



*5th Healthy Cities: Working
Together to Achieve Liveable Cities*
Conference

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Architecture, building and planning

*Healthy cities, climate change and the
role of high albedo and green
infrastructure*

Introduction

- The health of people in cities is impacted by many factors – smog, heat, depression, isolation, inactivity, etc. and these are exacerbated by predicted climate change
- Our research has been specifically looking at the impact of green infrastructure and lighter materials can have on some of these

Specifically

- The Urban Heat Island effect – Melbourne often 4 degrees hotter CBD than rural areas
- Which in 2009 resulted in over 350 excess deaths
- We can address UHI with vegetation and removing the reason the cities warm up

Other researchers have found

- Increasing albedo reduced UHI and energy costs for cooling
- Increasing street trees reduces UHI and energy costs for cooling
- Using green roofs reduces UHI and energy costs for heating and cooling
- Giving people access to more trees and green space reduces physical and psychological disorders

Our questions

- What impact does increasing material albedo (more reflection of solar energy)
- What impact do urban trees have
- What impact does a green roof have
- Are there other benefits – energy savings?
- Can we create a model that helps us use this for planning and design decision making?



When I say 'we'

Researchers:

Dr Dominique Hes (ABP)

Dr Lu Aye (MSEng)

Dr Nicholas Williams
(MSLE)

Dr Stephen Livesley
(MSLE)

RF – Chris Jensen (ABP)

RA – Xavier Cadorel
(ABP)

Industry partners:

City of Melbourne

EPA coatings – durabond

Sky Cool

Thermoshield

DULUX

DSE

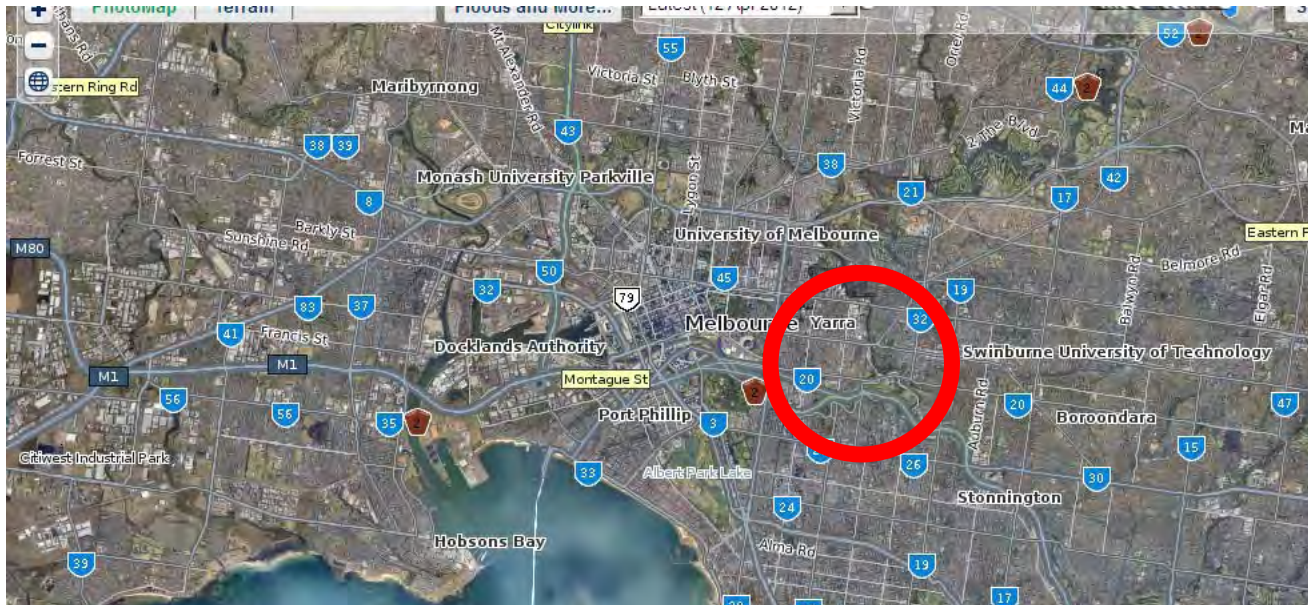
NGIA – Nursery Growers
Industry association

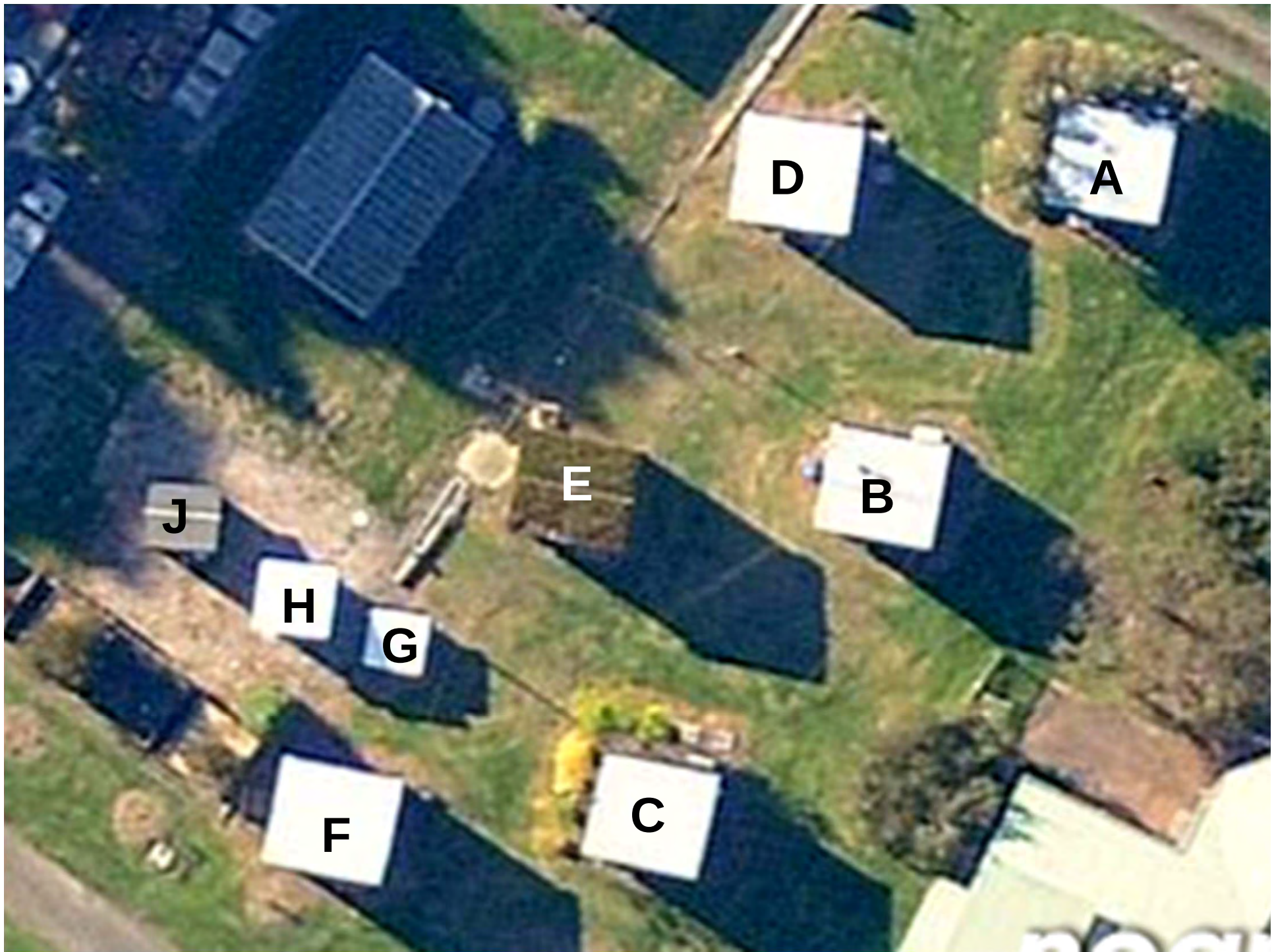


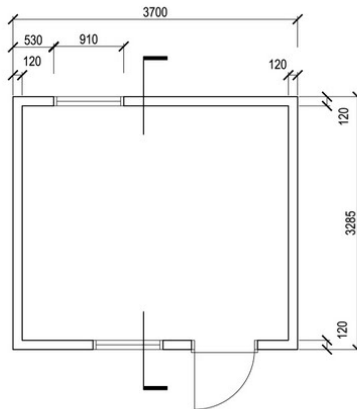
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The site

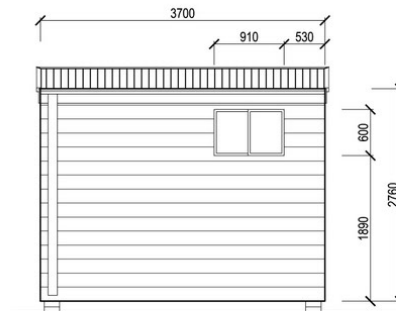
to Achieve Liveable Cities Conference



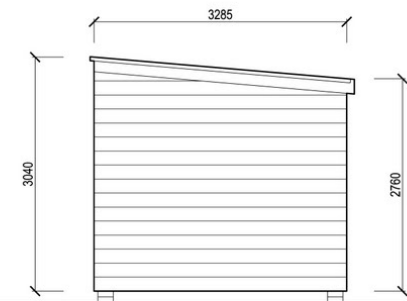




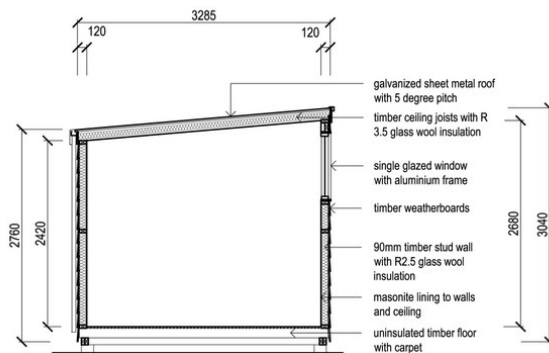
PLAN SCALE 1:50



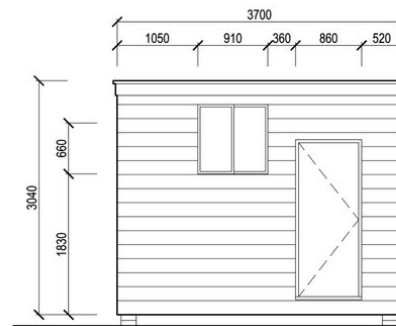
NORTH ELEVATION SCALE 1:50



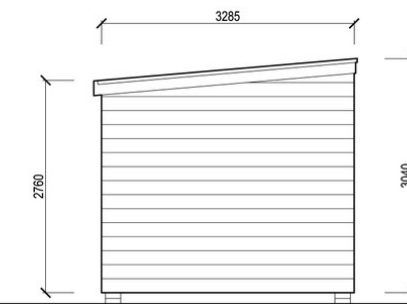
EAST ELEVATION SCALE 1:50



SECTION SCALE 1:50



SOUTH ELEVATION SCALE 1:50

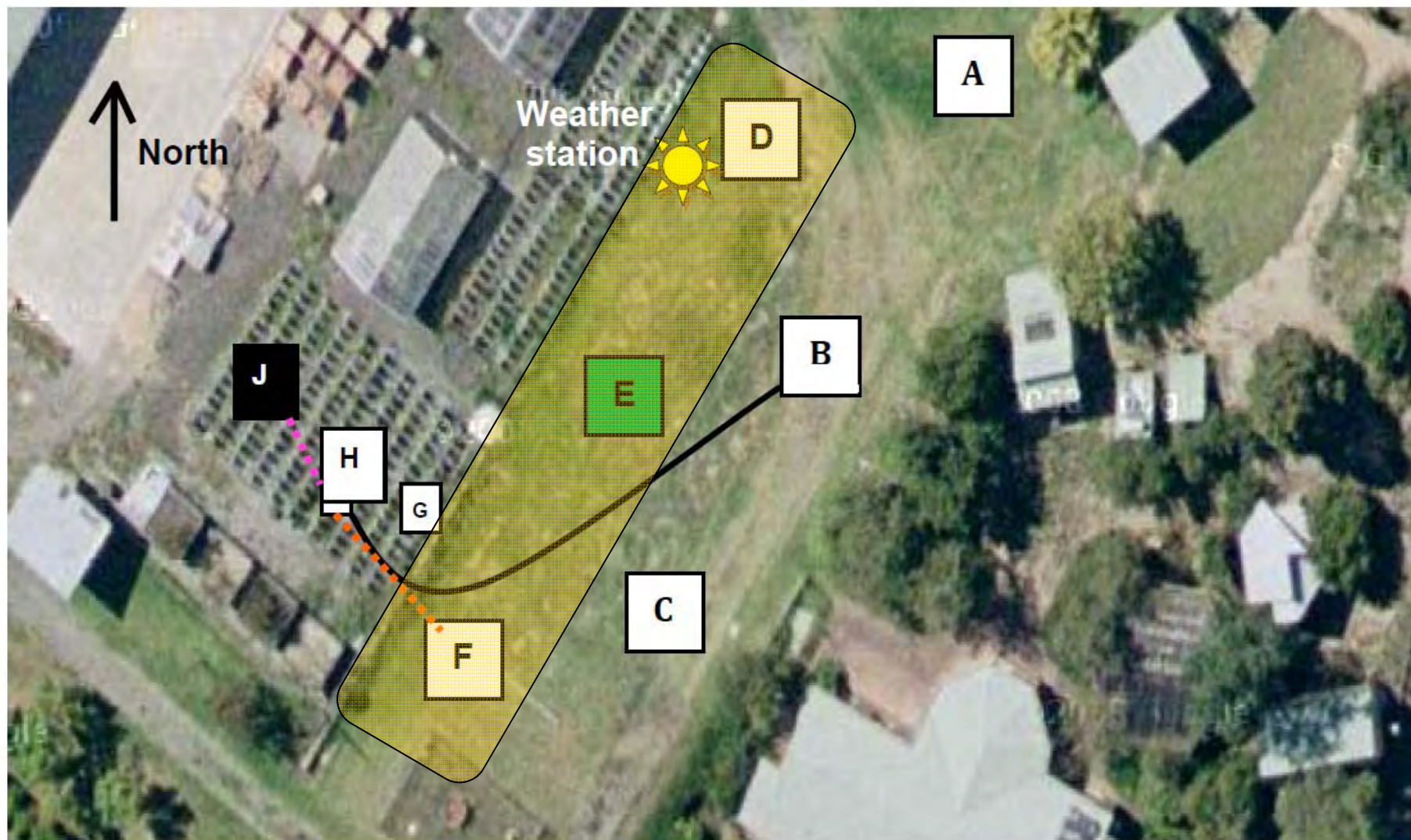


WEST ELEVATION SCALE 1:50



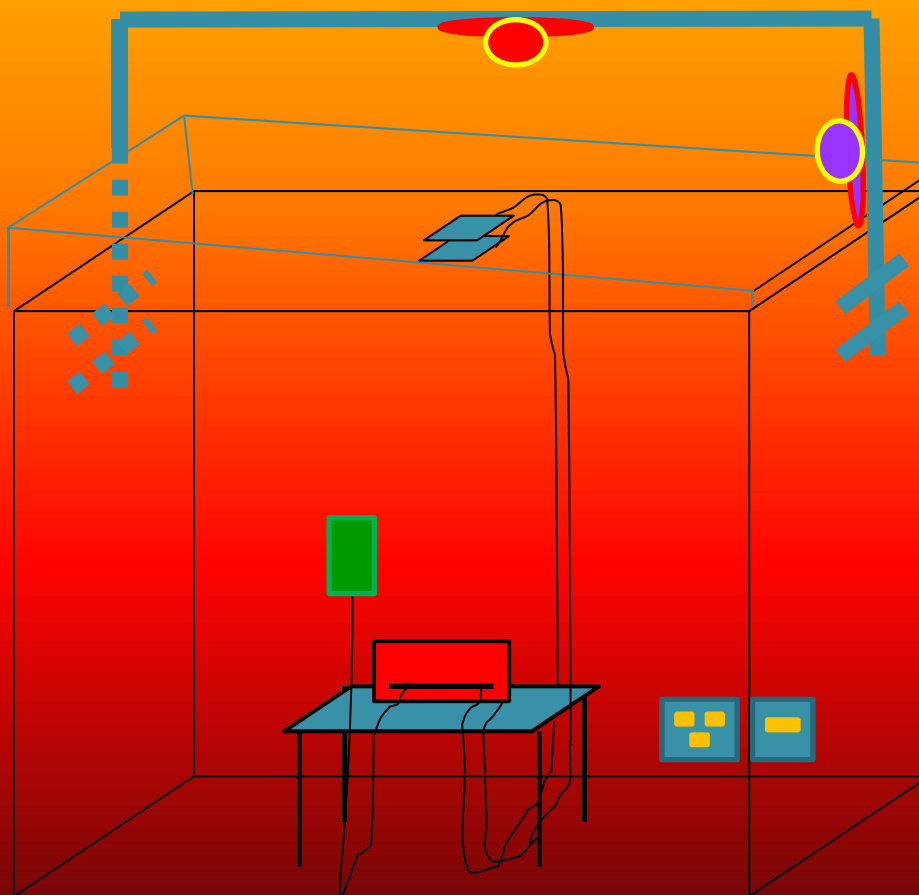
High albedo (light coloured) and green roof retrofits



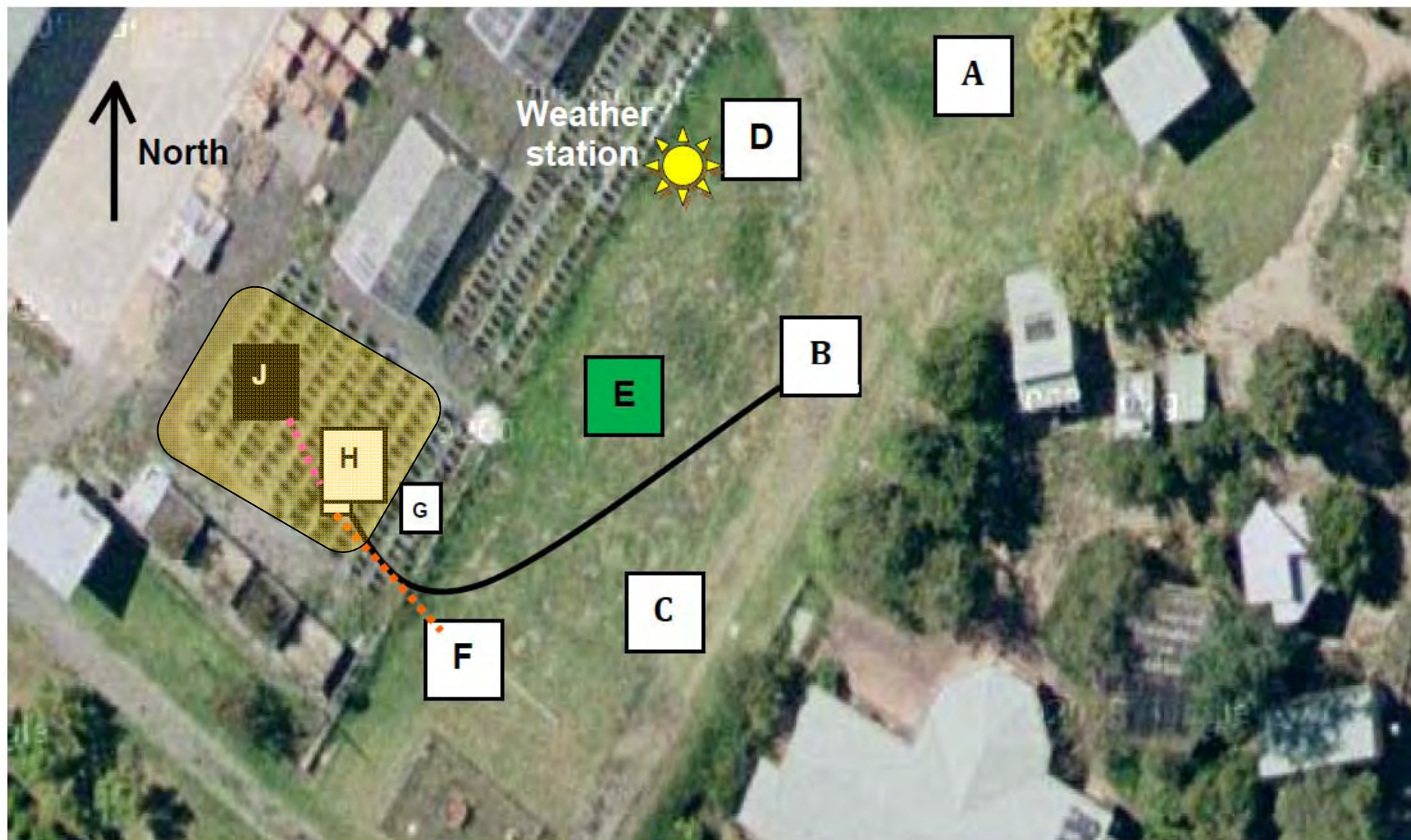


Instruments

Pyranometer



Building E







healthy
cities
CONFERENCE

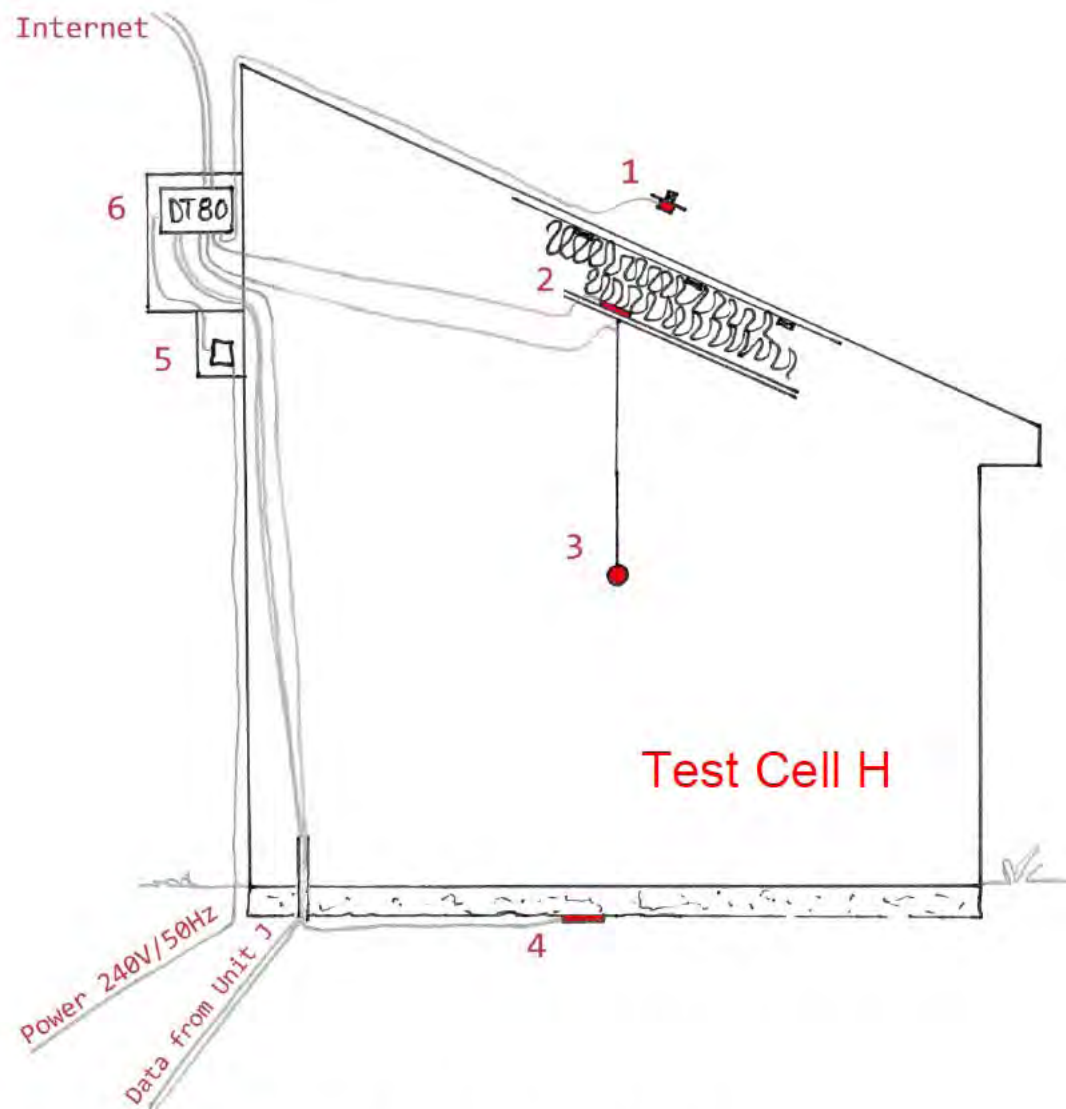
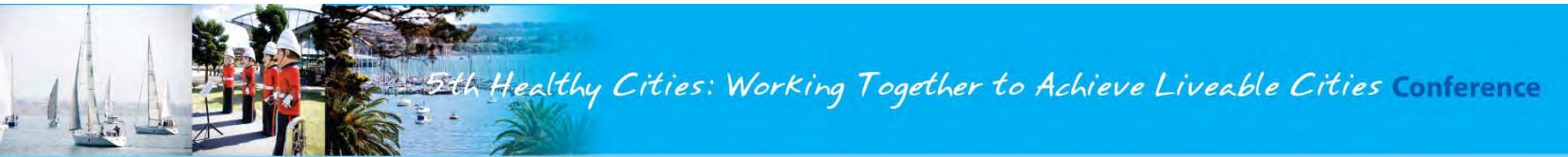
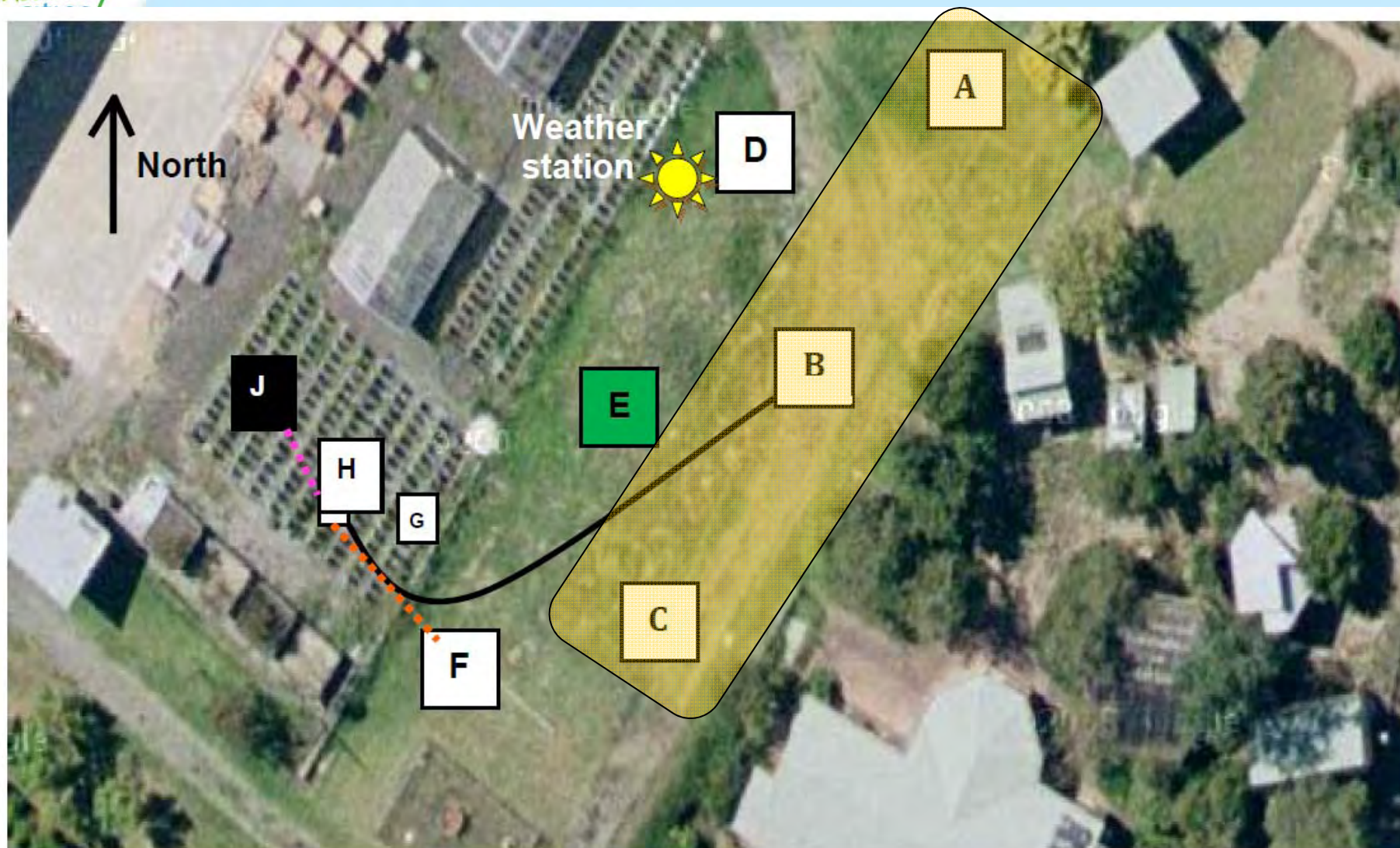


Figure 19 : Cross section of Test Cell H with monitoring instruments

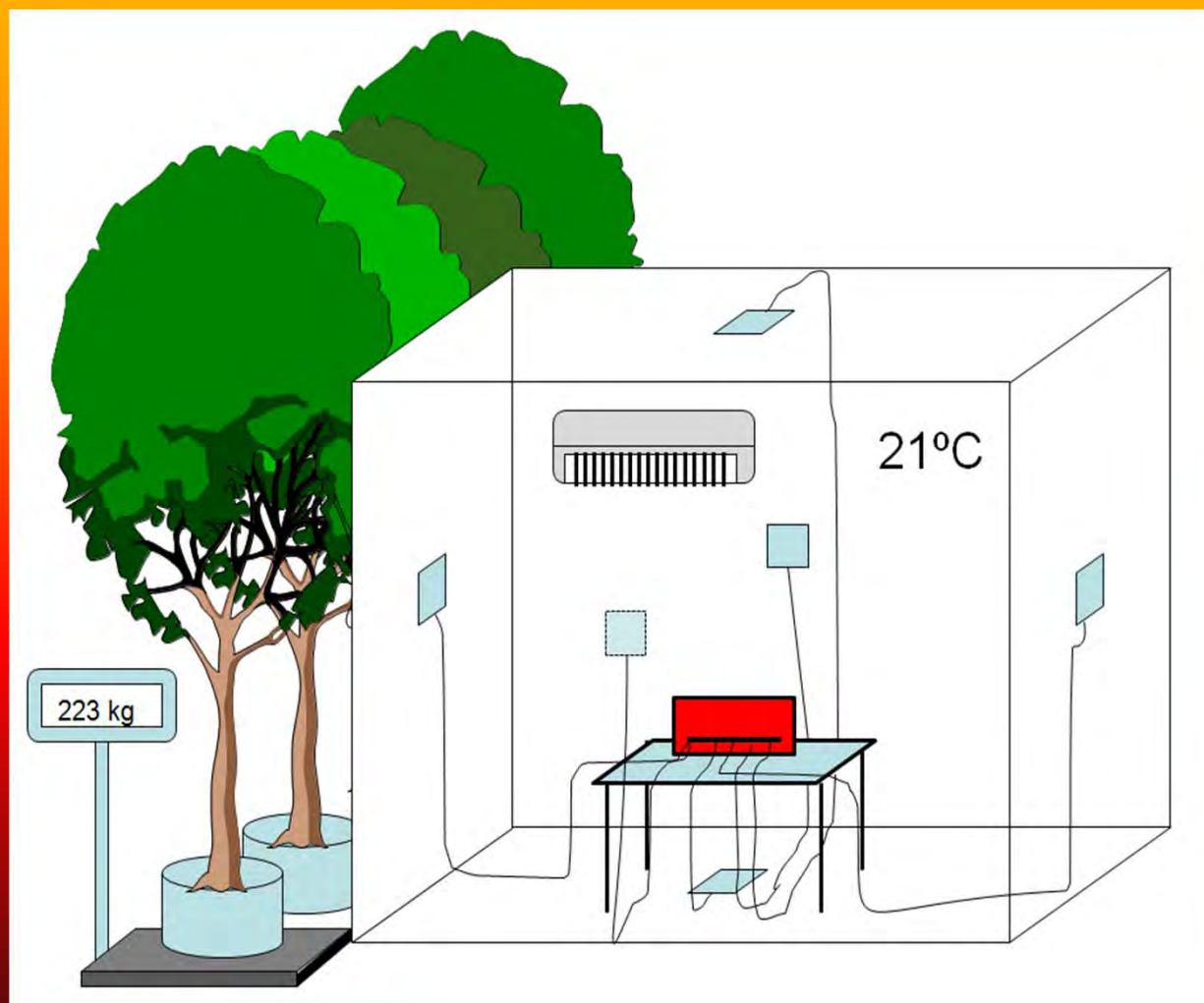


The trees





Instruments





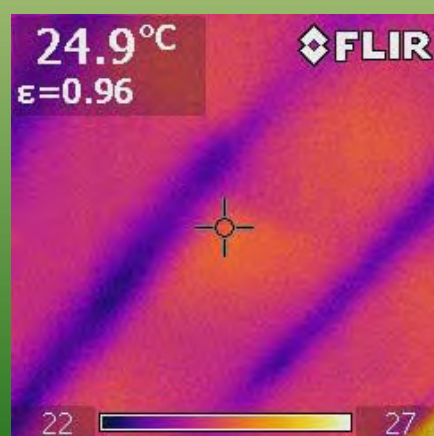
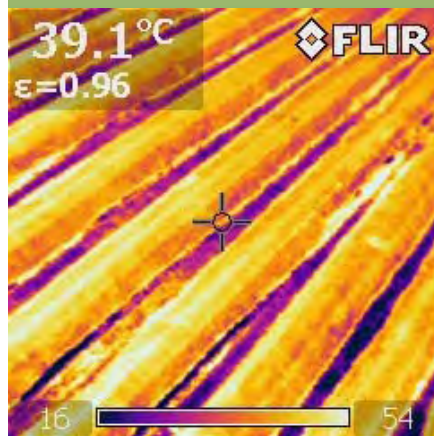
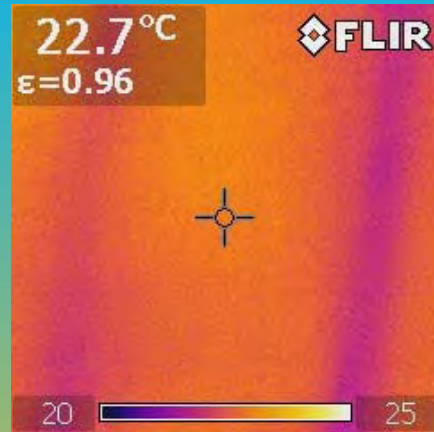
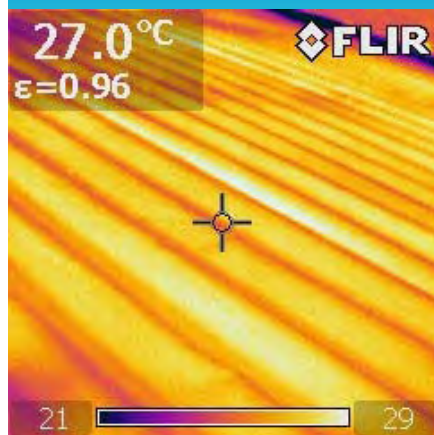
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Results

High albedo retrofit

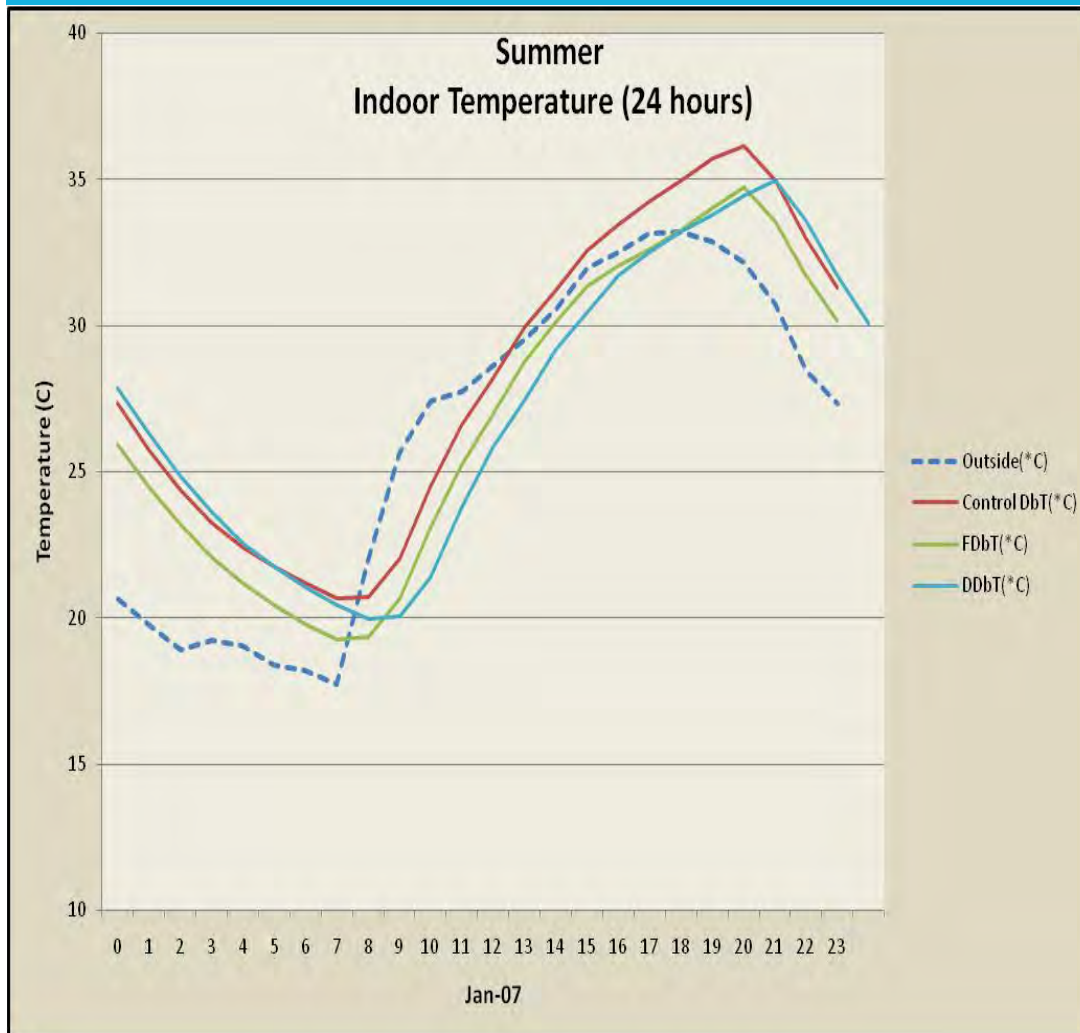


Less heat comes through the ceiling



Internal temperatures
were up to
4 degrees cooler

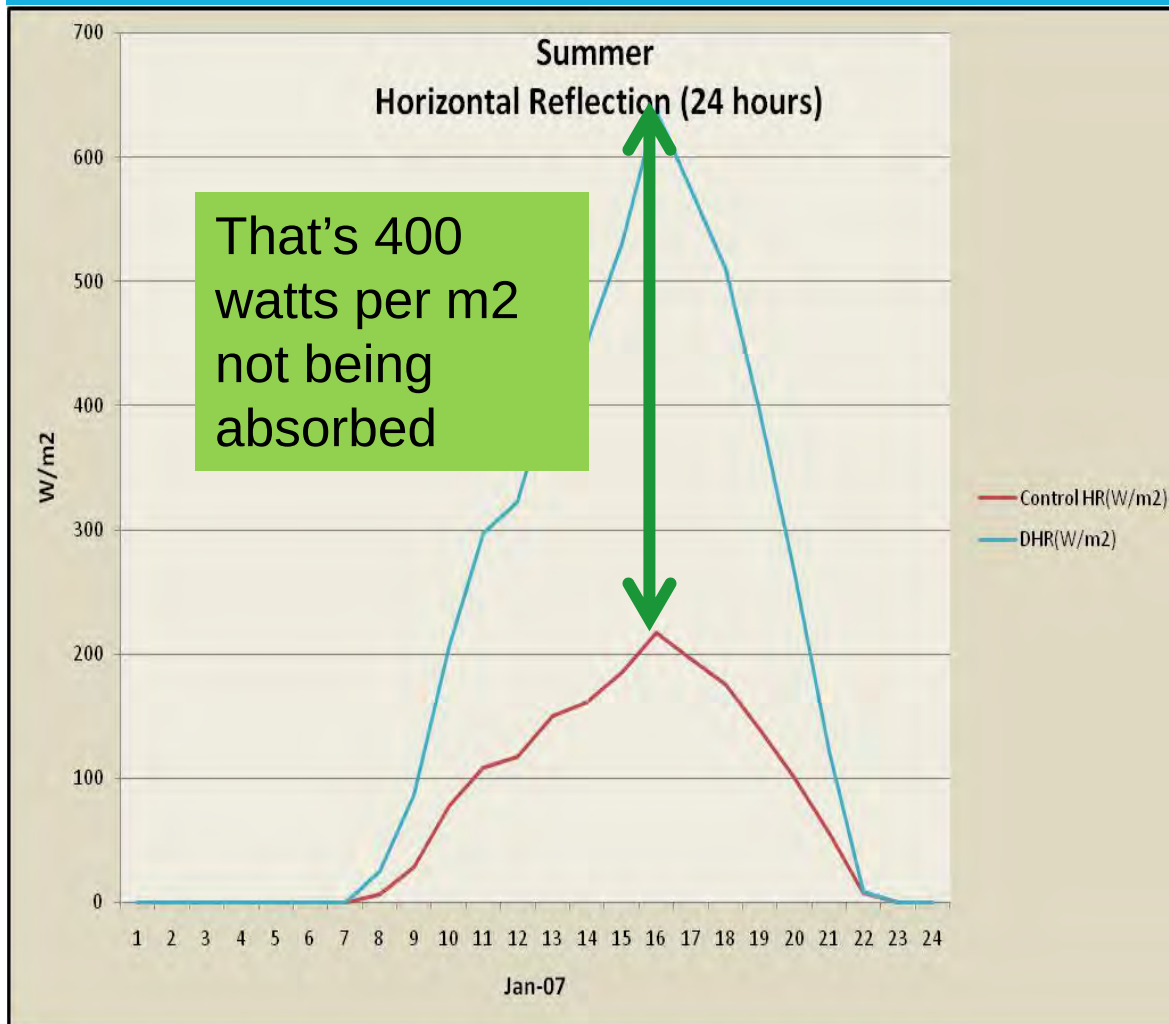
Less heat comes through the ceiling



4 degrees
Cooler

Less heat stress
Less energy costs

Less heat is trapped by the roof



30 degrees
Cooler

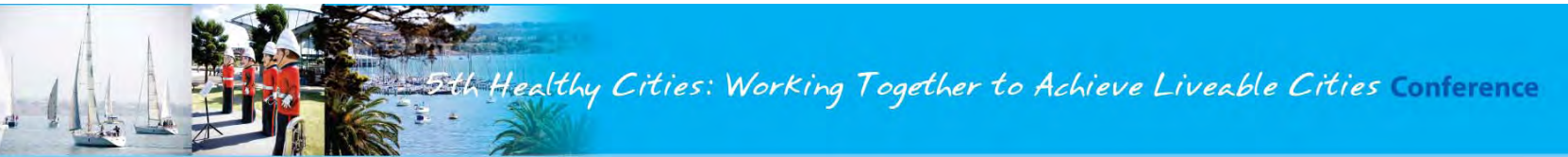
Less contribution
To UHI
Less heat stress



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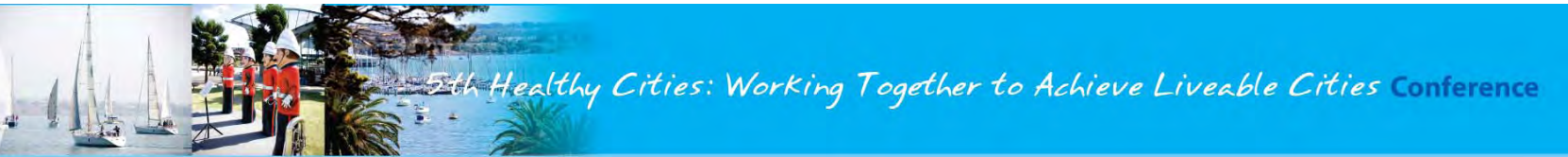
Results

Green roof retrofit



Preliminary Results

- Up to 4 degrees cooler in summer
- Up to 2 degrees warmer in winter
- On a large building on the site 48% air-conditioning savings for the space under the green roof



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Preliminary Results – Cont.

- No radiation of heat off the roof...
- Yet no heat through the roof....
- And it only gets to ambient... WHY?
- Evapotranspiration, insulation, plants, water and soil



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So green roofs=

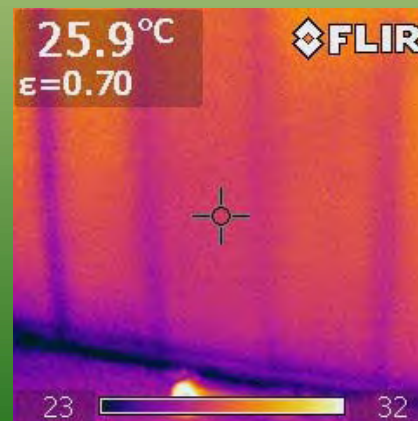
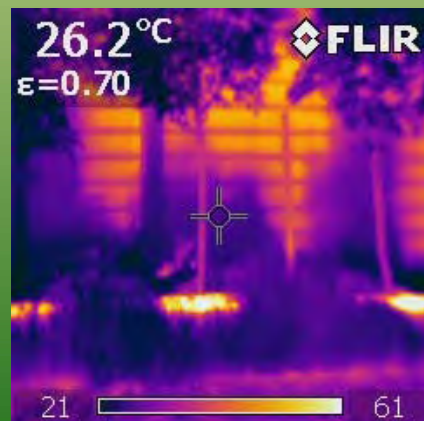
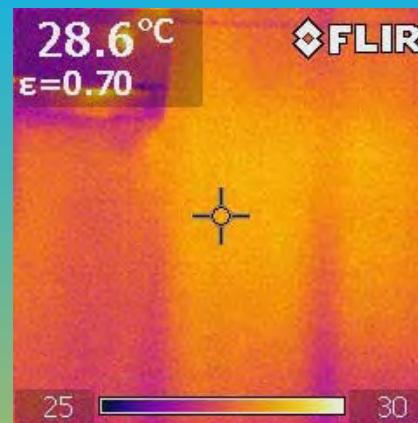
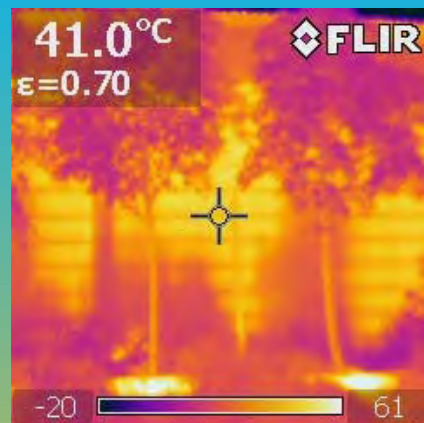
- Less contribution to UHI
- Less energy costs
- Create a better microclimate
- Potentially create amenity – Biophilia



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Results

Trees



Up to 10 degrees
less heat build up
through the walls

36% decrease in
Thermal load

At very little water cost



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So trees shading houses =

- Less contribution to UHI
- Less energy costs
- Create a better microclimate
- Create amenity – Biophilia

So to conclude

- Higher albedo roofs create a healthier city
- Green roofs create a healthier city
- Trees create a healthier city



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And the greatest of these is

Trees, to create the impact of 7% increase in trees in Melbourne, you would need to reduce 48% of the albedo from grey to white

Thank you