

Home Energy Model: Scottish Homes Standard Consultation Tool User Guide

This guide is to assist users of the consultation tool.



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1. Introduction



Introduction

This consultation is the second of two and considers the technical, commercial and wider policy implications of improvements to energy and environmental standards set within Scottish Building Standards. This is done in the context of broader action by the Scottish Government on climate change, to further our ambition of becoming a net-zero society by out the detail of the proposed level of challenge for new homes and non-domestic buildings alongside an enhanced compliance process. 2045. The consultation documents can be found [here](#). These set out the detail of the proposed level of challenge for new homes and non-domestic buildings alongside an enhanced compliance process.

A new home's compliance with these standards will be determined using the Home Energy Model: Scottish Homes Standard Assessment which will replace the current approved methodology SAP 10.2. The consultation tool gives you the opportunity to interact with the model and understand whether different dwelling designs are likely to comply with the proposed Scottish Homes Standard.

This consultation version of the tool is provided for the purposes of the Scottish Government's Scottish Homes Standard consultation only, and as such does not reflect any changes which may be made in the light of consultation responses. In addition, at the time of publication, the UK Government response to the Home Energy Model Consultation has not been published and the HEM may be subject to change following consideration of the responses. You can see the latest release of the Python code not linked to the consultation tool [here](#).

The Home Energy Model represents a complete overhaul compared with SAP 10.2 and previous versions of SAP. The consultation document linked above, explains the key changes, and we would encourage you to read the consultation. However, this consultation tool looks similar to previous versions of iSAP and its user interface is basic. Please note that this is not representative of the user experience users will have when the final version is planned to be released in 2026. This tool has only been developed for the purpose of providing users with a basic working tool.

2. Navigating the Website



1. How to make a project and duplicate existing projects

- A project contains the information needed to define inputs for the Home Energy Model for a single dwelling.

The screenshot shows a web interface for the Home Energy Model. On the left is a sidebar with three buttons: 'Home', 'My Projects', and 'New Project'. The 'New Project' button is highlighted with a green oval. A callout box points to it with the text: 'Want another project? Click New Project.' The main content area has two sections. The top section is titled 'Create a Project' and 'New project'. It contains a text input field labeled 'Enter project name:' followed by a 'Create' button. A callout box points to the input field with the text: 'To create a new project, enter a name here and click \'Create\'.' The bottom section is titled 'Duplicate an existing project'. It contains a dropdown menu labeled 'Select project:' with 'Test' selected, and a text input field labeled 'Enter project name:'. A 'Duplicate' button is to the right of the input field. A callout box points to the input field with the text: 'To duplicate a project, select the project you want to duplicate, give it a new name in the box below and hit the \'Duplicate\' button.'

2. Pre-populated example projects

The screenshot shows a web interface for creating a project. On the left is a sidebar with three buttons: 'Home', 'My Projects', and 'New Project'. The 'New Project' button is highlighted with a green oval and has an arrow pointing to it from a text box that says: 'When you click on 'New Project' you can also review the pre-populated example homes.'

The main content area is titled 'Create a Project' and 'New project'. It contains a form with the following sections:

- Create a Project**
New project
Enter project name:
- Duplicate an existing project**
Select project:
Enter project name:
- Example project**
You can also start with an example and customise for your needs. Choose from the following projects:

Two example projects are listed, each with a link to a details page:

- Example 1**
Detached house with two bedrooms
Size 82m2
Heat pump serving both hot water and space heating
living zone with underfloor heating, rest of dwelling with radiators
- Example 2**
Bungalow with one bedroom
Size 40.5m2
Space heating with direct electric, water heating with 100L storage tank with immersion heater

A green oval highlights the 'Example project' section. An arrow points from a text box to the oval that says: 'Some example projects have been pre-populated for you to review, edit and test.'

3. How to navigate the project tree

The screenshot shows a web interface for managing projects. On the left is a sidebar with three buttons: 'Home', 'My Projects' (highlighted in green), and 'New Project'. An arrow points from a text box 'Click here to view your projects.' to the 'My Projects' button.

The main content area is titled 'Your projects on Wales HEM Consultation'. It contains the text: 'Your current projects are listed below. Choose (by clicking on the name) any project you wish to open. To create a new project, follow the link from the menu on the left.'

Below this text, it says 'Number of projects: 3' (with '3' highlighted in green). An arrow points from a text box 'The number of projects that are available.' to the number '3'.

There is a table with the following headers: 'Name of project', 'Post Code', and 'Delete'. The table contains three rows of project data:

Name of project	Post Code	Delete
Test		Delete
Detached house		Delete
Bungalow (highlighted in green)		Delete (highlighted in green)

Two text boxes provide instructions: 'To open a project, click on its name to load it.' with an arrow pointing to the 'Bungalow' link, and 'Careful! This button will permanently delete a project.' with an arrow pointing to the 'Delete' button for the 'Bungalow' row.

3. How to navigate the project tree- Alternative without header

The screenshot shows a web application interface with a left-hand navigation menu and a main content area. The navigation menu contains three buttons: 'Home', 'My Projects' (highlighted in green), and 'New Project'. A callout box points to the 'My Projects' button with the text: 'Click here to view your projects.'

The main content area is titled 'Your projects on Wales HEM Consultation' and contains the following text: 'Your current projects are listed below. Choose (by clicking on the name) any project you wish to open. To create a new project, follow the link from the menu on the left.'

Below this text, it says 'Number of projects: 3' (highlighted in green). A callout box points to this text: 'The number of projects that are available.'

The projects are listed in a table with columns 'Name of project' and 'Post Code'. The first row shows 'Test' and 'Detached house'. The second row shows 'Bungalow' (highlighted in green). A callout box points to the 'Bungalow' link: 'To open a project, click on its name to load it.'

Each project row has a 'Delete' button. A callout box points to the 'Delete' button for the 'Bungalow' project: 'Careful! This button will permanently delete a project.'

- After selecting a project, you should be able to see the interface below.

The screenshot displays the Home Energy Model interface. On the left is a 'Project Tree' with a 'test3' project containing 'Living space', 'Linear Thermal Bridge', 'Rest of dwelling', and 'Infiltration & Ventilation'. Below the tree are buttons for 'Home', 'My Projects', and 'New Project'. The main area shows the 'General' tab of the 'Project details' section. A warning banner at the top states: 'Home Energy Model This is a demonstration tool and should not be used for any official calculations.' Below this are tabs for 'General', 'Heating Systems', 'Water Heating', 'Cooling', 'PV and Energy Storage', and 'Results'. The 'General' tab contains fields for 'Project name' (test3), 'Weather Data Location' (Birmingham), 'Number of Bedrooms' (1), and 'Number of ADF wet rooms' (2). A 'Move Dwelling' dialog is open at the bottom, allowing users to rotate orientation or shift the dwelling up or down. A callout box explains that 'Living space' is 'zone 1' and 'Rest of dwelling' is 'zone 2', and that these are mandatory components. Another callout explains that once a dwelling is copied, users can move it by changing orientation and height.

Project Tree

- test3
 - Living space
 - Linear Thermal Bridge
 - Rest of dwelling
 - Infiltration & Ventilation

Home

My Projects

New Project

Home Energy Model This is a demonstration tool and should not be used for any official calculations.

General **Heating Systems** **Water Heating** **Cooling**

PV and Energy Storage **Results**

Project details

General

Project name: test3

Weather Data Location: Birmingham

Number of Bedrooms: 1

Number of ADF wet rooms: 2

Move Dwelling

Use these features if you want to change the orientation or base height of your project

Rotate orientation: 0 degrees **Confirm**

Shift dwelling up or down: 0 m **Confirm**

When you make a new project, these components by design get added to the project. Living space is 'zone 1' and Rest of dwelling is 'zone 2'.

These are mandatory for the project and hence cannot be removed.

Once a dwelling has been copied, go to the 'general' tab and then scroll to the bottom of the page to move the dwelling. You can change the dwelling's orientation and move the dwelling up or down in relation to the ground plane. This is useful for copying flats.

- After selecting a project with added components and their parameters, you should be able to see the interface below.

The screenshot displays the Home Energy Model interface. On the left, the 'Project Tree' shows a hierarchy for a 'Detached house' project, including 'Living space' and various window/door components like 'kitchen door', 'Glazed door', 'Stair window', and 'living window'. A green oval highlights these components, with a callout box stating: 'Once project components have been added, click components to view details from this area.' On the right, the 'Project details' section is active, showing the 'General' tab. A callout box points to this tab, stating: 'A project opens with general information first.' The 'General' tab contains fields for 'Project name' (Detached house), 'Weather Data Location' (Leeds), 'Number of Bedrooms' (2), 'Number of ADF wet rooms' (2), 'Heating Control Type' (SeparateTempControl), 'Water Heating Schedule' (AllDay), and 'Cold Water Source' (mains water). A disclaimer at the top right reads: 'Home Energy Model This is a demonstration tool and should not be used for any official calculations.'

4. How to Add, delete, and copy inputs

- This section explains how to add, delete, and copy components.

The screenshot displays the 'Home Energy Model' interface. On the left, the 'Project Tree' shows a hierarchical list of components for a 'Detached house', including 'Living space', 'kitchen door', 'Glazed door', 'Stair window', and 'living window', each with sub-options like 'overhang' and 'reveal side left/right'. A green oval highlights this tree, with a callout box stating: 'This box shows you everything currently in your project.' At the top right, a warning reads: 'Home Energy Model This is a demonstration tool and should not be used for any official calculations.' Below this is a tabbed interface with tabs for 'General', 'Heating Systems', 'Water Heating', 'Cooling', 'PV and Energy Storage', and 'Results'. A callout box points to these tabs, saying: 'Click these tabs to navigate to project components.' The 'General' tab is active, showing a 'Project details' section with the following settings:

General	
Project name	Detached house
Weather Data Location ⓘ	Leeds
Number of Bedrooms ⓘ	2
Number of ADF wet rooms ⓘ	2
Heating Control Type ⓘ	SeparateTempControl
Water Heating Schedule	AllDay
Cold Water Source	mains water

i. Add components

- Example using Heating Systems.

The screenshot shows a web application interface for adding components. At the top, there are four tabs: 'General', 'Heating Systems' (which is highlighted), 'Water Heating', and 'Cooling'. Below these, there are two sub-tabs: 'PV and Energy Storage' and 'Results'. The main content area is titled 'Project details Heating Systems'. It contains three sections for adding components, each with a list of options and 'Add' buttons. Callout boxes provide instructions: one points to the 'Heating Systems' tab, another explains that greyed-out buttons indicate single, unchangeable options, and a third explains that the 'Add' buttons are used to add components and prompt for a unique name. The 'Add heat source:' section lists Heat Battery, Heat Pump, Combi Boiler, Regular Boiler, and Heat Network. The 'Add space heating system:' section lists Instant electric heater, Warm Air Heat Pump, Electric Storage Heater, and Wet distribution. The 'Add water heating system:' section lists Point of use water heater, Storage Tank, and Heat Network Direct Heating. Some 'Add' buttons are green, while others are greyed out with a note: 'Not applicable with standard electricity tariff.'

General	Heating Systems	Water Heating	Cooling
PV and Energy Storage	Results		

Project details Heating Systems

Add heat source:

- Heat Battery *Not applicable with standard electricity tariff.*
- Heat Pump
- Combi Boiler
- Regular Boiler
- Heat Network

Add space heating system:

- Instant electric heater
- Warm Air Heat Pump
- Electric Storage Heater *Not applicable with standard electricity tariff.*
- Wet distribution

Add water heating system:

- Point of use water heater
- Storage Tank
- Heat Network Direct Heating

ii. Delete and Copy Component

- Example using PV and Energy Storage.

General	Heating Systems	Water Heating	Cooling
PV and Energy Storage	Results		

Project details
PV and Energy Storage

Solar PV Array

Select instance: Solar PV Array ▼ Delete Copy

Solar PV Array

Name	Solar PV Array
Peak Power ⓘ	2 kWp
Ventilation Strategy ⓘ	Moderately ventilated ▼
Fuel type ⓘ	electricity ▼
Pitch ⓘ	45 degrees
Orientation ⓘ	0 degrees
Base height ⓘ	0.5 m
Height ⓘ	1.5 m
Width ⓘ	1.5 m

Use arrowhead to select another component instance from list similar to the current viewed.

Delete current component.

Copy current component to a new component similar to the currently viewed.

Note: your project tree will instantly update as you add and delete components.

As you are inputting project data, it will be automatically saved as you enter it.

iii. Copy Components into Another Zone

- Example using Living space zone.

Project Tree

Select component to be copied.

- Test2
 - Living space
 - Window West
 - External wall West
 - Rest of dwelling
 - External wall North
 - Infiltration & Ventilation
 - Electric Shower
 - Bath
 - Solar PV Array
 - Wet distribution
 - Regular Boiler
 - Storage Tank
 - Heat Pump
 - Air Conditioning
 - PV Diverter

Home Energy Model This is a demonstration tool and should not be used for any official calculations.

General	Heating Systems	Water Heating	Cooling
PV and Energy Storage	Results		

Project details

Fabric

External wall

Select instance: External wall West

Select parent: Rest of dwelling

External Wall

Name	External wall West
Base Height ⓘ	0 m
Height ⓘ	2.5 m
Width ⓘ	7.3 m
U-Value	5.7 W / (m ² .K)
Area ⓘ	0.75 m ²
Pitch ⓘ	90 degrees
Orientation ⓘ	-45 degrees
Solar absorption coefficient ⓘ	0.6
Areal heat capacity ⓘ	Medium
Areal heat capacity	110000 J / (m ² .K)
Mass Distribution Class ⓘ	IE: mass divided over internal and e

Click copy button to copy current component.

Select zone to be copied to using the drop arrow and click confirm button.

Note: You will be prompted to save new copied component with a unique name.

Inputs that cannot be changed are displayed in grey.

iv. Copy Transparent Component Shading into Another Zone

- Example using Living space zone. This shows how to copy transparent component shading.

Project Select transparent component with shading to be copied.

Test2

- Living space
 - Window West
 - Window Shading
 - External wall West
- Rest of dwelling
 - External wall North
- Infiltration & Ventilation
- Electric Shower
- Bath
- Solar PV Array
- Wet distribution
- Regular Boiler
- Storage Tank
- Heat Pump
- Air Conditioning
- PV Diverter

Home

My Projects

New Project

Home Energy Model This is a demonstration tool and should not be used for any official calculations.

General	Heating Systems	Water Heating	Cooling
PV and Energy Storage	Results		

Project details

Fabric

Window or Glazed door

Select instance: Window West

Select parent: Rest of dwelling ☒ Include window Shading

Window or Glazed door

Name	Window West	
Pitch ⓘ	90	degrees
Orientation ⓘ	45	degrees
G-Value ⓘ	0.5	
Frame Area Fraction ⓘ	0.06	
U-Value	2	W / (m ² .K)
Base Height ⓘ	2.5	m
Height ⓘ	1	m
Width ⓘ	0.8	m

Select zone to be copied to using the drop arrow, tick box to include the shading and click confirm button.

Add window shading:

Window Shading

Click copy button to copy current component.

5. How to enter data

- An example of each type of data entry type (manual input, drop down list, checkbox) using infiltration and ventilation.

General Heating Systems Water Heating Cooling
PV and Energy Storage Results

Project details
General
Infiltration & Ventilation

If you require more information about a parameter move over to the tooltip.

Infiltration

Name Infiltration & Ventilation

Storey ① 2

Shelter ① normal

Build Type ① house

Airtightness Test Result ①

Test Type ① 50Pa

Enveloped Area ① 288.35 m²

Volume ① 268.44 m³

Sheltered Sides ① 4

Passive Stack Vents ① 0

Input fields with a blue border mean they are required for you to run the calculation.

1. Select an option for ventilation from the drop-down list.

Ventilation

Window equivalent area ①

Ventilation type ① Intermittent MEV

Intermittent Extract Fans ① 0

Required ACH ①

2. Once selected, this list comes up to be filled in.

Ventilation

Window equivalent area ① 59 m²

Ventilation type ① MVHR

Intermittent Extract Fans ① 0

Specific Fan Power ① 0.85 W/(litres/s)

Required ACH ① 50 ACH Value must be between 0.1 and 10 (inclusive).

Heat Recovery Efficiency ① 2 Value must be between 0.1 and 1 (inclusive).

Internal diameter ① 15 mm

External diameter ① 15 mm

Length of intake/supply ductwork ① 1.5 m

Length of extract/exhaust ductwork ① 1.5 m

Insulation thermal conductivity ① 1 W / m.K Value must be between 0.001 and 0.1 (inclusive).

Insulation thickness ① 20 mm

Reflective insulation? ① ☐

MVHR location ① inside

Inputs that are invalid will flag an error message (these values will not be saved)

6. How to ensure your project is valid

- Error messages are displayed, this helps in final project validation.

Project Tree

- Test2
 - Living space
 - Window West
 - Window Shading
 - External wall West
 - Rest of dwelling
 - Infiltration & Ventilation
 - Electric Shower
 - Bath
 - Solar PV Array
 - Wet distribution
 - Regular Boiler
 - Storage Tank
 - Heat Pump
 - Air Conditioning
 - PV Diverter

Home Energy Model This is a demonstration tool and should not be used for any official calculations.

General	Heating Systems	Water Heating	Cooling
PV and Energy Storage	Results		

Project details
Results

Download project data as json file here: [Project data](#)

Some required fields have not been entered, or data entered is invalid.
Please check inputs for the following:

- Internal diameter (Test2)
- External diameter (Test2)
- Length (Test2)
- Insulation thermal conductivity (Test2)
- Insulation thickness (Test2)
- Floor Area (Living space)
- Volume (Living space)
- Space heating system for this zone (Living space)
- Floor Area (Rest of dwelling)
- Volume (Rest of dwelling)
- Space heating system for this zone (Rest of dwelling)
- Reflective insulation? (Infiltration & Ventilation)
- Immersion Heater (PV Diverter)
- No roof/ceiling elements have been defined (Living space)
- No floor elements have been defined (Living space)
- No wall elements have been defined (Rest of dwelling)
- No roof/ceiling elements have been defined (Rest of dwelling)
- No floor elements have been defined (Rest of dwelling)
- No thermal bridges have been defined (Living space)
- No thermal bridges have been defined (Rest of dwelling)

After reviewing these please come back to this tab to run the sap11

Project status: No calculation results available

[Calculate](#) [View existing results](#)

When you finish defining your project, click on the results tab.

To view input json file for the project use this link.

Inputs listed here are not valid and should be checked before successfully running a project.

Mandatory components that are missing from your project will be listed at the bottom of this list.

7. Understanding the calculation & results

- When you finish defining your project, click on the results tab.

Home Energy Model This is a demonstration tool and should not be used for any official calculations.

General	Heating Systems	Water Heating	Cooling
PV and Energy Storage	Results		

Project details
Results

Results

Download project data as json file here: [Project data](#)

Project status: No calculation results available

[Calculate](#) [View existing results](#)

When you finish defining your project, click on the results tab.

Button displayed grey if no calculation has been done.

When a project has been defined without errors, you can run the calculation to see the results.

i. Execution Time

- Results will take a bit longer to run and therefore display outputs will take some time to show, so make sure to come and check back on them.

Home Energy Model This is a demonstration tool and should not be used for any official calculations.

General	Heating Systems	Water Heating	Cooling
PV and Energy Storage	Results		

Project details

Results

Results

Download project data as json file here: [Project data](#)

Project status: No calculation results available

[Calculate](#) [View existing results](#)

The time taken to run a project is shown here by both the numeric time and blue bar.

Execution Time: 01_m:18_s:33_{ms}

ii. Project Results

- Results Summary of project will be displayed in this window.

Results Summary				
Output	Units	Actual Dwelling	Notional Option 1	Notional Option 2
Delivered Energy Rate	kWh/yr			
Dwelling Space Heating Demand Rate	kWh/yr			
Delivered Energy use				
Space heating	kWh/yr			
Water heating	kWh/yr			
Cooling	kWh/yr			
Lighting (including topup)	kWh/yr			
Pumps & fans	kWh/yr			
PV generation	kWh/yr			
PV utilised	kWh/yr			
Unregulated load	kWh/yr			



3. Conventions and FAQ



Introduction

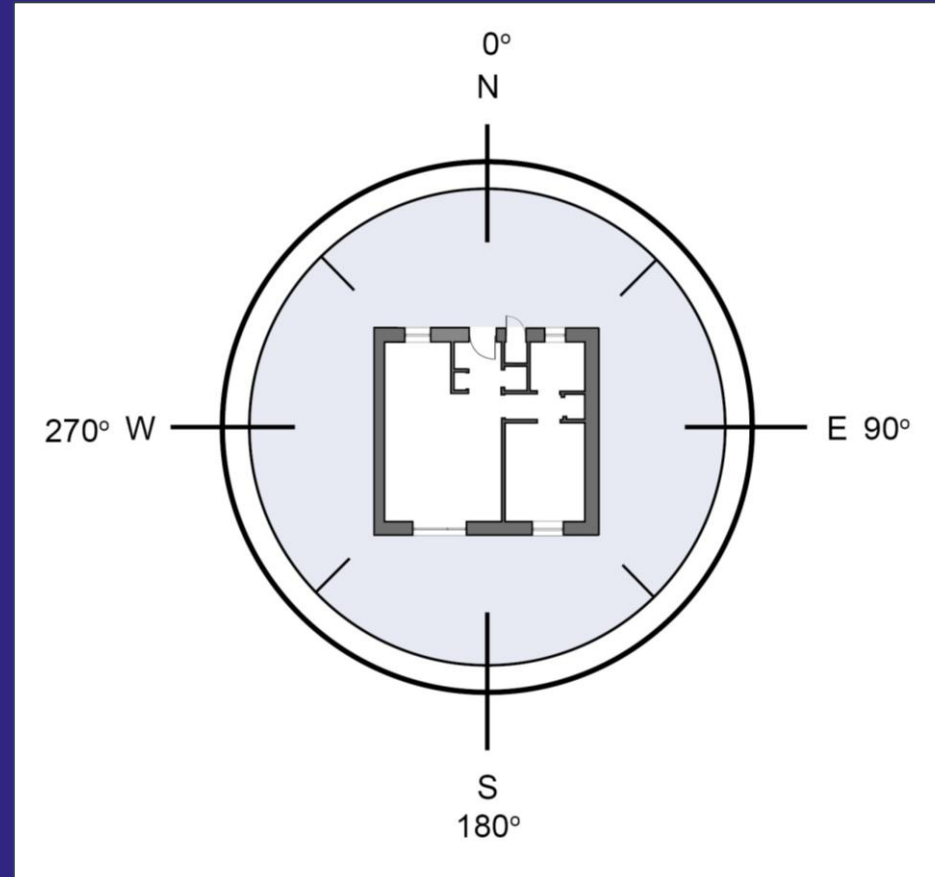
The Home Energy Model is still in development and does not yet have a comprehensive set of input conventions set out in a document, as SAP 10.2 does. To facilitate use of the new model, we highlight here some key conventions used for inputs and how they should be interpreted.

This section covers:

- Orientations
- Measuring zones (entering walls and thermal bridges between zones or fully within zones etc.)
- Perimeter and Pitch
- Distant shading
- Base heights
- Ventilation zone base heights
- Window shading
- Duct lengths
- Primary and secondary pipework
- Wet distribution
 - Eco design control class

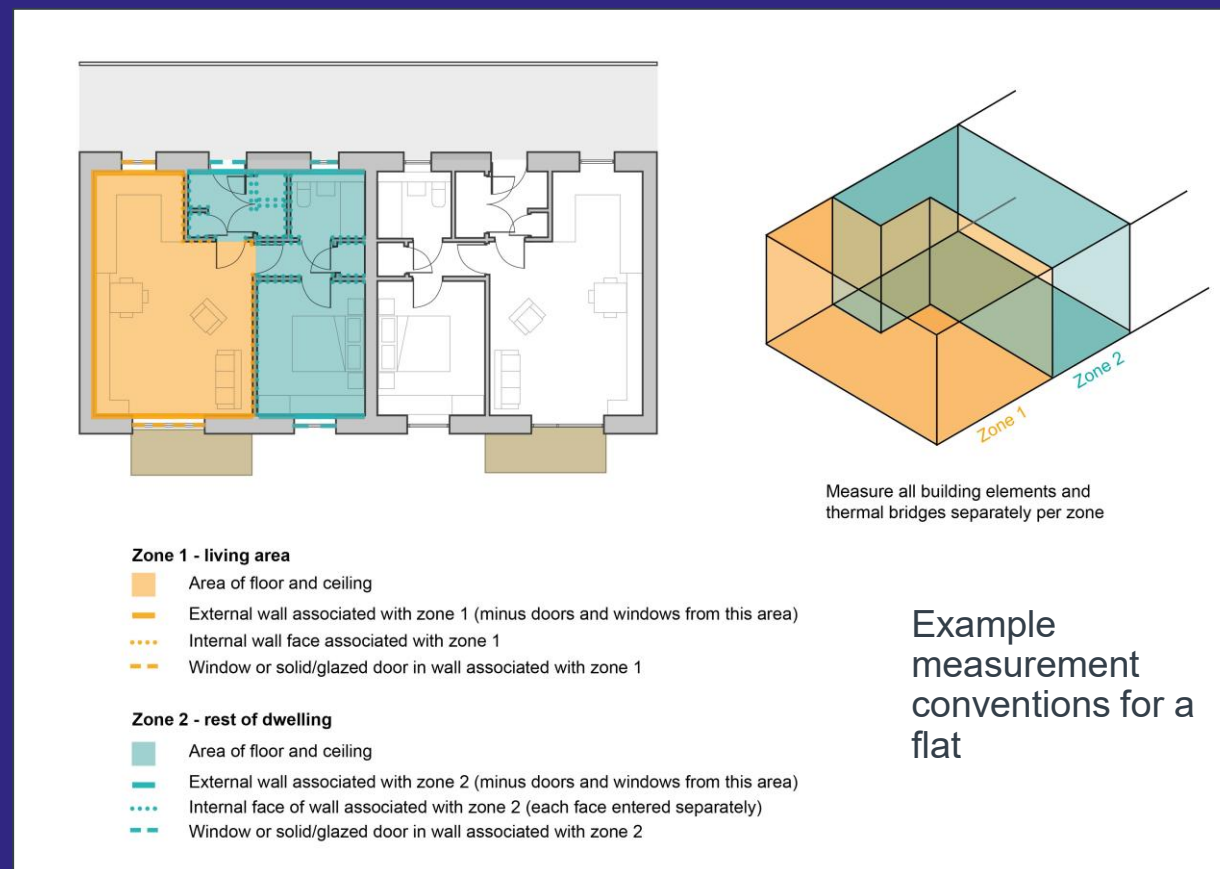
1. Orientations

- The orientation of the outside face of an object (such as a wall) should be measured clockwise from North to the nearest degree.



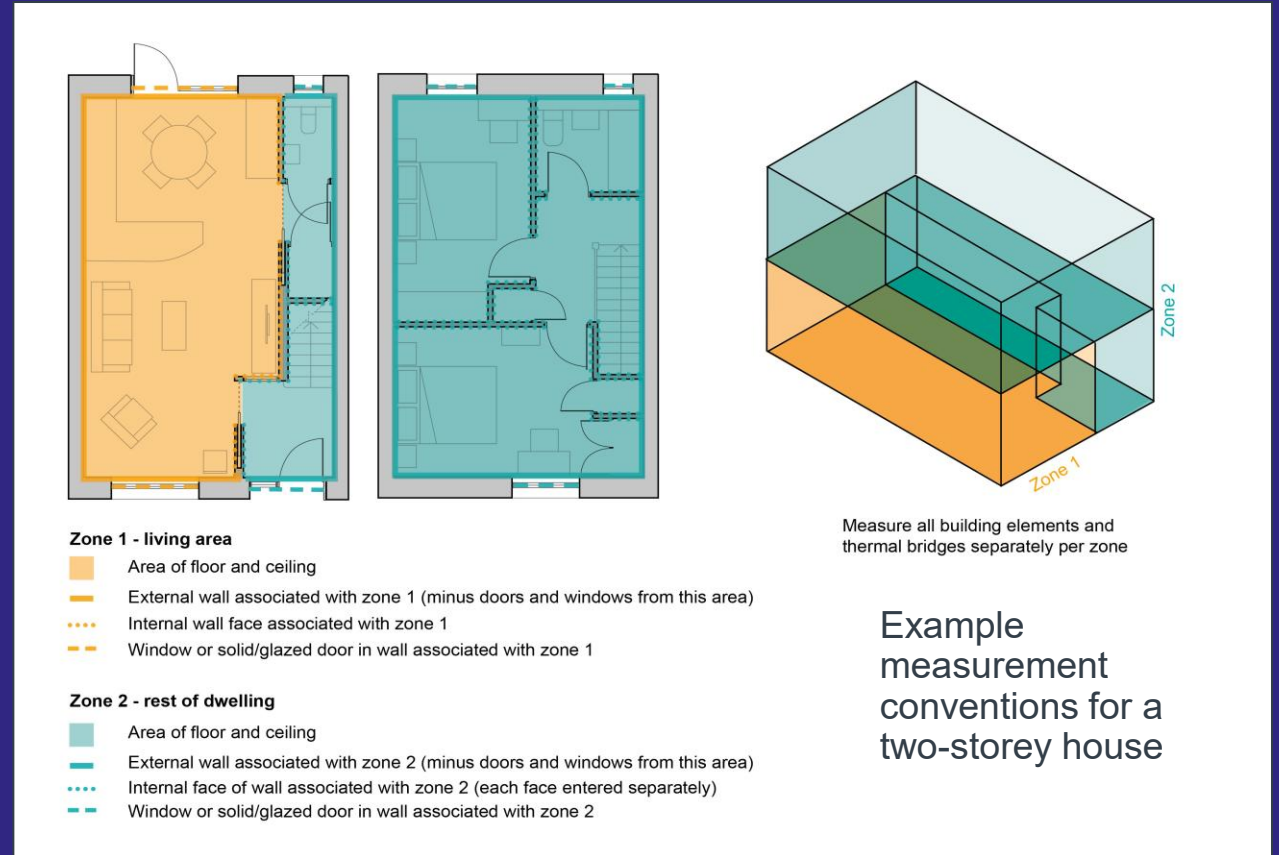
2.0. Measurement conventions - zones

- There are two zones (living and rest of dwelling). The zones are measured independently.
- External building elements such as walls, roof, floor, window are each individually defined and assigned to a zone. Window and door areas are not included in the wall areas (i.e. the user enters the net wall area, with aperture area subtracted).
- Thermal bridges are also assigned to the zone they occur in, with their length and linear thermal transmittance.
- The internal building elements are only included to account for thermal mass, and can therefore be grouped together if they have the same areal heat capacity, so internal floors, internal walls and internal ceilings only need to be defined once. For internal walls with two sides in the zone, both sides are counted as wall area. Where an internal wall is between two zones, only the area facing the zone is included.



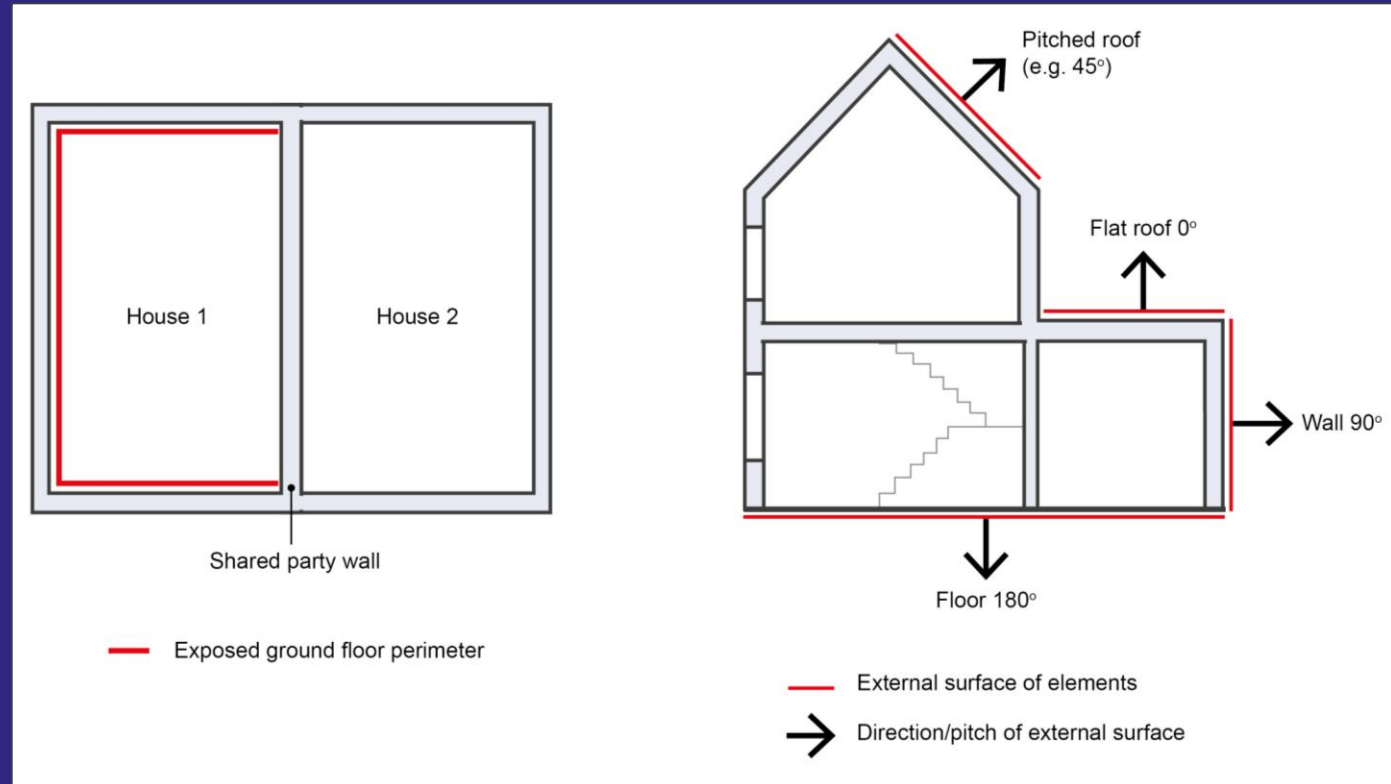
2.1. Measurement conventions - zones

- In the context of the housing energy model (HEM): A "house" refers to a standalone residential building surrounded by open space or terraced or semi-terraced, ground floor walls are measured floor-to-ceiling, mid-floor walls are measured ceiling to ceiling
- While a "flat" denotes a self-contained unit within a multi-unit structure, sharing common walls and areas. In a single-storey flat, wall height is measured floor to ceiling. In a two-storey flat, wall height is measured lowest floor to ceiling, upper-floor walls are measured ceiling to ceiling.
- The model distinguishes between these two types based on architectural and structural differences, considering factors like insulation and heating to accurately assess their distinct energy efficiency.



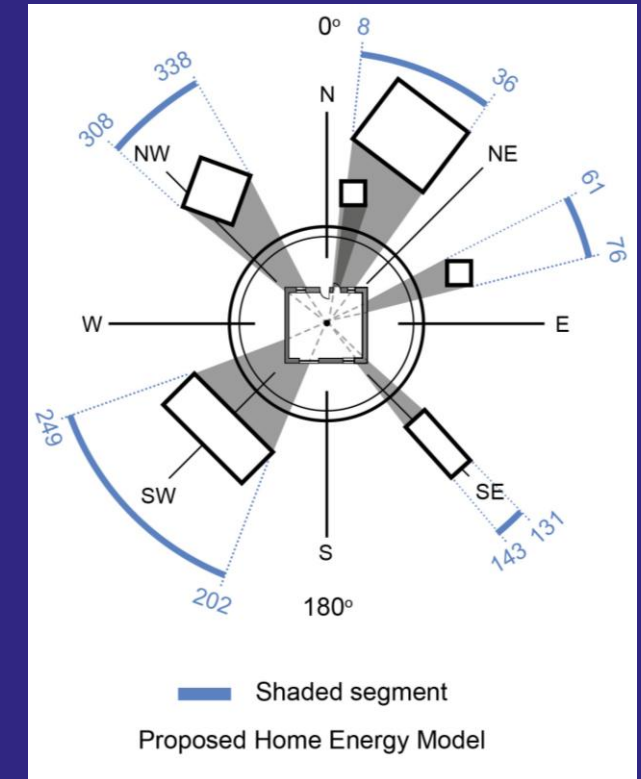
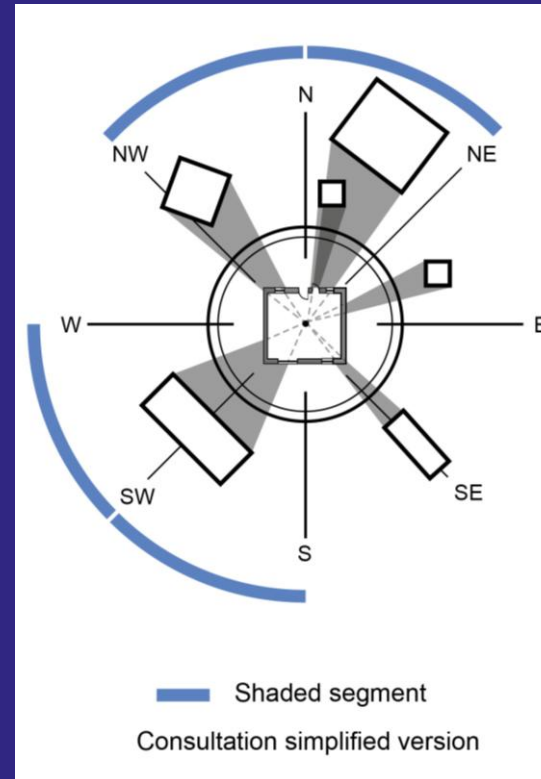
3. Perimeter and Pitch

- The perimeter of a dwelling should be entered as the exposed ground floor perimeter, excluding any shared party walls.
- Where the pitch of a building element is entered, it should refer to the relevant angle of the element surface between 0-180°. Pitches should be interpreted as a rotation where a flat element facing upwards is 0° and a flat element facing downwards is 180°.



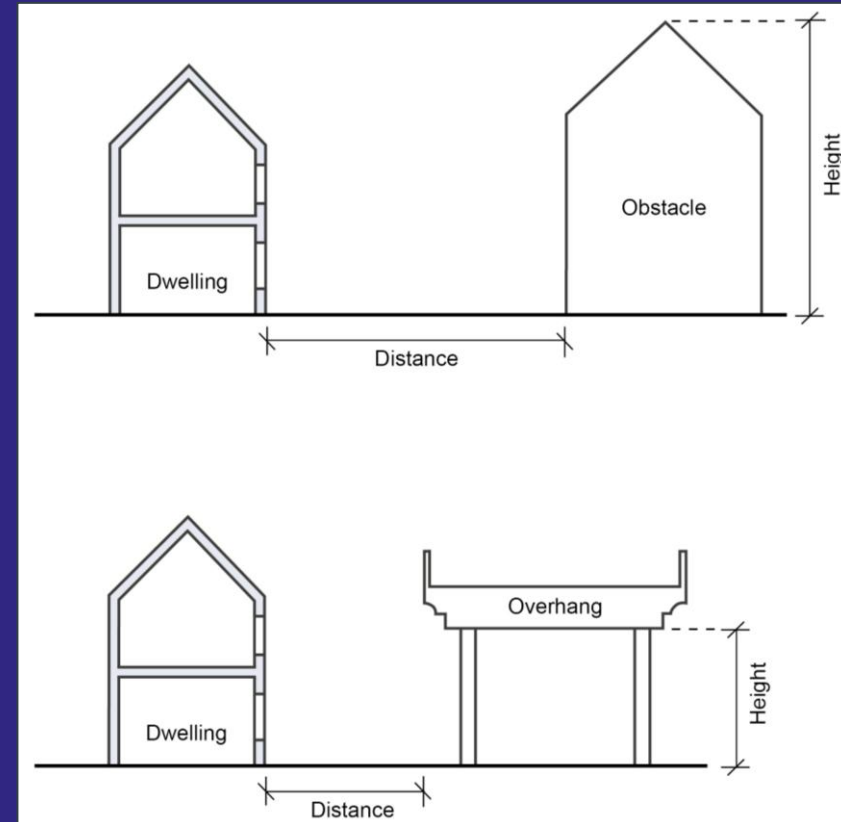
4.0. Distant shading - segments

- Distant shading has been simplified for the consultation and is considered in eight 45° segments taken from the centre of the dwelling.
- A segment should be considered shaded if an object covers over 22.5° of the segment (i.e. half a segment). If an object straddles two segments and covers over 22.5° of either or both segments, then one or both should be considered shaded.
- Where there are multiple shading objects in a segment only the most significant object should be entered.
- If other parts of a connected building (such as courtyard block of flats) shade the dwelling these should be accounted for using the above conventions. However, in the unusual case where a dwelling shades itself (such as L-shaped dwelling) this should not be included.
- The proposed Home Energy Model will later allow shaded segments to be entered in more accurate ranges, to the degree. Up to a maximum of 36 segments will be permitted (18 shaded and 18 unshaded).



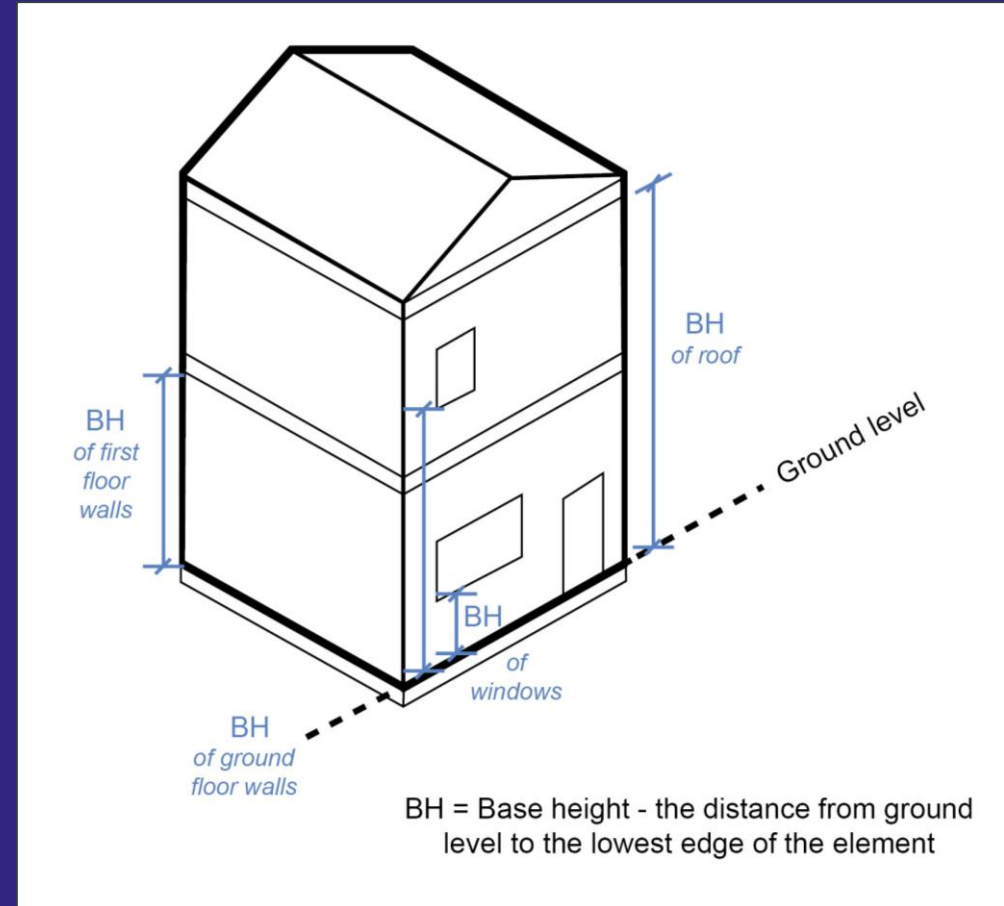
4.1. Distant shading - objects

- Where a shading segment is determined, details of the most significant shading object (obstacle or overhang) in that segment should be entered. This includes the height from the established ground and the distance between the centre of the closest external wall of the dwelling to the centre of the closest face of the shading object.
- If the vertical cross-section of the shaded object is not constant, the vertical cross-section shall be assessed in the middle of the object.
- The difference between obstacles and overhangs is that an obstacle ends at a certain height above the ground level, while an overhang starts at a certain height above the ground level.



5.0. Base heights

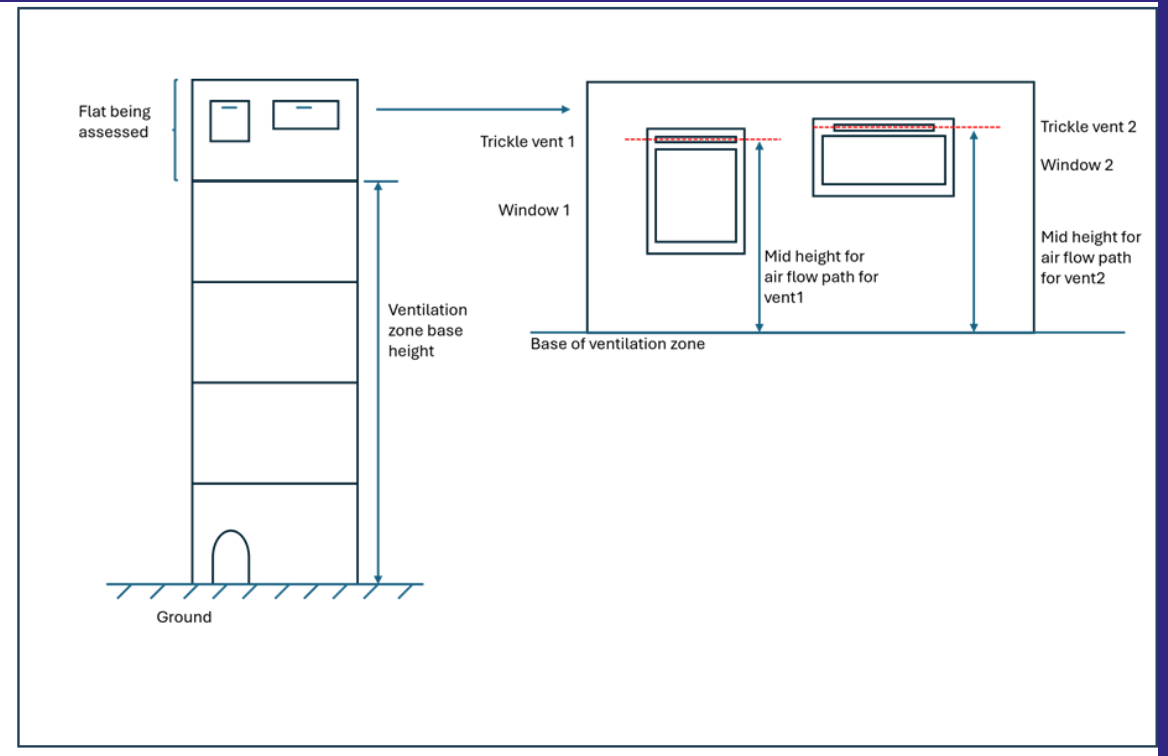
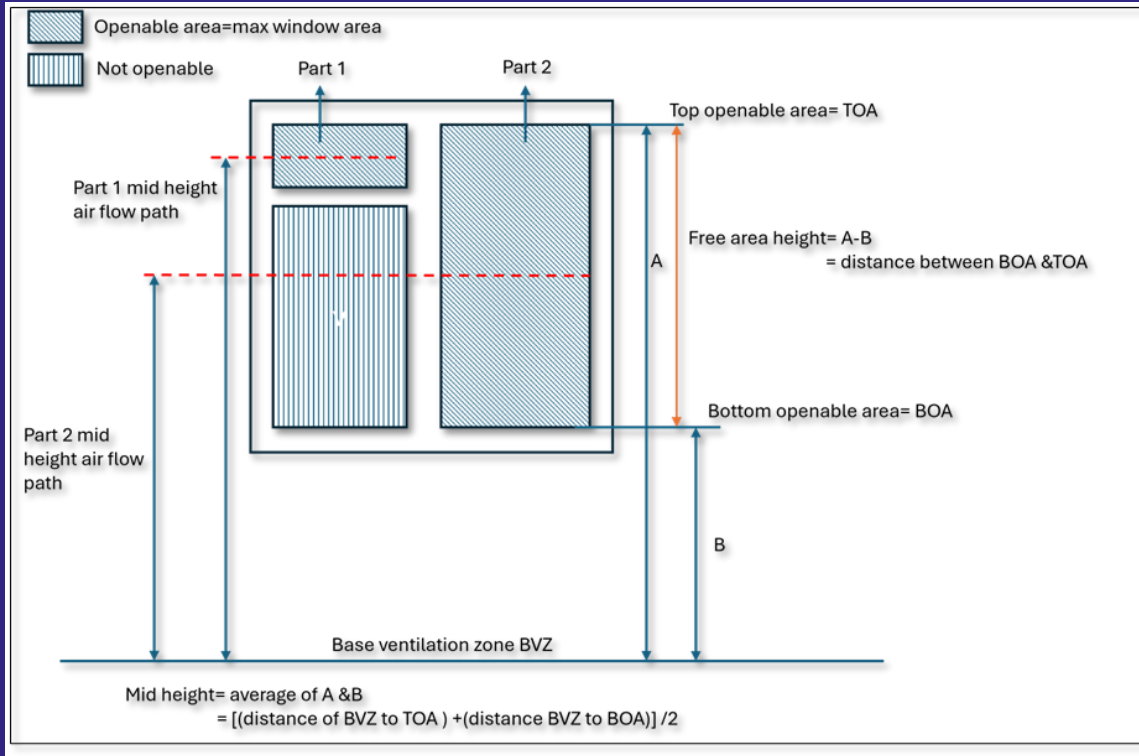
- The base heights of building elements are required to inform the Home Energy Model where the element is, relative to the ground, to determine if the element is shaded by a distant shading object.
- The base height of building elements should be measured from an established ground level. This is the level at which the lowest point of the building perimeter is in contact with the ground. Therefore, on a sloping site take the lowest level on the perimeter as the ground level. This same ground level should also be used when measuring the height of distant shading objects.
- In a two-storey house, the base height of the first floor is the height from ground level to the ceiling of the ground floor.
- The base height of the roof is the height from ground level to the ceiling of the highest floor.
- In a flat the base height is from the ground level to the floor level of the flat (as opposed to the ceiling level of the flat below).



5.1. Ventilation Zone Base Height

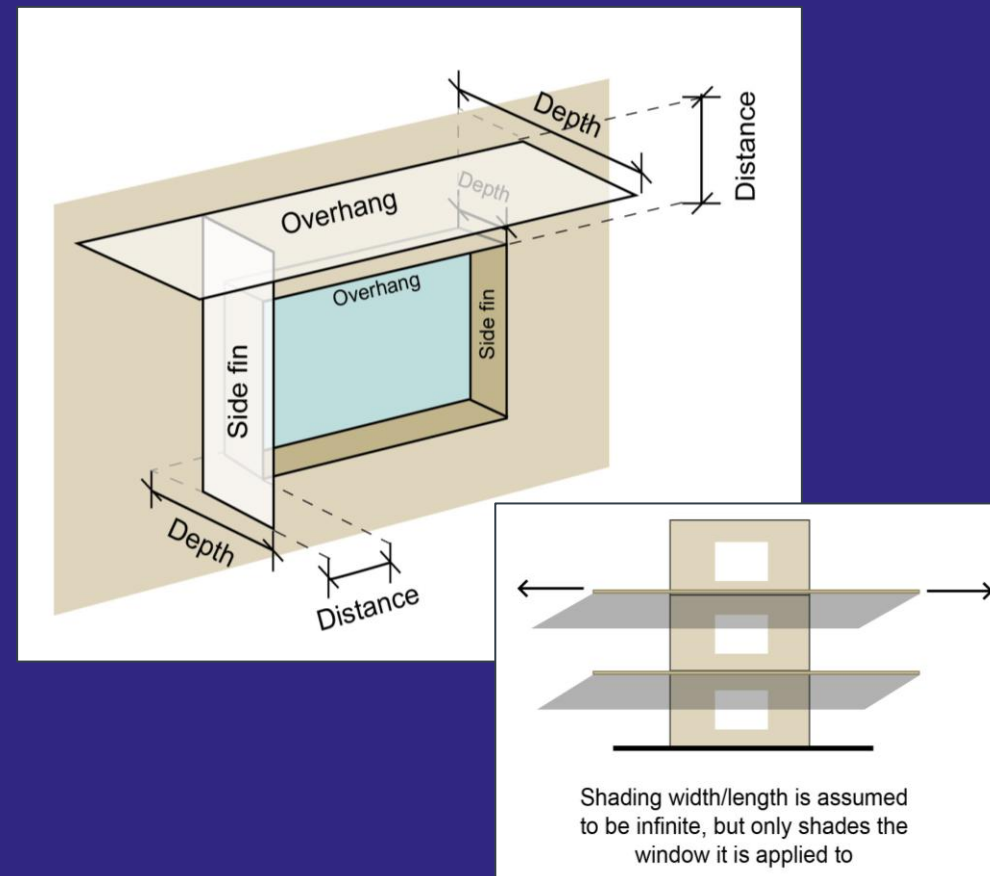
- The ventilation zone is a space or group of spaces within a building that is served by the same ventilation strategy or system. A ventilation zone typically shares common air supply/extract conditions.
- Ventilation zone base height is the distance between the ground and the lowest edge of the lowest building element within the ventilation zone. elevational height of zone above ground datum level

5.1.0. Ventilation Zone Base Height



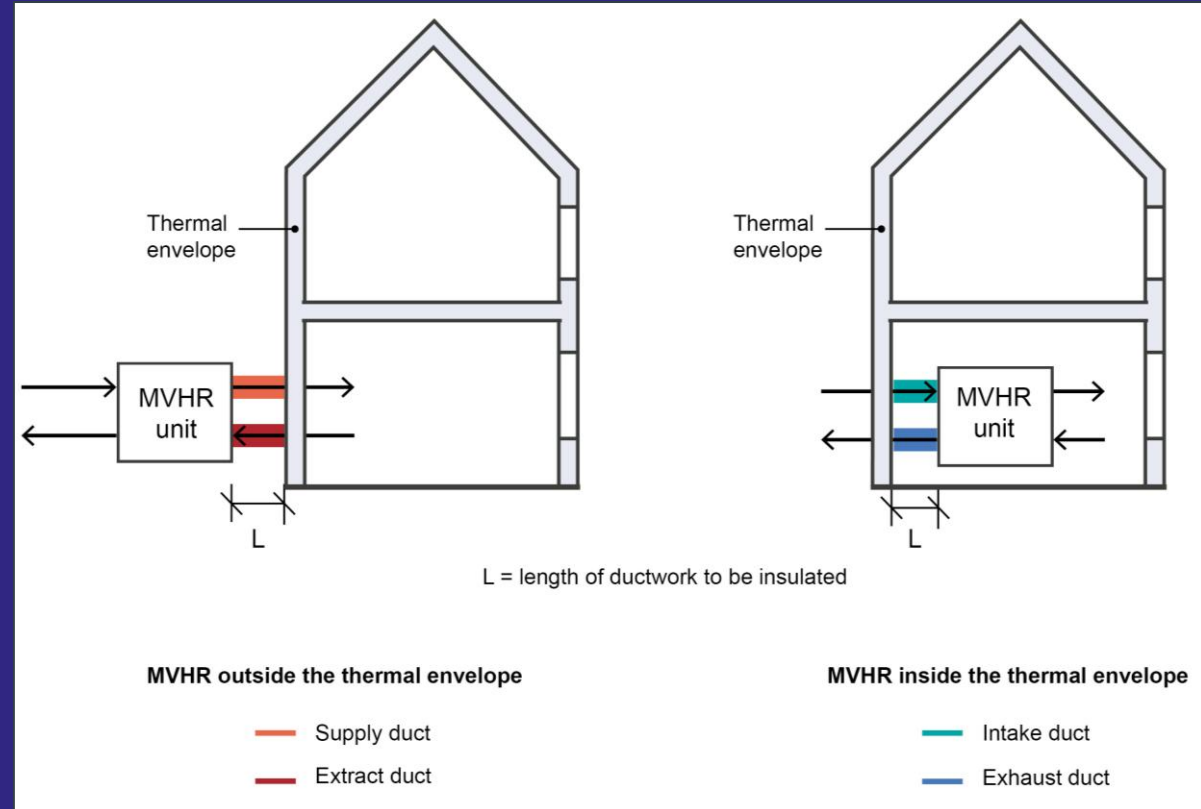
6.0. Window shading

- The shading effect of objects attached to the dwelling (including the dwelling itself) on transparent building elements (windows/glazed doors) is accounted for. To model this for each transparent building element any overhangs and side fins (including window reveals) should be added as window shading objects.
- For each window shading object the shading type (overhang, left side fin, or right side fin) should be entered. The 'depth' should be measured from the face of the glass to the furthest edge of the shading object. The 'distance' should be measured from the side or top edge of the glass to the closest edge of the shading object. This includes the window frame width, note it is not the distance to the outside edge of the window frame (hole in wall).
- Window reveals are considered as overhangs and side fins and should be entered accordingly. Where a shading device exceeds the depth of the reveal, only the shading device should be entered.
- The width of overhangs and height of side fins is not considered, they are assumed to be infinite in relation to the associated building element.
- Note: Left/right side fins should be specified from the perspective of looking out of the window.



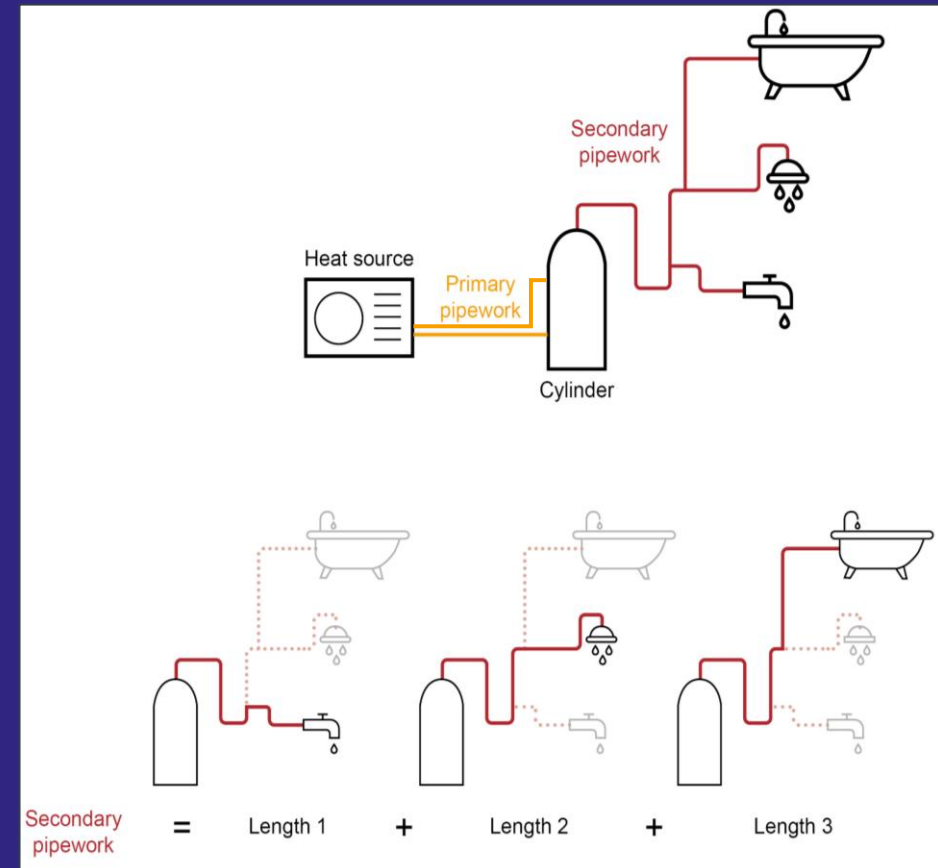
7. Duct lengths

- Duct lengths should be entered when a MVHR (Mechanical Ventilation with Heat Recovery) unit is present.
- If the MVHR unit sits outside the thermal envelope, supply and extract duct lengths should be entered measuring the distance between the unit and the exterior of the thermal envelope of the dwelling.
- If the MVHR unit sits within the thermal envelope the intake and exhaust duct lengths should be entered measuring the distance between the unit and the interior of the thermal envelope of the dwelling. In both cases the full length of the ducts given are assumed to be insulated as specified.



8. Primary and Secondary pipework

- The length of secondary distribution pipework is needed for modelling the hot water distribution system. (HEM does not handle secondary circulation pipework, which is secondary hot water pumped around in continuous circulation).
- The total secondary hot water distribution pipework length should be calculated as the sum of all lengths of pipework from the hot water source to a tapping point (i.e. tap, bath or shower), hence if a pipe is shared for multiple tapping points the length of shared pipe should be duplicated and added for each tapping point.
- If there is hot water distribution pipework outside the thermal envelope it should be entered in the separate pane marked 'external'.
- **NOTE:** Secondary distribution pipework is always needed if there are any hot water outlets in the property (hot water taps, showers).
- If required, the length of primary pipework should be measured from the heat source to the storage tank. Both the primary flow and return lengths should be included.
- **NOTE:** Primary pipework is required whenever there is a hot water tank or a thermal storage tank in the heating system, and it has pipework connected to a separate heat source.



9. Wet Distribution

- When a wet distribution space heating system is included in the dwelling there are several associated inputs (Heat Emitter Constant, Heat Emitter Exponent) that need to be supplied. To help estimate what these should be, an accompanying workbook has been produced. Note this is to calculate indicative values for a given system setup and should not be used outside this tool. The workbook can be found [here](#).
- Note the interface inputs should be for all the emitters in the given zone, hence when using the workbook, for each panel type the average radiator height should be input, along with the total radiator length and the system emitter temperature difference design. When these values are entered, a set of suggested emitter inputs for the tool will be generated.
- (Note: pipework also has some thermal mass, the workbook currently does not calculate the pipework thermal mass.)

Convector Radiator Input Estimator for Home Energy Model

This workbook should be used to provide indicative values for wet distribution inputs for the Home Energy Model interface.

This workbook should not be used when more detailed information is available or for any other purpose.

USER INPUT - Input total dimensions for each Panel Type within zone

Panel Type	T11	T21	T22	See notes below
Average Radiator Height*	mm	mm	mm	
Total Radiator Length	mm	mm	mm	
Emitter Temperature Difference Design	deg.C			

**Estimate based on available options*

Convector radiator panel types are as follows:

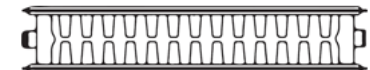
T11 Single panel with 1 set of convector fins



T21 Double panel with 1 set of convector fins



T22 Double panel with 2 sets of convector fins



10. Eco design control class

- **Class I** - On/off Room Thermostat: A room thermostat that controls the on/off operation of a heater. Performance parameters, including switching differential and room temperature control accuracy, are determined by the thermostat's mechanical construction.
- **Class II** - Weather compensator control, for use with modulating heaters: A heater flow temperature control that varies the set point of the flow temperature of water leaving the heater dependent upon prevailing outside temperature and selected weather compensation curve. Control is achieved by modulating the output of the heater.
- **Class III** - Weather compensator control, for use with on/off output heaters: A heater flow temperature control that varies the set point of the flow temperature of water leaving the heater dependent upon prevailing outside temperature and selected weather compensation curve. Heater flow temperature is varied by controlling the on/off operation of the heater.
- **Class IV** - TPI10 room thermostat, for use with on/off output heaters: An electronic room thermostat that controls both thermostat cycle rate and in-cycle on/off ratio of the heater proportional to room temperature. TPI control strategy reduces mean water temperature, improves room temperature control accuracy and enhances system efficiency.
- **Class V** - Modulating room thermostat, for use with modulating heaters: An electronic room thermostat that varies the flow temperature of the water leaving the heater dependent upon measured room temperature deviation from room thermostat set point. Control is achieved by modulating the output of the heater.
- **Class VI** - Weather compensator and room sensor, for use with modulating heaters: A heater flow temperature control that varies the flow temperature of water leaving the heater dependent upon prevailing outside temperature and selected weather compensation curve. A room temperature sensor monitors room temperature and adjusts the compensation curve parallel displacement to improve room comfort. Control is achieved by modulating the output of the heater.
- **Class VII** - Weather compensator and room sensor, for use with on/off output heaters: A heater flow temperature control that varies the flow temperature of water leaving the heater dependent upon prevailing outside temperature and selected weather compensation curve. A room temperature sensor monitors room temperature and adjusts the compensation curve parallel displacement to improve room comfort. Heater flow temperature is varied by controlling the on/off operation of the heater.
- **Class VIII** – Multi-sensor room temperature control, for use with modulating heaters: An electronic control, equipped with 3 or more room sensors that varies the flow temperature of the water leaving the heater dependent upon the aggregated measured room temperature deviation from room sensor set points. Control is achieved by modulating the output of the heater.

4. Inputs and Outputs Dictionary

Please navigate to the Inputs and outputs guides on the [Documentation page](#).