

# TGD L Example Dwelling Specifications.

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## **Sustainable Energy Authority of Ireland**

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## TGD L Example Dwellings

The following tables give a set of specifications which are calculated to achieve compliance for a typical 126 m<sup>2</sup> semi-detached house and 81 m<sup>2</sup> apartment. Compliance with this requirement could also be achieved by a number of other combinations of measures.

### Example A: Semi-detached dwelling with gas boiler for space heating and continuous mechanical extract ventilation

Element or system	Specifications
Dwelling size and shape	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 <sup>2</sup> Rectangular shape with no irregularities
Opening areas (windows and doors)	25 % of total floor area The above includes one opaque door of area 1.85 m <sup>2</sup> , any other doors are fully glazed
Walls	U = 0.13 W/m <sup>2</sup> K 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 <sup>2</sup> K e.g. 360 mm insulation of conductivity 0.04 W/mK, between and over ceiling joists
Floor	U = 0.14 W/m <sup>2</sup> K e.g. Slab-on-ground floor with 120 mm insulation of conductivity 0.023 W/mK
Opaque door	U = 1.5W/m <sup>2</sup> K
Windows and glazed doors	Triple glazed, low E (En = 0.05, soft coat) 20 mm gap, argon filled, PVC frames (U = 0.9 W/m <sup>2</sup> K, solar transmittance = 0.6)
Living area fraction	25 % of total floor area
Shading and orientation	28.7 m <sup>2</sup> glazing orientated E/W; 0.9 m <sup>2</sup> glazing orientated N; average overshadowing
Number of sheltered sides	2
Allowance for thermal bridging at element junctions	0.05 x total exposed surface area (W/m <sup>2</sup> K)
Internal heat capacity category	Medium
Ventilation system	Continuous Mechanical Extract Ventilation with SFP 0.2 W/(l/s)
Air permeability	Infiltration due to structure = 0.15ac/h (3m <sup>3</sup> /(hr.m <sup>2</sup> ))@50pa)
Chimneys	None
Open flues	None
Intermittent Extract fans	1 (cooker exhaust)
Draught lobby	None
Primary heating fuel (space and water)	Mains gas
Heating system	Boiler and radiators with energy efficient water pump in heated space(energy consumption of 52kWh/yr)
Heat generator	Mains gas condensing boiler, seasonal efficiency 91.3 %, room-sealed, fanned flue
Heating System Controls	Boiler Interlock and Time and Temperature Zone Control
Hot water system	120 litre cylinder with 100 mm insulation Demand met by space heating boiler, separate time control for space and water heating, cylinder temperature controlled by thermostat 2 shower, each with 6 litres/min flow restrictor ,1 bath
Primary water heating losses	Insulated primary pipework between heat generator and cylinder
Secondary space heating	None
Low energy light fittings	100 % low energy lighting, conforming to the following specification: · A+ Rated Bulbs with efficacy of 94 lumen/cW · Total =504 Watts
Renewable Energy Source	1.91 kWp Photovoltaic east/west facing, no overshadowing, 30° ,8.6m <sup>2</sup> (4.5m <sup>2</sup> /kWp)

**Example B: Semi-detached dwelling with gas boiler for space heating and natural ventilation with intermittent extract**

Element or system	Specifications
Dwelling size and shape	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 <sup>2</sup> Rectangular shape with no irregularities
Opening areas (windows and doors)	25 % of total floor area The above includes one opaque door of area 1.85 m <sup>2</sup> , any other doors are fully glazed
Walls	U = 0.13 W/m <sup>2</sup> K 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 <sup>2</sup> K e.g. 360 mm insulation of conductivity 0.04 W/mK, between and over ceiling joists
Floor	U = 0.14 W/m <sup>2</sup> K e.g. Slab-on-ground floor with 120 mm insulation of conductivity 0.023 W/mK
Opaque door	U = 1.5W/m <sup>2</sup> K
Windows and glazed doors	Triple glazed, low E (En = 0.05, soft coat) 20 mm gap, argon filled, PVC frames (U = 0.9 W/m <sup>2</sup> K, solar transmittance = 0.6)
Living area fraction	25 % of total floor area
Shading and orientation	28.7 m <sup>2</sup> glazing orientated E/W; 0.9 m <sup>2</sup> glazing orientated N; average overshadowing
Number of sheltered sides	2
Allowance for thermal bridging at element junctions	0.05 x total exposed surface area (W/m <sup>2</sup> K)
Internal heat capacity category	Medium
Ventilation system	Natural ventilation with intermittent extract fans
Air permeability	Infiltration due to structure = 0.25ac/h (5m <sup>3</sup> /(hr.m <sup>2</sup> ))@50pa)
Chimneys	None
Open flues	None
Intermittent Extract fans	3
Draught lobby	None
Primary heating fuel (space and water)	Mains gas
Heating system	Boiler and radiators with energy efficient water pump in heated space(energy consumption of 52kWh/yr)
Heat generator	Mains gas condensing boiler, seasonal efficiency 91.3 %, room-sealed, fanned flue
Heating System Controls	Boiler Interlock and Time and Temperature Zone Control
Hot water system	120 litre cylinder with 100 mm insulation Demand met by space heating boiler, separate time control for space and water heating, cylinder temperature controlled by thermostat 2 showers, each with 6 litres/min flow restrictor ,1 bath
Primary water heating losses	Insulated primary pipework between heat generator and cylinder
Secondary space heating	None
Low energy light fittings	100 % low energy lighting, conforming to the following specification: · A+ Rated Bulbs with efficacy of 94 lumen/cW · Total =504 Watts
Renewable Energy Source	2.08 kWp Photovoltaic east/west facing, no overshadowing, 30° ,9.38m <sup>2</sup> (4.5m <sup>2</sup> /kWp)

**Example C: Semi-detached dwelling with gas boiler for space heating and mechanical ventilation with heat recovery**

Element or system	Specifications
Dwelling size and shape	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 <sup>2</sup> Rectangular shape with no irregularities
Opening areas (windows and doors)	25 % of total floor area The above includes one opaque door of area 1.85 m <sup>2</sup> , any other doors are fully glazed
Walls	U = 0.13 W/m <sup>2</sup> K 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 <sup>2</sup> K e.g. 360 mm insulation of conductivity 0.04 W/mK, between and over ceiling joists
Floor	U = 0.14 W/m <sup>2</sup> K e.g. Slab-on-ground floor with 120 mm insulation of conductivity 0.023 W/mK
Opaque door	U = 1.5W/m <sup>2</sup> K
Windows and glazed doors	Triple glazed, low E (En = 0.05, soft coat) 20 mm gap, argon filled, PVC frames (U = 0.9 W/m <sup>2</sup> K, solar transmittance = 0.6)
Living area fraction	25 % of total floor area
Shading and orientation	28.7 m <sup>2</sup> glazing orientated E/W; 0.9 m <sup>2</sup> glazing orientated N; average overshading
Number of sheltered sides	2
Allowance for thermal bridging at element junctions	0.05 x total exposed surface area (W/m <sup>2</sup> K)
Internal heat capacity category	Medium
Ventilation system	Mechanical Ventilation with Heat Recovery, SFP =0.8, Heat Recovery Efficiency=85 %, Insulated Ductwork
Air permeability	Infiltration due to structure = 0.15ac/h (3m <sup>3</sup> /(hr.m <sup>2</sup> ))@50pa
Chimneys	None
Open flues	None
Intermittent Extract fans	1 (cooker exhaust)
Draught lobby	None
Primary heating fuel (space and water)	Mains gas
Heating system	Boiler and radiators with energy efficient water pump in heated space(energy consumption of 52kWh/yr)
Heat generator	Mains gas condensing boiler, seasonal efficiency 91.3 %, room-sealed, fanned flue
Heating System Controls	Boiler Interlock and Time and Temperature Zone Control
Hot water system	120 litre cylinder with 100 mm insulation Demand met by space heating boiler, separate time control for space and water heating, cylinder temperature controlled by thermostat 2 showers, each with 6 litres/min flow restrictor ,1 bath
Primary water heating losses	Insulated primary pipework between heat generator and cylinder
Secondary space heating	None
Low energy light fittings	100 % low energy lighting, conforming to the following specification: · A+ Rated Bulbs with efficacy of 94 lumen/cW · Total =504 Watts
Renewable Energy Source	1.51 kWp Photovoltaic east/west facing, no overshading, 30°, 6.8m <sup>2</sup> (4.5m <sup>2</sup> /kWp)

### Example D: Semi-detached dwelling with heat pumps for space heating and continuous mechanical extract ventilation

Element or system	Specifications
Dwelling size and shape	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 <sup>2</sup> Rectangular shape with no irregularities
Opening areas (windows and doors)	25 % of total floor area The above includes one opaque door of area 1.85 m <sup>2</sup> , any other doors are fully glazed
Walls	U = 0.13 W/m <sup>2</sup> K 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 <sup>2</sup> K e.g. 360 mm insulation of conductivity 0.04 W/mK, between and over ceiling joists
Floor	U = 0.14 W/m <sup>2</sup> K e.g. Slab-on-ground floor with 120 mm insulation of conductivity 0.023 W/mK
Opaque door	U = 1.5W/m <sup>2</sup> K
Windows and glazed doors	Triple glazed, low E (En = 0.05, soft coat) 20 mm gap, argon filled, PVC frames (U = 0.9 W/m <sup>2</sup> K, solar transmittance = 0.63)
Living area fraction	25 % of total floor area
Shading and orientation	28.7 m <sup>2</sup> glazing orientated E/W; 0.9 m <sup>2</sup> glazing orientated N; average overshadowing
Number of sheltered sides	2
Allowance for thermal bridging at element junctions	0.05 x total exposed surface area (W/m <sup>2</sup> K)
Internal heat capacity category	Medium
Ventilation system	Continuous Mechanical Extract Ventilation with SFP 0.2 W/(l/s)
Air permeability	Infiltration due to structure = 0.15ac/h(3m <sup>3</sup> /(hr.m <sup>2</sup> ))@50pa)
Chimneys	None
Open flues	None
Intermittent Extract fans	1 (cooker exhaust)
Draught lobby	None
Primary heating fuel (space and water)	Electricity
Heating system	Low temperature radiators
Heat generator	Heat Pump; Space Heating efficiency =375 %; Hot Water efficiency = 200 %
Heating System Controls	Time and Temperature Zone Control
Hot water system	As for space heating, cylinder 250 litre with 100 mm insulation Demand met by heat pump, separate time control for space and water heating, cylinder temperature controlled by thermostat 2 showers, each with 6 litres/min flow restrictor ,1 bath
Primary water heating losses	Insulated primary pipework between heat generator and cylinder
Secondary space heating	None
Low energy light fittings	100 % low energy lighting, conforming to the following specification: · A+ Rated Bulbs with efficacy of 94 lumen/cW · Total =504 Watts
Renewable Energy Source	Environmental energy from heat pump

### Example E Mid Floor Apartment Dwelling space heating-gas boiler and mechanical ventilation with heat recovery

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 <sup>2</sup> 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 <sup>2</sup> , any other doors are fully glazed
Walls	External U = 0.13 W/m <sup>2</sup> K 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 <sup>2</sup> K U-value of Original Wall 2.1 W/ m <sup>2</sup> K Resistance of Unheated Corridor = 4.7 m <sup>2</sup> K/W, based on ACH 0.15, Wall U value of 0.13 W/m <sup>2</sup> K and Window U value of 0.9 W/m <sup>2</sup> K. No heat loss floor or roof in corridor.
Opaque door	U = 1.5W/m <sup>2</sup> K
Windows and glazed doors	Triple glazed, low E (En = 0.05, soft coat) 20 mm gap, argon filled, PVC frames (U = 0.9 W/m <sup>2</sup> K, solar transmittance = 0.6)
Living area fraction	50 % of total floor area
Shading and orientation	10.8 m <sup>2</sup> glazing orientated E/W; 9 m <sup>2</sup> glazing orientated S; average overshadowing
Number of sheltered sides	2
Allowance for thermal bridging at element junctions	0.05 x total exposed surface area (W/m <sup>2</sup> K)
Internal heat capacity category	Medium
Ventilation system	Mechanical Ventilation with Heat Recovery, SFP =0.8, Heat Recovery Efficiency=85 %, Insulated Ductwork
Air permeability	Infiltration due to structure = 0.15ac/h (3m <sup>3</sup> /(hr.m <sup>2</sup> ))@50pa
Chimneys	None
Open flues	None
Intermittent Extract fans	1 (cooker exhaust)
Draught lobby	One
Primary heating fuel (space and water)	Mains gas
Heating system	Radiators
Heat Generator	Mains gas condensing boiler, seasonal efficiency 91.3 %, room-sealed, fanned flue
Heating System Controls	Boiler Interlock, Time and Temperature Zone Control
Hot water system	120 litre with 100 mm insulation Demand met by space heating boiler, separate time control for space and water heating, cylinder temperature controlled by thermostat, 1 shower with 6 litres/min flow restrictor, 1 bath
Primary water heating losses	Insulated primary pipework between heat generator and cylinder
Secondary space heating	None
Low energy light fittings	100 % low energy lighting, conforming to the following specification: · A+ Rated Bulbs with efficacy of 94 lumen/cW · Total =324 Watts
Renewable Energy Source	1.0 kWp Photovoltaic east/west facing, no overshadowing, 30° ,4.5m <sup>2</sup> (4.5m <sup>2</sup> /kWp)

## 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 <sup>2</sup> 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 <sup>2</sup> , any other doors are fully glazed
Walls	External U = 0.13 W/m <sup>2</sup> K 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 <sup>2</sup> K U-value of Original Wall 2.1 W/ m <sup>2</sup> K Resistance of Unheated Corridor = 4.7 m <sup>2</sup> K/W, based on ACH 0.15, Wall U value of 0.13 W/m <sup>2</sup> K and Window U value of 0.9 W/m <sup>2</sup> K. No heat loss floor or roof in corridor.
Opaque door	U = 1.5W/m <sup>2</sup> K
Windows and glazed doors	Triple glazed, low E (En = 0.05, soft coat) 20 mm gap, argon filled, PVC frames (U = 0.9 W/m <sup>2</sup> K, solar transmittance = 0.6)
Living area fraction	50 % of total floor area
Shading and orientation	10.8 m <sup>2</sup> glazing orientated E/W; 9 m <sup>2</sup> glazing orientated S; average overshadowing
Number of sheltered sides	2
Allowance for thermal bridging at element junctions	0.05 x total exposed surface area (W/m <sup>2</sup> K)
Internal heat capacity category	Medium
Ventilation system	Continuous Mechanical Extract Ventilation with SFP 0.2 W/(l/s)
Air permeability	Infiltration due to structure = 0.15ac/h (3m <sup>3</sup> /(hr.m <sup>2</sup> ))@50pa
Chimneys	None
Open flues	None
Intermittent Extract fans	1 (cooker exhaust)
Draught lobby	One
Primary heating fuel (space and water)	Electricity
Heating system	Low Temperature Radiators
Heat Generator	Heat Pump; Space Heating efficiency =400 %; Hot Water efficiency = 210 %
Heating System Controls	Boiler Interlock, Time and Temperature Zone Control
Hot water system	180 litre with 100 mm insulation Demand met by heat pump, separate time control for space and water heating, cylinder temperature controlled by thermostat, 1 shower with 6 litres/min flow restrictor, 1 bath.
Primary water heating losses	Insulated primary pipework between heat generator and cylinder
Secondary space heating	None
Low energy light fittings	100 % low energy lighting, conforming to the following specification: · A+ Rated Bulbs with efficacy of 94 lumen/cW · Total =324 Watts
Renewable Energy Source	Environmental heat from heat pump

The standardized primary energy consumption and CO<sub>2</sub> emissions for space heating, water heating, ventilation and lighting for this dwelling, as calculated by DEAP, are given in the table below, expressed per m<sup>2</sup> of floor area per annum. The table shows that the calculated EPC complies with the MPEPC requirement of 0.30, and the CPC complies with the MPCPC requirement of 0.35.

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/m <sup>2</sup> yr]	35	35	32	33	31	33
CO <sub>2</sub> emissions [kg/m <sup>2</sup> yr]	7	7	6	4	6	4
EPC	0.25	0.25	0.22	0.23	0.24	0.26
CPC	0.26	0.26	0.22	0.15	0.24	0.17
RER	0.35	0.37	0.32	0.43	0.33	0.38



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