

Condensation in the built fabric – *so what?*

Dr Tim Law, Architectural Scientist

ARCHSCIENCES

Architectural Design + Building Sciences

Housing Minister under attack over claims toxic mould threatens tenants' health

Updated 21 Aug 2013, 3:22pm

A Government backbencher has raised concerns that Housing Tasmania homes are riddled with toxic mould, saying the problem is heading towards epidemic proportions.

Labor MP Brenton Best is maintaining his attack on Greens government colleague and Human Services Minister, Cassy O'Connor, begun in Parliament yesterday, that she is failing Housing Tasmania tenants.

He says inadequate heating of the public housing is exposing tenants to dangerous black mould, which he says causes significant health problems, especially for pregnant women.

"It can lead to birth defects or miscarriage in some cases," he said.

Cassy O'Connor has defended her record and says Housing Tasmania is dealing with the issue, with a limited budget.

The Opposition Leader Will Hodgman says open sniping between government members is not healthy.

"Doesn't this just highlight Premier, how chaotic and dysfunctional your Labor-Green experiment really is?" he said.



PHOTO: [Human Services Minister Cassy O'Connor has defended heating for Housing Tasmania tenants](#) (ABC News)

RELATED STORY: [Labor MP Brenton Best targets the Greens again](#)

MAP: [TAS](#)

'Potentially deadly mould' in Royal Hobart Hospital demountables making workers sick, Labor claims

By [Rosemary Bolger](#)

Updated 26 Apr 2016, 1:28pm

Construction workers have developed respiratory illnesses after being exposed to "potentially deadly mould" at the Royal Hobart Hospital, the State Opposition has alleged.

Builders at the hospital have been putting together a demountable building as part of construction work at the site.

The completion of the demountable has been plagued by delays after mould was discovered in at least 18 out of the 64 modules.

The \$22 million building is designed to house patients while a major hospital redevelopment continues, but the building is yet to be declared fit for purpose.

Opposition Leader Bryan Green has now claimed in State Parliament an "illness cluster" has been identified among builders working on the demountable.

"These workers are now suffering respiratory conditions because you allowed them to be exposed to potentially deadly mould," he said.



PHOTO: Mould has been found in many of the Royal Hobart Hospital demountables. (Supplied)

RELATED STORY: [Builders knew about mould at Hobart hospital, carpenter says](#)

MAP: [TAS](#)

Key points:

- Labor claims mould "illness cluster" at hospital
- Health Minister not aware of allegations
- Roof and mould problems were raised in early April

Mould at Dunalley Primary School delays start to term

By Pablo Vinales

Posted 18 Jul 2016, 5:54pm

Concerns for the Dunalley Primary School on the state's east coast continue to grow as mouldy buildings delay the return of students from holidays.

The mould has forced the school to postpone classes by two days, and lessons for many of the students will be held in the school gym and kitchen.

Twice this year the [new buildings have been flooded in downpours](#).

In January 2013, it was destroyed when [a devastating bushfires swept through the Tasman Peninsula](#).

Robyn Kim, whose granddaughter goes to the school, said she was worried about her grandchild's health.

"Even though they're saying that mould spores are not a huge risk and will not cause serious illness with most kids, that's not good enough for me," she said.

"I would like to see, which I've asked them for a clinic set up, if kids have had the nagging cough, sinus problems etc, have they been exacerbated by the mould? Has that caused any problems?"

"These kids have been through enough. They need to know or they need support and parents need support to get through all of this, they've been taken out of they're school again."



PHOTO: [The Dunalley Primary School is off limits while mould in classrooms is remedied.](#) (ABC News: Pablo Vinales)

RELATED STORY: [Mould forces Tasmanian students into community buildings](#)

MAP: [Dunalley 7177](#)



PHOTO: [Robyn Kim is worried about the effect of the mould on her granddaughter's health.](#) (ABC News: Pablo Vinales)

Mould at Dunalley Primary School delays start to term (18 Jul 2016)

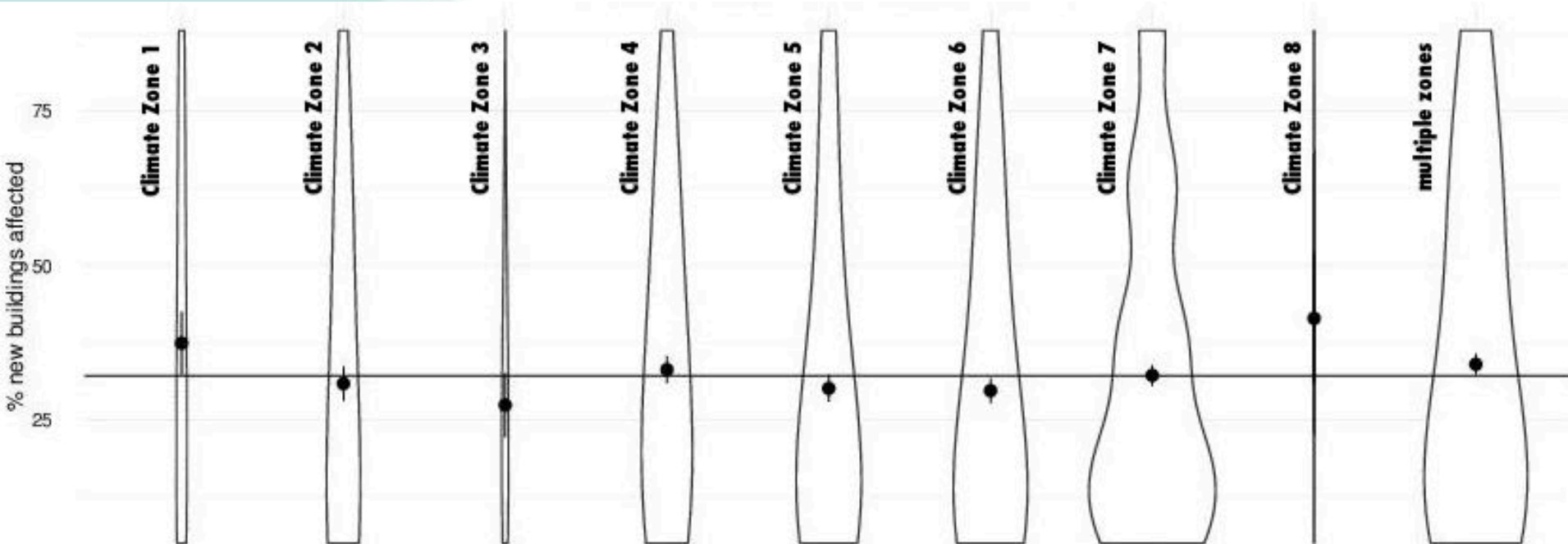
<http://www.abc.net.au/news/2016-07-18/mould-at-dunalley-primary-school-delays-start-to-term/7638938>



ABCB Condensation Survey (2015-16)

What do you believe is the overall proportion of new residential buildings (both houses and apartments) affected by condensation?

(10% or less; 11% - 25%; 26% - 50%; 51% - 75%; 76% - 100%; Unsure)





2012 House in Launceston





Investigation of Destructive Condensation in Australian Cool-temperate Buildings

Department of Justice Tasmania

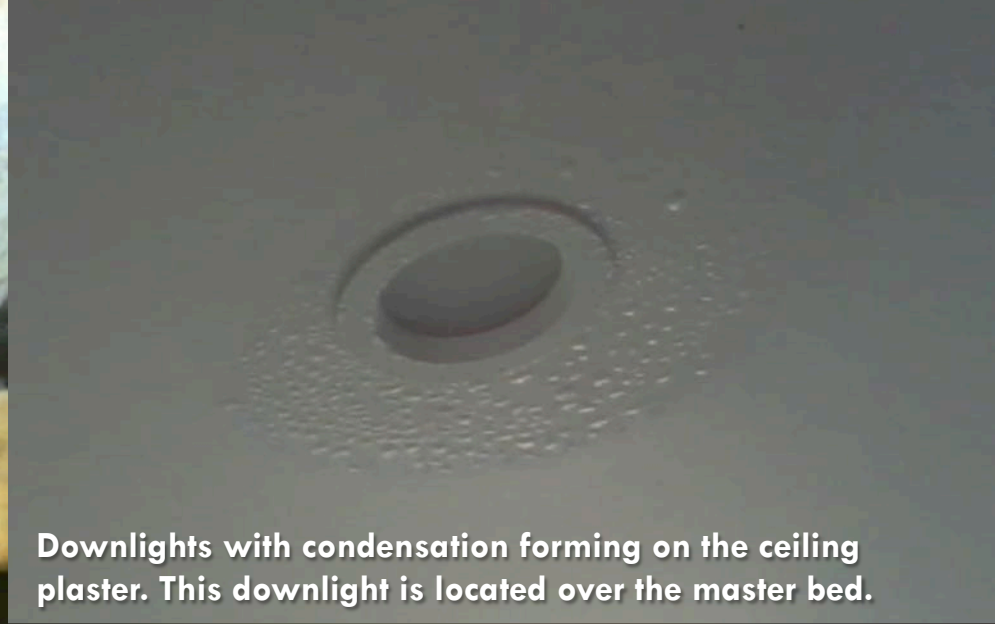
Dr Mark Dewsbury (CI); Dr Tim Law; Dr Alan Henderson; Mr A Livingston; Mr D Webster



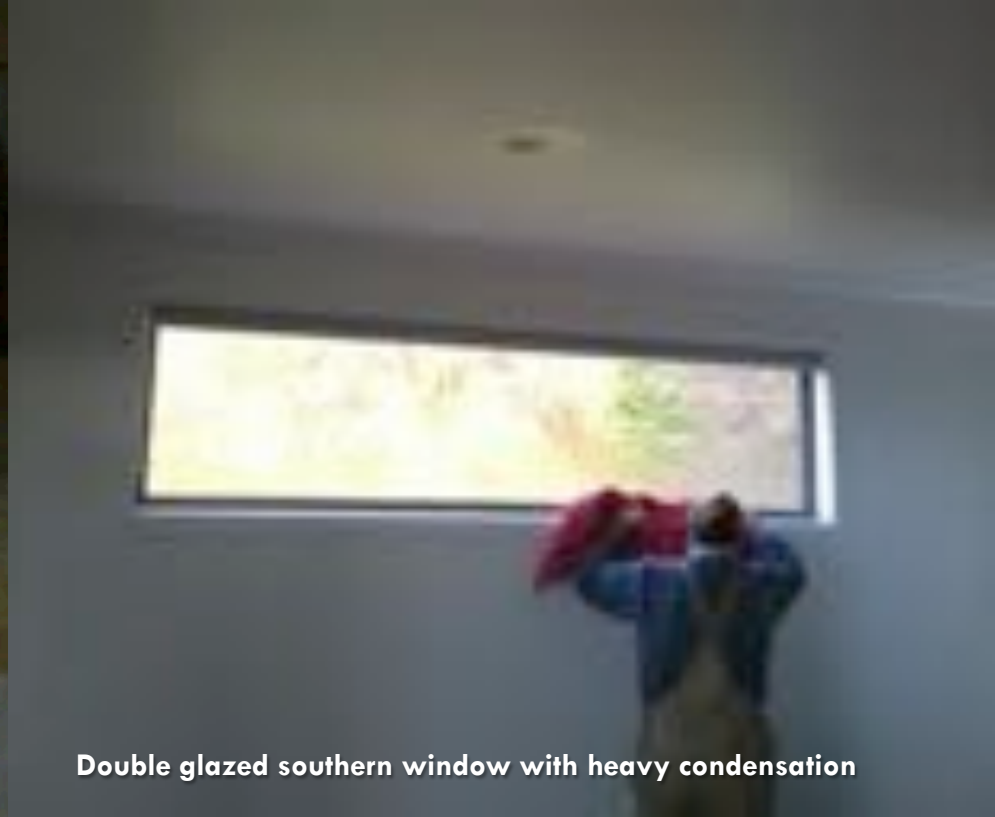
House in Burnie (2014)



Heavy and continuous daytime condensation



Downlights with condensation forming on the ceiling plaster. This downlight is located over the master bed.



Double glazed southern window with heavy condensation

Houses in Molesworth (2014)



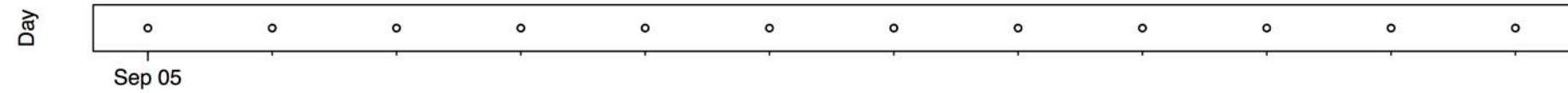
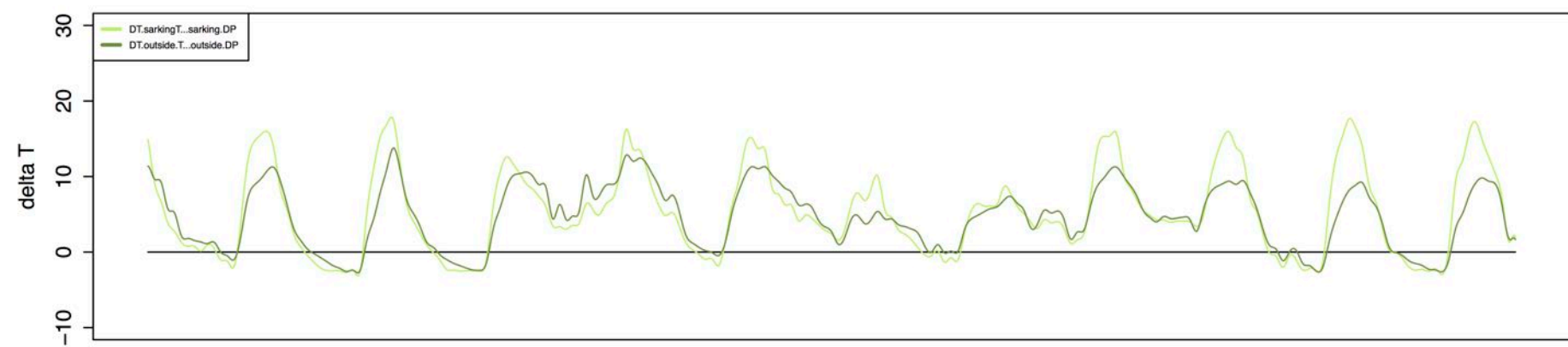
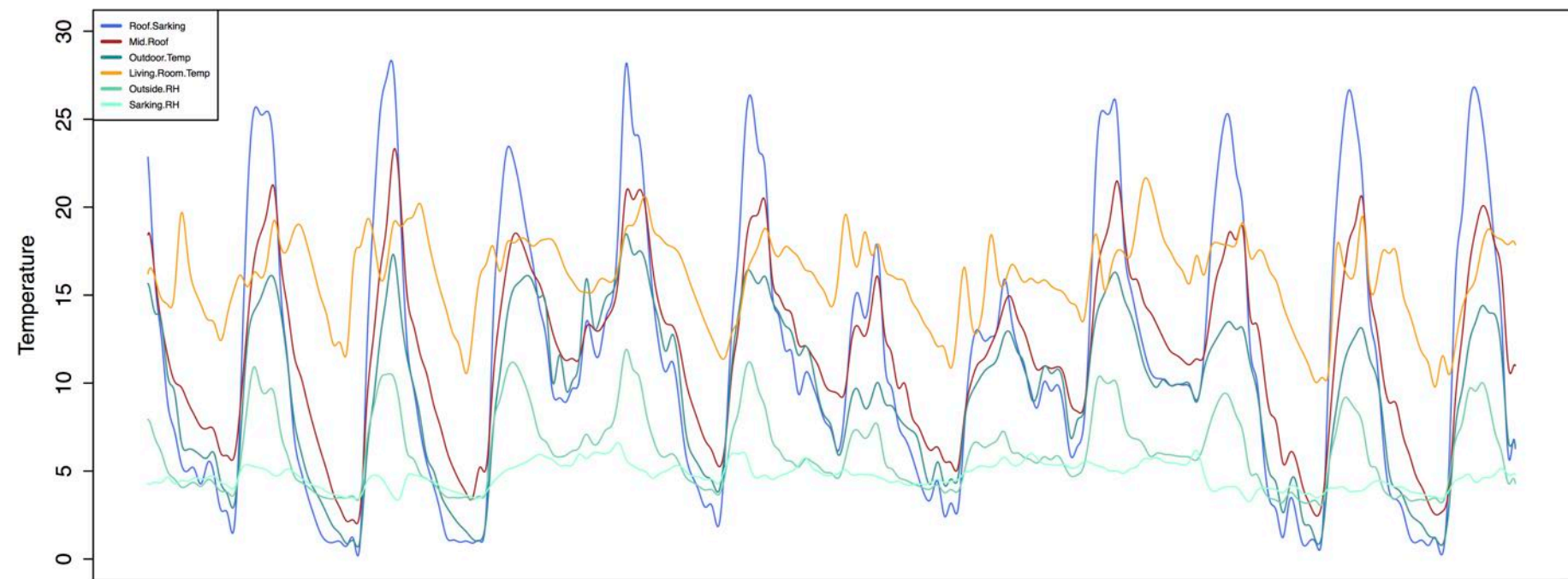
Mould on plasterboard behind and under the bed (MW2)

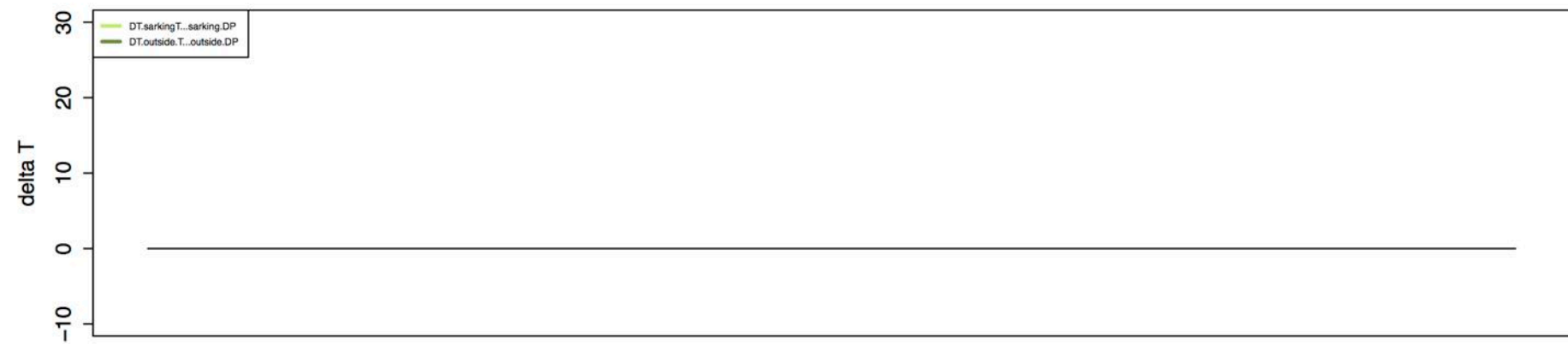
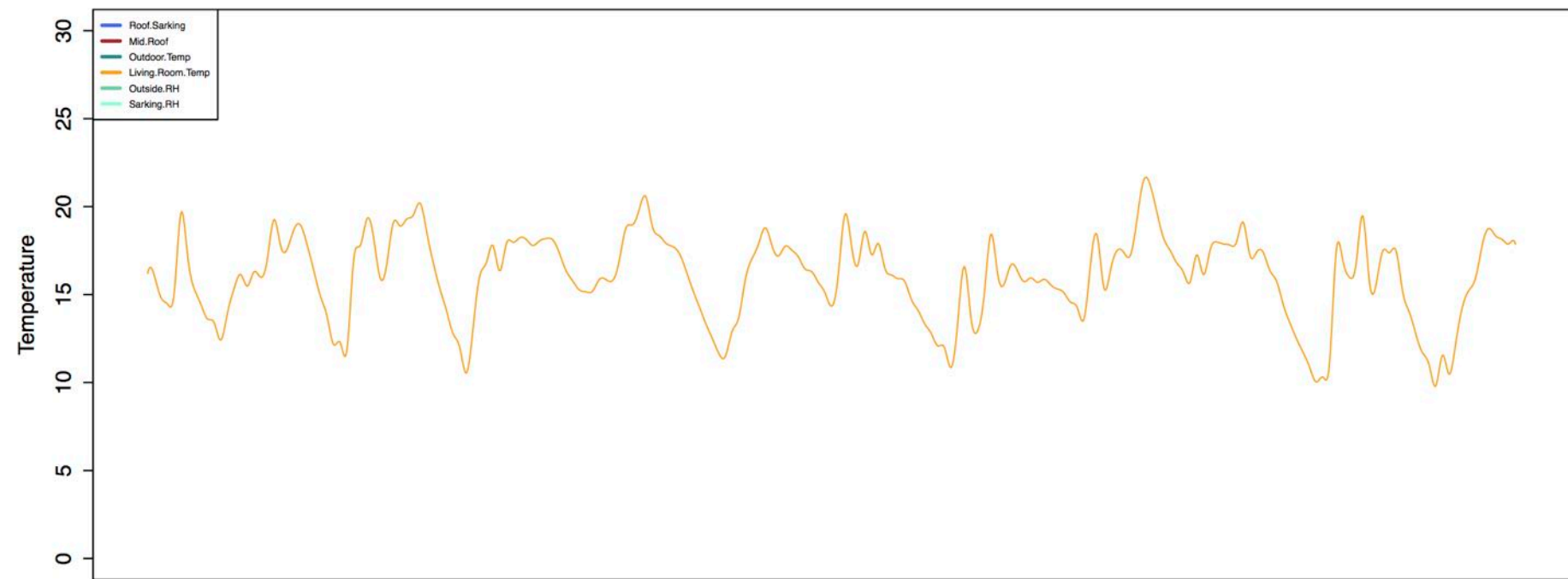


Sodden batts in contact with vapour impermeable wrap and metal cladding (no continuous cavity)

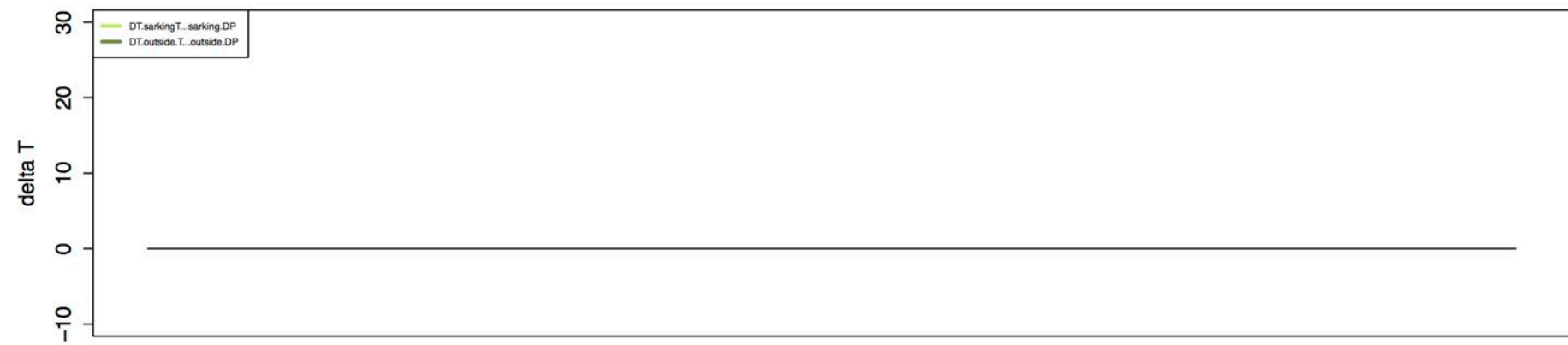
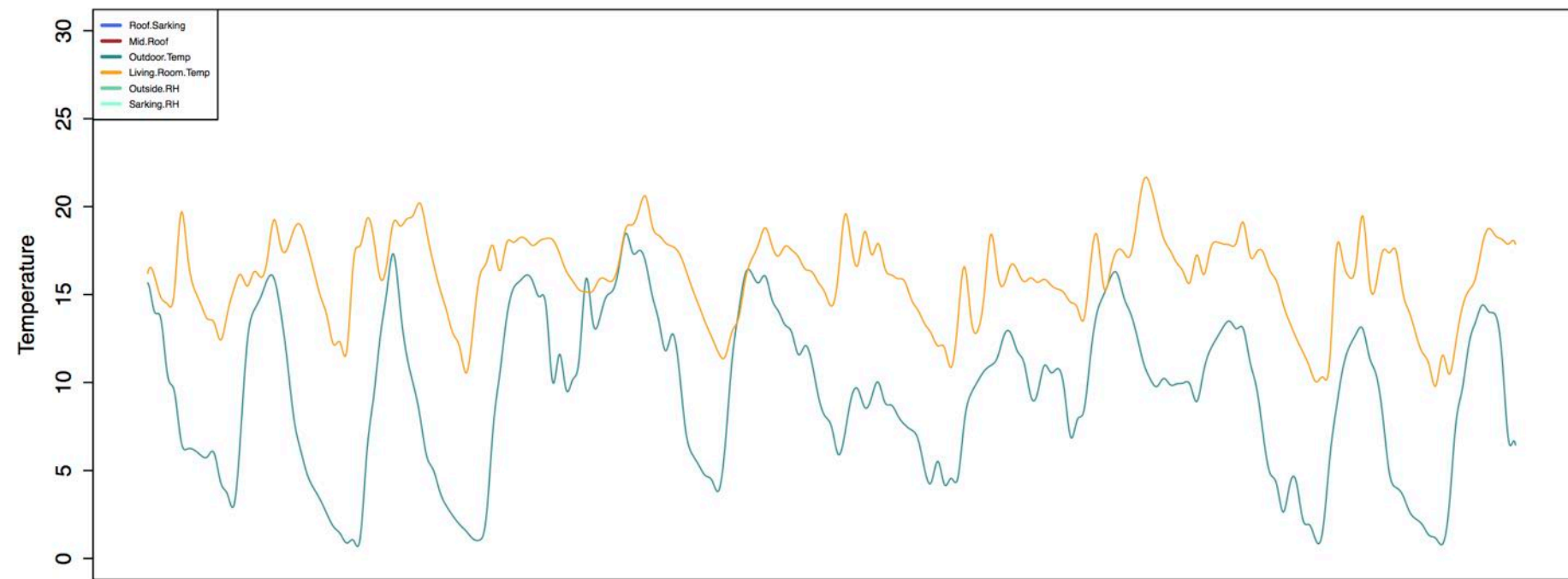


Mould on plywood sheathing that backs cladding (MW1)

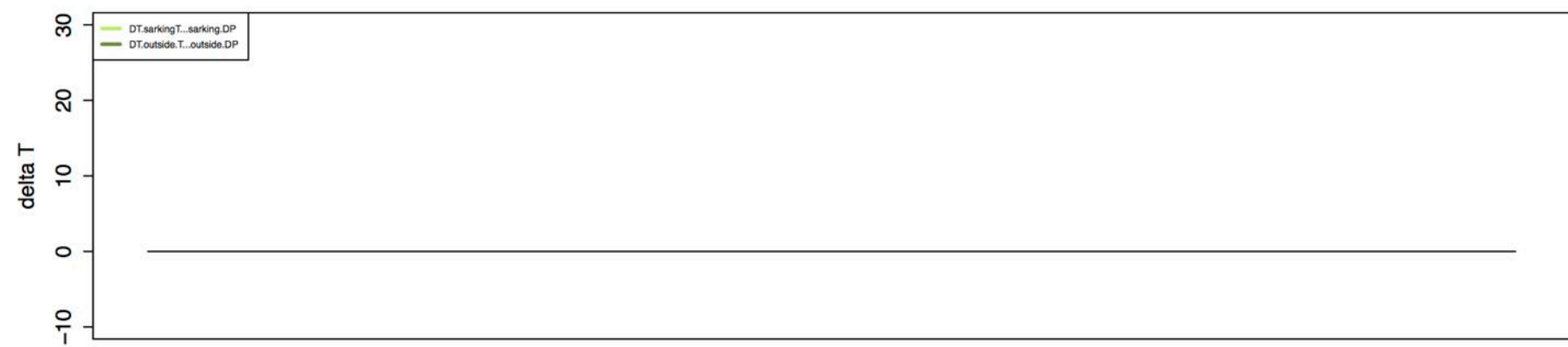
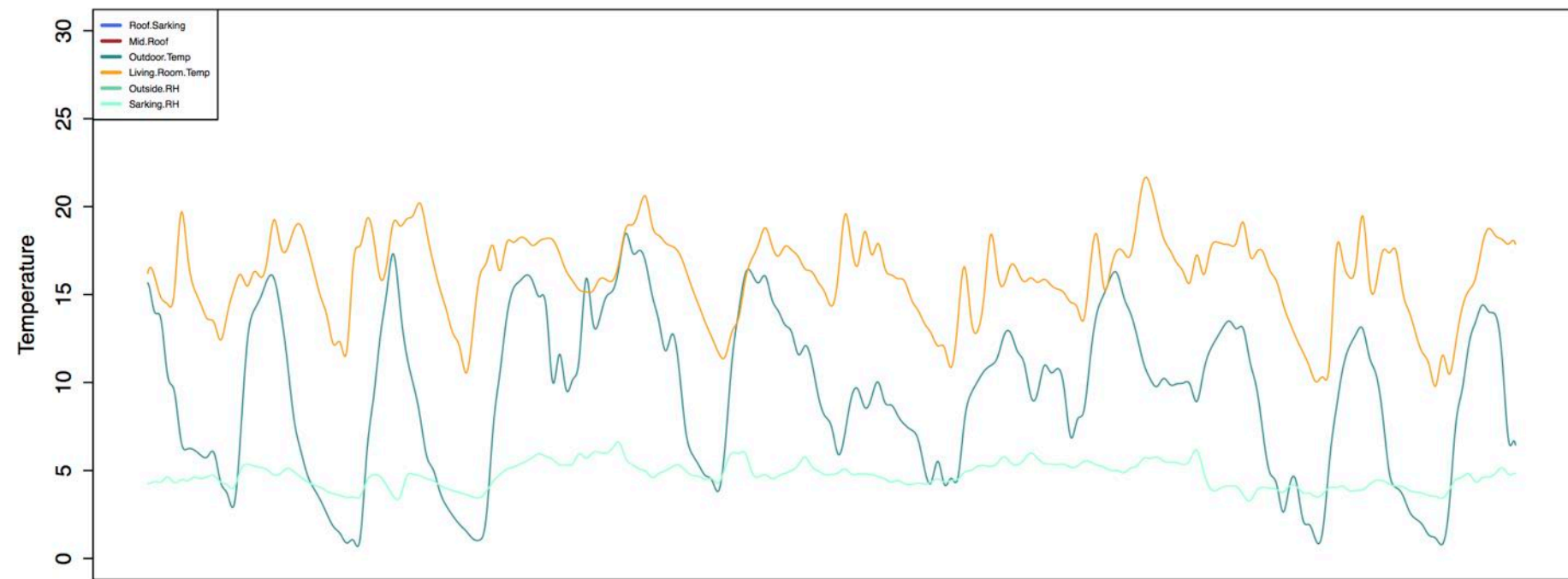




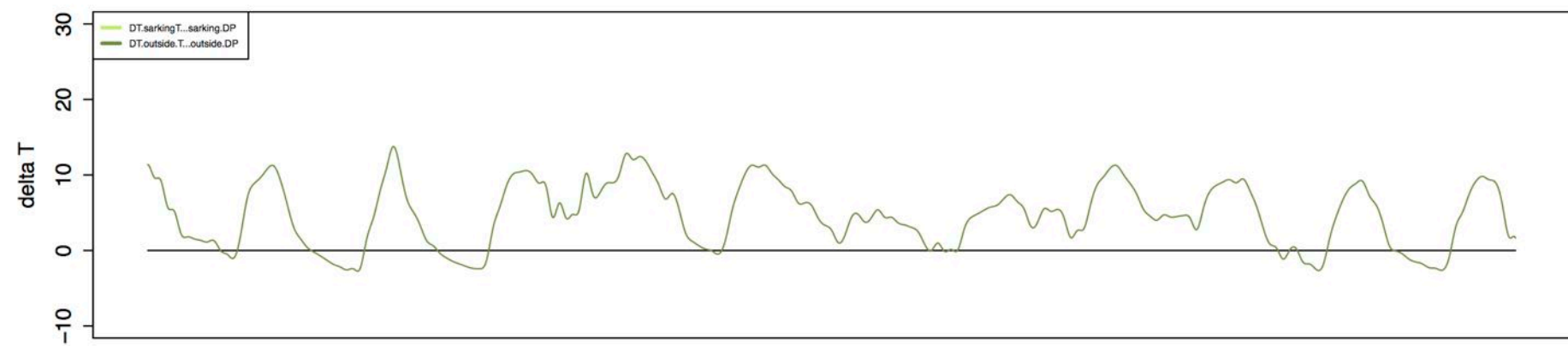
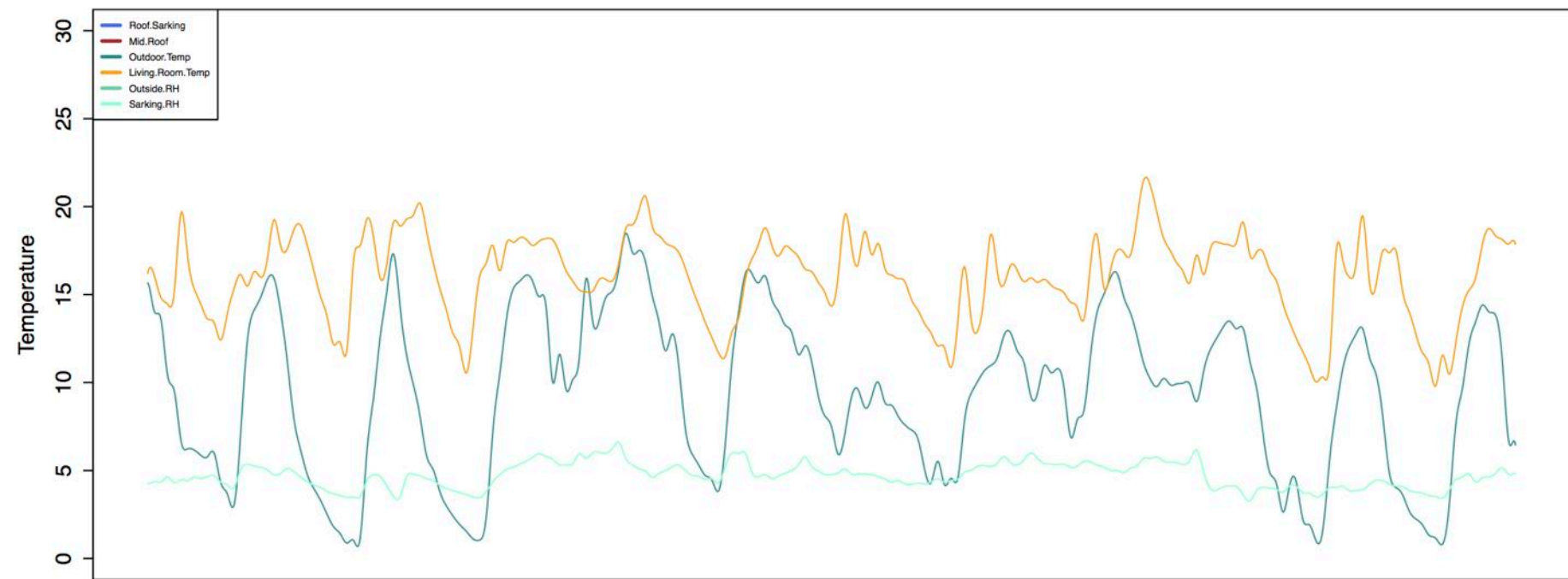
Living room T



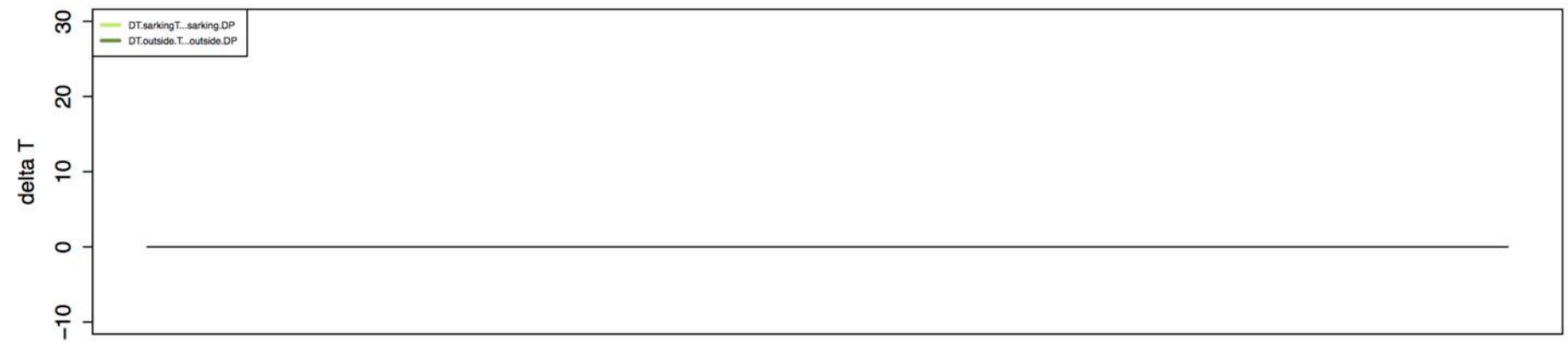
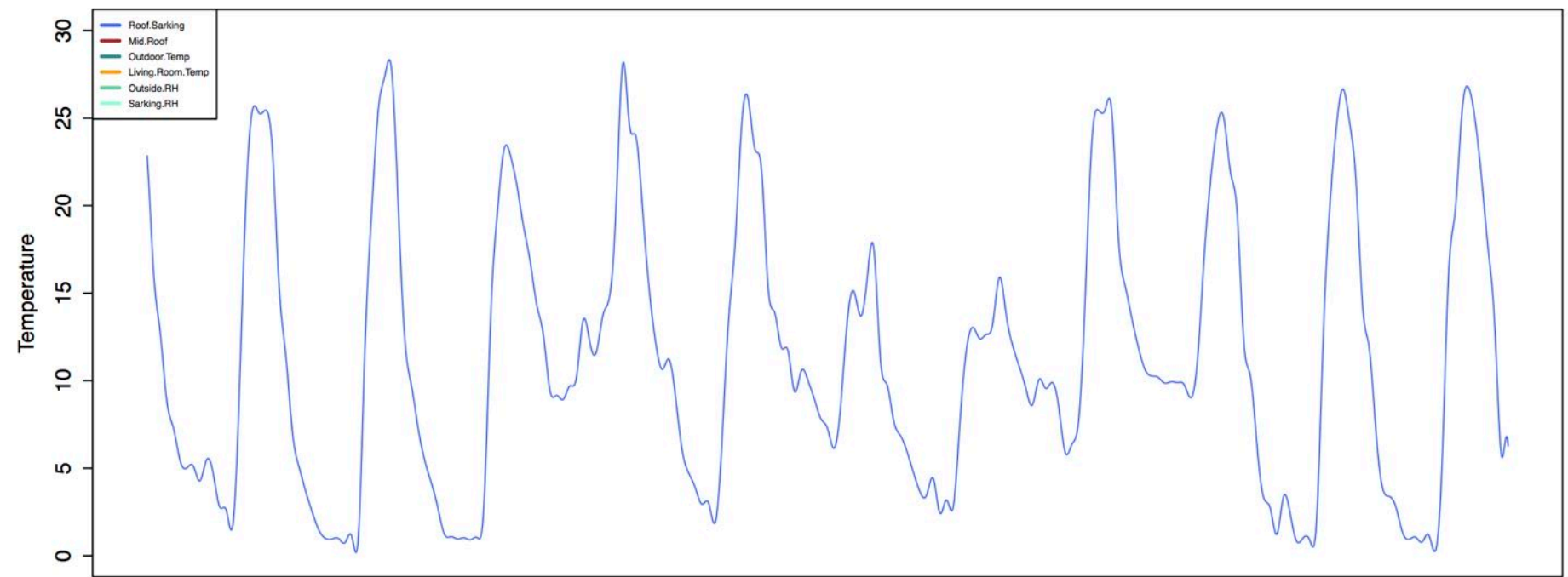
+ outdoor T



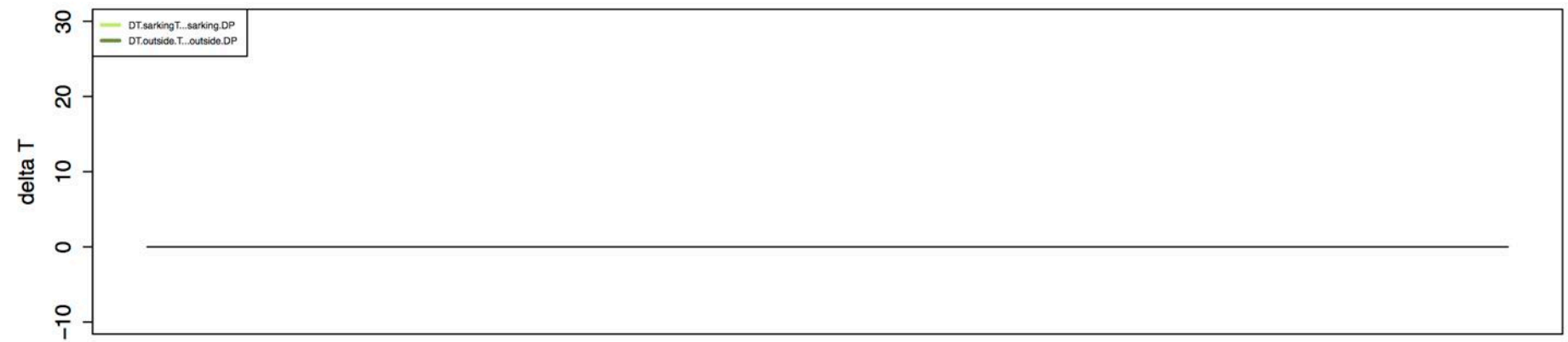
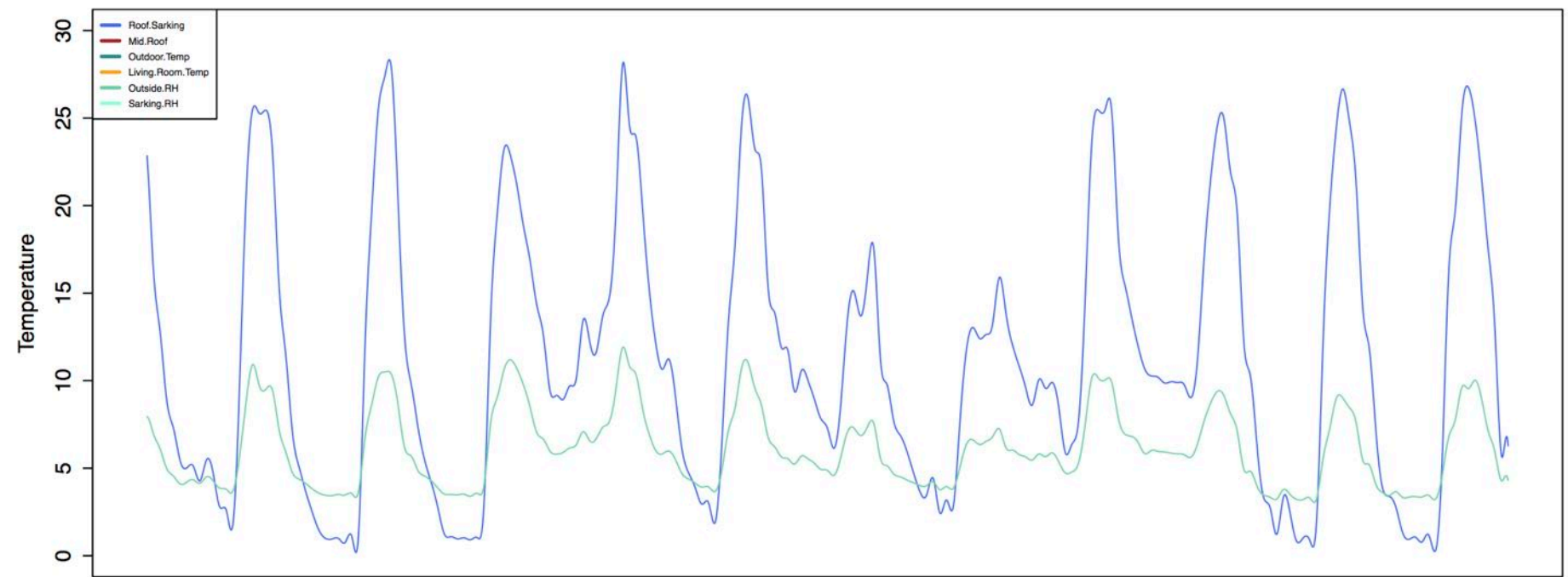
+ outdoor DP



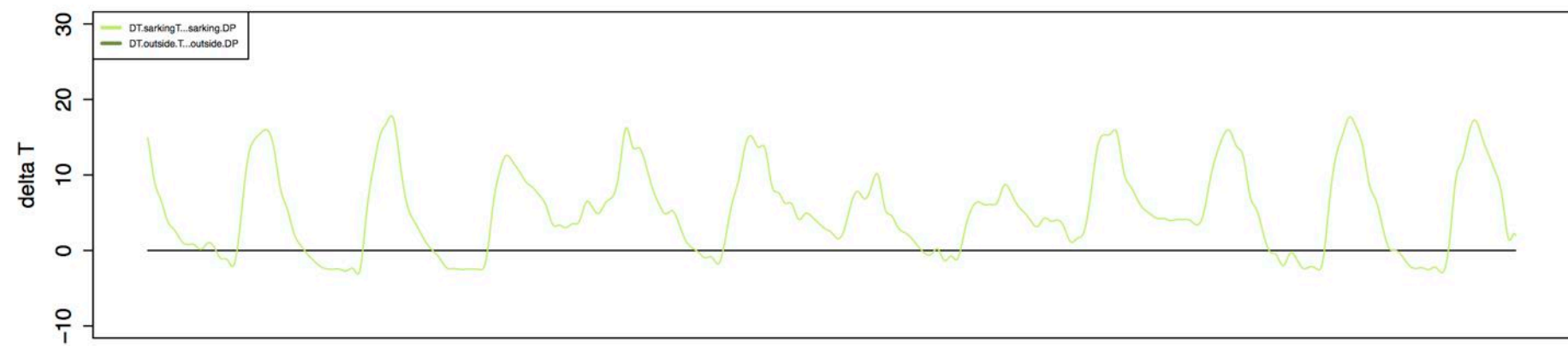
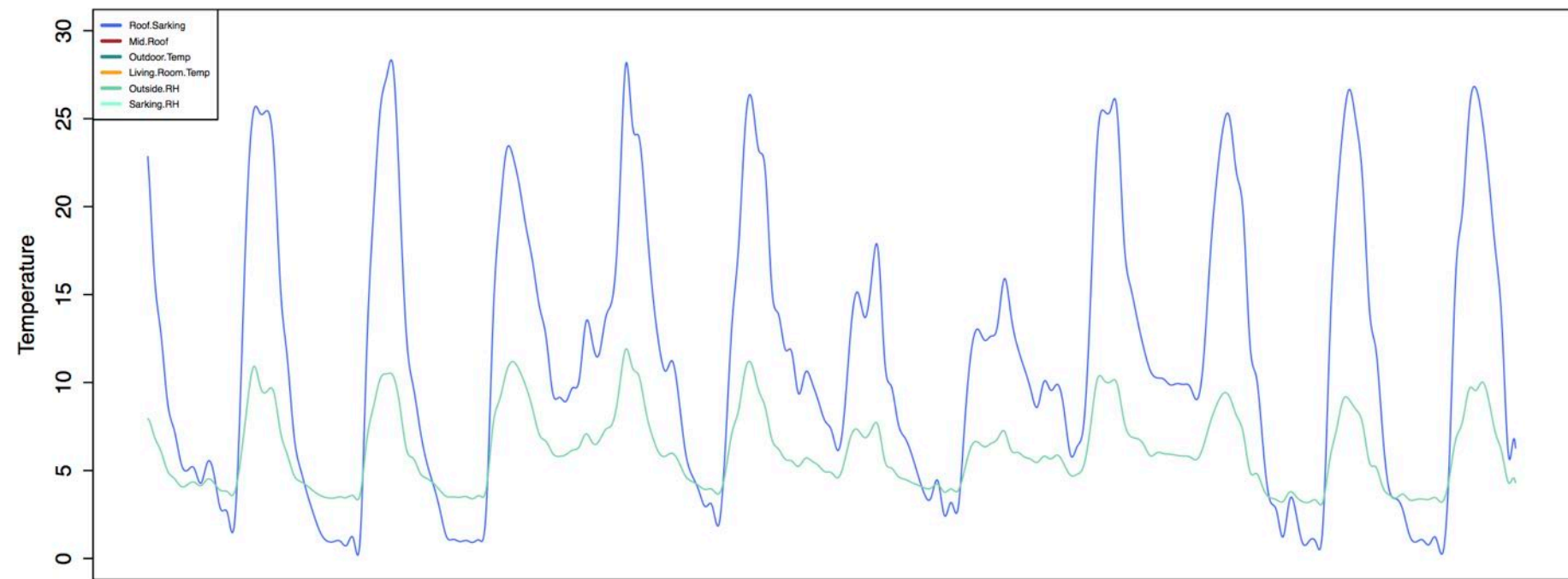
$$\Delta T = T_{\text{outdoor}} - DP_{\text{outdoor}}$$



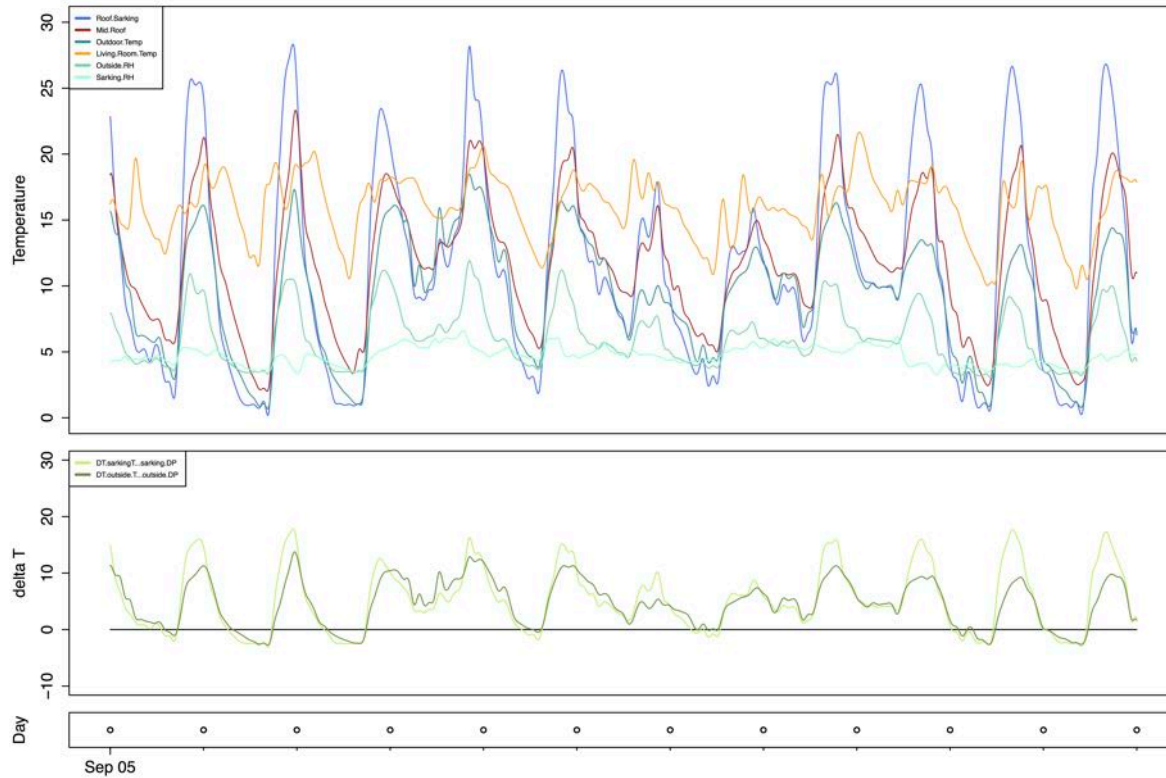
T roof
(measured between batten and foil blanket)



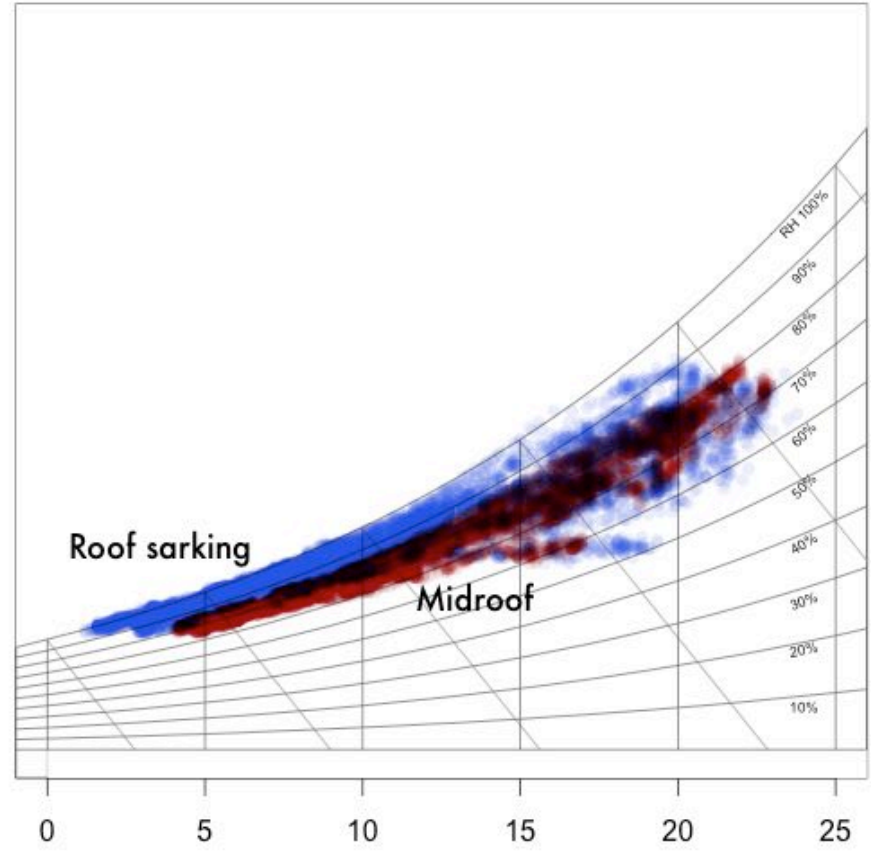
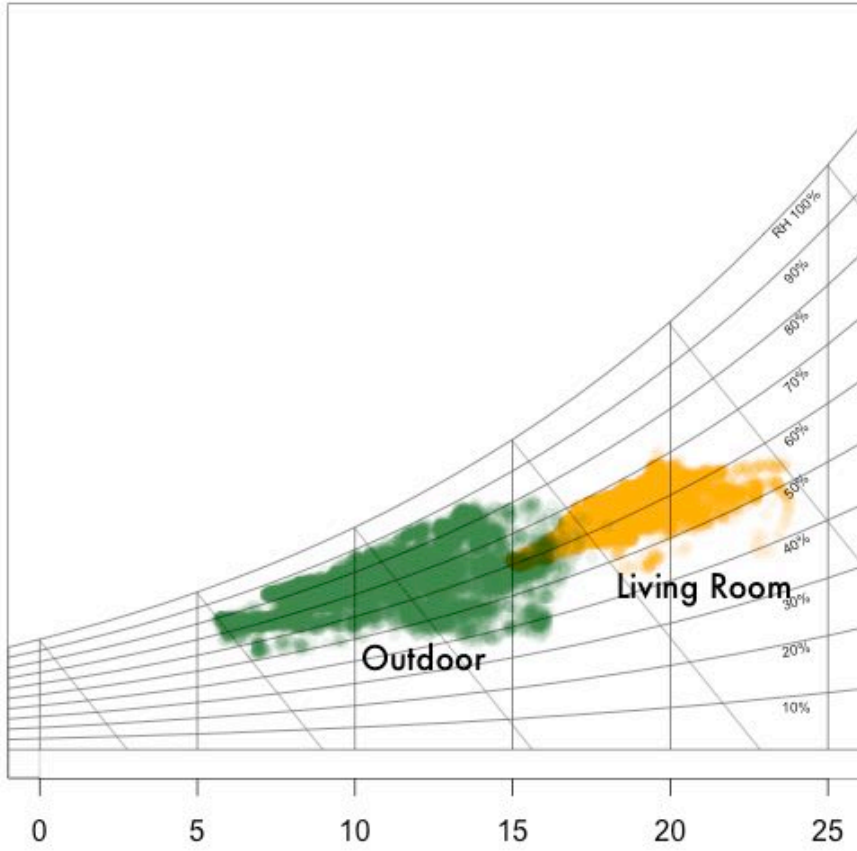
+ roof DP
(measured mid roof)



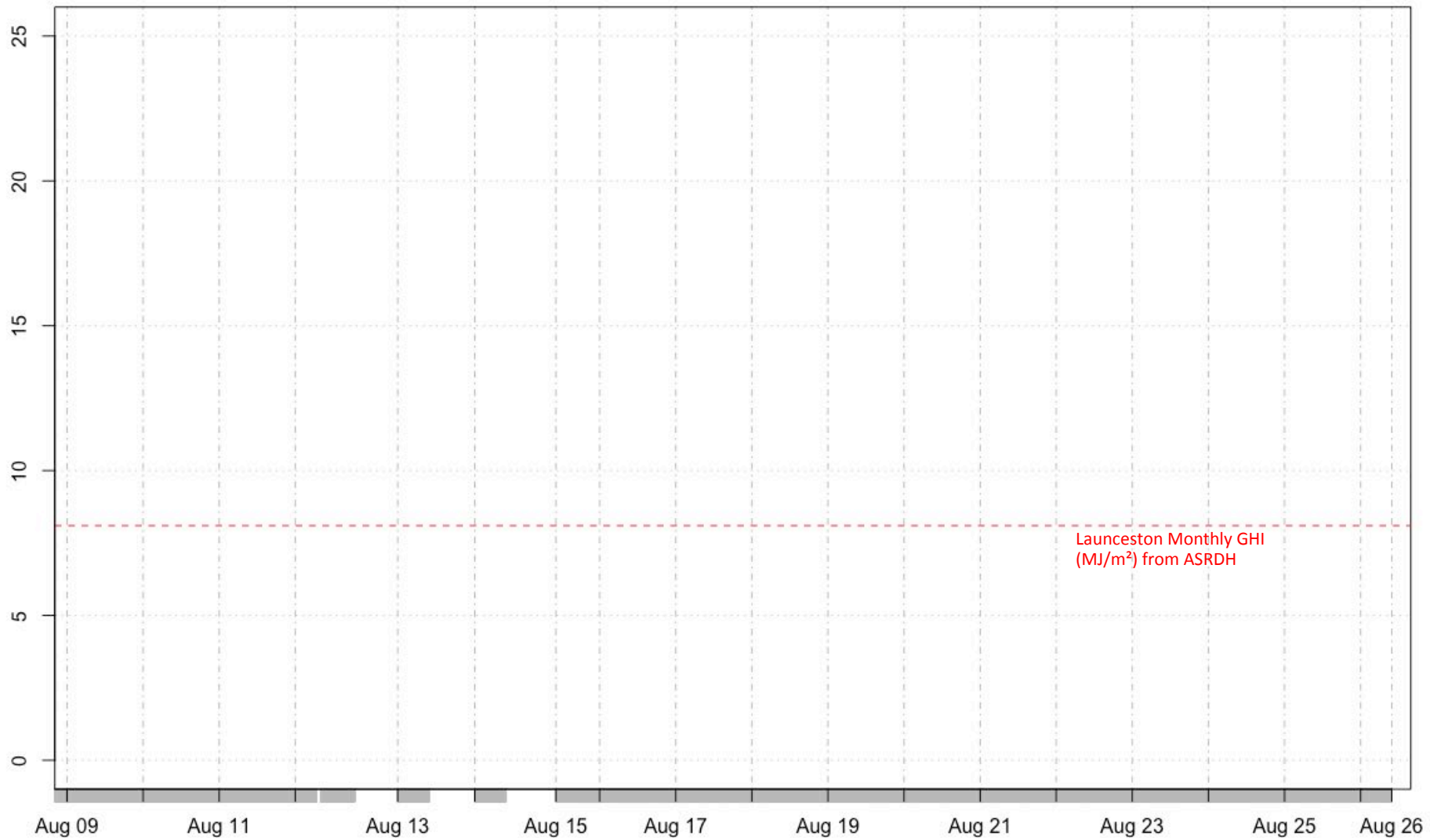
$$\Delta T = T_{\text{roof}} - DP_{\text{roof}}$$



**So condensation is happening, but is it serious enough to be of concern?
Can't it just dry up?**

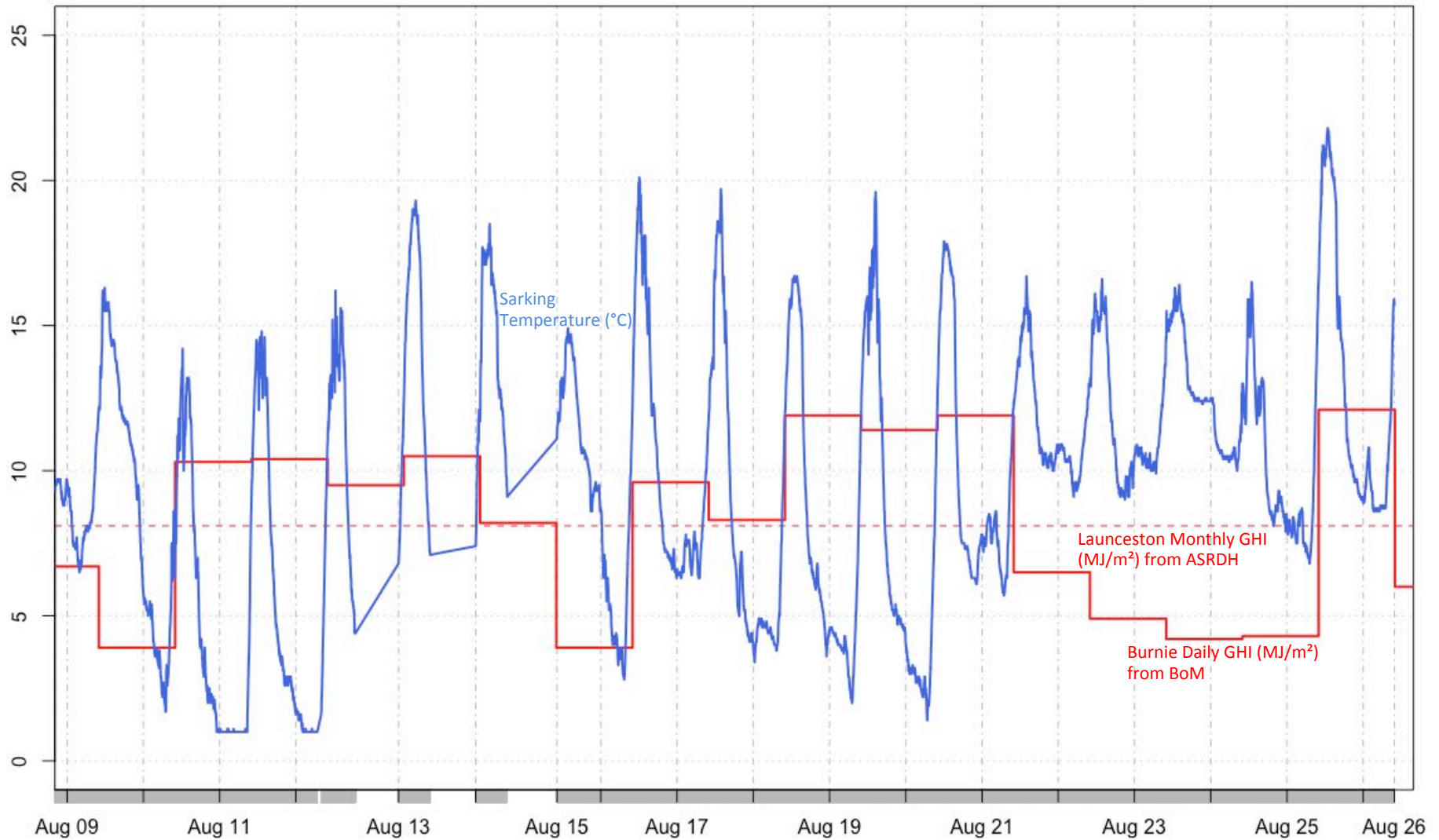


Cool roofs

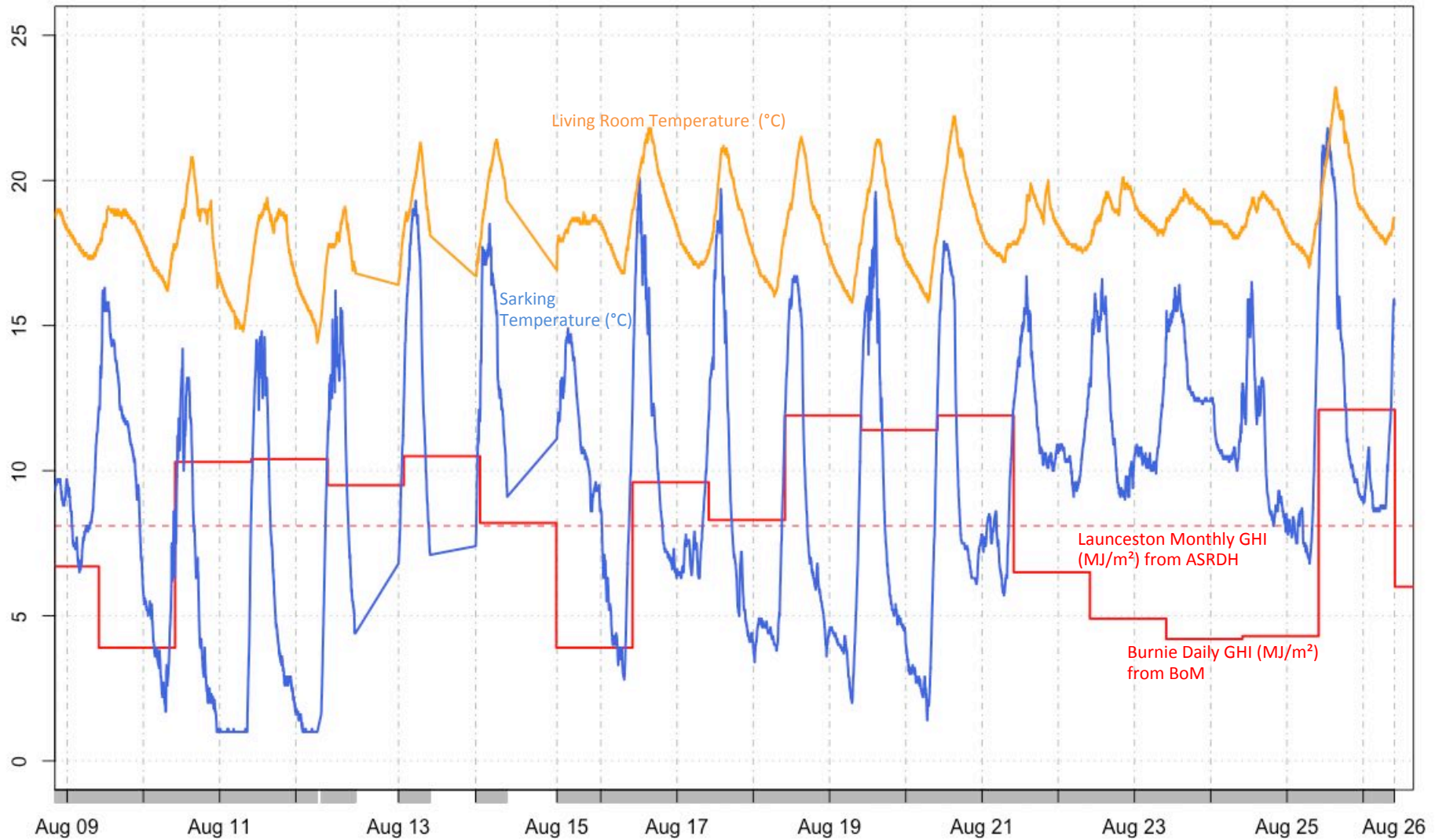




Cool roofs



Cool roofs





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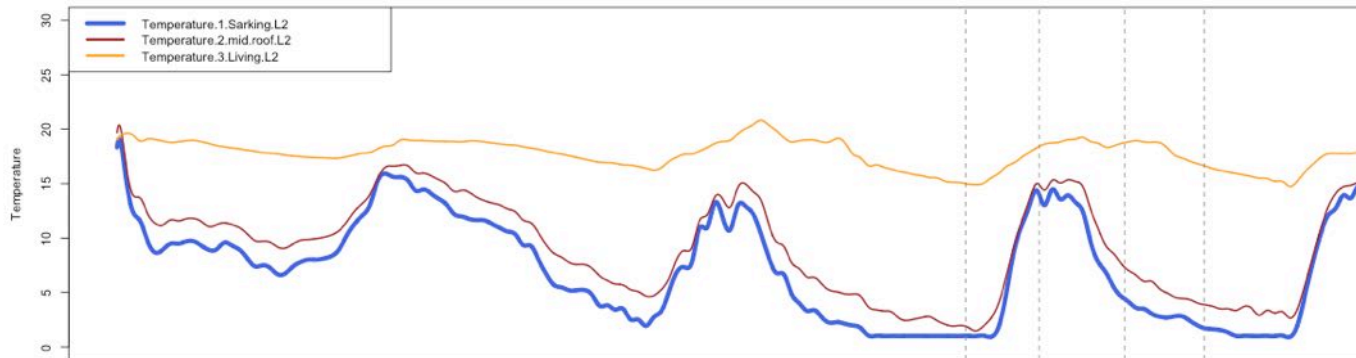
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14°C 08-11-2014 18:06:38 ●



9°C 08-12-2014 00:02:41 ●

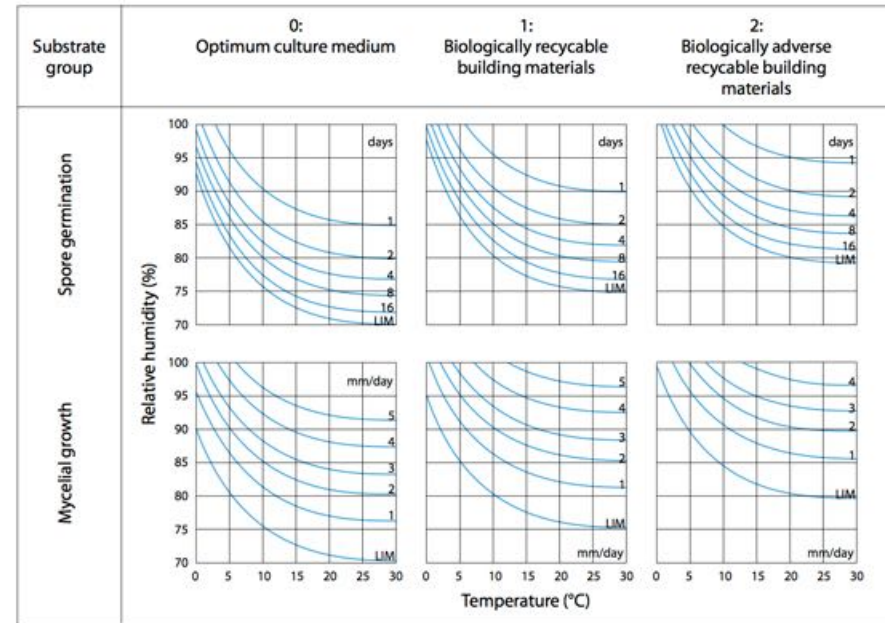
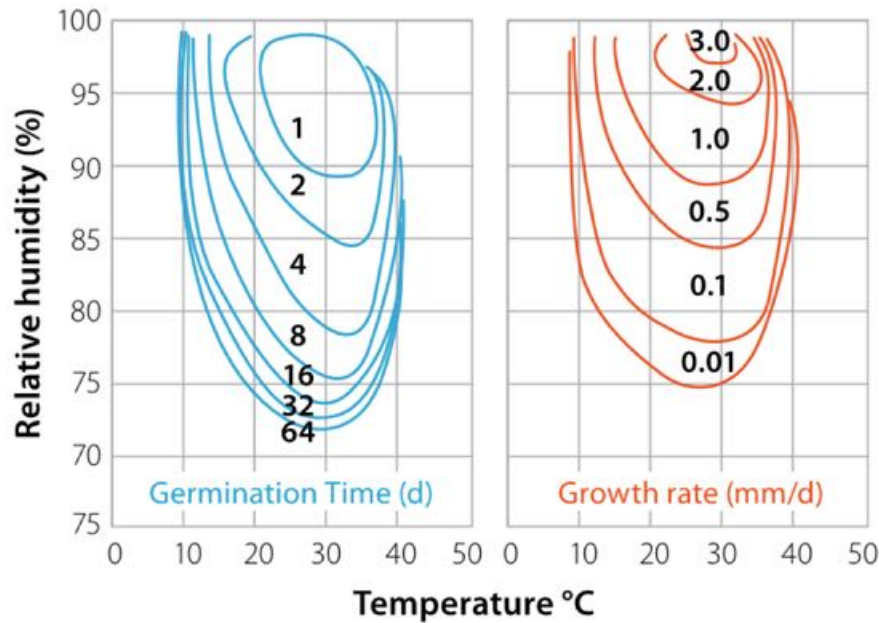




Northern Coast of Tasmania (21 Feb 2017)



Typical conditions that affect germination and growth rates for moulds



AIRAH (2016) Application manual “DA20 Humid Tropical Air Conditioning”

WHO (2009) “Guidelines for indoor air quality: dampness and mould”



When does my building envelope have a problem?

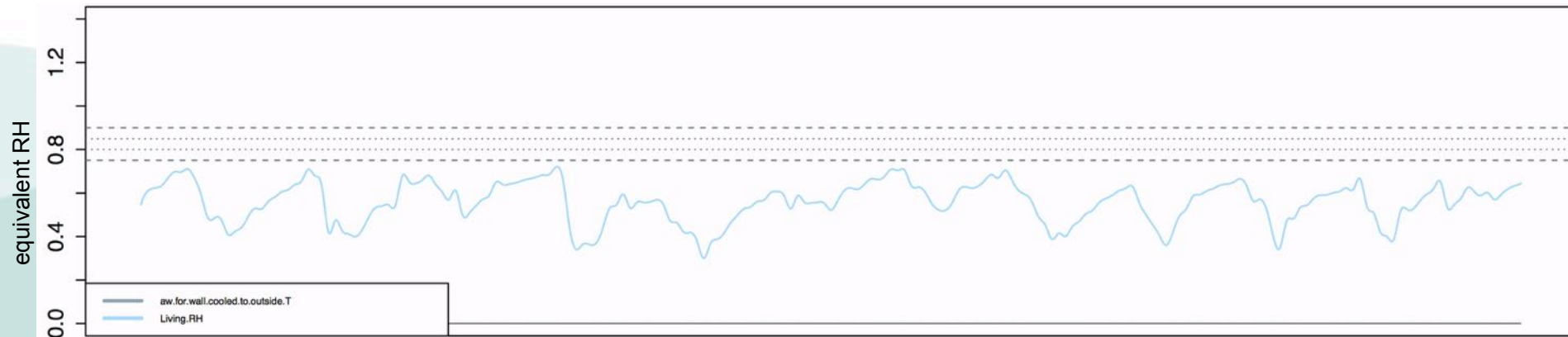


Table 2. Critical relative humidity for various groups of materials

Material group	Relative humidity (%)
Wood and wood-based materials	75–80
Paper on plasterboard	80–85
Mineral insulation materials	90–95
Extruded and expanded polystyrene	90–95
Concrete	90–95

Source: Johansson et al. (2005).

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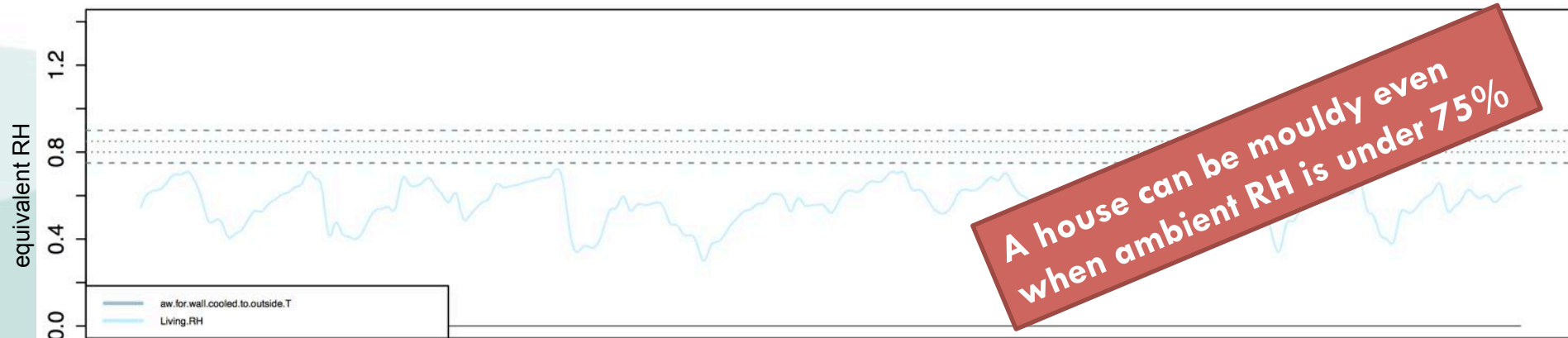


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identified genera (Sep 2014):

alternaria, aspergillus, cladosporium, penicillium, zygomycete



Water Activity, a_w

$$a_w = \exp \left(\frac{bT_d}{c + T_d} - \frac{bT_s}{c + T_s} \right)$$

b 17.502 C^{-1}

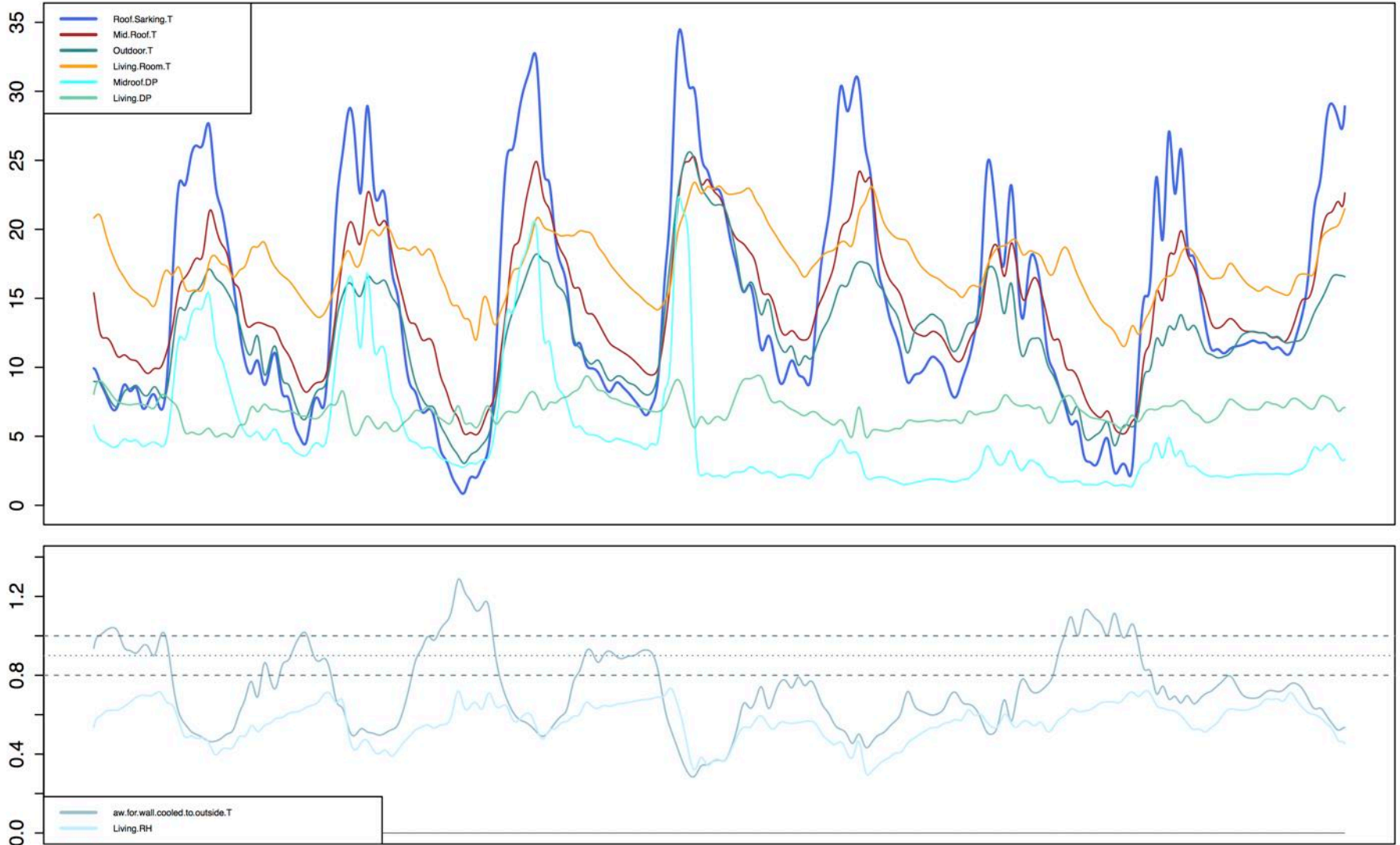
c 240.97 C

T_d dew point temperature $^{\circ}C$

T_s temperature of sample $^{\circ}C$



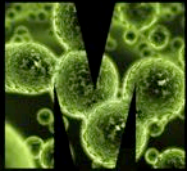
Water Activity, a_w



Infographics

MOULD ILLNESS

GOT MOULD?



1 IN 3 HOMES IN AUSTRALIA are actually water and mould damaged.



25% OF THE POPULATION is genetically susceptible to mould illness.

*The term "mould illness" is a subcategory of biofilm illness called Chronic Inflammatory Response Syndrome (CIRS).

Feeling **UNWELL?**

You might suffer from **"MOULD ILLNESS"***

What are the **SYMPTOMS?**

- Respiratory problems
- Asthma
- Diarrhoea
- Nausea
- Headaches/Migraines
- Chronic Fatigue
- Allergy
- Concentration difficulties
- and **MORE***

*Symptoms are unique for each person. For more information on the symptoms, visit www.toxic-mould-support-australia.org

How can I **BE SURE?**

- Visual Contrast Sensitivity (VCS) Test
- NeuroQuant Volumetric MRI
- HLA* DR/DO Gene Test
- Blood Biomarker Tests
- MARCoNS* swab

*Human Leukocyte Antigen
*Multiple Antibiotic Resistant Coagulase Negative Staphylococci

MOULD ILLNESS



Evacuate from mouldy building

Remove exposure to toxins and inflammagens



Visit www.survivingmould.com and follow Dr Ritchie Shoemaker for more information on mould illnesses.

KNOW YOUR LEGAL RIGHTS

GOT MOULD?



GOT MOULD? Do this :

- EVIDENCE - Photograph it
- Clean it with precaution
- Dispose affected items
- Document the result

*Contact your local government Environmental Health Officer for more information. They might be able to help.

Got mould **AGAIN?** Tired? Annoyed?

You may **WANT TO:**

TENANTS

Refer **RESIDENTIAL TENANCIES ACT**

End your tenancy & **LEAVE**

HOMEOWNER

Check **INSURANCE POLICY**

Consult **MOULD REMEDIATOR**

What should **YOU DO?**

- Write a letter/email **LANDLORD/AGENT**
- 1. List what needs fixing
- 2. Give a clear deadline
- 3. Record any conversations as evidence

Contact your **STATE TENANCY TRIBUNAL**

Are there any **MOULD EXCLUSIONS?**

Please check their **QUALIFICATION**

File a claim at your **LOCAL/MAGISTRATE COURT**

KNOW YOUR LEGAL RIGHTS



Important Tip: You must back up your claims with evidence such as expert reports, photos, tenancy agreement, receipts for expenses, mould sample, etc.

MOULDY BUILDINGS

GOT MOULD?



Does your building **HAVE THIS?**

- Extensive visible mould growth
- Strong mildew odours
- Visible water damage

It is better to assume that:

MOULDY BUILDING!

WHAT CAUSES a water-damaged building?

OCCUPANT BEHAVIOR
Unventilated moisture from heating, cooking, bathing & laundry causes condensation.

FAULTY BUILDING
"Inadequate ventilation"
"Leaks" Moisture ingress "Condensation"

NATURAL DISASTER
"Flood" "Hurricane" "Storm" "Cyclone"

What **SHOULD YOU DO?**

- Ventilate the building** - Install vents/fans
- Check your heating system**
- Find the causes** - Fix it
- Schedule a regular check-up**
- Dry out & clean up the building within 24-48 hours.**
- Photograph for evidence.**

Who **SHOULD YOU CONSULT?**

- CERTIFIED INDUSTRIAL HYGIENIST**
They are who conduct sampling to identify the source of mould and they may also identify appropriate remediation procedures.
- CONSTRUCTION EXPERT**
They can inspect and provide advice relative to a building's design, construction, soundness and source of moisture.
- Insurance Agent**
- Certified Plumber**

MOULDY BUILDINGS

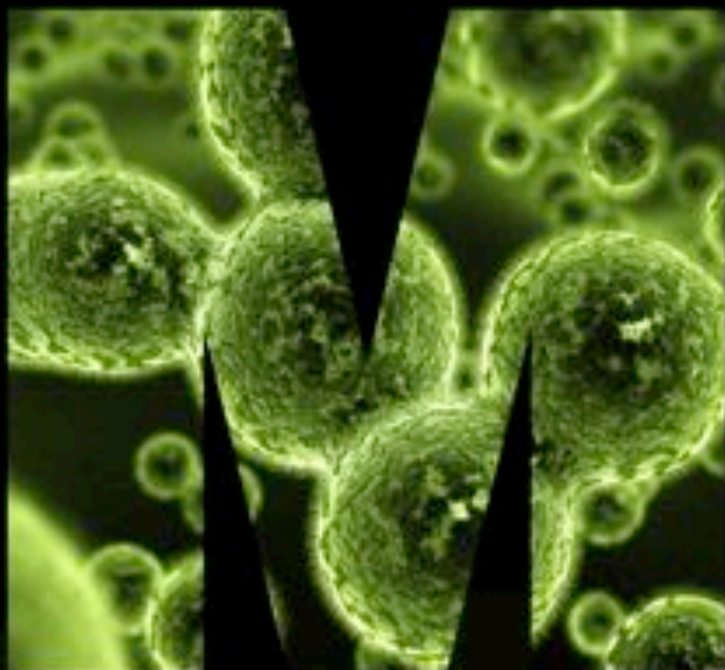


- Design for climate and ensure air is able to circulate.
- Duct gas appliances, range hood, dryers, exhaust fans to outside air.
- Consider make up air strategies (e.g. passive background/baffle vents).
- Cover ground soil with sealed impervious membrane to control sub floor dampness.
- Use 2nd generation vapour permeable wall wraps (not punched sealings).
- Insulate the roof and ventilate the roof spaces using eaves and soffit vents.
- Create air spaces and ventilate wall cavities.
- Keep building materials dry during construction.
- Avoid light fittings that allow warm moist air into colder roof spaces (e.g. downlight).
- Minimise use of cold surface materials in warm air spaces.

*For more information, refer to ABCB Construction's Buildings Handbook

MOULD ILLNESS

GOT MOULD?



MOULD?



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HLA* DR/DQ Gene Test

Blood Biomarker Tests

MARCoNS* swab



*Human Leukocyte Antigen
*Multiple Antibiotic Resistant Coagulase Negative
Staphylococci

MOULD ILLNESS

Evacuate from mouldy building



Remove exposure to toxins and inflammagens



No Toxins



No VOC's [Volatile
Organic
Compounds]



No Pesticides



No Cosmetic Toxins



No Household
Products Toxins



No High
Fungal Food



No Fragrance

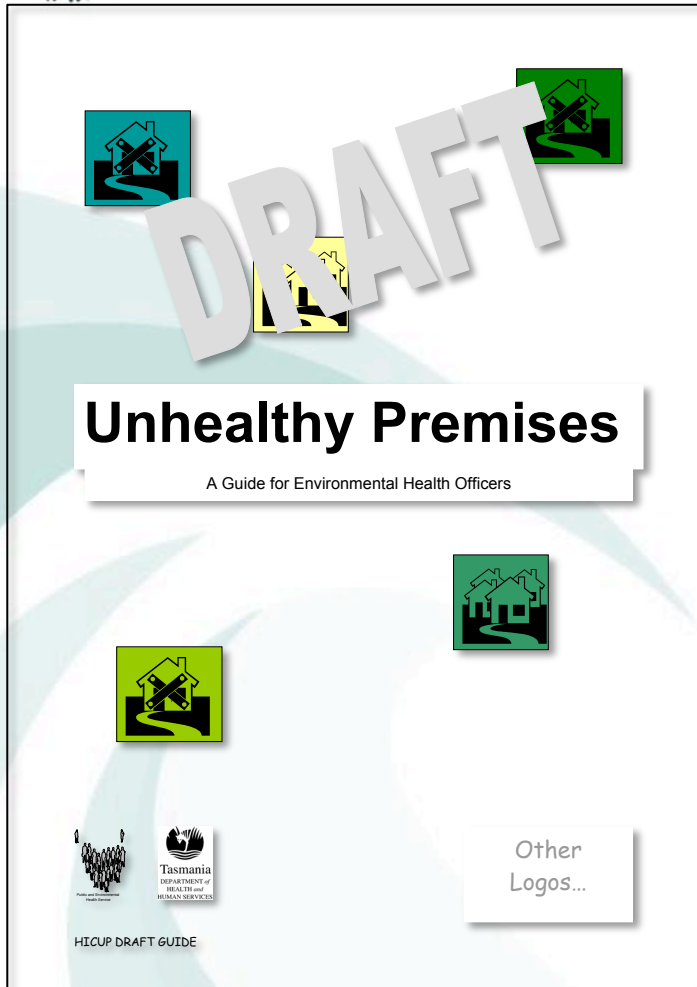


Other Blotoxins

You may
WANT TO..

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Guide to Assessing Unhealthy Premises

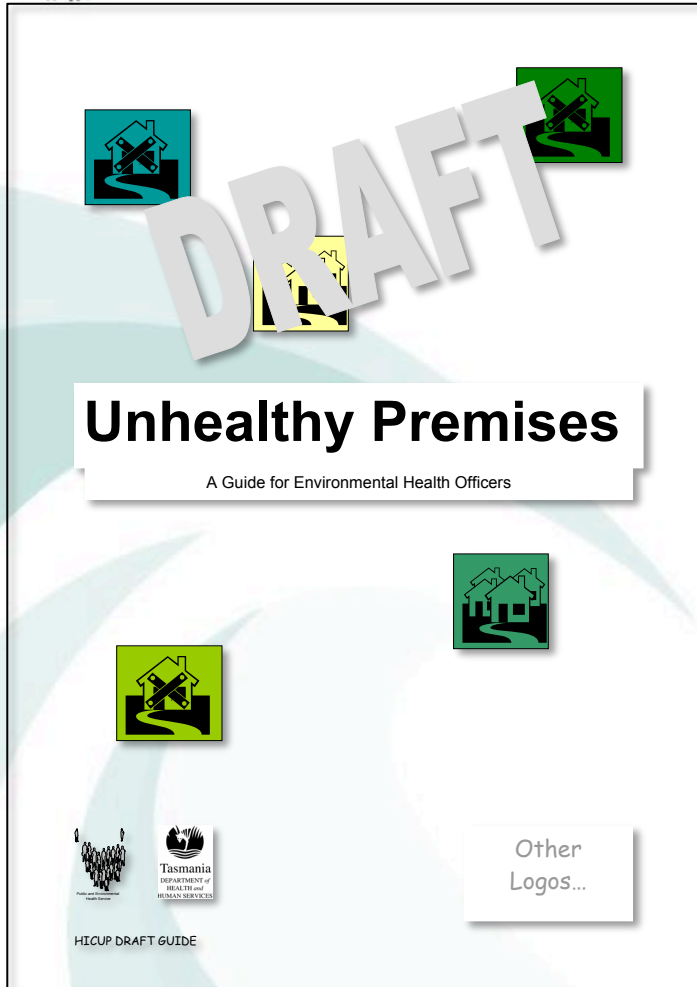


EHOs have very broad powers of entry and inspection under the Public Health Act 1997 that can be employed when assessing unhealthy housing.

An increasing body of evidence has **associated substandard housing quality with poor health**. For example, damp, cold and mouldy housing has been linked with asthma and other chronic respiratory symptoms, as well as anxiety and depression.



Guide to Assessing Unhealthy Premises

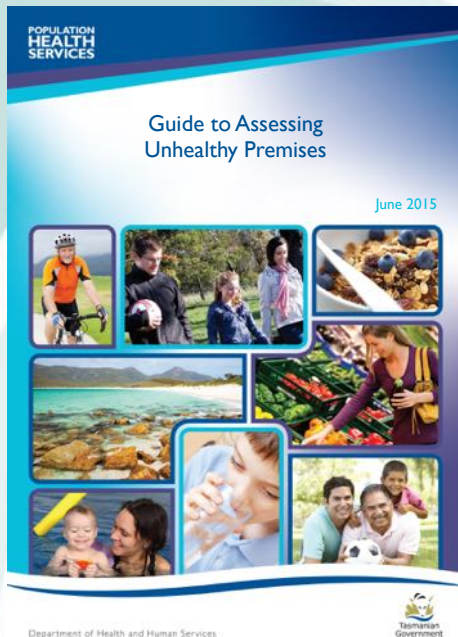
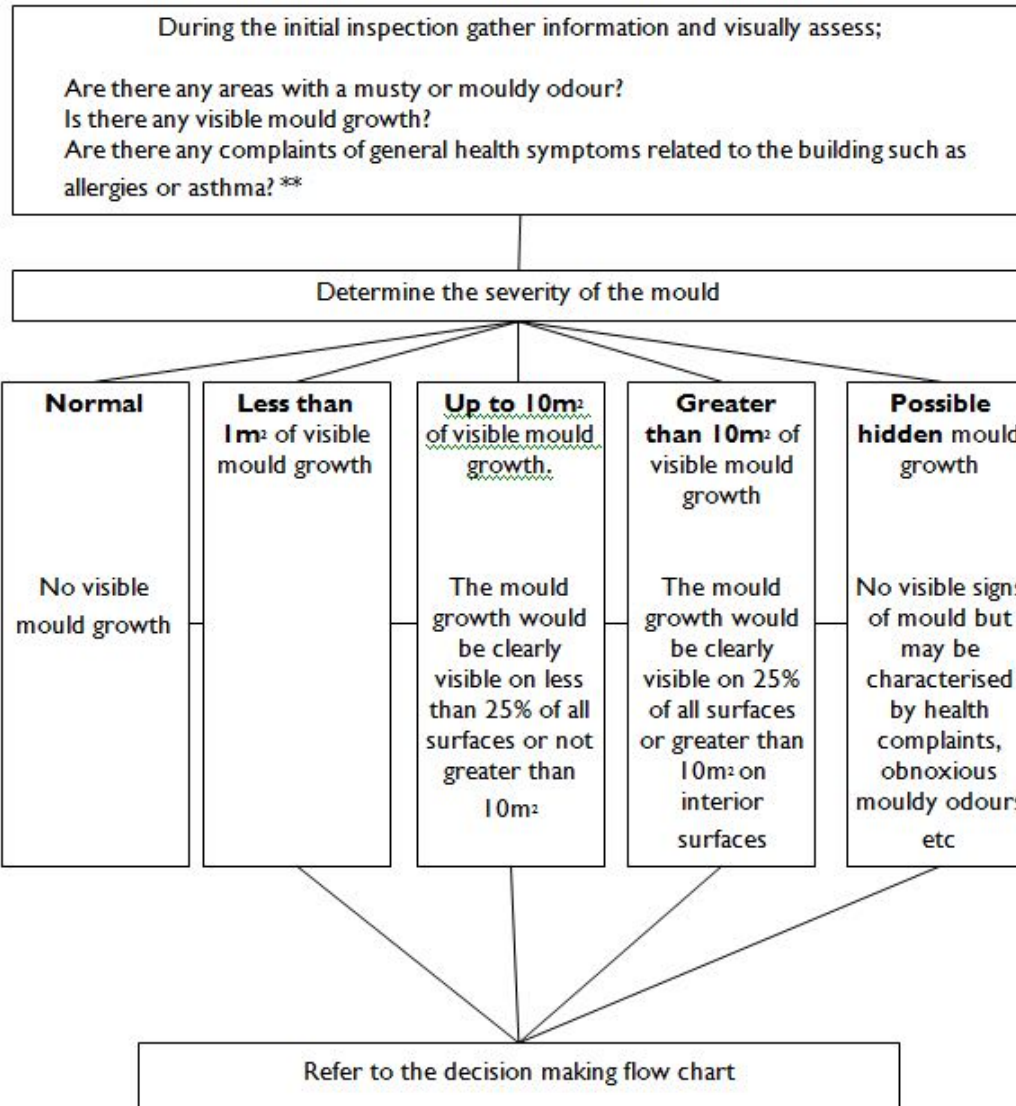


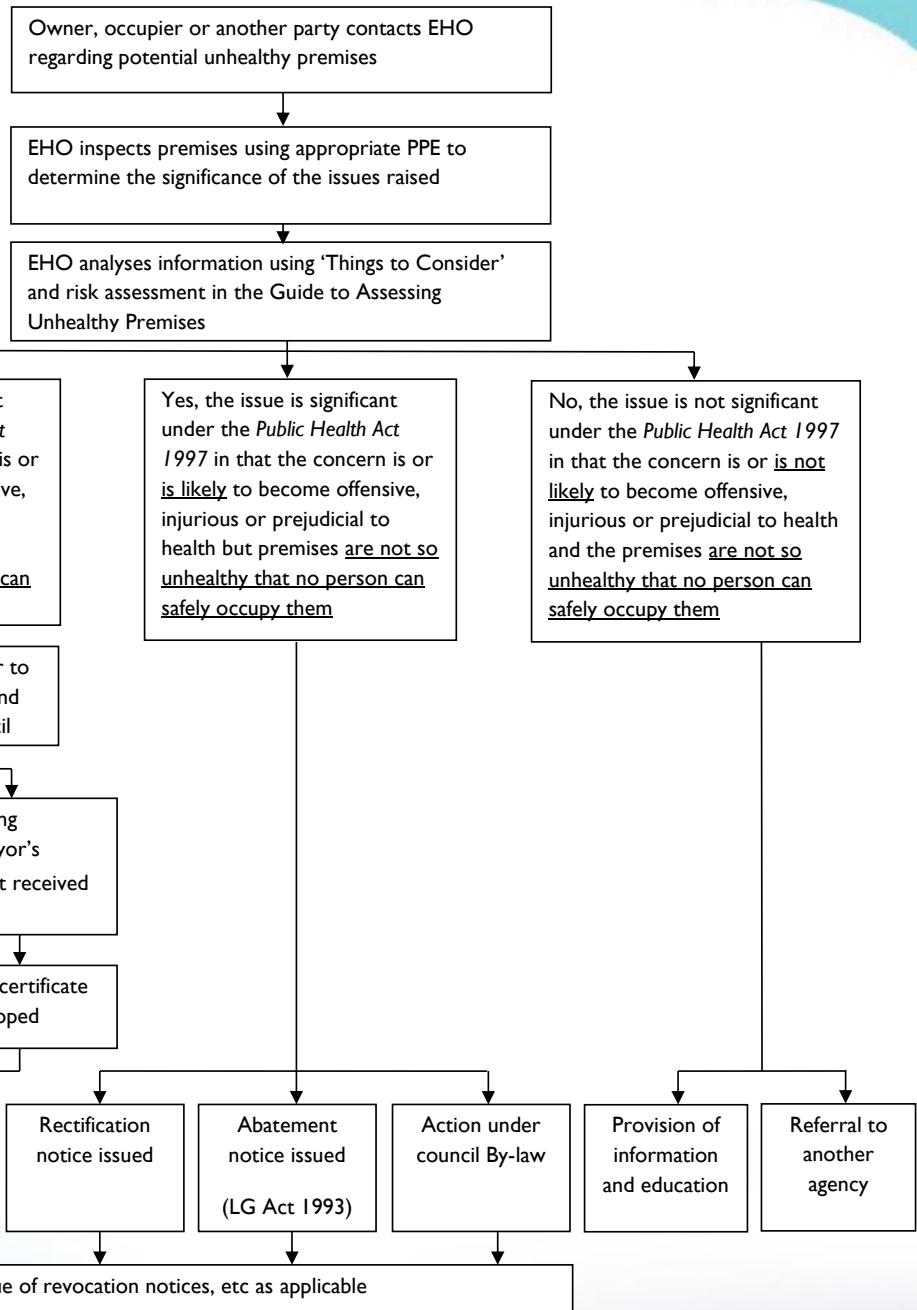
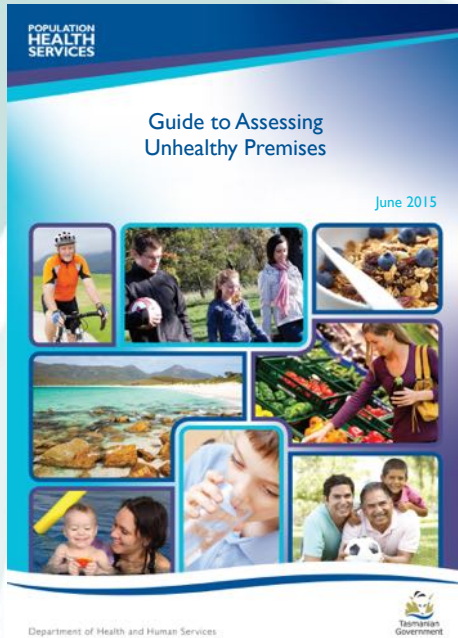
Mould is less likely to be found in conditions of penetrating or rising damp since the salts, which emerge with the moisture tend to inhibit its growth.

Condensation on the other hand contains relatively pure water, which is highly conducive to the growth and proliferation of mould spores. Once present, mould spreads easily to carpets, furniture and clothing.



Guide to Assessing Unhealthy Premises







Statutory Decision-making

RESEARCH AND THEORY

A Time to Review Training in Statutory Decision-making

Eve Richards

TAFE Tasmania

The proposed professional certification scheme for environmental health practitioners has implications for those who are involved in the education and training of students who may enter the environmental health profession as officers. It also has implications for those who have the responsibility for assessing the suitability of courses for certification. The success of the certification scheme depends, amongst other matters, on graduating students possessing the skills and knowledge that will permit them to engage in statutory decision-making with sufficient competence to allow their decisions, and the decision process they used, to remain substantially intact under the rigorous scrutiny of our administrative-legal system. This article, by carrying out a legislative exercise, will encourage stakeholders in the certification process to commence a review and assessment of the training requirements for statutory decision-making.

Key Words: Professional Certification; Statutory Decision-making

The momentum that appears to be building in relation to the development of a professional certification scheme for environmental health practitioners (Tenkate & Smith 2002) requires the several strands of the multi-disciplinary environmental health profession to engage in what the classical organisation theorist James D. Thompson refers to as opportunistic surveillance (1967, p. 151). Opportunistic surveillance is monitoring behaviour that scans the environment for opportunities rather than waiting for problems to present themselves for action. It will become apparent in this article that problems may arise in the future if members of the environmental health profession do not respond now to this proposed development.

The introduction of a certification scheme necessarily requires practitioners to be competent in that strand of environmental health for which they seek certification. Further, practitioners need to possess skills that will enable them to engage in continuing professional development in order that they can maintain their certification.

Inevitably, these considerations will require some of the stakeholders in the various strands of environmental health to review the training and education courses relevant to their particular strand to ascertain whether they are adequate for the purpose of certification of their graduates and their subsequent practice. With some strands of the profession this will be a big task that will take much time. A further consideration is that any changes to the training and education courses that are mandated by a review will take time to introduce. So it seems an opportune time to start the various reviews at the beginning of this mooted important change in the environmental health profession.

This article seeks to make a contribution to a review of the work of environmental health officers by looking at an aspect of one of their main tasks, namely statutory decision-making. It is inconceivable that an environmental health officer (EHO) should be able to obtain certification without demonstrating competency in the skills and knowledge required by the statutory decision process.

Environmental Health Vol. 2 No. 2 2002 11

... an [Environmental Health] officer needs to have sufficient knowledge to recognise that the hypothetical problem may be a “nuisance” or an “unhealthy premises”. In other words, diagnostic skills, which produce key words and phrases, are required to perform a legislation search. **Unless an officer possess diagnostic skills, it may be very difficult to carry out an efficient and productive legislation search to identify potentially useful provisions.**



Statutory Decision-making

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The momentum that appears to be building in relation to the development of a professional certification scheme for environmental health practitioners (Tenkate & Smith 2002) requires the several strands of the multi-disciplinary environmental health profession to engage in what the classical organisation theorist James D. Thompson refers to as opportunistic surveillance (1967, p. 151). Opportunistic surveillance is monitoring behaviour that scans the environment for opportunities rather than waiting for problems to present themselves for action. It will become apparent in this article that problems may arise in the future if members of the environmental health profession do not respond now to this proposed development.

The introduction of a certification scheme necessarily requires practitioners to be competent in that strand of environmental health for which they seek certification. Further, practitioners need to possess skills that will enable them to engage in continuing professional development in order that they can maintain their certification.

Inevitably, these considerations will require some of the stakeholders in the various strands of environmental health to review the training and education courses relevant to their particular strand to ascertain whether they are adequate for the purpose of certification of their graduates and their subsequent practice. With some strands of the profession this will be a big task that will take much time. A further consideration is that any changes to the training and education courses that are mandated by a review will take time to introduce. So it seems an opportune time to start the various reviews at the beginning of this mooted important change in the environmental health profession.

This article seeks to make a contribution to a review of the work of environmental health officers by looking at an aspect of one of their main tasks, namely statutory decision-making. It is inconceivable that an environmental health officer (EHO) should be able to obtain certification without demonstrating competency in the skills and knowledge required by the statutory decision process.

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The contemporary decision process, because the nature of legislation has changed from the very specific to the general, requires an officer not only to use this dye test but also ***to employ the same techniques that lawyers, courts and tribunals use to interpret legislation.***

KNOW YOUR LEGAL RIGHTS

GOT MOULD ?



MOULD ?



GOT MOULD? Do this :

1. EVIDENCE - Photograph it
2. Clean it with precaution
4. Dispose affected items
5. Document the result

*Contact your local government Environmental Health Officer for more information. They might be able to help.



TENANTS

HOMEOWNER

You may
WANT TO:

Refer **RESIDENTIAL TENANCIES ACT**

End your tenancy & **LEAVE**

Check **INSURANCE POLICY**

Consult **MOULD REMEDIATOR**



What should
YOU DO?

● Write a letter/email **LANDLORD/AGENT**

1. List what needs fixing
2. Give a clear deadlines
3. Record any conversations as evidence



Still not satisfied?

● Contact your
STATE TENANCY TRIBUNAL



● Is there any **MOULD EXCLUSIONS?**



Still not satisfied?

● File a claim at your
LOCAL/ MAGISTRATE COURT

● Please check their **QUALIFICATION.**



KNOW YOUR LEGAL RIGHTS

Who may
HELP you?



Certified Industrial Hygienist



Indoor Air Quality Specialist



Certified Mycologist



Certified Toxicologist



Board-certified Construction Expert



Board-certified Physician



Mould Specialised Lawyer



MONEY



Important Tips:

You must back up your claims with evidence such as expert reports, photos, tenancy agreement, receipts for expenses, mould sample, etc.

MOULDY BUILDINGS

GOT MOULD?



MOULD?



Does your building

HAVE THIS?

1. Extensive visible mould growth
2. Strong mildew odours
3. Visible water damage

It is better to assume that :

You've got a
MOULDY BUILDING!

WHAT CAUSES a
water-damaged building?

Did you
do it?

OCCUPANT BEHAVIOR

Unventilated moisture from heating, cooking, bathing & laundry causes condensation.

FAULTY BUILDING

°Inadequate ventilation
°Leaks °Moisture ingress °Condensation

NATURAL DISASTER

°Flood °Hurricane °Storm °Cyclone

What **SHOULD** **YOU DO?**



Ventilate the building



Install vents/fans



Check your heating system



Find the causes



Fix it



Schedule a regular check up



Dry out & clean up the building within 24-48 hours.



Photograph for evidence.

Who should you **CONSULT?**



CERTIFIED INDUSTRIAL HYGIENIST

They are who conduct sampling to identify the source of mould and they may also identify appropriate remediation procedures.



CONSTRUCTION EXPERT

They can inspect and provide advice relative to a building's design, construction, soundness and source of moisture.



Insurance Agent



Certified Plumber

MOULDY BUILDINGS



TOP 10 DESIGN TIPS to Limit Condensation

1

Design for climate and ensure air is able to circulate.

6

Insulate the roof and ventilate the roof spaces using eaves and soffit vents.

2

Duct gas appliances, range hood, dryers, exhaust fans to outside air.

7

Create air spaces and ventilate wall cavities.

3

Consider make up air strategies [e.g. passive background/trickle vents]

8

Keep building materials dry during construction.

4

Cover ground soil with sealed impervious membrane to control sub floors dampness.

9

Avoid light fittings that allow warm moist air into colder roof spaces. [e.g. downlight]

5

Use 2nd generation 'vapour permeable' wall wraps [not punched sarkings]

10

Minimise use of cold surface materials in warm air spaces.

*For more information, refer to ABCB Condensation in Buildings Handbook

MOULD

MOULD

somebody's problem, nobody's business...

MOULD

somebody's problem, nobody's business...

so try not to get it in the first place

AIRAH



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ARCHSCIENCES

Architectural Design + Building Sciences