Urban development

- Energy efficient buildings and neighbourhoods
- Sustainability
- Urban homes – near public transportation and main roads (air quality and noise)
- Taller and compact
Home

- New residential buildings are mostly apartment buildings
- Smaller apartments
  - 2-rooms, 3 rooms, studio, but fewer m²
- Flexibility and new layouts

The Scandinavian way

Cold climate
Well insulated buildings (nearly Passive house level)
Low infiltration (0.6 h⁻¹ at 50Pa)
 Balanced ventilation with efficient heat recovery. (>80%)
No cooling, only shading
No storage room
Requirements

General: remove moisture, odour, pollutants

NO- 1,2 m³/h pr m² (0,33 l/s) average, minimum 0,7 m³/h pr m² (TEK17)
26 m³/h per person in bedroom

DK – 0,3 l/s pr m² (BR 2018)

S – 0,35 l/s pr m² in use, minimum 0,1 l/s pr m² empty (Boverket, BFS 2011:6 with corrections) + R1

<table>
<thead>
<tr>
<th></th>
<th>NO-Basic</th>
<th>NO-Forced</th>
<th>DK general</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen</td>
<td>36 m³/h (10 l/s)</td>
<td>108 m³/h (30 l/s)</td>
<td>20 l/s</td>
</tr>
<tr>
<td>Bathroom</td>
<td>54 m³/h (15 l/s)</td>
<td>108 m³/h (30 l/s)</td>
<td>15 l/s</td>
</tr>
<tr>
<td>Toilet</td>
<td>36 m³/h (15 l/s)</td>
<td>36 m³/h (0 l/s)</td>
<td>10 l/s</td>
</tr>
</tbody>
</table>

Too high ventilation rates for small apartments?

Decentralised vs centralised system

- Centralised system:
  - Bod
  - Kjækken
  - Aggregat
  - Stue Soverom
  - Avkast
  - Luftinnat i fasade, mot bakgård

- Decentralised system:
  - Bod
  - Kjækken
  - Aggregat
  - Stue Soverom
  - Avkast
  - Luftinnat i fasade, mot bakgård
  - U. et.
  - Kjækkenhette
  - Fælles aggregat
  - Lykkehammer
Type of ventilation system and ownership

- Ownership often the reason behind type of system
- Decentralised preferred for control of IAQ
- Maintenance – access, understanding, time/ability. Tenant/owner

Kitchen ventilation

- Hot plate
- only some gas burners
- Placing of hood
- Capture efficiency
- Window and door?
Trends

- Kitchen island + open space living
- High airflow rates
- Downdraft
- Recirculation – odour, not moisture
- Noise
- Make up air?
- User profiles? Students, family, elderly
- One room apartments vs 4 rooms

Moisture

- Bathrooms without windows -forced ventilation?
- Cold climate
- Small apartments
- High ventilation rates
- Buffering
- Regeneration
Indoor temperature

- 22-24°C
- Open window at night?
- Featherbed cover
- Bedroom?
- Cooling?

Ventilation rate and strategy adapted to apartment size and assumed user profile?

- Define architypes of urban dwellings
- User profiles according to size/type
- Adapted ventilation strategies
App, Cloud and BMS

Reduction of power peaks

- Maximum installed power
Healthy Energy-efficient Urban Home Ventilation.

Norwegian research project 2020-2024
WP1: Types and user profiles of urban dwellings
WP2: Advanced residential exposure studies
WP3: Moisture, ventilation and building physics
WP4: Assessment and recommendation

ZEN? Deep renovation is necessary

- Prefabrication.
- Integrated ventilation and RES
- Modules with technical room
- https://4rineu.eu/demo-oslo/
Teknologi for et bedre samfunn

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