

Concrete Balconies: A Comparison of Thermal Performance and Whole Building Energy Impact

Executive Summary of Report by Morrison Hershfield:



Report No. 5120962.00
Thermal and Whole Building Energy Performance
Of Thermal Break Technology for Concrete Balconies
in High-Rise Multi-Unit Residential Buildings

Executive Summary

Balconies are a necessary feature for high-rise residential buildings, maximizing outdoor living space. The most common method of design is an extended concrete slab through the building envelope. These penetrations represent the most critical thermal bridges, resulting in significant energy loss, condensation and building degradation.

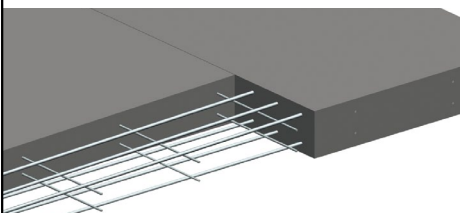
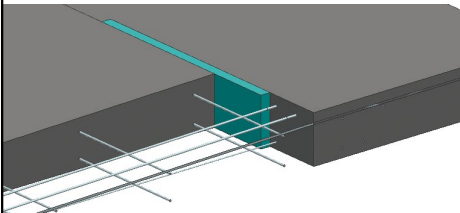
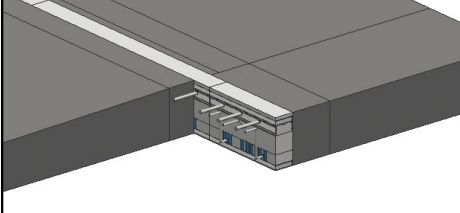
Design considerations regarding the appropriate method for balcony connections can be complicated because the thermal resistant properties of the entire wall are affected by the window details and wall insulation.

We are often asked to compare the impact of various balcony solutions on thermal transmittance, interior surface temperatures, overall R-values and whole building energy consumption. To answer these questions we

partnered with Morrison Hershfield, a leading building envelope specialist, to examine the performance of various balcony designs in a typical high-rise residential for a cold climate (ASHRAE climate zone 6), using common construction methods and materials. The study compares the performance between conventional untreated concrete slab extension, site solutions with intermittent insulation placed between un-separated concrete connections, and structural thermal break assemblies from Schöck Isokorb®. The whole building energy analysis was completed using EnergyPlus on a model building with 422 units over 32 floors with 3.5 % exposed cantilever concrete slab area. Included in this executive summary is a review of the results.

Download the full report:
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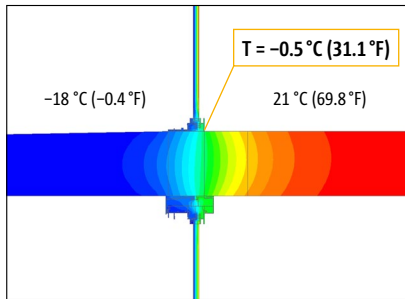


Key Findings						
Slab Scenario	U-value of Balcony Slab Area W/m ² K (Btu/ hr ft ² °F)	Reduction of Heat Loss	Coldest Concrete Temperature ¹⁾ [°C]	Meets Design Criteria With Regard to Condensation Resistance ²⁾	Meets Code ³⁾ [SB-10]	Heat Energy Savings
Continuous Slab (Conventional solution) 	4.88 (0.859)	N/A	-0.5 °C (31.1 °F)	No ✗	No ✗	N/A
Slab with intermittent concrete (Site solution) 	3.86 (0.680)	21%	1.5 °C (34.7 °F)	No ✗	No ✗	2.0%
Slab with Isokorb (Schöck solution) 	1.21 (0.213)	75%	7.0 °C (44.6 °F)	Yes ✓	Yes ✓	7.3%
¹⁾ at design temperatures of -18 °C (-0.4 °F) Exterior and 21 °C (69.8 °F) Interior (close to 2009 ASHRAE Handbook-Fundamentals) ²⁾ temperature greater than the dewpoint of interior air 5 °C (41 °F) at RH 35% and 21 °C (69.8 °F) ³⁾ Energy Efficiency Supplement (SB-10) of the Ontario Building Code requires to exceed by not less than 5 % the energy efficiency levels attained by conforming to the ASHRAE 90.1-2010						

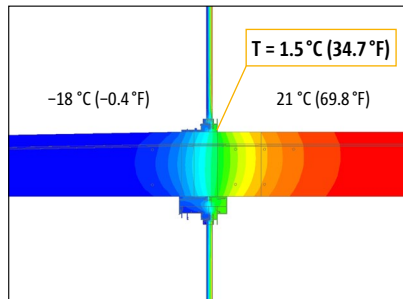
Surface Temperatures and Condensation Resistance

Cold surface temperatures from structural thermal bridging can result in condensation and mold, compromising the building quality and causing harmful health conditions. Therefore design criteria often specify a minimum interior surface temperature to avoid these critical issues.

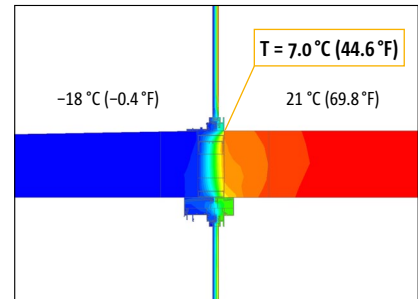
The Morrison Hershfield results confirm that a concrete slab with Schöck Isokorb® is the only option which meets the design criteria for condensation resistance¹⁾. Therefore Isokorb® ensures the durability of the building and avoids costly reparations. In addition, thermal comfort is increased by a 7.5 °C (13 °F) difference in surface temperatures compared to traditional solutions, improving quality of life for the occupants. This difference increases for enhanced envelope performances.



Conventional solution (continuous concrete slab)



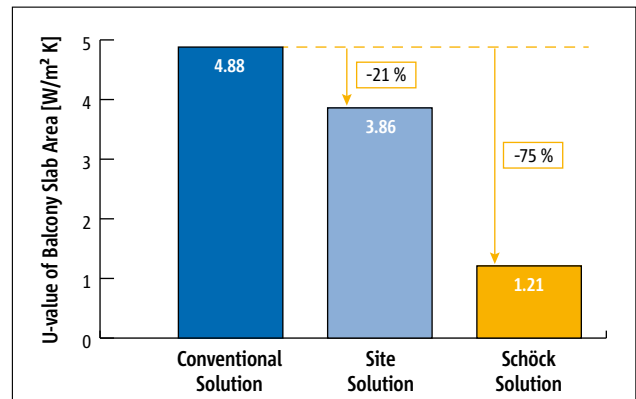
Site solution with intermittent concrete



Schöck Isokorb®, providing significantly improved interior surface temperatures

Thermal Transmittance and Reduction of Heat Loss

Structural thermal bridging results in increased heat flow caused by highly conductive materials penetrating the building envelope. Schöck Isokorb® thermally separates the exterior and the interior structure. The study demonstrates that the u-value at the modelled section is significantly reduced by implementing Schöck Isokorb® thermal breaks. Therefore the heat flow at the balcony section is effectively cut by 75 % compared to traditional construction methods. This not only results in increased interior surface temperatures but saves operational heating energy costs.

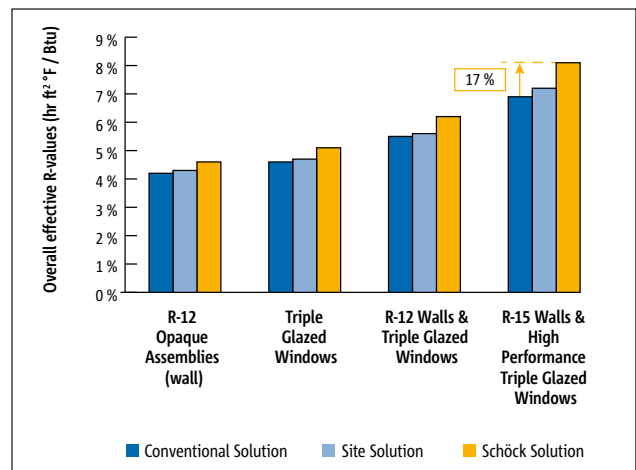


Whole Building Energy Analysis

The reduction of heat loss by implementing Schöck Isokorb® results in heating energy savings of 7.3 % for the high-rise building “as-designed”.

Looking at different enhanced envelope scenarios, the study shows that improving the balcony thermal bridge with Schöck Isokorb® increases the overall R-values of the façade by up to 17 % for high performing building envelopes.

This again saves up to 14 % operational heating costs and also helps the building to meet current building codes in terms of energy efficiency without other costly improvements to glazing, wall insulation or changes in window-to-wall ratio.

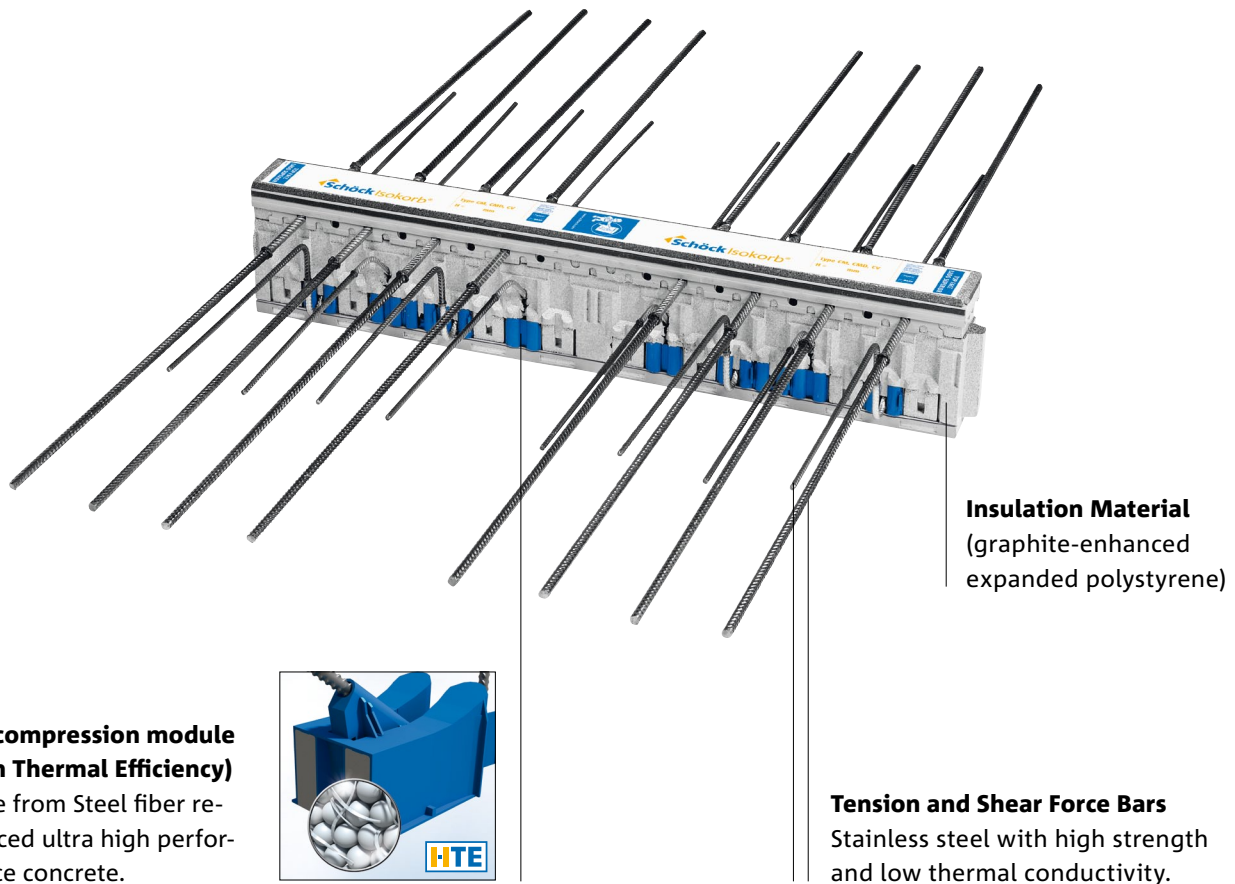


Conclusion

Balconies will continue to be an important feature of high-rise residential buildings. The findings from the Morrison Hershfeld research prove that Schöck Isokorb® structural thermal breaks provides:

- ▶ delivers an effective thermally broken slab that reduces the heat loss by 75 % through the balcony
- ▶ increases interior slab surface temperatures, providing improved thermal comfort
- ▶ avoids condensation risks
- ▶ substantially saves overall heating energy costs.

For further information on implementing Schöck Isokorb® in your projects, visit www.schock-us.com, or contact us at 855-572-4625.



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