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# Advances in Hygrothermal Performance of Building Envelopes

STP 1599

Editors:  
Phalguni Mukhopadhyaya  
Diana Fisler



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**SELECTED TECHNICAL PAPERS**  
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# Advances in Hygrothermal Performance of Building Envelopes: Materials, Systems and Simulations

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## Foreword

THIS COMPILATION OF Selected Technical Papers, STP1599, *Advances in Hygrothermal Performance of Building Envelopes: Materials, Systems and Simulations*, contains peer-reviewed papers that were presented at a symposium held October 26–27, 2016, in Orlando, Florida, USA. The workshop was sponsored by ASTM International Committee C16 on Thermal Insulation and Subcommittee C16.33 on Insulation Finishes and Moisture.

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## Overview

Since 1938, ASTM Committee C16 has been developing standards and disseminating information generated from research on the hygrothermal (i.e., heat-air-moisture) response of building envelope materials and systems. During the last eight decades, the building construction industry has witnessed many social, economical, and technical challenges. These challenges at times appeared to be overwhelming, but innovations and adaptations have been key factors for the advancement and state of the building construction industry today. This advancement has been possible because of the synergistic collaborations between academics, researchers, and industry managers. ASTM successfully provided a platform to stimulate and nurture these interactions over the years.

Buildings account for about 40 % of national energy demand in developed nations. Quite naturally, in recent years, sustainability and energy efficiency of buildings have become key issues for national and international policy makers dealing with the impacts of climate change and mitigation strategies. National and international energy efficiency benchmarks for buildings, established by codes and regulations, have gone up significantly during the last decade. In order to meet these targets, new energy-efficient building materials, insulations, and technologies are being introduced in the construction industry, at times with very little information on their effectiveness and durability. Successful implementation of building codes and regulations and integration of novel materials and technologies need a strategic approach towards research and development focusing on the performance and durability of new materials and technologies.

The *Symposium on Advances in Hygrothermal Performance of Building Envelopes: Materials, Systems and Simulations* was held on October 26 and 27, 2016, at the Renaissance Orlando at SeaWorld in Orlando, FL, USA. The primary aim was to create a forum for lively discussion of progress in laboratory testing, field monitoring, modeling, and validation of the hygrothermal properties of thermal insulations and related building materials. This special technical publication (STP) presents 19 selected peer-reviewed papers from the symposium, authored by experts and researchers from industry and academics. The first section of the STP presents the papers that deal with the challenges associated with the measurement, analysis, and test standard development. The second section presents the challenges and observations related to the assessment of system performance. The

papers in the final three sections demonstrate the applicability and effectiveness of simulation tools and engineering analyses to address materials, systems, and in-situ hygrothermal performance issues. Overall, the contents of this STP present the latest advances in research and applications related to hygrothermal performance of building envelopes.

Finally, the editors would like to thank the ASTM C16 symposium organizing committee and all of the reviewers, sponsors, and session chairs who devoted their valuable time and resources for the successful organization of the symposium. Special thanks are due to Dr. David Yarbrough for his constructive suggestions, guidance, and support throughout, and the ASTM C16 staff manager Mary Mikolajewski and publishing specialists Alyssa Conaway and Sara Welliver for their timely assistance, patience, and attention to all minute details and timelines.

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