MVHR & ventilation monitoring

AECB conference 2015

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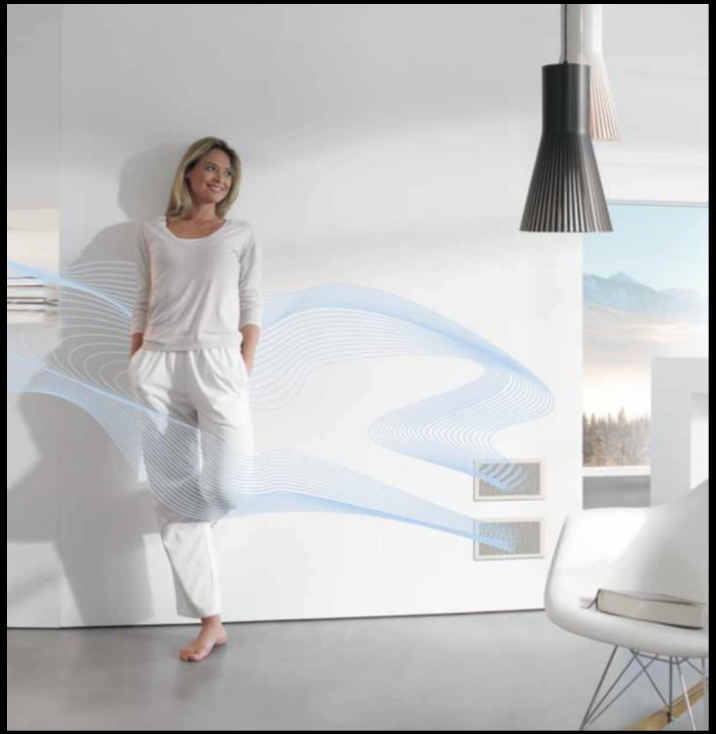
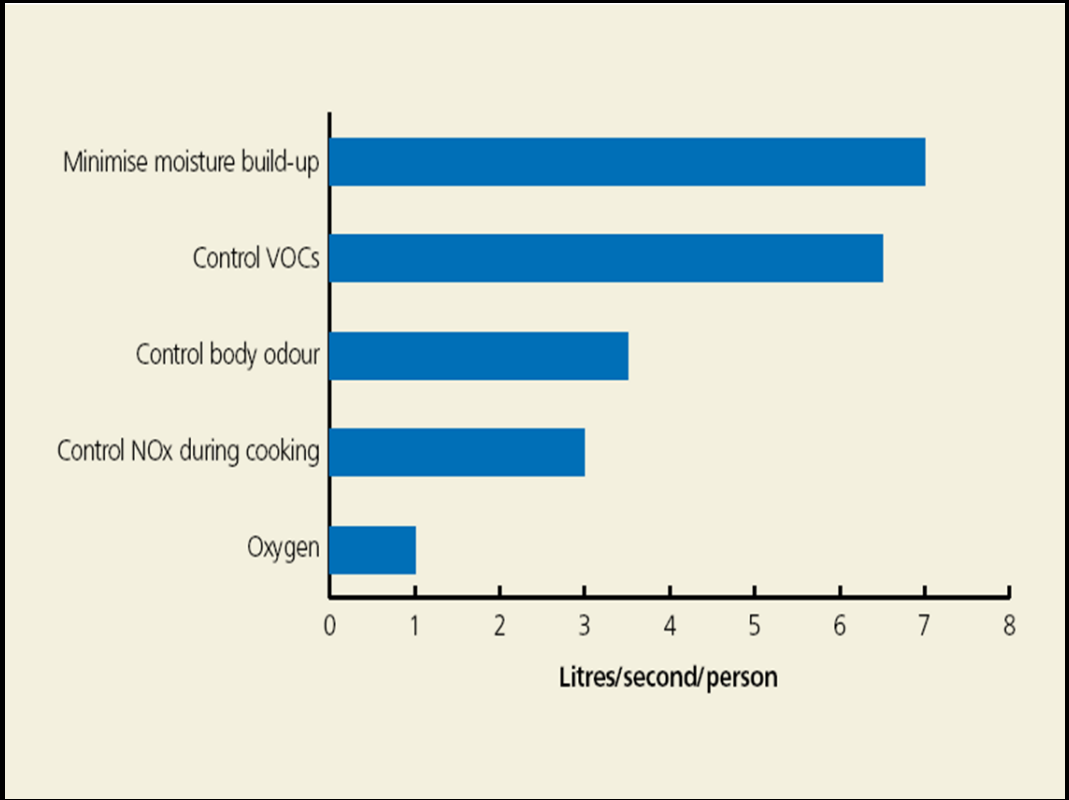
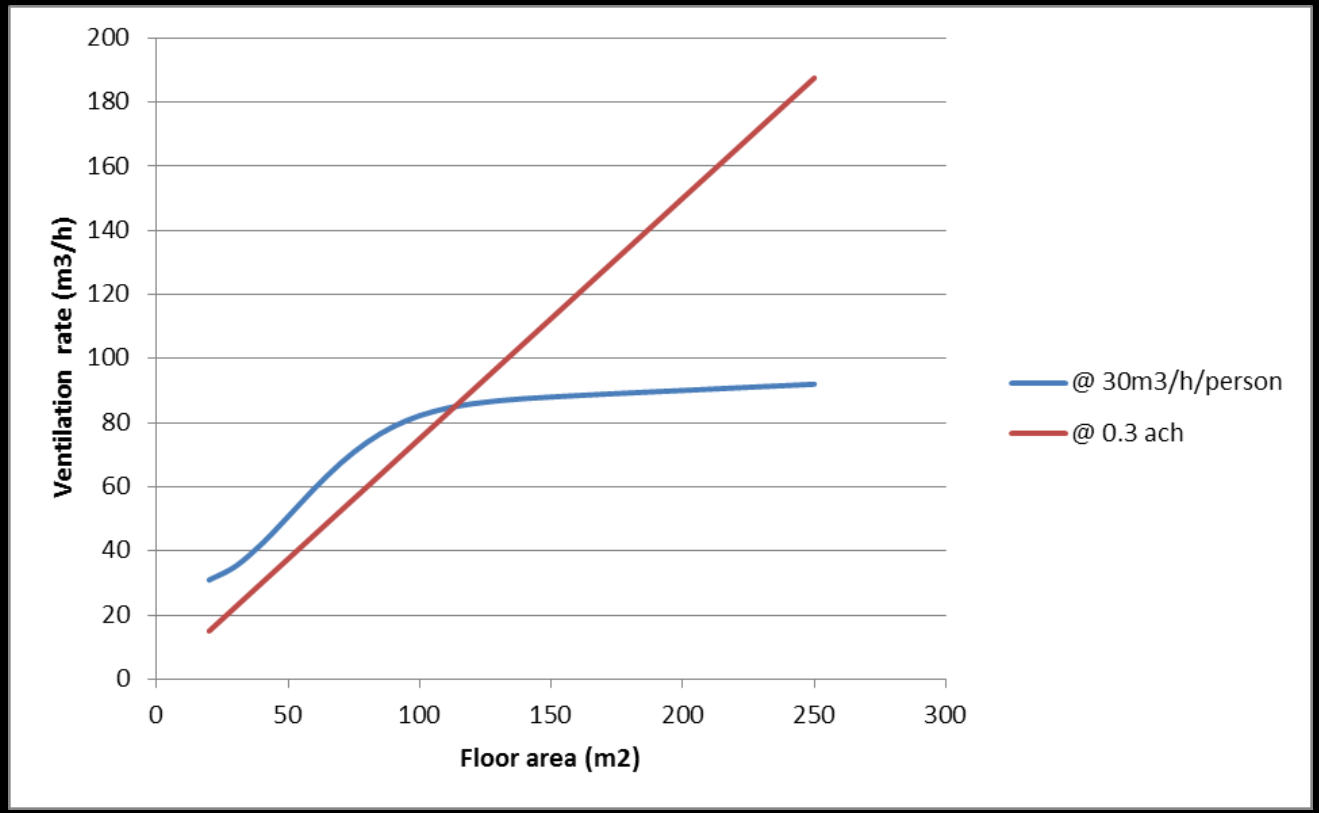


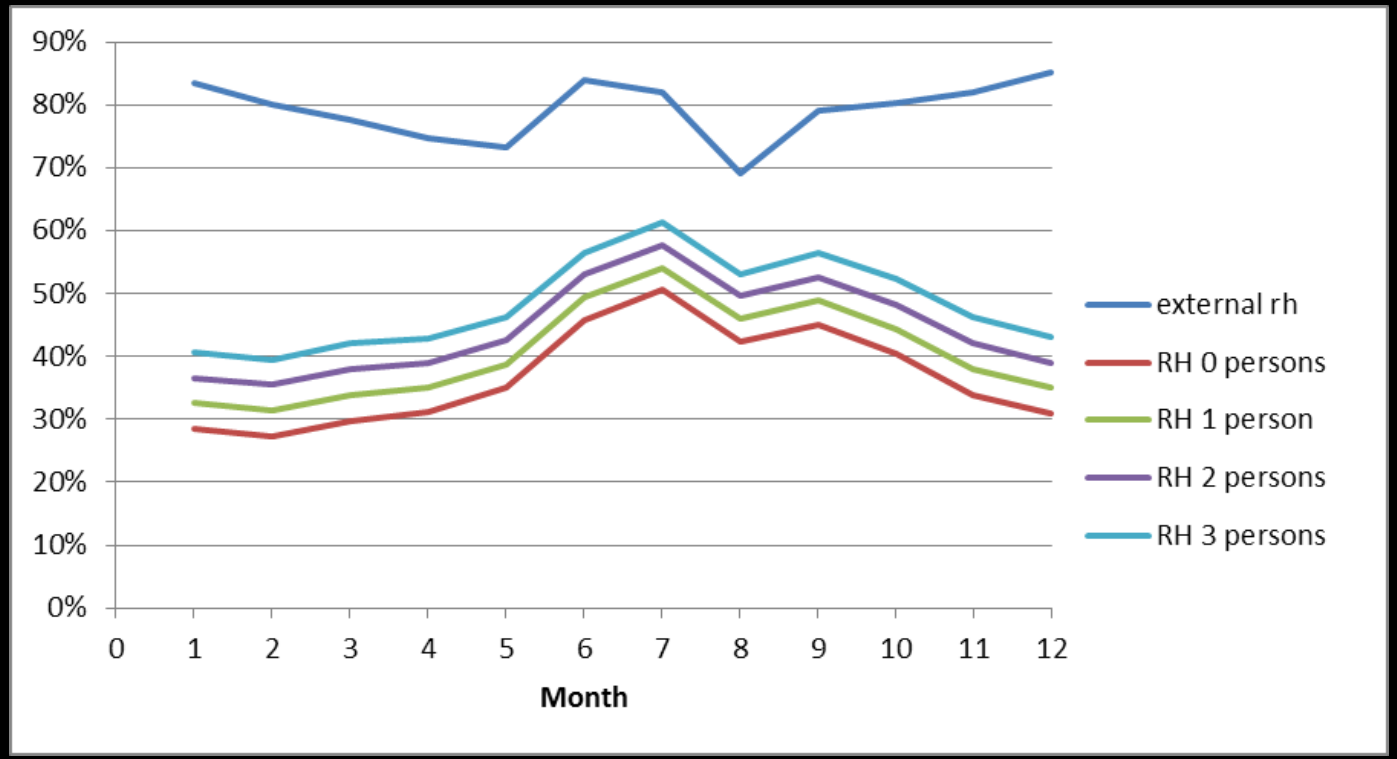
How much air do we need?



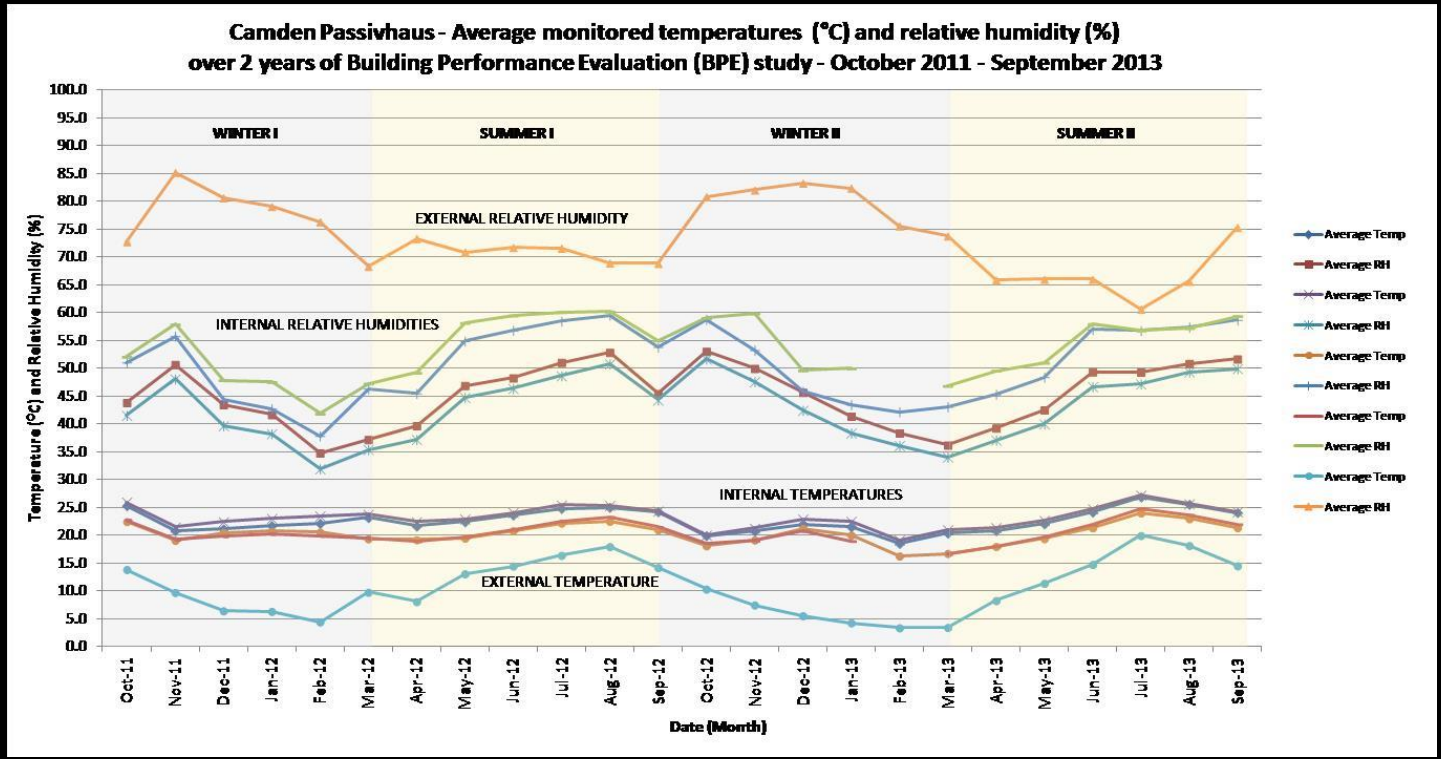
Vent rate for moisture vs VOCs



Humidity depends on occupancy



..and monitored

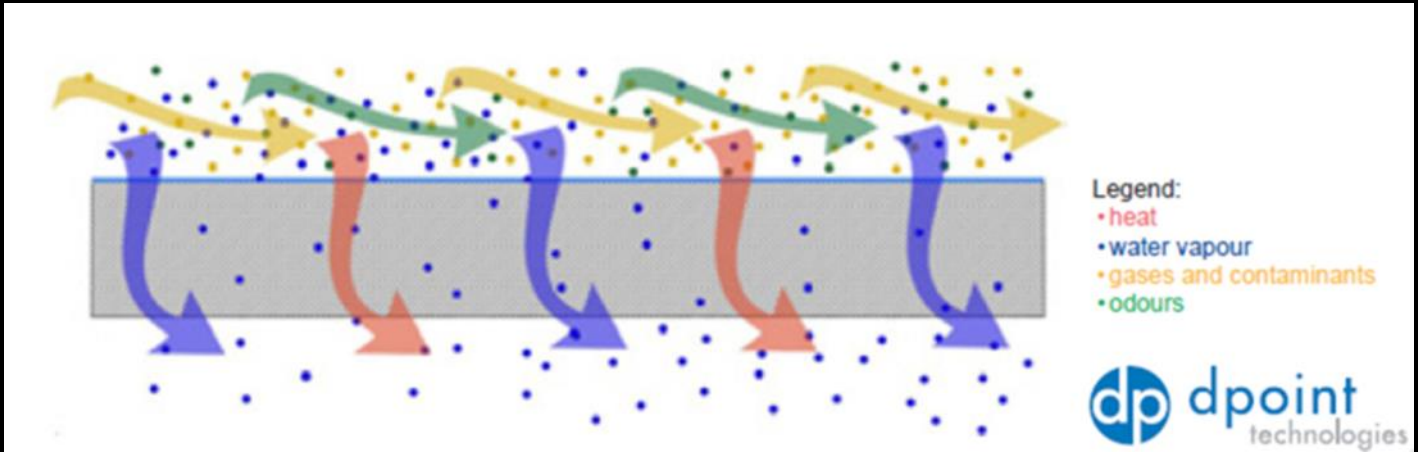


Low humidity problems

- Dry skin
- Itchy eyes
- Dry nose & throat
- Cold and flu viruses thrive
- Ideal minimum RH=40%

- Problem – low relative humidity
- Solution #1 – humidity recovery, aka enthalpy recovery

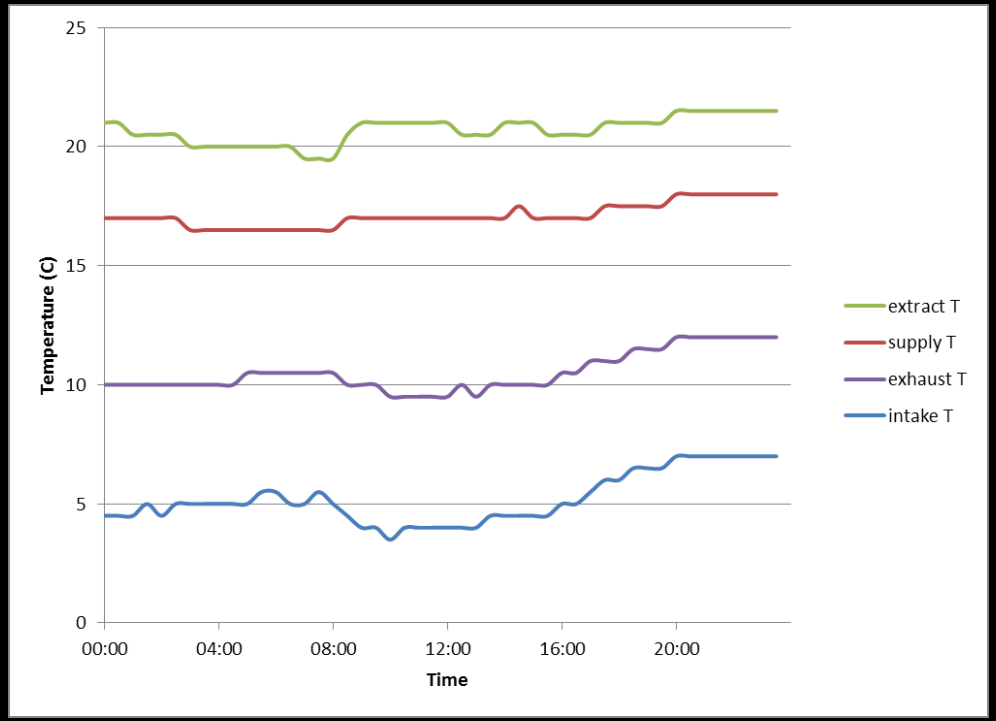
Humidity recovery



Trial heat exchanger swaps

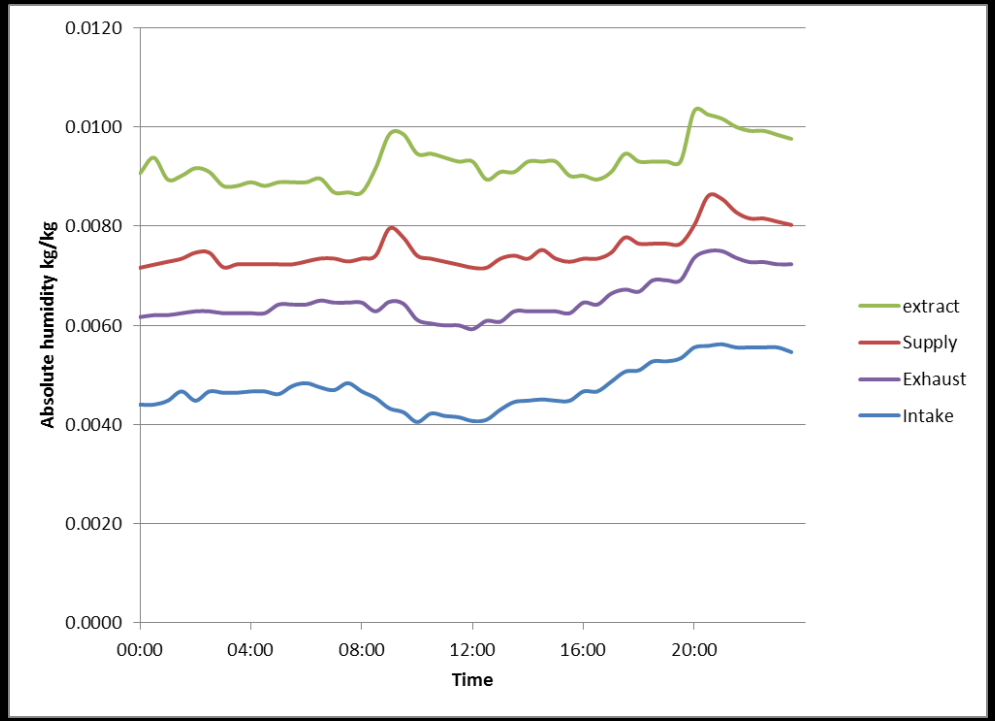
- 1 Lancaster coho
- 2 Wimbish

MVHR temperatures – 1 day in Jan



Efficiency on temperature = 77%

Moisture levels



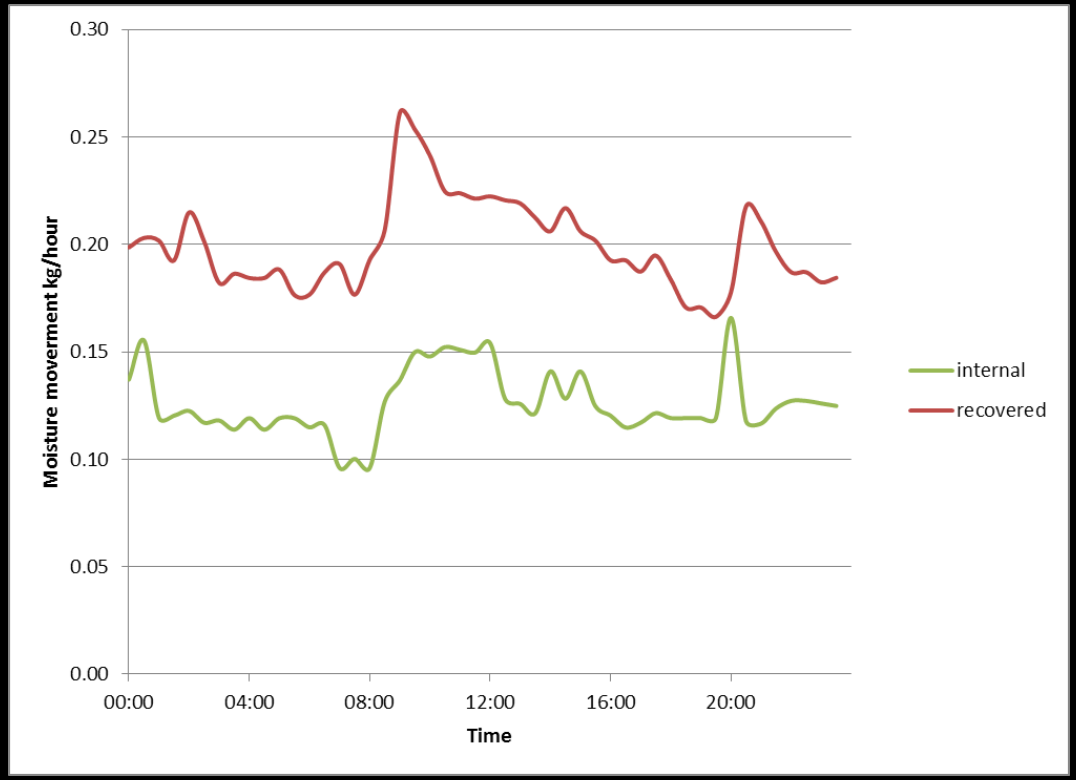
Efficiency of moisture recovery = 61%

Moisture balance

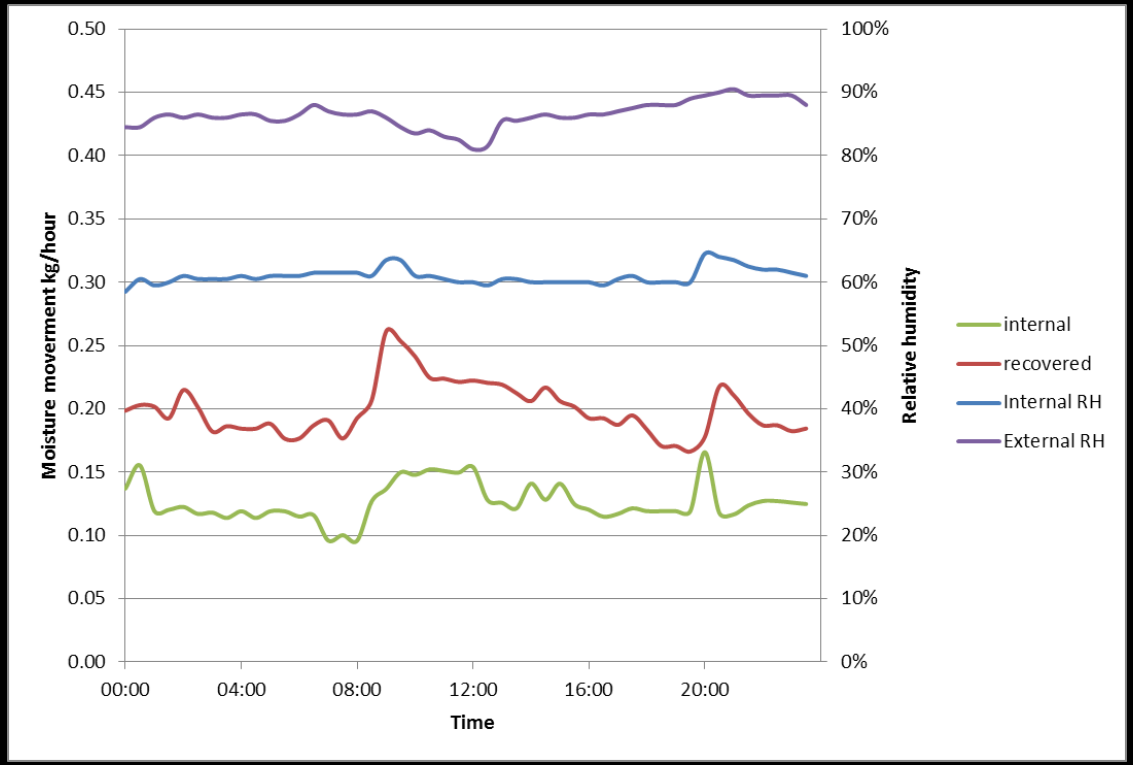
Averages:

Internal =130g/h

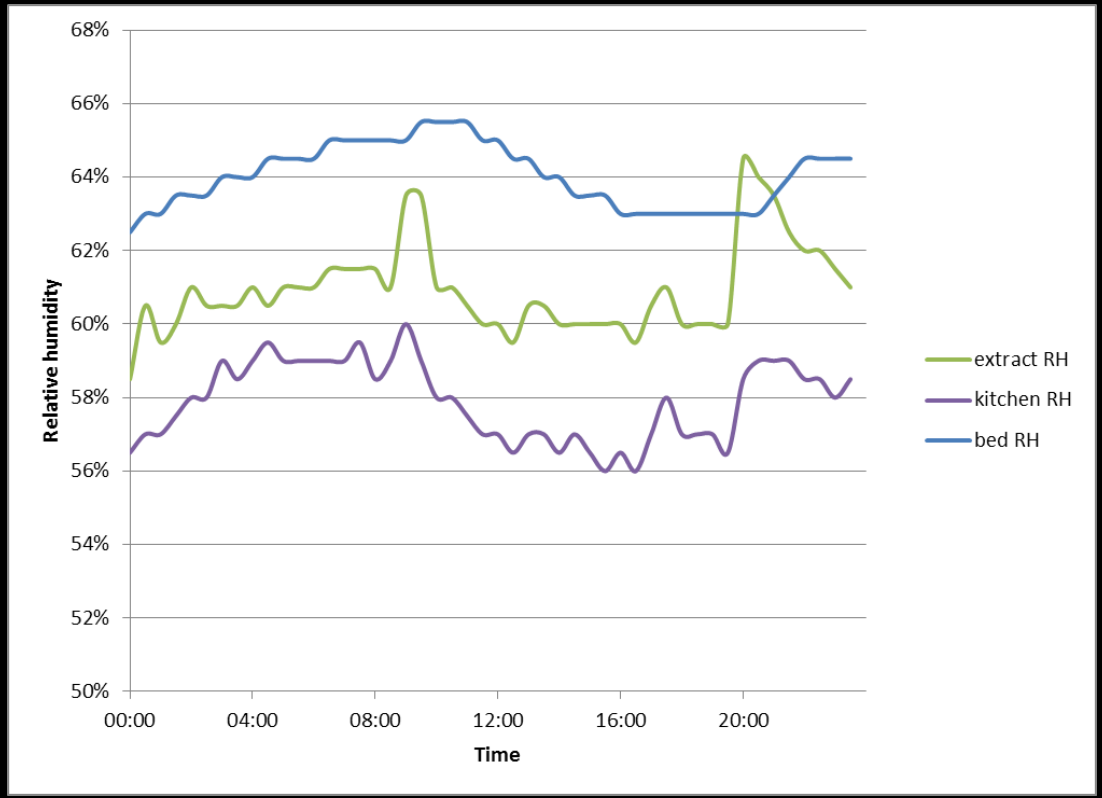
Recovered =200g/h



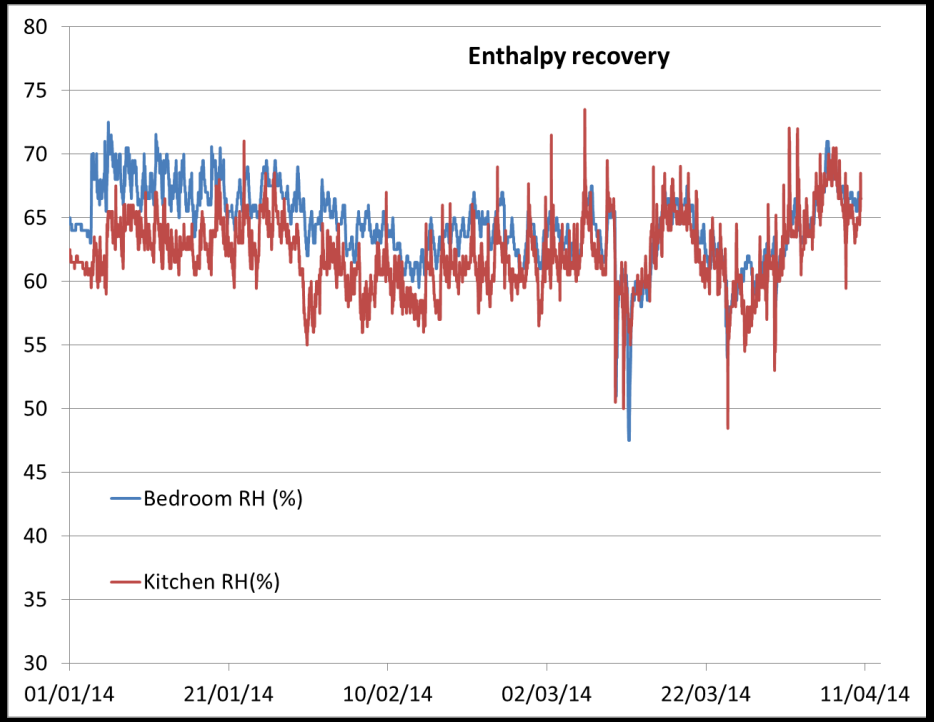
With internal and external RH

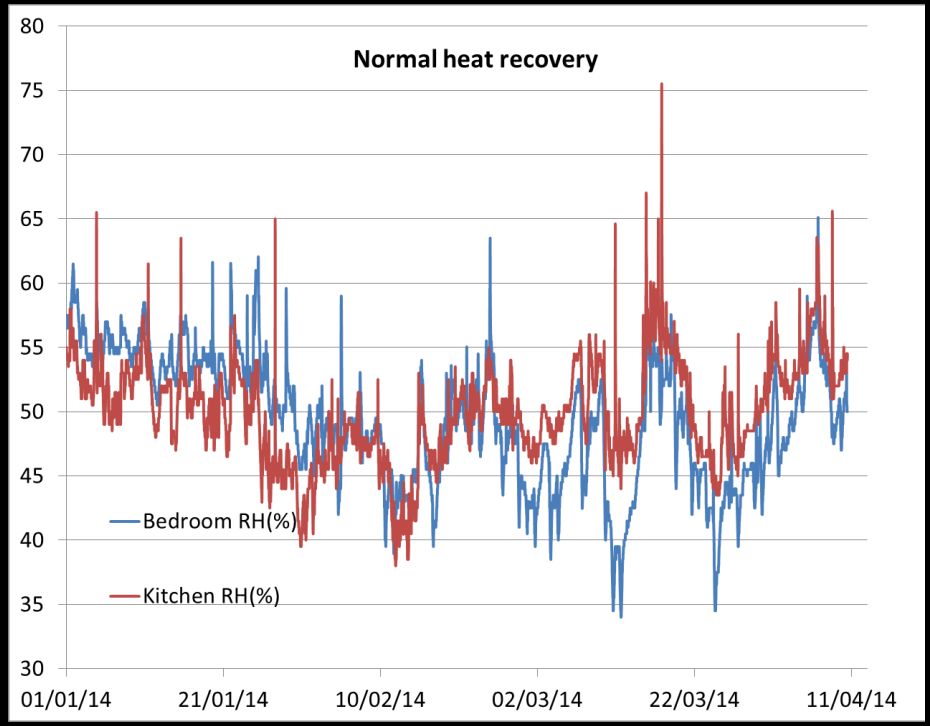


Internal conditions

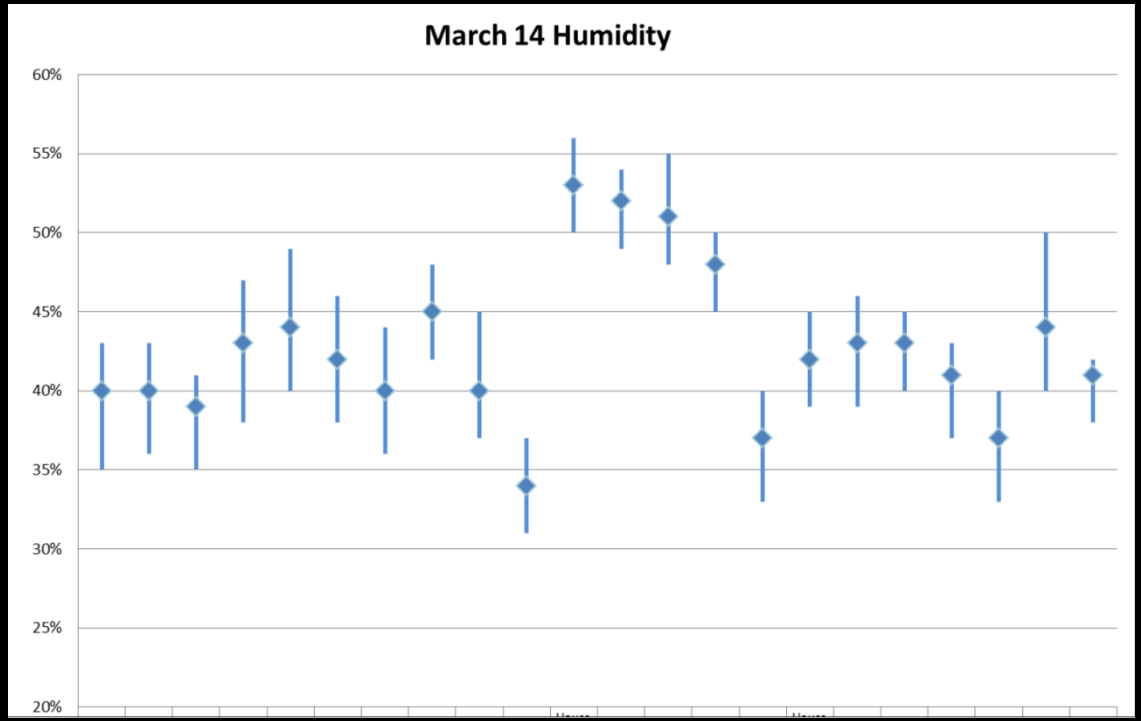


Over the months





And at Wimbish



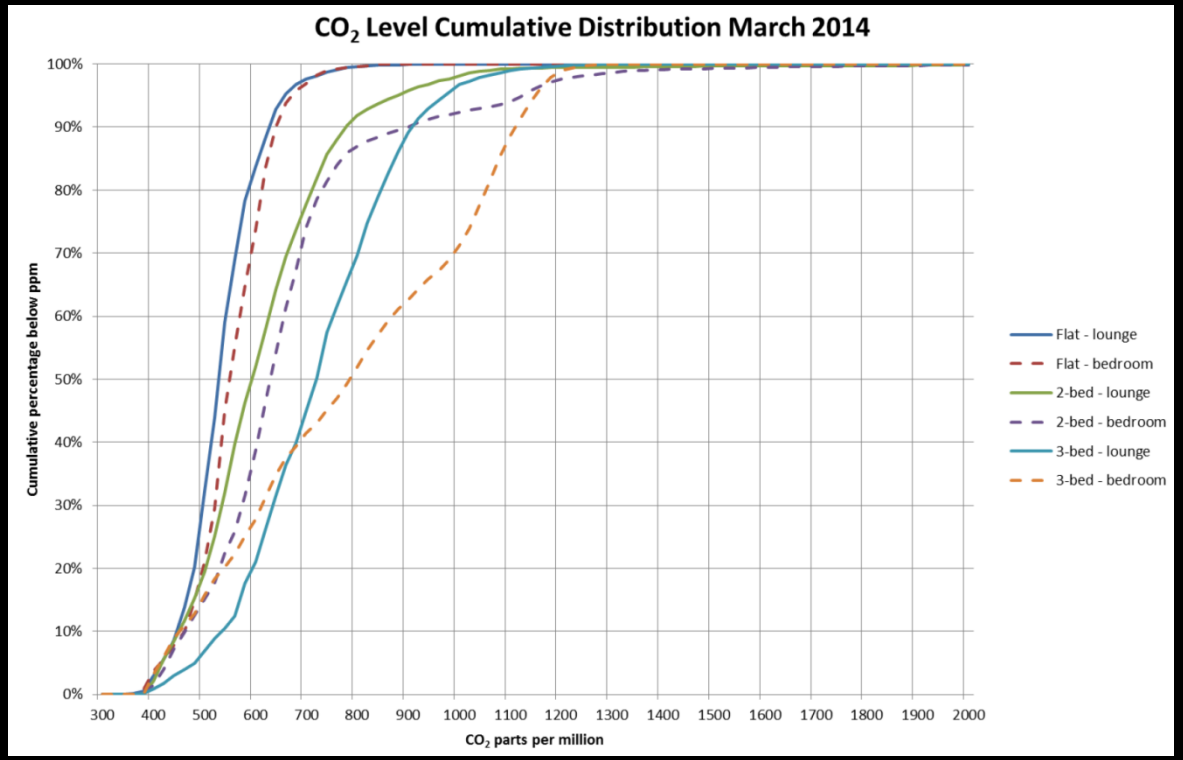
- 4 highest in one house with enthalpy recovery
- Other enthalpy house has normal RH
- Only a few show average < 40%RH

Conclusion

- Humidity recovery does what it says
- Internal moisture generation is lower than we expected
- RH in bedroom is too high
- Enthalpy recovery not applicable in small UK dwellings!

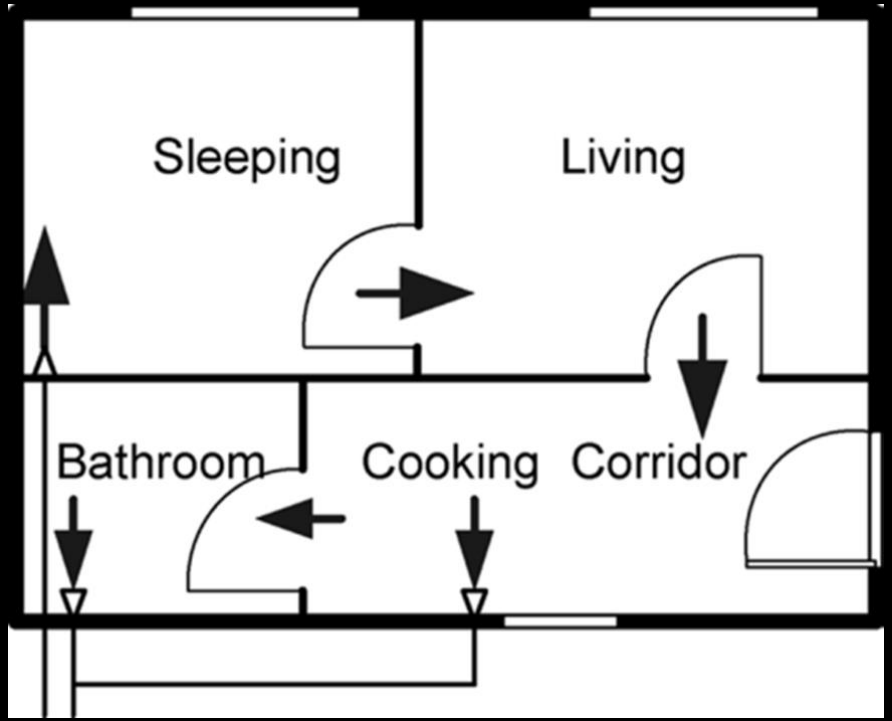
- Problem – low relative humidity
- Solution #2 – cascade ventilation

Wimbish monitoring:



Beds tend to be under-ventilated

Principle of cascade vent



‘Proper’ ventilation

Andrew Farr to talk about cascade ventilation

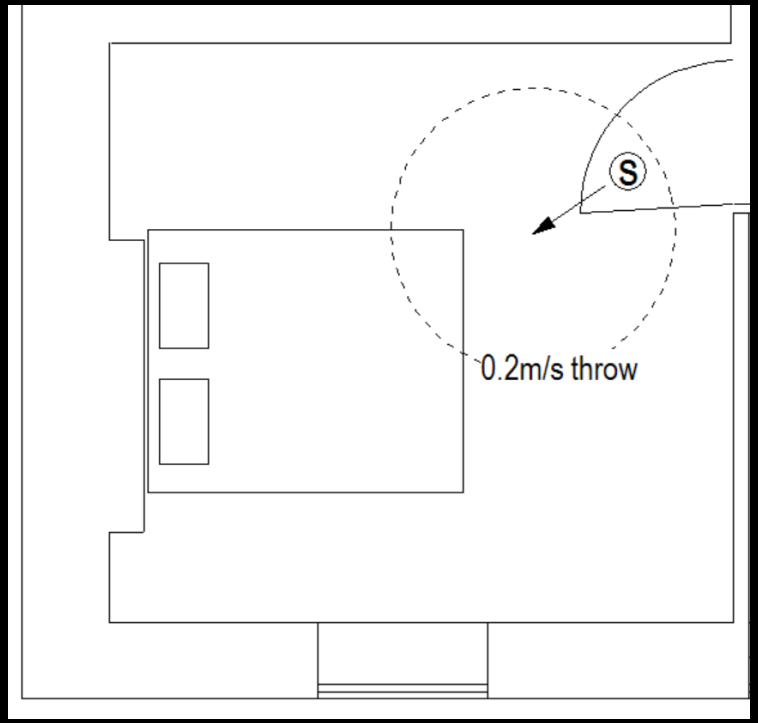
Air distribution in rooms

- Where to put the terminal?
- The centre?
- Over the window?
- Over the door?

Advantage of doorway terminal

- Never covered by furniture
- Shorter ducts – cheaper, less pressure loss
- Doesn’t clash with lights
- Not over bed – quieter when sleeping

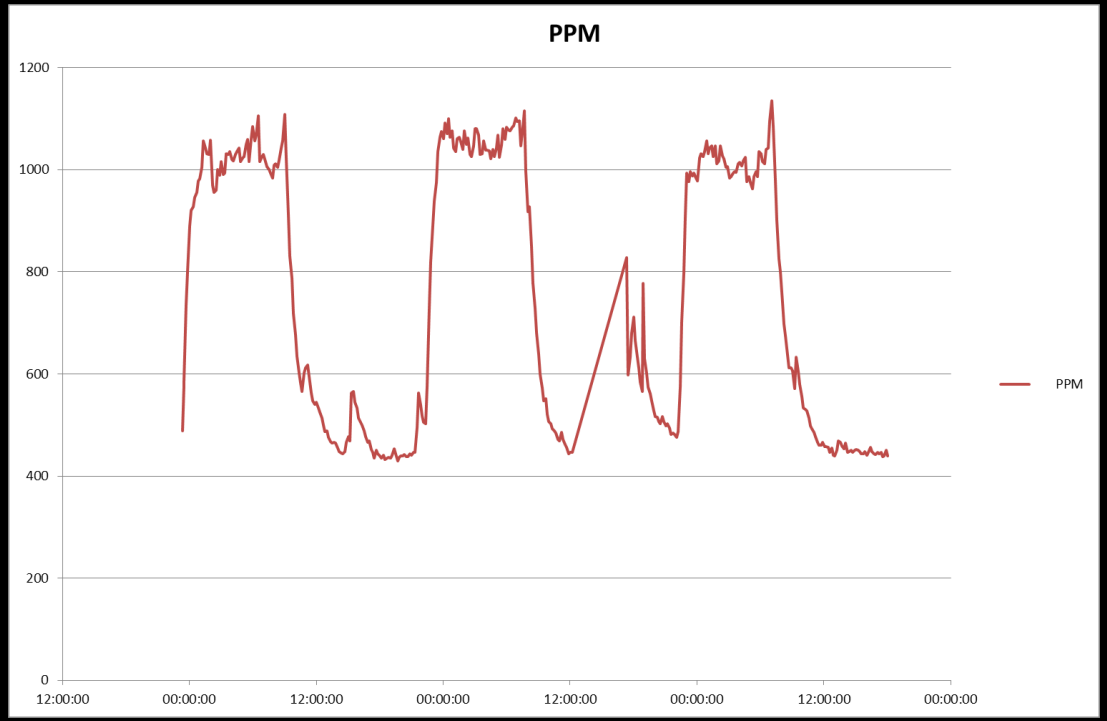
Ceiling terminal, over door



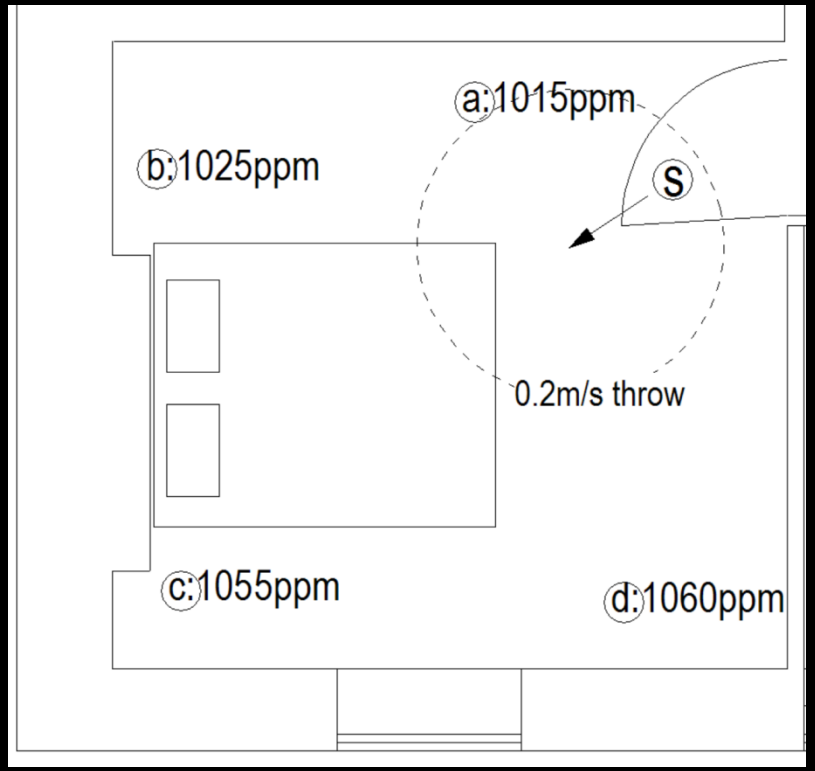
180˚ directional insert

Time to measure

CO_2 monitoring



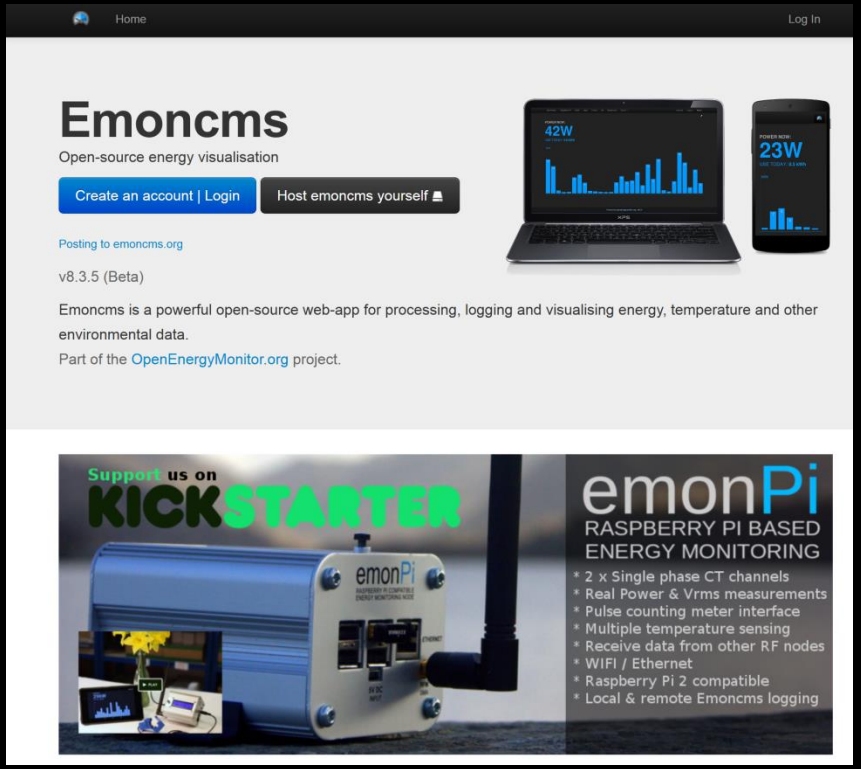
Results – nightly average



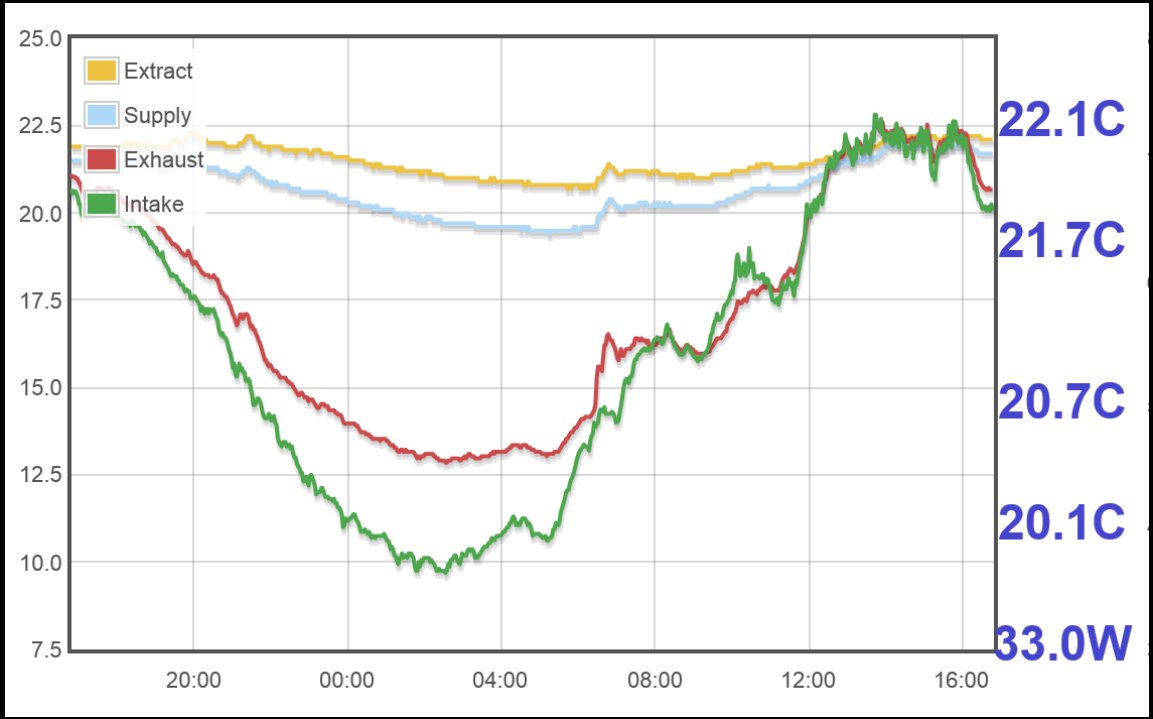
Conclusions

- Air mixes better than you might expect
- Ventilation effectiveness uniform close to and remote from terminal
- High “throw” terminals not essential for domestic ventilation
- No need to design for “cross flow” etc

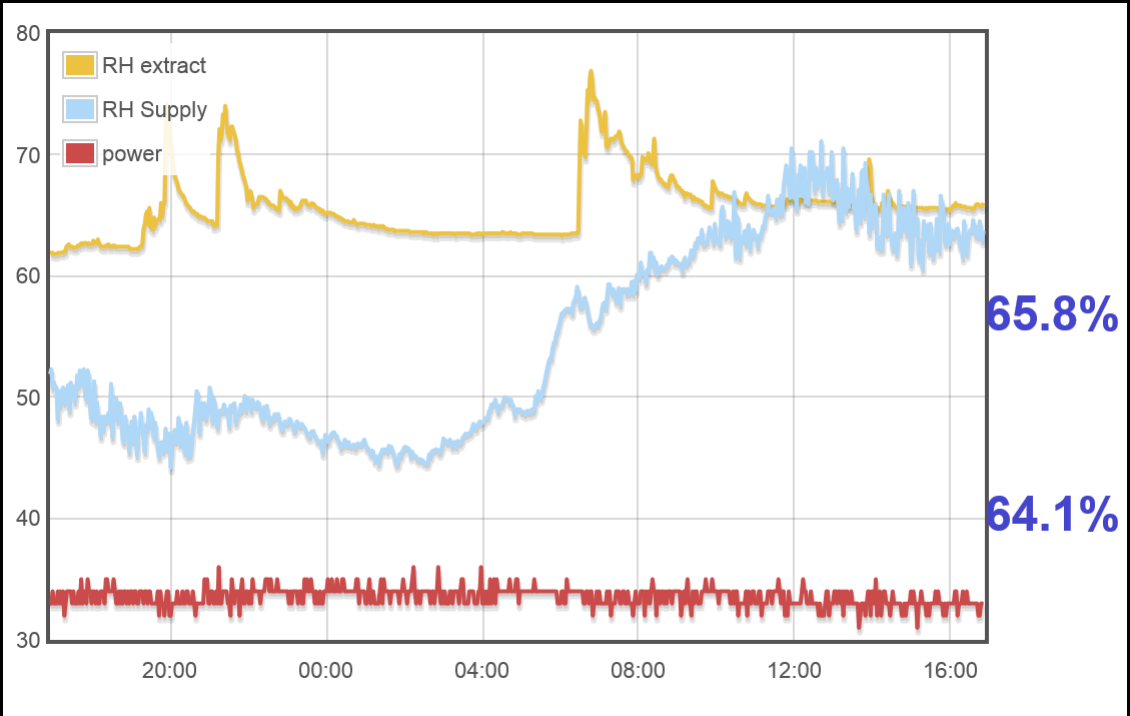
Our home MVHR monitoring



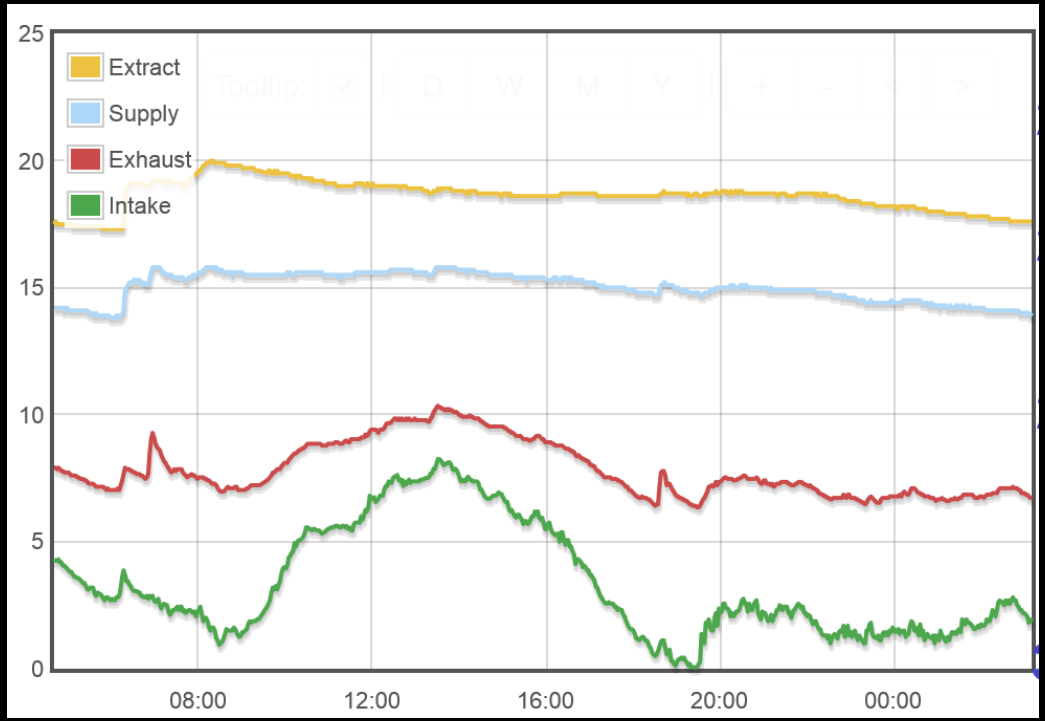
Examples of June temperatures



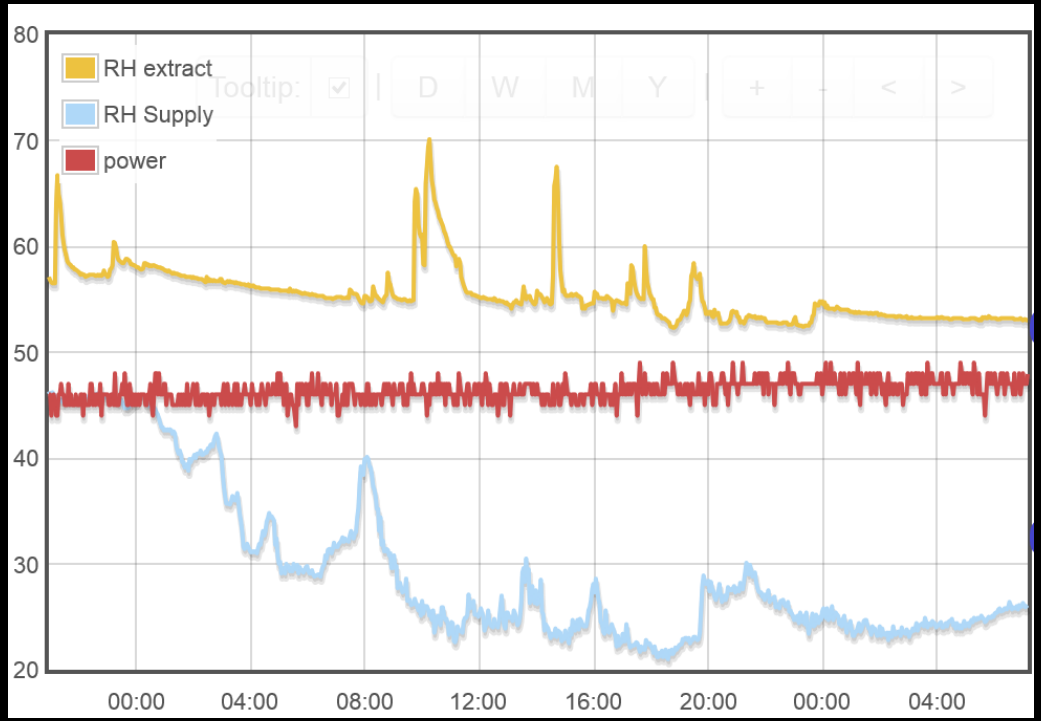
And relative humidity



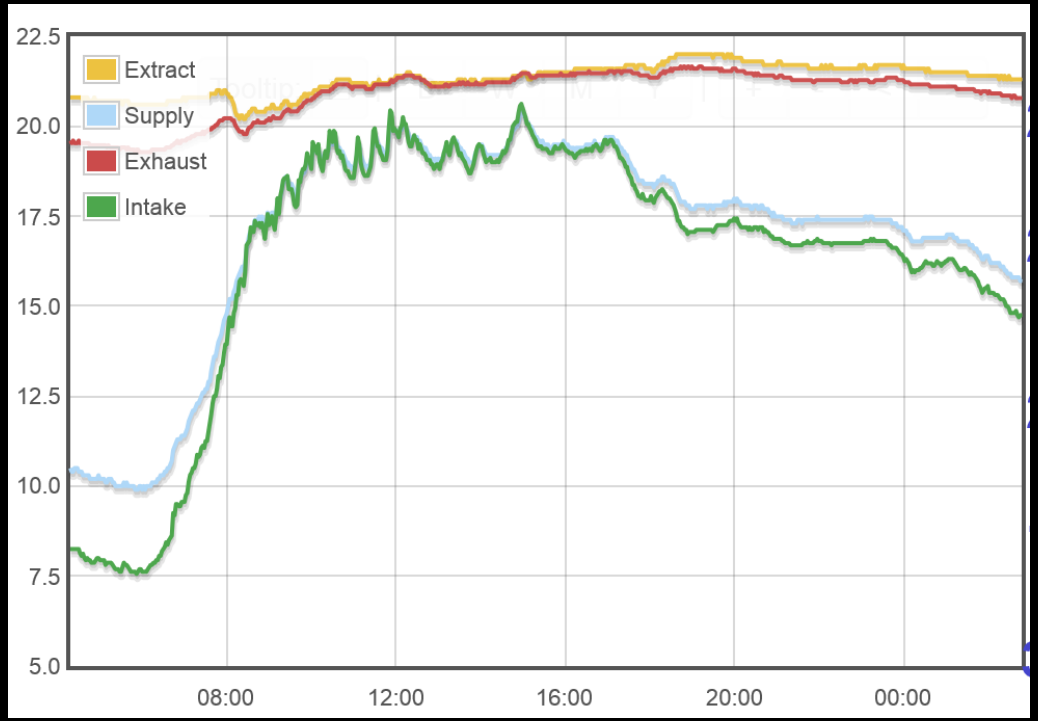
Winter temperatures



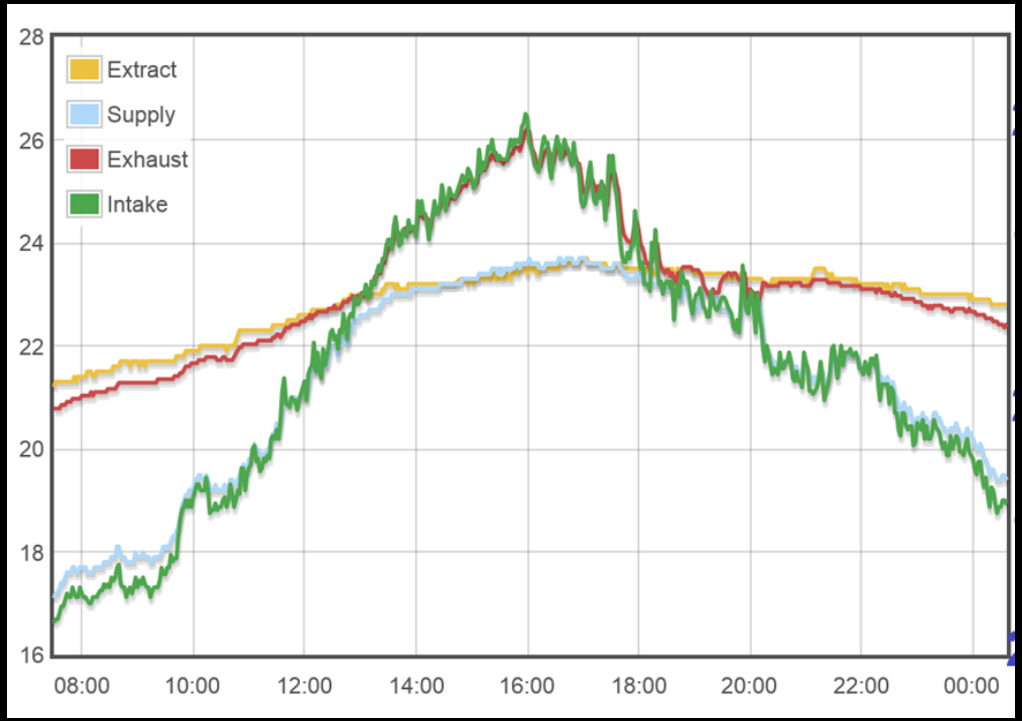
RH


RH extract
RH Supply
power
80
70
60
50
40
30
20
00:00
04:00
08:00
12:00
16:00
20:00
00:00
04:00

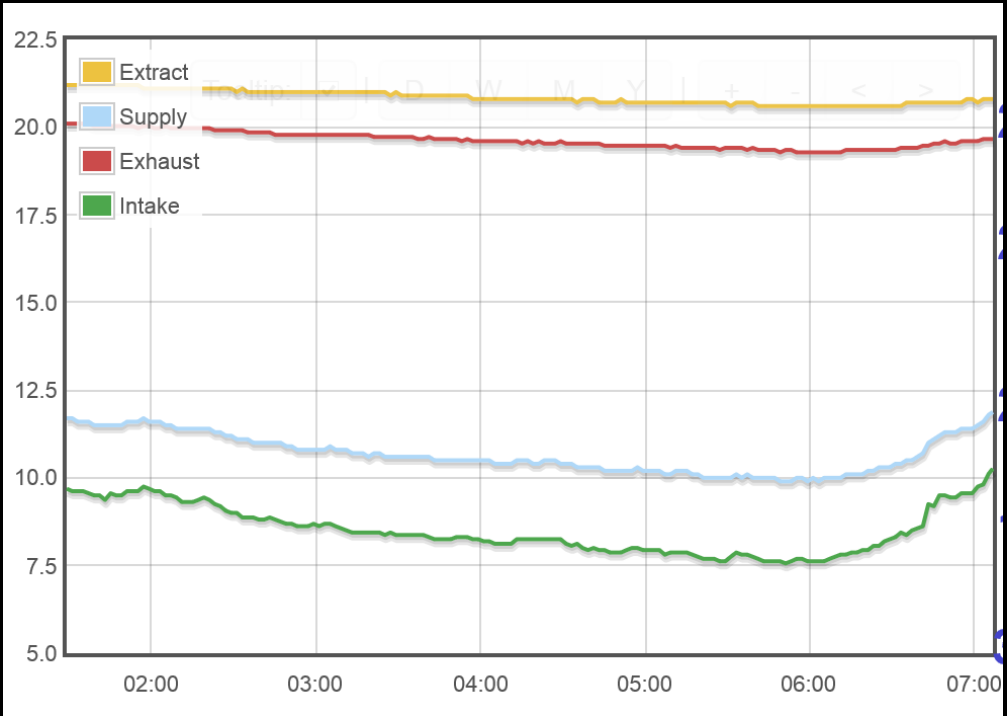
Summer bypass mode



Summer bypass + heat recovery



Look closer…



6am:

Extract=20.6

Exhaust=19.3

Supply=9.9

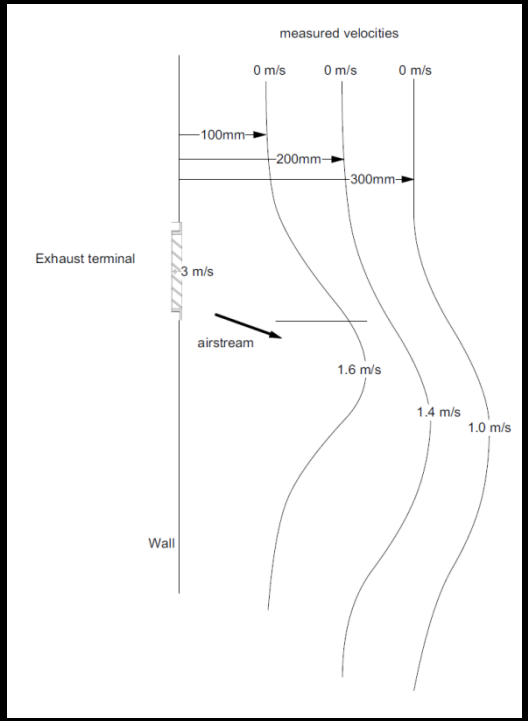
Intake=7.6

Heat Recovery=18%

External terminals

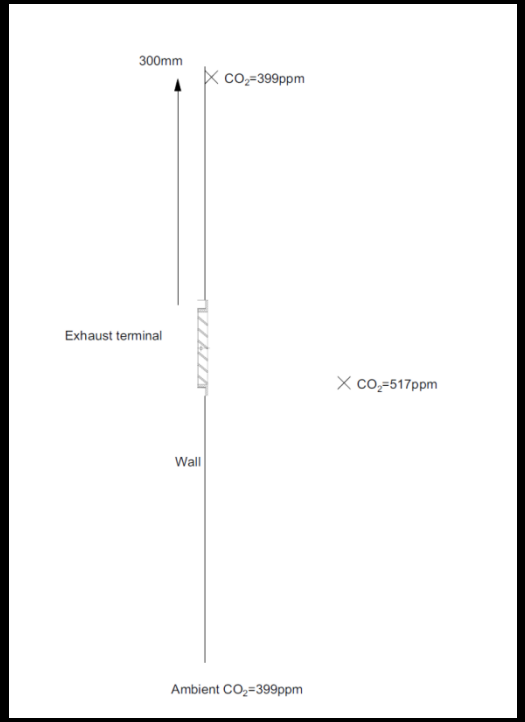
How close can they go?

Measured air velocity



Can’t measure air movement towards intake postion

Measured CO_2



We plan to use CO_2 measurement to determine cross contamination between exhaust and intake.

Additional CO_2 source needed for meaningful results.

Further research

- Release relatively high level of CO_2 inside house
- Measure level in intake duct
- Note
  - Heat exchanger leakage max limit = 3%
  - Indoors mixing eg en-suite-bedroom =< 100%?

Conclusions

- Air can move in mysterious ways
- Don’t make assumptions – measure
- “guidelines” appear often to be based on someone else’s assumptions