

CPD Session

Non-Domestic Conventions Issue 8

Roof / Zone Heights

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Roof / Zone Heights

Presentation by:

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Proficiency is a national organisation supporting and representing energy assessors.

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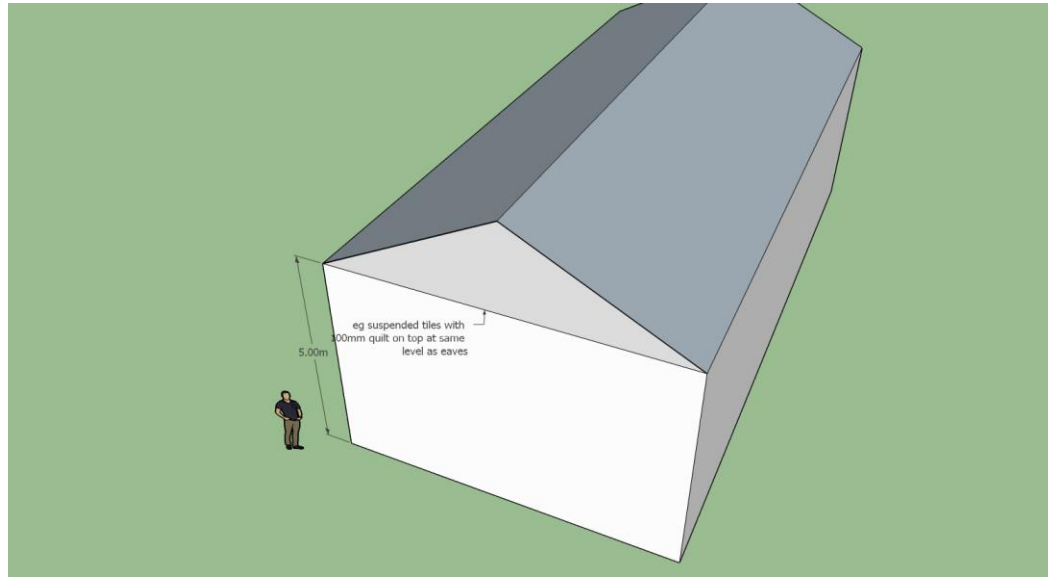
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Credits:

Scenarios and 3D images kindly provided by Hazel Smith

Convention 10.03

Scenario 1 - Ceiling at eaves level



It does not matter whether the ceiling is permeable or non-permeable.

Model the ceiling as a horizontal ceiling/roof envelope at its actual position (which in this cases is also eaves level)

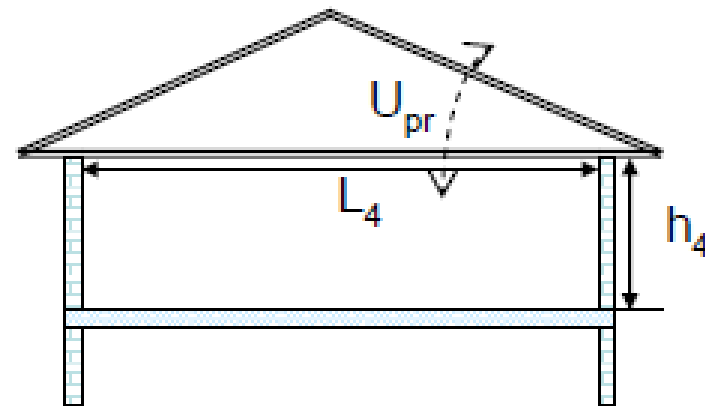
Do not disregard the ceiling and model the roof. That would be incorrect.

Zone height is height to ceiling (which in this cases is also eaves level)

Why?

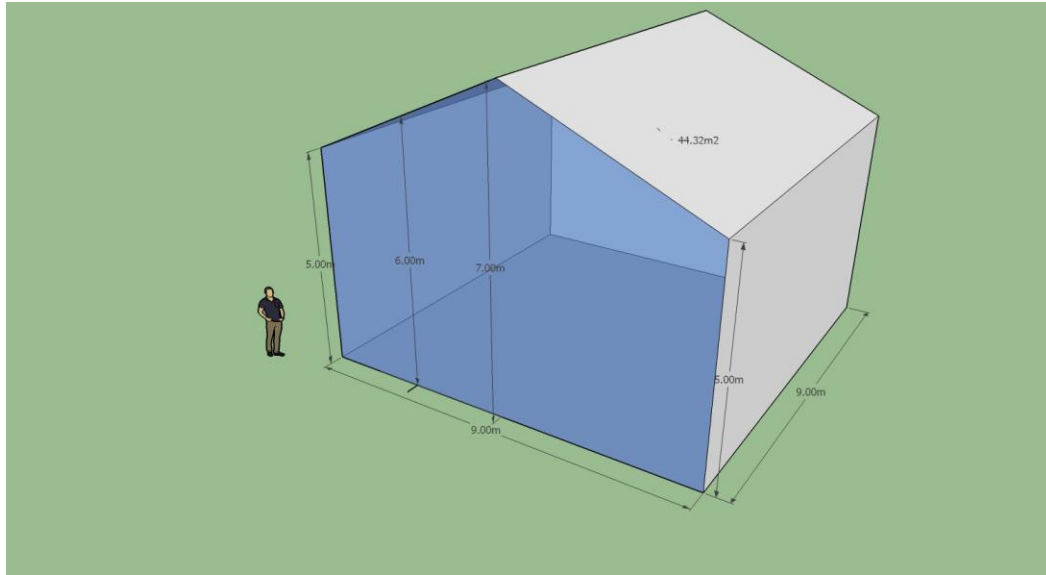
For top floors with a flat ceiling at eaves level

- *Zone height is top of floor to underside of soffit/eaves level (h_4)*
- *Area of walls are those below soffit/eaves level i.e. length L_4 x h_4*



Convention 10.03

Scenario 2 - Vaulted ceiling is roof envelope



Model all envelopes as they are exposed to the zone.

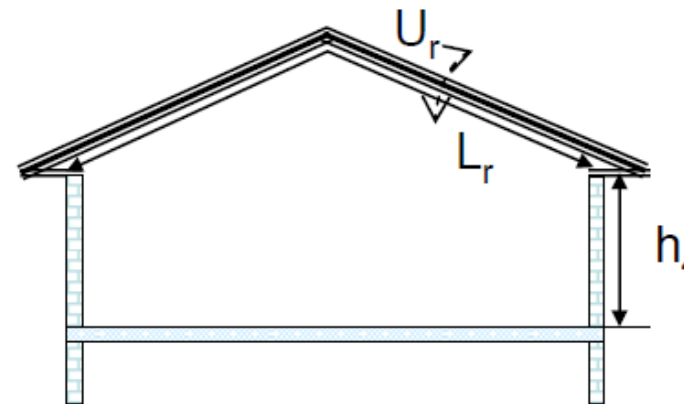
Roof area will be greater than floor area and gable is included in wall area.

Zone height is height to eaves. (Do not average the roof height. That would be incorrect)

Why?

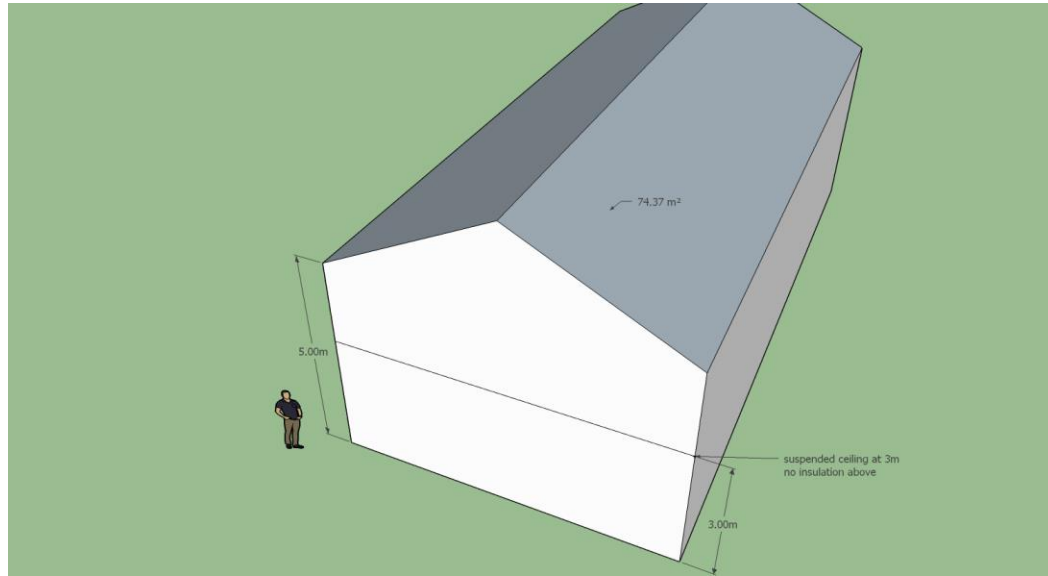
For rooms with pitched ceiling (e.g. where ceiling is fixed in line of pitched roof)

- *Zone height (h_4) is top of floor to underside of soffit/eaves level (not average room height)*
- *Roof heat loss area is as seen from underside of ceiling, i.e. $L_r \times d$ (zone depth)*
- *U value is from under ceiling to outside roof (U_r)*
- *End wall area is whole gable up to roof apex (as this is all exposed to inside temperature)*



Convention 10.03

Scenario 3 - Permeable dropped ceiling



Model a horizontal ceiling/roof envelope at eaves height as the roof envelope.

Do not disregard the ceiling and model the roof. That would be incorrect.

Zone height is height to eaves. Do not average the roof height. That would be incorrect.

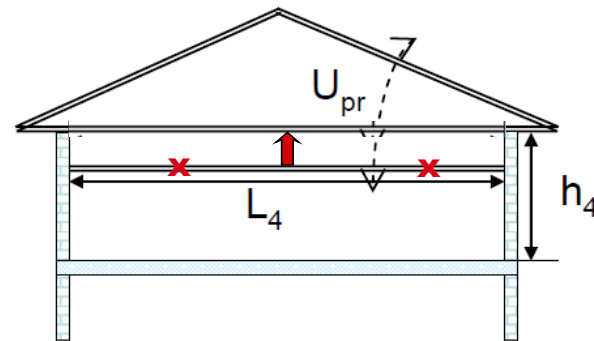
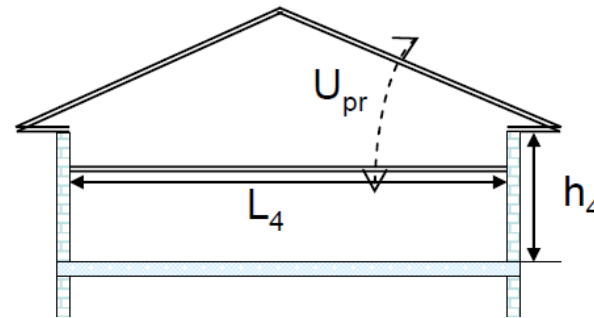
Gable above eaves is not included in wall area.

All wall above actual ceiling height and up to eaves level where ceiling is modelled is included in wall area.

Why?

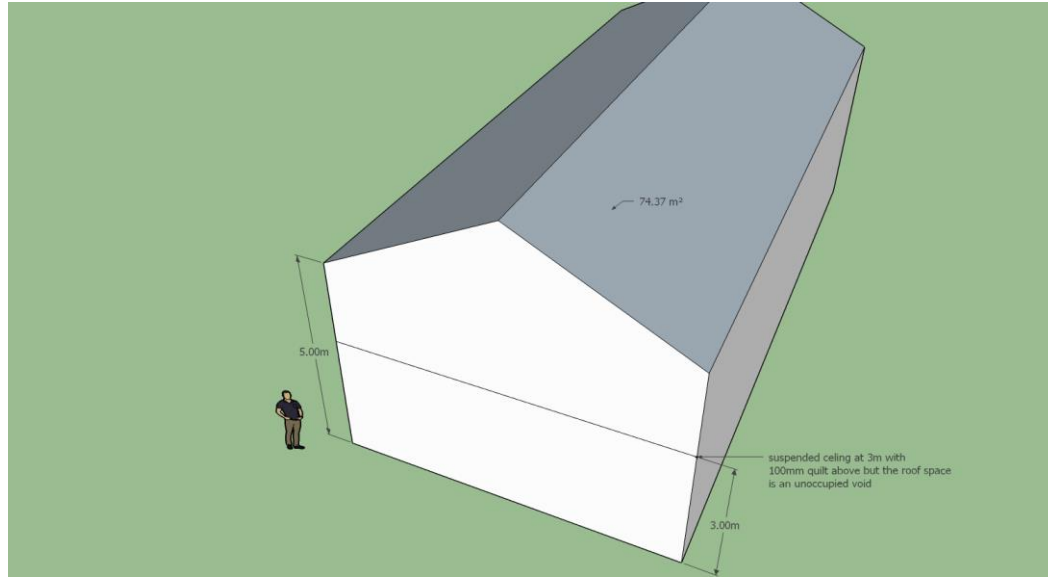
For top floors with dropped permeable ceiling without insulation at ceiling level

- Zone height (h_4) is top of floor to underside of soffit/eaves level (not ceiling)
- Side and end wall areas are calculated to soffit/eaves level i.e. dropped ceiling is treated as though it is at soffit/eaves level



Convention 10.03

Scenario 4 - Non-permeable dropped ceiling



Model a horizontal ceiling/roof envelope at the height of the ceiling (3m in example above).

Do not treat the ceiling as being at eaves height. That would be incorrect.

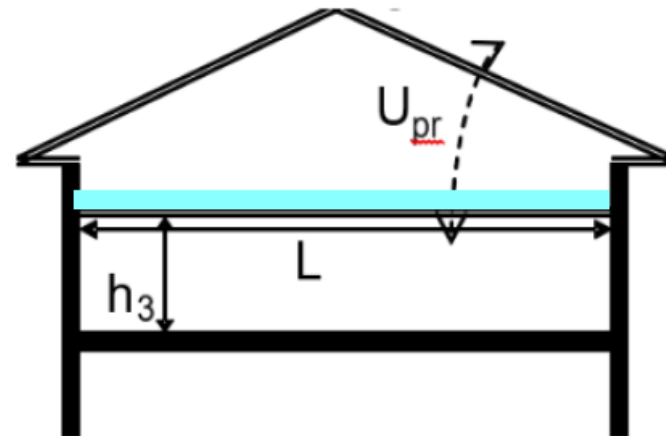
Zone height is height to ceiling. Do not use eaves height. That would be incorrect.

Walls and gable above ceiling are not included in wall area.

Why?

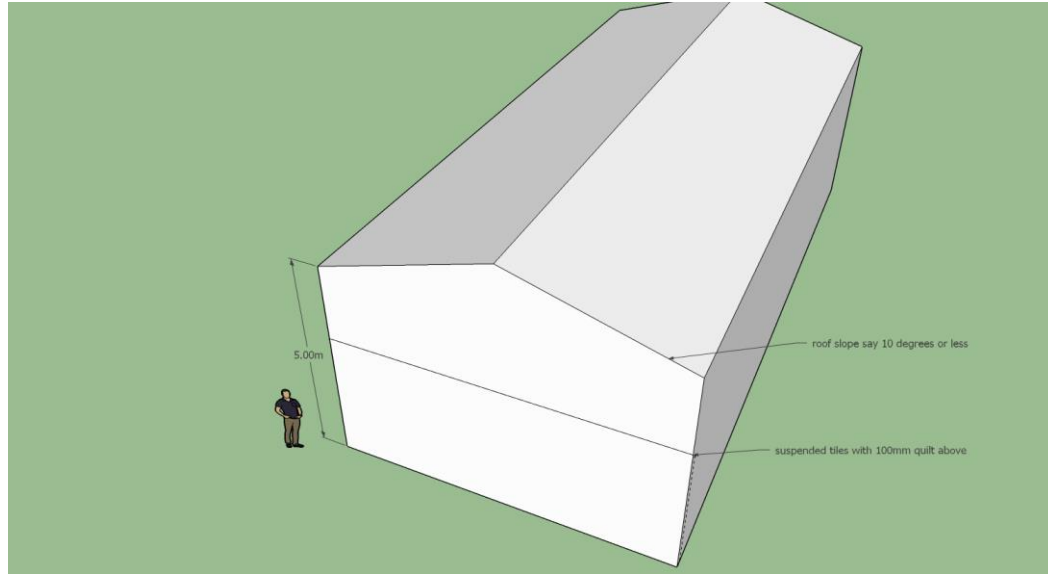
For top floors with dropped non-permeable ceiling with or without insulation at ceiling level or permeable ceiling with an insulation layer across the entire ceiling.

- *Zone height (h_3) is top of floor to underside of ceiling*
- *Side and end wall areas are calculated to underside of ceiling i.e. $L \times h_3$*



Convention 10.03

Scenario 5 - Non-permeable dropped ceiling under flat / low pitch roof



Why?

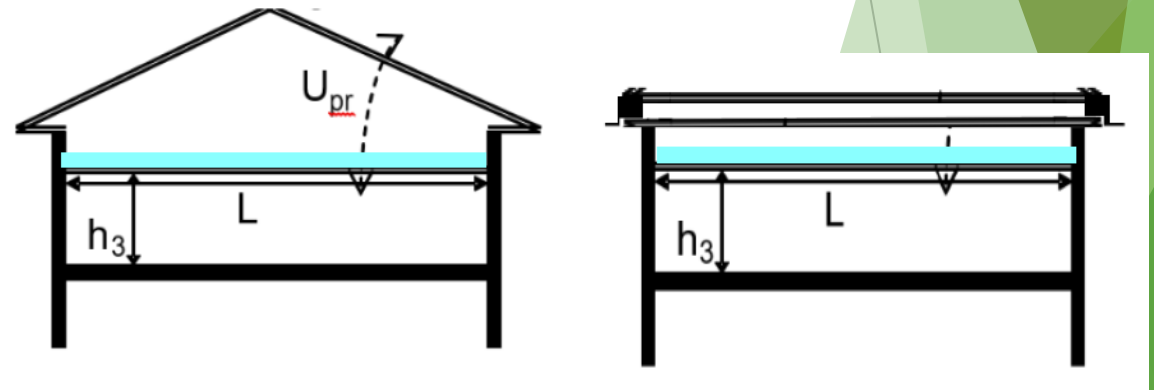
For top floors with dropped non-permeable ceiling with or without insulation at ceiling level or permeable ceiling with an insulation layer across the entire ceiling.

- *Zone height (h_3) is top of floor to underside of ceiling*
- *Side and end wall areas are calculated to underside of ceiling i.e. $L \times h_3$*

This is absolutely identical to Scenario 4.

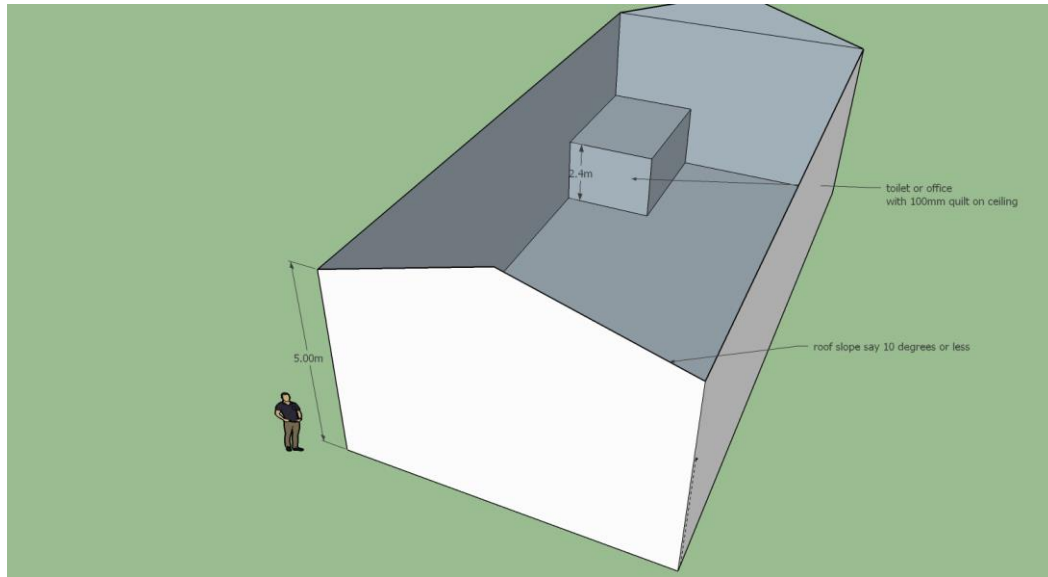
The horizontal ceiling/roof envelope at the height of the ceiling (3m in example above) is the top of the building for SBEM purposes.

The shape of the roof above the non-permeable (or insulated permeable) ceiling is completely irrelevant.



Convention 4.08 (Do not attempt to apply 10.03 to inner zone)

Scenario 6 - Zone within a zone



Model every envelope in the position it is and at the size it is.

Do not raise the ceiling of the inner zone in the example because the space above it is part of the outer zone and must be modelled as such.

Inner zone height is height to top of ceiling (floor of space above). Do not use eaves height. That would be incorrect.

Outer zone height is height to eaves. (Same principle as Scenario 2).

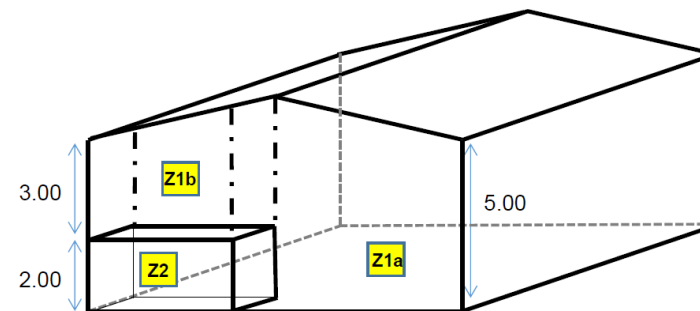
Why?

The floor envelope of Z1b must be entered to take account of the heat transfer and thermal mass. However, it must only be included as floor area on the EPC if it has permanent fixed access and it is a useable floor space in accordance with the definition of GIA from RICS Code of measuring practice.

For the purposes of modelling this scenario in SBEM

If the space above Zone 2 is accessible floor area, Zone 1a and Zone 1b are entered as two separate zones which can have different properties if applicable.

If the space above Zone 2 is not accessible floor area Zone 1a and Zone 1b are entered as a single zone and will have the same properties. The floor area of Zone 1b is not to be included in the zone area. (The method of achieving this will vary depending upon the approved software used).

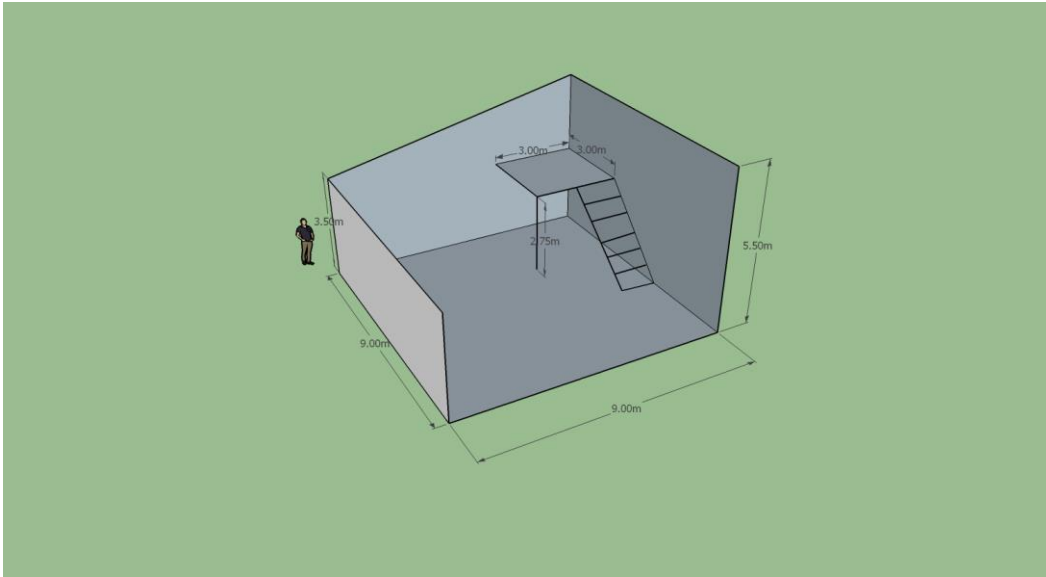


The inner zone is not a top floor as another zone sits above it. Apply the principles of a ground or intermediate floor to it.

The outer zone is a top floor so apply the top floor principles to it.

Convention 4.08 (Do not attempt to apply 10.03 to inner zone)

Scenario 7 - Zone within a zone (again)



The space below the mezzanine is an inner zone and modelled exactly the same as in Scenario 6.

The only difference is that it has virtual (rather than physical) wall envelopes between it and the outer zone.

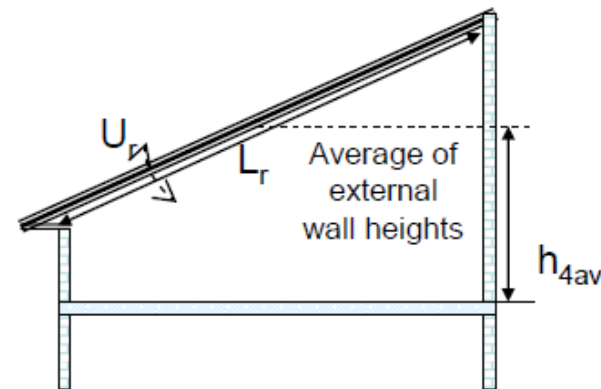
In this example of a mono-pitch roof it is the average external wall height which is used as the zone height for the outer zone.

Why?

The treatment of the inner zone is no different to the treatment of the inner zone in Scenario 6. It is not a top floor zone so the top floor principles of convention 10.03 must not be applied to it.

For the outer zone, which is a top floor zone...

- *Zone height is top of floor to weighted average height of all external walls - h_{4av}*
- *Area of roof (A_r) is as seen from underside i.e. $L_r \times$ zone depth*
- *U value from under ceiling to outside roof is U_r*
- *Use total area of external gable wall*
- *Note that zoning for daylight areas must be carried out manually in these circumstances*



How to avoid getting confused

- 1) Read the relevant convention carefully.
- 2) Do not try to read between the lines and interpret the convention, just follow what it tells you to do.
- 3) Never ignore a ceiling when it is the top floor ceiling below a roof. You may need to model it where it is. You may need to model it at eaves height. You must never ignore it and model the underside of the roof above it.

The text in convention 10.03 which says...

“ignore the suspended ceilings and raised floors for the purposes of

- *zone height*
- *surrounding wall areas”*

... applies only to “*Intermediate floors with suspended ceilings and raised floors*”. It does not apply to top floor ceilings.

- 4) The actual shape of a roof above an envelope that has been entered as the top floor ceiling/roof envelope is irrelevant to SBEM.
- 5) If you are struggling to understand the principles of Convention 4.08 (Zone within a zone) watch this <https://youtu.be/f-5NAyM5EtA>

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