

What is Thermal Bridging?

In the pursuit of energy efficiency and sustainable design, understanding the concept of thermal bridging is crucial. Buildings are responsible for a substantial portion of global energy consumption, and properly comprehending thermal bridging is an important step towards enhancing energy efficiency.

Thermal bridging, also referred to as a cold bridge or heat bridge, refers to areas within a building envelope where heat can flow more easily, across conductive building materials, bypassing insulation materials. It occurs when a component with higher thermal conductivity disrupts the continuity of thermal insulation, creating a pathway for heat transfer. These bridges provide a path of least resistance for heat transfer, resulting in localised heat loss or gain, reduced energy efficiency, and creating potential condensation issues.

Thermal bridging plays a vital role in determining a structure's overall energy efficiency. In this blog post, we will explore causes and examples of thermal bridging, why it's important, and effective strategies to mitigate its effects in order to reduce impact on energy bills, and the environment.

Causes and examples of thermal bridging

Several factors contribute to the occurrence of thermal bridging in buildings. Common causes include the presence of structural elements such as steel beams or concrete slabs that conduct heat past insulation materials. Other examples of thermal bridges include window frames, balconies, parapets, brick shelf angles, and connections between different building components.

Differences in thermal conductivity

Some materials have a much higher thermal conductivity than others, meaning they create a path of least resistance. When these materials are in direct contact or create a bridge across the insulation layer, they facilitate the flow of heat. Examples include:

- Structural elements including concrete slabs, steel beams and metal studs
- Window frames made of metal which create localised areas of heat transfer, compromising the overall effectiveness of insulation
- Connections between building components such as walls and roofs, if not properly insulated

Penetrations and small elements

Even seemingly minor elements or penetrations in the building envelope can contribute to thermal bridging if they are not properly insulated. Examples include:

- Fasteners and brackets including screws and nails which can create localised areas of heat transfer as small elements can conduct heat more easily
- Electrical outlets and switches which can allow heat to bypass the insulation, leading to energy loss and potential cold spots
- Balconies and cantilevers which extend beyond the building envelopes can act as conduits for heat transfer

Why is combatting thermal bridging important for buildings?

Thermal bridging can have a detrimental impact on a building's overall energy performance. Addressing the causes of thermal bridging is essential in minimising energy loss and ensuring the optimal thermal performance of a building.

A structure with effective insulation but little thermal bridge planning can experience up to *30%-60% higher heat loss compared to a building with proper thermal bridging mitigation.
(*Morrison Hershfield)

Recognising this impact, many energy efficiency standards and regulations now include guidelines to address thermal bridging.

Through proper design, insulation techniques and attention-to-detail during the construction process, the detrimental effects of thermal bridging can be significantly reduced.

Thermal bridging significantly impacts a building's energy efficiency. By allowing heat to bypass insulation and creating localised areas of heat transfer, thermal bridging increases the overall heat loss or gain within a building. This leads to higher heating and cooling loads, resulting in increased energy consumption and therefore, higher utility bills.

Thermal bridging affects the overall performance of a building. When heat is allowed to escape or enter a building through thermal bridges, it can create ~~thermal~~ uncomfortable spaces for its occupants. Cold areas near thermal bridges can cause drafts and uneven temperatures. Addressing thermal bridging helps to maintain a consistent and comfortable indoor environment.

Thermal bridging can contribute to moisture-related problems within a building. When warm moist air encounters a cold surface created by a thermal bridge, condensation can occur. This condensation can lead to moisture accumulation, encouraging the growth of mold and potentially compromising the health of the occupants, as well as the building's structural integrity. Addressing thermal bridging helps to prevent moisture-related issues and ensures a healthier indoor environment.

Thermal bridging can impact the long-term durability of a building. Excessive heat loss or gain through thermal bridges can cause temperature fluctuations, which can affect the performance and lifespan of building materials. By minimising thermal bridging, the overall durability and longevity of a building can be improved.

Energy efficiency standards and building codes are increasingly recognising the importance of addressing thermal bridging. Many building codes and energy efficiency certifications

require the consideration and mitigation of thermal bridging in building design. Complying with these regulations not only ensures the energy efficiency of a building, but also facilitates compliance with sustainable building practices.

Strategies to mitigate thermal bridging

Various strategies can help mitigate the effects of thermal bridging. The selection of appropriate insulation materials and installation techniques is crucial. Continuity of insulation across building components and connections is essential to minimise heat transfer. Additionally, incorporating thermal breaks, like Armatherm's innovative insulating materials into structural connections, can interrupt the heat flow and create a much more efficient structure.

Advanced techniques and technologies

Advancements in building design and construction have introduced innovative techniques and technologies to tackle thermal bridging. These include the use of high-performance insulation materials, that can bear structural loading, and address thermal bridging in those difficult areas. Additionally, thermally broken window frames, improved building envelope design, and the application of thermal modelling tools can optimise energy performance.

Overall, thermal bridging is an imperative aspect of building design and energy efficiency. Understanding its causes, impact, and effective mitigation strategies is essential for architects, engineers, and builders committed to creating sustainable and energy-efficient structures. By addressing thermal bridging, we can reduce energy consumption, improve thermal comfort, and contribute to a more sustainable built environment.

To learn more about the effects of thermal bridging and Armatherm's thermal break materials, please contact Armatherm and the team by using the details on our [contact us page](#).