10 indicates the best).
- Integrating the 7-point and the 10-point methods is helpful to identify the thermal comfort expectation of people in various climates.
- The acceptable ASHRAE 7-point scale limits apparently does not match the acceptable thermal comfort range for Adelaide residents.

	ASHRAE 7-point thermal sensation scale	10-point scale
Hot	+3	2.3
Warm	+2	5.9
Slightly warm	+1	6.5
Neutral	0	6.9
Slightly cool	-1	7.6
Cool	-2	8.3

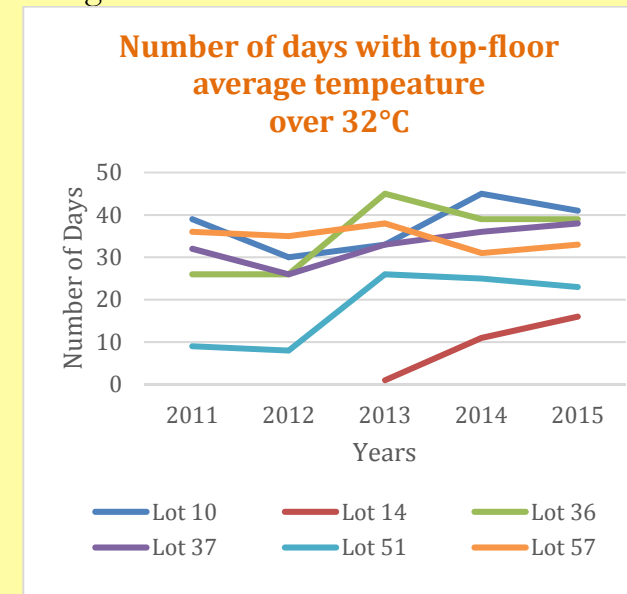
Analysing the four summers' indoor top-floor temperature of eight houses shows that:

- As in conditioned zones the average number of hours with temperature more than 32°C increase or decrease by 30 hours, the unit in 10-point scale.

- Most of the days in a year, the top-floor is warmer than low-floor with a maximum 8 °C difference.



- Top-floor has remarkable temperature fluctuation.
- The number of days in top-floor with average daily temperature over 32° is rising.



- Overheating happens in seven months: Jan, Feb, Mar, Dec, Apr, Nov and Oct according to their number of overheated hours.

- Number of hours over 32°C in attics are about 3-4.5 times more than their corresponding hottest room.

• A new method for evaluating thermal comfort is proposed based on the adaptive thermal comfort method:

Weighted Exceedance Hours	Thermal Comfort Rating
<1	10
1	9
1 < ≤ 1.5	8
1.5 < ≤ 2	7
2 < ≤ 2.5	6
2.5 < ≤ 3	5
3 < ≤ 3.5	4
3.5 < ≤ 4	3
4 < ≤ 5	2
5 < ≤ 6	1

Anticipated impacts

- Introduce a method to evaluate, rate and report the thermal comfort in a home.
- Provide healthier, more liveable and energy-efficient environment

Key statement

Improving thermal comfort in top-floors is a matter of health, energy-efficiency and life quality.

Contact



UniSA Sormeh Sharifi
 PhD Student in the University of South Australia, Master of Architecture
 Principal Supervisor: Prof. Wasim Saman
 Co-Supervisors: Dr Stephen Berry, Dr Alemu T. Alemu
Sormeh.sharifi@mymail.unisa.edu.au



