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

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NYC, Oct 12, 2017



NESEA

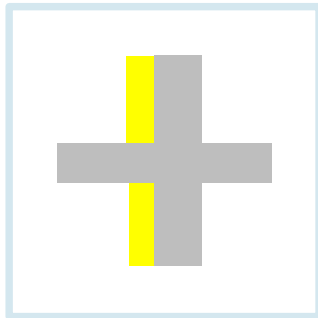
NORTHEAST SUSTAINABLE ENERGY ASSOCIATION

Outline

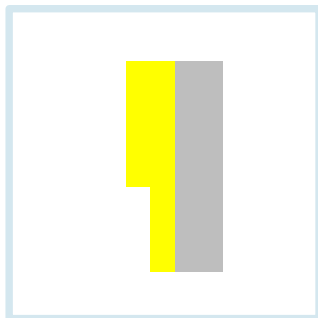
- What is a thermal bridge
- Identifying thermal bridges
- Measuring thermal bridges
- Managing thermal bridges
- Demonstrating thermal bridge simulations

What is a thermal bridge?

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

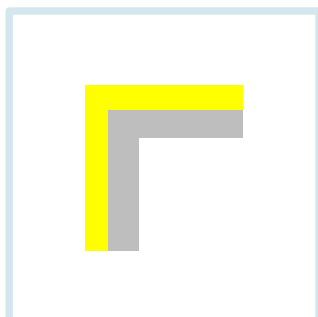


full or partial penetration of the insulating layers by materials with a different thermal conductivity



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

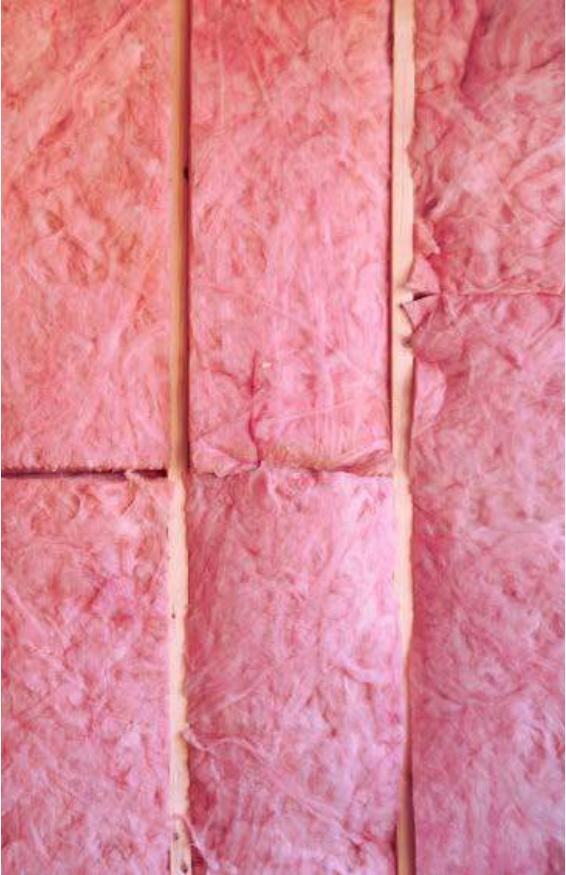
(> 60° change in orientation)



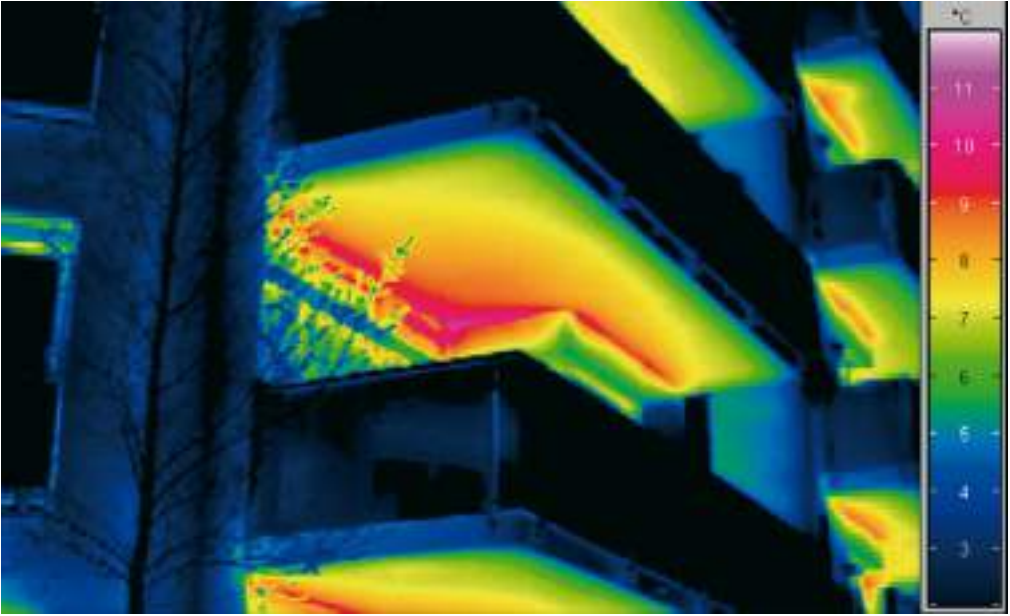
Construction



Repeating



Cold surfaces, mold, condensation, heat loss



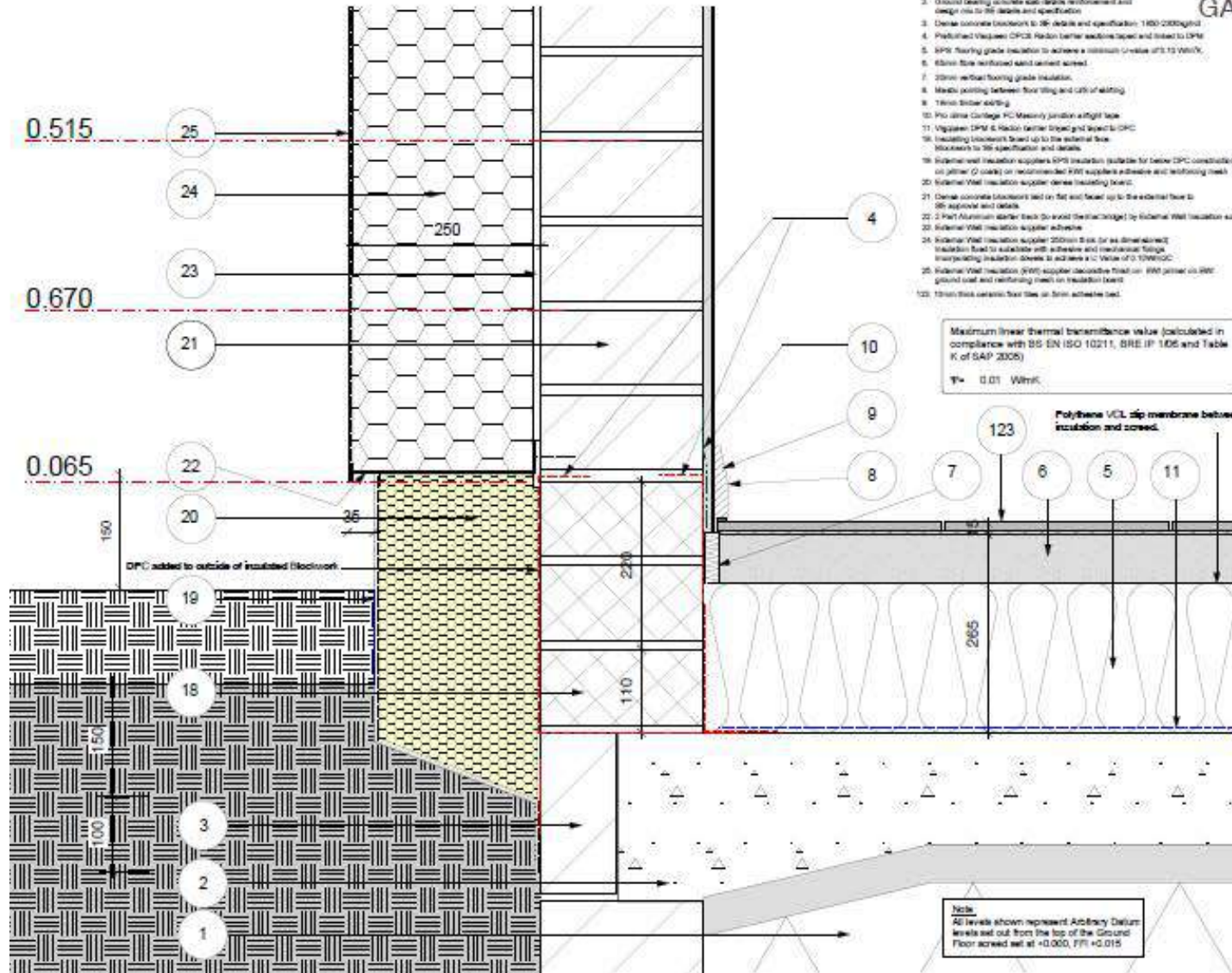
Identifying thermal bridges

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



1. Well compacted hardcore to 300 details and specification
2. Ground bearing concrete slab double reinforcement and concrete cast to 300 details and specification
3. Dense concrete blockwork to 300 details and specification 1400 200x600
4. Polystyrene Vapour DPM Radon barrier adhesive taped and fixed to DPM
5. EPS Insulating grade insulation to achieve a minimum U-value of 0.13 W/m²K
6. 60mm fibre reinforced sand cement screed
7. 200mm vertical flooring grade insulation
8. Mason pointing between floor string and cills of walling
9. 10mm linear edging
10. Pro stone Corrugate PC Masonry junction edge/step face
11. Vapour DPM & Radon barrier adhesive taped and fixed to DPM
12. Insulating blockwork fixed up to the external face blockwork to 300 specification and details
13. External wall insulation supplier EPS insulation (outside for below DPM construction) on primer (2 coats) or recommended PIR supplier adhesive and reinforcing mesh
14. External Wall insulation supplier dense insulating board
15. Dense concrete blockwork laid on flat and fixed up to the external face to 300 specification and details
16. 2 Part Aluminium starter base (to avoid the substrate) by External Wall insulation supplier
17. External Wall insulation supplier adhesive
18. External Wall insulation supplier 250mm thick (or as dimensioned) insulation board to substrate with adhesive and mechanical fixing (insulating insulation sheets to not have a U-Value of 0.10 W/m²K)
19. External wall insulation (EPS) supplier decorative finish on PIR primer on 300 ground cast and reinforcing mesh on insulation board
20. 10mm thick ceramic floor tile on brick adhesive bed

Maximum linear thermal transmittance value (calculated in compliance with BS EN ISO 10211, BRE IP 106 and Table K of SAP 2009)

$U_L = 0.01 \text{ W/m}^2\text{K}$

Polythene VCL slip membrane between insulation and screed.



architects • engineers
 integrated sustainable design
 mechanical engineering
 renewable engineering
 energy modelling
 healthy building design
 parametric design
 research & development

Notes
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Revisions
 11 21/10/20 Construction Issue
 01 09/07/19 Construction Issue
 02 05/05/19 Polythene VCL sealed between screed and insulation and DPM added to outside of insulated blockwork
 03 05/05/19 Construction Issue - Fresh View Construction Amendments

CONSTRUCTION ISSUE
Workstage E/G

Merlin Crescent
 Ground floor and external wall junction

Client:	LPRRTG	Rev:	1.5 @ AD
Designer:	JS	Date:	30/06/20
Checker:	BWB	Design No:	AA03010
		Issue:	C2

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REIA Chartered Practice

REIA Chartered Practice

REIA Chartered Practice

Directors: D Gale, L Lifford, J Snowden

This drawing is available at a larger scale and format if required. For details please contact our office on 01392 279220

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.
113. 10mm thick ceramic floor tiles on 5mm adhesive bed.

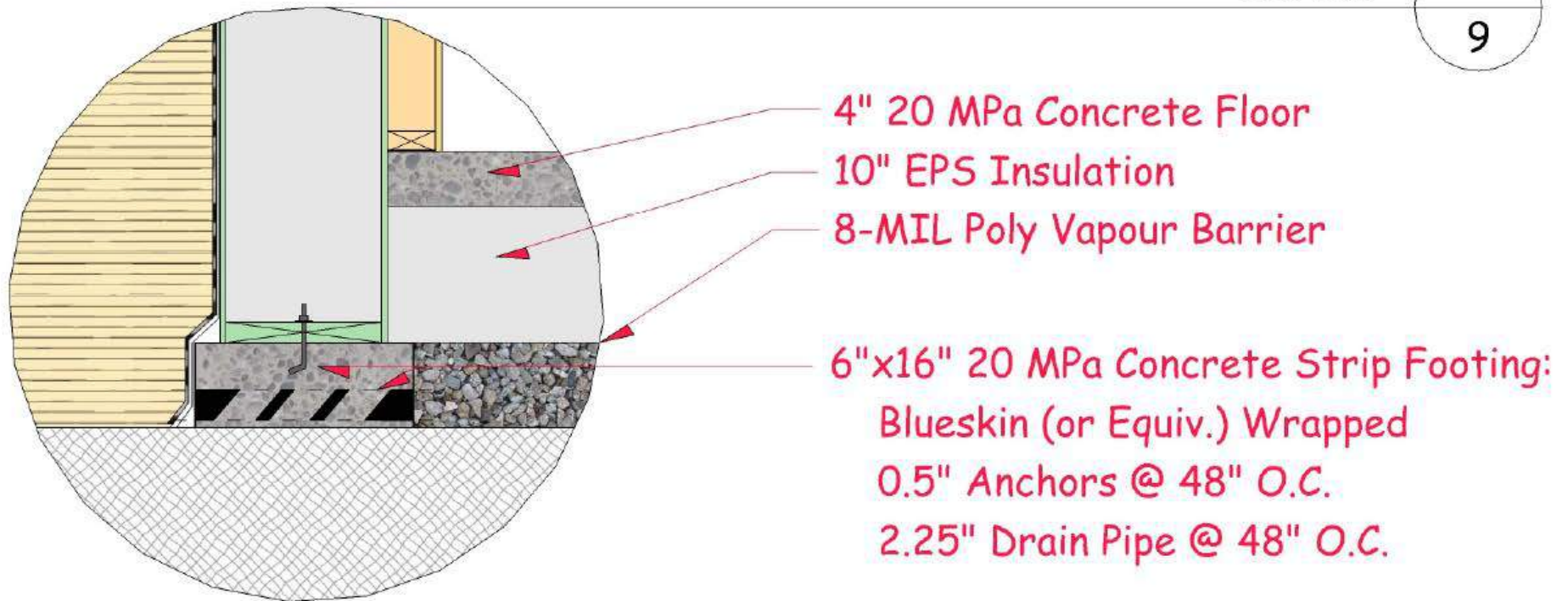
What's missing?

- Material types
- Material conductivities

Poor detail

Detail

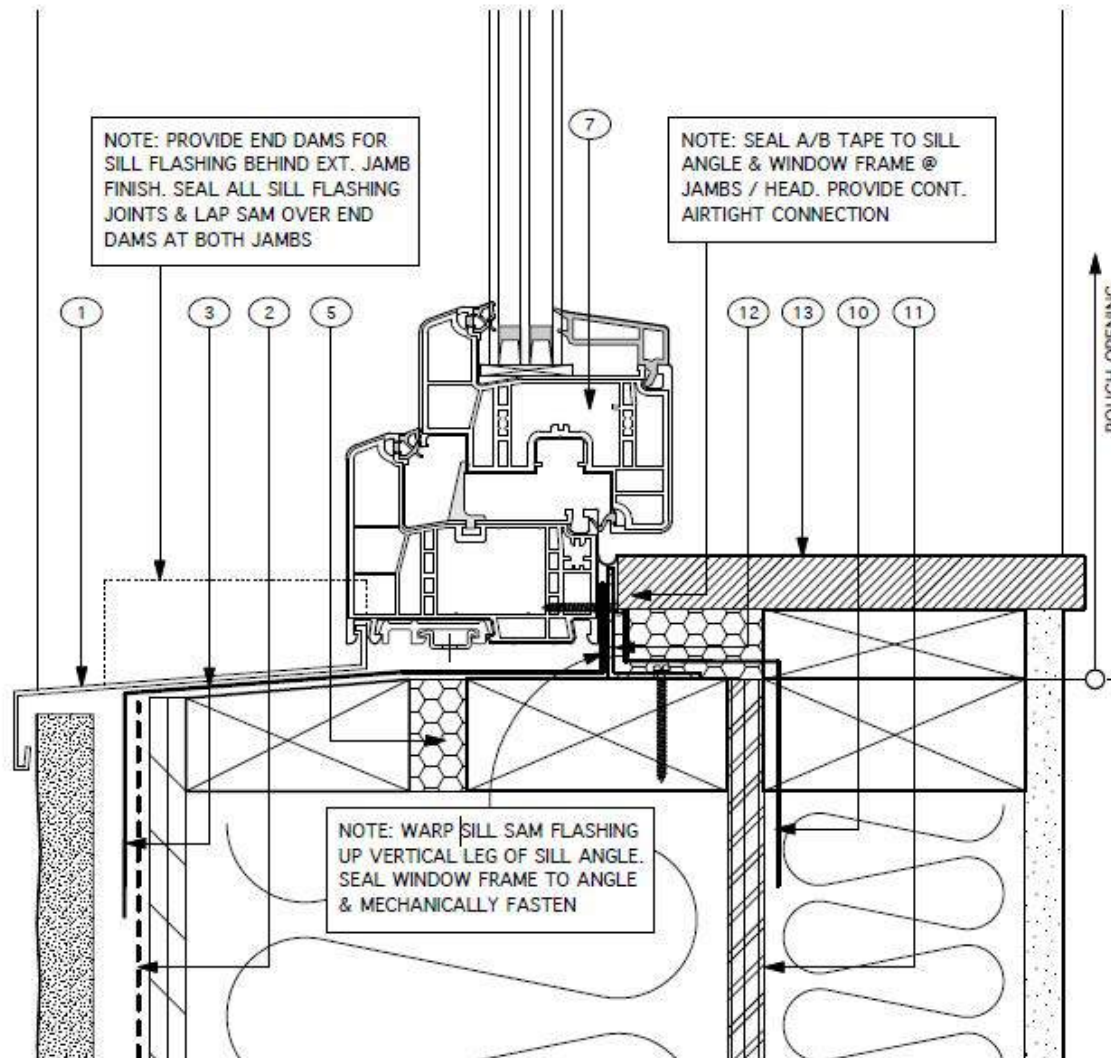
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9



What's missing?

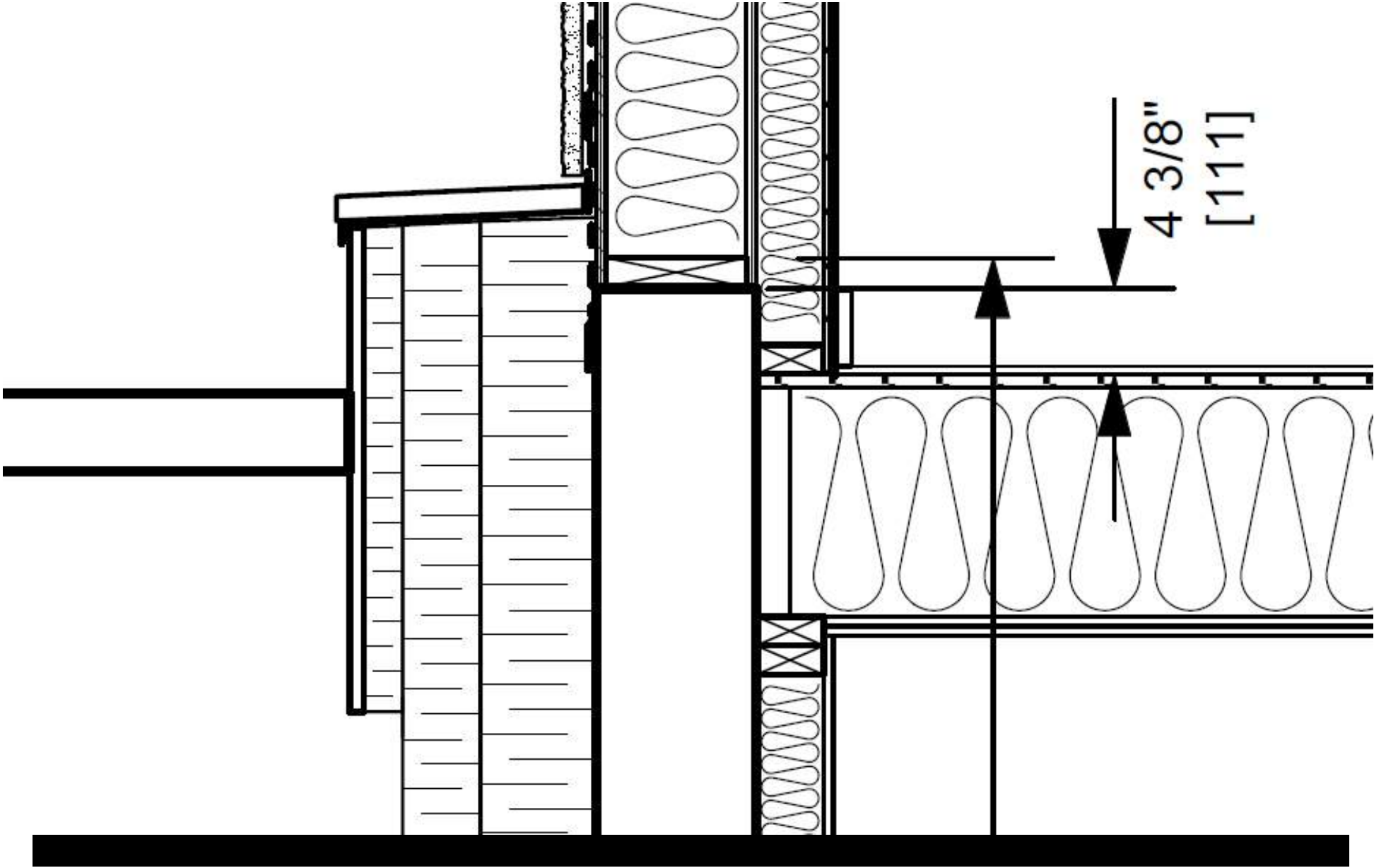
- Dimensions
- Wall materials
- EPS Type
- Air barrier to wall
- Air barrier connection details

Good Detail

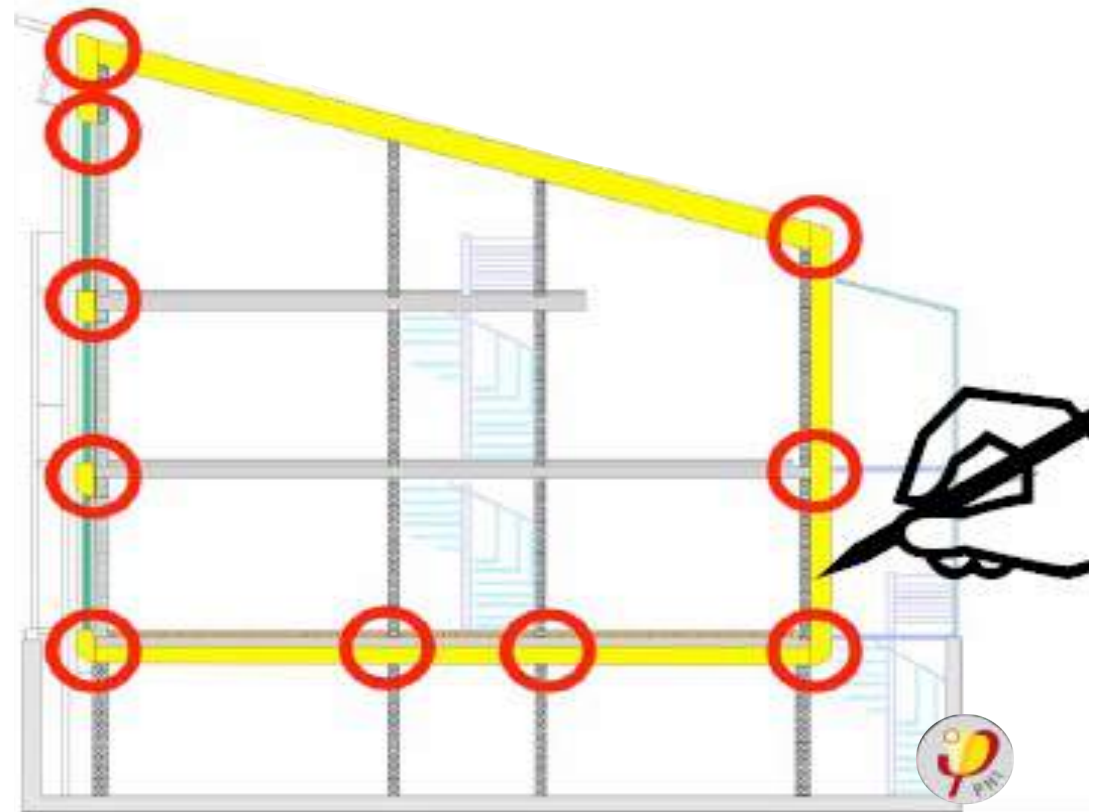
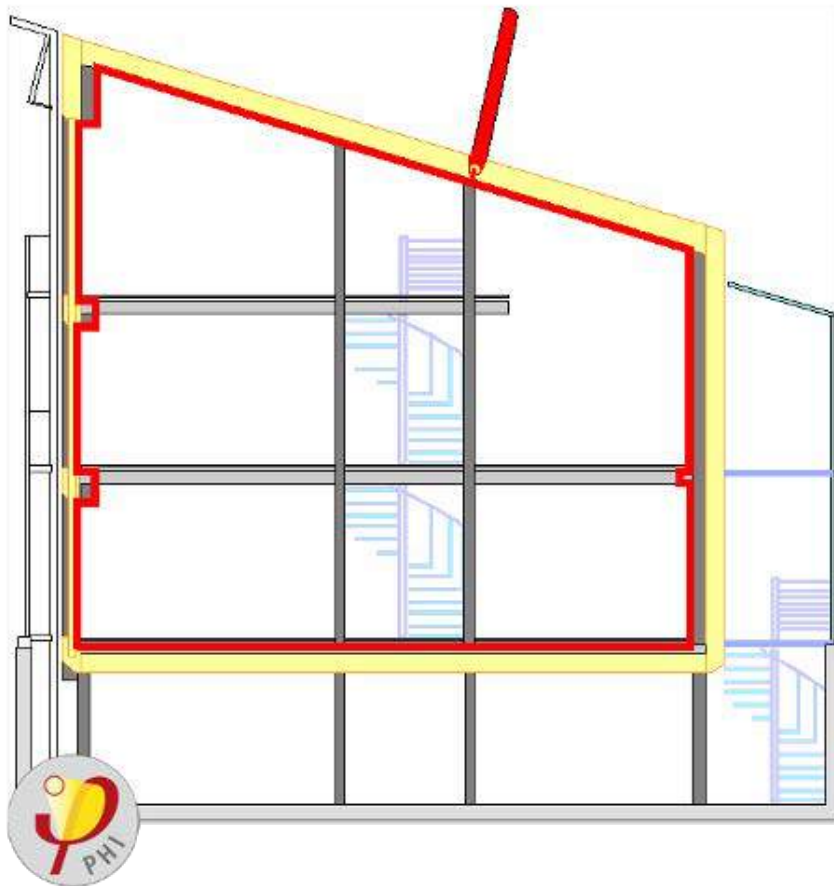


- ① PRE-FIN. 22ga. METAL FLASHING
- ② BUILDING WRAP
- ③ SELF-ADHERING W/P MEMBRANE (SAM)
- ④ CONT. FLEXIBLE EXT. GRADE SEALANT & FOAM BACKER ROD - FRONT AND BACK OF WINDOW FRAME
- ⑤ RIGID INSULATION
- ⑥ WINDOW REBATE FASTENER CLIP
- ⑦ WINDOW FRAME & GLAZING TO MEET PPHP PERFORMANCE REQU'TS.
- ⑧ CONT.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

Inadequate Detail



“A break in the thermal continuity of the building envelope



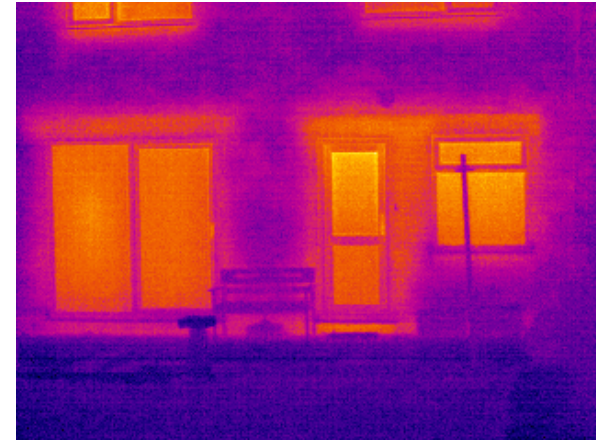
Source: PHI, Author: JS

How do we identify them?

1. Visually



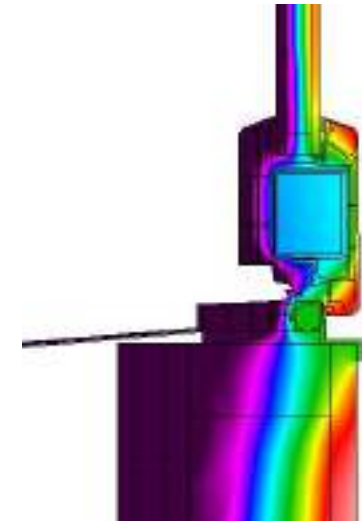
2. Thermal Imaging



3. Temperature Probe



4. Calculation



Quantifying Thermal Bridging

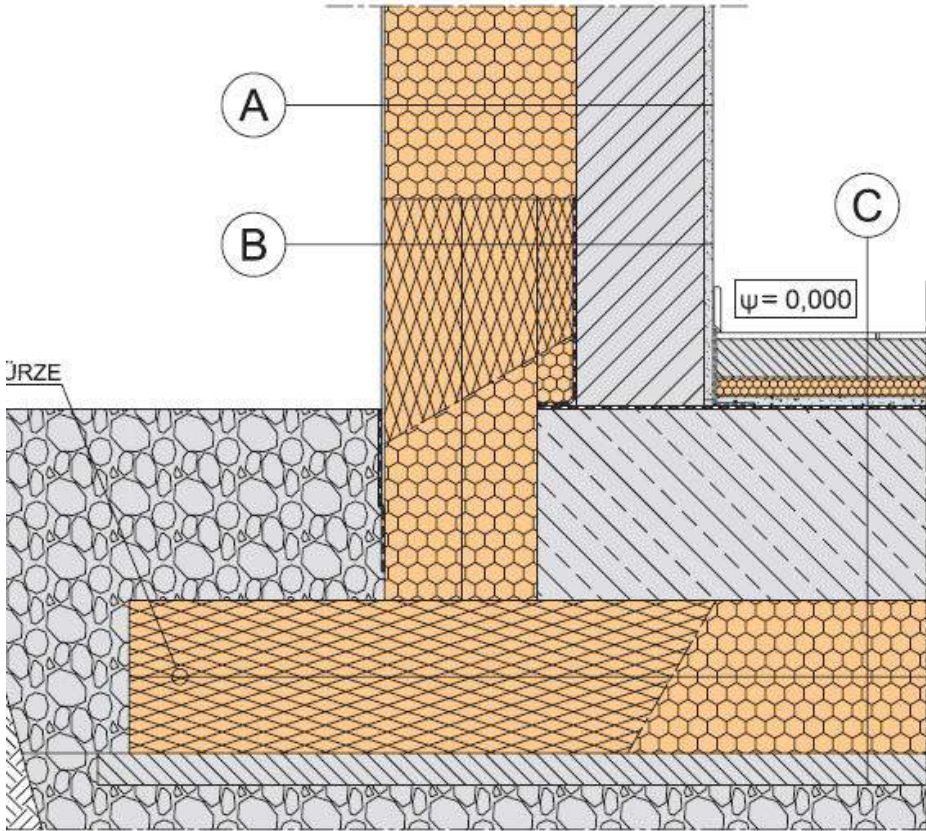
How can you quantify the amount thermal bridging?

1. Inspection: Is it TB free?

- Continuous insulation
- Amount of bridging material
- Conductivity of bridging material

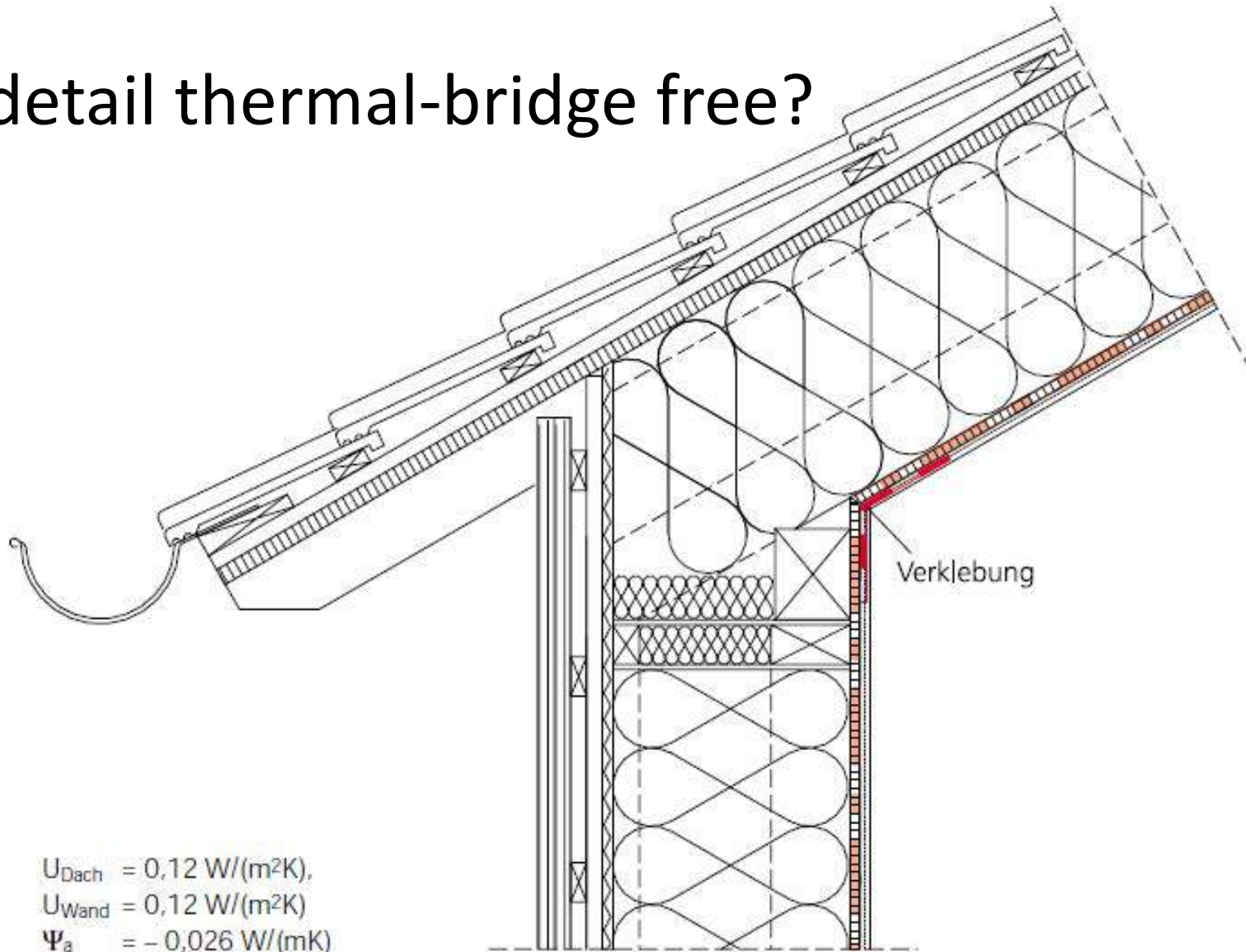
Qualitative Assessment

Is this detail thermal-bridge free?



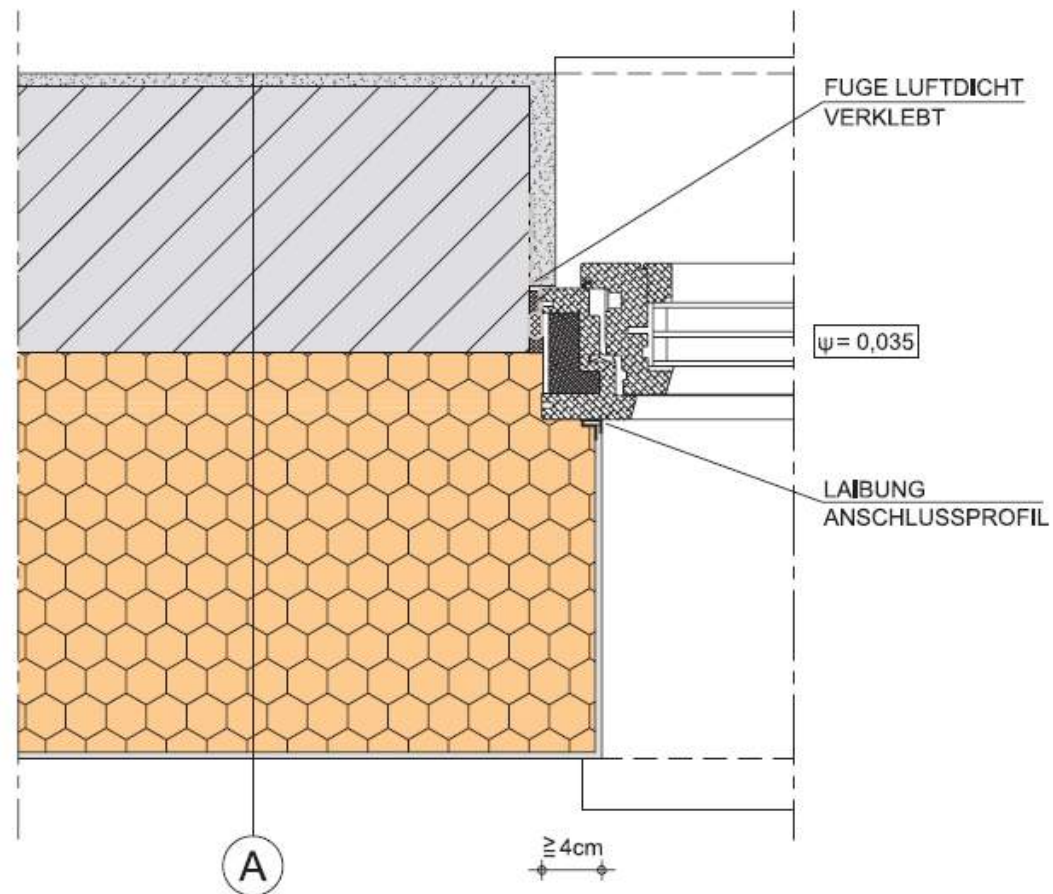
Qualitative Assessment

Is this detail thermal-bridge free?



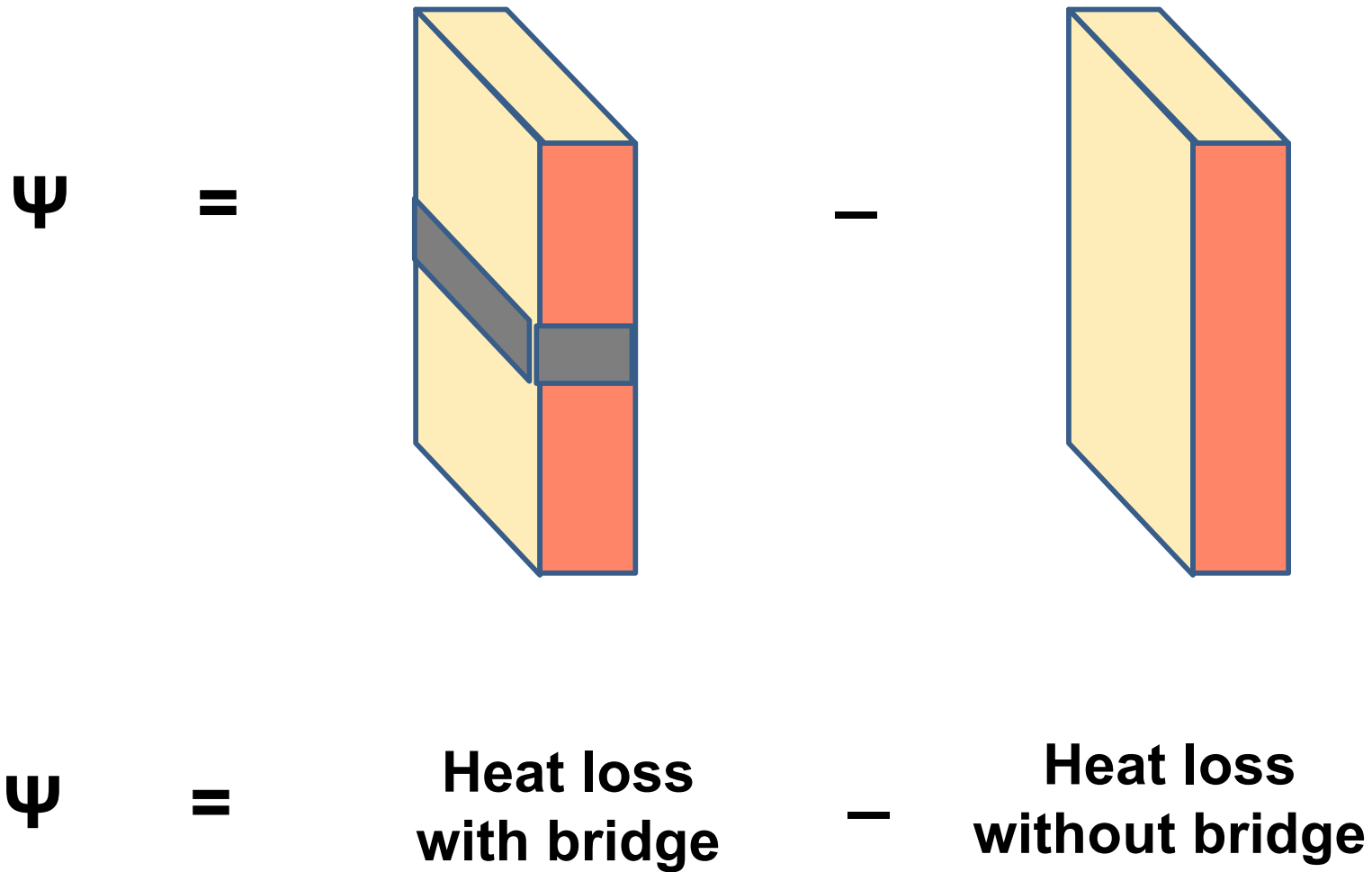
Qualitative Assessment

Is this detail thermal-bridge free?



Measuring thermal bridges

The 'PSI' Value



It's an accounting principle!