Introducing the new PHPP Expert Seal

Andrew Peel
Accredited Passive House Building Certifier
Peel Passive House Consulting
PeelPHC
Background

PH Consultancy

PH Training
www.passivehousetraining.ca

PH Building Certification

PH Research

PH Component Certification

m³/h
Contents

• The Issue
• The Solution
• The Details
The Issue

• CPHC qualification provides foundational PH knowledge
• PHPP training varies widely
• Certification process has revealed substantial gap in PHPP knowledge of CPHCs
Mini-test

0.034 W/mK

0.067 W/mK
Mini Test

- Does this window install meet the hygiene requirement?
- A: It depends on the climate.
- Cool temperate = yes, Cold = no

\[
\begin{align*}
\theta_{\text{si min}}^\text{A-B} &= 12.1 \, ^\circ\text{C} \\
\phi_{\text{Rsi}} &= 0.735 \\
\phi_{\text{si(50\%)} } &= 83\% \\
\phi_{100\%} &= 60\% \\
\phi_{80\%} &= 48\%
\end{align*}
\]
Mini-test

- Are PH occupant health requirements met in this building?

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
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</tbody>
</table>
Mini-test

\[ \theta_{si_A} = 19.00 \, ^\circ C \]

\[ f_{RSi} = 0.906 \]

\[ \varphi_{s(50\%)} = 60\% \]

\[ \varphi_{100\%} = 83\% \]

\[ \varphi_{80\%} = 66\% \]
The Consequence

- Substandard PHPP models
  - Major mistakes, Incomplete worksheets etc
  - Bad data sources

- Huge underestimation energy demand
  - Shifts of
    - SHD: 15 to 30+ kWh/m²/yr (4.8 to 9.6+ kBTU)
    - PER: 15 kWh/m²/yr (4.8+ kBTU)

are not uncommon

<table>
<thead>
<tr>
<th>Energy demand</th>
<th>PER factor kWh/kWh</th>
<th>Effective PER factor (including biomass kWh/kWh)</th>
<th>PER specific value kWh/(m²a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference: Treated floor area</td>
<td></td>
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<tr>
<td>DHW generation</td>
<td></td>
<td></td>
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<tr>
<td>Electricity (HP compact unit)</td>
<td>1.30</td>
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<td>0.2</td>
</tr>
<tr>
<td>Electricity (heat pump)</td>
<td>1.30</td>
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<td>0.2</td>
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</tbody>
</table>
The Consequence

• PHI prides itself on PHPP’s accurate predictions
• A tool is only as effective as the user’s capabilities
• One of key reasons we highly recommend CPHCs go through certification at least once  
  • It’s a training ground. But be prepared to compensate certifier
• Certification process doesn’t prevent bad modelling  
  • Team may wait till it’s too late for the first review
• Worst outcome: Client commits to certification, then receives news that project cannot certify.  
  • Not because of cost, construction issues  
  • Rather: bad modelling that informed design decisions  
  • But certification process is blamed
The Solution

• Advanced training
  • Building certification course
  • Advanced PHPP

• Establish new designation ("seal")
  • an add on to CPHC designation

• Prerequisite: CPHC designation
**Expansion of Professional Certification**

Objective:
- Promote "lifelong learning"
- Reach different occupational groups
- Clear / flexible / expandable system

Solution:
- Additional training and qualification
- "Add-on" certificates in addition to existing certificates (designer/consultant and tradesperson)
- "Trainer" and "Component Assessor": please contact PHI
- "PHPP Expert": first exam on 23.03.2019, next course at PHI November 2019
Exam Topics

- PHPP Basics
  - This is assumed knowledge
- PHPP Advanced
- designPH
- BIM2PH
- Thermal bridge modelling
Advanced PHPP Topics

• Mixed-use buildings
## Advanced PHPP Topics

- Non-residential IHGs, occupancy

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<thead>
<tr>
<th>Time</th>
<th>Sunday</th>
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</table>
Advanced PHPP Topics

• Large building ventilation

Source: GAIRWILLIAMSONARCHITECTS, Rocky Point Engineering
Advanced PHPP Topics

• Curtain walls, structural glazing
Advanced PHPP Topics

• Complex shading situations
### Advanced PHPP Topics

- **Variants Tool**

![Graph showing heating demand [kWh/(m²a)]](image)

<table>
<thead>
<tr>
<th>Heating demand [kWh/(m²a)]</th>
<th>1-Winter SHD</th>
<th>2-Summer</th>
<th>3-Heating Load</th>
<th>4-Summer Tilted windows</th>
<th>5-Summer Fully Open Windows</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Winter SHD</td>
<td>336.7</td>
<td>73.2</td>
<td>8.8</td>
<td>8.1</td>
<td>8.1</td>
</tr>
<tr>
<td>2-Summer</td>
<td></td>
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<tr>
<td>3-Heating Load</td>
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<tr>
<td>4-Summer Tilted windows</td>
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<tr>
<td>5-Summer Fully Open Windows</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Results</th>
<th>Units</th>
<th>4-Passive house natural gas</th>
<th>Existing</th>
<th>Moderate thermal insulation</th>
<th>Passive House with compact HP unit</th>
<th>Passive house natural gas</th>
<th>Passive House with compact HP unit + solar thermal system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating demand</td>
<td>kWh/(m²a)</td>
<td>9.0</td>
<td>336.7</td>
<td>73.2</td>
<td>8.8</td>
<td>9.0</td>
<td>8.8</td>
</tr>
<tr>
<td>Heating load</td>
<td>W/m²</td>
<td>8.1</td>
<td>145.3</td>
<td>40.1</td>
<td>8.0</td>
<td>8.1</td>
<td>8.0</td>
</tr>
<tr>
<td>Cooling &amp; dehum. demand</td>
<td>kWh/(m²a)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Cooling load</td>
<td>W/m²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency of overheating (&gt; 25 °C)</td>
<td>%</td>
<td>0.4</td>
<td>1.5</td>
<td>0.6</td>
<td>0.5</td>
<td>0.4</td>
<td>0.6</td>
</tr>
<tr>
<td>PER demand</td>
<td>kWh/(m²a)</td>
<td>71.8</td>
<td>1011.8</td>
<td>204.3</td>
<td>28.8</td>
<td>71.8</td>
<td>28.2</td>
</tr>
<tr>
<td>Passive House Classic?</td>
<td>yes / no</td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

Author: Peel Passive House Consulting © 2019
Advanced PHPP Topics

- Economics Tools

### Total annual costs [€/a]

- Annuity (annual capital costs)
- Annual operation costs

### Operation (heating + cooling + mechanical ventilation)

<table>
<thead>
<tr>
<th>Area</th>
<th>Per m² of TFA</th>
<th>Entire building</th>
<th>Per m² of TFA</th>
<th>Entire building</th>
<th>Per m² of building</th>
<th>Complete building</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating demand</td>
<td>239.1</td>
<td>37299</td>
<td>12.4</td>
<td>1934</td>
<td>191.9</td>
<td>35365</td>
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<tr>
<td>Cooling + dehumidification demand</td>
<td>84.99</td>
<td>13258</td>
<td>4.31</td>
<td>673</td>
<td>68.29</td>
<td>12585</td>
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<tr>
<td>CO₂ emissions</td>
<td>4.80</td>
<td>35047</td>
<td>7.37</td>
<td>1150</td>
<td>183.95</td>
<td>33897</td>
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</table>

**Annual operation costs**

<table>
<thead>
<tr>
<th></th>
<th>32.99</th>
<th>5147</th>
<th>1.67</th>
<th>261</th>
<th><strong>26.51</strong></th>
<th><strong>4885</strong></th>
</tr>
</thead>
</table>

Author: Peel Passive House Consulting © 2019
Advanced PHPP Topics

• EnerPHit Step by Step Retrofits
designPH Topics

• 3D building data entry
designPH Topics

• Verification of Building Model and the limitations
designPH Topics

• Specifications & TFA Entry Options
BIM2PH Topics

• Data exchange & limitations
BIM2PH Topics

• Templates & Data entry
Thermal Bridge Modelling Topics

- TB concepts and calculations

\[
\psi = L_{2D} \quad (2D) \quad U_1 \cdot L_1 \quad (1D) \quad U_2 \cdot L_2 \quad (1D)
\]

Actual \hspace{2cm} Estimated \hspace{2cm} Estimated
Thermal Bridge Modelling Topics

• Modelling Conventions and Boundary Conditions

Author: Andrew W. Peel @ 2015
Note: Ground floor resistances apply to all types of floors (e.g. heated basement, crawl space, etc)

Author: Peel Passive House Consulting © 2019
Thermal Bridge Modelling Topics

- Simulation outputs

\[ \Psi_{A\rightarrow C} = \frac{\Phi_{A\rightarrow C}}{b_1 \Delta T_1 - b_2 \Delta T_2} = \frac{144.804 \cdot 0.249 - 1.602 \cdot 0.000 - 2.461 \cdot 4.102 \cdot 15.000}{15.000} = -0.442 \text{ W/(m} \cdot \text{K)} \]

\[ \Phi_{A\rightarrow C} = 144.804 \text{ W/m} \]

\[ U = 0.249 \text{ W/(m}^2 \cdot \text{K)} \]

\[ U = 2.461 \text{ W/(m}^2 \cdot \text{K)} \]
Thermal Bridge Modelling Topics

• Window and Ground junction details

![Diagram of thermal bridge](image)

\[ T = 20^\circ C \]
\[ R_{se} = 0.04 \]
\[ T = 0^\circ C \]
\[ R_{si} = 0.13 \]

\[ R_{si} = 0.17 \]
\[ T = 20^\circ C \]

\[ R_{si} = 0.13 \]
Thermal Bridge Modelling Topics

• Typical TB values and when to model
Thermal Bridge Modelling Topics

• How to optimize details

\[ \theta_{\text{si min}}_{A-B} = 10.31^\circ \text{C} \]
\[ f_{Rsi}^* = 0.677 \]

\[ \theta_{\text{si min}}_{A-B} = 13.85^\circ \text{C} \]
\[ f_{Rsi}^* = 0.795 \]
Other Seals
Construction Verifier

• PHI is in the process of developing further seals
• NACC developed VeriPHier program to meet needs
• Construction Verifier will supersede VeriPHier
• Intention to launch at Chinese conference
Trainer

- Currently, trainers are contracted under PHI Affiliates
- New seal provides formal designation for trainers who have met minimum requirements
  - Didactic experience
  - PHI Train the Trainer course
Component Assessor

- PHI is currently only body authorized to certify components
- Component Assessors work hand-in-hand with PHI to support process
- New PH window modelling guide will be a big help for aspiring Assessors
Tradesperson

- For CPHTs, there are two additional seals
- Retrofit
  - CPHTs that can demonstrate competence in EnerPHit retrofits
- Site Supervisor
Building Certifier

• Open to experienced CPHCs wishing to become building certifiers

• Complete
  • 3 certified building
  • certifier course
  • trial certifications
PHPP Expert Exam Prep Course

• Virtual
• 5 parts
  • Intro Workshop
  • Online seminars
  • Exam Prep Material
  • Recap Workshop
  • Exam
  • Option for access to full courses for heavily discounted price

• All content will be recorded and made available to participants for review up to exam
• **Starts Wednesday Mar 6**
• If you can’t start on Mar 6, can review videos at a later date
• Exam date: Friday June 28, 2019
• Thermal Bridge Modelling
  • Using Therm
  • March 12-13, Montreal
  • http://www.peelpassivehouse.ca/thermal-bridge-calculations.html

• Other Online Courses
  • Heat3 modelling
  • Large Building PH Ventilation
  • www.passivehousetraining.ca
Final Questions?

Thank you for attending

Andrew Peel
Course Instructor

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w: peelpassivehouse.ca
w: passivehousetraining.ca
Additional Slides
Guide to online content

• Refer to **NOTE-PHPP Modeller exam.docx**
  https://peelpassivehouse.sharepoint.com/:w:/s/teamfolder/EUrJqVcDGrFASlRLnnsYvYcBTRWh7TCfFADBxy5YWqxNJw?e=7zQXdR

• Topic, resource
  • E.g. TFA, PHPP Online course
• Ask participants to track how long homework takes
• Option to use own project for homework
  • E.g. for people we’re already working on a project with PPHC
e.g. DSR