



NTNU

Norwegian University of Science and Technology

Alternative air circulation concepts in pools

How can the air quality for the swimmer be improved?

IAKS seminar Asker, Norway

2022-09-08

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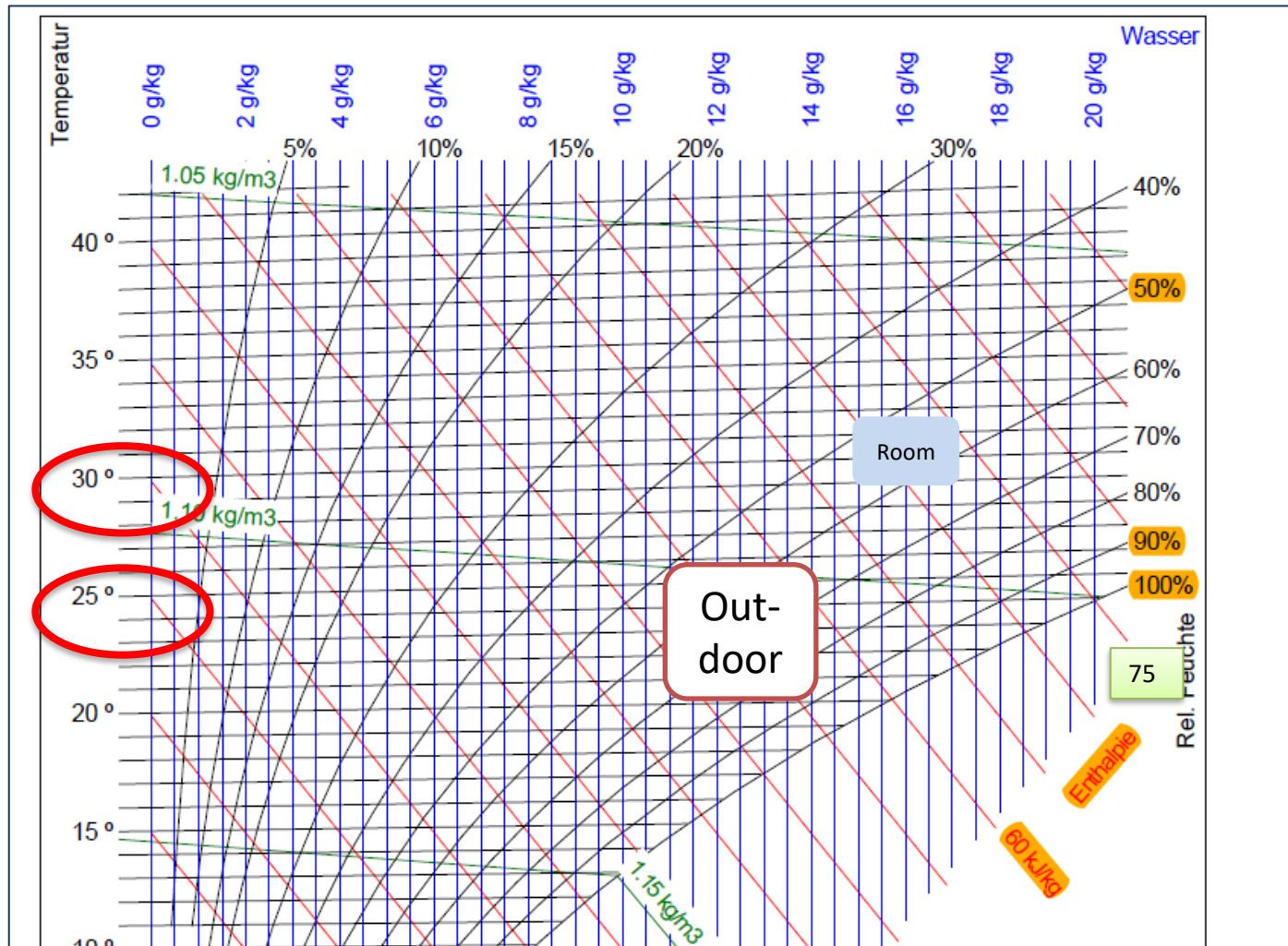


IAKS

International Association
for Sports and Leisure Facilities

Why ventilation?

Purpose	Comment
Person's fresh air demand	We all need fresh air, and athletes much more than others
Remove pollution	Which, from where, how much?
Building physics	Moisture and air pressure, temperature
Good energy economy	Keep energy in system, reduce energy bill



Fresh air demand

Swimmers 250 m³/h

Pool guards 26- 50 m³/h

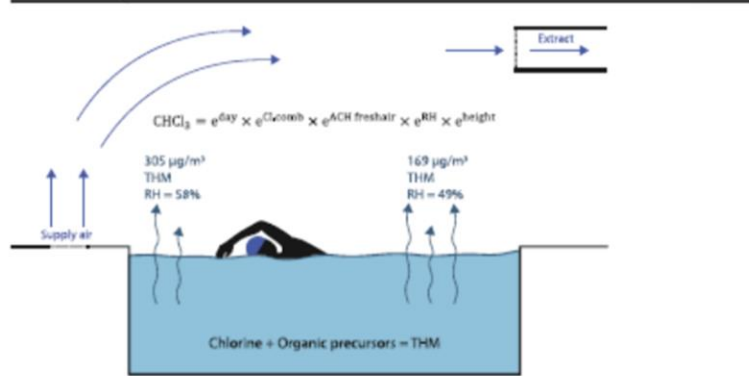
Modern design

- Avoid recycling
- Use fresh air

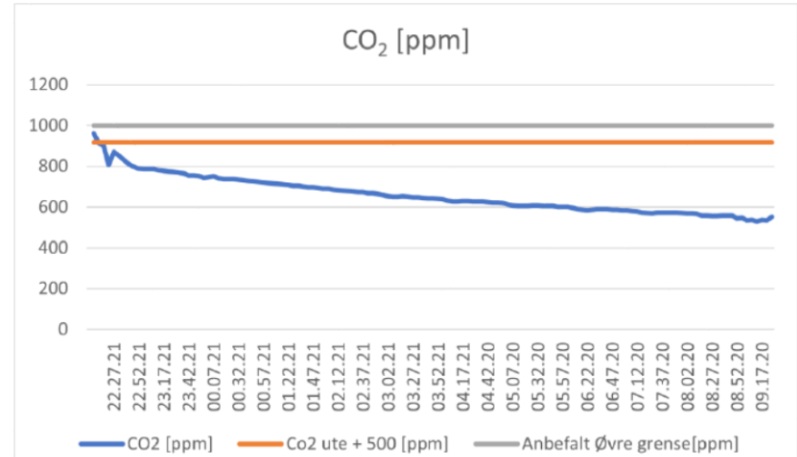


Remove pollution

GRAPHICAL ABSTRACT

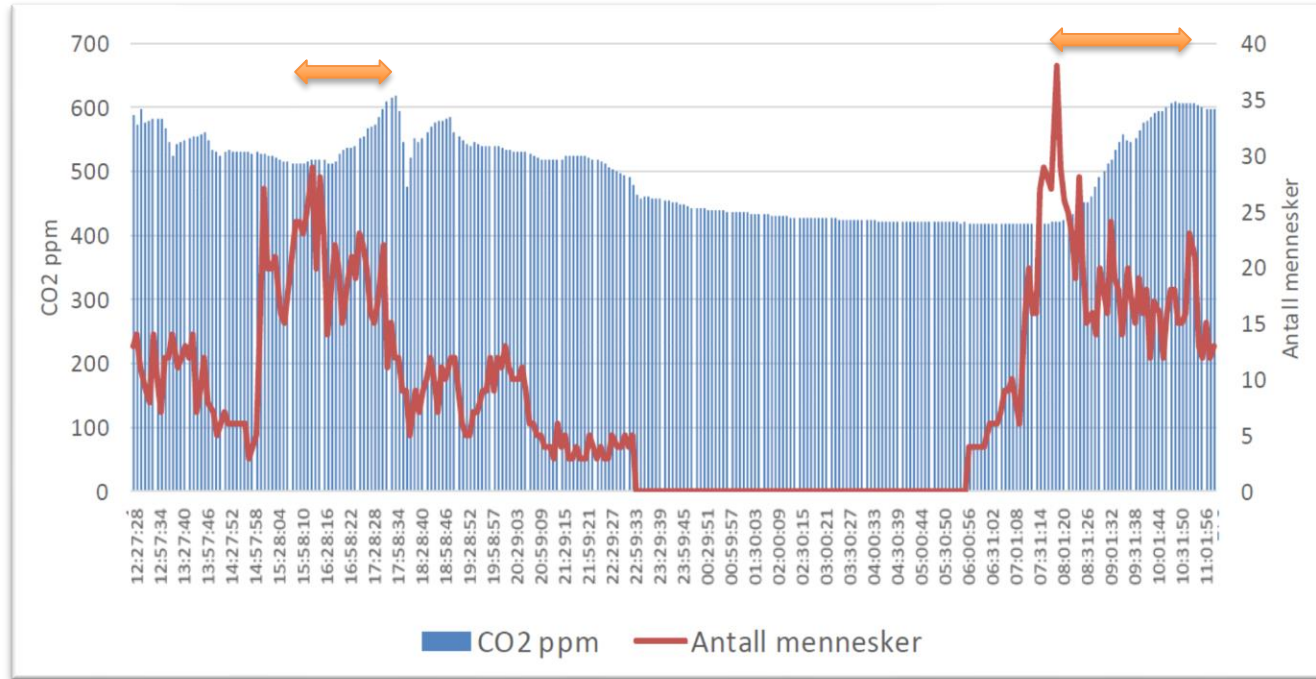


Nitter et. al., 2020



Ayyad 2022

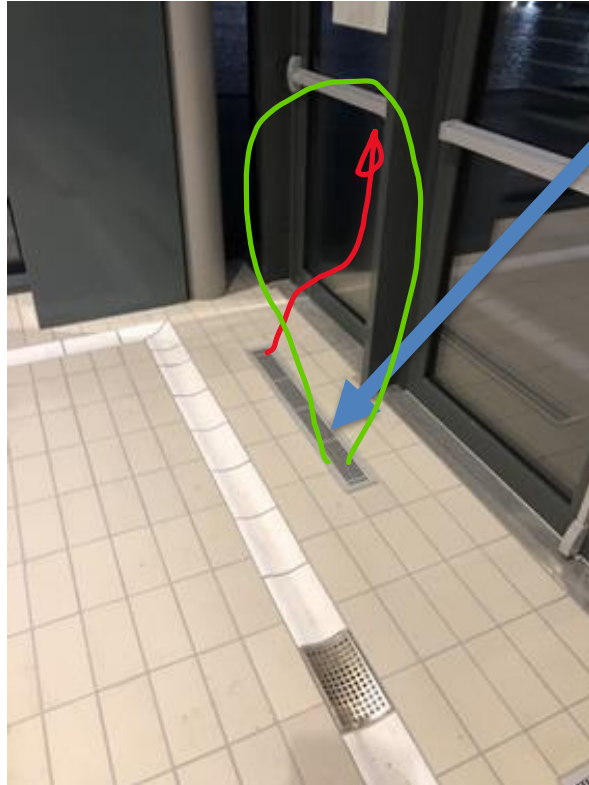
CO₂ vs people in the room



Example test of two swimmers, born 2004, 2005



Maintain healthy building envelope



Air intake by floor

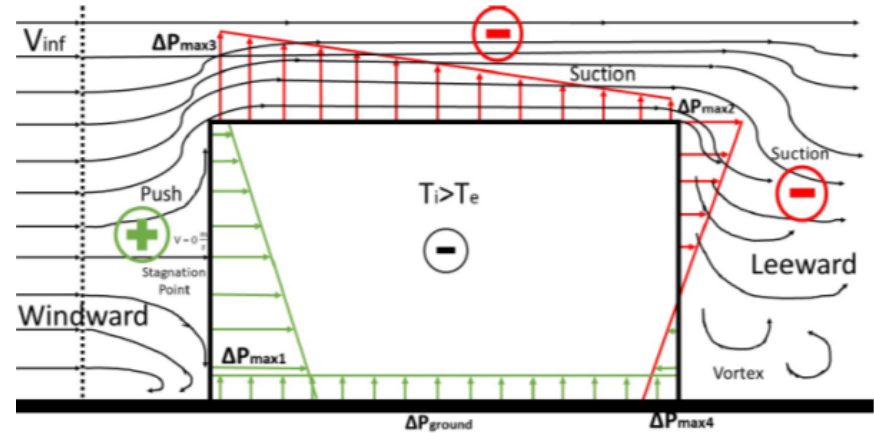


Figure 2.7: Sketch of the sum of stack effect and wind effect on a building

Traditional air flow design

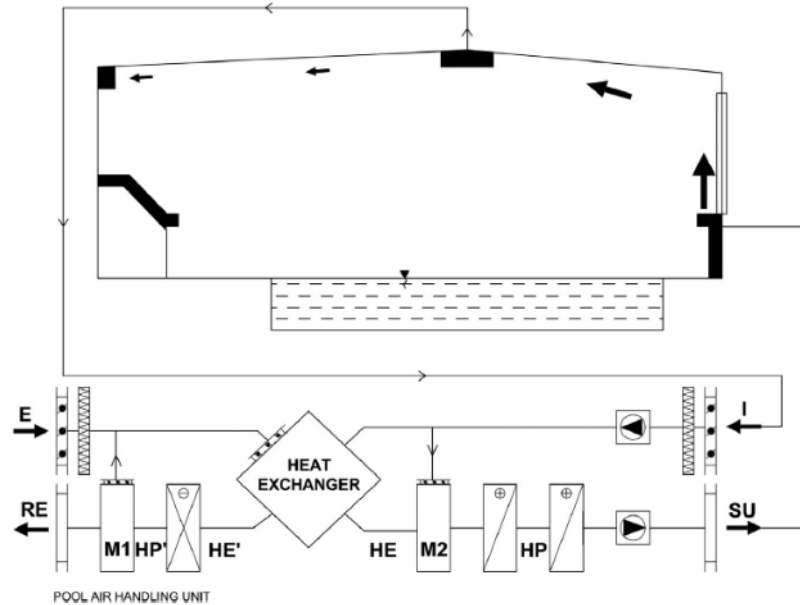


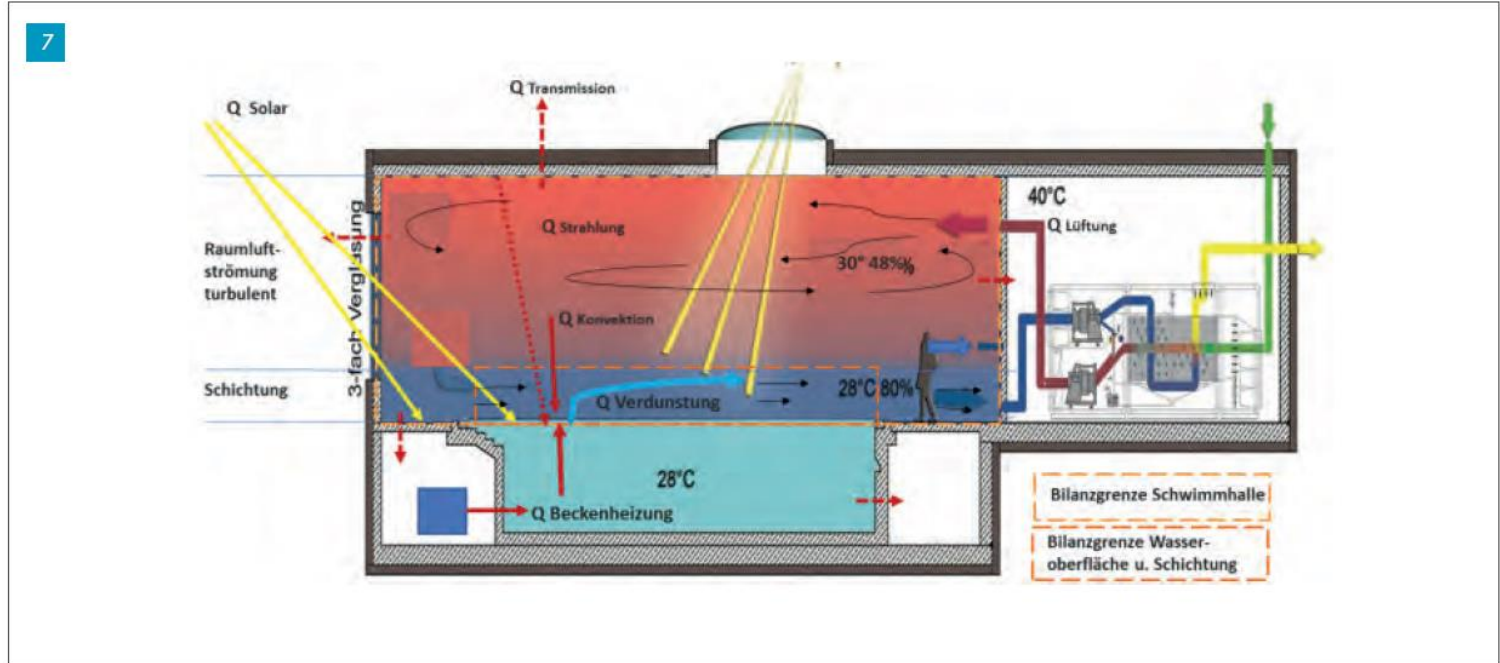
Fig. 5. Scheme of traditional centralized ventilation system for swimming pool.

Ratajczak et. al. 2019

The perfect Coanda demo



German design approach



Smoke test stratification Germany



Fiedler, Kaluza 2022

From Poland

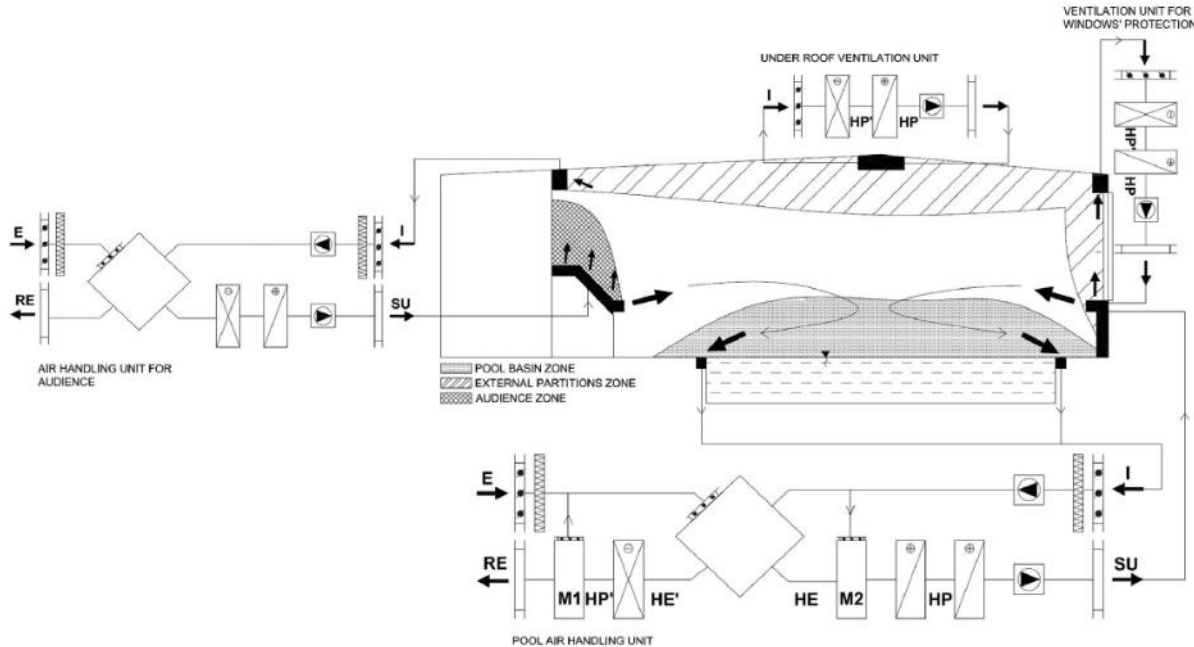
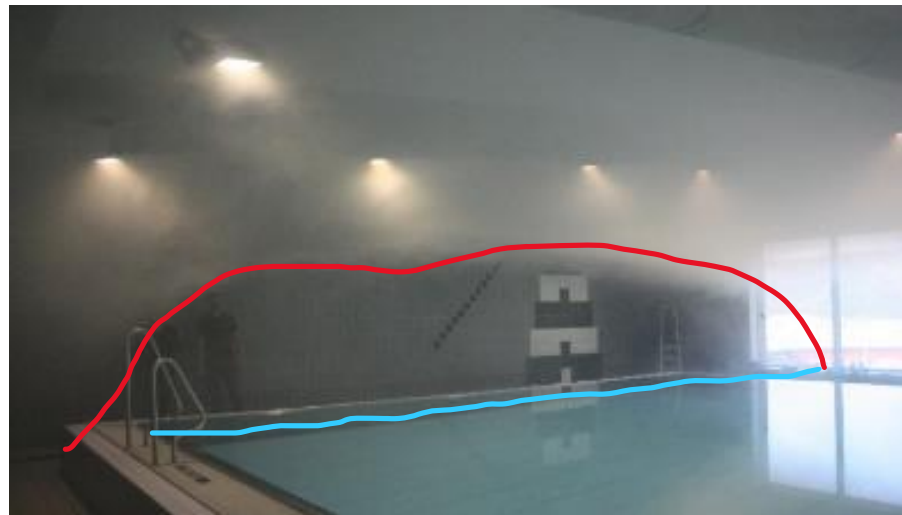
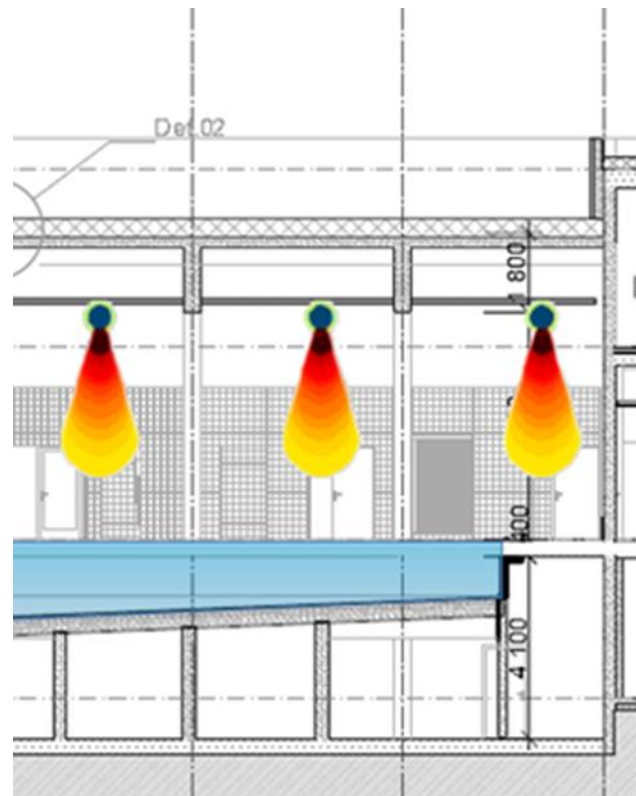


Fig. 4. Scheme of the proposed decentralized ventilation system.

Separate systems are good, but investment and complexity of plant and operation is a risk

Pools in operation in Norway



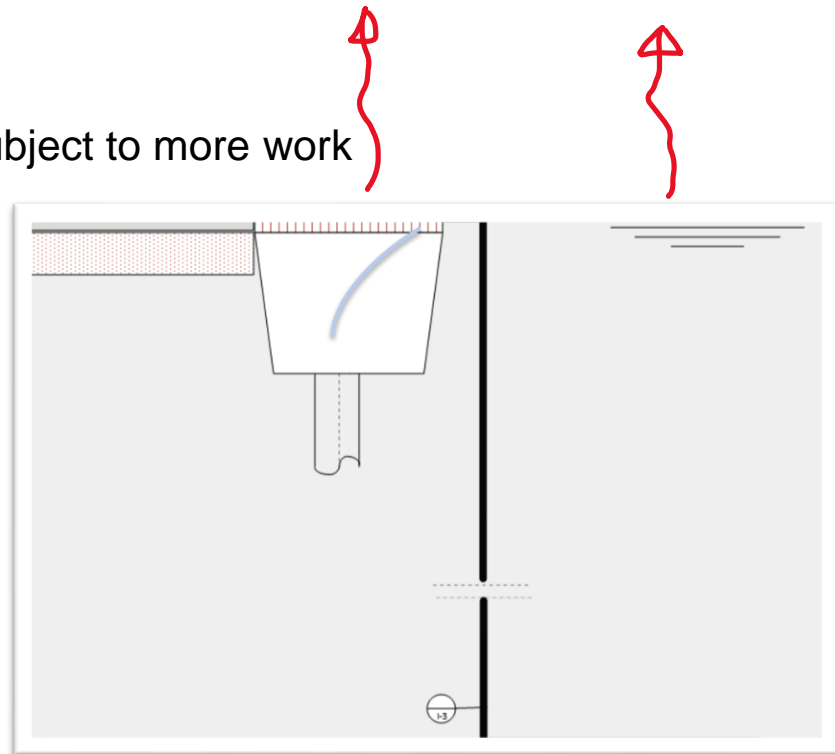


Ventilation – sum up:

Action	Measure
People	Air flow <ul style="list-style-type: none">• By water surface• In breath zone of pool room
Pollution	Water quality Air exchange efficiency
Buildning	Climate (Temp, RH) Pressure differences

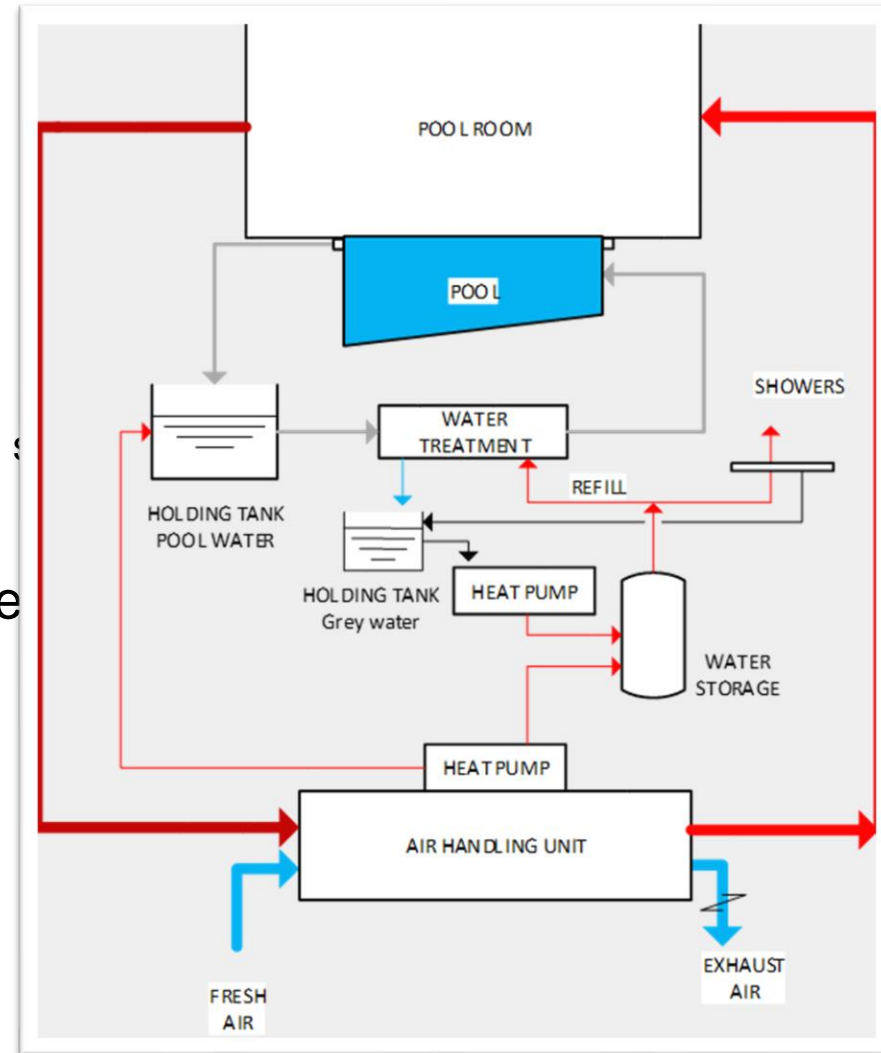
The challenge

- Fresh air
 - Demand is known
 - Impact on health and performance subject to more work
- Pollution formation
 - CO₂ from people detectable
 - DBP
- Humidity
 - As above
- Energy recovery



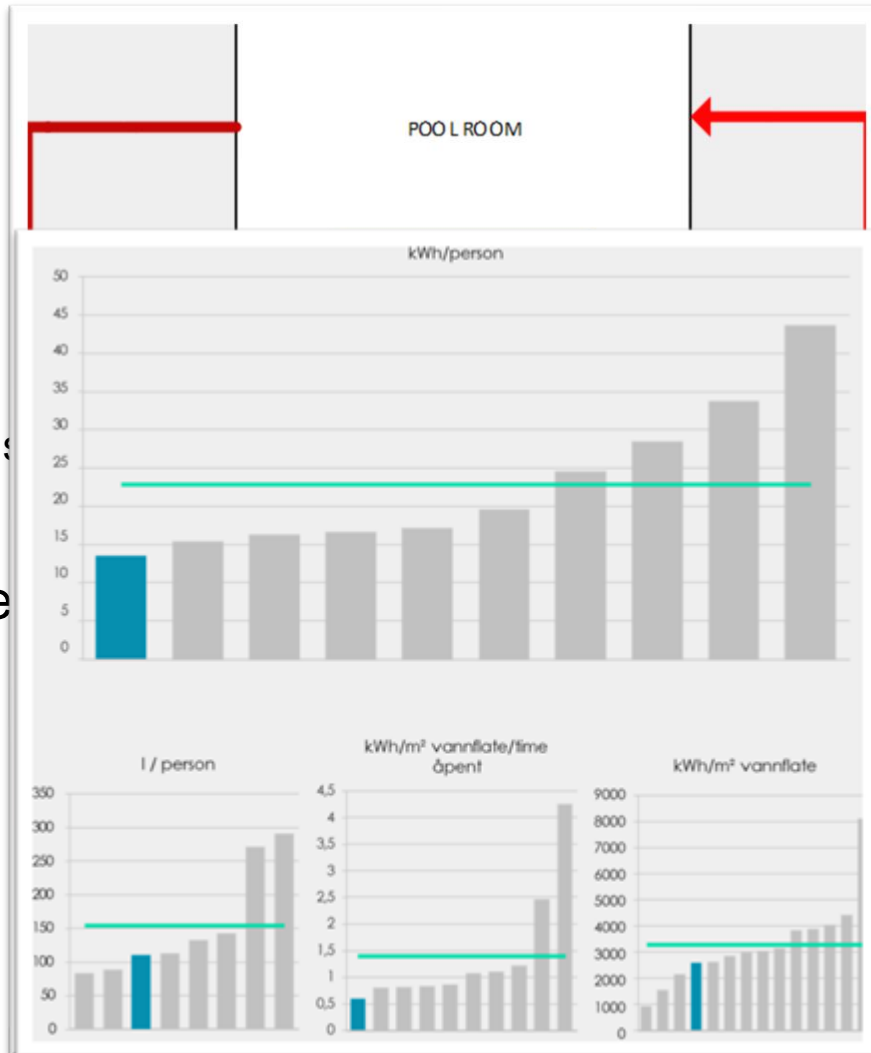
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Thank you for your attention

