High Performance Buildings;

Solutions to Thermal Bridging

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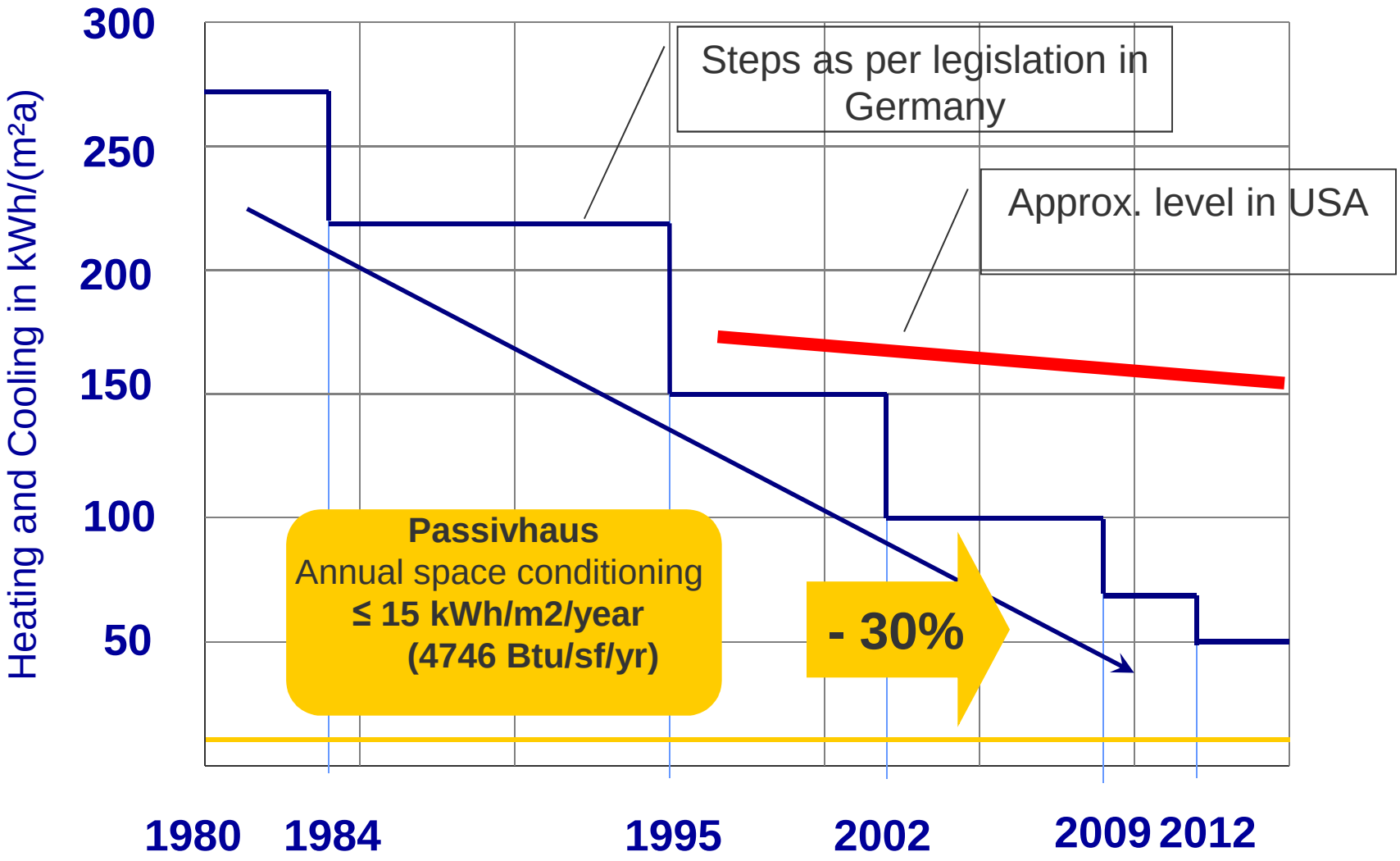
Schöck

Innovative Building Solutions

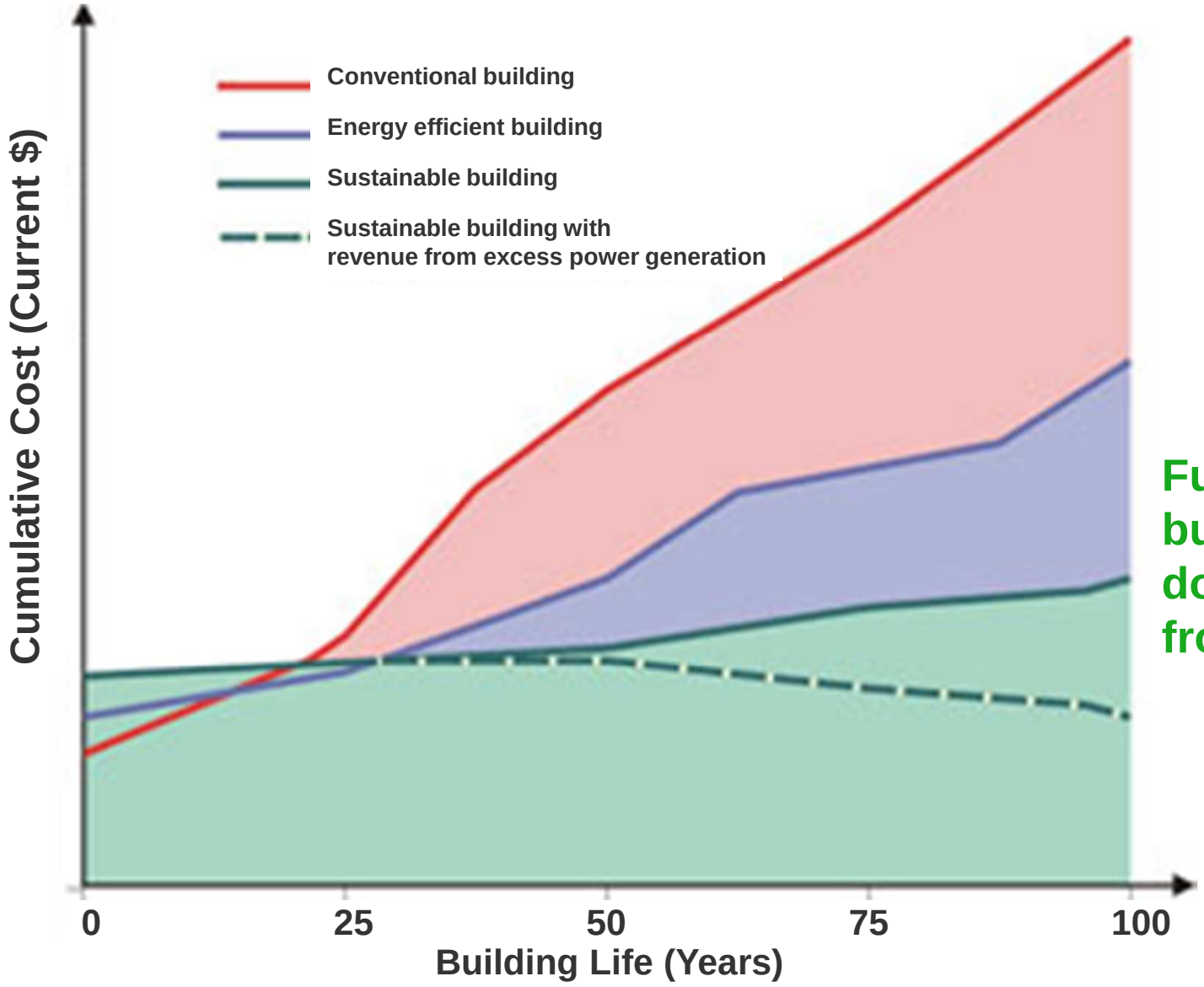
Status quo of energy design and indoor climate.

- Energy consumption
- Life cycle costs
- Comfort

Energy Consumption of Buildings USA vs. Germany



Comparison of Costs in Energy Efficient Building

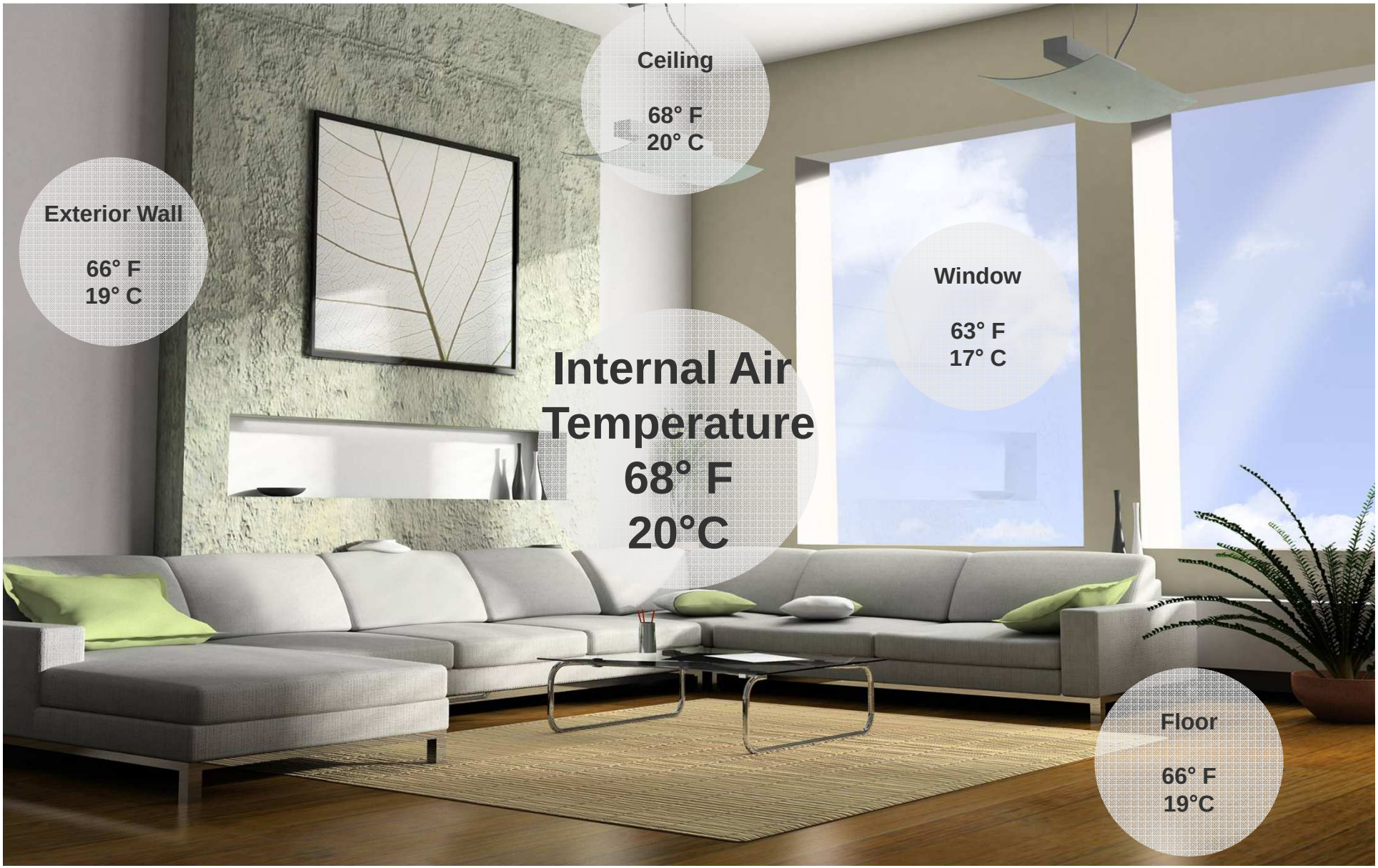


Future-Proof buildings by doing it right from the start!

Source: http://www.canadianarchitect.com/asf/perspectives_sustainibility/measures_of_sustainability/measures_of_sustainability_lca.htm

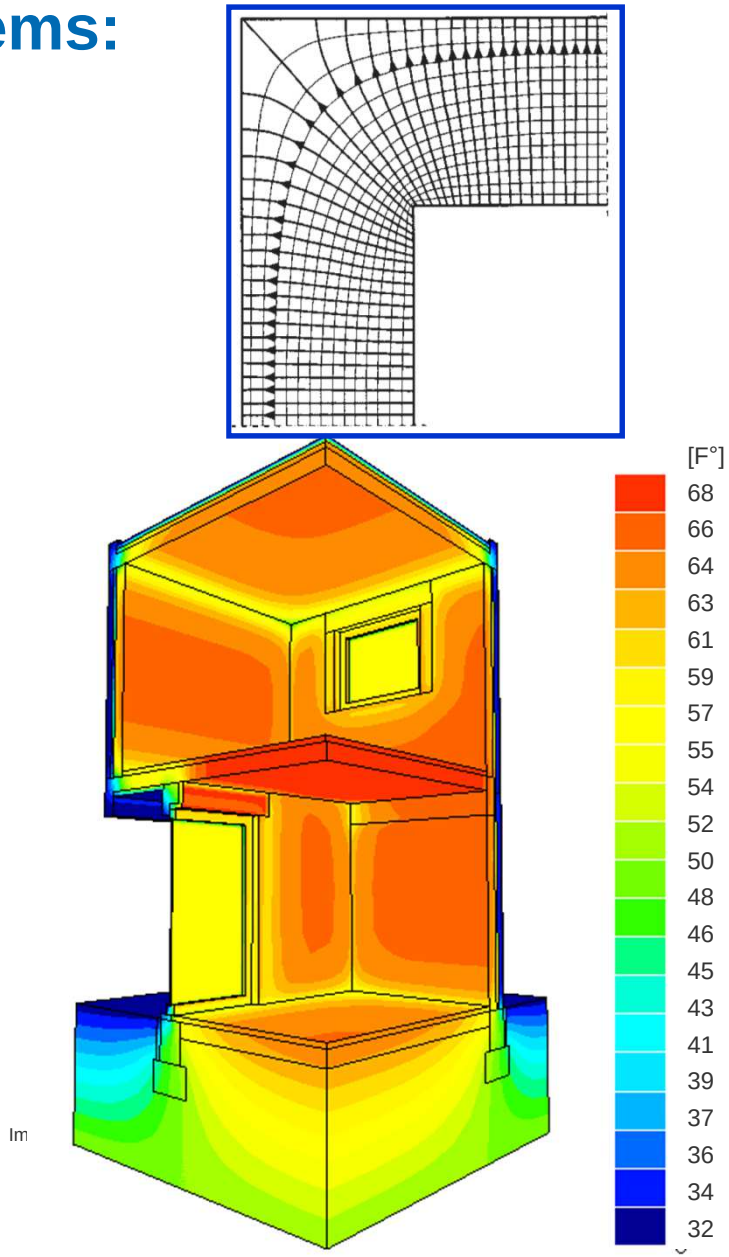
Air Temperature of Poorly Insulated House

Thermal Comfort in Well Insulated Space



Identifying Thermal Bridge Problems: Causes

- Thermal Bridge: local areas with a higher thermal heat loss and a lower inside surface temperature
- Common Causes of Thermal Bridges in Building Envelopes:
  - **Geometry**: at corners which provide additional heat flow paths
  - **Building envelope interfaces:** window sills, jambs and headers
  - **Penetration of the building envelope**: balcony supports, fixings and structural elements
  - **Structural interfaces:** floor to wall junctions and eaves
  - **Poor construction practice:** gaps in insulation or debris in wall cavity



Energy Loss in Buildings

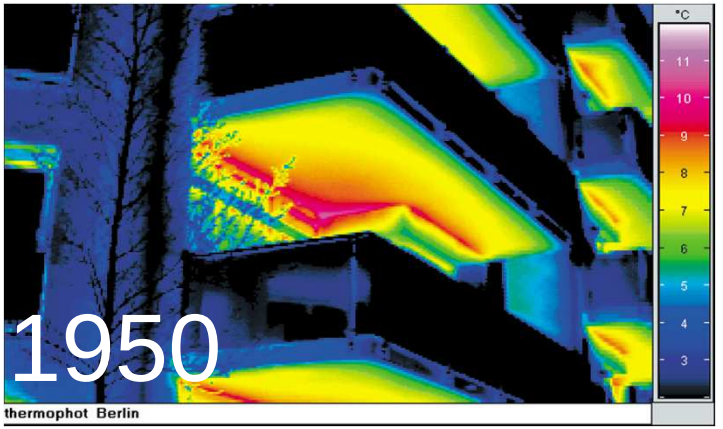
- Balconies, canopies, and cantilever parts can be responsible for substantial heat and energy loss and substantial R-value reduction of the wall assembly.

* In relation to space heating, depending on the construction

Cooling Fins in Building Design

A cooling fin is a surface that extends from an object to increase the rate of heat transfer to or from the environment by increasing convection.

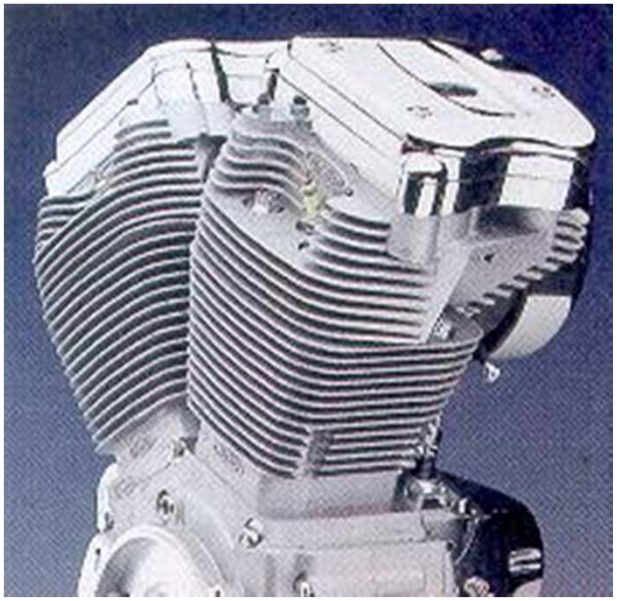
Thermography

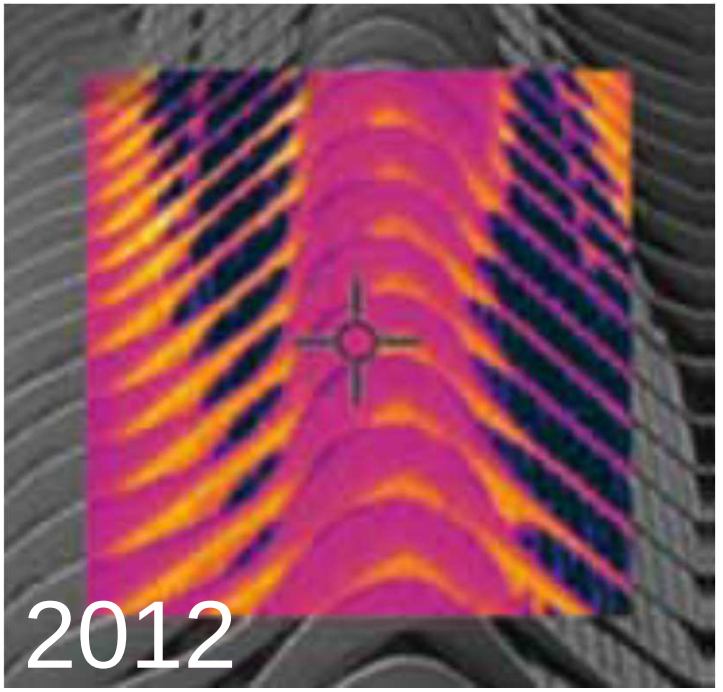


53°F
13°C

32°F
0°C

Balconies act like cooling fins on an engine!!





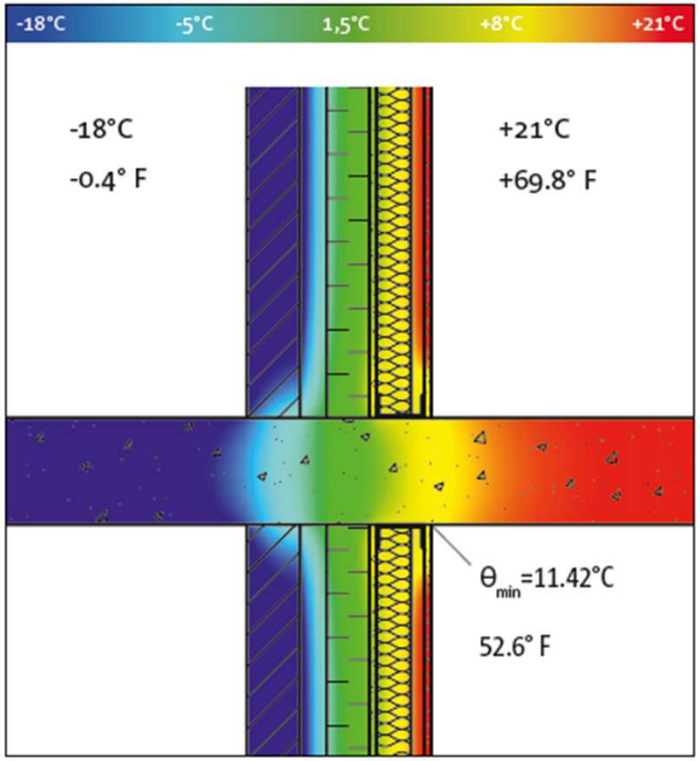
Mold Due to Condensation on Cold Spot

- Claims from Tenants
- Serious Health Problems
- Loss in Rent and Income
- Decrease in Property Market Value
- High Renovation Costs

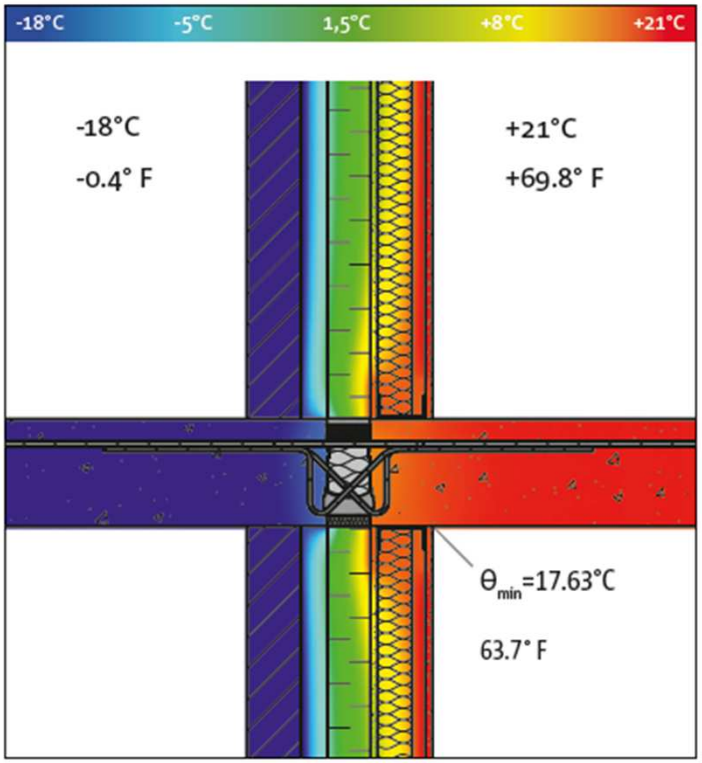
Mold is often hidden for years.

Comparison of thermal break solutions

Without thermal break

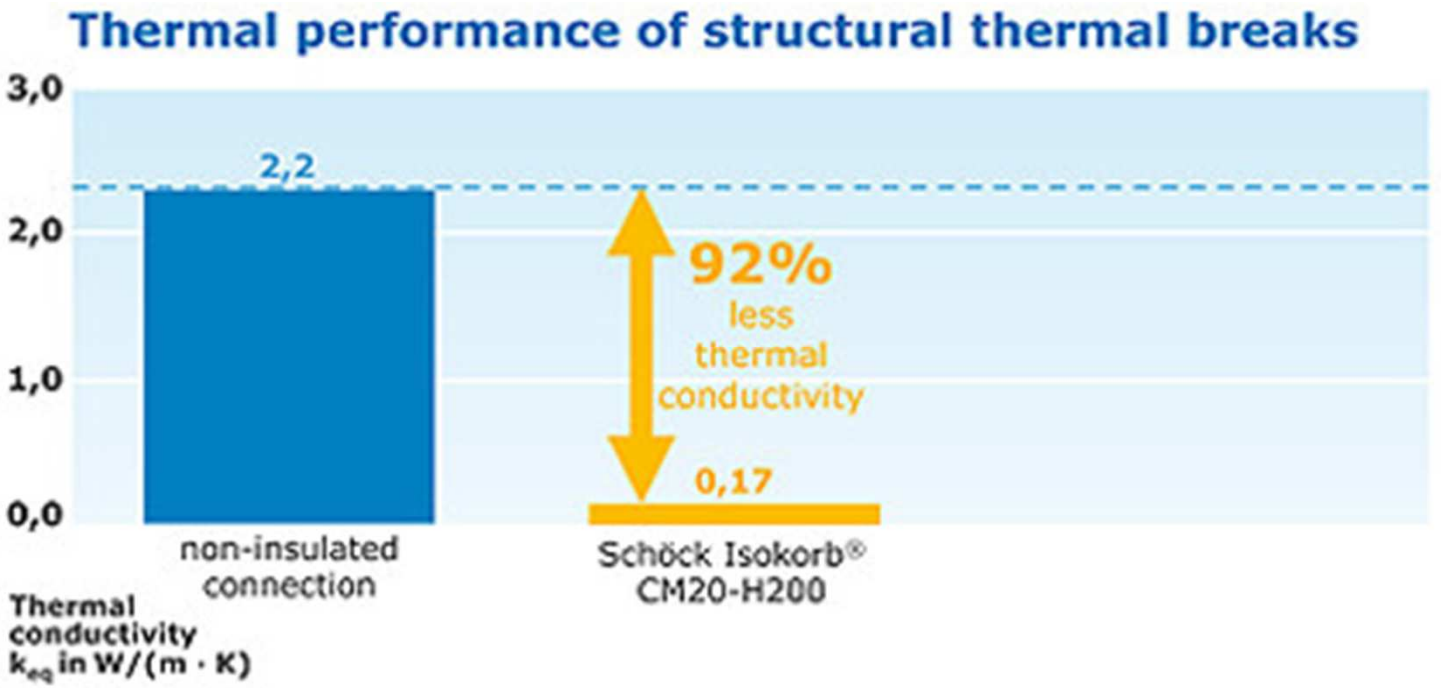


With thermal break



- Thermal breaks improve living comfort by increasing the surface temperatures by up to 11 degress fahrenheit
- Thermal breaks reduce the risk of condensation and mold

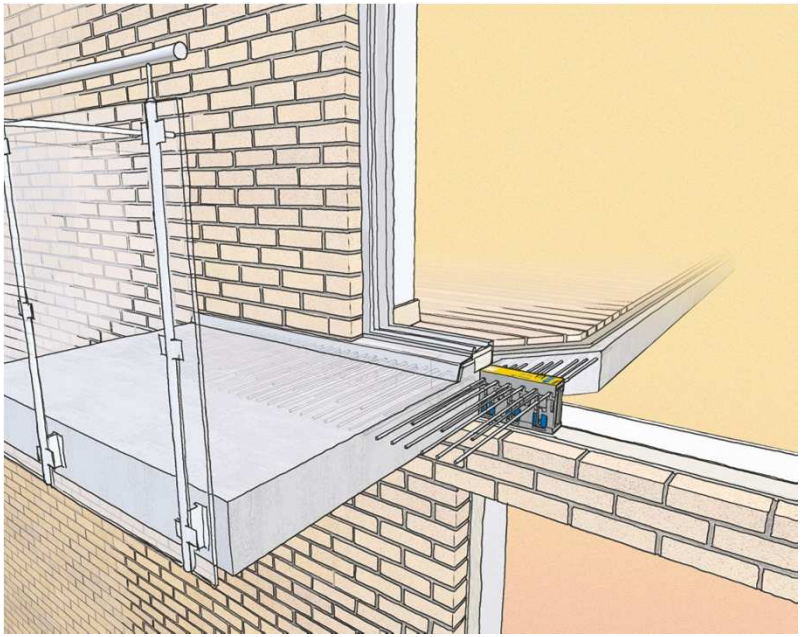
The thermal performance in comparison

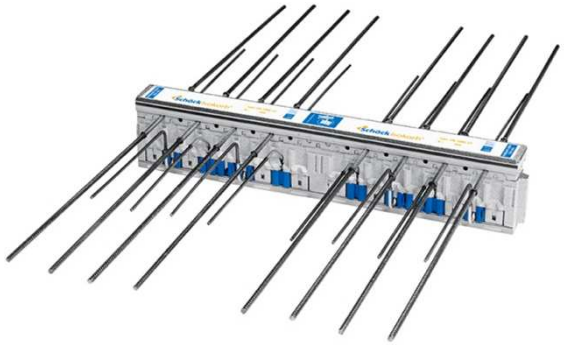


- The Structural design minimizes reinforcement cross-section with optimized load-bearing capacity.
- Compared to non-insulated connections, the Schöck Isokorb® element achieves a 90% reduction in thermal conductivity in the connection area for standard load-bearing scenarios.

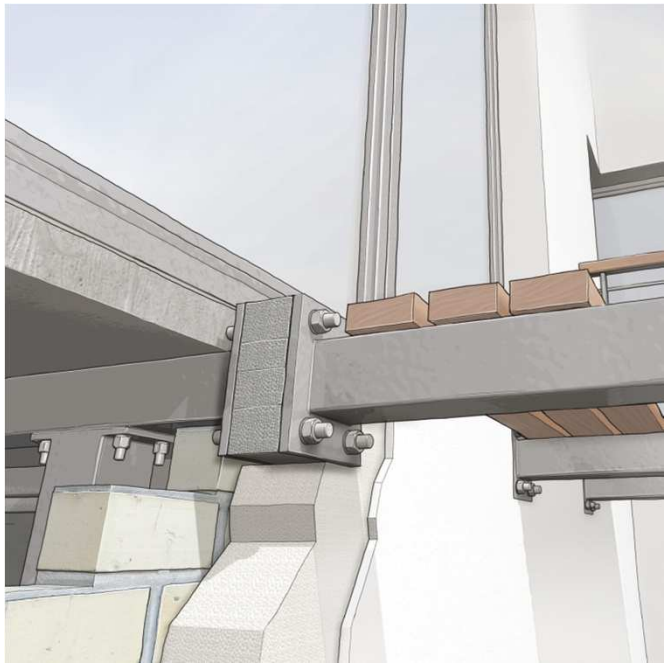
Thermal Break Solutions

Concrete-to-Concrete

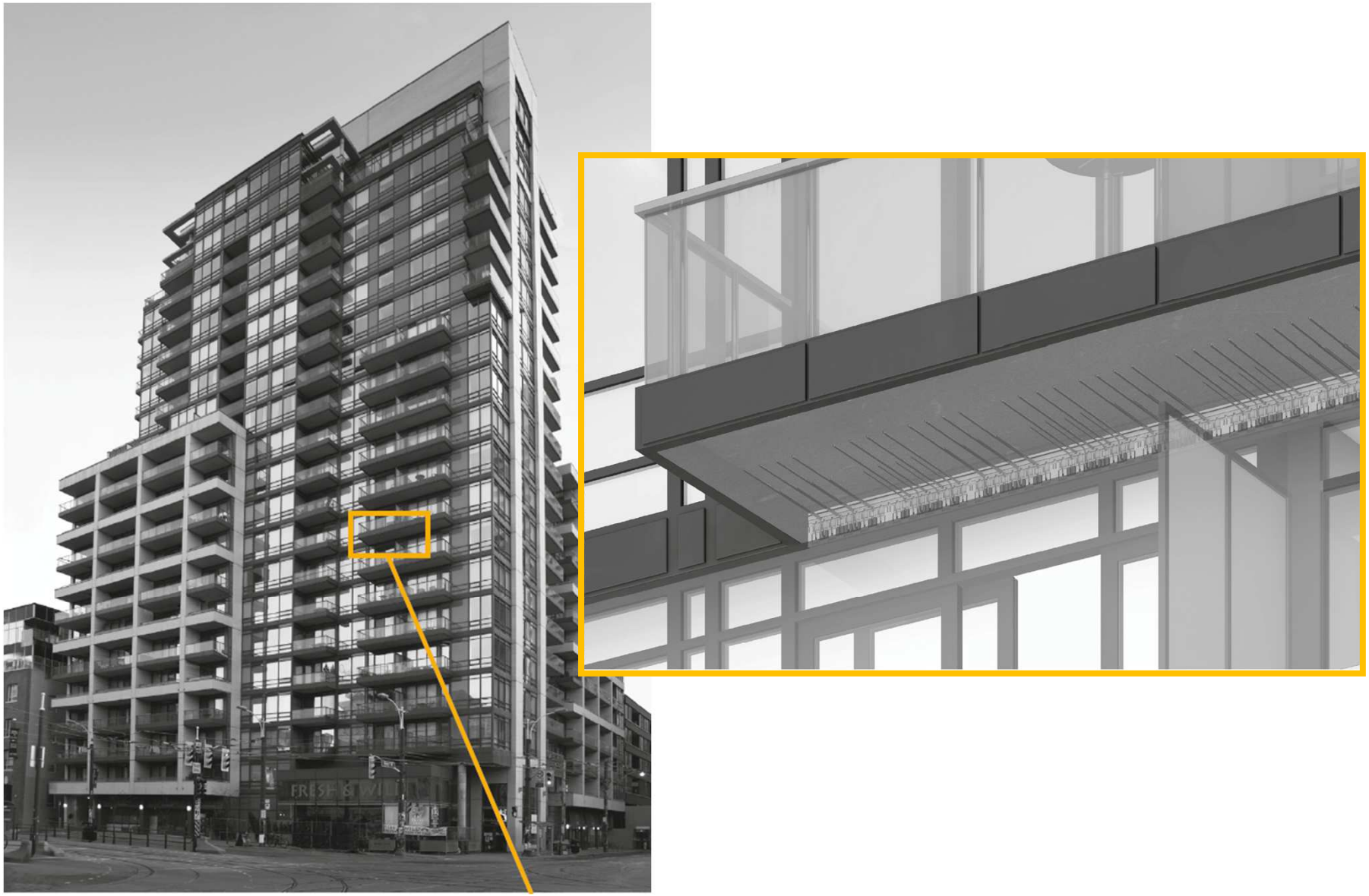




Steel-to-Steel

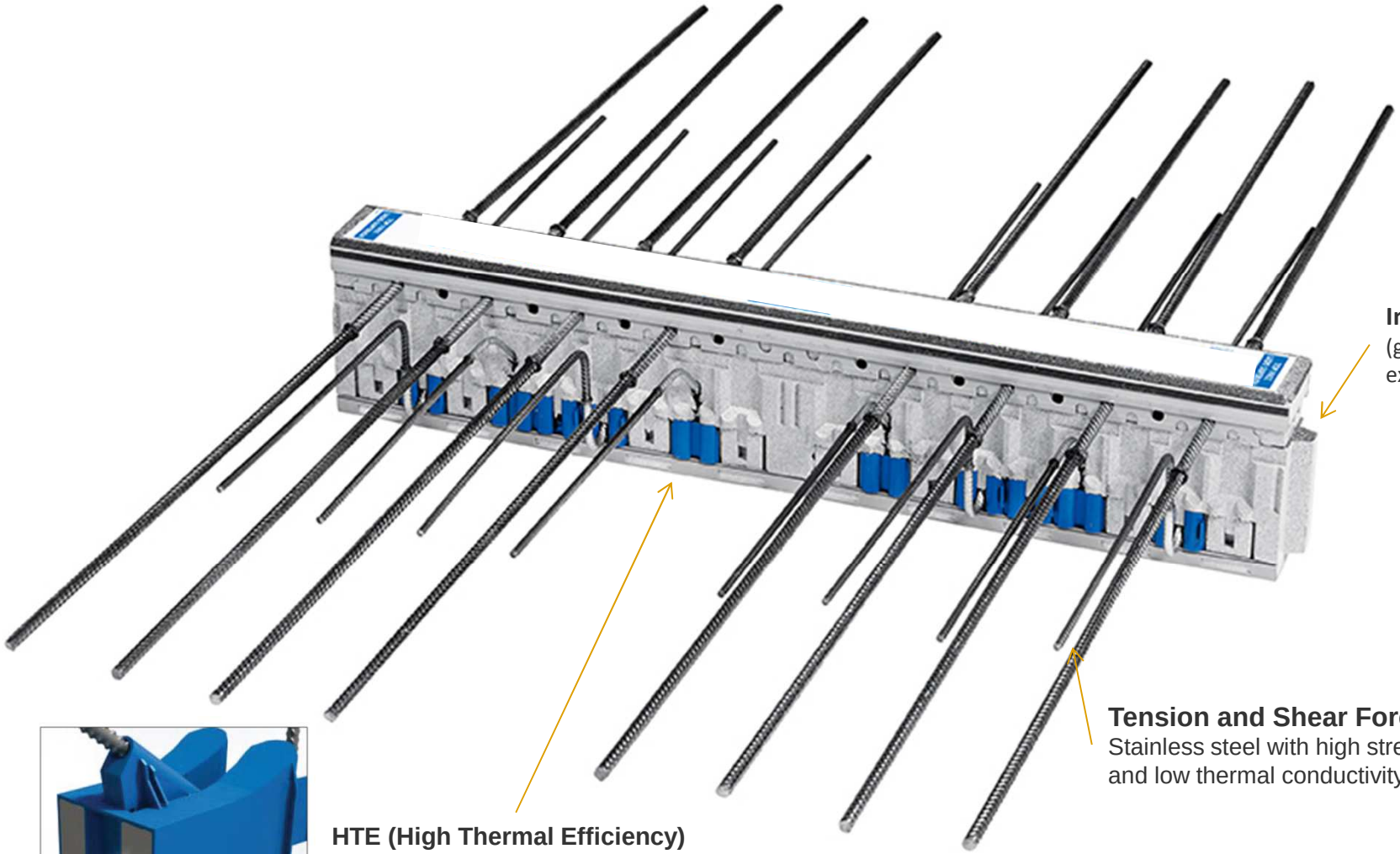


Integrating thermal breaks in modern Buildings



Concrete Slab Solution

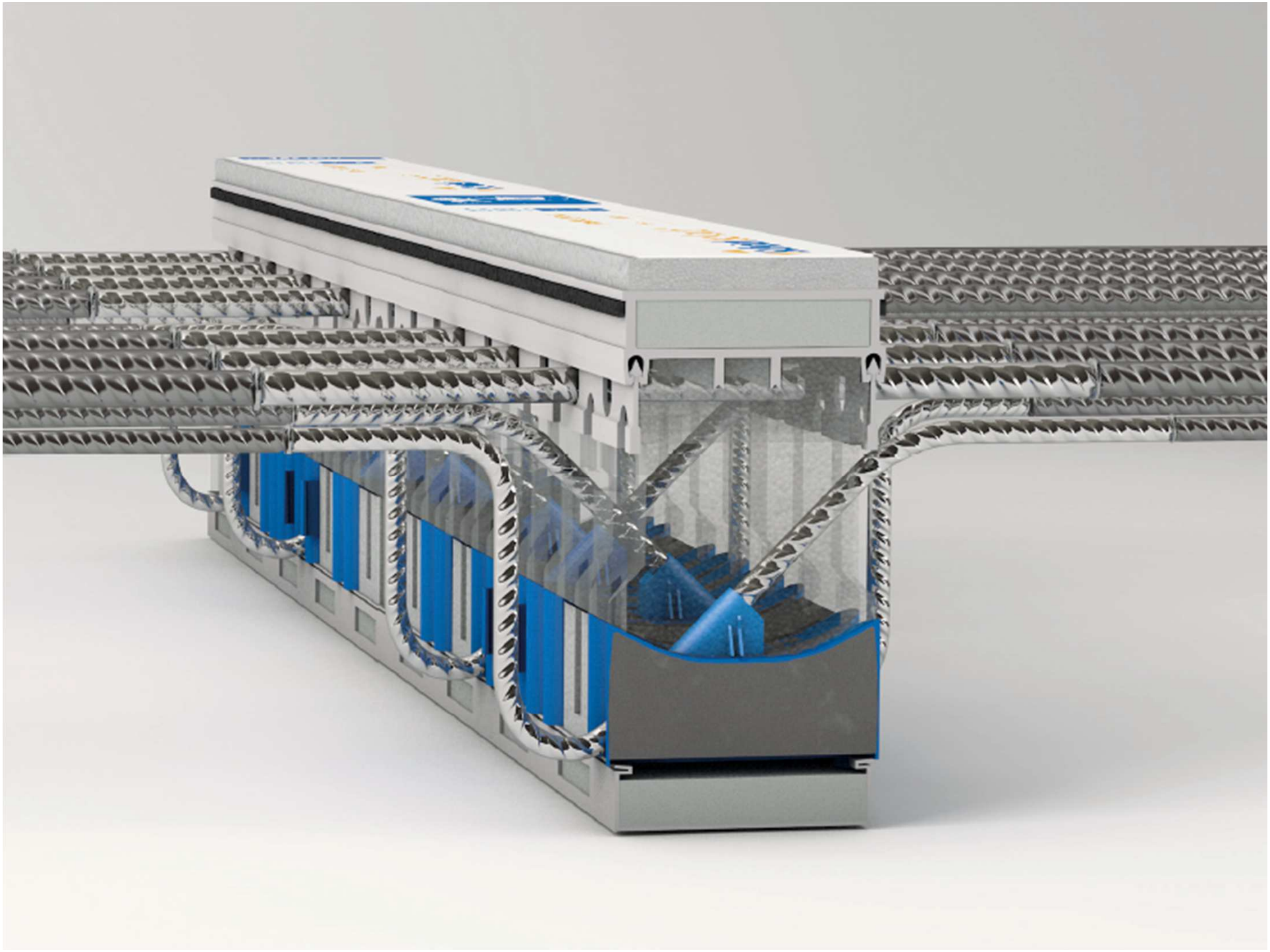
Thermal Break Element



Insulation Material
(granite-enhanced
expanded polystyrene)

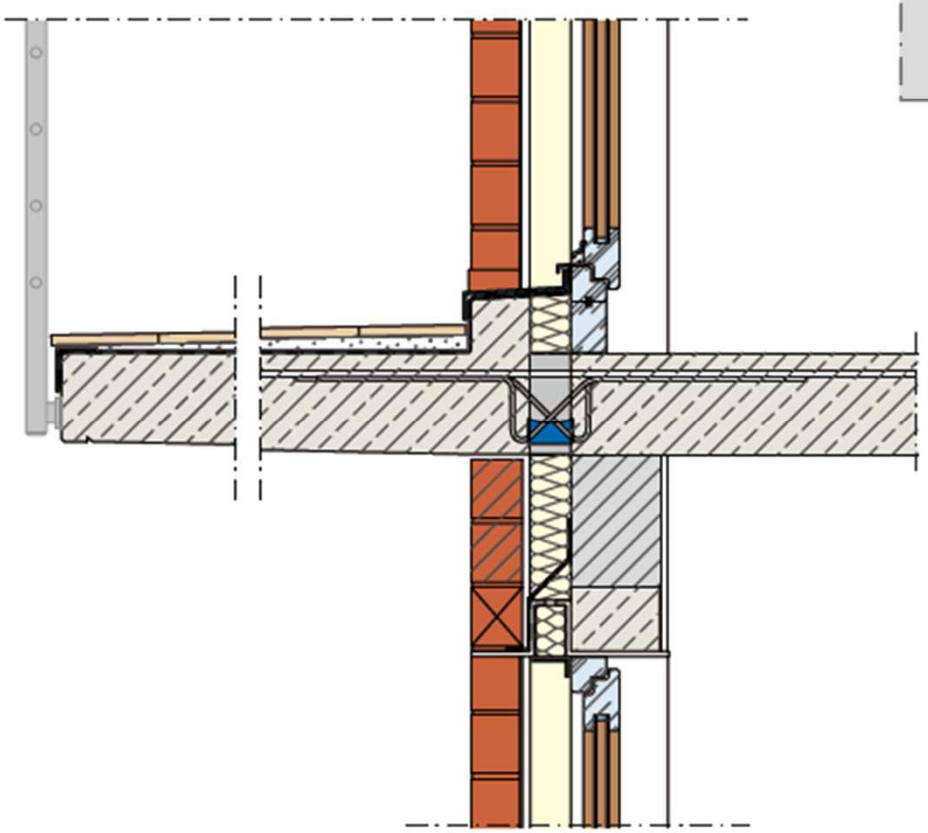
Tension and Shear Force Bars
Stainless steel with high strength
and low thermal conductivity.

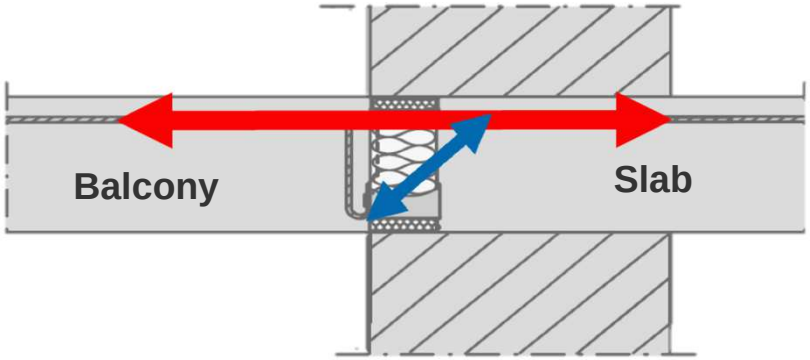
HTE (High Thermal Efficiency) Compression Module
Made from Steel fiber reinforced
ultra high performance concrete.



Concrete Slab Solution

Thermal Break Acts as a Control Joint



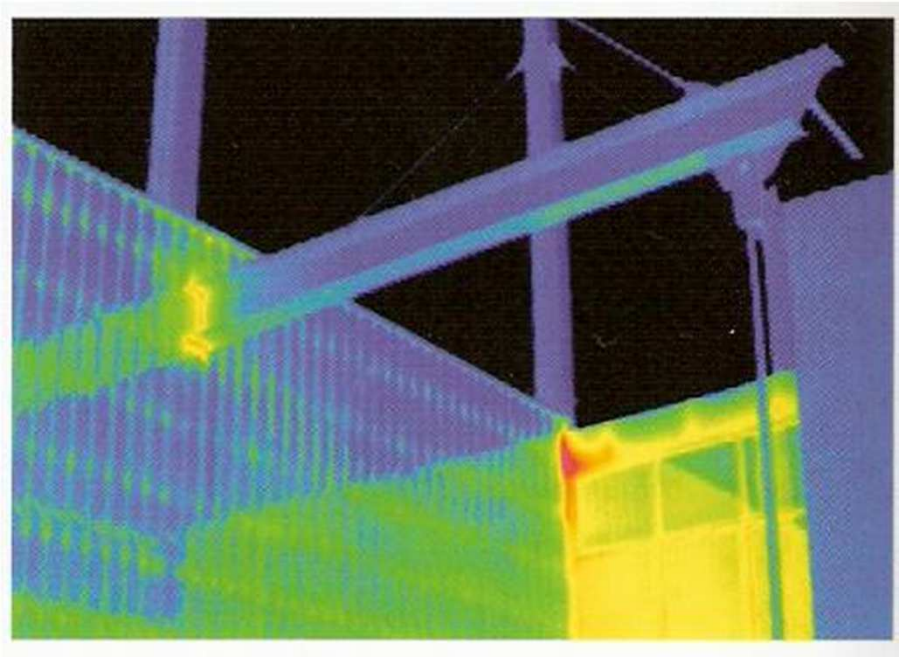


- Bending moment split in tension and compression forces.
- Vertical forces are transferred by the shear force bars.
- Stresses can be taken by a thermal break which acts like an control joint at the same time.

Thermal Break Technology

Onsite Installation of Concrete-to-Concrete Thermal Break

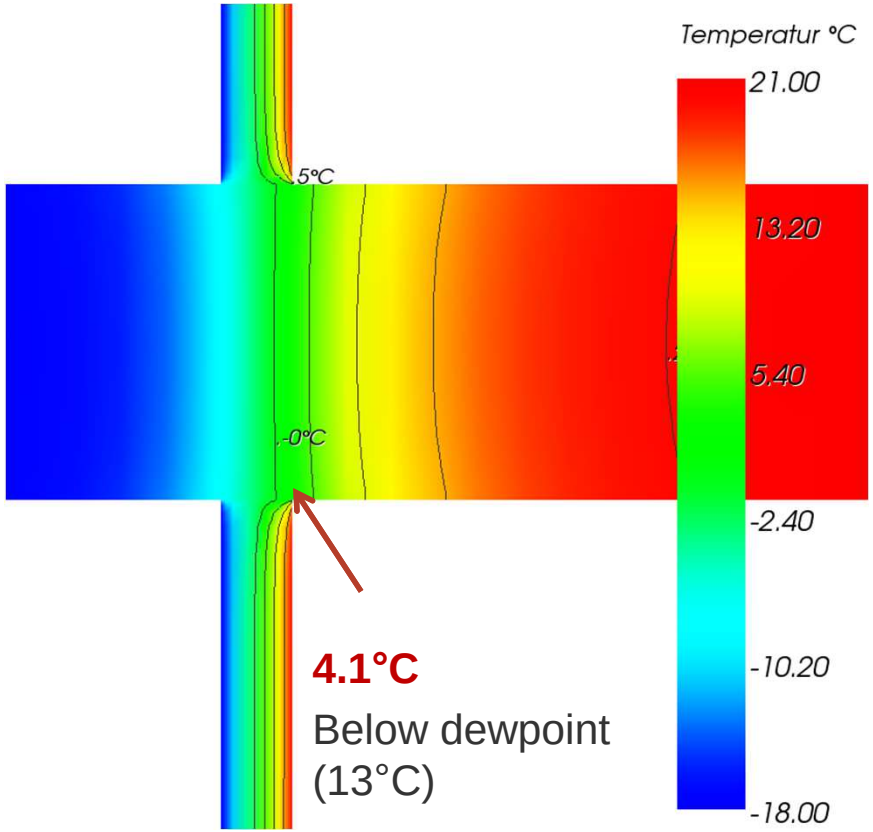
Steel-to-Steel Thermal Break Technology



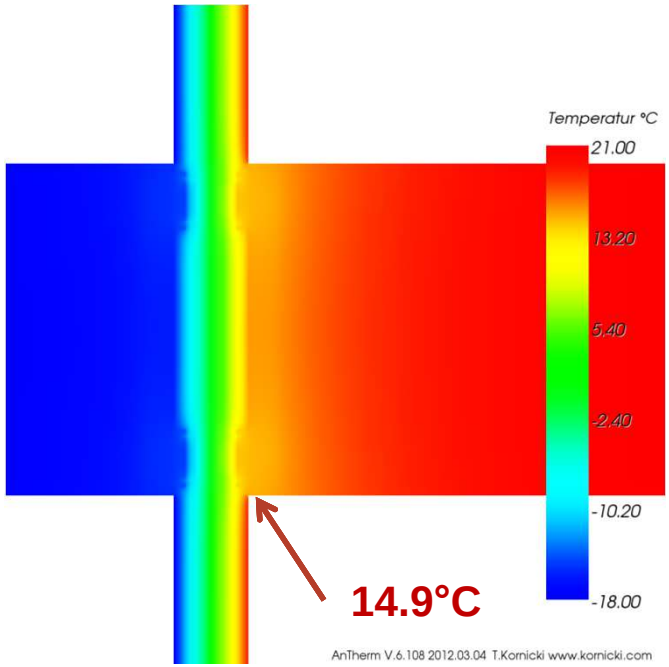
Comparison of thermal performance

- In terms of minimum surface temperatures

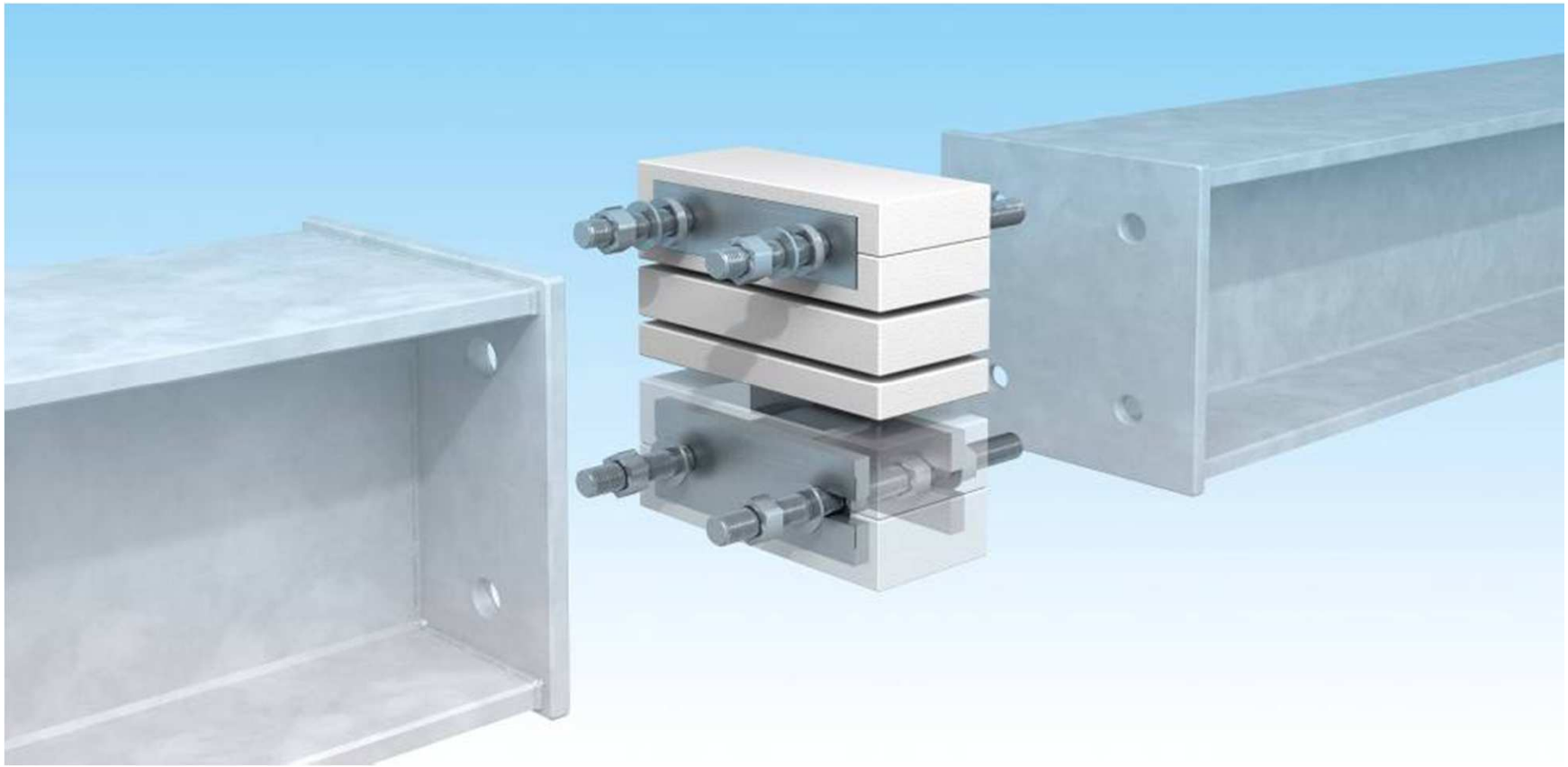
Without thermal breaks



With thermal breaks



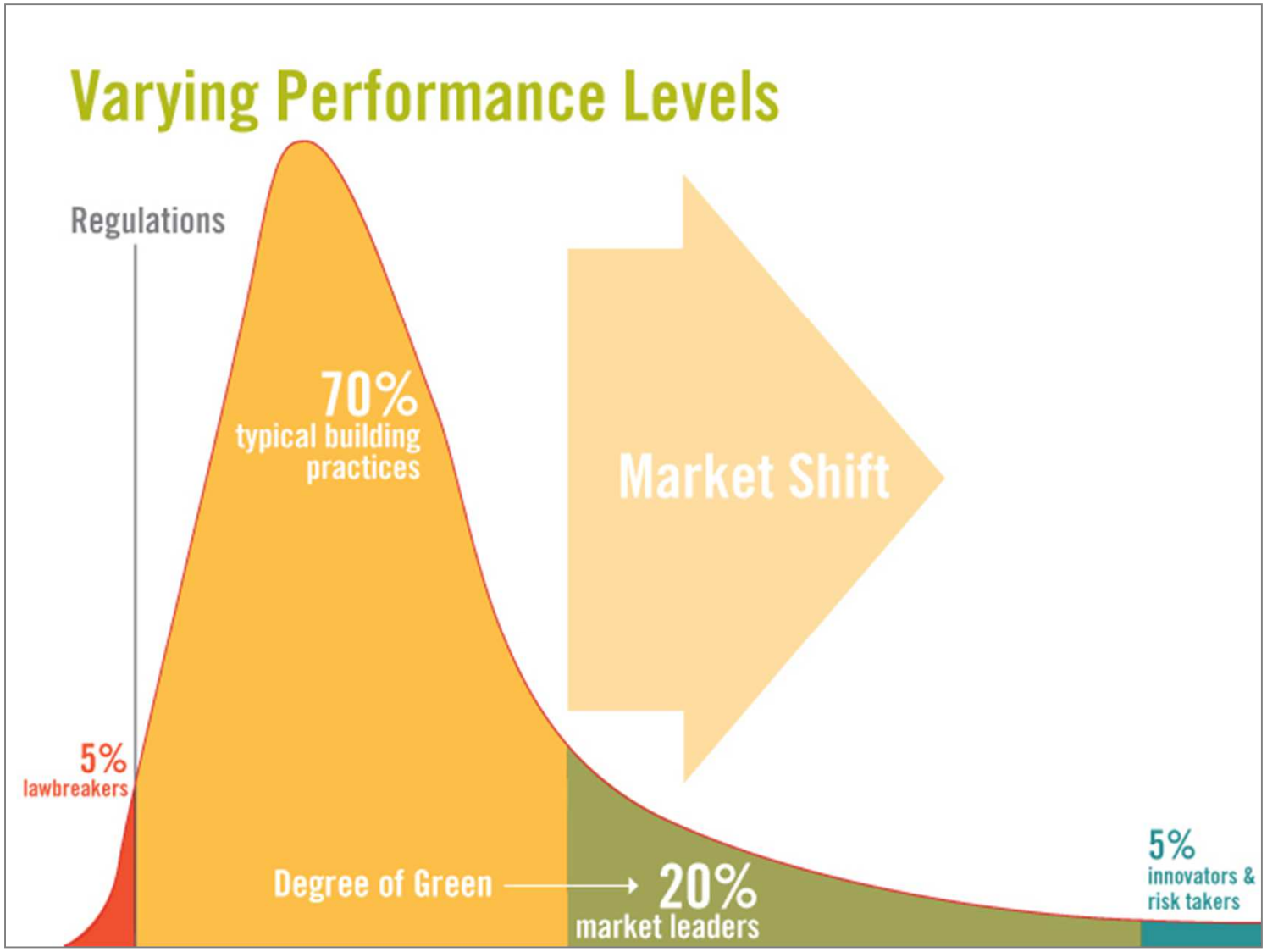
Steel-to-Steel Thermal Break Solution



Steel-to-Steel Thermal Break Canopy

Installation of Steel-to-Steel Thermal Break
R-value between 2-5

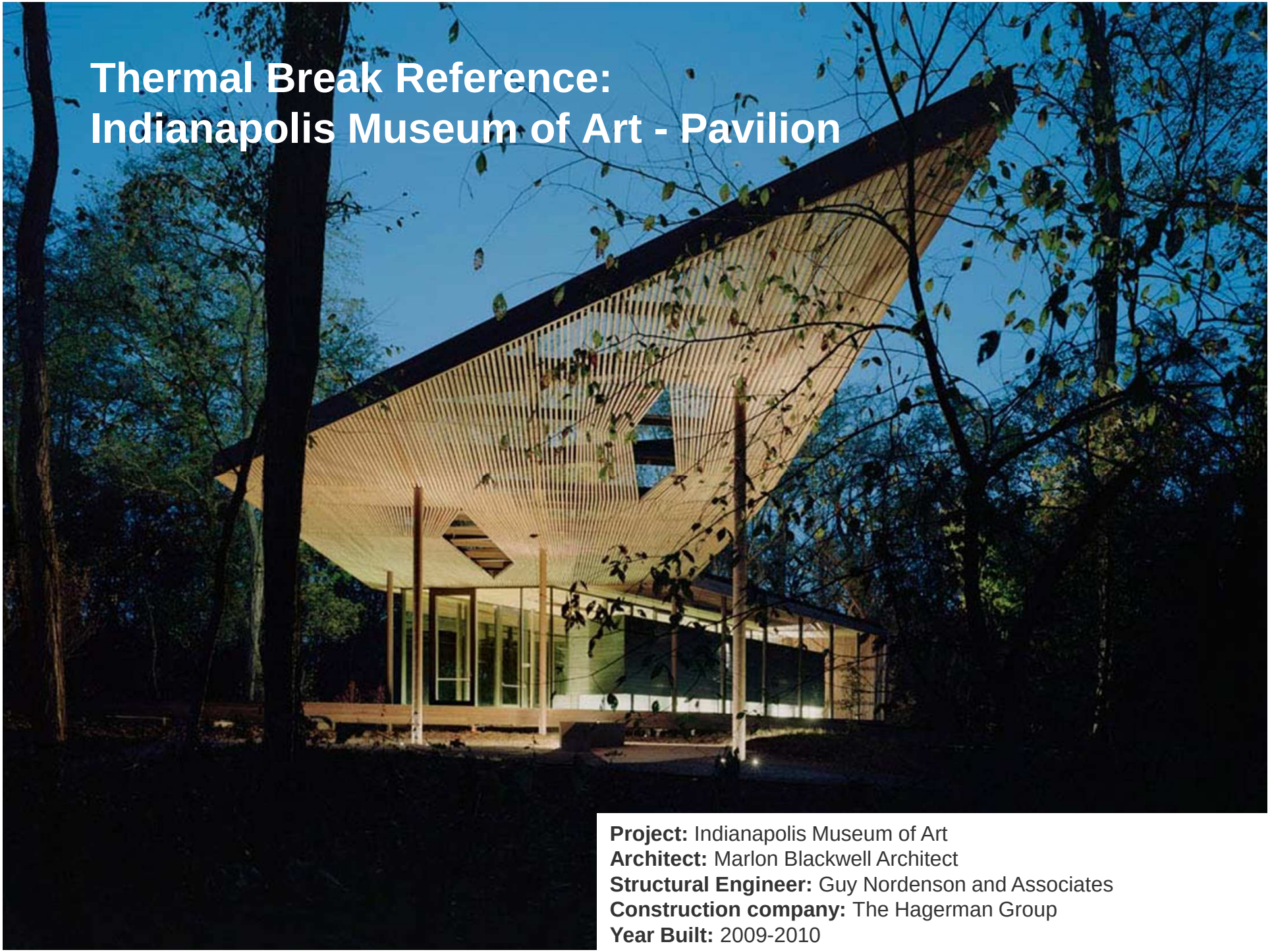
How do your Buildings Perform?



Source: USGBC Green Homes Presentation

References of Thermal Break Technology

Thermal Break Reference:
Indianapolis Museum of Art - Pavilion

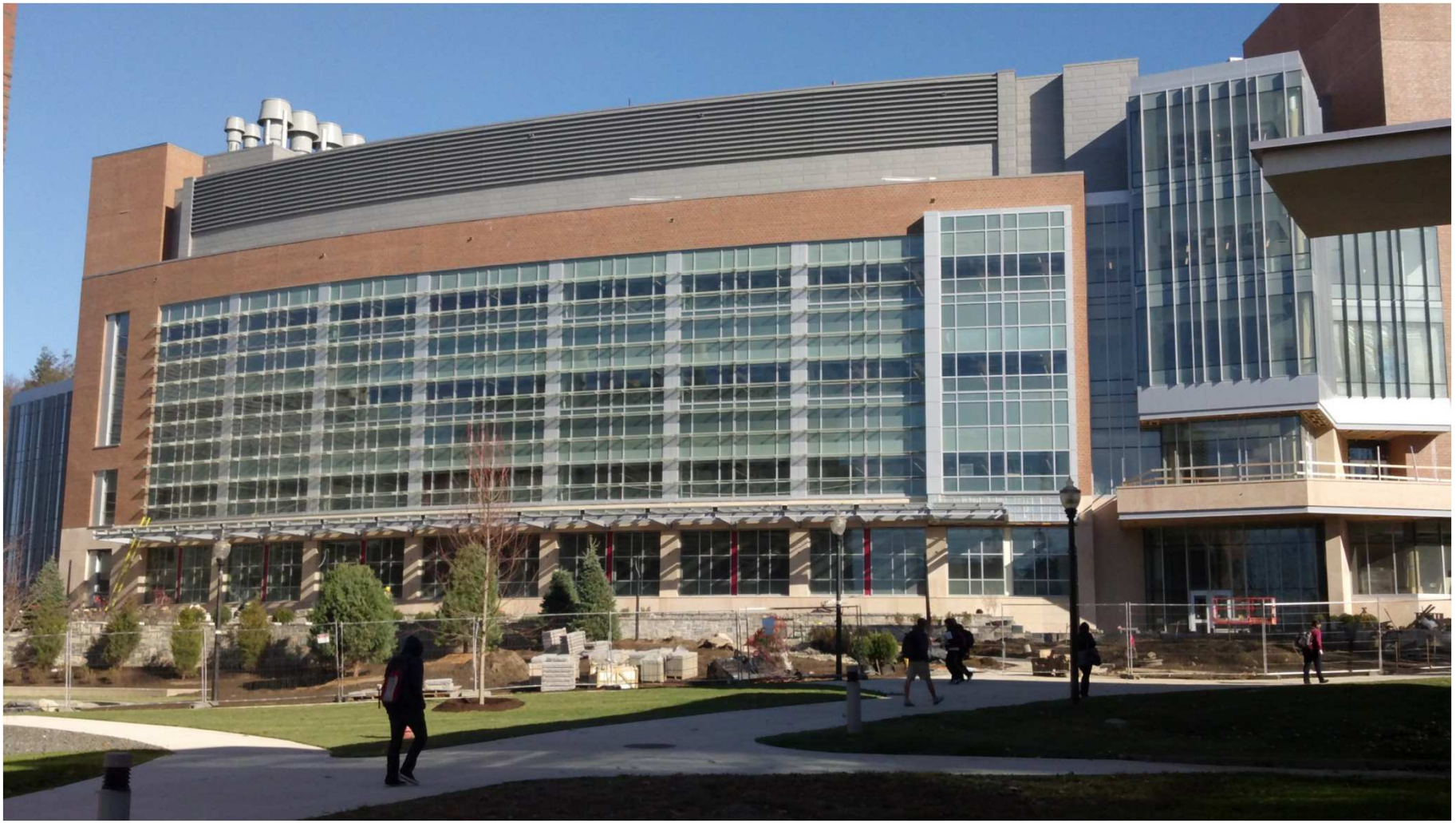


Project: Indianapolis Museum of Art
Architect: Marlon Blackwell Architect
Structural Engineer: Guy Nordenson and Associates
Construction company: The Hagerman Group
Year Built: 2009-2010

Thermal Break Reference:
Indianapolis Museum of Art - Pavilion

University of Massachusetts

New Laboratory Science Building



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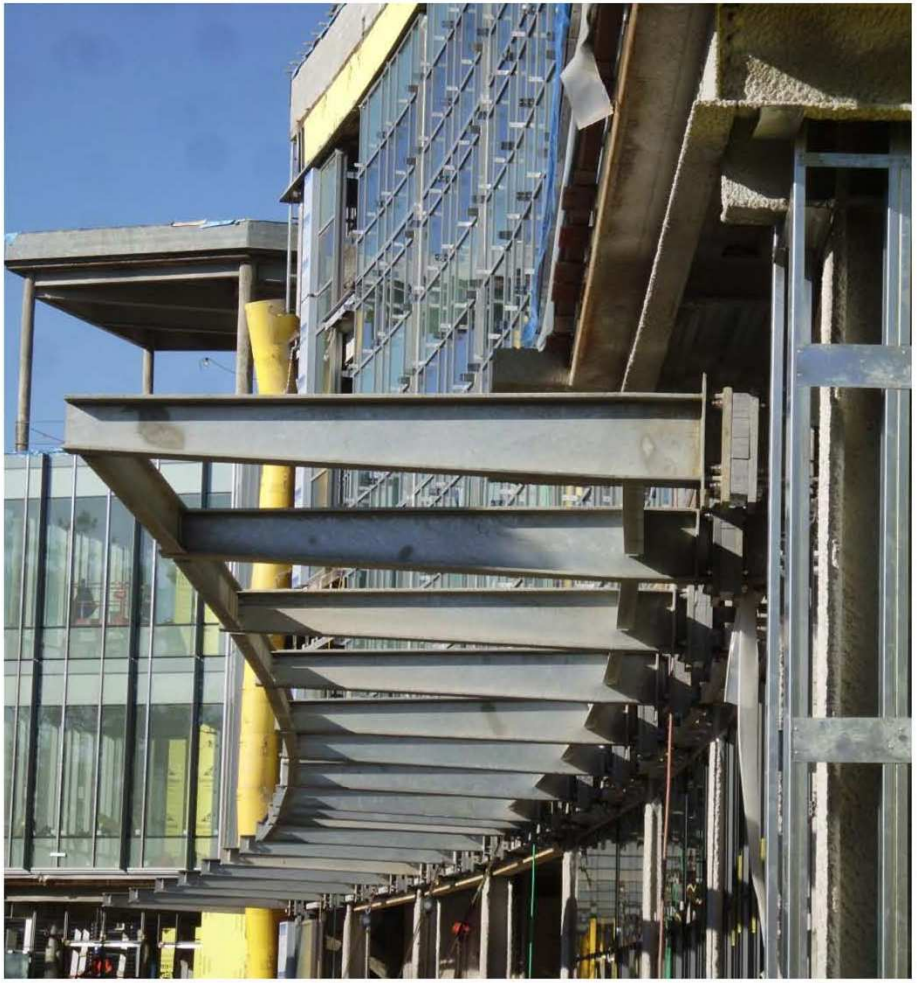
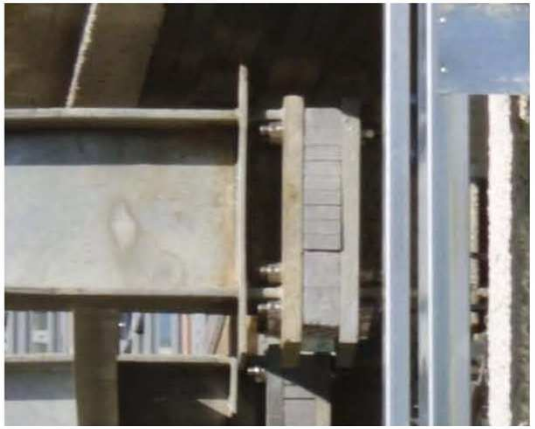
University of Massachusetts

New Laboratory Science Building





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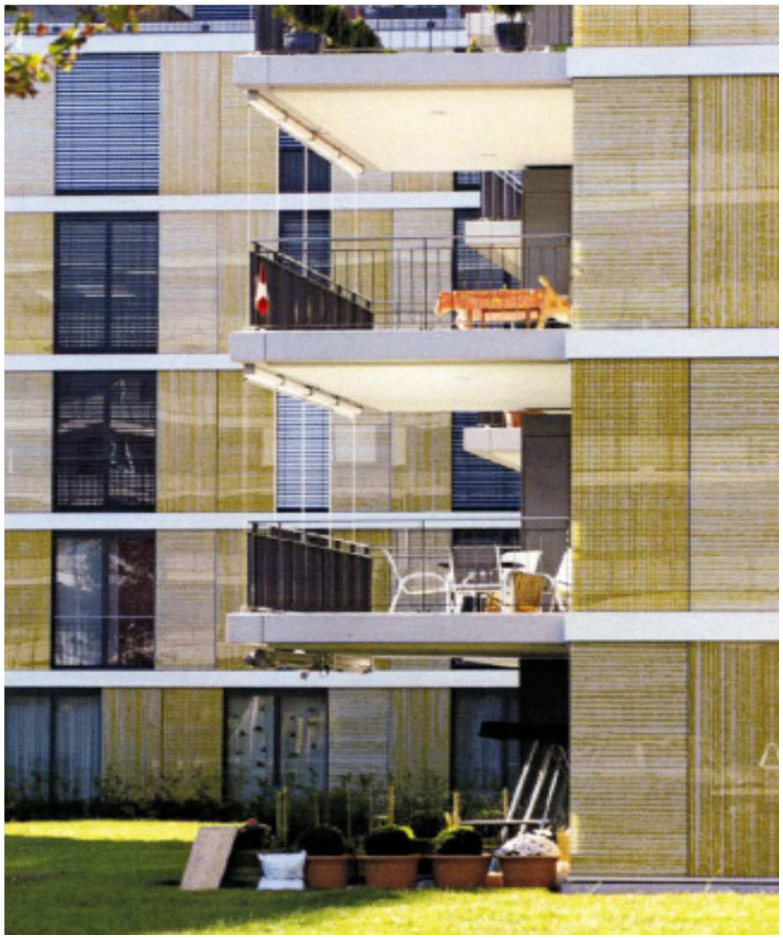
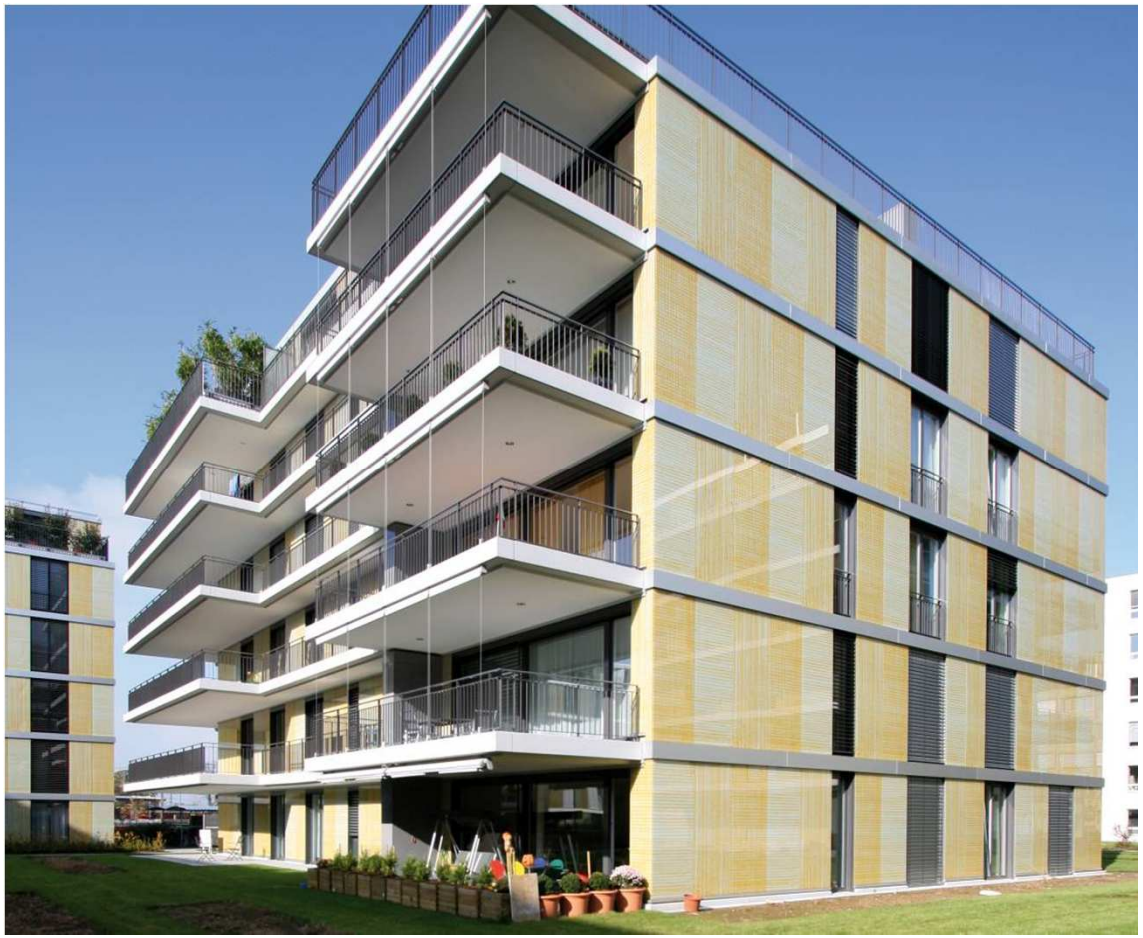
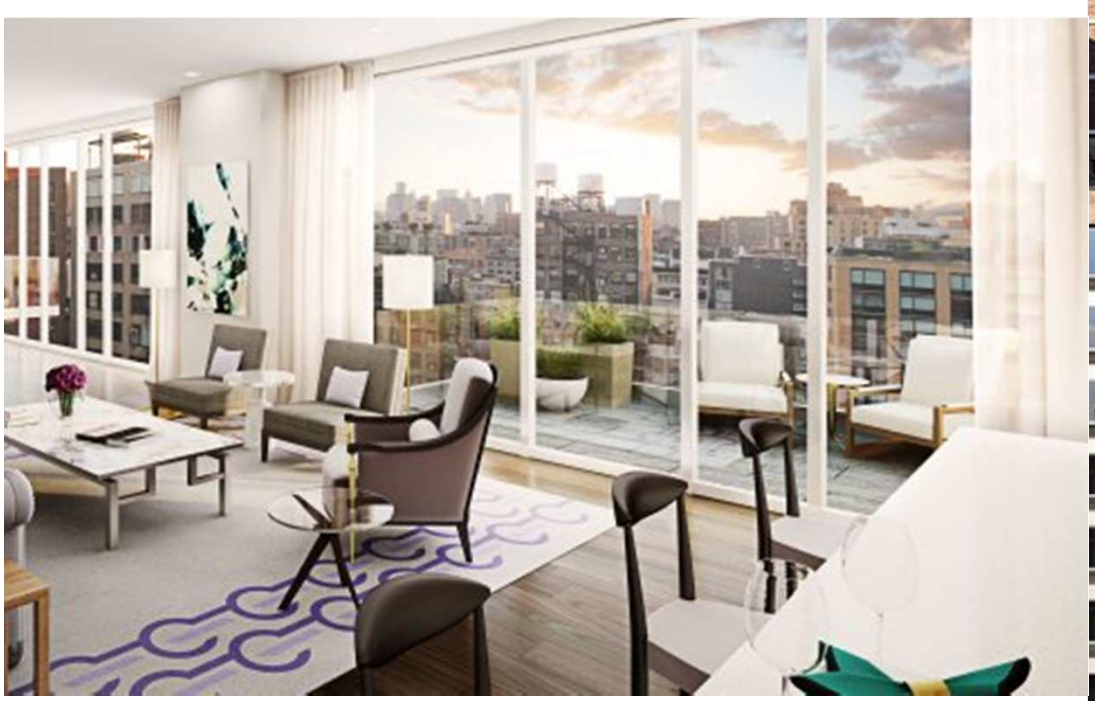
Innovative Design and high thermal Performance

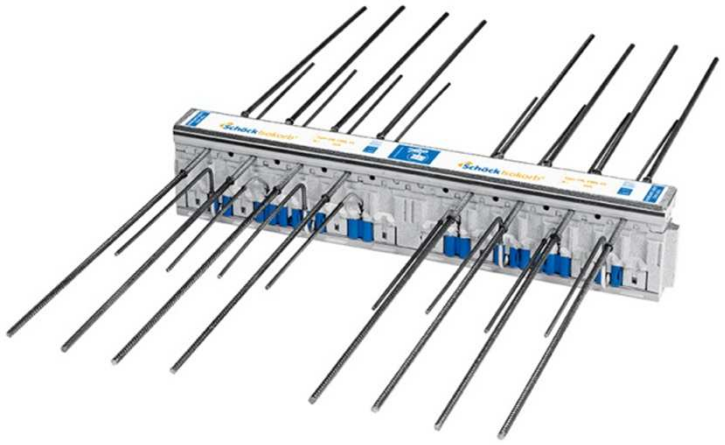




Balcony Example - Vienna Social Housing

Chelsea Green – NYC





Thermal Break Technology: Summary

- Increases Comfort in the Building
- No Condensation, Therefore No Mold
- Energy Savings
- Increase Market Value of Building
- Contributes to Obtaining LEED Credits
- Technology Proven in Market Over 25 Years

Questions

- Comments, questions……