Don’t Let Thermal Bridging Undermine Your Building’s Performance

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NESEA
NORTHEAST SUSTAINABLE ENERGY ASSOCIATION

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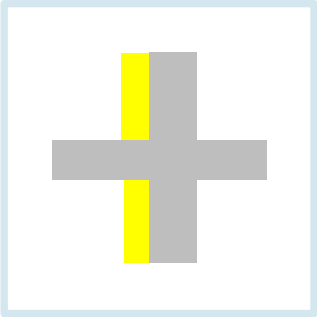
Outline

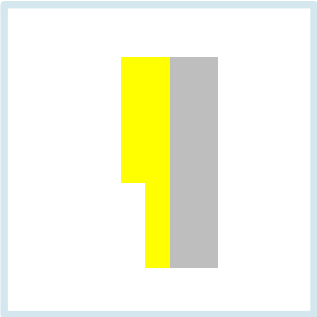
- What is a thermal bridge
- Identifying thermal bridges
- Measuring thermal bridges
- Managing thermal bridges
- Demonstrating thermal bridge simulations

What is a thermal bridge?

Part of the building envelope where the otherwise uniform thermal resistance is significantly reduced by:

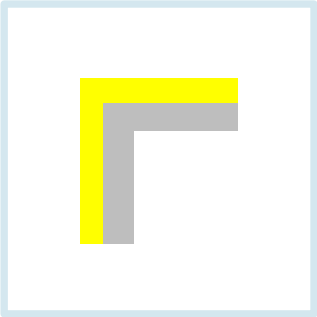


full or partial penetration of the insulating layers by materials with a different thermal conductivity



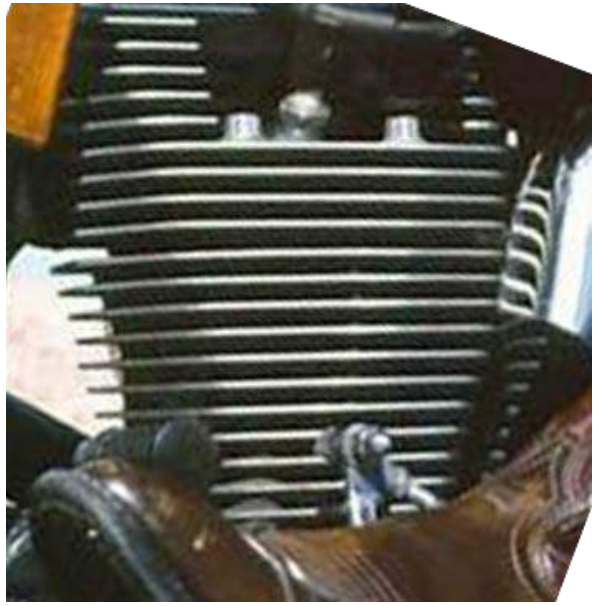
and/or

a change in thickness of the insulating layers



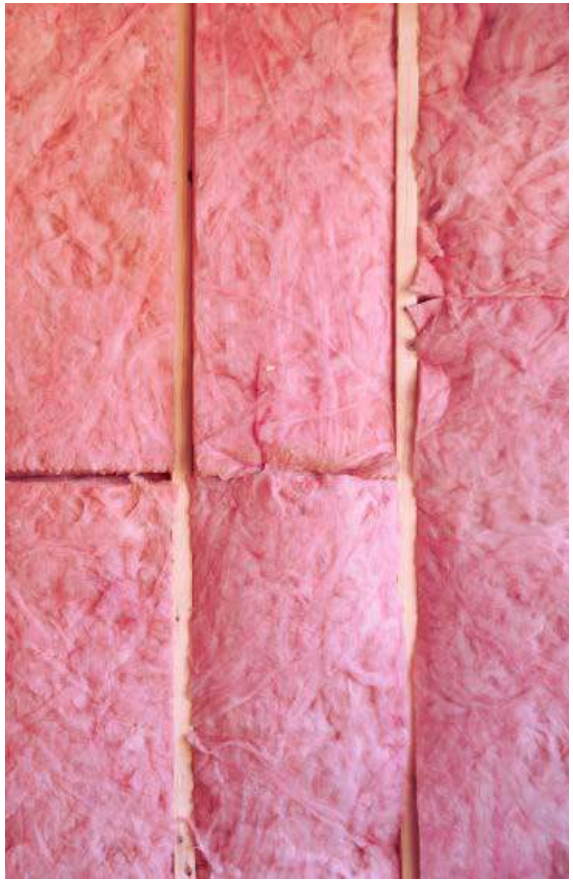
and/or

a difference between internal and external areas, such as occurs at wall/floor/ceiling junctions.



3 Types of linear thermal bridges

Geometric *(> 60° change in orientation)*	Construction	Repeating



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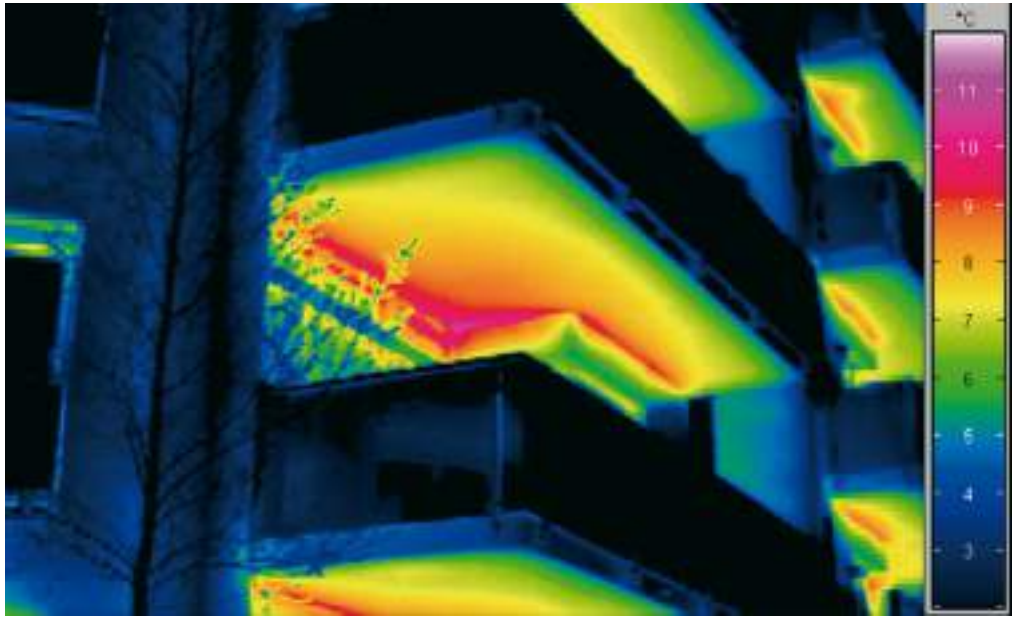
Cold surfaces, mold, condensation, heat loss



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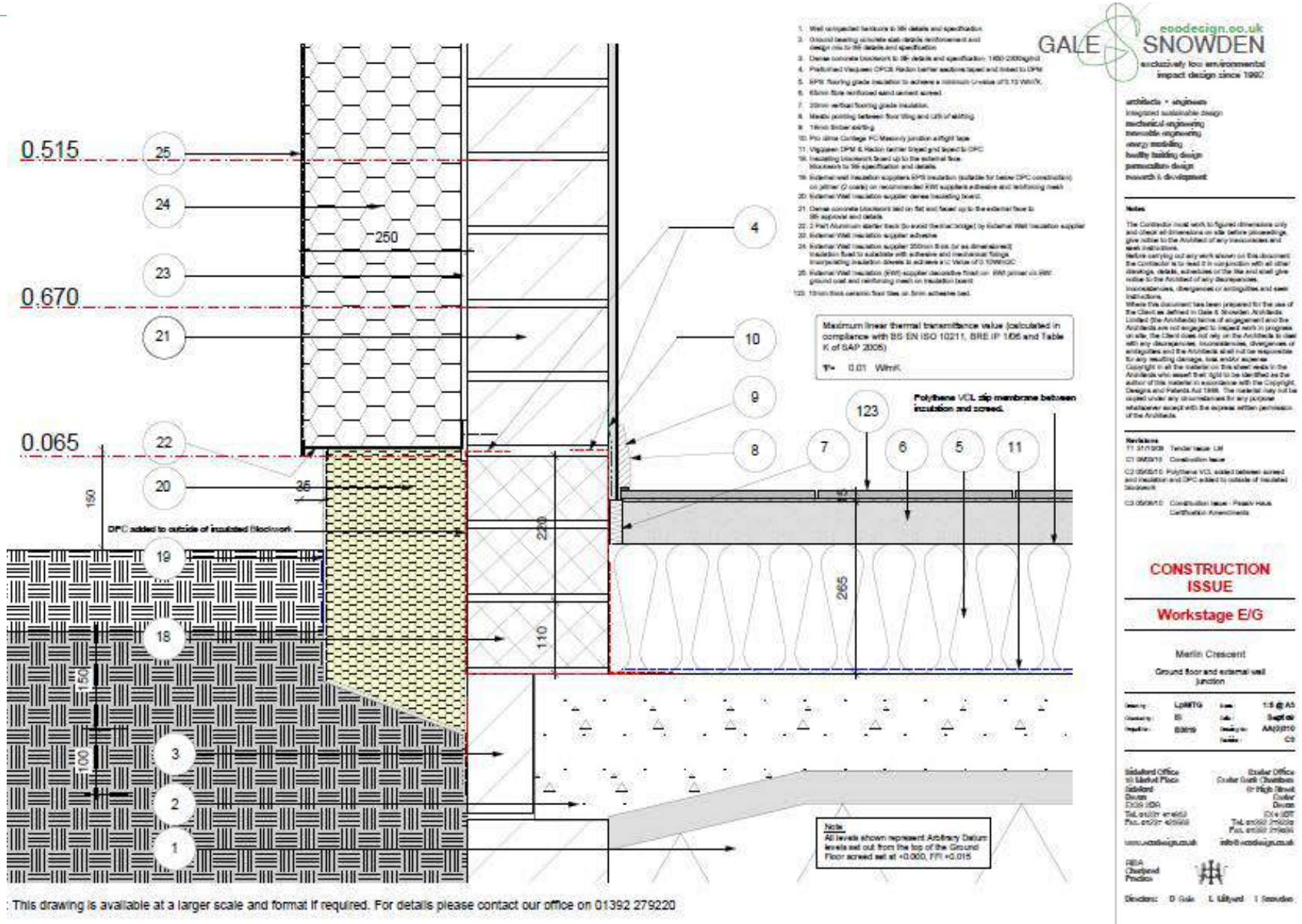
Identifying thermal bridges

Detailing

Q: What makes a good junction detail?

- Clear drawing showing all necessary detail
  - All materials and conductivities
  - Dimensions
  - Air barrier materials and connections
- Description of how connections are made

Good Detail



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Good Detail

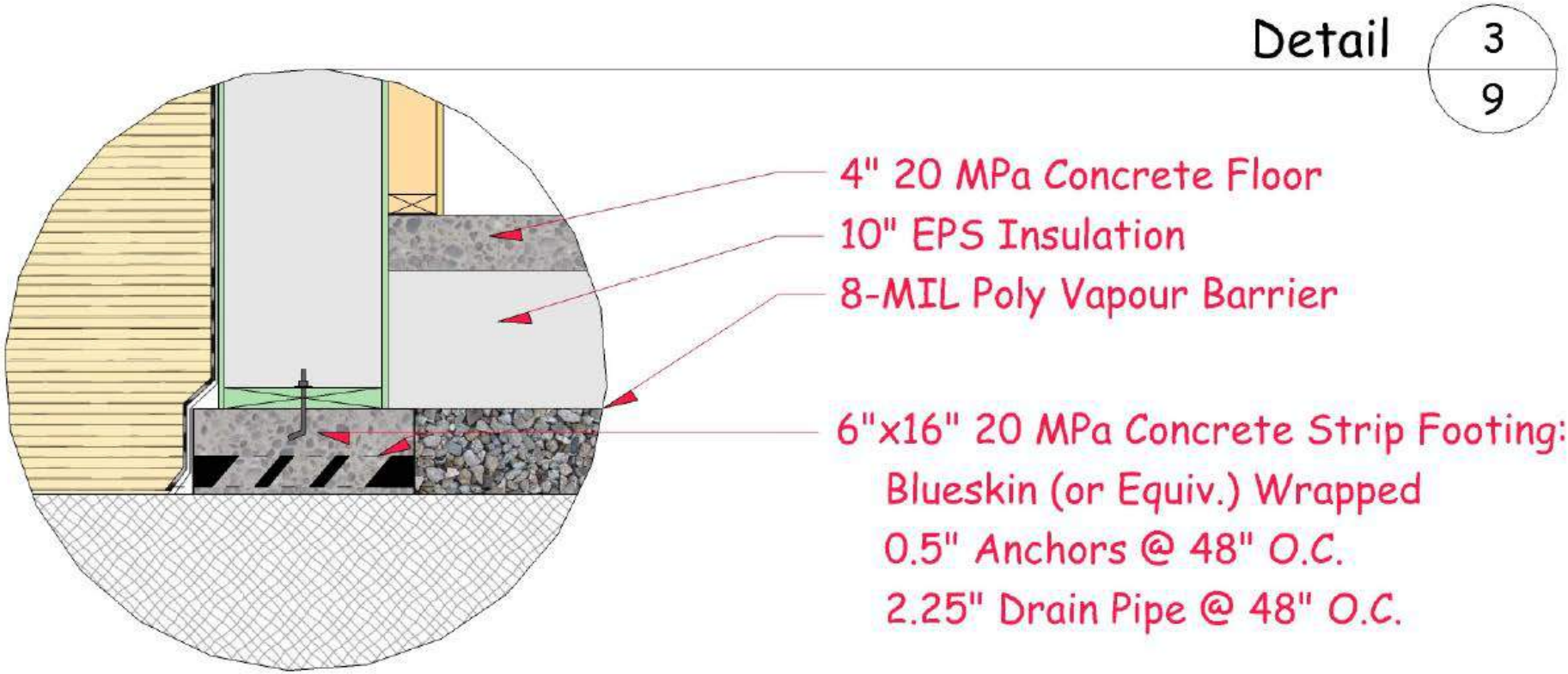
1. Well compacted hardcore to SE details and specification.
2. Ground bearing concrete slab details reinforcement and design mix to SE details and specification
3. Dense concrete blockwork to SE details and specification. 1850-2300kg/m3
4. Preformed Visqueen DPC& Radon barrier sections taped and linked to DPM
5. EPS flooring grade insulation to achieve a minimum U-value of 0.10 W/m²K.
6. 65mm fibre reinforced sand cement screed.
7. 20mm vertical flooring grade insulation.
8. Mastic pointing between floor tiling and U/S of skirting.
9. 18mm timber skirting.
10. Pro clima Contega FC Masonry junction airtight tape.
11. Visqueen DPM & Radon barrier linked and taped to DPC
18. Insulating blockwork faced up to the external face. Blockwork to SE specification and details.
19. External wall insulation suppliers EPS insulation (suitable for below DPC construction) on primer (2 coats) on recommended EWI suppliers adhesive and reinforcing mesh
20. External Wall Insulation supplier dense insulating board.
21. Dense concrete blockwork laid on flat and faced up to the external face to SE approval and details
22. 2 Part Aluminum starter track (to avoid thermal bridge) by External Wall Insulation supplier
23. External Wall Insulation supplier adhesive
24. External Wall Insulation supplier 250mm thick (or as dimensioned) insulation fixed to substrate with adhesive and mechanical fixings incorporating insulation dowels to achieve a U Value of 0.10W/m2C
25. External Wall Insulation (EWI) supplier decorative finish on EWI primer on EWI ground coat and reinforcing mesh on insulation board.

123. 10mm thick ceramic floor tiles on 5mm adhesive bed.

What's missing?

- Material types
- Material conductivities

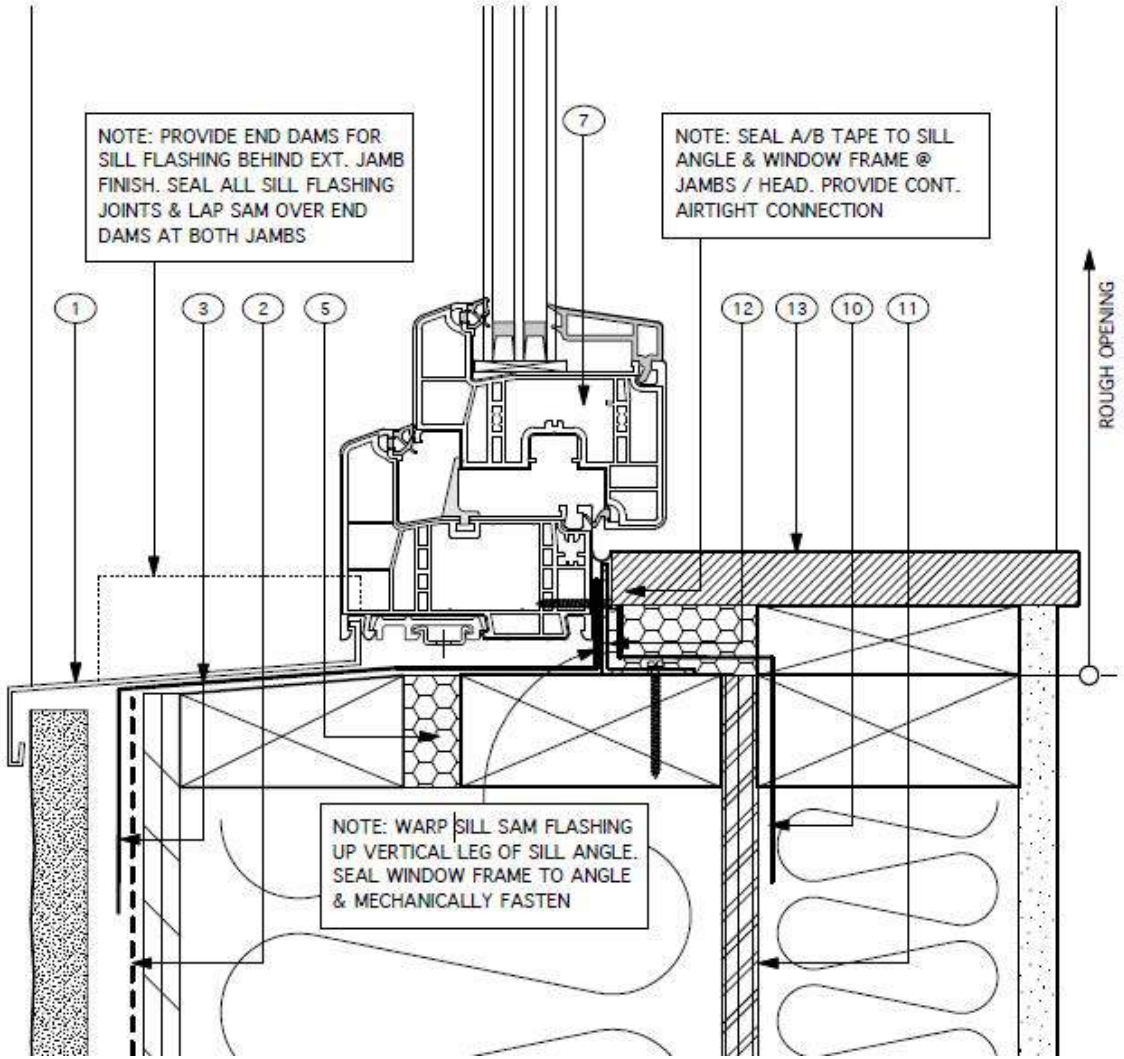
Poor detail



What's missing?

- Dimensions
- Wall materials
- EPS Type
- Air barrier to wall
- Air barrier connection details

Good Detail



1. PRE-FIN. 22ga. METAL FLASHING
2. BUILDING WRAP
3. SELF-ADHERING W/P MEMBRANE (SAM)
4. CONT. FLEXIBLE EXT. GRADE SEALANT & FOAM BACKER ROD - FRONT AND BACK OF WINDOW FRAME
5. RIGID INSULATION
6. WINDOW REBATE FASTENER CLIP
7. WINDOW FRAME & GLAZING TO MEET PPHP PERFORMANCE REQU'TS.
8. CONT. FLEXIBLE EXT. GRADE SEALANT & FOAM BACKER ROD
9. GYPSUM WALLBOARD
10. SELF-ADHERING A/B TAPE & SEALANT - PROVIDE CONT. CONNECTION OF OSB A/B LYR WITH WINDOW FRAME
11. OSB A/B LAYER
12. CONT. 1.5 X1.5 ALUM. SILL INSTALL ANGLE
13. 1 ENG. or SOLID STONE SILL

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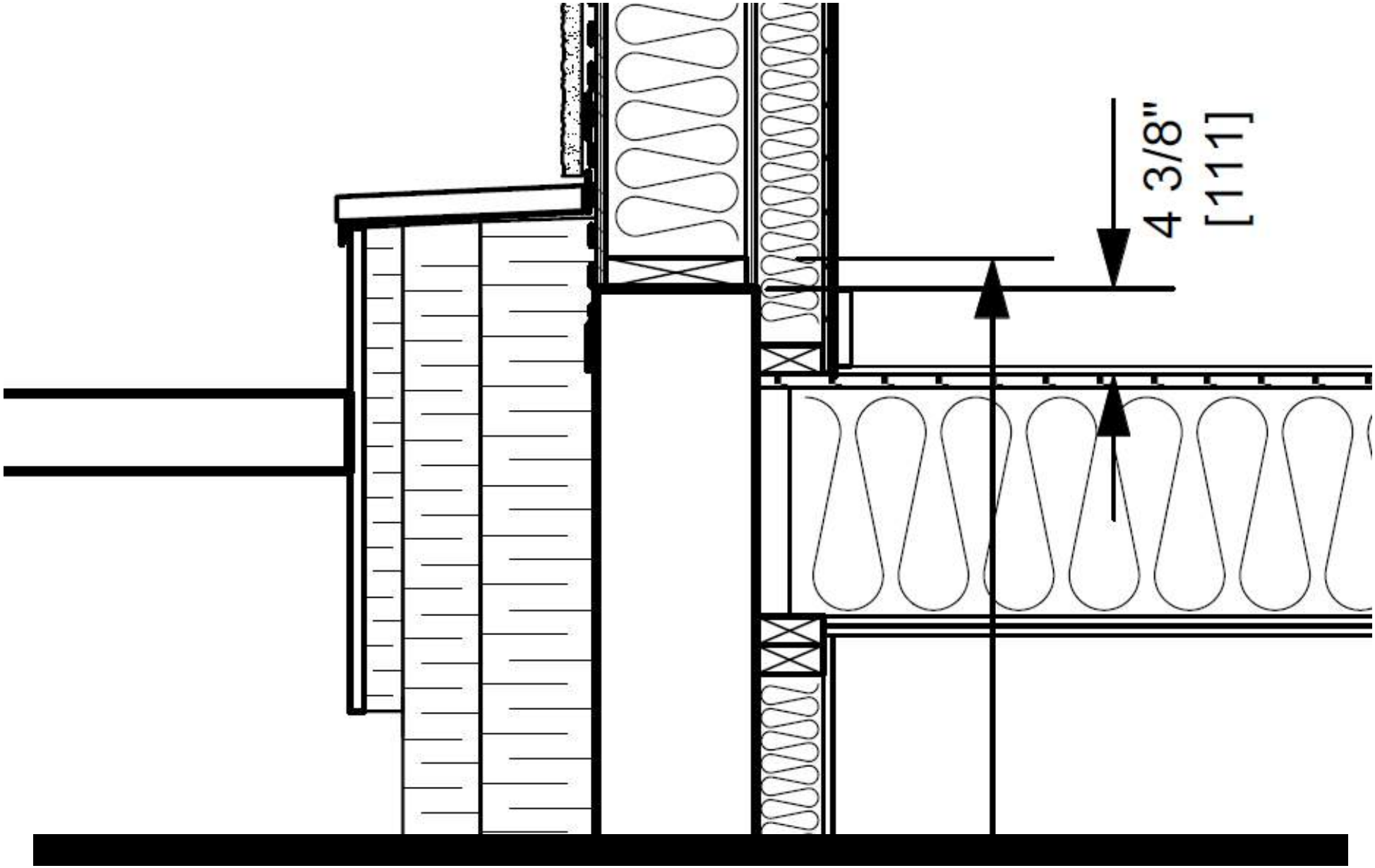
Inadequate Detail



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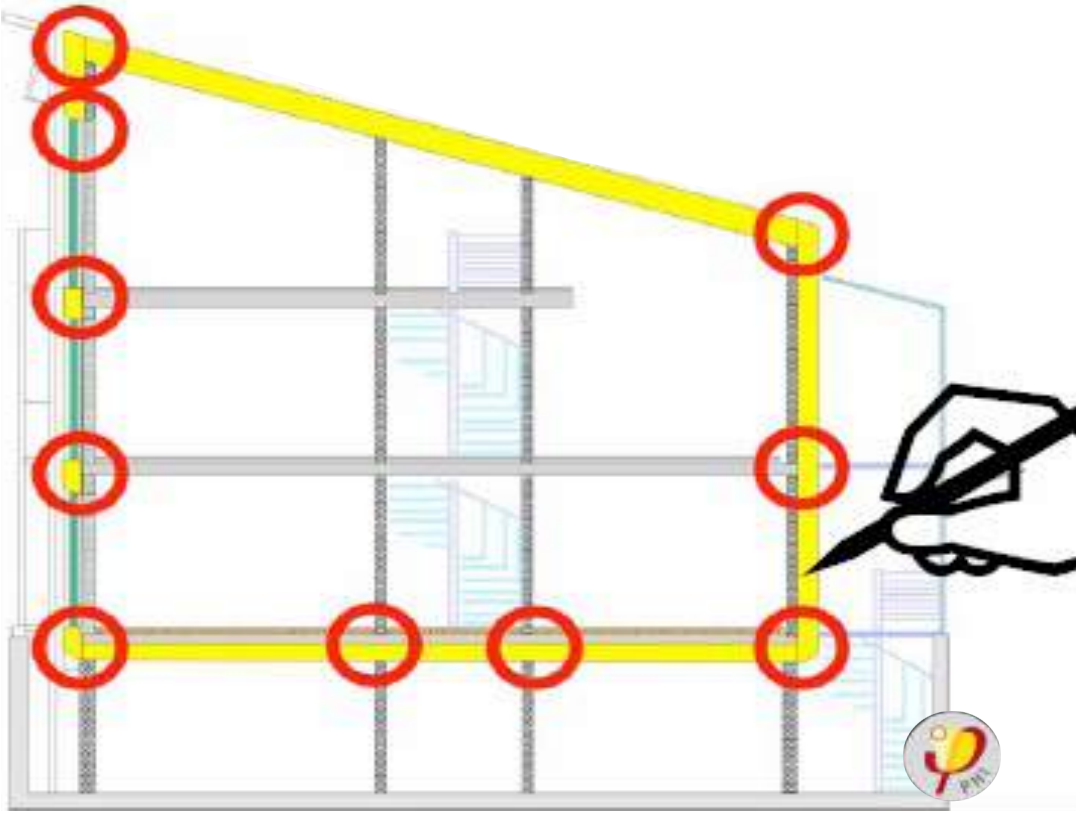
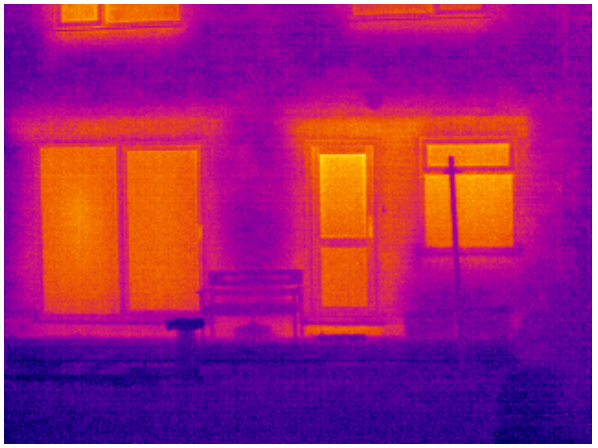
“A break in the thermal continuity of the building envelope



Source: PHI, Author: JS

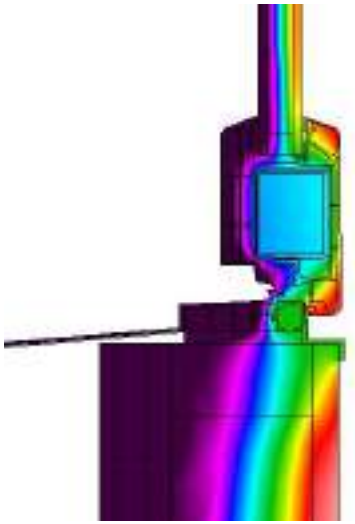
How do we identify them?

1. Visually



2. Thermal Imaging

3. Temperature Probe



4. Calculation

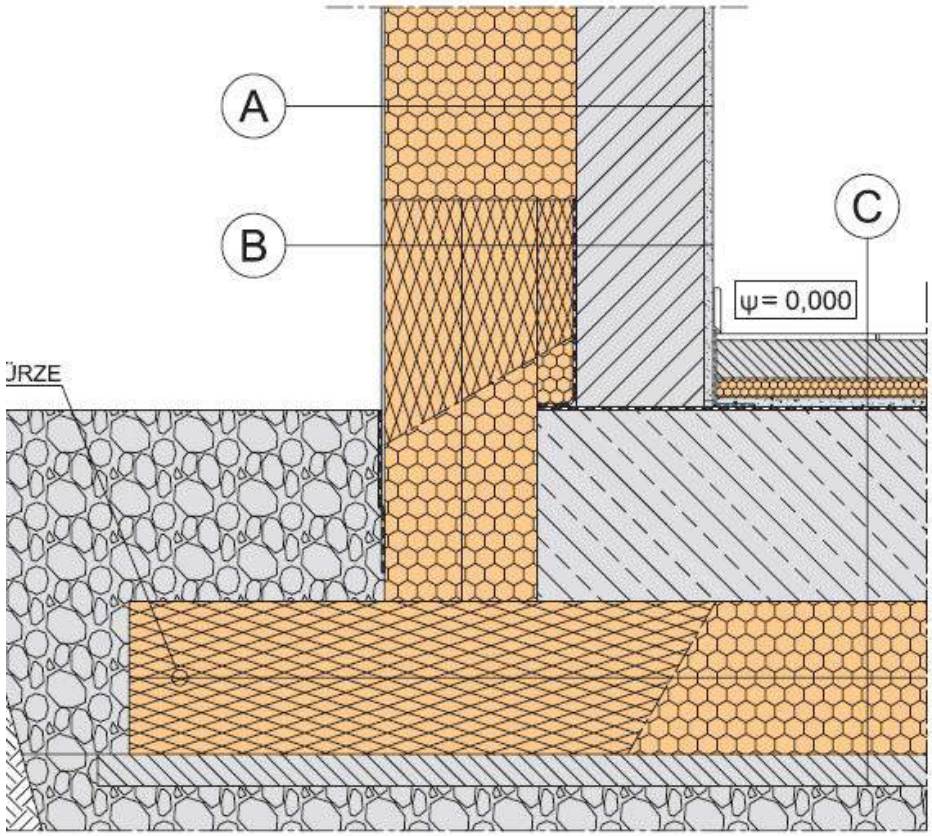
Quantifying Thermal Bridging

How can you quantify the amount thermal bridging?

1. Inspection: Is it TB free?
    - Continuous insulation
    - Amount of bridging material
    - Conductivity of bridging material

Qualitative Assessment

Is this detail thermal-bridge free?



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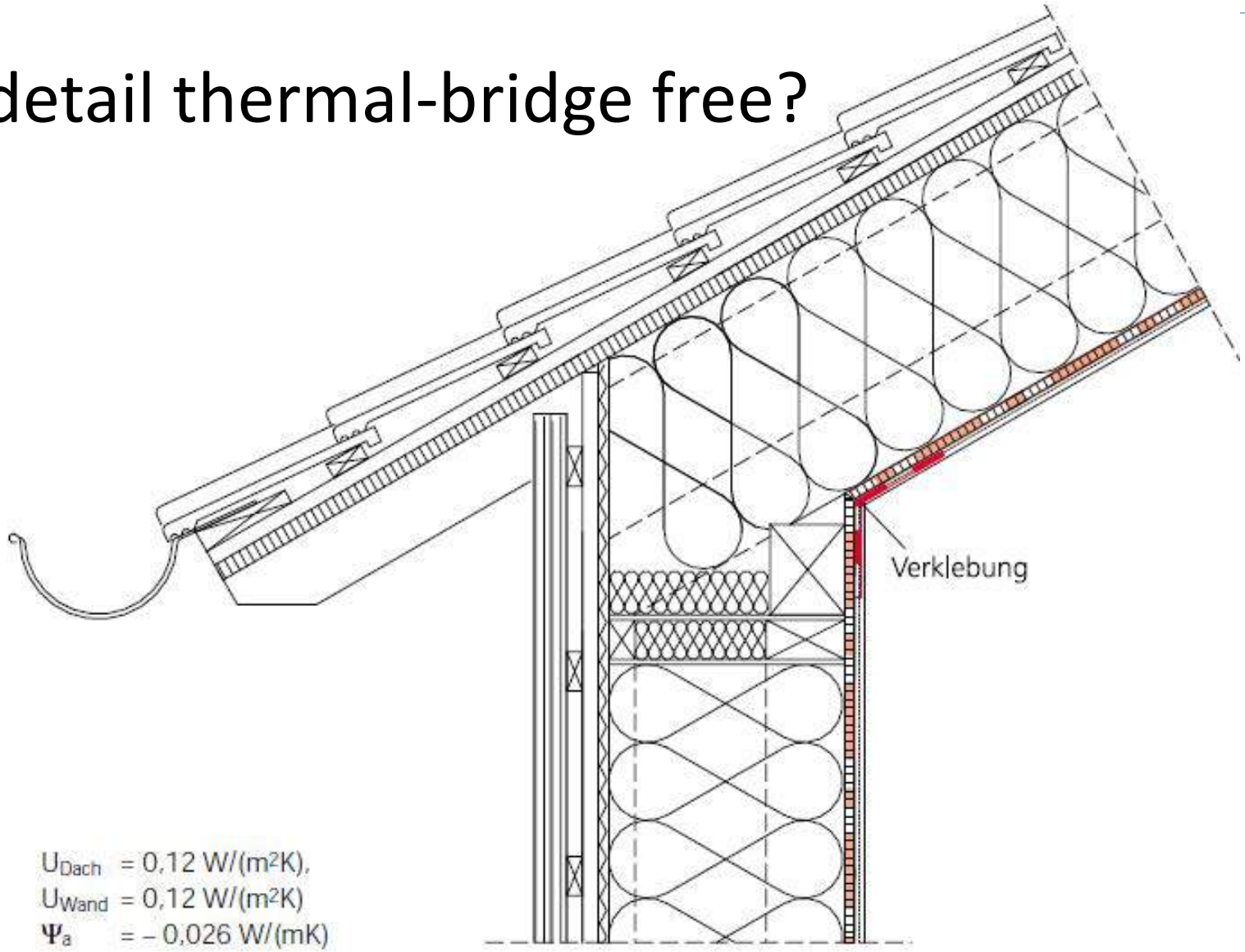

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Qualitative Assessment

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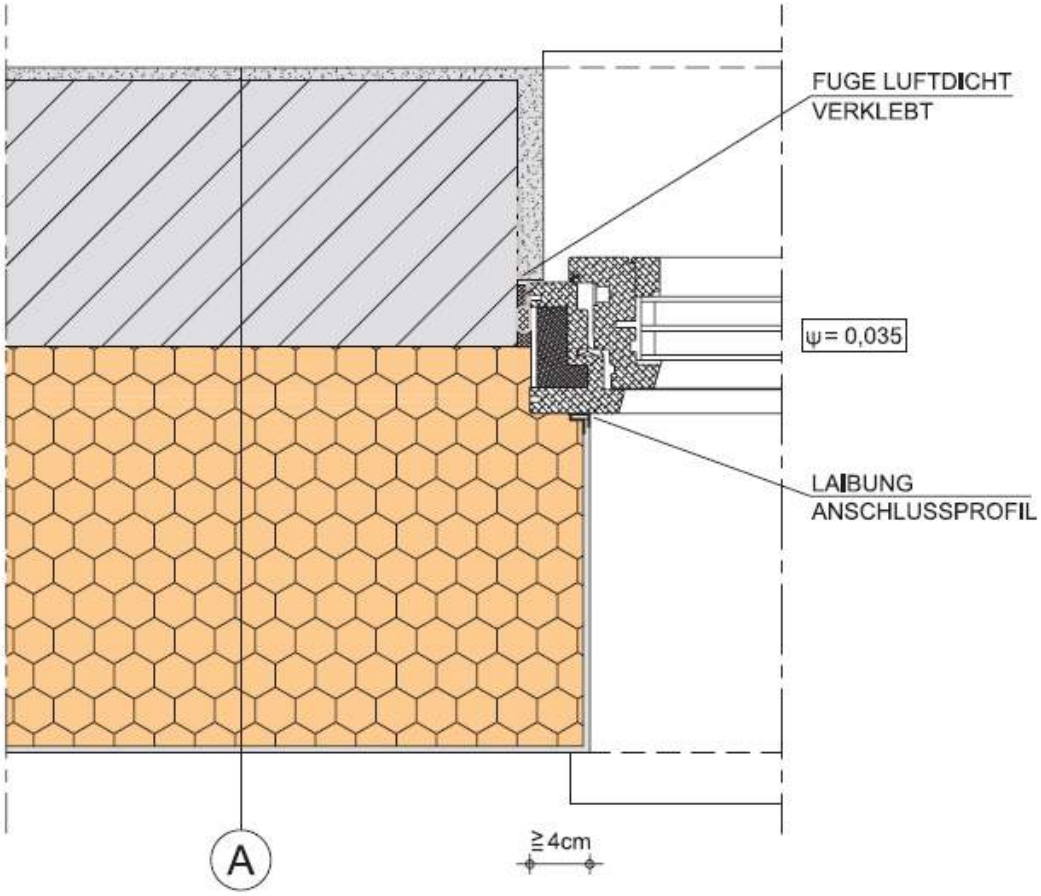

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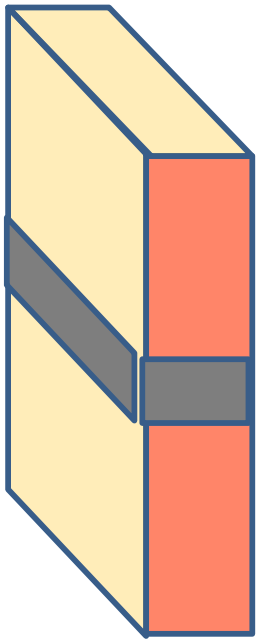
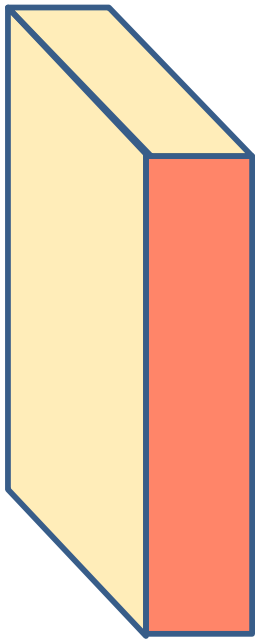
Measuring thermal bridges

The ‘PSI’ Value

Ψ =  – 

Ψ = Heat loss with bridge – Heat loss without bridge

It’s an accounting principle!