Legislation

Overheating Study on Residential Buildings

Research, Demonstration and Development Projects
Legislation
Residential – Semi Detached House

- EPC 1.0
- EPC 0.6
- EPC 0.4
- EPC 0.3

KWh/m²/yr

Year:
- 2005
- 2007
- 2011
- 2019

Energy Performance Certificates (EPC) grades:
- BER C1
- BER B1
- BER A3
- BER A2
Non-Residential – Naturally Ventilated Office

EPC 1.0

2007

EPC 1.0*

2017

KWh/m²/yr

BER B2

BER A2
## Typical Fabric Performance

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Part L 2019 Residential</th>
<th>Part L 2017 Non-Residential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall U Value</td>
<td>0.13 W/m²K</td>
<td>0.18 W/m²K or 0.27 W/m²K</td>
</tr>
<tr>
<td>Floor U Value</td>
<td>0.14 W/m²K</td>
<td>0.15 W/m²K or 0.25 W/m²K</td>
</tr>
<tr>
<td>Roof U Value</td>
<td>0.11 W/m²K</td>
<td>0.15 W/m²K or 0.16 W/m²K</td>
</tr>
<tr>
<td>Window U Value</td>
<td>0.9 W/m²K</td>
<td>1.4 W/m²K</td>
</tr>
<tr>
<td></td>
<td></td>
<td>G Value 0.4</td>
</tr>
<tr>
<td>Air Permeability</td>
<td>5 m³/hr/m² or 3 m³/hr/m²</td>
<td>5 m³/hr/m² or 3 m³/hr/m²</td>
</tr>
</tbody>
</table>
Implementation through Non-Domestic Regulations

• Overheating Calculation for Naturally Ventilated
  – Simple Check in Compliance Tool or
  – Dynamic Thermal Modelling for Complex Buildings

• Solar Gain Check
  – East facing
  – Full width glazing to a height of 1m
  – g value of 0.68
  – Frame factor of 10%
Overheating Study on Residential Buildings
Do new homes with advanced thermal performance tend to overheat?

• Are certain dwelling types more prone to risk of overheating?
• Which design features most influence the risk?
• What is the sensitivity to weather data?
• What type of interventions can help mitigate the risk?
• Is there scope/need to refine existing tools to adequately capture the risk?
Modelling parameters and assumptions

Future weather data – DSY1 2020s High emissions scenario

Daytime occupancy in all rooms

Internal gains (lighting, equipment) as per TM59
18°C set point for heating excl. June, July and August

Fabric thermal performance as per TGD L 2018

Medium thermal mass, masonry construction

Windows in occupied rooms start to open when internal temp >22°C, fully open when >26°C
Openable area 1/20th of floor area for habitable rooms
Modelling parameters and assumptions

- Semi detached house
- Bungalow
- Apartment
Overheating risk - Weather data – Criterion A

3% compliance threshold

- Bungalow
- Flat
- Semi detached house

Belfast DSY1 2020 High (base case)  
Belfast DSY1 2050 High  
Belfast DSY2 2020  
Dublin 89  
Manchester DSY1 2020 High
Overheating risk – Glazing – Criterion A

25% Double G 0.65
35% Triple G 0.6
40% Triple G 0.6
40% Triple G 0.4

3% compliance threshold
Overheating risk – Ventilation – Criterion A

- 5% free area (base case)
- 2% free area
- 3.5% free area
- cMEV with boost at 2.5 ach

3% compliance threshold

- Bungalow
- Flat
- Semi detached house
### Overheating risk – Shading – Criterion A

**5% free area** (base case) | **Window reveals** | **Fixed external shading** | **Internal blinds** | **Movable ext. shading**
---|---|---|---|---
Bungalow | | | | |
Flat | | | | |
Semi detached house | | | | |
Overheating risk – Combined – Criterion A

- 5% free area (base case)
- 2% free area
- 40% Triple G 0.6
- 40% Triple G 0.6 + fixed ext. shading
- 40% Triple G + int. blinds

Belfast DSY2 2020 + single sided ventilation

3% compliance threshold
Summary

• Modelling of 2018 fabric standards using future/current weather data highlights the need to consider overheating risk in new build design

• Key parameters to consider
  • Net solar gains (glazed areas, window g-value, shading)
  • Ventilation rates (window opening areas; ability to cross-ventilate)

• Choice of weather data – fit for purpose over a significant proportion of the building life; build resilience

• Aggregated impacts are critical!
Research, Demonstration and Development Projects
Assessment Methodology Building Energy Ratings (AMBER);

• **Total Project Cost:** €416,062
• **Funding Agency:** SEAI
• **Year Funded:** 2018
• **Lead Organisation:** Trinity College, RIAI, IES

**Aspects Include:**

“The AMBER project aims to provide a set of guidelines to minimise the performance gap in A-rated buildings, complemented by design best practices and user comfort and wellness recommendations.”

“The project will collect BER and sensor data from 100 domestic and 25-40 non-domestic A-rated buildings, to analyse power loads and indoor environmental quality at 5 minute resolution for one year in each building, taking into account the differences in use and operation of different building types.”

“Energy and IEQ data will be paired with post-occupancy surveying to carry out a set of in-depth analyses, and made available to SEAI via dashboards for 12 months after the project.”
VALIDate to assess of the effectiveness of the ventilation system in 'A' rated dwellings

- Total Project Cost: €271,326
- Funding Agency: SEAI
- Year Funded: 2018
- Lead Organisation: NUI Galway

Aspects Include:

The purposed project is a longitudinal study aimed at conducting multi-zone indoor environmental quality monitoring in 100 'A' rated energy efficient Irish residential dwellings. The project will monitor environmental quality (temperature, humidity, CO2, radon and VOCs) over two heating sessions and a cooling season.
nZEB_101

- **Total Project Cost:** €321,011
- **Funding Agency:** SEAI
- **Year Funded:** 2018
- **Lead Organisation:** University College Dublin

**Aspects Include:**

“Building on an established monitoring project of low-energy dwellings which has been running for over two years, the vision for nZEB101 is to uncover the key nZEB design and operations lessons as Ireland embarks on the unprecedented mass market implementation of these low-energy buildings.”

“nZEB101 monitors over 101 geographically dispersed domestic and nondomestic, new and retrofit properties and ensures a statistically robust sample size which will yield; Operational performance of A rated buildings, including energy and Indoor Environmental Quality (IEQ);”
Deep Energy Renovations bring improved energy performance but what impact does this have on indoor air quality.

- **Total Project Cost:** €204,533
- **Funding Agency:** SEAI
- **Year Funded:** 2018
- **Lead Organisation:** NUI Galway

**Aspects Include:**

"measure the air concentration of ten priority pollutants for health in 20 homes participating in SEAI's DR Pilot programme, before and after deep energy renovations"

"The data will also help SEAI understand and address information barriers to the adoption of energy efficiency measures, specifically related to the impact of deep renovations on occupant comfort and air quality in the home. This research will also make a significant contribution to international building energy research."
Questions