

SUSTAINABLE ARCHITECTURE

SUSTAINABLE ARCHITECTURAL DEVELOPMENTS

PASSIVE DESIGN

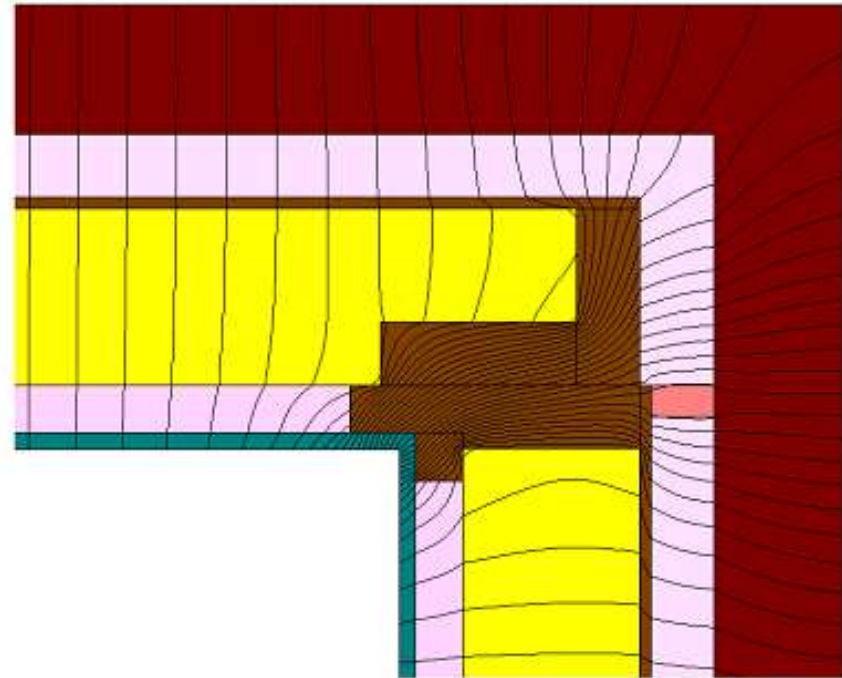
Thermal Bridging



THERMAL BRIDGES

also called a cold **bridge**, **heat bridge**, or **thermal** bypass.

Area or component of an object which has higher **thermal** conductivity than the surrounding materials, creating a path of least resistance for **heat** transfer.



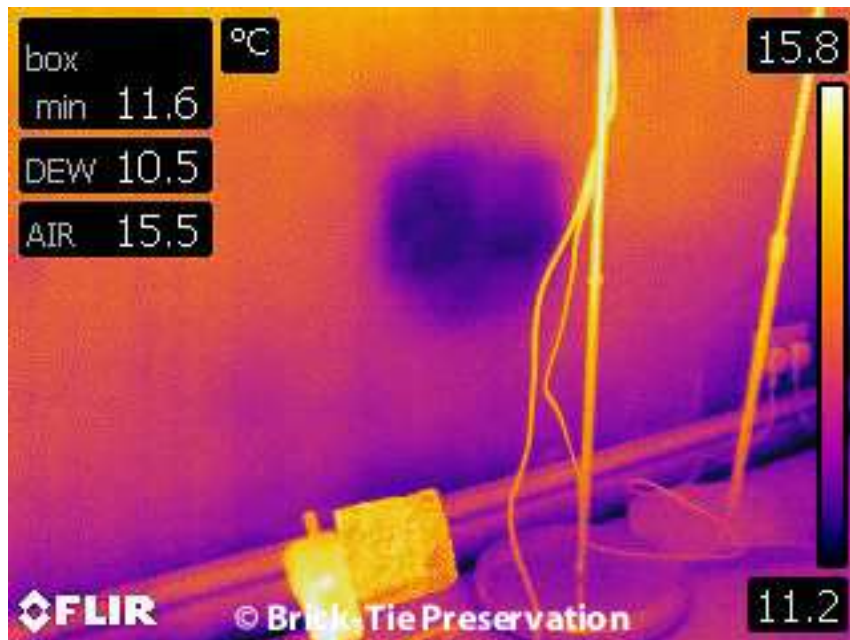


THERMAL BRIDGES

Main concern is insulation continuity

No consideration for condensation and damp

A thermal bridge will become a cold area that may produce damp in the fabric





THERMAL BRIDGES

Thermal bridges occur within the building fabric where, because of the geometry or the presence of high conductivity materials, heat flows are two or three dimensional.

For many situations, simple calculations are no longer sufficient to determine thermal performance correctly and it is necessary to analyse the construction using numerical modelling.

BRE BR 497 Conventions for calculating linear thermal transmittance and temperature factors



TYPES OF THERMAL BRIDGES

Repeating: Usually follow a regular pattern and are evenly distributed

- Ceiling joists in cold pitched roofs that are insulated at ceiling level.
- Ground floor joists in an insulated suspended timber ground floor.
- Timber studwork and I-beams in timber frame construction.
- Mortar joints in an insulating block inner leaf.
- Steel wall ties in masonry cavity external wall construction.

Non-repeating: intermittent and occur at a specific point in the construction

- Around windows, doors and rooflights.
- Around loft hatches.
- Where internal walls or floors penetrate the thermal envelope.
- Where steel I-beams have been used to support timber roofs.



THERMAL BRIDGING

Steel wall ties
In cavity wall
construction

Mortar joints on
internal blockwork
leaf





THERMAL BRIDGING

Box lintel with
perforated base
plate





THERMAL BRIDGING



Insulated preformed steel lintels. Heat will be conducted through the steel, bypassing the thermal insulation contained within the lintel.

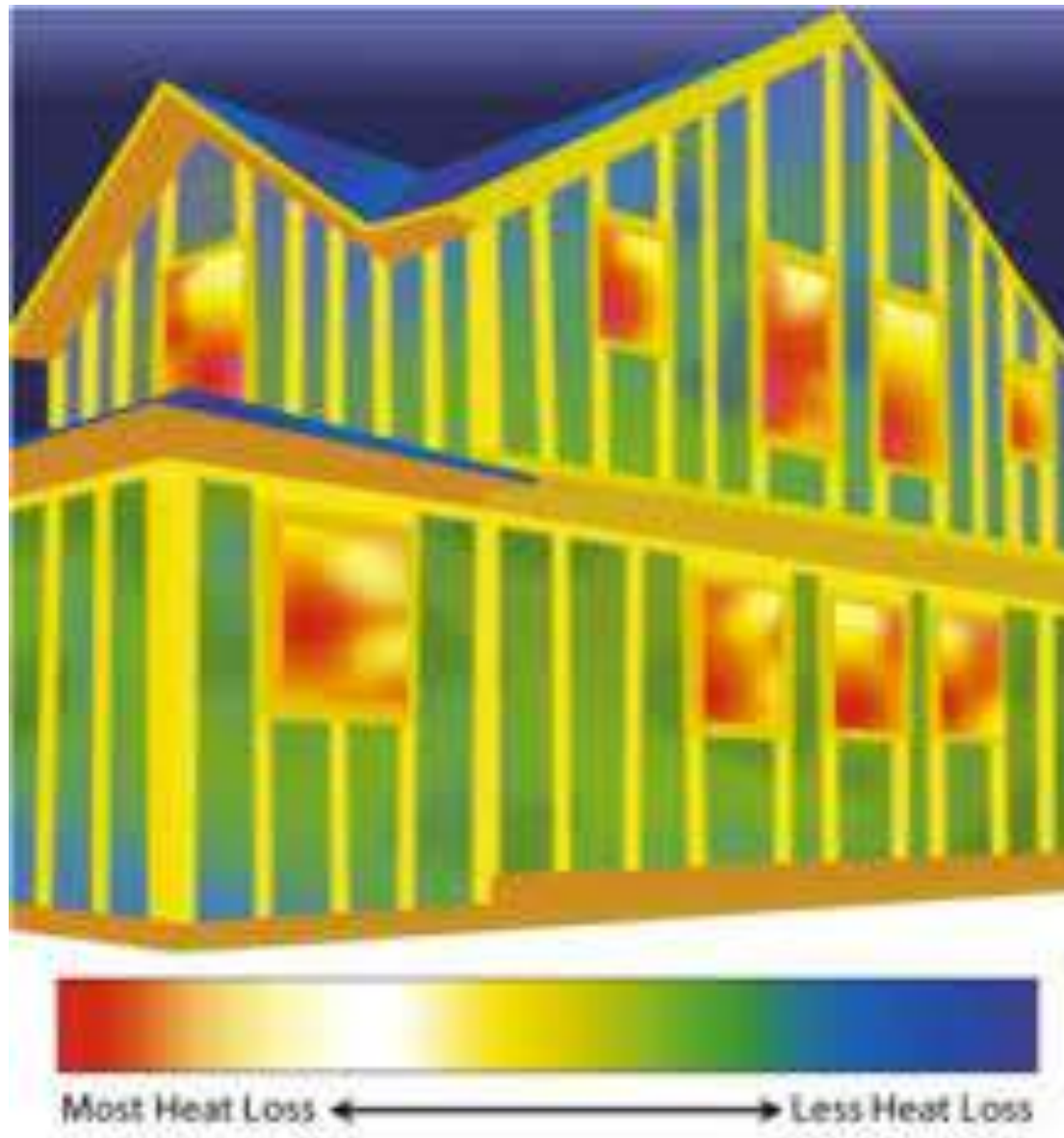


THERMAL BRIDGING





THERMAL BRIDGING





LINEAR TRANSMITTANCE VALUE (PSI-VALUE ψ)

heat flow rate in the steady state divided by length and by the temperature difference between the environments on either side of a thermal bridge

The heat loss will depend on the type of thermal bridge

Calculations are developed with numerical software packages

- BS EN ISO 6946 and BRE 443 for repeating thermal bridges
- BS EN ISO 10211, BRE IP 1/06 and BR 497 for non-repeating and geometrical thermal bridges

Software (e.g. THERM)



ACCREDITED CONSTRUCTION DETAILS

Developed to assist the construction industry achieve the performance standards required to demonstrate compliance with the energy efficiency requirements (Part L) of the Building Regulations.

Focus on the issues of insulation continuity (minimising cold bridging) and airtightness

Section 1 - Introduction and general theory

Section 2 - Indicative detail drawings:

- Steel frame details
- Timber frame details
- Masonry cavity wall insulation details
- Masonry internal wall insulation details
- Masonry external wall insulation details

https://www.planningportal.co.uk/info/200135/approved_documents/74/part_l_-_conservation_of_fuel_and_power/6



WHEN CALCULATING THERMAL MODEL

Only consideration for new buildings.

Reasonable provision for thermal bridges. Any of the following:

1. Use of linear thermal transmittance values from Approved Construction Details
2. Use construction details with linear thermal transmittance values calculated according BR 497
3. Use linear thermal transmittance values by default in Table K1 in SAP 2012
4. Use of conservative y -value default of $0.15 \text{ W/m}^2\text{K}$