Interim NZEB Performance Specification for new buildings owned and occupied by Public Authorities

Introduction

The following is sets out a performance specification for new buildings owned and occupied by Public Authorities after 31st Dec 2018. It is intended that this specification will form the Nearly Zero Energy Buildings requirement in the interim period until the new 2017 Part L for Buildings other than Dwellings takes effect.

The definition of Nearly Zero Energy Buildings as defined in Directive 2010/31/EU on the energy performance of buildings (recast) as:

"'nearly zero-energy building' means a building that has a very high energy performance, as determined in accordance with Annex I. The nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby;"

Application

Public Authorities should use this performance specification in the design of all new buildings from the 1st January 2017. It is intended that applying this standard from this date will enable all new buildings owned and occupied by Public Authorities after the 31st Dec 2018 to be Nearly Zero Energy Buildings. The application of the performance parameters specified in Table 1 will achieve a performance that is in the order of 50% to 60% better than current requirements.

This specification and any updates will be available to download from the SEAI website. Any supporting guidelines or support tools for this specification will be made available there.

Energy from Renewable Sources

The definition of "nearly zero energy building" requires that "*the nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby;"*

In order to achieve this, a target of 20% Renewables Energy Ratio (RER) has been set as the NZEB energy from renewable sources onsite or nearby target. The draft software tool provided by SEAI will be provided to support the calculation of the RER.

It is recognised that in certain confined situations it may not be possible to achieve the full 20% RER. In these situations Public Sector Authorities should provide the optimum proportion of energy from renewable energy sources that is practically possible.

In all cases the overall energy performance of the building should be equivalent to the performance of the building as if the 20% RER had been achieved.

Overheating

Public Authorities should work with their design teams to define a satisfactory criteria for the internal environment and carry out the necessary assessments to ensure

there is no risk of overheating. Energy efficient methods of cooling and use of natural ventilation should be optimised as appropriate.

Performance Specification

The following tables detail the performance specifications to be achieved for new buildings owned and occupied by Public Authorities.

- Table 1 provides typical performance specifications for fabric and services. Subject to meeting the backstop values in Table 3 and the target RER of 20% the energy performance achieved by the performance specification below can be achieved by a number of different combinations.

- Table 2 provides a set of linear thermal transmittance values for thermal bridges for use with Table 1

- Table 3. provides a set of backstop Values for fabric and U values which are the maximum values that may be used .when designing buildings to be owned and occupied by Public Authorities.

Alternative approaches to the performance specification in Table 1 are permitted provided they give the same whole building energy performance when calculated in current Non-domestic Energy Assessment Procedure (NEAP) as provided by SEAI.

For buildings other than dwellings, three reference “building” specifications have been provided in Table 1 that vary depending on the dominant form of daylighting. The generic forms are:

a) sidelit through vertical windows (offices, halls of residence etc.). These have 40% glazing with 10% framing factor;
b) toplit through rooflights (warehouses, industrial buildings etc). These are 12% glazed with 30% framing factor;
c) no glazing (theatres, cinemas etc).

A formula for Renewable Energy Ratio (RER) is also provided in the notes to Table 1

Appendix 1 provides a procedure for checking the performance of new buildings using the current NEAP methodology available from the SEAI website at:

http://www.seai.ie/Your_Building/BER/Non_Domestic_buildings/Download_SBEM_Software/Download_SBEM_Software.html

Table 1 Interim Reference Building Specification for Public Authority Non-residential Buildings

Element	Side lit or unlit (where HVAC specification is heating only)	Side lit or unlit (where HVAC specification includes cooling)	Top lit
Roof U Value (W/(m^{2}K))	0.15	0.15	0.15
Wall U Value (W/(m^{2}K))	0.18	0.18	0.18
Floor U Value (W/(m^{2}K))	0.15	0.15	0.15
Thermal Bridging	Key TB length x psi value in Table 2	Key TB length x psi value in Table 2	Key TB length x psi value in table 2
Window U Value (W/(m^{2}K)) Side lit :Exposed facades will have windows with area that is the lesser of either: 1.5m high × full facade width OR 40% of exposed facade area Top Lit[1]::12% of exposed roof area will be made up of roof-lights*	1.4 (10% FF)	1.4 (10% FF)	1.6 (30% FF)
G-Value (%)	40	40	40
Light Transmittance (%)	71	71	71
Air Permeability (m^3/(m^{2}h) Gross internal area less than 250 m^2	5	5	5
Air Permeability (m^3/(m^{2}h) Gross internal area greater than 250 m^2	3	3	3
Lighting luminaire (lm/circuit watt)	65	65	65
Occupancy Control	Yes	Yes	Yes
Daylight Control	Yes	Yes	Yes
Maintenance Factor	0.8	0.8	0.8
Heating efficiency (heating and hot water)%	91	91	91
Central Ventilation SFP (W/(l/s))	1.8	1.8	1.8
Terminal unit SFP	0.3	0.3	0.3
Cooling (air-conditioned) (SEER/SSEER)	N/A	4.5/3.6	4.5/3.6
Cooling (mixed mode) (SSEER)	N/A	2.7	2.7
Variable speed control of fans and pumps controlled via multipe sensors	Yes	Yes	Yes
Demand Control (mechanical ventilation only) Variable speed	Yes	Yes	Yes

*The number of roof-lights per roof element is determined using the following equation: $\boldsymbol{Number\ of\ rooflights\ per\ roof\ element = roof\ element\ area / (1.68 \times zone\ height / (\cos(angle\ of\ slope)))^2}$ The number of roof-lights should be rounded to the nearest integer and be greater than zero. Where the roof element is sloped, the zone height should be the height to the eaves or lowest point of the roof element.

control of fans via CO_2 sensors			
Renewable Energy Ratio (RER) % (provided by photovoltaics with at 30 degrees and a south west or south east orientation)	20	20	20

Note 1: Mixed mode assumed to be cooled by DX Unit where SSEER includes indoor and outdoor units and fans, pumps and losses.

Note 2: The renewable energy ratio RER is given by:

$$\mathbf{RER} = \frac{\mathbf{E_{Pren}}}{\mathbf{E_{Ptot}}}$$

where: E_{Ptot} is the total primary energy including renewable energy and E_{Pren} is the renewable primary energy, [kWh/m2a].

Table 2: Thermal Bridging Details (W/mK)

Junction	W/mK	W/mK
Type of junction	**Involving metal cladding**	**Not involving metal-cladding**
Roof to wall	0.28	0.12
Wall to ground floor	1.0	0.16
Wall to wall (corner)	0.2	0.09
Wall to floor (not ground floor)	0.0	0.07
Lintel above window or door	1.0	0.30
Sill below window	0.95	0.04
Jamb at window or door	0.95	0.05

Table 3: **Maximum elemental U-value[1,2] (W/m²K)**		
Column 1 Fabric Elements	Column 2 Area-weighted Average	Column 3 Elemental U-value- Individual element or section of element
Pitched roof, insulation horizontal at ceiling level	0.16	0.3
Pitched roof, insulation on slope	0.16	
Flat roof	0.20	
Walls	0.21	0.60
Ground Floors[3]	0.21	0.6
Other Exposed Floors	0.21	0.6
External personnel doors, windows and rooflight[4,5,6]	1.6	3.0
Opaque Curtain Walling	0.21	3.0
Vehicle access and similar large doors	1.5	3.0

[1]The U-value includes the effect of unheated voids or other spaces.

[2]Reasonable provision would also be achieved if the total heat loss through all the opaque elements did not exceed that which would be the case if each of the area weighted average U-value (Um) set out in Table 2 were achieved individually

[3] Where the source of space heating is underfloor heating, a floor U-value of 0.15 W/m2K should generally be satisfactory

[4]Excludes display windows and similar glazing but their impact on overall performance must be taken into account in EPC and CPC calculation.

[5]Includes glazed sections of curtain walling

[6]In buildings with high internal heat gains a less demanding area-weighted average U-Value for the glazing may be an appropriate way of reducing overall CO_2 emissions. If this case can be made, then the average U-value for windows can be relaxed from the values given above. However values should be no worse than 2.2 W/m^{2}K

Appendix 1: Procedure to check the performance of new building designs against the draft Interim Public Sector NZEB performance specification

The performance of new buildings to achieve NZEB should be checked using the current NEAP methodology available from the SEAI website[2]. In order to assess whether a new public building achieves the NZEB performance it is necessary to first calculate the performance of the building being designed in SBEM V3.5b using the parameters for the draft Interim Public Sector NZEB performance specification and then compare this performance to that of the same building modelled using its actual performance specification. The actual building performance should be equal to or better than that of the building modelled with the Interim Public Sector Performance Specification. It should be noted that the embedded reference building in SBEM V3.5b does not represent the draft Interim NZEB performance specification.

The above approach is set out in a step by step basis below:

1. Calculate the performance of the proposed buildings in SBEM V3.5b using the draft Interim Public Sector Specification for fabric and services. This must be done manually using "table 1" from the draft interim specification with same size and shape as actual building. This then becomes the reference building.

2. Calculate performance of the actual building in SBEM V3.5b using the actual specification for fabric and services.

3. Compare the primary energy (kWh/m^2/yr) and carbon dioxide emissions (kgCO_2/m^2/yr) between the building modelled with the actual performance specification and the building modelled with the draft Interim Public Sector performance specification.

4. Where the actual building performance specification has a primary energy performance equal to, or lower than the primary energy performance (kWh/m^2/yr) of the same building modelled using the draft Interim Public Sector Specification it achieves the NZEB performance specification for energy i.e.

$$EPC = \frac{\text{Primary Energy of Actual Building}}{\text{Primary Energy of reference building}}$$

Must be equal to or less than MPEPC =1.0

5. Where the actual building performance has a carbon dioxide emissions performance equal to, or lower than 1.15 times the carbon dioxide performance (kgCO_2/m^2/yr) of the building modelled using the draft Interim Public Sector Specification it achieves the NZEB performance specification for carbon dioxide emissions.

$$CPC = \frac{\text{Primary Carbon Dioxide emissions of Actual Building}}{\text{Primary Carbon Dioxide emissions of reference building}}$$

Must be equal to or less than MPCPC =1.15

6. The Renewable Energy Ratio (RER) should equal 20% of the overall total energy performance when calculated in SBEM.

[2] http://www.seai.ie/Your_Building/BER/Non_Domestic_buildings/Download_SBEM_Software/Download_SBEM_Software.html