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Residential Mechanical Ventilation Systems in Canada

Outline

• Historical perspectives and code development.
• Recent field study results.
• New evaluation protocols.
Historical perspectives

Air tightness in Canadian homes

Mean airtightness [ac/h @ 50Pa]

Year Built

Ottawa  Vancouver  Saskatoon

History and trends in air tightness in Canadian homes.
Field study on Ventilation and Health

• Comprehensive study analysing associations between 16 IAQ measurements with 4 ventilation parameters in 115 homes.

• Assessment of respiratory health of asthmatic children by our research health partner INSPQ.

• Quebec’s Working Group on Residential Ventilation is integrating our data in their recommendations for residential ventilation.

Field study findings

• 83% of the homes were under-ventilated (ACH < 0.30 h⁻¹).

• HRV/ERV’s intervention:
  • increased ventilation.
  • improved IAQ.
  • managed RH.
Field study findings

Increased ventilation noticeably improved IAQ:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Pre-intervention (median)</th>
<th>Post-intervention (median)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂ (24-hr, ppm)</td>
<td>899</td>
<td>770*</td>
</tr>
<tr>
<td>Formaldehyde (µg m⁻³)</td>
<td>34.3</td>
<td>24.1*</td>
</tr>
<tr>
<td>Ethyl acetate (µg m⁻³)</td>
<td>10.9</td>
<td>5.5*</td>
</tr>
<tr>
<td>α-pinene (µg m⁻³)</td>
<td>13.3</td>
<td>5.9*</td>
</tr>
<tr>
<td>Airborne mould spore (CFU M⁻³)</td>
<td>57</td>
<td>30*</td>
</tr>
</tbody>
</table>

* Statistically significant to p<0.05

Indoor Air Purification Solutions

- Develop and use protocols to assess the efficacy of solutions & technologies.
- Establish three more scientific and consensus-based protocols.
- Apply protocols to commercially available products and technologies.
Indoor Air Purification Solutions

Guidance by a Technical Advisory Committee:
• Provide advice on evaluation protocols.
• Representatives from Federal and Provincial agencies, industry associations, NGOs, municipal governments, and standards associations.

Portable Air Cleaners (PACs): Objectives

Evaluate initial performance with respect to:
• Emissions and by-product formation.
• Particles and VOC removal.
• Energy consumption.
• Noise generation.
Portable Air Cleaners (PACs): Outputs/Outcomes

- Protocol validated against 12 commercially available PAC’s employing various technologies.
- Draft ISO standard on VOCs and particle removal.
- Draft CSA standard on ozone by-product formation.
**Portable Air Cleaners (PACs)**

- Controlled test environment.
- Contaminant generation.
- Advanced monitoring.
- Long-term performance.

[Images of monitoring equipment and full-scale chamber]

[Images of VOC generation and nano-particle counting]

[Web address: www.nrc-cnrc.gc.ca]