

'Proper' ventilation

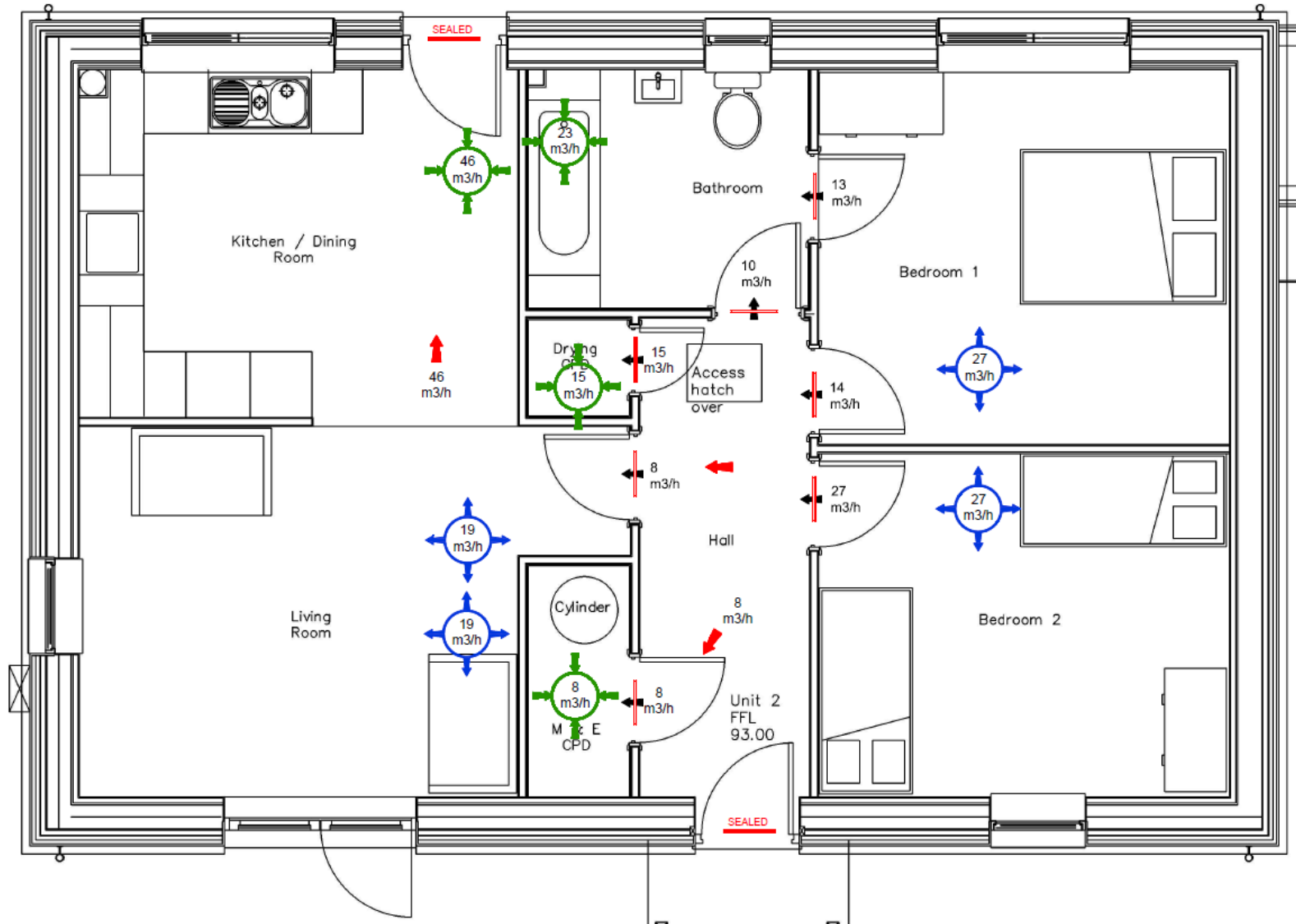
Andrew Farr

Do we need air valves everywhere?

Cascade / 'Extended Cascade'

the sensible solution to good air quality?

The classic problem



Cascade verses supplying every room

- Roughly we get 30m³/hr per person to ventilate a small to medium sized domestic dwelling. 1m³/m² of floor area
- We need 15m³/hr per person in a bedroom?
- We need 15m³/hr per person in a living room?
- Is it OK to 'predict' room usage, not everybody has 2.5 kids? (Rob Prewitt)
- What if there's a study and a dining room too?

What effect does cascade have on ventilation rates?

- 'Normal'

- Bed 1, 30m³/hr
- Bed 2, 30m³/hr
- Living room
60m³/hr?

Total 120m³/hr

Then maybe
there's a study
too?

- Cascade

- Bed 1, 30m³/hr
- Bed 2 30m³/hr
- Living room
transfer air

Total 60m³/hr

Ok, so maybe we
need to add a bit
for the study?

Pros and cons of Cascade

- Pros
 - We make better use of the air available?
 - We don't need to predict room usage?
- Cons
 - Supply air heating doesn't work!
 - We get stale pockets of air lurking in the corners of rooms?

**Cascade ventilation – air exchange
efficiency in living rooms without
separate supply air inlets and exhaust
(extract) air outlets**

Authors: Gabriel Rojas, Dr. Rainer Pfluger

Previous supporting work: Elisabeth Sibille

Method

The method to evaluate the air quality in the living-room is similar as described and used in the parameter sensitivity study developed in [Rojas 2012]. According to this method, the multi-zone simulation software CONTAM (NIST) was chosen to simulate the CO₂ and humidity rates on which the user's comfort in the living-room is evaluated. The software assumes by default that the air is perfectly mixed in each zone. In fact, several studies have shown that the air can be assumed as perfectly mixed in almost all usual shapes of room [Schneiders 2003], [Fräfel 2009].

- From what I have access to all the research was based on modelling.

Terminology

- There is some difference in the way that terms are used normally in the discourse between Germany and UK
 - They often use to ‘extended cascade’ to refer to what we usually call ‘cascade’ when discussing MVHR systems.
 - Technically I think they are right and we are lazy!
 - I’m going to use ‘cascade’ to refer to what I have been taking about and ‘extended cascade’ for the following...

With normal cascade room layouts the modelling showed good vent levels

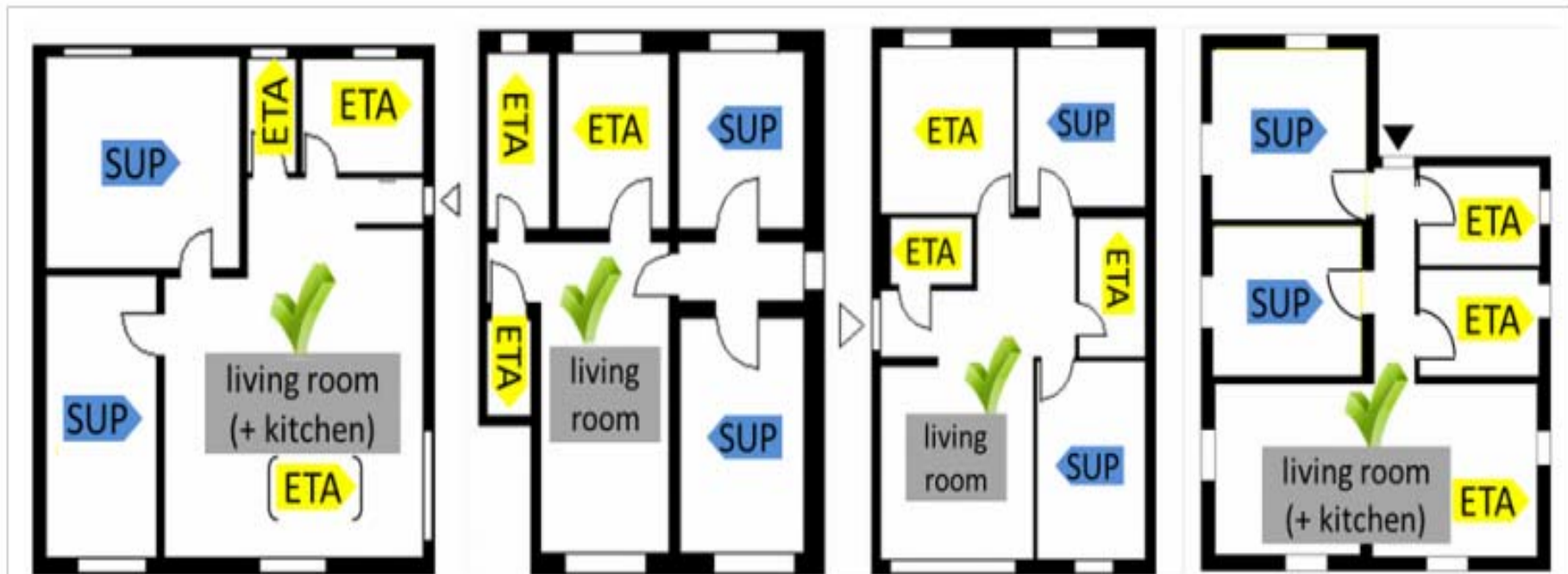


Figure 6:

Examples of floor plans in which extended cascade ventilation can be used effectively.

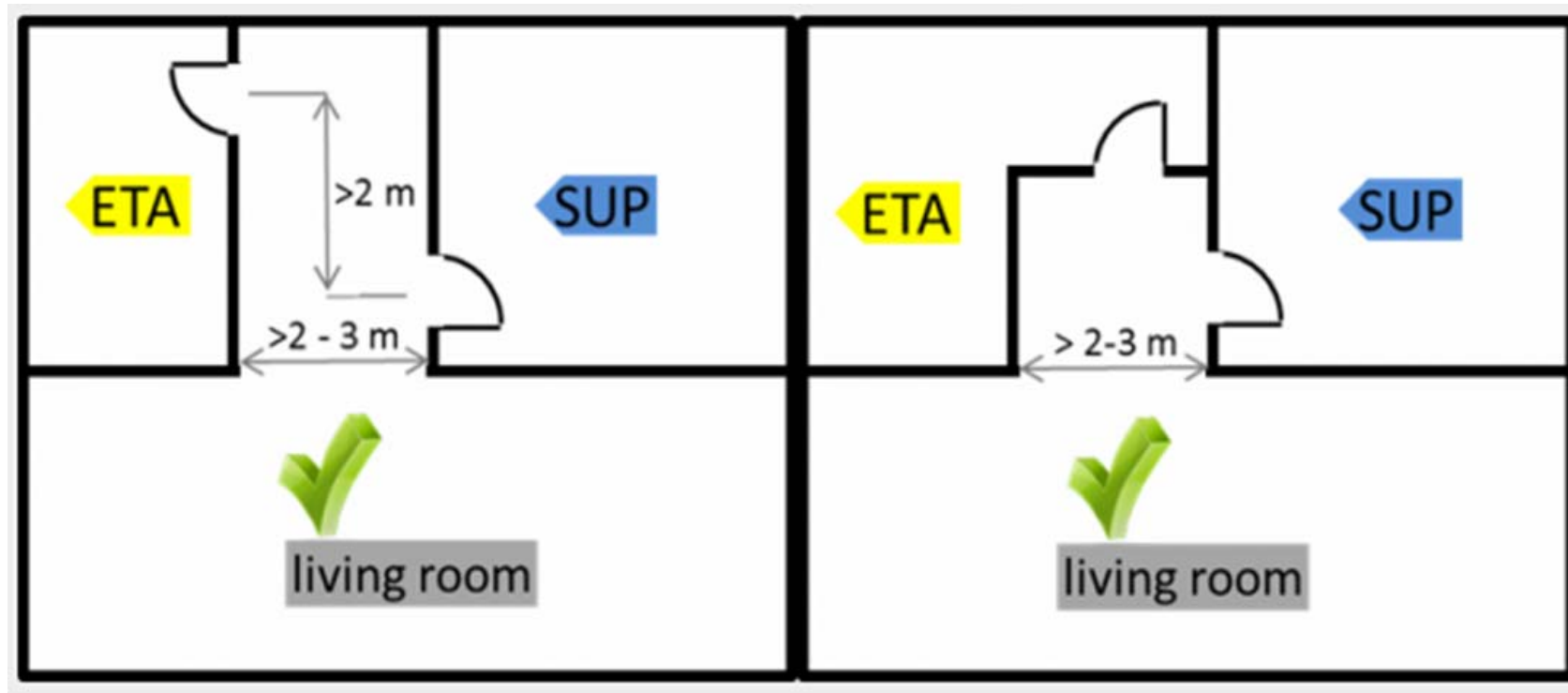
The living room receives enough fresh air

from this airflow. The overall airflow within the apartment is used more efficiently and can be reduced.

Pushing the boundaries:
Does the living room need a supply?

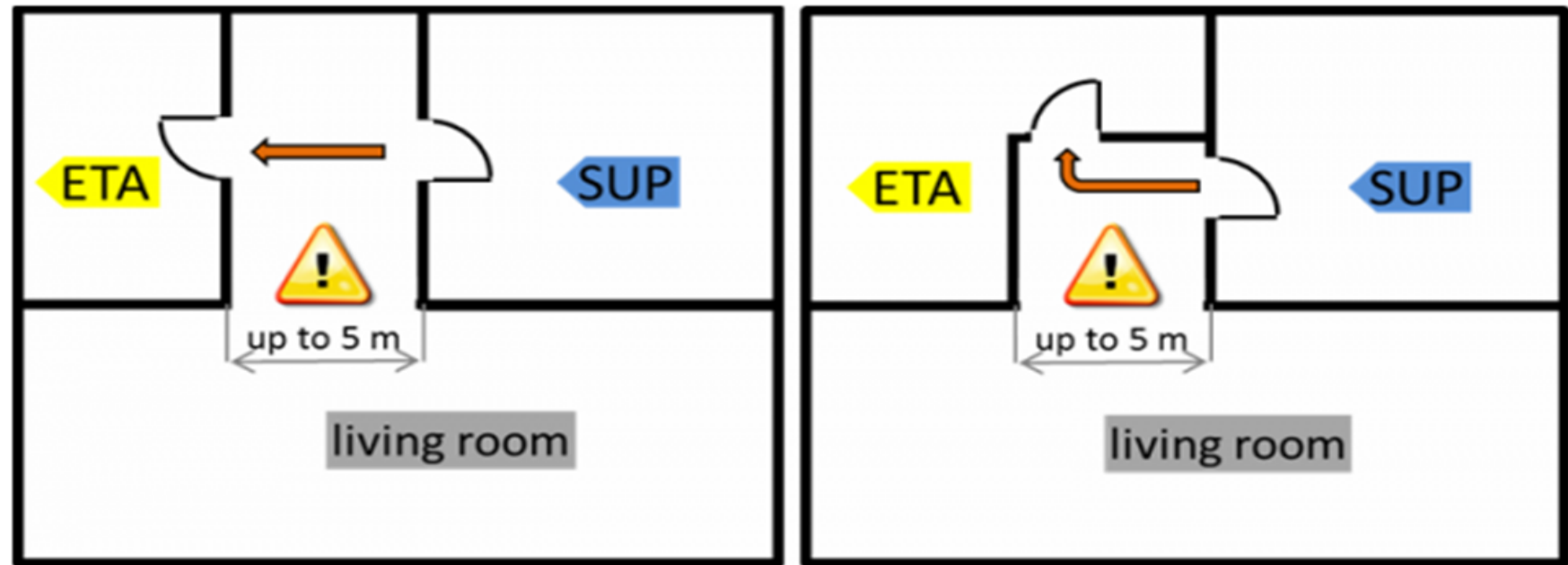


In direct air transfer



‘Possible arrangement of air outlets to significantly reduce the risk of short circuiting. The simulation revealed an air exchange efficiency of > 0.4 ’

Short circuiting



‘Hallway and airflow arrangement in which there is a potential of airflow short circuiting depending on boundary conditions.’

What questions arise for me from this?

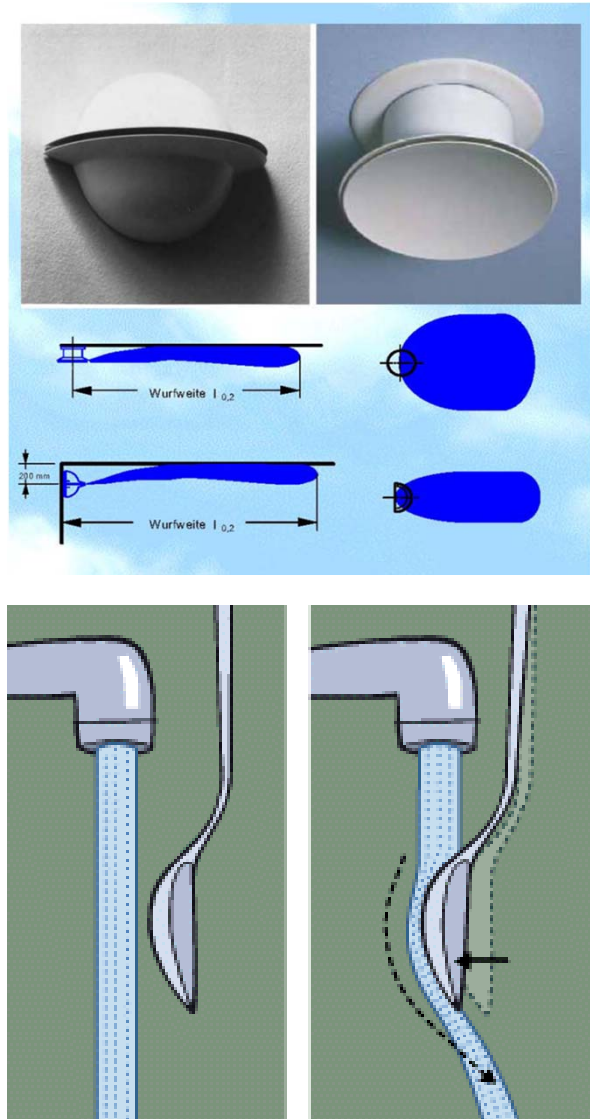
- The modelling assumed that doors were closed.... How many people in real life close all the internal doors habitually?
- If for the ventilation to be reliable width of the hall way needs to be 2-3m won't most people in this country put furniture in them?

My conclusions

- The 'extended cascade' ventilation could do with a bit more real life research.
- Maybe it works with people who lead 'perfectly' ordered lives'?
- What it does show is that normal cascade ventilation is very robust.
- Air mixing in domestic rooms is very good, if there is an air valve in there it will work?
- Architects need to think about ventilation at early concept stage.

Where does this leave us with Coanda effect?

- Why have we been using these type of air valves?
 - Because they allow us to blow air from one side of a room to the other
 - Because they increase air mixing
 - Because they are beautiful and every architect loves them





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Conclusions about coanda air valves

- Yes the work:
 - Yes they help with mixing
 - The VVTK has very good attenuation
- But actually if we get the air into the room the movement of air due to the other drivers will mix perfectly well.