ASSESSMENT OF THERMAL BRIDGING OF FASTENERS THROUGH INSULATED ROOF ASSEMBLIES

ABSTRACT

Roof fastener systems are comprised of metal screws and plates used to attach roof membranes, cover boards, and insulation. These systems can have an adverse impact on the thermal performance of roof assemblies, as the components create thermal bridges that bypass the thermal resistance of insulation in the roof assembly. This in turn allows heat to escape at an accelerated rate, flowing outward in cold weather and inward in warm weather. While the thermal performance of 3-D thermal bridges can be numerically simulated with software tools, such simulations are time-consuming and need to be verified by laboratory tests to validate the underlying assumptions made during the simulation.

During this presentation, participants will learn how the research team used a series of laboratory tests to compare the thermal performance of physical models of simple roof assemblies under controlled laboratory environmental conditions with computer simulations of the same conditions. Assemblies were comprised of high-density polyisocyanurate cover board, polyisocyanurate insulation, and steel deck, tested both with and without #12 and #15 fasteners and plates. In this session, the results of both physical models and computer simulations are presented and compared. The outcome is an experimentally validated computer simulation approach that will enable consultants to evaluate a broader range of roof assemblies and roof fastener configurations.

LEARNING OBJECTIVES

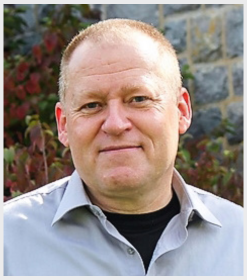
» Understand the physics behind the adverse impact of fasteners and plates on the thermal performance of roof assemblies.

» Identify the limitations of both physical models and computer simulations of real-world roof assemblies.

» Describe the impacts of fasteners and plates on the thermal performance of roof assemblies as identified in physical models and computer simulation studies.

» Recognize the potential application of this study's conclusions to the evaluation of additional roof assemblies and modification of existing codes and standards.

SPEAKERS



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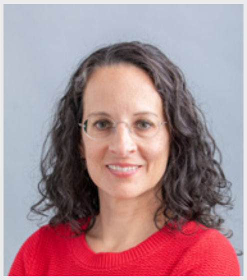
Dr. Georg Reichard is a professor and department head of building construction and an associate director in the Myers-Lawson School of Construction at Virginia Tech. His research deals with experimental and numerical methods, simulation, and data modeling, in particular in the area of building sciences related to building enclosures and environmental systems. In his current research, he focuses on building performance, enclosure durability, disaster resilience, energy efficiency, and integrated decision-making for retrofit solutions in connection with different control strategies and building materials. Reichard holds a master's and a doctoral degree in civil engineering from Graz University of Technology, Austria.



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Elizabeth J. Grant is director of building enclosure research + innovation at GAF. She is a member of IIBEC, National Women in Roofing, Roofing Industry Committee on Weather Issues, and American Institute of Architects. Grant wrote Integrating Building Performance with Design: An Architecture Student's Guidebook, and has published in IIBEC Interface, the Journal of Architectural Engineering, the Journal of Green Building, Professional Roofing, Architectural Science Review, and Buildings & Cities. Before joining GAF, she was an associate professor at Virginia Tech's School of Architecture + Design, researching the building enclosure and offering courses in architectural design, environmental design research, and environmental building systems.