Rialtas na hÉireann
Government of Ireland

Technical and practical implications of the new Part L Dwelling & Part F 2019

Architecture + Building Expo
RDS - 4th October 2019

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Outline

EPBD and NZEB

Transitional Arrangements

TGD L 2019

- **New dwellings: Changes, Cost Optimum, Regulatory Impact Assessment and Compliance Examples**
- **Existing dwellings: Changes**
- **Major Renovations: Definition, Requirements, Cost Optimum and Compliance Examples**

TGD F 2019

- **Changes and Compliance Examples**
- **NSAI Domestic Ventilation Systems Validation Scheme**

NZEB market changes: what is an NZEB dwelling in 2019?

What next?

Energy Performance of Buildings Directive (EPBD) NZEB and Major Renovations

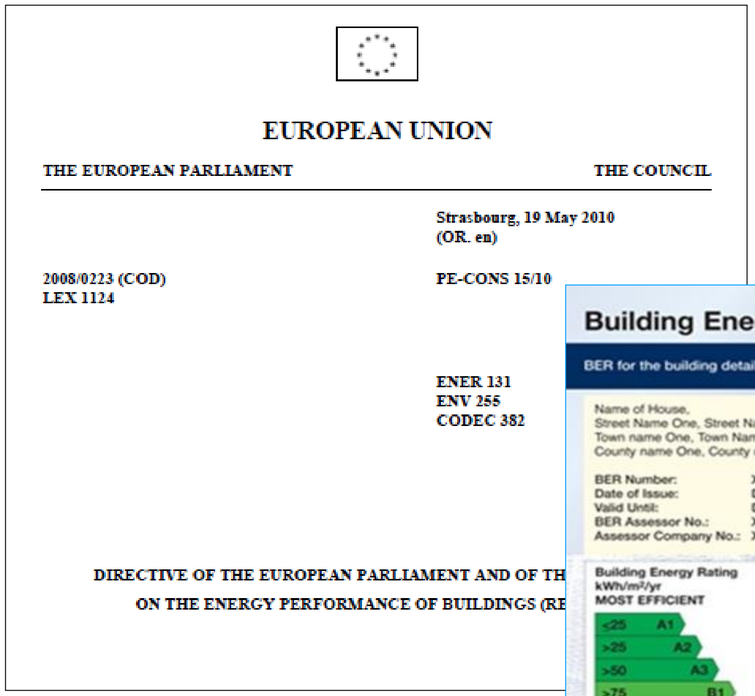
Article 9

Member states to ensure that all new buildings are “Nearly Zero Energy Buildings” by 31st Dec 2020

Article 7

Major Renovations to be at Cost Optimal Level in Building Codes

Nearly Zero-Energy Building (NZEB): means a building that has a very high energy performance, as determined in accordance with Annex I of the EU EPBD. 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.



EUROPEAN UNION

THE EUROPEAN PARLIAMENT THE COUNCIL

Strasbourg, 19 May 2010
(OR. en)

2008/0223 (COD)
LEX 1124

PE-CONS 15/10

ENER 131
ENV 255
CODEC 382

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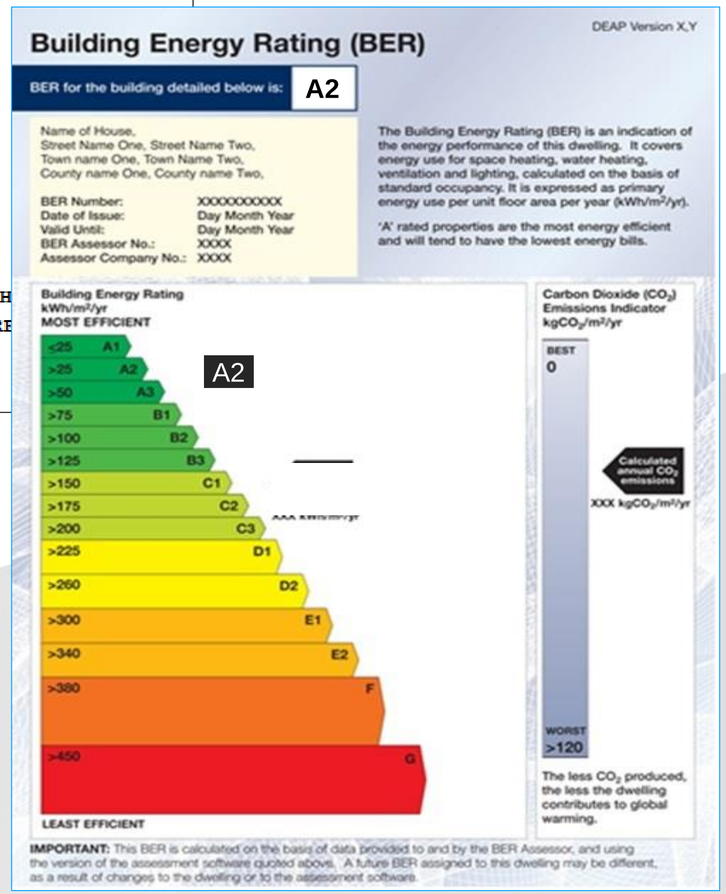


EPBD - 2018 Amendments (IAQ)

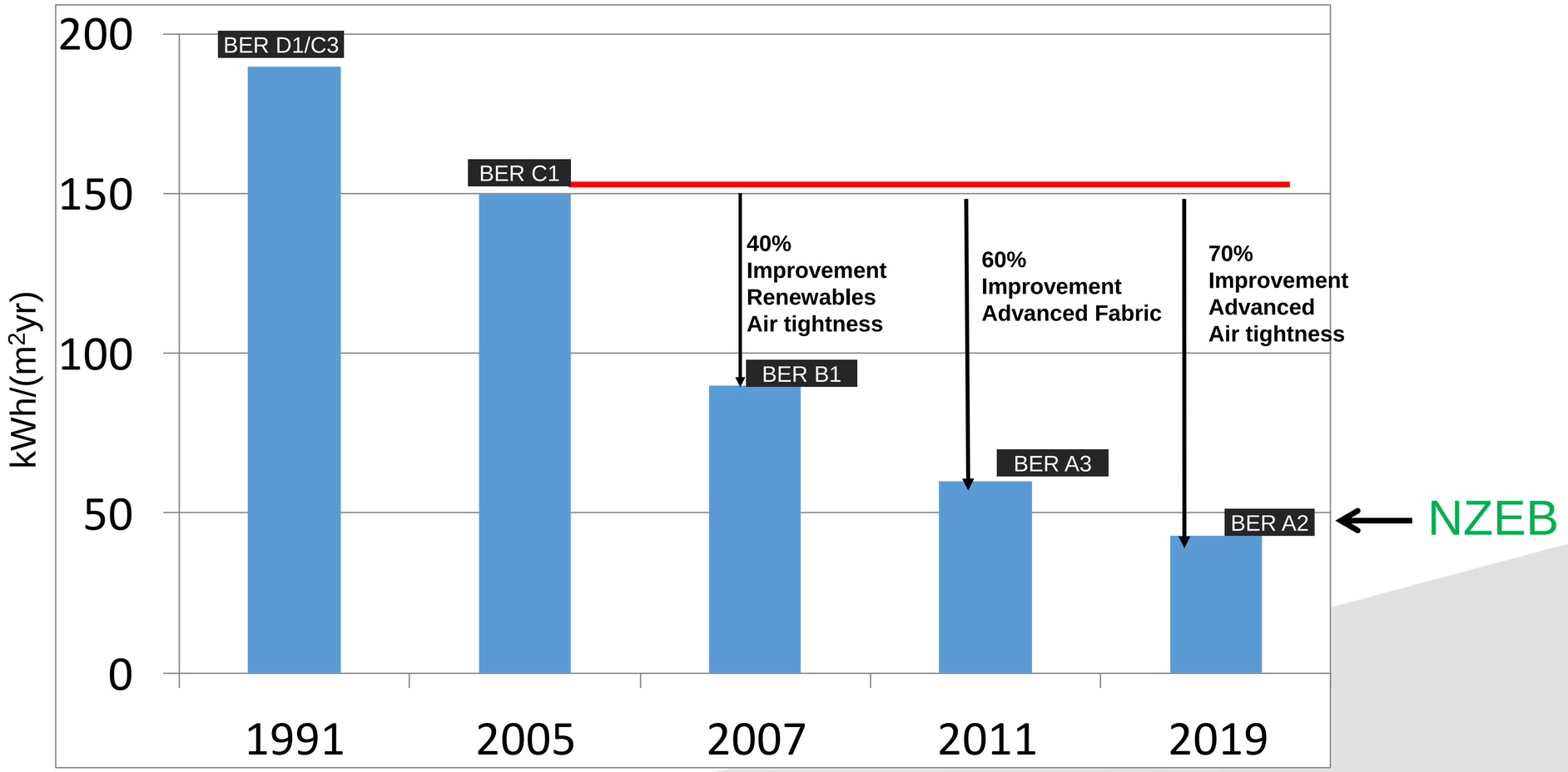
2018 Art. 7: Member States shall encourage, in relation to buildings undergoing major renovation, high-efficiency alternative systems, in so far as this is technically, functionally and economically feasible, **and shall address the issues of healthy indoor climate conditions, fire safety** and risks related to intense seismic activity.'

2018 Annex 1. The energy needs for space heating, space cooling, domestic hot water, ventilation, lighting and other technical building systems **shall be calculated in order to optimize health, indoor air quality and comfort levels defined by Member States at national or regional level**.

Ireland- Housing

- Buildings - 40% of energy use
- 2 million dwellings
- 90% Detached/Semi-detached houses.
- Oceanic Temperate Climate
- Masonry Construction

Development of NZEB in Building Codes



Building code requirements for new Dwellings (primary energy)

BER-Building Energy Rating

Transition Arrangements

- TGD L Dwellings & TGD F 2019 to apply to new Dwellings commencing construction from 1st November 2019 subject to transition

- Transitional arrangements to allow TGD L 2011 (amended 2017) and TGD F 2009 - Dwellings to be used where planning approval or permission has been applied for on or before 1st November 2019 and substantial completion is completed within 1 year i.e. by 31st October 2020

- Substantial completion means that the structure of the external walls has been erected.

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Part L – Conservation of Fuel and Energy - Dwellings

Built Environment Advisory Unit
Department of Housing, Planning and Local Government

Achieving compliance with 2019 Part L Dwellings

Overall Compliance
Sect. 1.1 calculation in DEAP by achieving MPEPC (0.3) and MPCPC(0.35) (equivalent to 70% Reduction on 2005)

+

Minimum Threshold Level Compliance
TGD L Sections:
- 1.2 Renewable Energy Ratio = 20%
- 1.3 Building Fabric
  - U-Values (Backstops)
  - Thermal Bridging ACDs
  - Air Tightness < 5m3/hr/m2
- 1.4Building Services
  - Boiler Efficiency 90%
  - Space Heating Controls (zoning and time control)
  - Insulation
  - Mechanical Ventilation System Efficiency
- 1.5 Construction Quality and Commissioning
- 1.6 User Information

=

Compliance with Part L Dwellings

N.B. Check
Overall compliance
Prior to Commencement

TGD L Dwellings-Renewable Energy Ratio (RER) from ISO 52000

Renewables requirement included in TGD L Dwellings as per the ISO 52000 Standard Renewable Energy Ratio (RER) - 20%

$$RER = \frac{E_{\text{Pren;RER}}}{E_{\text{Ptot}}}$$

Renewable energy sources include Photovoltaics, Heat Pumps (Air source and ground source), Biomass, Solar Thermal ,Primary Energy Savings from Combined Heat and Power (CHP), Renewable district heating

Backstop U-values - New Dwellings

Table 1	Maximum elemental U-value (W/m^2K)[1, 2]	
Column 1 Fabric Elements	Column 2 Area-weighted Average Elemental U-value (Um)	Column 3 Average Elemental U-value – individual element or section of element
Roofs Pitched roof - Insulation at ceiling - Insulation on slope Flat roof	 0.16 0.16 0.20	 0.3
Walls	0.18	0.6
Ground floors[3]	0.18	0.6
Other exposed floors	0.18	0.6
External doors, windows and rooflights	1.4[4,5]	3.0

Notes:

1. *The U-value includes the effect of unheated voids or other spaces.*
2. *For alternative method of showing compliance see paragraph 1.3.2.3.*
3. *For insulation of ground floors and exposed floors incorporating underfloor heating, see paragraph 1.3.2.2.*
4. *Windows, doors and rooflights should have a maximum U-value of 1.4 W/m^2K.*
5. *The NSAI Window Energy Performance Scheme (WEPS) provides a rating for windows combining heat loss and solar transmittance. The solar transmittance value g_{perp} measures the solar energy through the window.*

Typical Fabric Specifications to meet the backstop U-values

System	Comments
Walls	
110mm PIR in 150 mm partial filled cavity	U=0.18 W/m²K Note: 5 wall ties per m2
150 mm PIR in 150mm full fill cavity	U=0.13 W/m²K Note: 5 wall ties per m2
150mm grey EPS blown bead full filled cavity with 52.5mm internal PIR board	U=0.16 W/m²K Note: 5 wall ties per m2
200mm grey EPS blown bead full filled cavity	U=0.16 W/m²K, Note: Specialist Structural design
Timber Frame - 140mm stud with PIR between & over studs with Service Void	U=0.17 W/m²K
External Insulated Render system – 210 mm White EPS/200 mm MW/170 mm Grey EPS	U=0.17 W/m²K
Rainscreen – 110 mm PH/120 mm PIR/200 mm MW	U=0.18 W/m²K

Based on masonry substrate except Timber Frame

Typical Fabric Specifications to meet the backstop U-values

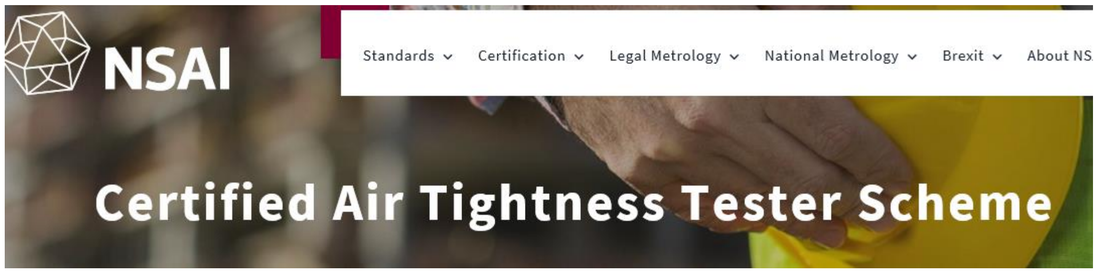
System	Comments
Roofs	
300mm MW between and over joists	**U=0.13 W/m^{2}K, Mineral wool TC= 0.035 W/mK**
Floors	
110 mm PIR under slab (for typical semi-detached perimeter)	**U=0.15 W/m^{2}K**

Air Tightness

- Air pressure testing should be carried out on all dwellings on all development sites including single dwelling developments to show attainment of backstop value of 5 $m^3/hr.m^2$.

- The tests should be carried out by a person certified by an independent third party to carry out this work, e.g. Irish National Accreditation Board (INAB), National Standards Authority of Ireland (NSAI) certified or equivalent. The test report should contain at least the information specified in Section 7 of I.S. EN 9972:2015.

Air Tightness



- 65 registered
  - Leinster: 36
  - Munster: 11
  - Connacht: 9
  - Ulster: 9

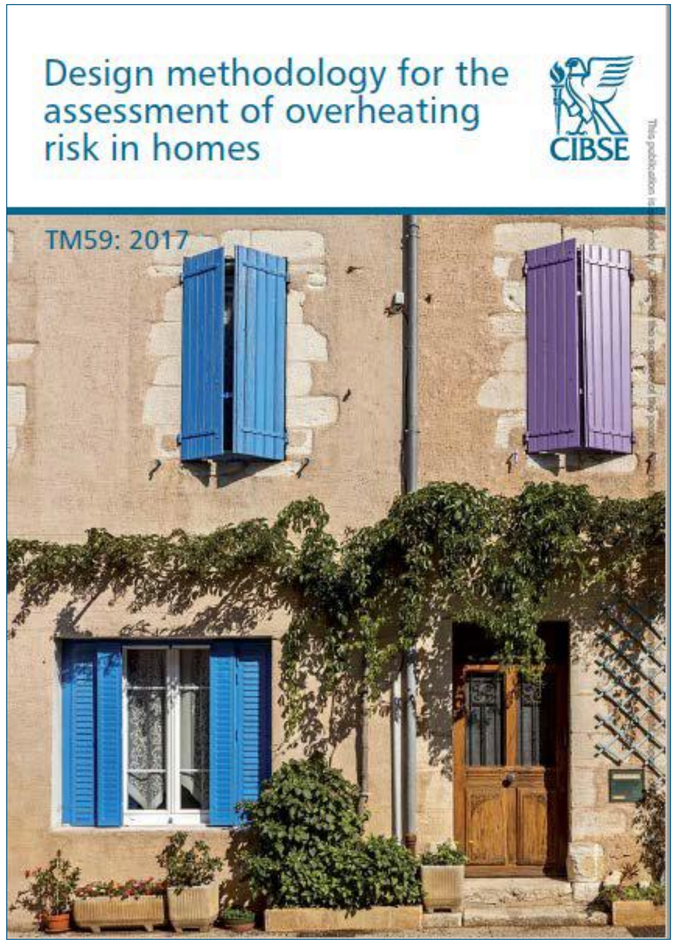
Overheating risk

CIBSE TM59 was used to assess the risk of overheating. It is a new methodology specifically developed to assess the risk of overheating in residential buildings. It is based on the use of thermal modelling; IES Virtual Environment software was used for this evaluation.

An overheating assessment was undertaken on 5 building types

All dwellings passed with some mitigation required (reduced solar transmittance, appropriate use of blinds).

New guidance in DEAP to assess overheating



Acceptable Construction Details

Y-value represents heat loss due to thermal bridging:

Options for Y-value are:

1. If ACDs are not used - default Y = 0.15 W/m^{2}K

2. Where ACDs are used - default Y=0.08 W/m^{2}K

3. Where heat loss is calculated according to junction lengths i.e. Y-value = Σ (Length of Junctions x Heat loss (psi)) / Heat Loss Area

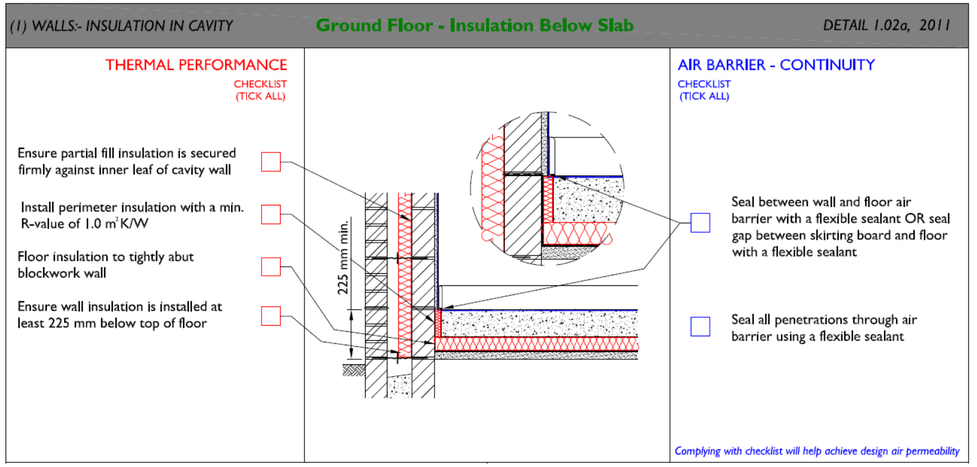
Typical Y-value for NZEB ≤ 0.05 W/m^{2}K

Acceptable Construction Details

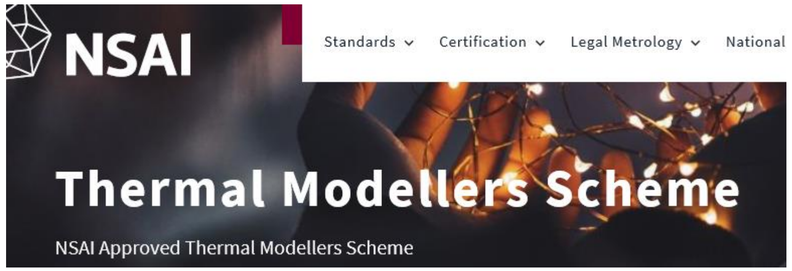
Section 1 – Introduction and general theory of insulation continuity and air tightness

Section 2 – Acceptable Construction Details

General Details
Cavity Wall Insulation
External Wall Insulation
Internal Wall Insulation
Timber Frame Insulation
Steel Frame Insulation
Cavity Block Insulation



Thermal Bridging and ACDs



- 16 registered Thermal Modellers

- TGD L 2019, Appendix D, Table D7: Y-value calculation example

- DEAP Thermal bridging Y-value calculation tool
- DEAP Technical Bulletin on dealing with Thermal bridging and weekly workshops on DEAP 4.2.0 (Sept. to December 2019).

Importance of Thermal Bridging Factor Y-value

Calculated Y-value 0.05 W/m²K:

Examples	EPC	CPC	RER
A	✓	✓	✓
B	✓	✓	✓

Default Y-value 0.08 W/m²K:

Examples	EPC	CPC	RER
A	✗	✓	✓
B	✗	✓	✓

Unheated corridors – Apartments

1.3.1.2 Unheated areas which are wholly or largely within the building structure, do not have permanent ventilation openings and are not otherwise subject to excessive air-infiltration or ventilation, e.g. common areas such as stairwells, corridors in buildings containing flats, may be considered as within the insulated fabric. In that case, if the external fabric of these areas is insulated to the same level as that achieved by equivalent adjacent external elements, no particular requirement for insulation between a heated dwelling and unheated areas would arise, subject to achieving the EPC and CPC requirements. It should be noted that heat losses to such unheated areas are taken into account by the DEAP methodology in the calculation of the dwelling EPC and CPC (see Section 1.1).

Unheated corridors – Apartments

- TGD L 2019, Appendix A: Default values and Calculation method.

- DEAP Unheated space U-value calculation tool

The Ru values derivation is detailed in Appendix A of BR443:2006.

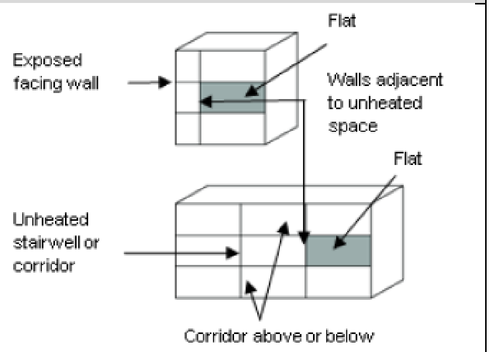
$$R_u = \frac{A_i}{\sum(A_e \times U_e) + 0.33nV}$$

where:

- Ai the area(s) of the element between the conditioned zone and unheated space being calculated, m^2;
- Ae is the area of each of the external elements, excluding ground floor, m^2;
- Ue is the U value of each of the external elements of the adjoining unheated space, W/m^2K;
- n is the air change rate (ach) of the unheated space;
- V is the volume of the unheated space, m^3.

Table A4 Typical resistance (R_u) for unheated space

(b) Unheated stairwells and access corridors in flats



Unheated space	R_u
Stairwells:	
Facing wall exposed	0.82
Facing wall not exposed	0.90
Access corridors:	
Facing wall exposed, corridor above or below	0.31
Facing wall exposed, corridor above and below	0.28
Facing wall not exposed, corridor above or below	0.43

Table A6
Typical air change rates for unheated spaces (from BRE 443)

Air tightness type	n (air changes per hour)
No doors or windows, all joints between components well-sealed, no ventilation openings provided	0.1
All joints between components well-sealed, no ventilation openings provided	0.5
All joints well-sealed, small openings provided for ventilation	1.0
Not airtight due to some localised open joints or permanent ventilation openings	3.0
Not airtight due to numerous open joints, or large or numerous permanent ventilation openings	10.0

NZEB

User defined/calculated R_u

Table E1.6 Example F Mid Floor Apartment Dwelling space heating-heat pump and continuous mechanical extract ventilation	
Element or system	**Specifications**
Dwelling size and shape	Apartment Dwelling, single-storey Overall internal dimensions: 9 m wide x 9m deep x 2.45 m high Total floor area 81 m^2 Rectangular shape with no irregularities
Opening areas (windows and doors)	27 % of total floor area The above includes one opaque door of area 1.85 m^2, any other doors are fully glazed
Walls	External U = 0.13 W/m^2K e.g. 150 mm cavity wall with 100 mm cavity insulation of thermal conductivity 0.022 W/mK and 60 mm internal insulation of conductivity 0.022 W/mK Wall Adjoining Unheated Corridor U-value 0.194 W/ m^2K U-value of Original Wall 2.1 W/ m^2K Resistance of Unheated Corridor = 4.7 m^2K/W, based on ACH 0.15, Wall U value of 0.13 W/m^2K and Window U value of 0.9 W/m^2K. No heat loss floor or roof in corridor.

Example	EPC	CPC	RER
F	✓	✓	✓

Default value for R_u

Table E1.6 Example F Mid Floor Apartment Dwelling space heating-heat pump and continuous mechanical extract ventilation	
Element or system	**Specifications**
Dwelling size and shape	Apartment Dwelling, single-storey Overall internal dimensions: 9 m wide x 9m deep x 2.45 m high Total floor area 81 m^2 Rectangular shape with no irregularities
Opening areas (windows and doors)	27 % of total floor area The above includes one opaque door of area 1.85 m^2, any other doors are fully glazed
Walls	External U = 0.13 W/m^2K e.g. 150 mm cavity wall with 100 mm cavity insulation of thermal conductivity 0.022 W/mK and 60 mm internal insulation of conductivity 0.022 W/mK Wall Adjoining Unheated Corridor U-value **0.72** W/ m^2K U-value of Original Wall 2.1 W/ m^2K Resistance of Unheated Corridor **0.9** m^2K/W, based on ACH 0.15, Wall U value of 0.13 W/m^2K and Window U value of 0.9 W/m^2K. No heat loss floor or roof in corridor.

Example	EPC	CPC	RER
F	✗	✓	✓

	TGD L Dwellings 2011 (amended 2017)	TGD L Dwellings 2019	
Semi-detached house, two-storey Overall internal dimensions: 7 m wide x 9 m deep x 5.1 m high Total floor area 126 m^2 Rectangular shape with no irregularities	**Example: Semi-detached dwelling with gas boiler for space heating and natural ventilation with intermittent extract fans**	**Example A: Semi-detached dwelling with gas boiler for space heating and continuous mechanical extract ventilation**	**Example D: Semi-detached dwelling with heat pumps for space heating and continuous mechanical extract ventilation**
Element or system	**Specifications**	**Specifications**	**Specifications**
Opening areas (windows and doors)	25 % of total floor area The above includes one opaque door of area 1.85 m^2, any other doors are fully glazed	25 % of total floor area The above includes one opaque door of area 1.85 m^2, any other doors are fully glazed	25 % of total floor area The above includes one opaque door of area 1.85 m^2, any other doors are fully glazed
Walls	U = 0.13 W/m^2K e.g. 150 mm cavity wall with 100 mm cavity insulation of thermal conductivity 0.022 W/mK and 60 mm internal insulation of conductivity 0.022 W/mK	U = 0.13 W/m^2K e.g. 150 mm cavity wall with 100 mm cavity insulation of thermal conductivity 0.022 W/mK and 60 mm internal insulation of conductivity 0.022 W/mK	U = 0.13 W/m^2K e.g. 150 mm cavity wall with 100 mm cavity insulation of thermal conductivity 0.022 W/mK and 60 mm internal insulation of conductivity 0.022 W/mK
Roof	U = 0.11 W/m^2K e.g. 360 mm insulation of conductivity 0.04 W/mK, between and over ceiling joists	U = 0.11 W/m^2K e.g. 360 mm insulation of conductivity 0.04 W/mK, between and over ceiling joists	U = 0.11 W/m^2K e.g. 360 mm insulation of conductivity 0.04 W/mK, between and over ceiling joists
Floor	U = 0.14 W/m^2K e.g. Slab-on-ground floor with 120 mm insulation of conductivity 0.023 W/mK	U = 0.14 W/m^2K e.g. Slab-on-ground floor with 120 mm insulation of conductivity 0.023 W/mK	U = 0.14 W/m^2K e.g. Slab-on-ground floor with 120 mm insulation of conductivity 0.023 W/mK
Opaque door	U = 1.5W/m^2K	U = 1.5W/m^2K	U = 1.5W/m^2K
Windows and glazed doors	Double glazed, low E (En = 0.05, soft coat) 20 mm gap, argon filled, PVC frames (U = 1.3 W/m^2K, solar transmittance = 0.63	Triple glazed, low E (En = 0.05, soft coat) 20 mm gap, argon filled, PVC frames (U = 0.9 W/m^2K, solar transmittance = 0.6)	Triple glazed, low E (En = 0.05, soft coat) 20 mm gap, argon filled, PVC frames (U = 0.9 W/m^2K, solar transmittance = 0.63)
Thermal bridging	0.05 x total exposed surface area (W/m^2K)	0.05 x total exposed surface area (W/m^2K)	0.05 x total exposed surface area (W/m^2K)

	TGD L Dwellings 2011 (amended 2017)	TGD L Dwellings 2019	
Semi-detached house, two-storey Overall internal dimensions: 7 m wide x 9 m deep x 5.1 m high Total floor area 126 m^2 Rectangular shape with no irregularities	**Example: Semi-detached dwelling with gas boiler for space heating and natural ventilation with intermittent extract fans**	**Example A: Semi-detached dwelling with gas boiler for space heating and continuous mechanical extract ventilation**	**Example D: Semi-detached dwelling with heat pumps for space heating and continuous mechanical extract ventilation**
Element or system	**Specifications**	**Specifications**	**Specifications**
Ventilation strategy and Air Permeability ($m^3/hr.m^2$)	Natural Ventilation with intermittent extract fans in wet rooms at 5 $m^3/hr.m^2$	Natural Ventilation with Intermittent extract fans in wet rooms at 5 $m^3/hr.m^2$ OR Continuous Mechanical Extract Ventilation at 3 $m^3/hr.m^2$	Natural Ventilation with Intermittent extract fans in wet rooms at 5 $m^3/hr.m^2$ OR Continuous Mechanical Extract Ventilation at 3 $m^3/hr.m^2$
Primary heating fuel (space and water)	Mains gas	Mains gas	Electricity
Heat generator	Mains gas condensing boiler, seasonal efficiency 91.3 %, room-sealed, fanned flue	Mains gas condensing boiler, seasonal efficiency 91.3 %, room-sealed, fanned flue	Heat Pump; Space Heating efficiency =375 %; Hot Water efficiency = 200 %
Heating System Controls	Boiler Interlock and Time and Temperature Zone Control	Boiler Interlock and Time and Temperature Zone Control	Time and Temperature Zone Control
Hot water cylinder insulation	100 mm factory insulated	100 mm factory insulated	100 mm factory insulated
Hot Water Demand		1 shower with 6 l/min flow restrictor, 125 l/person/day	1 shower with 6 l/min flow restrictor, 125 l/person/day
Secondary space heating	Gas Fire, Closed front, fan assisted, balanced flue – efficiency 80%	None	None
Low energy light fittings	· 100% low Energy lighting	100 % low energy lighting, conforming to the following specification: · A+ Rated Bulbs with efficacy of 94 lumen/cW · 4 Watts/m^2	100 % low energy lighting, conforming to the following specification: · A+ Rated Bulbs with efficacy of 94 lumen/cW · 4 Watts/m^2
Renewable Energy Source	1.05 kWp Photovoltaic east/west facing, no overshading, 30° ,7.9m^2 (7.5m^2/kWp)	1.15 kWp Photovoltaic east/west facing, no overshading, 30° ,8.6m^2 (7.5m^2/kWp)	Environmental energy from heat pump

Appendix E – Examples

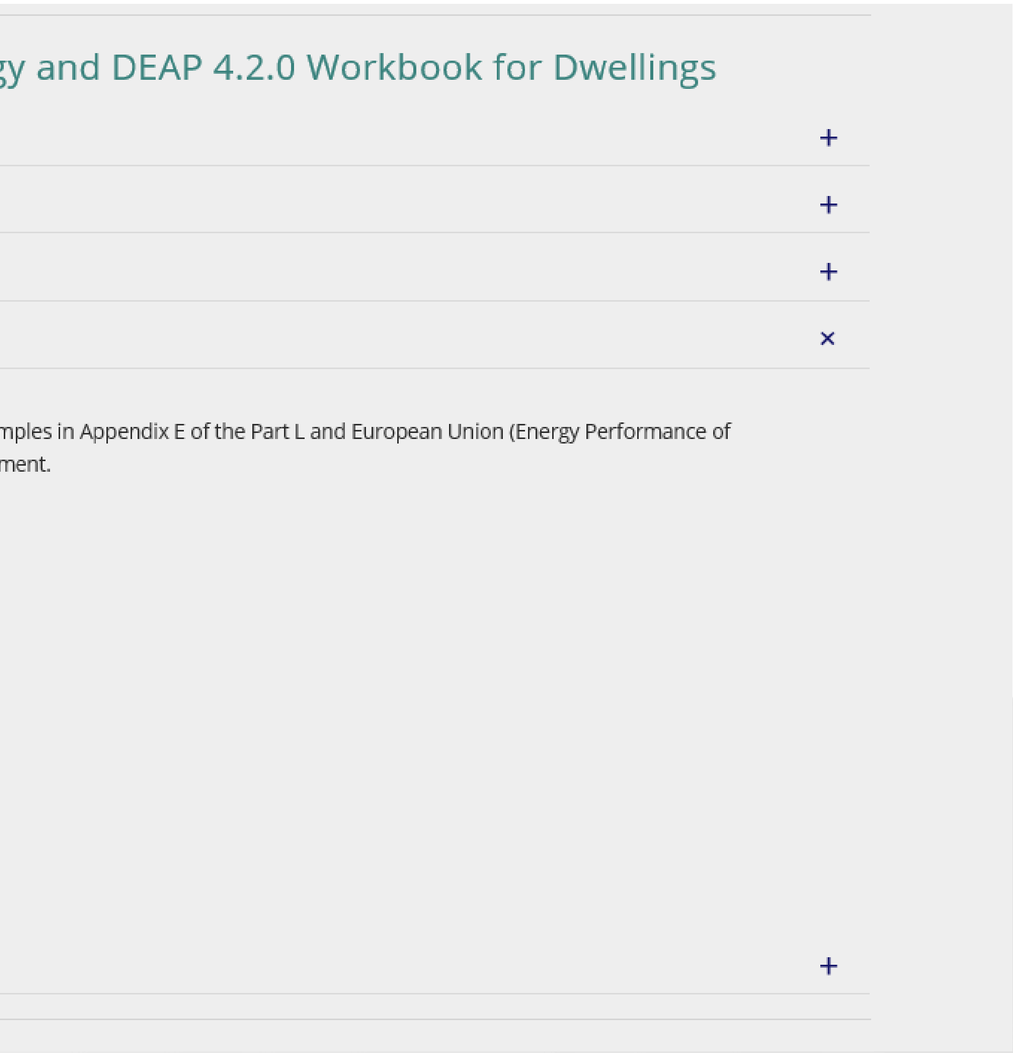
	TGD L 2011 Semi-D Dwelling heated by mains gas + PV	TGD L 2019 Semi-D Dwelling heated by mains gas + PV	TGD L 2019 Semi-D Dwelling heated by heat pump
Primary energy [kWh/m²/yr]	56	42	39
CO2 emissions [kg/m²/yr]	10	8	8
EPC	0.40	0.29	0.27
CPC	0.37	0.26	0.26
Renewable Energy Ratio (RER)	0.18	0.24	0.39

Table E2 Example Dwellings - Results

	Example A – Semi-detached heated by mains gas and cMEV	Example B – Semi-detached heated by mains gas and NV with intermittent extract	Example C – Semi-detached heated by mains gas and MVHR	Example D – Semi-detached heated by heat pump and cMEV	Example E - Apartment heated by gas and MVHR	Example F - Apartment heated by heat pump and cMEV
Primary energy [kWh/m² yr]	42	42	38	39	37	39
CO_2 emissions [kg/m² yr]	8	8	7	8	7	8
EPC	0.29	0.29	0.26	0.27	0.28	0.29
CPC	0.26	0.26	0.24	0.26	0.26	0.28
RER	0.24	0.26	0.22	0.39	0.23	0.34

Appendix E – Examples

https://www.seai.ie/energy-in-business/ber-assessor-support/deap/



NZEB Calculation Methodology and DEAP 4.2.0 Workbook for Dwellings

Key Changes to DEAP 4.2.0 +

DEAP 4.2.0 Draft Manual and Workbook +

Survey Guide and Form +

TDG L 2019 Workbook Examples ×

The following workbooks represent the 6 worked examples in Appendix E of the Part L and European Union (Energy Performance of Buildings) Regulations 2019 Technical Guidance Document.

DEAP 4.2.0 TGDL 2019 Example A

DEAP 4.2.0 TGDL 2019 Example B

DEAP 4.2.0 TGDL 2019 Example C

DEAP 4.2.0 TGDL 2019 Example D

DEAP 4.2.0 TGDL 2019 Example E

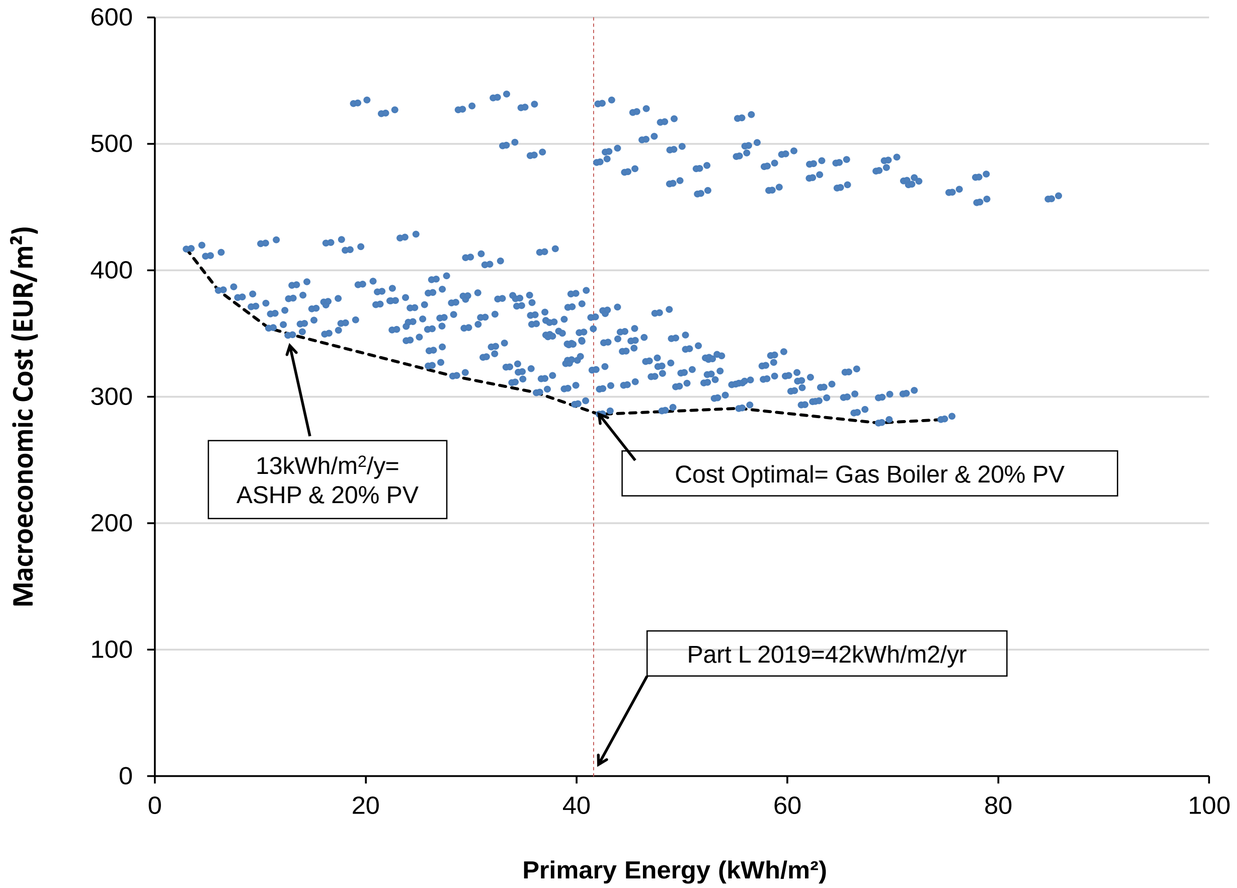
DEAP 4.2.0 TGDL 2019 Example F

Additional Resources +

Cost Optimal Report 2018

New Semi-Detached

Macroeconomic Costs (Central energy price, 5% discount rate, EUR/m²)



NZEB New Dwelling in 2019

NZEB

- “A2” Rated or 43 kWh/(m^2 yr) $_{p.e.}$
- Advance fabric to passive levels (0.11 to 0.15 W/m^{2}K), triple glazed windows and Y-value =0.05
- Air Source Heat pumps or photovoltaics
- Airtightness 1-3m^3/(hr m^2) @ 50 Pa & Mechanical Ventilation

Small increase in overall cost with each incremental change

Regulatory Impact Assessment

- Uplift costed across 5 dwelling types (semi-detached, detached, bungalow, apartment-mid and top floor) using different combinations of fabric, services, ventilation and renewables.
- The average uplift in cost across all dwelling types modelled was 1.9% over current construction costs depending on the dwelling archetype and design specification applied.
- Overheating assessment on all types with some mitigation measures (reduced solar transmittance, appropriate use of blinds). SEAI to publish overheating guidance.
- High rise apartments assessed for renewables.

https://www.housing.gov.ie/housing/building-standards/tgd-part-f-ventilation/public-consultation-review-part-l-f-building

High Rise apartment blocks and Renewables

Multiple storey apartment blocks modelled

Photovoltaics with gas boiler viable up to 12 floors

Heat pumps viable for all heights

Backstop U-values - Existing Dwellings

Table 5	Maximum elemental U-value (W/m^2K)[1, 2,6] for Material Alterations or Material Change of Use	
Column 1 **Fabric Elements**	**Column 2** **Area-weighted Average Elemental U-value (Um)**	**Column 3** **Average Elemental U-value – individual element or section of element**
Roofs Pitched roof - Insulation at ceiling - Insulation on slope Flat roof	 0.16 0.25 0.25	 0.35
Walls Cavity walls[4] Other walls	 0.55 0.35	 0.6
Ground floors[3]	- 0.45[5]	-
Other exposed floors[3]	0.25	0.6
External doors, windows and rooflights and curtain walling	1.40	3.0

Notes:

1. *The U-value includes the effect of unheated voids or other spaces.*
2. *For material alterations, the U-values relate to the new works.*
3. *For insulation of ground floors and exposed floors incorporating underfloor heating, see paragraph 2.1.2.2.*
4. *This only applies in the case of a wall suitable for the installation of cavity insulation. Where this is not the case it should be treated as for "other walls".*
5. *This U-value only applies where floors are being replaced.*
6. *For buildings of architectural or historical interests or permeable traditional construction, refer to paragaragh 0.6.*

TGD L & EPBR 2019 - Dwellings
Major Renovation - Definition

Where more than 25 % of the surface of the building envelope undergoes renovation, the energy performance of the building or the renovated part thereof is upgraded in order to meet minimum energy performance requirements with a view to achieving a cost optimal level in so far as this is technically, functionally and economically feasible.

The cost optimal performance level to be achieved is 125 kWh/m^2.yr when calculated in DEAP (B2).

Qualifying elemental works for surface area calculation defined in Table 6.

Alternative compliance routes in Table 7.

Major Renovation-Table 6

Table 6 **Elemental works that are included in the surface area calculation for major renovation[1,2,3]**
External walls renovation • External insulation of the heat-loss walls • Replacement or upgrade of the external walls' structure • Internal lining of the surface of heat-loss walls
Windows renovation • Replacement of windows
Roofs renovation • Replacement of roof structure
Floors renovation • Replacement of floors
Extension • Extension works which affect more than 25 % of the surface area of the existing dwelling

[1] Major renovation requirement can be activated by works to a single element or to a combination of elements as per column 1 of table 7.

[2] Where major renovations to walls, roofs and ground floors constitute essential repairs e.g. repair or renewal of works due to fire, storm or flood damage or damage as a result of a material defect such as reactive pyrite in sub-floor hardcore or defective concrete blockwork, it is not considered economically feasible to bring these renovations to a cost optimal level.

[3] Painting, re-plastering, rendering, re-slating, re-tiling, cavity wall insulation and insulation of ceiling are not considered major renovation works.

Major Renovation-Table 7

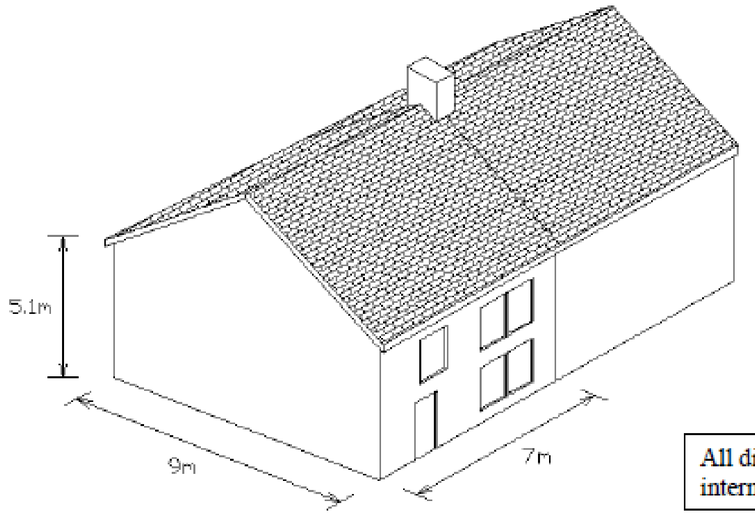
Table 7 - Cost Optimal Works activated by Major Renovation

Major Renovation > 25% surface area[1,2,3,5]	**Cost Optimal level as calculated in DEAP (Paragraph 2.3.3 a.)**	**Additional Works to bring dwelling to cost optimal level in so far as they are technically, economically and functionally feasible (Paragraph 2.3.3 b.)**
External walls renovation	The cost optimal performance level to be achieved is 125 kWh/m^2/yr.	Upgrade insulation at ceiling level where U-values are greater than in Table 5 & Oil or gas boiler replacement[6] & controls upgrade where the oil or gas boiler is more than 15 years old and efficiency less than 86% &/or Replacement of electric storage heating[7] systems where more than 15 years old and with heat retention not less than 45% measured according to IS EN 60531.
External walls and windows renovation		
External walls and roof renovation		
External walls and floor renovation		
New Extension affecting more than 25% of the surface area of the existing dwelling's envelope (see 2.3.6)	The cost optimal performance level to be achieved is 125 kWh/m^2/yr	Upgrade insulation at ceiling level where U-values are greater than in Table 5 & Oil or gas boiler replacement[6] & controls upgrade where the oil or gas boiler is more than 15 years old and efficiency less than 86% &/or Replacement of electric storage heating[7] systems where more than 15 years old and with heat retention not less than 45% measured according to IS EN 60531 & Upgrade insulation at wall level where U-values are greater than in table 5.

Major Renovation trigger for extensions – Example House

Existing dwelling total envelope area
(based on insulation at ceiling level):
(floor & roof) + (gable wall) + (front & rear walls) =
(2 x 9 x 7) + (9 x 5.1) + (2 x 7 x 5.1) =
126 + 45.9 + 71.4 = 243.3 m²

25% trigger = 60.825 m² of existing dwelling's total envelope area



Extension	Dwelling envelope area affected	% of dwelling envelope area affected	Major Renovation triggered
1 storey rear wall	17.85 m²	7.3 %	✗
2 storey rear wall	35.7 m²	14.7 %	✗
1 storey rear wall and gable wall	40.8 m²	16.8 %	✗
2 storey rear wall and gable wall	81.6 m²	33.5 %	✓

Major Renovation - Examples

Semi-detached house (126 m²): hollow blocks walls with 25 mm mineral wool internal insulation, pitched roof with 50 mm mineral wool insulation on the ceiling, double glazing with 6 mm air gap, 80 % gas boiler installed with no heating controls, solid fuel stove secondary heating.

Proposed works to elements[1]	Major renovation (Yes/No)	Required additional works
A) Window replacement (13 % of envelope)	No	NA
B) EWI or IWI of walls (35 % of envelope)	Yes	Upgrade insulation at ceiling level to 0.16 W/m²K or better as per table 5, and 90 % efficiency condensing gas boiler replacement and controls upgrade: time and temperature controls for space heating + time and temperature controls on domestic hot water
C) EWI or IWI of Walls and windows replacement (48 % of envelope)		
D) EWI or IWI of Walls and replacement of roof structure (61 % of envelope)		
E) EWI or IWI of Walls and replacement of floor (61 % of envelope)		

[1] Major Renovation of all elements should meet the requirements of Table 5 where material alteration applies.

Primary energy consumption before major renovation: 233 kWhr/m²/yr

Proposed works package B) is based on the following specification: 100 mm EWI, 300 mm attic insulation, 91 % efficiency gas boiler, full zone time and temperature controls on space heating with weather compensation, time and temperature control on domestic hot water with insulated primary pipework.

Primary energy consumption post major renovation: 121 kWhr/m²/yr

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Part F - Ventilation

Built Environment Advisory Unit

Department of Housing, Planning and Local Government

TGD F 2019: Changes vs 2009

- Continuous Mechanical Extract Ventilation (NEW)
  - Mechanical Ventilation with Heat Recovery
- Natural Ventilation with Intermittent extract Fans

Diagram 1a: Continuous Mechanical Extract Ventilation - House

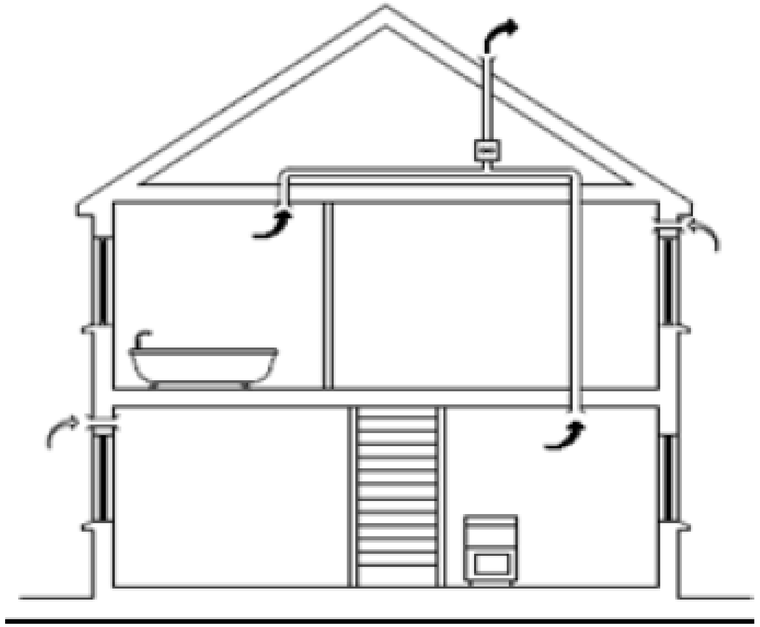


Diagram 2a: Mechanical ventilation with heat recovery – House

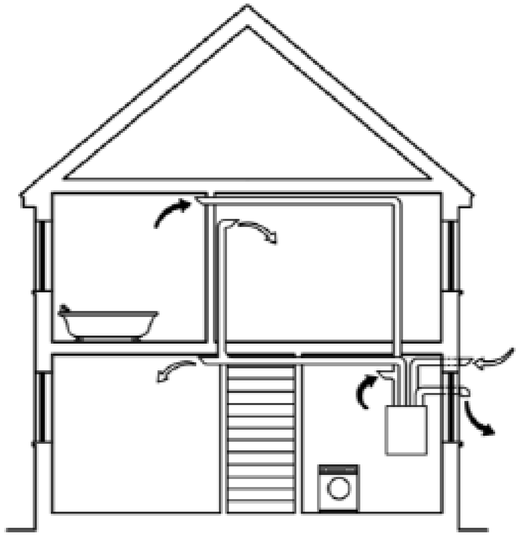
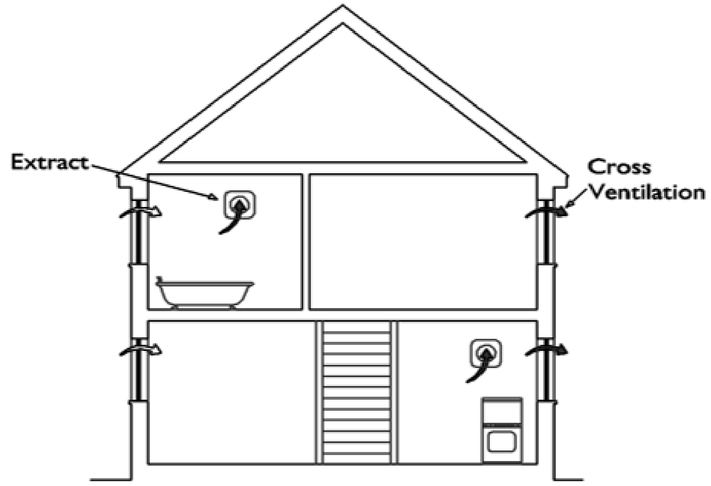


Diagram 2c: Natural Ventilation with intermittent fans mechanical extract - House



Exhaust Air Heat Pump to be treated as CMEV

TGD F 2019: Changes vs 2009

- **TGD F 2019 ventilation systems application range:**

Ventilation System	Air Permeability range: 3-5 $m^3/h.m^2$	Air Permeability range: Less than 3 $m^3/h.m^2$
CMEV	✓	✓
MVHR	✓	✓
Natural Ventilation with intermittent extract ventilation	✓	✗

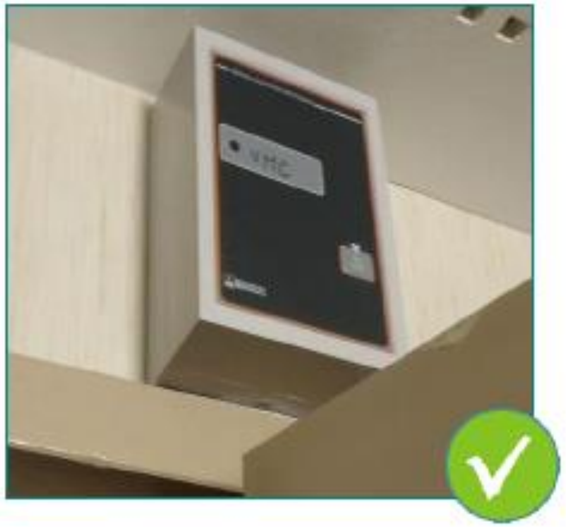
- **1.2.4: Natural ventilation with intermittent extract**

  Minimum (total) equivalent area of background ventilators increased by 40%.

TGD F 2019: Changes vs 2009

- **1.2.2.10 and 1.2.3.12: Control indicators**

Control indicators to be in a visible location to the occupant and not in a remote location such as in the attic or above the ceiling. Control indicators should indicate to the occupant that the system is operating correctly and if a fault has occurred.



TGD F 2019: Changes vs 2009

- **1.2.2.12, 1.2.3.14 and 1.2.4.17: Information to homeowner**

The owner of the building should be provided with sufficient information about the ventilation systems and their maintenance so that an effective and an efficient ventilation system can be operated and maintained.

A way of complying would be to provide a suitable set of operating and maintenance instructions on the centralized continuous mechanical extract ventilation system in a way the householder can understand. The instruction should be directly related to the system installed in the dwelling without prejudice to the need to comply with health and safety regulations. The instructions should explain the important function of the system to provide adequate ventilation, how the system is intended to work, **why the system should not be turned off**, how the controls should be used and how and when the system should be cleaned and maintained. The location of the continuous centralized mechanical ventilation unit in the dwelling and the location of filters on the unit should be identified in the document.
Boost and normal operation of the unit should be explained and the effects of opening windows. Guidance on the operation of controls and how a fault is indicated, location of fault alarms and their meaning should also be included.

Major Renovations

- **1.2.2.13 and 1.2.3.15 Major Renovations:**

Where more than 25 % of the surface of the building envelope undergoes renovation the energy performance of the building or the renovated part thereof is upgraded in order to meet minimum energy performance requirements with a view to achieving a cost optimal level in so far as this is technically, functionally and economically feasible (Maximum 125 kWh/m^2.yr – Minimum B2 building energy rating).

Where new mechanical extract ventilation systems are installed as part of a Major Renovation as defined in Part L-2019, then the system should be designed, installed, commissioned and validated as per 1.2.2.11 and 1.2.3.13.

TGD F 2019: Changes vs 2009

- **Appendix 1: 4 Examples**

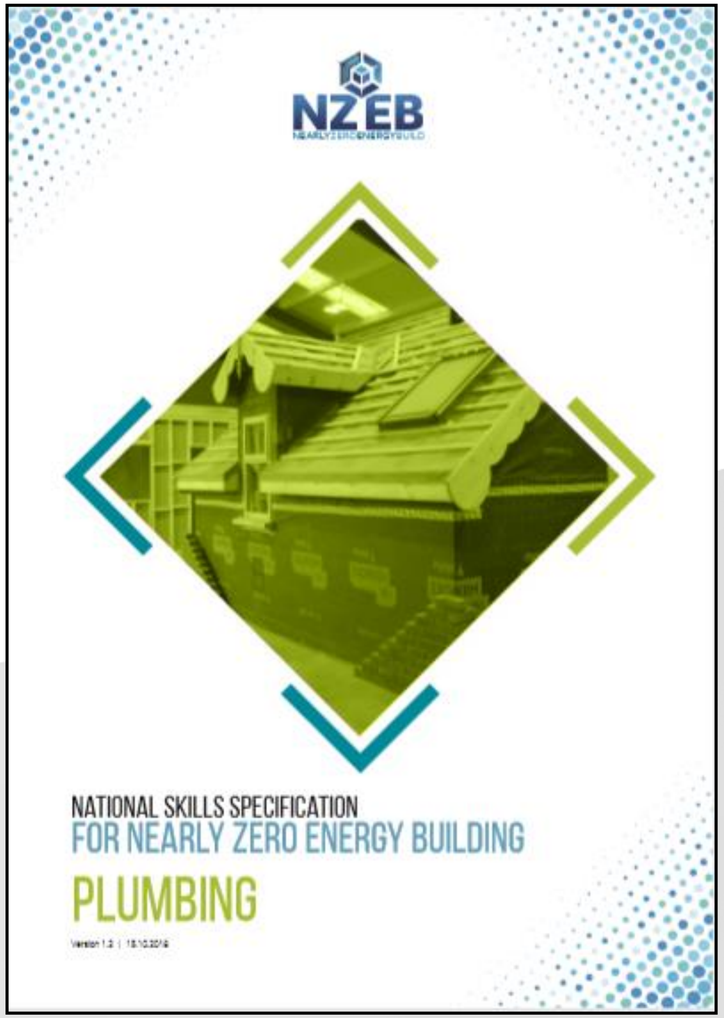
  - Semi-detached house, CMEV, 130 m^2
  - Semi-detached house, MVHR, 130 m^2
  - Apartment, MVHR, 80 m^2
  - Semi-detached house, Background Ventilation, 130 m^2

  - Calculation of minimum continuous and boost ventilation rates
  - Calculation of extract and supply ventilation rates
  - Distribution of extract and supply rates per room
  - Calculation of minimum total equivalent area of background ventilators

Training

- *Systems should be installed, balanced and commissioned by competent installers e.g. QQI or ETB or equivalent.*

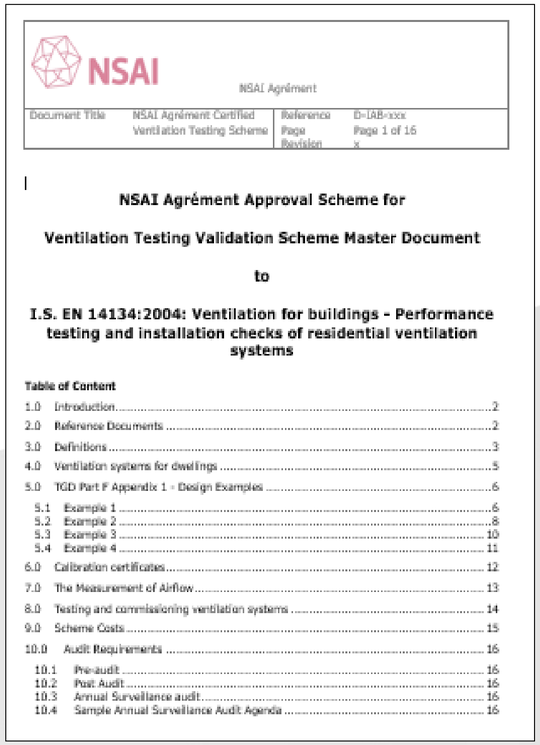
- Waterford and Wexford ETB – NZEB National Training centre, Enniscorthy. City and Guilds Quality Approved.
- Suite of NZEB training courses: Electrical, Plastering, Carpentry, Bricklaying, Plumbing, Site Supervisor, Installation and Commissioning of ventilation systems, Fundamental NZEB.
- All courses are fully funded under the Skills to Advance Initiative. Skills to Advance is a SOLAS initiative in partnership with ETBs and supported by Government.



NSAI Ventilation testing Validation Scheme

- *Systems should **<u>then</u>** be validated - to ensure that they achieve the design flow rates - by an independent competent person certified by an independent third party e.g. NSAI or equivalent.*

- **National Standards Authority of Ireland**
- **NSAI** currently consulting with Ventilation industry
- Based on **I.S. EN 14134:2004** Ventilation for Buildings – Performance Testing and installation checks of residential ventilation systems
- Similar to Certified Air Tightness Tester Scheme (created 2011 – 65 testers in 2019)



NSAI

NSAI Agrément

Document Title	NSAI Agrément Certified Ventilation Testing Scheme	Reference	D-IAB-xxx
		Page	Page 1 of 16
		Revision	x

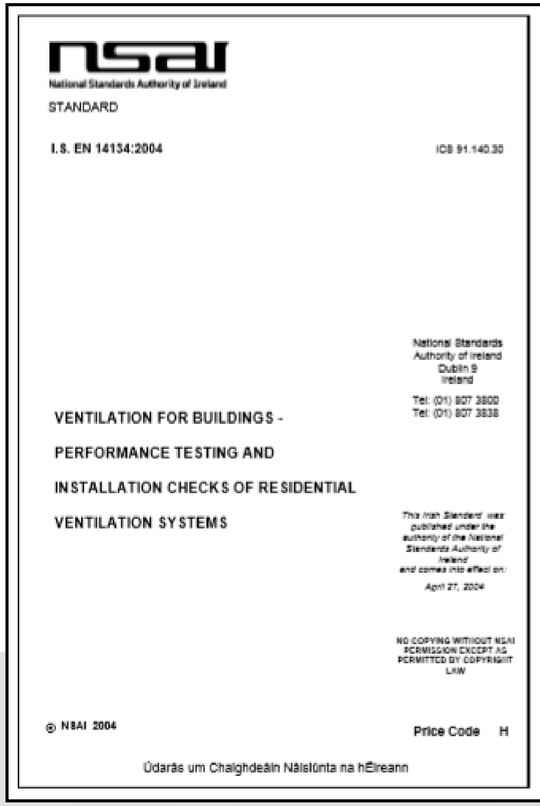
NSAI Agrément Approval Scheme for

Ventilation Testing Validation Scheme Master Document

to

I.S. EN 14134:2004: Ventilation for buildings - Performance testing and installation checks of residential ventilation systems

Table of Content



nsai

National Standards Authority of Ireland

STANDARD

I.S. EN 14134:2004

ICS 91.140.30

National Standards Authority of Ireland
Dublin 9
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VENTILATION FOR BUILDINGS -

PERFORMANCE TESTING AND

INSTALLATION CHECKS OF RESIDENTIAL

VENTILATION SYSTEMS

This Irish Standard was published under the authority of the National Standards Authority of Ireland and comes into effect on:

April 21, 2004

Price Code H

Údarás um Chaighdeáin Náisiúnta na hÉireann

Achieving Compliance with Part F 2019

- *Systems should **then** be validated - to ensure that they achieve the design flow rates - by an independent competent person e.g. NSAI, INAB certified or equivalent.*

- Installation and commissioning Guide for:
  - Continuous Mechanical Extract Ventilation
  - Mechanical Ventilation with Heat Recovery
  - Natural Ventilation

and

  - Completion checklist and installation/commission/validation sheet templates including measured and design flow rates.

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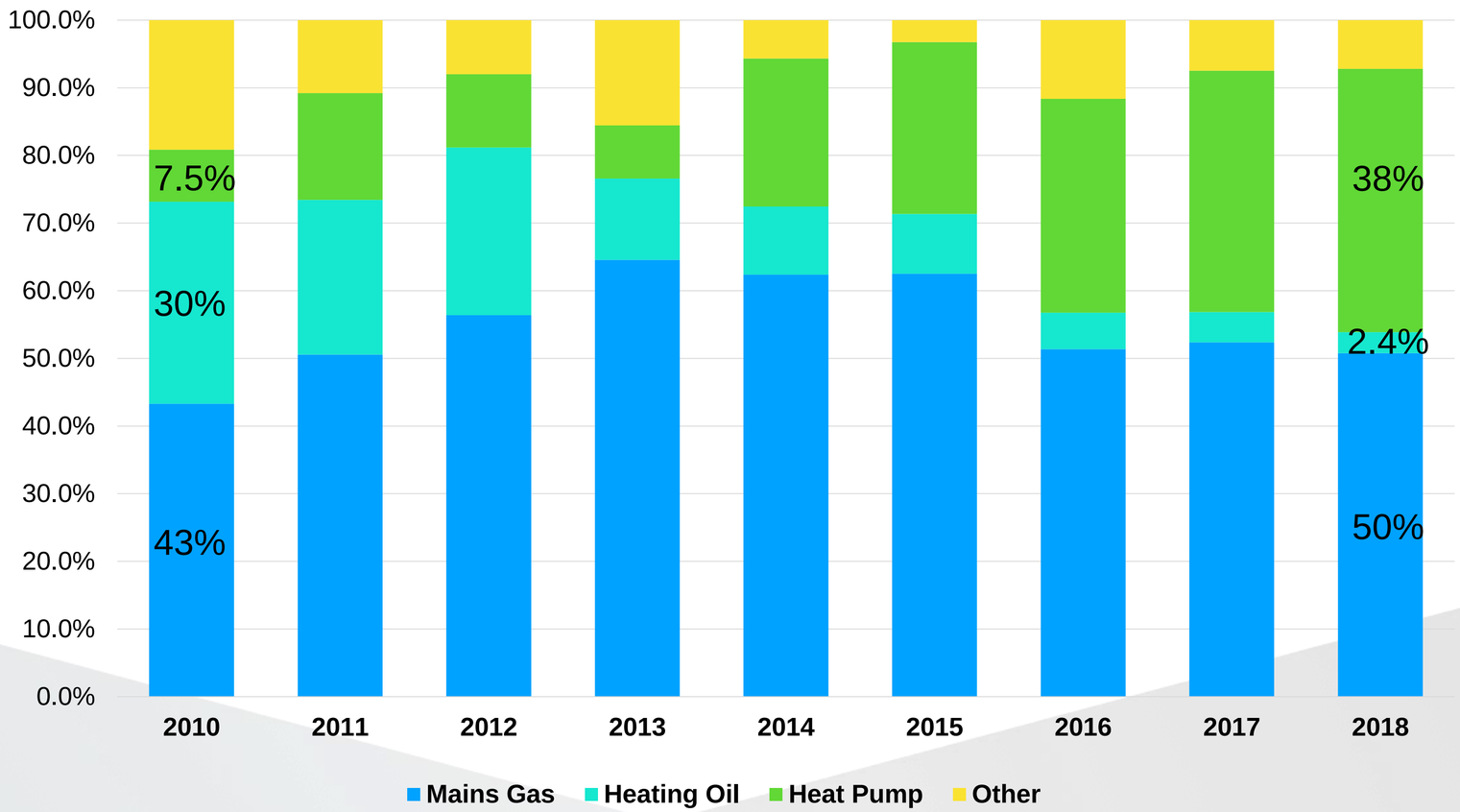
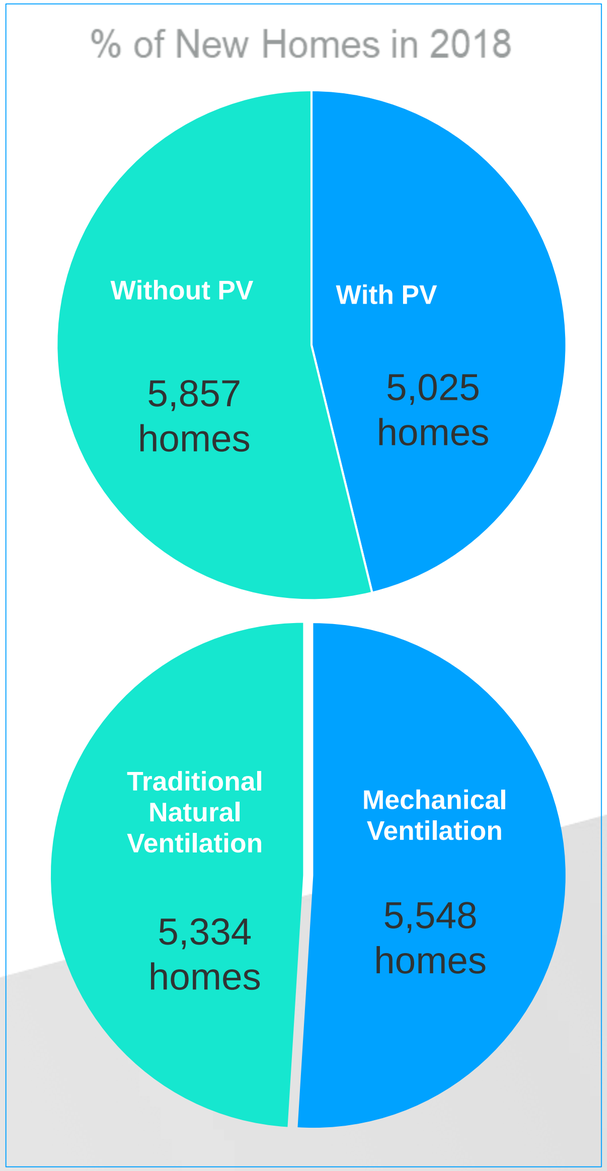
NZEB market

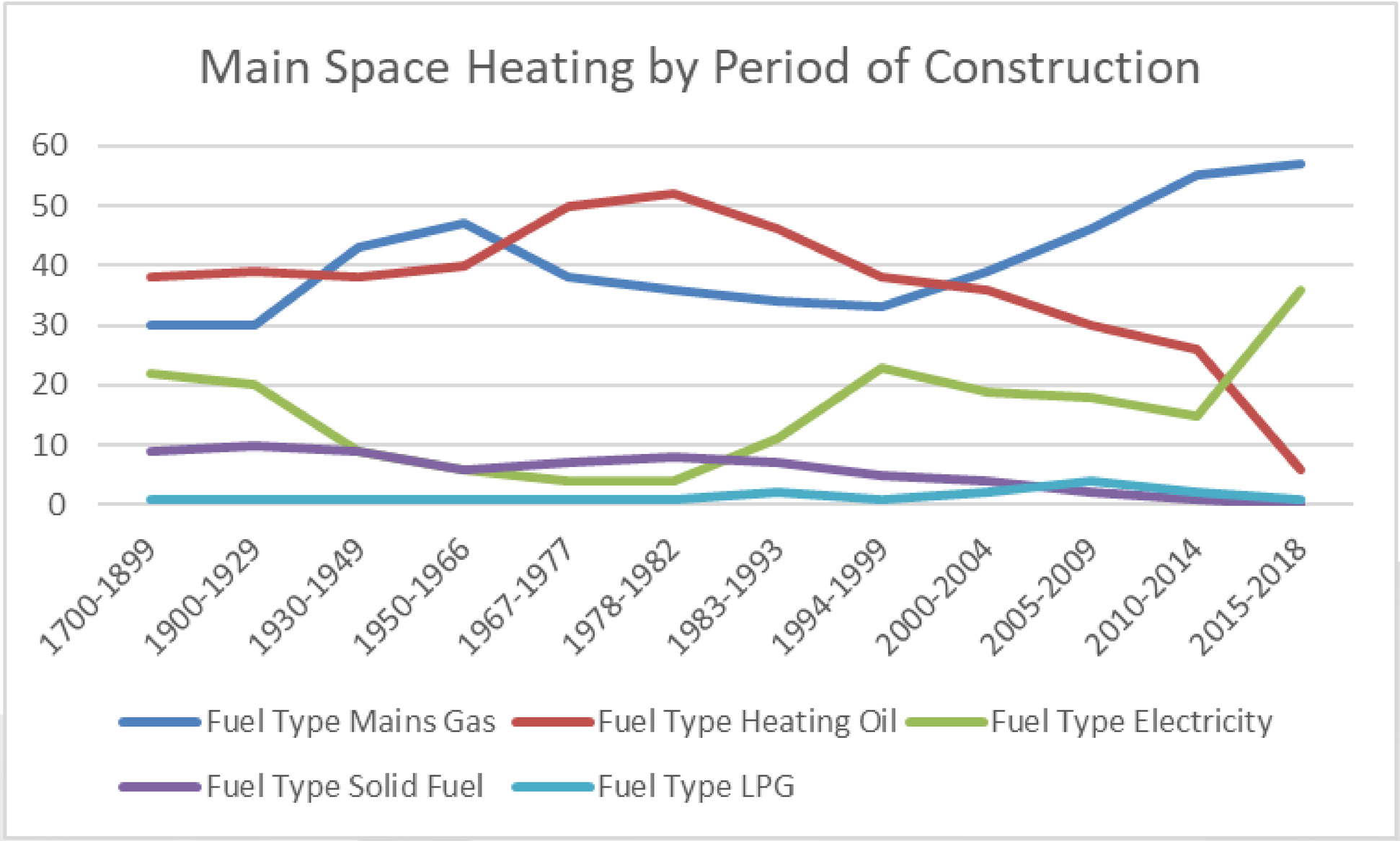
Built Environment Advisory Unit
Department of Housing, Planning and Local Government

New Buildings

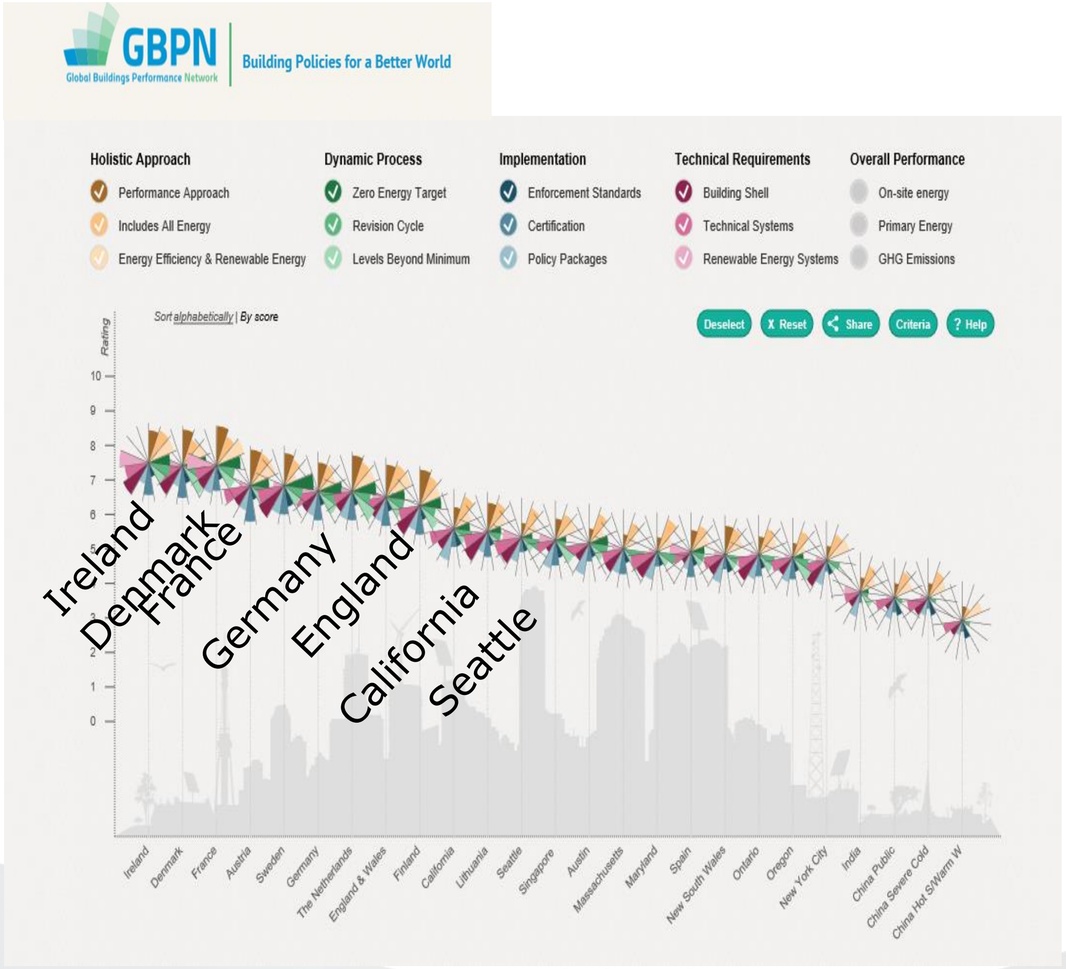
NZEB sees 25% Improvement on 2011 Building Regulations



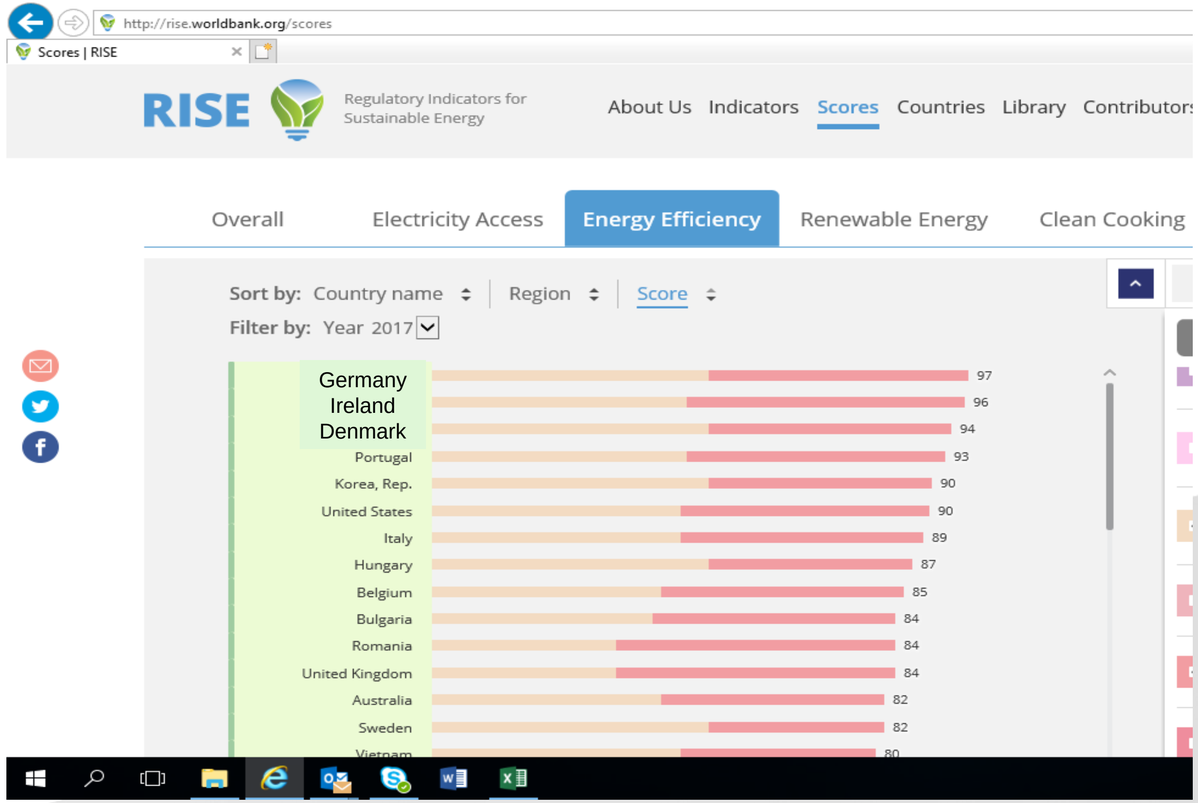



Main Space Heating by Period of Construction
60
50
40
30
20
10
0
1700-1899
1900-1929
1930-1949
1950-1966
1967-1977
1978-1982
1983-1993
1994-1999
2000-2004
2005-2009
2010-2014
2015-2018
Fuel Type Mains Gas
Fuel Type Heating Oil
Fuel Type Electricity
Fuel Type Solid Fuel
Fuel Type LPG

Buildings - International Comparison



GBPN 2013



World Bank 2018

Comparison of Energy Efficiency Policies for New Buildings

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What's next?

Built Environment Advisory Unit
Department of Housing, Planning and Local Government

NSAI Standards program to support the Climate Action Plan

- SR 50-x Building Services: Code of Practice for design, installation and commissioning of:
    - Photovoltaics panels
    - Heat Pumps
- February 2021

SEAI – DEAP

- DEAP 4.2.0 launch (Q3 2019)
- Overheating mitigation tool
- Heating and Domestic Hot water - Achieving Compliance with Part L and EPBR 2019 (Q3 2019)

DHPLG – Part L

- EV Rechargers on apartment blocks, New and Major Renovations >10 spaces – 10th March 2020

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Questions?

Built Environment Advisory Unit
Department of Housing, Planning and Local Government